APPENDIX A

Notice of Preparation and Comments Received

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

San Francisco Planning

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San Francisco, CA 94103
628.652.7600
www.sfplanning.org

NOTICE OF PREPARATION OF ENVIRONMENTAL IMPACT REPORT

Date:	June 16, 2021
Case No.:	**2019-016230ENV**
Project Title:	**San Francisco Housing Element 2022 Update**
Zoning:	Various Use Districts Various Height and Bulk Districts
Block/Lot:	Various
Project Sponsor:	San Francisco Planning Department, Kimia Haddadan – (628) 652-7436, kimia.haddadan@sfgov.org
Staff Contact:	Elizabeth White – (628) 652-7557, CPC.HousingElementUpdateEIR@sfgov.org

Introduction

The San Francisco Planning Department (department) prepared this notice of preparation of an environmental impact report (EIR) for the San Francisco Housing Element 2022 Update (housing element update). The housing element update is mandated by state law, Government Code section 65583. The purpose of the EIR is to provide information about the physical environmental effects of the housing element update, identify possible ways to minimize any potentially significant adverse effects, and describe and analyze possible alternatives to the housing element update. The department is issuing this notice to inform the public and responsible and trustee agencies about the housing element update and its intent to prepare an EIR and provide notice of a public scoping meeting to solicit comments on the scope of the EIR.

You may participate in the public process concerning the project's environmental effects by:

- Contacting Elizabeth White via email, phone, or by mail; OR
- Attending a virtual public scoping meeting on Tuesday, June 29, 2021, at 6 p.m. by Zoom conference or telephone. You can register for the meeting via the online platform link at https://zoom.us/webinar/register/WN_4cHkRmZBQkic08Ah3JqnSA or join by phone, using the following phone number: 669-900-6833 (Meeting I.D.: 936 5692 7021). To request a language interpreter, please contact Candace SooHoo at 628-652-7550 at least 72 hours in advance of the meeting to help ensure availability.

The notice of preparation, scoping meeting presentation, and virtual scoping meeting instructions are available here: sfplanning.org/sfceqadocs. You may also request a CD or paper copy of the notice of preparation by contacting Elizabeth White.

Proposed Action

The department proposes to update the 2014 housing element of the San Francisco General Plan (general plan). The EIR will evaluate the physical impacts on the environment that could result from adoption and implementation of the housing element update.

中文詢問請電 Para información en Español llamar al Para sa impormasyon sa Tagalog tumawag sa 628.652.7550
للحصول على معلومات باللغة العربية، اتصل على 628.652.7557 Информацию на русском языке можно получить, позвонив по телефону 628.652.7557
Để biết thông tin bằng tiếng Việt, hãy gọi số 628.652.7557 한국어로 된 정보는 628.652.7557로 전화주세요.

The housing element update establishes goals, policies, and actions to address the existing and projected housing needs of San Francisco. The goals, policies, and actions are required to plan for the regional housing targets allocated to San Francisco by regional agencies for the 2023–2031 cycle and meet future housing demand in San Francisco. The housing element update includes policies designed to improve housing affordability and advance racial and social equity in accordance with the directives from the planning commission and historic preservation commission in June 2020. The housing element update includes six overarching goals for the future of housing in San Francisco that respond both to state law requirements as well as local community values. The underlying policies and actions would guide development patterns and the allocation of resources to San Francisco neighborhoods.

The public process for updating the housing element was launched in June 2020, and the first phase of outreach was completed in December 2020. Based on this community outreach and engagement, a first draft of goals, policies, and actions was published in April 2021. The housing element update process will include two additional rounds of outreach; the public vetting process is scheduled to complete by early 2022.

The draft goals, policies, and actions were informed by other recently completed housing-related initiatives, such as the housing affordability strategies report published by the department in March 2020. That report analyzed land use concepts and how they would improve housing affordability over the next 30 years, particularly for low- and moderate-income households. It analyzed development feasibility, along with City and County of San Francisco (City) policies, and public investments to add 150,000 housing units by 2050, or approximately 5,000 new housing units per year; at least one-third of the housing units should be permanently affordable at low and moderate incomes. The future development patterns that will be analyzed by the EIR as the probable result of the housing element update will draw from these land use concepts.

The housing element update would modify the policies of the general plan's housing element. In general, the proposed housing element update would shift an increased share of the city's future housing growth to transit corridors and low-density residential districts within high-opportunity areas.[1] It would not include specific changes to existing land use controls (e.g., zoning) or approve any physical development (e.g., construction of housing or infrastructure). However, the EIR assumes that such actions are reasonably foreseeable future outcomes of the housing element update. As such, the EIR will evaluate the potential physical environmental impacts that could result from future actions for implementing the policies proposed under the housing element update at a programmatic level, in accordance with California Environmental Quality Act (CEQA) Guidelines section 15168. A programmatic analysis is appropriate for a project that will involve a series of actions that are (1) related geographically, (2) logical parts in a chain of contemplated actions, (3) connected as part of a continuing program, and (4) carried out under the same authorizing statute or regulatory authority and have similar environmental impacts that can be mitigated in similar ways. To the extent that any future changes to land use controls are proposed that were not contained in the housing element update, those changes would most likely require further environmental review and approval.

One foreseeable future outcome of the housing element update would be the designation of housing sustainability districts that would streamline review and approval of residential and mixed-use residential development projects, as directed by several draft policies of the housing element. Therefore, in addition to programmatic review of the housing element update, the EIR will also evaluate at a project level the designation

[1] High-opportunity areas are neighborhoods identified by the State of California that provide strong economic, health, and educational outcomes for its residents.

of portions of San Francisco as housing sustainability districts, in accordance with Government Code sections 66202 to 66210 and Public Resources Code sections 21155.10 and 21155.11.

Plan Bay Area 2050

In addition to the proposed action described above, the EIR will analyze growth forecasted in San Francisco by the Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG) as part of Plan Bay Area 2050. Plan Bay Area 2050 is expected to be adopted by MTC and ABAG in fall 2021. Plan Bay Area 2050 forecasts approximately 578,000 households residing in San Francisco by 2050. The approximately 578,000 households would result in approximately 596,000 housing units a 35,000-unit increase over the city's proposed housing element update, and could result in a different development pattern.

Housing Element Background

The housing element is San Francisco's long-range plan for meeting anticipated future housing needs throughout the city. As discussed below, the housing element must be updated on a regular basis in accordance with state planning and housing law. The housing element update addresses anticipated growth through 2050 and centers on housing affordability and racial and social equity. It includes goals that will guide the future of housing in San Francisco, policies that will guide land use decisions and resource-allocation decisions for housing creation and services, and actions that will help meet the city's housing goals.

State certification of the housing element provides the city with a number of benefits, including priority access to state housing funds. Without a certified housing element, the city risks ineligibility for state housing and infrastructure funds as well as the loss of state and federal housing assistance funding.

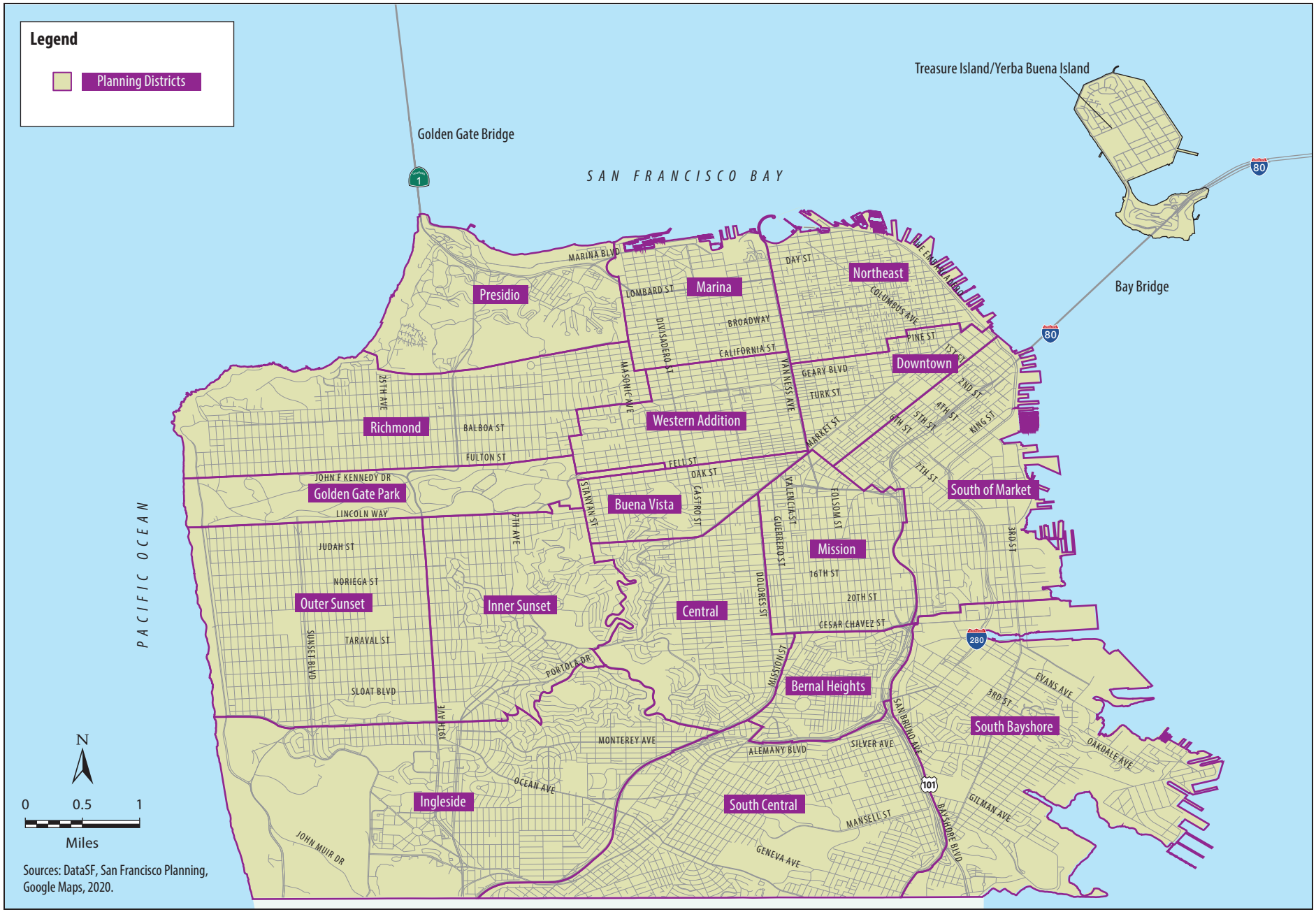
Location

San Francisco is a consolidated city and county, approximately 49 square miles in size. The city is the northern tip of the San Francisco Peninsula, with the Golden Gate Strait to the north, San Francisco Bay to the east, San Mateo County to the south, and the Pacific Ocean to the west. The city is one of nine counties adjacent to San Francisco Bay and San Pablo Bay collectively known as the San Francisco Bay Area. Daly City and the city of Brisbane abut San Francisco to the south. Interstate 280 (I-280) and State Route 1 (SR-1) provide access to the city from the south, U.S. 101 provides access to the city from the north and south, and Interstate 80 (I-80) provides access to the city from the east.

Topography in the city is varied; portions of the city are rolling or hilly, with elevations rising from sea level to 938 feet at Mount Davidson in the south-central part of the city. Most of the city's natural hydrology has been altered by urban development.

As illustrated in Figures 1 and 2, respectively, the city is divided into planning districts[2] and planning areas.[3] Although the city is densely developed, developable vacant and underutilized parcels[4] exist throughout the city.

[2] The city is divided into 17 planning districts, which are used in various aspects of the planning process.
[3] Planning areas are those parts of the city identified in the general plan that have undergone comprehensive community planning efforts and for which specific localized goals and objectives have been defined.
[4] The department defines *underutilized parcels* as those where the ratio of maximum possible building square footage allowed by zoning to the existing total building square footage is 30 percent or less.



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Case No. 2019-016230ENV
San Francisco Housing Element 2022 Update

Figure 1
Project Location and Planning Districts

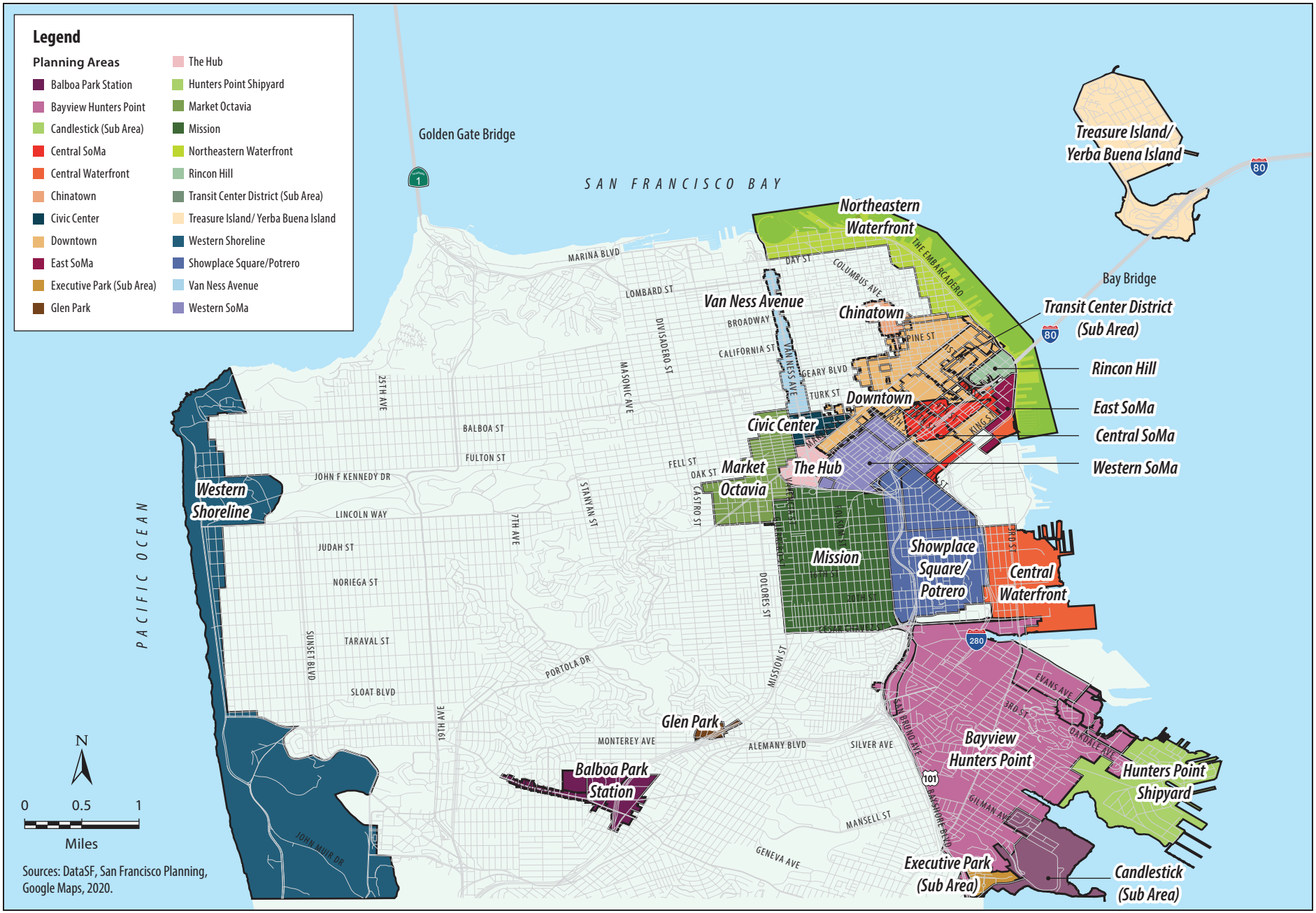

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Figure 2
Project Location and Planning Areas

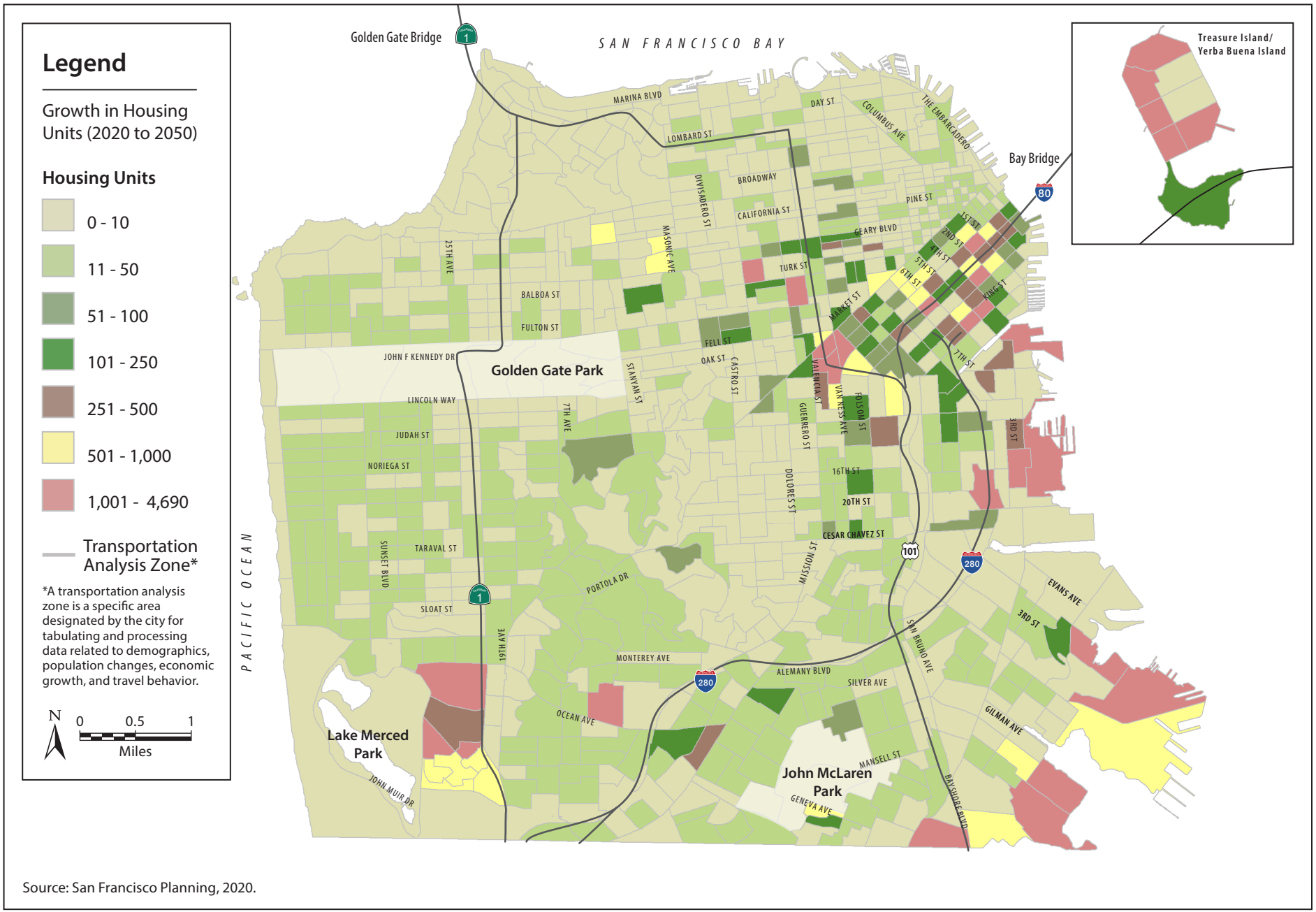
Baseline Conditions

If the proposed housing element update is not adopted, the EIR will assume that housing development would continue to occur under the policies and implementing measures of the existing 2014 housing element. As such, the environmental impact analysis in the EIR will use projected future conditions (2050) as a baseline against which the significance of environmental impacts will be assessed, not existing conditions. Using existing conditions as a baseline would be misleading and would have minimal informative value for decision-makers and the public because growth would continue to occur in the city whether or not the policies in the updated housing element are adopted. Figure 3 shows the anticipated housing growth in the city through 2050 under baseline conditions.

As of 2020, there were approximately 407,000 households and 770,900 jobs in the city. Under 2050 baseline conditions, the department projects that there would be approximately 508,800 households and 881,600 jobs in the city, an increase of 101,700 households and 110,700 jobs compared to 2020 conditions.

Generally, as of 2020, the highest housing densities in the city exist in the downtown area, at an average density of 218 dwelling units per acre, while lower densities (as low as 14 dwelling units per acre) exist in the western and southern areas of the city.[5] Figure 4 shows a generalized zoning map of the city. As shown, most areas in the city allow residential uses; the eastern portion of the city comprises commercial, mixed, and industrial uses. Figure 5 shows a generalized height map of the city. As shown, the tallest height districts occur in the downtown and South of Market (SoMa) planning districts.

[5] San Francisco Planning Department, *Summary of the Planning Code Standards for Residential Districts,* https://sf-planning.org/sites/default/files/FileCenter/Documents/5358-Residential%20Standards%20 Summary%20Table.pdf, accessed September 3, 2020.



Source: San Francisco Planning, 2020.

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Figure 3
Anticipated Housing Growth under Baseline Conditions

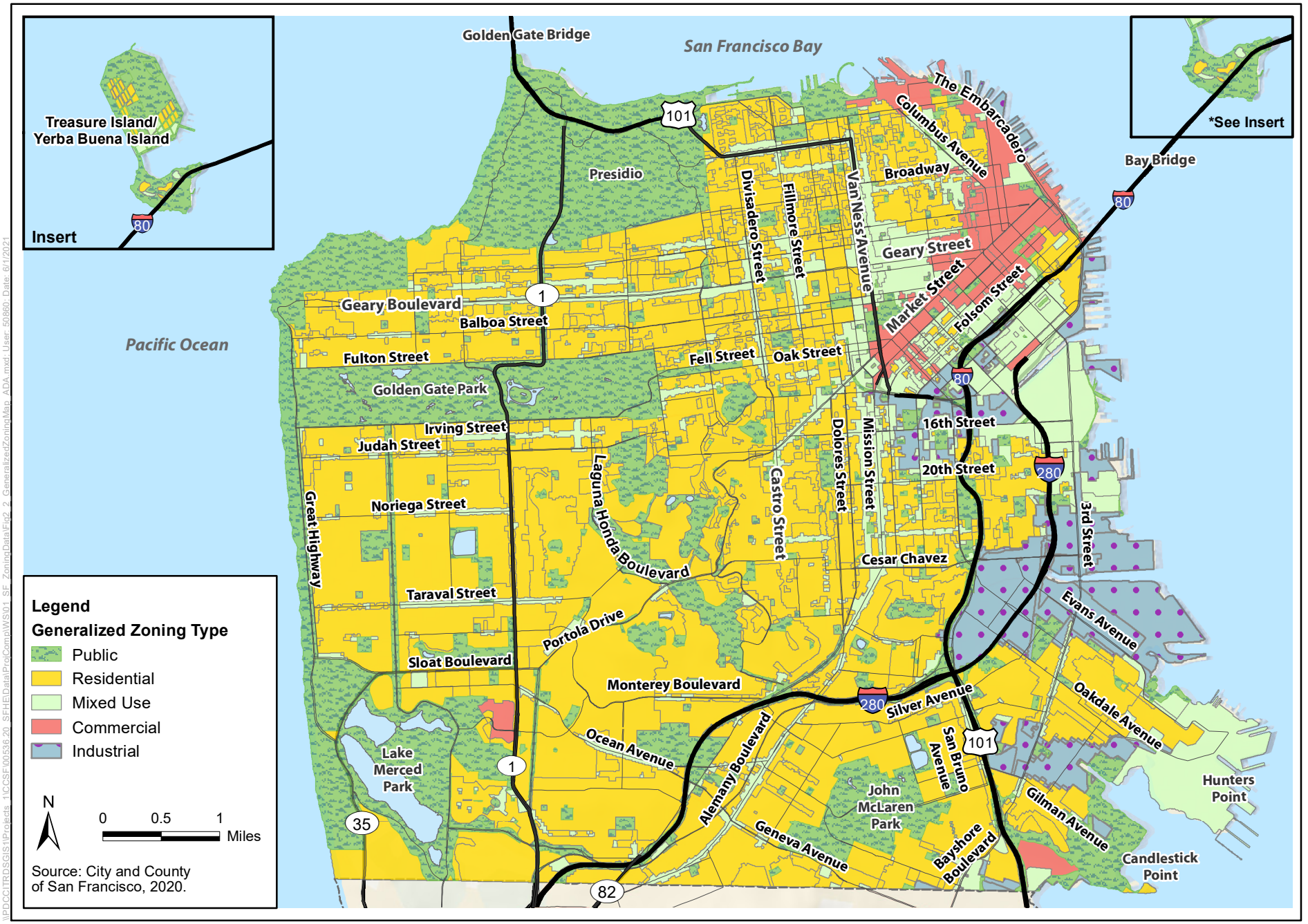

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Figure 4
Generalized Citywide Zoning Map under Baseline Conditions

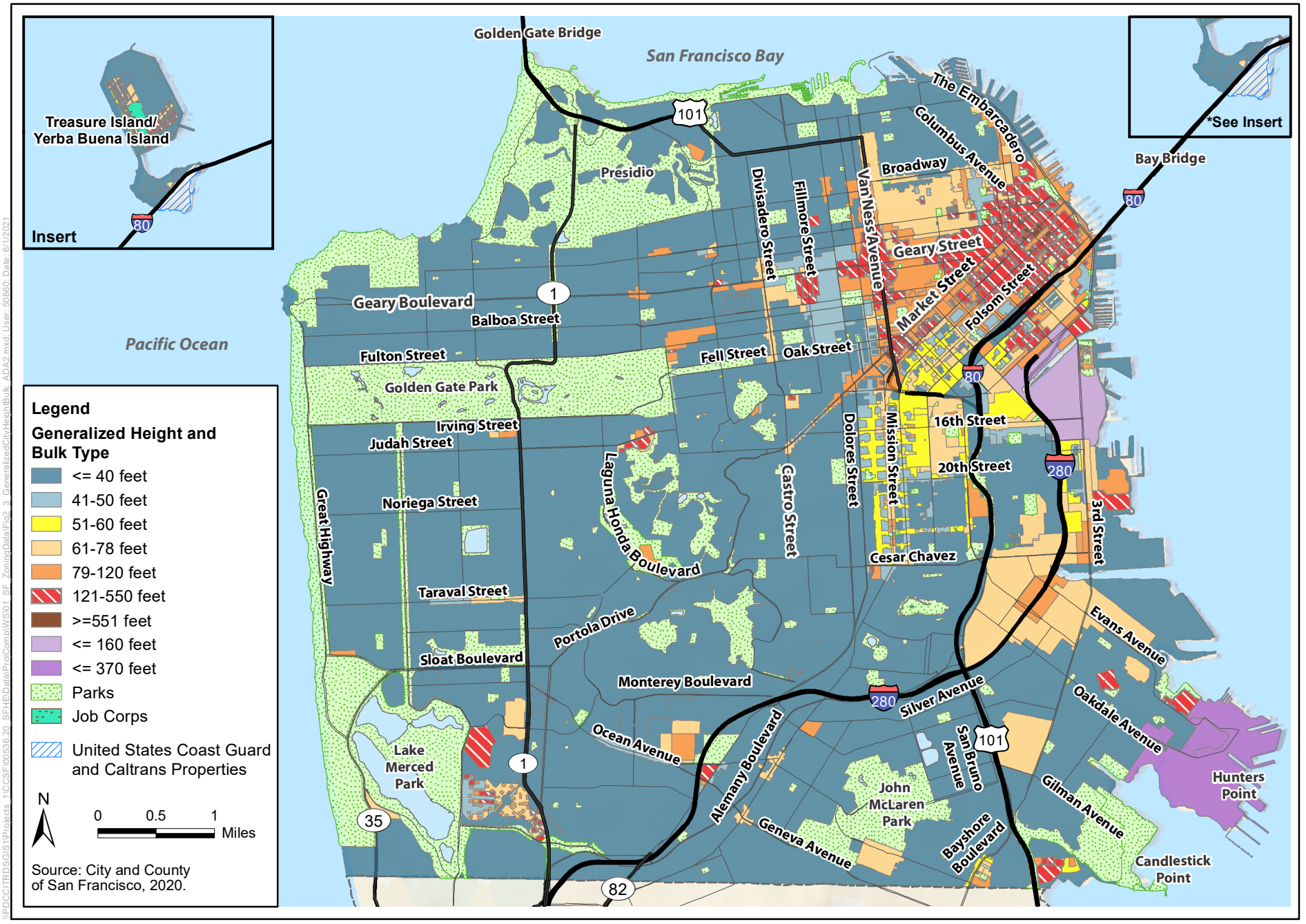

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Figure 5
Generalized Citywide Height and Bulk Map under Baseline Conditions

Housing Element Update Components

The proposed housing element update, as drafted, would shift an increased share of the city's future housing growth to transit corridors and low-density residential districts within high-opportunity areas.

To analyze the physical impacts of the proposed housing element update, the environmental analysis will rely on two land use concepts: 1) transit corridors and 2) residential districts. These two concepts are based on the concepts from the housing affordability strategies.

TRANSIT CORRIDORS

The housing element update would focus development and encourage increased land use density and intensity along transit corridors and transit nodes in the city, including but not limited to:

- Van Ness Avenue
- Geary Boulevard
- Irving/Judah streets
- Taraval Street
- Park Presidio and 19th Avenue
- Mission Rapid San Francisco Municipal Railway (Muni) Corridor
- San José Avenue Muni Corridor
- Ocean Avenue
- Geneva Avenue
- Lombard Street
- West Portal Avenue
- Transit Nodes
    - 500-foot radius at Castro and Market streets
    - 500-foot radius of Forest Hill Station
    - 500-foot radius of 19th Avenue and Taraval Street

The majority of these corridors are located in high-opportunity areas, which currently provide amenities for local residents. The increased housing along these corridors and nodes could result in the development of new or improved amenities, such as schools, parks, and health clinics, or the development of additional commercial and retail uses. Policies and objectives supporting this land use concept would direct a greater portion of the projected growth for the city through 2050 to the transit corridors identified above as well as areas within approximately two blocks (or 0.25 mile) of these corridors. Figure 6 shows the areas where additional housing growth is anticipated under the Transit Corridors land use concept.

Legend

Areas for Additional Housing Growth

N 0 0.5 1.0 Mile

Source: San Francisco Housing Affordability Strategies, 2020.

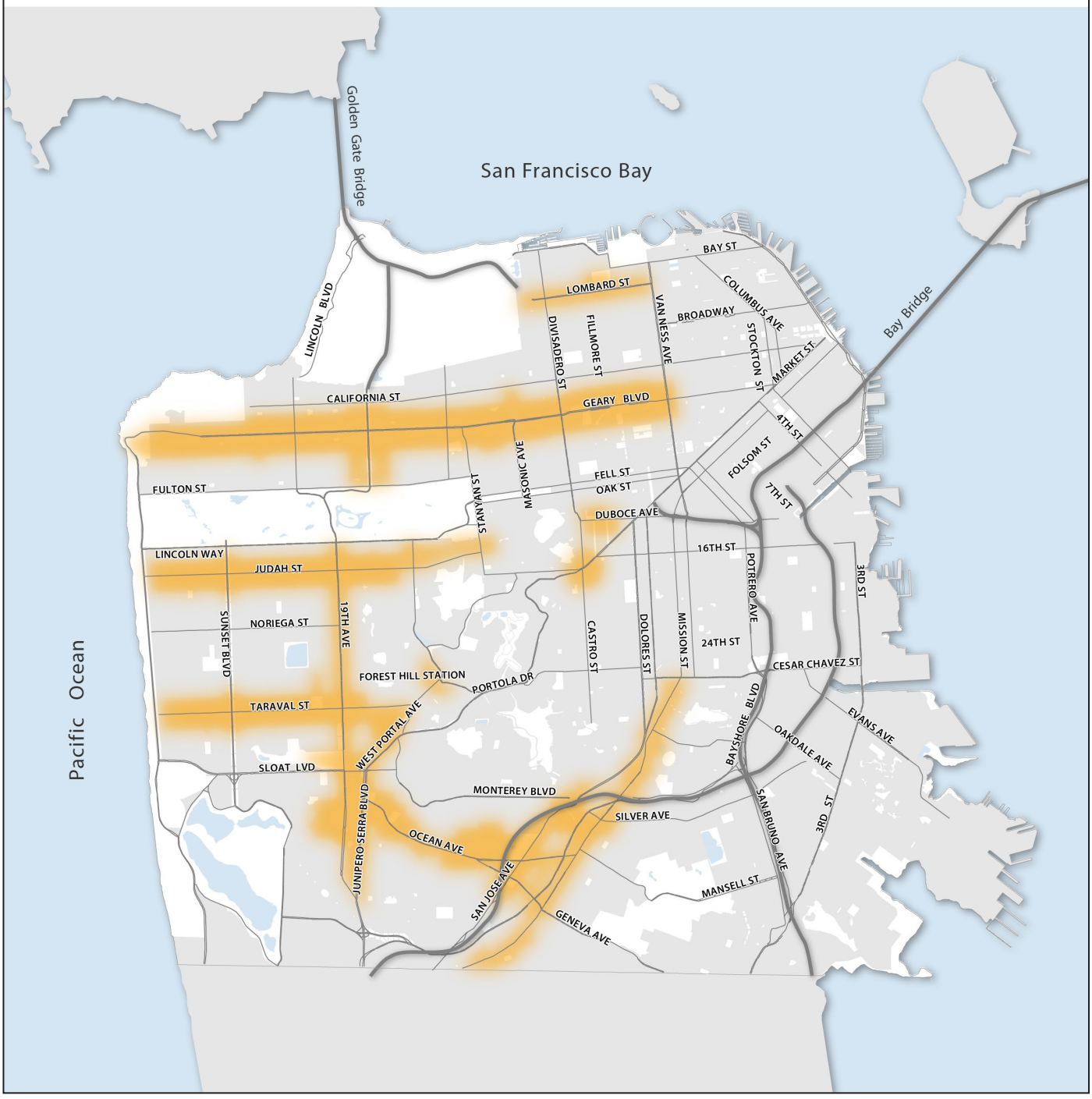

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Figure 6
Transit Corridors

RESIDENTIAL DISTRICTS

The housing element update would promote more housing throughout existing residential neighborhoods outside of the downtown and eastern neighborhoods, allowing multi-family buildings[6] in neighborhoods that are currently zoned for single-family uses. These neighborhoods would continue to serve mostly local needs. In some locations, they could result in demand for the development of new amenities, such as schools, parks, and health clinics, or the development of additional commercial and retail uses. Policies and objectives supporting this land use concept would direct a substantial portion of the projected growth for the city through 2050 to residential neighborhoods by removing density limits in high-opportunity areas that allow residential uses, including Residential Housing (RH) and Residential Mixed (RM) zoning districts and Neighborhood Commercial (NC-1 thru NC-3) districts. Figure 7 shows the areas where additional housing growth is anticipated under the Residential Districts land use concept.

DRAFT HOUSING ELEMENT POLICIES

At the date of the publication of this notice of preparation of an EIR, the department is actively engaged in a community planning process to develop and finalize the specific goals, policies, and actions that will form the proposed housing element update. The department published the first draft of the housing element update policies on April 8, 2021. Examples of policies proposed in this first draft that could lead to different physical environmental effects than those anticipated under the existing housing element include:

- Policy III.5: Ensure equitable geographic distribution of new multi-family housing throughout the city to reverse the impacts of exclusionary zoning practices and reduce the burden of concentrating new housing within priority geographies.
- Policy III.6: Increase housing choices along rapid bus and rail corridors and near major transit stops in high-opportunity neighborhoods through zoning changes and streamlined approvals.
- Policy III.7: Increase housing choices by allowing and facilitating small multi-family buildings in low-density areas within high-opportunity neighborhoods.
- Policy III.8: Enable low- and moderate-income households, particularly American Indian, Black, and other People of Color, to live and prosper in high-opportunity neighborhoods by increasing the number of units that are permanently affordable.
- Policy IV.2: Maintain sufficient development capacity to respond to the increasing housing need and the scarcity of housing supply within the city and the region.
- Policy IV.3: Reduce development constraints, such as high construction cost and the lengthy City-permitting timeline, to increase housing choices and improve affordability.
- Policy IV.4: Maximize the number of permanently affordable housing units constructed through private development without public subsidy.
- Policy IV.5: Maximize the use of publicly owned sites for permanently affordable housing in balance with community infrastructure and the facilities that can be accommodated on those sites.

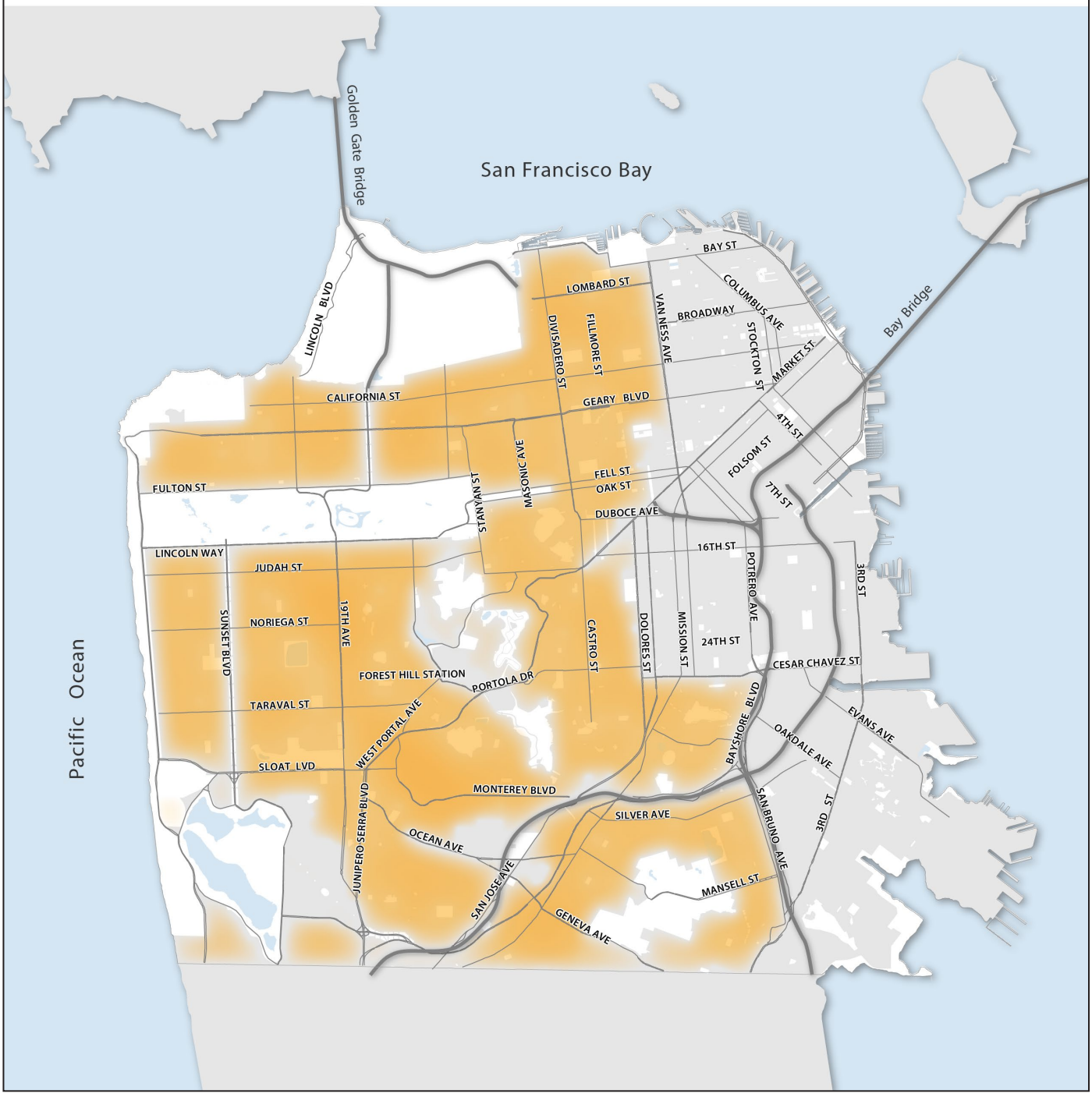
[6] The number of homes allowed on residential lots under this concept would be based on rules for controlling the form of buildings, including height, bulk, setbacks, design, and open space, as well as requirements for multi-bedroom units.

Legend

Areas for Additional Housing Growth

N 0 0.5 1.0 Mile

Source: San Francisco Housing Affordability Strategies, 2020.



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Case No. 2019-016230ENV
San Francisco Housing Element 2022 Update

Figure 7
Residential Districts

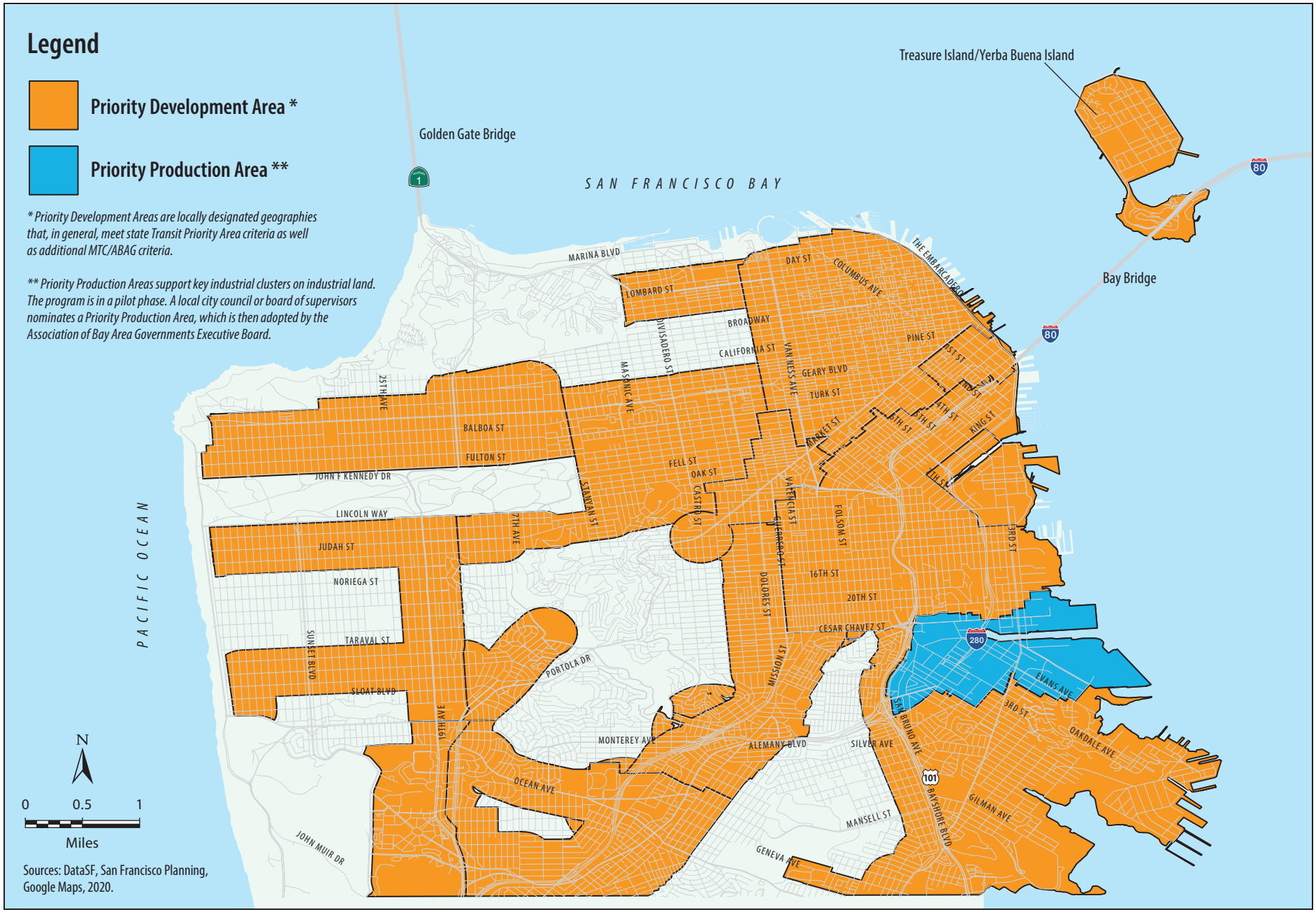
- Policy V.1: Promote and facilitate aging in place for seniors and multi-generational living.
- Policy V.2: Prevent the outmigration of families with children and support the needs of families to grow.
- Policy V.3: Retain and increase the moderate- and middle-income households by building permanently affordable workforce housing.
- Policy V.4: Facilitate small multi-family buildings as a prominent housing type that private development can deliver to serve middle-income households.
- Policy V.5: Promote group housing as an entry-level housing option for moderate-income households, particularly single-person households.
- Policy VI.1: Facilitate neighborhoods where proximity to daily needs promotes social connections, supports the city's sustainability goals, and advances a healthy environment.
- Policy VI.2: Ensure transportation investments and new housing are planned in parallel to advance well-connected neighborhoods and equitable access to transit.
- Policy VI.3: Advance equitable access to high-quality amenities and resources as part of a healthy and equitable environment in parallel with planning for increased housing.
- Policy VI.4: Advance equitable access to a healthy environment through improved air quality and resilience to natural hazards and climate change impacts, particularly in environmental justice communities.

A second draft of the policies, which will incorporate feedback received during public review, public outreach, and planning commission hearings, will be published in fall 2021 and will inform the draft EIR's impact analysis. Information regarding the housing element update policies is available at https://www.sfhousingelement.org/.

HOUSING SUSTAINABILITY DISTRICTS

One foreseeable future outcome of the housing element update would be the designation of one or more of the areas identified in Figure 8 as a housing sustainability district.[7] Possible housing sustainability districts would be within the areas identified in Figure 8 that are zoned to permit residential use. Should any of these areas be designated as a housing sustainability district, any proposed ordinance would include zoning and design review standards. Eligible projects seeking entitlement under the housing sustainability district that meet the zoning and design review standards would be approvable through a ministerial process. Pursuant to Government Code sections 66202 to 66210 and Public Resources Code sections 21155.10 and 2155.11, subsequent projects in the designated housing sustainability district areas that meet the requirements of a housing sustainability district would not require further environmental review, but would be required to implement applicable mitigation measures determined to be necessary to reduce significant impacts identified in the EIR. The housing sustainability district would require approval from the board of supervisors regarding planning, business and tax regulations and codes, and text amendments to designate portions of the city as housing sustainability districts.

[7] Under Government Code sections 66202 to 66210 and Public Resources Code sections 21155.10 and 21155.11, a housing sustainability district is a designated area in a city created by ordinance and located within 0.5 mile of public transit in which at least 20 percent of all housing units would be affordable for very low-, low-, and moderate-income households for at least 55 years. Individual projects in the housing sustainability district in which at least 10 percent of all units are affordable units that meet certain labor standards and design criteria are eligible for ministerial approval without further environmental review.



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Case No. 2019-016230ENV
San Francisco Housing Element 2022 Update

Figure 8
Plan Bay Area 2050

Plan Bay Area 2050

In addition to the proposed housing element update, the EIR will also evaluate the environmental impacts that could result from growth forecasted in San Francisco as a result of the 35 strategies in Plan Bay Area 2050. Plan Bay Area 2050 serves a long-range regional vision for transportation, housing, the economy, and the environment, defined by strategies – policies and investments advanced by state, regional, and local governments. These strategies would further intensify the existing development pattern in the city to achieve regional climate, equity, and jobs-housing balance goals, among others. Development would be focused primarily in San Francisco's locally-adopted *priority development areas.*[8] It would also focus development on the east side of the city while encouraging increased land use density and intensity along transit corridors and nodes. Figure 9 shows growth for San Francisco under Plan Bay Area 2050.

Approvals and Other Actions Required

Housing Element

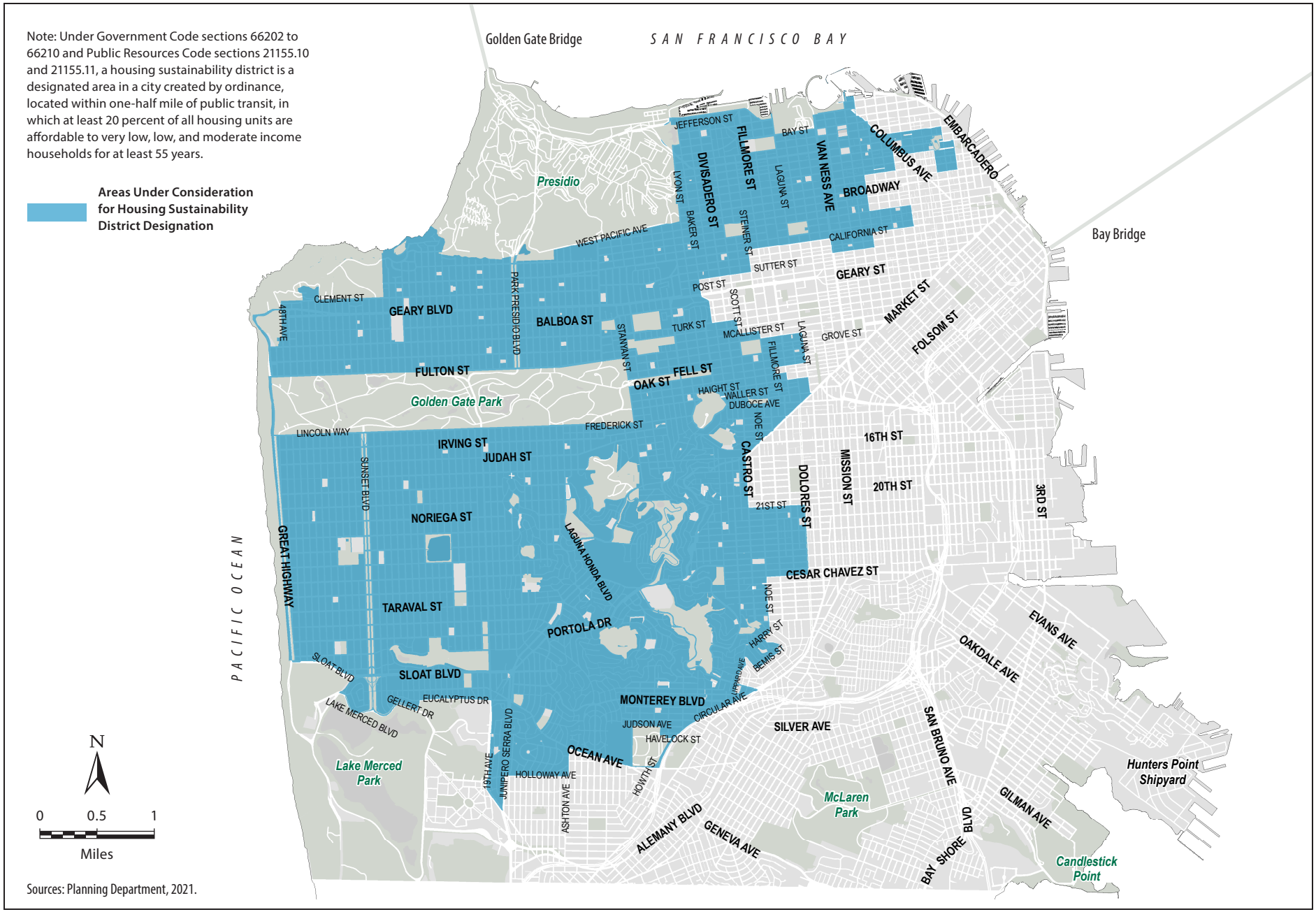
Before any actions can be taken to approve the housing element update, the planning commission must certify the final EIR and recommend the general plan amendments to the board of supervisors. Once the EIR is certified, the housing element update would be adopted through an amendment to the general plan. General plan amendments must be approved by the planning commission and the board of supervisors. Prior to the board of supervisors' adoption, the housing element must be certified as compliant with state housing element law by the California Department of Housing and Community Development.

Summary of Potential Environmental Issues

Adoption of the housing element update and housing sustainability districts could result in potentially significant environmental effects. As such, the department will prepare an initial study and draft EIR to evaluate the physical environmental effects of the housing element update and housing sustainability districts. As required by CEQA, the EIR will further examine those issues identified in the initial study as having potentially significant effects, identify mitigation measures, analyze whether the proposed mitigation measures would reduce the environmental effects to less-than-significant levels, and identify alternatives to the housing element update and housing sustainability districts that would reduce such impacts. The initial study will be published as an appendix to the draft EIR and be considered part of the EIR.

The housing element update does not include any specific planning code amendments, zoning changes, development projects, or other implementing measures. Given that no such actions are proposed at this time, the EIR will evaluate the reasonably foreseeable impacts of such future actions at a program level, in accordance with CEQA Guidelines section 15168.

[8] Priority production areas support key industrial clusters on industrial land. The program is in a pilot phase. A local city council or board of supervisors nominates a Priority Production Area, which is then adopted by the Association of Bay Area Governments Executive Board.



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Case No. 2019-016230ENV
San Francisco Housing Element 2022 Update

Figure 9
Areas Under Consideration for Housing Sustainability District Designation in San Francisco

The EIR will evaluate the physical environmental impacts that could occur as result of possible future rezoning actions as well as future development and infrastructure projects that would implement the policies proposed under the housing element update. The EIR will identify mitigation measures to reduce or avoid impacts determined to be significant. As discussed above, if the proposed housing element update is not adopted, the EIR assumes that housing development would continue to occur under the policies and implementing measures of the existing housing element. As such, the environmental impact analysis presented in this EIR uses projected future conditions (2050) as a baseline against which the significance of environmental impacts are assessed The initial study and EIR will address all environmental topics in the department's CEQA environmental checklist, including the following environmental topics:

- Land Use and Planning
- Aesthetics
- Population and Housing
- Cultural Resources
- Tribal Cultural Resources
- Transportation and Circulation
- Noise
- Air Quality
- Greenhouse Gas Emissions
- Wind
- Shadow
- Recreation
- Utilities and Service Systems
- Public Services
- Biological Resources
- Geology and Soils
- Hydrology and Water Quality
- Hazards and Hazardous Materials
- Mineral Resources
- Energy
- Agriculture and Forestry Resources
- Wildfire

The EIR will include an analysis of the comparative environmental impacts of feasible alternatives to the proposed action that would reduce or avoid one or more of the significant impacts while still meeting most of the action objectives. It will also include analysis of the no-project alternative, as required by CEQA. The EIR will include a discussion of topics required by CEQA, including cumulative impacts, significant unavoidable impacts, significant irreversible impacts, any known controversy associated with the proposed action and its environmental effects, and issues to be resolved by decision-makers.

Finding

The housing element update and housing sustainability district adoption may have a significant effect on the environment; therefore, an EIR is required. This finding is based on the criteria of the *Guidelines of the State Secretary for Resources*, sections 15064 (Determining Significant Effect) and 15065 (Mandatory Findings of Significance). The purpose of the EIR is to provide information about potential significant physical environmental effects of the housing element update, identify possible ways to minimize the significant effects, and describe and analyze possible alternatives to the housing element update. Preparation of a notice of preparation or EIR does not indicate a decision by the city to approve or disapprove the housing element update or adopt a housing sustainability district. However, prior to making any such decision, the decision-makers must review and consider the information contained in the EIR.

Public Scoping Meeting

The department welcomes your comments concerning the potential environmental effects of this project. You can submit your comments verbally at the public scoping meeting, and/or via email or mail to the staff contact below.

The department will hold a PUBLIC SCOPING MEETING on Tuesday, June 29, 2021 at 6 p.m. Due to the COVID-19 emergency, in order to protect the health of city staff and members of the public, the meeting will occur virtually through video and teleconference. The meeting will consist of a staff presentation followed by an opportunity for the public to provide verbal comments regarding the scope of environmental review. Meeting details are included above. Written comments should be emailed to CPC.HousingElementUpdateEIR@sfgov.org (preferred) or sent to Elizabeth White, San Francisco Planning Department, 49 South Van Ness Avenue, Suite 1400, San Francisco, CA 94103 by 5 p.m. on July 16, 2021. Written comments should reference the project title and case number on the front of this notice. If you have questions or comments concerning this notice, please email CPC.HousingElementUpdateEIR@sfgov.org or contact Elizabeth White at (628) 652-7557 by July 16, 2021.

If you work for an agency that is a responsible or a trustee agency, we need to know the views of your agency as to the scope and content of the environmental information that is relevant to your agency's statutory responsibilities in connection with the housing element update. Your agency may need to use the EIR when considering a permit or other approval for this action. We will also need the name of the contact person for your agency.

Members of the public are not required to provide personal identifying information when they communicate with the planning commission or the department. All written or oral communications, including submitted personal contact information, may be made available to the public for inspection and copying upon request and may appear on the department's website or in other public documents.

Recipients of this notice are encouraged to pass on this information to others who may have an interest in the project.

NOTE: This notice is being issued during the suspension of certain CEQA filing and posting requirements pursuant to Executive Order N-80-20, and its issuance complies with the alternative posting requirements stated in the order. This notice also complies with local requirements under the March 23, 2020, Fifth Supplement to the Mayoral Proclamation Declaring the Existence of a Local Emergency Dated February 25, 2020.

June 16, 2021
Date



Lisa Gibson
Environmental Review Officer

COUNTY AND CITY OF SAN FRANCISCO

EIR SCOPING MEETING

HOUSING ELEMENT 2022 UPDATE

---OOO---

Reporter's Transcript of Proceedings

REMOTE HEARING

via video and teleconferencing

TUESDAY, JUNE 29, 2021

6:00 P.M.

Reported by:

Connie J. Parchman, RPR, CRR, CSR 6137

JAN BROWN & ASSOCIATES

WORLDWIDE DEPOSITION & VIDEOGRAPHER SERVICES

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(415)981-3498 or (800) 522-7096

Staff:

Elizabeth White, Senior Environmental Planner

Alana Callagy, Senior Environmental Planner

Chris Kern, Principal Environmental Planner

Ryan Shum, Environmental Planner

Candace Soohoo, Deputy Communications Manager

Interpreters:

Sheila Chau, Cantonese

Marissa Ayerdi, Spanish

Dulce Pino, Tagalog

Consultant:

Kim Avila, ICF

Jessica Viramontes, ICF

TUESDAY, JUNE 29, 2021

HOUSING ELEMENT 2022 UPDATE

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ELIZABETH WHITE: Hi, everyone. Welcome to the Housing Element 2022. My name is Liz White and I'm a planner with the San Francisco Planning Department.

We're just going to give everyone another minute or two to enter the room before we begin this meeting.

So please also note that if you have logged in using Zoom and are experiencing any technical issues, please use the chat box and a member of our team will try to assist you.

So again we'll just give it a couple minutes while we wait for our participants to join.

Again, hello. Thank you, everyone, for attending. For those of you that have just joined, my name is Elizabeth White. And welcome to the Housing Element 2022 Update, Environmental Impact Report, or EIR, scoping meeting.

I would like to introduce other members of the Housing Element EIR team from San Francisco Planning.

Chris Kern, Principal Environmental Planner.

Alana Callagy and Ryan Shum, Senior Environmental Planners and Housing Element EIR

coordinators.

I would also like to introduce our Housing Element EIR consultant team, Kim Avila, Project Director and Jessica Viramontes, Senior Environmental Planner.

Kim will be moderating today's meeting.

Please note that we will be recording and posting a link to this recording on our San Francisco --

(Computer voice: This meeting is being recorded)

ELIZABETH WHITE: Next slide, please.

We are broadcasting this meeting in Cantonese, Spanish and Filipino. Our interpreters, Sheila, Marissa and Dulce will now provide the call-in information for each language room in Cantonese, Spanish and Filipino.

(Foreign languages spoken.)

ELIZABETH WHITE: Thank you. I will now provide an overview of the meeting agenda.

We will be playing an approximately 13-minute presentation on the Housing Element 2022 Update and environmental review process.

Following that, Kim will provide instructions on how to give public comment on the project and begin moderating the public comment portion of the scoping meeting.

Again, if you are logged in through the Zoom

application and are experiencing technical difficulties, please use the chat box and a member of our team will try and assist you.

Please note that we will be working from one main Zoom room and three language rooms. There may be some delay in the proceedings to account for keeping all four virtual rooms on the same track, as the presentations in the virtual rooms will not end at the same time.

We will wait until the presentation has ended in all four rooms before proceeding with public comment.

As previously mentioned, for the scoping meeting presentation, Kim will explain how to provide public comment on the project.

And now I will share my screen with the presentation.

(Video presentation playing.)

VIDEO VOICEOVER: Hello and thank you for viewing this environmental impact report scoping meeting presentation for San Francisco's Housing Element 2022 Update.

My name is Liz White and I am a planner at the San Francisco Planning Department.

This scoping meeting is an early step in the environmental review process and notices the public that

the Planning Department is preparing an environmental impact report, or EIR.

We are seeking your comment on the scope and content of the EIR for the Housing Element Update by July 16th, 2021.

Spanish, Cantonese and Tagalog interpretation is provided for this meeting. To listen to this meeting in any of these languages, please follow the language instructions provided below.

Please note this meeting will be broadcast simultaneously in English, Spanish, Cantonese and Tagalog.

During this presentation, we will go over the following topics:

The California Environmental Quality Act, or CEQA, review process.

An overview of Housing Element 2022 Update.

An overview of Plan Bay Area 2050.

The Housing Element 2022 Update and CEQA schedule.

And finally how you can participate in the CEQA process.

In San Francisco, the Planning Department leads the CEQA process for projects in compliance with state and local requirements. Here the Planning Department is

preparing a programmatic EIR for the Housing Element 2022 Update.

The purpose of CEQA is to inform decision makers and the public about the proposed action's potential environmental effects;

Engage the public in the environmental review process;

Disclose significant impacts on the environment;

And avoid or reduce significant impacts through alternative and mitigation measures.

The EIR is prepared for the proposed action prior to any final decision by the Planning Commission about whether to recommend adoption of the Housing Element 2022 Update to the San Francisco Board of Supervisors.

The EIR will describe the existing environment and identify both the individual and cumulative impacts of the growth and related development envisioned under the Housing Element Update.

The San Francisco Housing Element 2022 Update is an update to San Francisco's existing 2014 Housing Element. The Housing Element establishes goals, policies and actions to address existing and future housing needs, including regional housing targets for San Francisco's

2023-2031 cycle.

The Housing Element 2022 Update will adopt policies designed to improve housing affordability, advance racial and social equity, and will guide development patterns and resource allocations to San Francisco neighborhoods.

The draft goals, policies, and actions of the San Francisco Housing Element 2022 Update were informed by other recent housing-related initiatives, such as the Housing Affordability Strategies Report.

This report published in March of 2020 analyzed very plain-use concepts to improve housing affordability in San Francisco over the next 30 years.

Phase 1 of the Housing Element 2022 Update outreach started in June of 2020. The team held 15 listening sessions and administered a survey with over 1,600 respondents, most of whom are low-income people of color.

The team worked with a group of housing policy and development experts along with a broader inter-agency review team to create the first draft of goals, policies and actions that were published on April 8th, 2021. This release launched the second phase of outreach and engagement to seek input on the first draft.

The Housing Element 2022 Update is required to

plan for 82,000 units for 2023 to 2031 and will also plan for an estimated $150,000 new housing units by 2050 or approximately 5,000 new housing units per year.

Key draft policies that would enable San Francisco to meet this goal include:

Increasing development capacity, height and density for mid rise buildings along transit corridors;

Enabling small, multifamily homes in low-density areas of high opportunity by removing density control and improving feasibility;

And limiting zoning changes in priority geographies to the needs of American Indian, Black and other communities of color.

The San Francisco Planning Department launched the second phase of outreach and engagement in April of 2021 to seek input on the first draft of the Housing Element 2022 Update policies. This draft proposes shifting an increased share of the city's future housing growth to transit corridors and low-density residential districts within high-opportunity areas.

High-opportunity areas are areas identified by the state as providing positive economic, educational, and health outcomes from low-income households, particularly their children.

The two images on this slide are potential ways

that the Housing Element Update policies could guide development patterns in the city.

As a point of clarification, the Housing Element 2022 Update would not include specific changes to existing land use controls or approve any physical development. However, the environmental review process assumes that such actions are reasonably foreseeable future outcomes of the Housing Element Update and analyzes the potential effects of this outcomes at a programmatic level.

Also under consideration and being explored through the remaining outreach and engagement processes is the designation of housing sustainability districts that would streamline review and approval of residential and mixed-use residential development.

As shown on this image, the area of San Francisco shaded in blue are currently under consideration for designation as a housing sustainability district. When, and if, a housing sustainability district is adopted, eligible development projects that meet the zoning and design review standards could be approved through ministerial process.

Projects that meet the requirements of the housing sustainability district would not require further environmental review, but would be required to implement

applicable mitigation measures determined to be necessary to reduce significant impacts identified in the Housing Element 2022 Update EIR.

In addition to the proposed action described previously, the EIR will analyze growth forecasted in San Francisco by the Metropolitan Transportation Commission or MTC and the Association of Bay Area Governments or ABAG, as part of Plan Bay Area 2050.

Plan Bay Area 2050 is expected to be adopted by MTC and ABAG in fall of 2021.

Plan Bay Area 2050 forecast approximately 578,000 households in San Francisco, which is approximately 596,000 housing units by 2050. This forecast would be planning for 185,000 units for the next 30 years instead of 150,000 units.

The additional 35,000 units under Plan Bay Area 2050 could result in a different development pattern than under the proposed Housing Element Update.

As previously mentioned, the Department published the first draft of the Housing Element Update policies on April 8th, 2021. The Department is actively engaged in a community planning process to develop and finalize the specific goals, policies and actions that will form the proposed Housing Element Update.

A second draft of the policies, which will

incorporate feedback received during the public review, public outreach and Planning Commission hearings will be published in fall of 2021.

A third draft will be published in winter of 2022 and be submitted for state review and compliance.

Public hearings on the approval of the Housing Element 2022 Update are anticipated to start in early 2023.

I will now go over the environmental review schedule.

The current schedule anticipates publishing the Draft EIR and initial study in late spring slash early summer 2022.

To seek input we will distribute a notice of availability of the Draft EIR to interested parties and there will be a public hearing before the Planning Commission during the Draft EIR's public comment period.

Following the close of the Draft EIR comment period we will prepare a Responses to Comments document to address all substantive comments and also identify any changes to the Draft EIR as necessary to fully respond to the comments received.

Following publication of the Responses to Comments document, the Planning Commission will certify the Final EIR and make a recommendation to the Board of

Supervisors regarding adoption of the Housing Element 2022 Update.

I would now like to discuss participation in this first part of the environmental review process.

As previously mentioned, the Planning Department is beginning the environmental review process and we are seeking the public's input on environmental impacts.

Specifically:

Any significant environmental issues;

Comments on the environmental analysis methods or depth of analysis;

Measures to avoid or lessen environmental impacts;

Mitigation or alternatives to reduce impacts.

This is also an opportunity to let us know if you would like to be notified or receive updates as the environmental review progresses.

I would like to clarify that the focus of the scoping process and scoping meeting is to seek comments on the environmental effects of the proposed project.

Comments related to the project, project merits or other non-environmental impacts should be directed to the Housing Element team by visiting www.SFHousingElement.org.

We would like to thank you for viewing this presentation and for your participation in the public scoping process for the Housing Element 2022 Update.

This video is posted on the SFPlanning.org/SFCEQAdocs website along with the notice of availability and notice of preparation.

To submit a written comment on the scope of the Housing Element 2022 Update Environmental Review or to request hard copies of any documents, please email CPC.HousingElementUpdateEIR@SFgov.org.

Or address your comments to Elizabeth White, San Francisco Planning Department, 49 South Van Ness Avenue, Suite 1400, San Francisco, California, 94103.

Verbal comments may be provided by calling (628)652-7557.

Comments are due by July 16th, 2021.

Thank you again for your time and participation.

Now, I will go over instructions for participation during the public comment part of the scoping meeting.

All attendees have been automatically muted upon entry. If you would like to give public comment, you will be given two minutes to speak. And if your comment is being translated, you will be given four

minutes to allow for translation services.

To comment, press the raise hand feature on your screen. Or if you have dialed in, press star nine to unmute. We will state your name or number when it is your turn to speak and you will be unmuted.

If you need technical assistance, please use the chat box to send your message.

(Video presentation concluded.)

ELIZABETH WHITE: Claudia, you can share the next slide?

Thank you.

Kim, I'm going to turn it over to you now.

MS. AVILA: Perfect. So I will be speaking now more slowly than usual as we're translating into three rooms.

This is the public comment, as Elizabeth just explained. We are asking folks to go ahead and raise your hand if you would like to provide comment there will be two minutes per person and we will have a timer on the screen.

And if you are being translated or interpreted into the main room, then we will allot four minutes.

You can press star nine if you're on the Zoom room or star six if you're in a language room.

We will state your name when it's your turn and

you will be unmuted.

Raise your hand or press star nine if you would like to provide a comment on this presentation.

We are keeping a list of commenters from the language rooms. There we go.

Anastasia Yovanopoulos has raised their hand, and I will unmute you. And you will be our first speaker.

I'm unmuting you now. And we will start the timer. And once we do, then you can begin your public comment.

Go ahead and begin.

ANASTASIA YOVANOPOULOS: Can you hear me?

MS. AVILA: Yes.

ANASTASIA YOVANOPOULOS: Anastasia Yovanopoulos and I'm a member of Race and Equity in All Planning Coalition. We have like 35 groups within San Francisco. And we've been studying the Housing Element.

Many of us were involved in taking the survey.

And I want to know first from Kimia, she said the survey was open until July. And you're telling us now that it is probably already closed, so we can't give feedback anymore?

That's one thing I would -- question that got brought up to me during this overview.

And now I'm aware that there's a document and our coalition is going to have to study this document and see what we -- what we come up with in the next two weeks and get it back to you in written form. Is that true?

So, it is a short time frame to provide comments. I know specifically that we don't like some of the language, like priority geographies and some of the things that -- that you said are happening.

So, there's -- we will be giving feedback. And I haven't read the document yet to -- to see how this is going.

You're coordinating with the state. You are coordinating with ABAG, but --

MS. AVILA: You have 30 seconds left.

ANASTASIA YOVANOPOULOS: -- are you really coordinating with the people, people of color, low-income people? There will be so much market-rate housing we won't be able to afford to live here.

Thank you.

MS. AVILA: Thank you for your comment.

We can restart the timer.

I just want to remind folks that in this scoping meeting we are taking comments. We are not replying to comments at this time.

And I'm looking for a raised hand. And also

checking the language rooms to see if there is anyone in our language rooms who would like to speak.

So if you are in a language room, you will have four minutes to speak because your comments will be interpreted a phrase at a time. So you will speak in the language room and our interpreters will be interpreting into this main Zoom room for our court reporter.

And if you're in the main Zoom room, if you could raise your hand or otherwise indicate in the chat that you would like to speak, you can press star nine on your phone. If you're in a language room it would be star six.

We do have members of the public in our different rooms.

We are here today from 6:00 P.M. to 9:00 P.M. Depending on how many folks need to speak.

We will be here -- if there's no one who wishes to speak -- we are checking the language rooms right now to see if there is anyone who wishes to provide comments.

If you're in the main Zoom room, we will ask you to raise your hand or press star nine.

This public scoping meeting is to receive comments on the San Francisco Housing Element 2022 Update Environmental Impact Report.

And if you wish to speak on this document, we

would ask that you raise your hand in the Zoom room or press star nine if you have called in by telephone.

In our language rooms, Cantonese, Tagalog and Spanish, we would ask that you press star six. Those links are available with the meeting announcements.

We will allow four minutes for the interpretation of comment from any of our language rooms. If you are speaking in the main Zoom room, it would be two minutes.

This presentation is available online and we will repeat those links at the end of this meeting. It is available in English, Cantonese, Tagalog and Spanish.

And we will take public comment not just tonight, but also through the public comment period.

I see that there is a commenter.

The only document that has been provided to date is the notice of availability of an Environmental Impact Report. An initial study will be published in the future, in advance of the Environmental Impact Report.

So this public scoping meeting is for the purpose of identifying -- I see a raised hand.

Okay. The next speaker will be a phone number, starting with 650 and ending in 439.

This will be one of our interpreters providing the trans -- the interpretation along with the commenter.

We will set a four-minute timer.

If everyone is ready, that is again the phone number starting with 650 and ending in 439.

If that commenter can now begin.

And that's a four-minute countdown. Thank you.

Our interpreter will be speaking into the Zoom room unmuted.

PHONE APPEARANCE: Hello, can you hear me?

MS. AVILA: Yes.

JONATHAN BUENEMANN: Okay. My name is Jonathan Buenemann. I'm a resident of District 2. And I just wanted to give the comment that I would love if the environmental review would reflect the impact of not building the housing units in San Francisco, but instead building them in outlying more car-dependent areas.

That is my comment.

MS. AVILA: Thank you for your comment.

We can stop the clock.

JONATHAN BUENEMANN: Yes.

MS. AVILA: And I'm sorry, what is the spelling of your last name?

PHONE APPEARANCE: B-U-E-N-E-M-A-N-N.

Bravo, uniform, echo, November, echo, May, alpha, November, November.

MS. AVILA: Thank you.

MS.WHITE: Kim, Claudia, there was a question about where the documents are located.

Until we have another member of the public who wishes to speak, could we go to the slide that shows where a member of the public can find the document?

We do have -- and this is in response to Anastasia. We do have the notice of preparation and notice of availability that are on our web page that are available for members of the public to review.

Comments on the scope of the environmental review are requested by July 16th, 2021. And these are the links where the documents are available. Specifically on that SFPlanning.org/SFCEQAdocs.

And I just want to add if there's any further questions about the environmental review, my number is there as well as an email and I would be happy to talk more.

MS. AVILA: Okay. We are open for public comments.

We can leave this slide up and I will just describe the public comment process.

We are here to take public comment on the San Francisco Housing Element 2022 Update. You may raise your hand or press star nine to provide a comment. If you're in one of our language rooms, you would press star

six.

It's two minutes per commenter. If you're in one of our language rooms, there are four minutes, as you will be translated or interpreted simultaneously into this main session.

We are waiting to see if anyone raises their hand or otherwise indicates that they would like to comment.

We have call-in lines for Cantonese, Spanish as well as Tagalog.

Steve Marzo has raised his hand.

Steve, I will go to the list. You will have two minutes to provide your comments and we will start now.

STEVE MARZO: Hello, my name is Steve Marzo. I live in Ingleside in the south part of San Francisco.

I'm a resident and homeowner. And I would hope that the climate or the environmental impact review would study the impact of building mixed-income housing, especially in wealthy urban neighborhoods, to help improve our climate and their equity.

Right now California has a huge housing shortage. It's been decades in the making, an economic boom has accompanied exodus of nearly a million low-income Californians, often to, you know, states with

cheaper housing.

But also this shortage has caused pressure on mid-income housing. And that's also spurred them to move to suburbs and exurbs which has increased our carbon footprint as well as our efficiency for energy.

The largest source of climate pollution is driving. The majority of this pollution comes from people driving their passenger cars and trucks and also, you know, flying as well.

But, the miles driven has --

MS. AVILA: You have 30 seconds remaining.

STEVE MARZO: -- Through the years. And a big part of this is the sprawl of building out instead of up.

So, you know, what I would hope this environmental review would conclude is not only the conventional efficiency that you would get from, you know, more public transit, but also reducing the vehicle miles traveled by investing inclusive, complete, compact transit.

MS. AVILA: Thank you, Steve. Thank you for your comments.

STEVE MARZO: Thanks a lot.

MS. AVILA: Okay. We are taking public comments on the San Francisco Housing Element 2022 Update, Environmental Impact Report.

Comments are limited to two minutes per speaker. And in our language room --

There we go. Chris Heriot has raised their hand.

I will allow Chris to speak.

Chris, you will have two minutes and you may begin now.

MR. HERIOT: Hi, can you hear me okay?

MS. AVILA: Yes.

MR. HERIOT: Thank you.

I was looking at the document and I noticed that in the baseline scenario, it assumes a job growth of about 15 percent. Actually a little bit less, 14.3 percent over the next 30 years.

That's substantially lower than job growth over the last 30 years, both because of the city's propensity to approve new office development and the booming economy.

I'm wondering what that is based on and if that should actually be much higher.

Even during the pandemic the Board of Supervisors has approved Parcel F for new offices. We have all the offices that were unfilled at the end of 2019. And we've got the Central SOMA Plan permitting a bunch more.

So, with all of those jobs coming here and all of the people that work in them are going to be commuting from the East Bay, will the environmental impact of all of these long, carbon-intensive commutes be accounted for in the EIR?

Thank you.

MS. AVILA: Thank you, Chris.

Checking the language rooms to see if we have any commenters there.

Again, this is the scoping meeting for the San Francisco Housing Element 2022 Update, Environmental Impact Report.

Speakers will have two minutes to provide their comments by pressing raise hand or star nine. And members of the public that are maybe calling in to the language rooms, it would be star six.

We will allow four minutes from the language rooms as we are doing a simultaneous translation.

If you would like to provide comment, please let the moderator know in the rooms by raising your hand or by pressing star nine in the main Zoom room or star six in the language rooms.

Liz, we can show the final slide again to show folks where the documents are.

Claudia, can you advance the slide?

So as we mentioned earlier, the environmental documents are available online at SFPlanning.org/SFCEQAdocs.

There is a San Francisco Housing Element 2022 Update website at https:\\www.SFHousingElement.org\.

This video conference, as well as the scoping meeting translation videos are available at a Zoom link. Comments will be accepted until July 16th via this meeting tonight, and also via email.

By phone, if you would like to give comment tonight, please raise your hand or press star nine in the main Zoom room. Star six in the language rooms.

Each commenter will be allocated two minutes.

If you are speaking in a language room, you will be allotted four minutes for the translation, which will occur simultaneously into this main room.

This meeting is being recorded and will be provided at the end -- well, it will be available on a Zoom link, a recording of this meeting.

ELIZABETH WHITE: Kim, I just want to add that if we are not receiving any members of the public who wish to give -- provide public comment, we will give it another 10 to 15 minutes, but then we will be ending this public scoping meeting.

So I just wanted to let our participants that

are on the call right now know this.

MS. AVILA: If you would like to provide public comment please raise your hand or press star nine.

In the language rooms that would be star six or raise your hand.

Other opportunities for public comments are available through July 16th via email, CPC.HousingElementUpdateEIR@SFgov.org.

By phone at (628)652-7557.

Or by email to Elizabeth White, San Francisco Planning Department, 49 South Van Ness Avenue, Suite 1400, San Francisco, California 94103.

We are taking public comment at this Zoom presentation as well as by phone in a Cantonese room, Spanish room, and Tagalog room.

ELIZABETH WHITE: Kim, I just wanted to jump in again. We will be ending the meeting at 7:00 P.M. if there are no more individuals who wish to provide public comment this evening.

So again, to all our participants, if you would like to provide public comment, please raise your hand. And if we do not see participants with their hand raised, we will be closing this public meeting -- this public scoping meeting at 7 P.M. tonight.

Thanks, Kim.

MS. AVILA: Great. And I know we have some closing comments, so we can start that soon.

If you would like to make public comment, please raise your hand or otherwise press star nine to provide public comment. We will be closing at 7:00 P.M. if there are no further public comments.

I am checking in with the language room to see if there are any further comments.

This is the San Francisco Housing Element 2022 Update meeting, scoping meeting, looking for comments on the Environmental Impact Report.

If you would like to provide a public comment, please raise your hand or press star nine.

I don't believe there are any further speakers tonight.

ELIZABETH WHITE: Okay. I think we can advance to -- if we are on the last slide?

So with that, thanks again, Kim.

Again, to our participants, we would like to thank you for viewing this presentation. And for your participation in the public scoping process for the Housing Element 2022 Update.

As a reminder, the presentation video is posted on SFPlanning.org/SFCEQAdocs, the CEQA docs website, along with the notice of availability and notice of

preparation.

As shown on this slide, to submit a written comment on the scope of the Housing Element 2022 Update, environmental review, or if you would like to request hard copies of any documents, please email CPC.HousingElementUpdateEIR@SFgov.org, or address your comments to Elizabeth White, San Francisco Planning Department, 49 South Van Ness Avenue, Suite 1400, San Francisco, California 94103.

Verbal comment may be provided by calling (628)652-7557.

Comments are due by July 16th, 2021.

Thank you again for your time and participation in this public scoping meeting.

And I believe with that, Candace, we will close out this scoping meeting.

Thank you again, everyone.

(Proceedings concluded.)

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REPORTER'S CERTIFICATE

I, the undersigned, a Certified Shorthand Reporter of the State of California, do hereby certify:

That the foregoing proceedings were taken before me at the time and place herein set forth; that a verbatim record of the proceedings was made by me using machine shorthand which was thereafter transcribed under my direction; further, that the foregoing is an accurate transcription thereof.

I further certify that I am neither financially interested in the action nor a relative or employee of any attorney or any of the parties.

IN WITNESS WHEREOF, I have this date subscribed my name.

July 02, 2021

Connie Parchman

Connie J. Parchman

CSR No.6137

From:	White, Elizabeth (CPC)
To:	CPC.HousingElementUpdateEIR
Subject:	FW: [PAR_board] HE presentation at PAR
Date:	Thursday, July 15, 2021 9:46:48 AM
Attachments:	HE2022-PAR_7.12.21.pdf

From: Haddadan, Kimia (CPC) <kimia.haddadan@sfgov.org>
Sent: Thursday, July 15, 2021 9:21 AM
To: White, Elizabeth (CPC) <elizabeth.white@sfgov.org>; Callagy, Alana (CPC) <alana.callagy@sfgov.org>
Subject: Fw: [PAR_board] HE presentation at PAR

Kimia Haddadan, Senior Housing Policy Planner

Community Equity Division

San Francisco Planning

49 South Van Ness Avenue, Suite 1400, San Francisco, CA 94103

Direct: 628.652.7436 | www.sfplanning.org

San Francisco Property Information Map

Expanded in-person services at the Permit Center at 49 South Van Ness Avenue are available. Most other San Francisco Planning functions are being conducted remotely. Our staff are available by e-mail, and the Planning and Historic Preservation Commissions are convening remotely. The public is encouraged to participate. Find more information on our services here.

From: Jean Barish <jeanbbarish@hotmail.com>
Sent: Wednesday, July 14, 2021 12:01 PM
To: Haddadan, Kimia (CPC) <kimia.haddadan@sfgov.org>
Subject: Fw: [PAR_board] HE presentation at PAR

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Hi Kimia,

Thank you for the Housing Element 2022 presentation to PAR on Monday evening, and for the information you just sent about scoping comments.

The Housing Element 2022 is an important document, as you well know.

And, so, I'm disappointed and puzzled that you didn't speak at our meeting PAR before Monday, July 12. That doesn't give the PAR Board the time it needs to review the document and submit a thorough scoping document. It also makes it impossible for us to reach out to our members soon enough for them to competently review and comment on the document. In view of the inadequacy of notice, is it possible for us to have an extension of time to submit scoping comments?

Thank you,

Jean

Jean B Barish
jeanbbarish@hotmail.com

Stay safe and be well

From: par_board@googlegroups.com <par_board@googlegroups.com> on behalf of Nick Belloni <nick.belloni@swpsf.com>
Sent: Wednesday, July 14, 2021 11:23 AM
To: Par Board <par_board@googlegroups.com>
Subject: [PAR_board] HE presentation at PAR

> **From:** Nick Belloni <nbelloni@gmail.com>
> **Date:** July 14, 2021 at 11:21:41 AM PDT
> **To:** Par Board <par_board@googlegroups.com>
> **Subject: Fwd: HE presentation at PAR**
>
> Here is all the stuff for the housing element
>
> - Nick
>
> Begin forwarded message:
>
> > **From:** "Haddadan, Kimia (CPC)" <kimia.haddadan@sfgov.org>
> > **Date:** July 14, 2021 at 11:14:28 AM PDT
> > **To:** Nick Belloni <nbelloni@gmail.com>
> > **Cc:** "Tong, Reanna (CPC)" <reanna.tong@sfgov.org>

Subject: Re: HE presentation at PAR

Hi Nick,

Apologies for my delay.

Attached you can find the presentation slides.

Here's the methodology document for the high opportunity areas, you can look at pages 6 and 7 of the documents to see the variables uses and data sources: https://www.treasurer.ca.gov/ctcac/opportunity/2021-hcd-methodology.pdf

https://www.treasurer.ca.gov/ctcac/opportunity.asp

NOP Info:

Comments for public scoping meeting: https://sfplanning.org/event/public-scoping-meeting-housing-element

Public comments concerning the scope of the EIR will be accepted until 5:00 p.m. on July 16, 2021 and should be addressed to:

Elizabeth White, EIR Coordinator
San Francisco Planning Department
49 South Van Ness Avenue, Suite 1400
San Francisco, CA 94103
or CPC.HousingElementUpdateEIR@sfgov.org

Let me know if there are any other questions.

Kimia Haddadan, Senior Housing Policy Planner

Community Equity Division

San Francisco Planning

49 South Van Ness Avenue, Suite 1400, San Francisco, CA 94103

Direct: 628.652.7436 | www.sfplanning.org

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From: CPC.HousingElementUpdateEIR
To: Par Land use; CPC.HousingElementUpdateEIR
Cc: dan_baroni@gensler.com
Subject: RE: Case No. 2019-016230ENV; San Francisco Housing Element 2022 Update
Date: Friday, July 16, 2021 1:32:48 PM

Hi Dan,

I'm confirming receipt of your email.

Thank you,
Liz

From: Par Land use <sfparlanduse@gmail.com>
Sent: Friday, July 16, 2021 1:13 PM
To: CPC.HousingElementUpdateEIR <CPC.HousingElementUpdateEIR@sfgov.org>
Cc: dan_baroni@gensler.com
Subject: Case No. 2019-016230ENV; San Francisco Housing Element 2022 Update

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This note requests EIR evaluation of the issue noted below in connection with the above referenced Case No. 2019-016230ENV Housing Element 2022 Update.

The Planning Association for the Richmond District has a list of concerns we would like to be scoped and included in the EIR Process.
1. Explicit study of Community infrastructure be taken into account to address the proposed increase in density, especially for systems currently deficient for current densities. These include;
a. Auxiliary Water Supply System (AWSS), SFPUC's plan for fighting post-earthquake fires is inadequate to service the 15 currently unprotected neighborhoods not serviced by the current or proposed Auxiliary Water Supply System (AWSS) of high pressure and high volume hydrants.
b. Waste Water Systems
c. Domestic water systems, including seismic protection of the delivery system

2. Traffic Impact of greater densities and appropriate Public Transit infrastructure to enable movement of the increased population.

3. Schools. Public School planning has not been addressed in recent years and should be included in the scoping for increased housing density.

4. Mapping more specific to Neighborhoods, the preliminary maps identifying High Opportunity and High Resource Areas inappropriately incorporate public open space including the Lincoln Park and Lincoln Park Golf Course, Parts of the Presidio and the Beachfront (GGNRA) lands. Specific mapping is necessary for any study.

Thank you,
Dan Baroni, AIA
PAR Land Use Chair

From: Scot Conner
To: CPC.HousingElementUpdateEIR
Subject: Upzone more of District 2 for Housing Element
Date: Saturday, June 19, 2021 7:22:48 AM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Dear Elizabeth White,

Thank you for the opportunity to provide written comment on SF's 2022 Housing Element Update. I'm a renter and a resident of District 2. I will not be able to attend the live feedback meeting, so I'm writing to provide my comments on SF's Housing Element Plan.

Overall, I'm so excited by this plan. SF must build far more homes in the North and West sides of the City because those areas are the highest resource and therefore, at the least risk of displacement and gentrification. However, I do not think this plan goes far enough in upzoning transit corridors in District 2 (specifically Pacific Heights, the Marina, Cow Hollow and Presidio Heights).

Those D2 neighborhoods are wealthier and more highly resourced than the West side, but only Lombard St is identified as a transit corridor subject to modest mid rise up-zoning in the preliminary maps provided. SF should include Union and Chestnut streets west of Van Ness as transit corridors because of the ample bus service provided on those streets by the 30 and 45 Muni lines. SF Planning should also include California St (west of Van Ness) as a transit corridor since it is well served by the 1-California and runs through the very wealthy areas of Pac Heights and Presidio Heights. All of these areas are extremely walkable with some of the best access to parks and the waterfront in the City (e.g. Ft Mason, Crissy Field, Presidio, Lafayette Park, Atla Plaza, etc.). We need to concentrate more development in the Marina, Cow Hollow and Pac Heights.

Moreover, these D2 transit corridors should be upzoned to a higher level than the general midrise heights proposed for transit corridors (and certainly higher than the embarrassing current 40 ft height limits). SF should zone for Parisian style 10-12 story buildings along these corridors because these areas are wealthier than the west side transit corridors and have closer proximity to downtown. Design standards tailored to the character of each area can be implemented. We can have good design and density that respects the feel of neighborhoods, the only sacrifice is height which should no longer be a legitimate policy goal of SF since we know that the most effective way to reduce greenhouse gas emissions and mitigate climate change is to build urban infill housing (i.e. make it easy for people to decarbonize their lifestyles). Every time SF limits the height of buildings, we force people to live in suburbs or exurbs or areas at risk of wildfire and drive cars in their commutes and daily lives that further worsen climate change.

10-12 story heights actually fit with the historical character of these neighborhoods. If you walk around the area just north and a bit west of Lafayette Park you will find dozens of beautiful 8-10 story buildings of dense apartments. It's pretty crazy those buildings were legal to build 100 years ago, but today are illegal to build (with the 40 ft height limits and strict density controls).

It cannot be a legitimate or equitable policy goal of the SF Planning Department to protect the views of rich people's Pacific Heights mansions. Let's make D2 more like Paris or Barcelona and zone for 10-12 story residential buildings that will make these neighborhoods incredibly lively, walkable, encourage low carbon lifestyles and ease displacement pressures on communities of color in the Mission and SOMA.

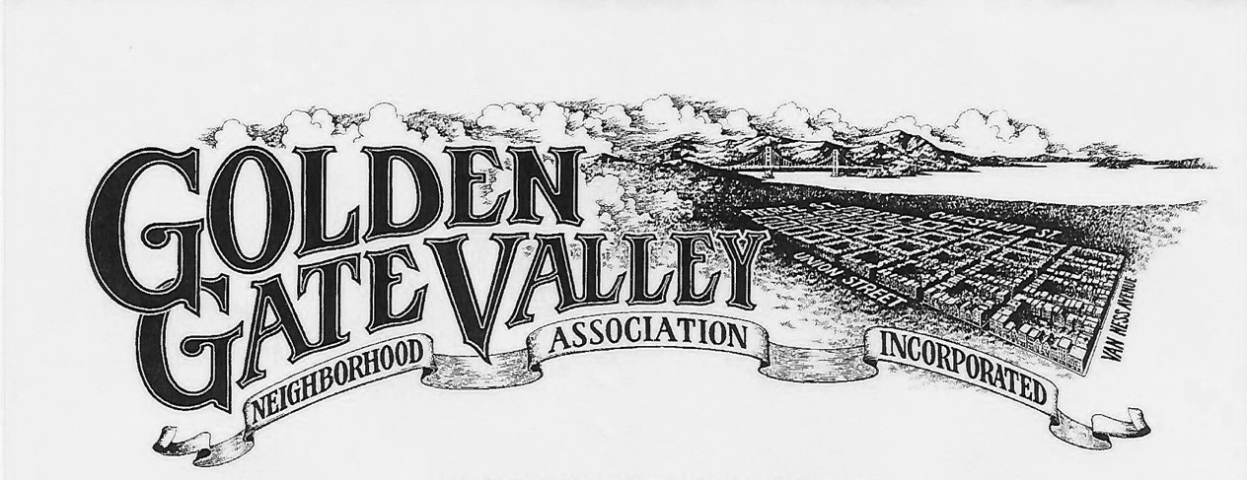
Also, there should be a higher upzoning for the Van Ness corridor to maximize the city's investment in time, money, and years of construction for Van Ness BRT. SF Planning should extend the "Hub" style zoning from Market St to the Bay along the new BRT corridor and allow 400 ft buildings to be built there. We need to fully take advantage of SF's most advanced transit corridor after Market St and zone for 40 story buildings here rather than the current zoning which at most allows for 130 ft in some places. If we want to decarbonize SF we need to maximize housing along robust transit corridors like Van Ness and allowing a massive abundance of new homes to flood the market by building 400 ft tall buildings on this corridor will help stabilize housing costs throughout the City.

Finally, SF should remove building height restrictions for residential buildings downtown. There are so many lots downtown that are either parking lots or parking garages that will become obsolete in a future decarbonized SF. Also, as widespread remote work changes commuting patterns, downtown needs to build more tall residential towers to add enough daytime and non-commuting population that can support the businesses that rely on commuters who live in other parts of the Bay Area. Removing the height limits on parking lots and garages would not only encourage decarbonized lifestyles but would also better incentivize proposals to maximize housing in transit rich and walkable areas that will help keep downtown lively as remote work decreases the daily commuting population.

SF needs to be building far more housing of all kinds (market rate and affordable). Due to our inclusionary zoning requirements, allowing more market rate housing will build more affordable housing at no public cost. We will most effectively affirmatively further fair housing by upzoning SF's richest neighborhoods in District 2 - Pacific Heights, the Marina, Cow Hollow and Presidio Heights.

Thank you,

Scot Conner



P.O. Box 29086
Presidio Station
San Francisco, CA 94129

July 16, 2021

Re: Housing Element 2022 Update EIR

Honorable Commissioners:

Despite coinciding with the Independence Day holiday weekend and the "post-pandemic" reopening as well as providing only a 10-day commentary period, the EIR for the 2022 Housing Element did not quite slip by the eyes of all San Franciscans.

The board of directors of Golden Gate Valley Neighborhood Association (GGVNA), founded 1976, read it, discussed it, and wondered why there wasn't more outcry over proposals that, carried to their logical conclusion, would alter San Francisco beyond recognition.

Please, before you toss this down with an epithet, realize that despite its location in Cow Hollow, at the time GGVNA was founded, it was considered more or less of a "stepsister" of its far more affluent neighboring associations. That property values rose may, perhaps, be somewhat credited to residents' middle class values, but mostly to outside forces. GGVNA doesn't expect younger folks to know this history or realize we're not just one big enclave of conservatives, but rather for the most part accidental, if fortunate, heirs to demographic changes over the past few decades.

The 2022 Housing Element EIR sounds more like groundwork for a coup than the previous ones we've perused since the '90s.

One doesn't have to be reactionary to wish SF, like most great cities that continue to deserve that modifier, would keep its variety of architectural styles, from grand to petite Victorians, Queen Annes, and Edwardians forward to today's expressions. **Retenementing,** however, will recreate some of the country's worst living conditions while modifying or eliminating private property as it has been defined here--especially in light of as yet unexamined claims of thousands of available spaces "out there." It will also set the stage to demolish historic residential zoning such as height limits, backyards, spacing, privacy, and even the "peaceful enjoyment" our city's documents so often mention.

Using vague terms like "transit corridors," planning documents may not cause folks to take out their city maps and therefore many may not notice that in SF these convenient corridors could easily cover almost the entire city.

Many of us have been environmentalists for decades. We never defined our beliefs and support as using a hatchet where a carving knife might be more appropriate.

We wonder how many artists, nonconformists, or tourists would continue to flock to San Francisco should it become a crowded, airless, gardenless, architectureless, charmless, mostly viewless location, still dotted with those unfortunates who cannot tolerate the minimal confinement or rules of affordable housing and prefer the perceived freedom of the streets.

Until the entire Bay Area, working with mental health practitioners, can begin for find ways to help addicts become content former addicts, sociopaths and psychopaths a way or place to fit in, there will remain street people, the preponderance where the weather is temperate. It will certainly take cooperation with the federal government to try to help victims of the above-mentioned diseases and the realization of all Americans that these are their family members who fled be it discrimination or bad weather to congregate in massive numbers where acceptance is greater and weather is kinder. (Yes, we know about surveys saying SF's homeless are from SF, but we wonder how many of those are (a) verified or (b) asked for how long.)

Sincerely yours,

Phil Faroudja, GGVNA President

Serena Bardell, GGVNA Vice President

From: Joan Klau
To: CPC.HousingElementUpdateEIR
Subject: SF Housing Element Update
Date: Thursday, July 01, 2021 9:34:56 AM

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Hello, I was hoping to attend the virtual public scoping meeting while it was live on Tuesday night, but got held up at work.

I just wanted to confirm that this link is the recording of Tuesday's meeting:
https://www.youtube.com/watch?v=ZA4MxK7c5Zk

And this is the document (in English) being discussed:
https://citypln-m-extnl.sfgov.org/SharedLinks.aspx?accesskey=3fcc08083eff0ef20401f868a218142103b46466eee0d93253b87a794da739f3&VaultGUID=A4A7DACD-B0DC-4322-BD29-F6F07103C6E0

And we have until 5pm on July 16 to provide comments in writing to:

Elizabeth White, EIR Coordinator
San Francisco Planning Department
49 South Van Ness Avenue, Suite 1400
San Francisco, CA 94103
or CPC.HousingElementUpdateEIR@sfgov.org

Thanks in advance for your help!
Joan Klau
1273 27th Ave
SF, CA 94122

STATE OF CALIFORNIA

Gavin Newsom, Governor

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EXECUTIVE SECRETARY
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Pomo

NAHC HEADQUARTERS
1550 Harbor Boulevard
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(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

June 30, 2021

Elizabeth White
San Francisco Planning Department
49 South Van Ness Avenue, Suite 1400
San Francisco, CA 94103

Re: 2021060358, San Francisco Housing Element 2022 Update Project, San Francisco County

Dear Ms. White:

The Native American Heritage Commission (NAHC) has received the Notice of Preparation (NOP), Draft Environmental Impact Report (DEIR) or Early Consultation for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code §21000 et seq.), specifically Public Resources Code §21084.1, states that a project that may cause a substantial adverse change in the significance of a historical resource, is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, §15064.5 (b) (CEQA Guidelines §15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) shall be prepared. (Pub. Resources Code §21080 (d); Cal. Code Regs., tit. 14, § 5064 subd.(a)(1) (CEQA Guidelines §15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources within the area of potential effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code §21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code §21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code §21084.3 (a)). **AB 52 applies to any project for which a notice of preparation, a notice of negative declaration, or a mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements.** If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. §800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments.

Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:
   a. A brief description of the project.
   b. The lead agency contact information.
   c. Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code §21080.3.1 (d)).
   d. A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code §21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code §21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or Environmental Impact Report. (Pub. Resources Code §21080.3.1(b)).
   a. For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code §65352.4 (SB 18). (Pub. Resources Code §21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:
   a. Alternatives to the project.
   b. Recommended mitigation measures.
   c. Significant effects. (Pub. Resources Code §21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:
   a. Type of environmental review necessary.
   b. Significance of the tribal cultural resources.
   c. Significance of the project's impacts on tribal cultural resources.
   d. If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code §21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code §6254 (r) and §6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code §21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:
   a. Whether the proposed project has a significant impact on an identified tribal cultural resource.
   b. Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code §21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code §21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:

a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or

b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code §21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code §21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code §21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code §21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code §21084.3 (b). (Pub. Resources Code §21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:

a. Avoidance and preservation of the resources in place, including, but not limited to:

i. Planning and construction to avoid the resources and protect the cultural and natural context.

ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.

b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

i. Protecting the cultural character and integrity of the resource.

ii. Protecting the traditional use of the resource.

iii. Protecting the confidentiality of the resource.

c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.

d. Protecting the resource. (Pub. Resource Code §21084.3 (b)).

e. Please note that a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code §815.3 (c)).

f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code §5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An Environmental Impact Report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:

a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code §21080.3.1 and §21080.3.2 and concluded pursuant to Public Resources Code §21080.3.2.

b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.

c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code §21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code §21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code §65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf.

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code §65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code §65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code §5097.9 and §5097.993 that are within the city's or county's jurisdiction. (Gov. Code §65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
   a. The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
   b. Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/.

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:
   a. If part or all of the APE has been previously surveyed for cultural resources.
   b. If any known cultural resources have already been recorded on or adjacent to the APE.
   c. If the probability is low, moderate, or high that cultural resources are located in the APE.
   d. If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
   a. The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
   b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:
   a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.
   b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
   a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, §15064.5(f) (CEQA Guidelines §15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
   b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
   c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code §7050.5, Public Resources Code §5097.98, and Cal. Code Regs., tit. 14, §15064.5, subdivisions (d) and (e) (CEQA Guidelines §15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions or need additional information, please contact me at my email address: Sarah.Fonseca@nahc.ca.gov.

Sincerely,



Sarah Fonseca
Cultural Resources Analyst

cc: State Clearinghouse

State of California
Native American Heritage Commission
1550 Harbor Blvd., Ste. 100
West Sacramento, CA 95691



RECEIVED

JUL 06 2021

CITY & COUNTY OF S.F.
PLANNING DEPARTMENT
RECEPTION DESK

June 30, 2021

Elizabeth White
San Francisco Planning Department
49 South Van Ness Avenue, Suite 1400
San Francisco, CA 94103

CHAIRPERSON
Laura Miranda
Luiseño

94103$3799 C003

SAN FRANCISCO LAND USE COALITION

Dolores Heights Haight Ashbury* Midtown Terrace* Miraloma Park*Noe Valley* Richmond District *Russian Hill* Sunset District* Van Ness Corridor*

Date: July 16, 2021

To: Kimia Haddadan, Project manager
Shelley Caltagirone, Senior Planner
Malena Leon-Farrera, Policy Analyst and Outreach Coordinator
Elizabeth White
San Francisco Planning Department

Subject: Housing Element Comments

SFLUC has reviewed much of the proposed Housing Element Survey, a somewhat exhaustive and complex survey. We have also looked over the responses from the Race and Equity in all Planning Coalition (REP) and agree with many of their conclusions. Our particular issues are as follows:

- We are concerned with the survey assumptions about applying different concepts to various parts of San Francisco. 'High Opportunity Neighborhoods,' 'Priority Development Areas,' and 'Geographic Areas' are being designated without local-based community input and information on the impact of the proposed policies on those areas. This kind of input requires more than just conceptual terms; it requires maps and specific illustrations of the impacts on each neighborhood and input from the residents as to those impacts.
- Although singling out support for people to live within "Priority Geographies" sounds beneficial, that concept also appears to make decisions for people about where they should live, instead of leaving it up to the people to decide.
- Evictions and displacement should be addressed all over San Francisco, not just one or two specific areas.
- RHNA goals have been imposed on San Francisco with no regards to community input and the risks of displacement and gentrification. Building even more market rate housing works against racial and social equity. Many of the proposals will promote incentives for market rate development and that will not solve the affordable housing problems in San Francisco. Market rate developments typically increase housing prices, speculation, displacement, and gentrification.
- For all new housing that is to be built, affordable units with deep affordability should be prioritized. We oppose relaxing inclusionary requirements or streamlining the approval process for market rate developments. In addition, streamlining approvals means taking the power of self-determination away from the very communities that many of the policies state they are trying to help.
- In publicly-owned sites and large privately-owned sites, the City needs to do away with top-down planning processes and replace with bottom-up processes which put an emphasis on gathering and implementing public input.
- In particular, public land should have only housing that is 100% affordable.

- We support community infrastructure improvements to transit, parks, streetscape, and neighborhood amenities, but agree that this must be first signed off on by the local residents and also be carefully developed so as not to lead to increased land and housing speculation and displacement of low-income residents.
- Many of the proposals will require extensive funding. The manner of raising the funding and the extent of funding should be worked out with the affected communities and reflect community input into the funding uses and allocations.

In summary, many of the proposal leave out the voices of the community and should be rewritten to include extensive outreach and a serious commitment to real participation and decision-making at the community-level.

Sincerely,

Ozzie Rohm

Ozzie Rohm for SFLUC

cc: Rich Hillis
SF Board of Supervisors
SF Planning Commission

From:	Frida Lopez Ruiz
To:	CPC.HousingElementUpdateEIR
Cc:	Silena Layne
Subject:	ENR for SF Housing Element 2022 6/29/21 @ 6 pm
Date:	Tuesday, June 29, 2021 6:20:48 PM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Hi Elizabeth,

My name is Frida Lopez Ruiz, and I am the assistant program director at Compass Family Shelter. I logged in to the meeting via conference call and YouTube stream and was not able to access it. The conference call line asked for a passcode which wasn't included in the calendar information and the YouTube page was showing "waiting for SF planning" before showing a video unavailable screen at 6:18 pm.

Will the ENR be recorded and shared online? I am interested in any follow up information regarding future SF housing planning.

Please let me know any next steps.

Best,

From: Gene Schnair
To: CPC.HousingElementUpdateEIR
Subject: Case No. 2019-016230ENV; San Francisco Housing Element 2022 Update
Date: Tuesday, July 13, 2021 3:12:10 PM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

This note requests EIR evaluation of the issue noted below in connection with the above referenced Case No. 2019-016230ENV Housing Element 2022 Update.

SFPUC's plan for fighting post-earthquake fires is inadequate to service the 15 currently unprotected neighborhoods not serviced by the current or proposed Auxiliary Water Supply System (AWSS) of high pressure and high volume hydrants.

The approved ESER bonds provide funding for a portable AWSS in only two of the fifteen unprotected neighborhoods. The growth in housing goals will dramatically increase the need for more fire fighting water particularly in the underserved western and northwestern residential areas of the City. These same housing goals were not envisioned in the current AWSS planned updates. This is a serious environmental risk to the health, safety and welfare of the impacted neighborhoods. This matter should be addressed in the EIR evaluation of housing goals which include increasing development capacity, identification of "high opportunity" areas, housing sustainability districts and priority development areas identified in the proposed housing element updates.

From: Thomas Schuttish
To: CPC.HousingElementUpdateEIR
Subject: Update
Date: Tuesday, June 29, 2021 6:07:04 PM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Dear Ms. White,
Good evening.
I just tried to call in, but they said I needed a password…I didn't realize that from the instructions…I thought it was just like a Commission Meeting when I could call in and listen.
Is there a password?
Thanks.
Georgia Schuttish

From: Thomas Schuttish
To: CPC.HousingElementUpdateEIR
Subject: Public Comment
Date: Tuesday, July 13, 2021 4:21:06 PM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Dear Ms. Haddadan and Ms. White,

Good afternoon.
Right now I am living across the street from a major construction job adding a unit to an existing single family home. The second unit will be below the garage…entirely subterranean. The zoning is RH-2. It is a spec project.
The amount of soil removal and trucks and cement mixing machines and dumpsters and dump trucks already seems astronomical and the project has barely commenced. Apparently the excavation will range anywhere from 11 feet to 20 feet deep on the full 27' x 114' lot.
Many projects seeking to densify in the RH neighborhoods, whether through extreme Alteration or Demolition followed by a brand new building, seem to follow this pattern of major full lot excavation.
1. What is the impact on air quality from extreme Alteration or Demo/Rebuild projects like this one, due to trucks (delivery trucks, worker trucks, porta-potty trucks, dump trucks, cement mixing trucks, trucks dropping off and picking up dumpsters, etc), bulldozers, demo work, cement work, building materials removed, building materials added, as this becomes the pattern as densification expands throughout the City, most particularly in the lower density neighborhoods and sites?
2. What is the plan to preserve existing housing and possibly reduce the environmental impact from projects that cumulatively command the use of all these resources and energy just like the ones I am describing?
3. As densification occurs, often with a pattern of full lot excavation what is the impact from the loss of tree canopy and soil. I attached the link to Mr. Webster's Map of the SF tree canopy. How much or what percentage of the tree canopy is located in the rear yards of existing housing and what is the potential loss of tree canopy as densification, particularly with the full lot major excavation occurring in the Residential neighborhoods throughout San Francisco?
4. Are some neighborhoods and communities likely to be more affected than other neighborhoods and communities from any of these potential impacts?
https://url.avanan.click/v2/___https://sfplanning.org/sites/default/files/resources/2018-08/Urban%20Tree%20Canopy.pdf___.YXAzOnNmZHQyOmE6bzowMjA2NTI0ODlkZTU1MjJmOTUyMTliZWY0M2NmYzQ3NTo0OjQ3N2E6NjNjZmY4ZTJmZjNmMTM1ZjE0M2JjY2MxZjQwYTUzYjk2ZGUyOWE5MjFmOTIwZmQzZWNkYzVhMTU1Y2Y1Mzg4NA
Thank you and take good care.
Sincerely,
Georgia Schuttish

From: Jia Hong Situ
To: CPC.HousingElementUpdateEIR
Subject: June 29th Housing Element Public Scoping Meeting
Date: Thursday, June 17, 2021 12:47:55 PM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Hello Elizabeth White,

I am an SF resident and am interested in the upcoming June 29th Housing Element Public Scoping Meeting regarding the Notice of Preparation for an EIR. Could I receive a calendar invite link to the teleconference?

Thanks!

--

Jia Hong Situ

SJSU, Master of Urban Planning

aounnuoa@gmail.com | LinkedIn

From: anastasia Yovanopoulos
To: CPC.HousingElementUpdateEIR
Subject: EIR presentation
Date: Wednesday, June 16, 2021 5:08:00 PM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Hello Elizabeth White,

How do I get the EIR document? Please send it to me. Thanks.
How do I join the meeting on June 29th @ 6 pm?

Anastasia Yovanopoulos
SF Tenants Union &
Race and Equity in All Planning Coalition, member

From: anastasia Yovanopoulos
To: CPC.HousingElementUpdateEIR
Subject: How do I comment on the Housing Element EIR Scoping?
Date: Tuesday, July 13, 2021 4:47:25 PM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Hello Elizabeth White,

I attended the Housing Element 2022 Update EIR Scoping Meeting on June 29, 2021. Can you tell me how to know to register a comment on the Housing Element EIR Scoping by the July 16 deadline?

Anastasia Yovanopoulos
(415) 826-5886

From: anastasia Yovanopoulos
To: CPC.HousingElementUpdateEIR
Subject: Comment on the Housing Element EIR Scoping
Date: Friday, July 16, 2021 3:40:23 PM

This message is from outside the City email system. Do not open links or attachments from untrusted sources.

Comment on the Housing Element 2022 EIR Scoping

Our 100+ year old infrastructure can't handle big increases in population that would result from the increased volume of housing the RHNAs demand, that will be reflected in the Housing Element 2022.

Traffic problems, air pollution and noise pollution will be horrendous and make living in San Francisco untenable without smart urban planning to address the emerging issues, and funds built-in to implement those plans.

Poor planning for the growing population and improving our infrastructure will result in a diminished quality of life and health issues for San Francisco residents.

Anastasia Yovanopoulos
SF Tenant Union,
a member organization of Race and Equity in All Planning

----- Forwarded Message -----
From: anastasia Yovanopoulos <shashacooks@yahoo.com>
To: CPC.HousingElementUpdateEIR@sfgov.org <CPC.HousingElementUpdateEIR@sfgov.org>
Sent: Tuesday, July 13, 2021, 04:47:09 PM PDT
Subject: How do I comment on the Housing Element EIR Scoping?

Hello Elizabeth White,

I attended the Housing Element 2022 Update EIR Scoping Meeting on June 29, 2021. Can you tell me how to know to register a comment on the Housing Element EIR Scoping by the July 16 deadline?

Anastasia Yovanopoulos
(415) 826-5886

APPENDIX B

Housing Element Update Policies and Implementing Actions

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

DRAFT 3: GOALS, OBJECTIVES, POLICIES, AND ACTIONS

Housing Element 2022 UPDATE

March 2022

San Francisco Planning

Overview of Goals and Objectives

1. Recognize the right to housing as a foundation for health, and social and economic well-being.
    a. Ensure housing stability and healthy homes. *(Policies 1, 2, 3, 4, 9)*
    b. Advance equitable housing access. *(Policies, 5, 6, 7, 27, 3)*
    c. Eliminate homelessness. *(Policies 8, 9, 22)*
2. Repair the harms of historic racial, ethnic, and social discrimination against American Indian, Black, and other people of color.
    a. Make amends through truth-telling of the historic harms. *(Policy 10)*
    b. Offer reparations for communities directly harmed by past discriminatory government action[1] and bring back their displaced people. *(Policies 11, 12, 5)*
    c. Increase accountability to American Indian, Black, and other communities of color. *(Policies 13, 14, 21)*
3. Foster racially and socially inclusive neighborhoods through equitable distribution of investment and growth.
    a. Build intergenerational wealth for American Indian, Black, and other communities of color.[2] *(Policies 15, 5, 23, 11, 16, 17, 33, 18, 12, 22)*
    b. Create a sense of belonging for all communities of color within Well-resourced neighborhoods[3] through expanded housing choice. *(Policies 19, 20, 22, 26)*
    c. Eliminate community displacement within areas vulnerable to displacement.[4] *(Policies 21, 1, 3)*
4. Provide sufficient housing for existing residents and future generations for a city with diverse cultures, family structures, and abilities.
    a. Substantially expand the amount of permanently affordable housing for extremely low- to moderate-income households. *(Policies 22, 8, 15, 19, 23, 24)*
    b. Expand small and mid-rise multi-family housing production to serve our workforce, prioritizing middle-income households. *(Policies 20, 25, 26, 21)*
    c. Diversify housing types *for all* cultures, family structures, and abilities. *(Policies 27, 28, 7, 29, 30, 31)*
5. Promote neighborhoods that are well-connected, healthy, and rich with community culture.
    a. Connect people to jobs and their neighborhood with numerous, equitable, and healthy transportation and mobility options. *(Policies 17, 32, 33, 20)*
    b. Advance environmental justice, climate, and community resilience. *(Policies 34, 35)*
    c. Elevate expression of cultural identities through the activation and design of neighborhood buildings and spaces. *(Policies 36, 37, 12, 32)*

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[1] Discriminatory programs led or sanctioned by government action, include but are not limited to urban renewal, redlining, segregated public housing, racial covenants, and exclusionary zoning regulations, such as single-family zoning.

[2] For the purpose of the Housing Element these communities are defined as Priority Equity Geographies that are identified and updated by Department of Public Health's Community's Health Needs Assessment as Areas of Vulnerability.

[3] These areas are identified under California Housing and Community Development Opportunity Area Maps, as high and highest resource.

[4] Areas identified in the Urban Displacement Project's displacement and gentrification analysis as vulnerable or undergoing displacement or gentrification. This analysis is undergoing an update and a new version will be released early 2022, which will inform changes to the definition used under this objective.

Note to Reader

The following section is organized as follows:

- Goal: a short narrative provides a framework for each goal
    - Objectives: a short narrative provides a framework for each objective
        - Policies
            - Actions: each action cites the agencies responsible for each action and the timeframe for full implementation
                - Partners: *Lead Implementing Agency*, *Other Agency Partner*
                - Timeframe: *Short (0-5 years); Medium (6-15 years); Long (16+ years)*

Note: Census data cited in the goal and objective narratives has been updated since its last release in January 20202. This new data reflects population definitions based on conversations with the American Indian community. Data from other sources, such as SF Planning, MOHCD, and HSH, however, were not able to be updated along this new definition.

A glossary of terms is provided at the end of this document as a reference.

The following is a list of acronyms used to identify the agencies responsible for each Housing Element action:

APD	Adult Probation Department
ARTS	Arts Commission
BOS	Board of Supervisors
DBI	Department of Building Inspection
DPH	Department of Public Health
DPW	Department of Public Works
HSA	Human Services Agency
HRC	Human Rights Commission
HSH	Department of Homelessness and Supportive Housing
Mayor	Mayor's Office
MOD	Mayor's Office on Disability
MOHCD	Mayor's Office of Housing and Community Development
OCII	Office of Community Investment and Infrastructure
OEWD	Office of Economic and Workforce Development
ORE	Office of Racial Equity
ORCP	Office of Resilience and Capital Planning
OSB	Office of Small Business
Planning	Planning Department
SF Port	Port of San Francisco
SFFD	Fire Department
SFHA	San Francisco Housing Authority
SFMTA	San Francisco Municipal Transportation Agency
SFPUC	San Francisco Public Utilities Commission

Goal 1: Recognize the right to housing as a foundation for health, and social and economic well-being.

Challenge- Access to safe and affordable housing is a social determinant of health. Several studies have found that housing instability contributes to children and youth being more vulnerable to mental health problems – including developmental delays, poor cognitive outcomes,[5] and depression[6] - and inferior educational opportunities.[7] This trauma can compound to impact health, education, and employment outcomes that can affect people throughout their lives and their descendants' lives. The racial and social disparities associated with housing instability are well documented and include rent burden (paying more than 30% of their income on rent), homelessness, overcrowded living (more than one person per room, including the living room), and health conditions (see Figure 1).

The COVID-19 pandemic further exposed longstanding racial disparities. Communities of color have endured higher infection and death rates partially due to poor living conditions (such as overcrowding) and poor health conditions.

Path forward- The United Nations (UN) defines the right to adequate housing as "the right to live somewhere in security, peace and dignity." The UN sees the right to adequate housing as enacting policies, strategies, and programs that "are needed to prevent homelessness, prohibit forced evictions, address discrimination, focus on the most vulnerable and marginalized groups, ensure security of tenure to all, and guarantee that everyone's housing is adequate."[8] For the first time, San Francisco is formally recognizing the right to housing. By doing this, the City is making a commitment to offer housing solutions that are healthy and dignified to vulnerable households: those who are unhoused, poorly housed, have been subject to discrimination, or are exposed to instability or inequities due to disabilities, disorders, criminal records, traumas, immigration status, tenure, income, sexual orientation, gender identity, or race.

In response to the current COVID-19 health crisis, the City prioritized housing and shelter for our unhoused populations embracing the connection between housing and health. A commitment to the right to housing will direct the City to scale up its resources in the long-term to offer these equitable outcomes through series of investments and prioritizations. Achieving this goal will mean eliminating homelessness, ensuring housing stability and reversing inequities in housing access for those who are vulnerable.

---

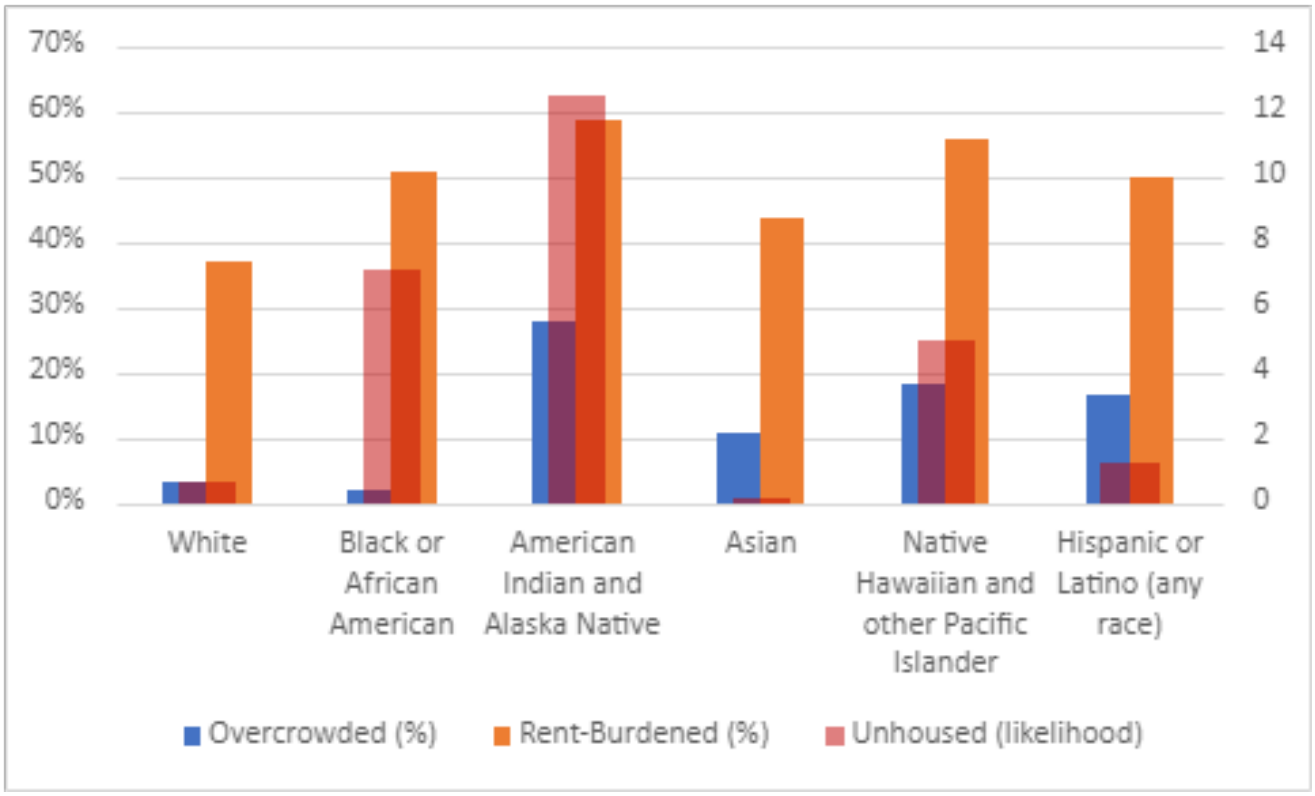
[5] Coley, R. L., Leventhal, T., Lynch, A. D., & Kull, M. (2013). Relations between housing characteristics and the well-being of low-income children and adolescents. *Developmental psychology*, *49*(9), 1775.

[6] Hatem, C., Lee, C. Y., Zhao, X., Reesor-Oyer, L., Lopez, T., & Hernandez, D. C. (2020). Food insecurity and housing instability during early childhood as predictors of adolescent mental health. *Journal of Family Psychology*, *34*(6), 721.

[7] Ziol-Guest, K. M., & McKenna, C. C. (2014). Early childhood housing instability and school readiness. Child development, 85(1), 103-113.

[8] Office of the United Nations High Commissioner for Human Rights, The right to adequate housing - Fact Sheet No. 21/Rev. 1 (2009). Geneva; United Nations.https://www.ohchr.org/documents/publications/fs21_rev_1_housing_en.pdf

Figure 1. Overcrowding, Housing Rent Burden, and Homelessness by Race (San Francisco)



Source: ACS 2019 1-year Estimates; 2019 San Francisco Point-In-Time Homeless Count and Survey Report, Department of Homeless and Supportive Housing.

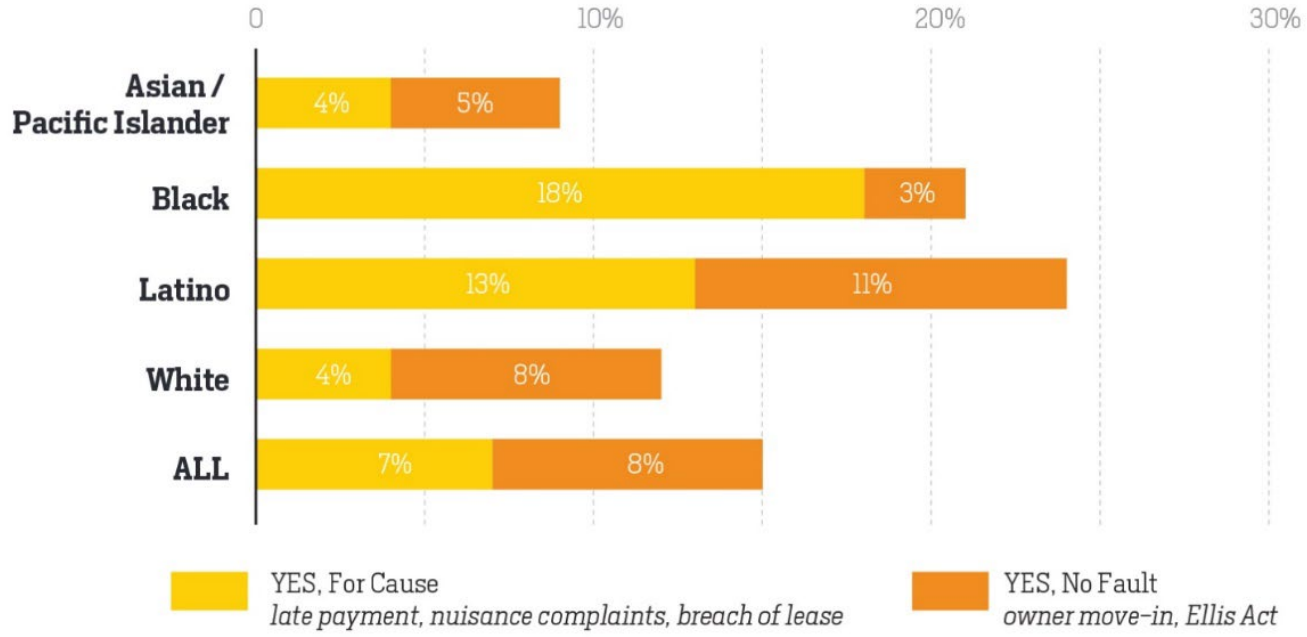
Objective 1.a: Ensure housing stability and healthy homes

Challenge- Around two thirds of San Francisco's households are renters. The majority of San Francisco's rental housing stock is subject to the Rent Control Ordinance, which limits annual rent increases and includes eviction protections. Rent control, however, has been critical but insufficient to fully protect low-and moderate-income residents, as well as American Indian, Black, and other people of color from being at risk of eviction or displacement (see Figure 2). Evictions and displacement increased during recent economic booms during which time rental prices in San Francisco rose to among the highest in the country. The increase in rental prices far outpaced wage growth for low- and moderate-income renters. Now over 80% of very low-income renter households in San Francisco are rent burdened (paying more than 30% of their income on rent). More low- and moderate-income renters are severely cost burdened (paying more than 50% of their income on rent) today compared to 1990 (see Figure 3). Over the past two decades, the city has more households in the low-income category than any other income group (see Figure 4). A survey of around 3,200 renters indicated that about one third would have no housing choice if displaced from their current residence, and another third would have to leave San Francisco to find housing (see Figure 5).

Path forward- Recognizing a right to housing must start ensuring housing stability for tenants, especially those with limited housing choices and who experience racial and social disparities. San Francisco will expand investment in rental assistance programs as a strong form of protection against housing instability, especially for

low-income tenants. These programs have proven critical in preventing evictions during the recent pandemic and have received increased funding at the federal level. San Francisco continues to maintain some of the strongest eviction protections in the region and the country. For effective implementation of these protections, San Francisco passed an ordinance to create a new rental housing inventory. Implementing this inventory will allow proactive enforcement and monitoring of our already strong protection measures, such as regulations controlling Owner Move-Ins or Ellis Act Evictions. Full implementation will also inform a series of new improvements to these protections. The City will also focus on minimizing the abuse of temporary and nuisance related evictions. Ensuring housing stability also relies on preserving affordability of existing units with deed restrictions. The City's acquisition and rehabilitation programs have been in effect in the past decade and will need to be revamped to ensure the investments are effective and reach those who have been underserved. A renewed interest and focus on co-operative housing will offer expanded opportunities, whether through protections of existing cooperative housing or creating new shared equity and cooperative ownership models.

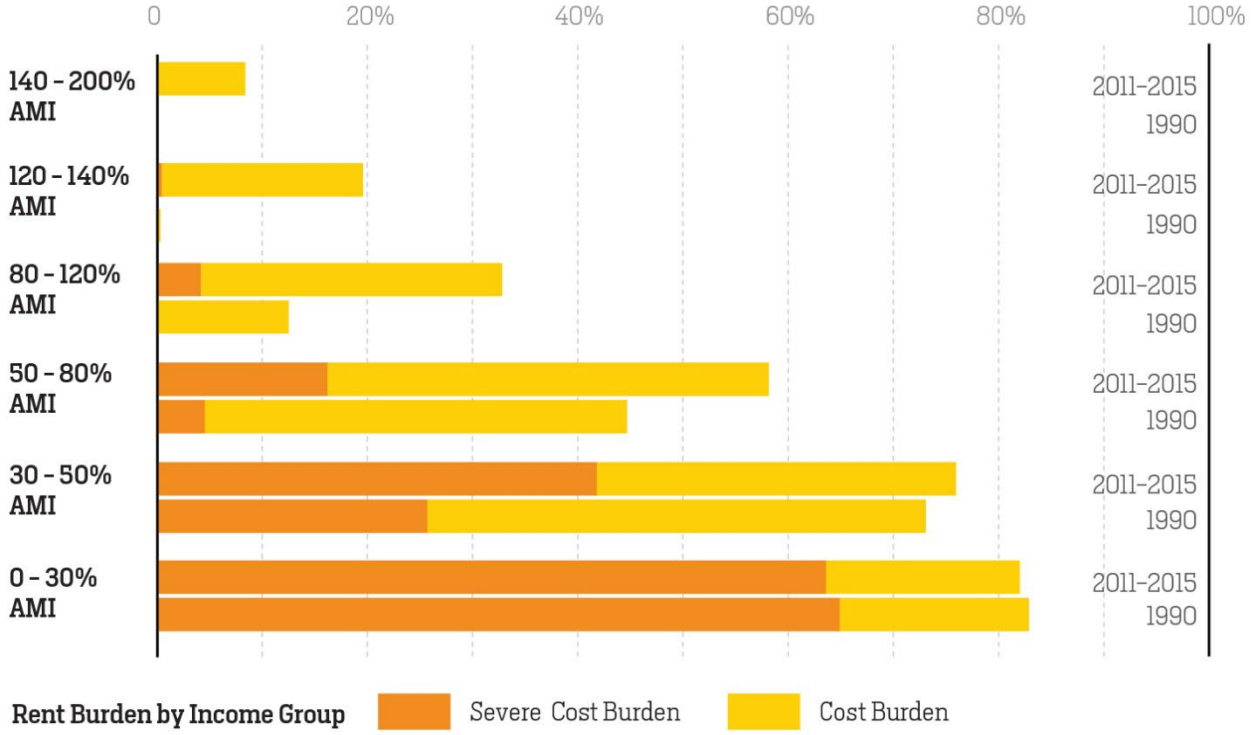
Figure 2. Percentage of the 2018 San Francisco Housing Survey respondents who reported being threatened with an eviction in the previous 5 years by race.



Source: San Francisco Housing Needs and Trends Report; San Francisco Planning Department 2018 Housing Survey.

Figure 3. Percentage of San Francisco households that were rent burdened* by income group (1990 vs 2015).

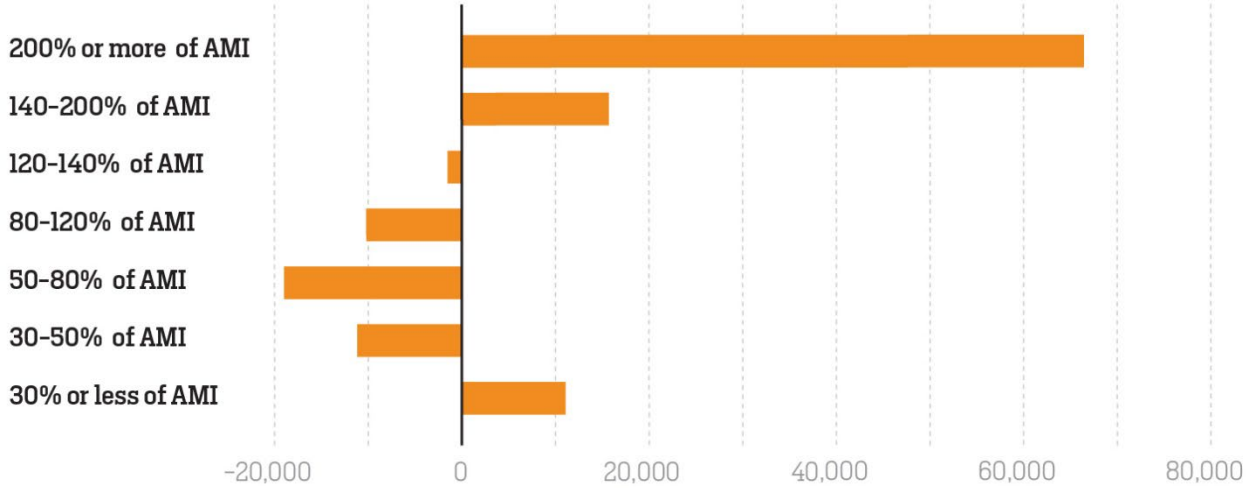
*Rent burden means paying between 30% and 50% of the household's income in rent; severe cost burden means paying more that 50% of the household's income in rent.



Source: San Francisco Housing Needs and Trends Report; 1990 Decennial Census (IPUMS-USA); ACS 2015 5-year Estimates IPUMS-USA).

Figure 4. Change in the number of households by household income group from 1990 to 2015.

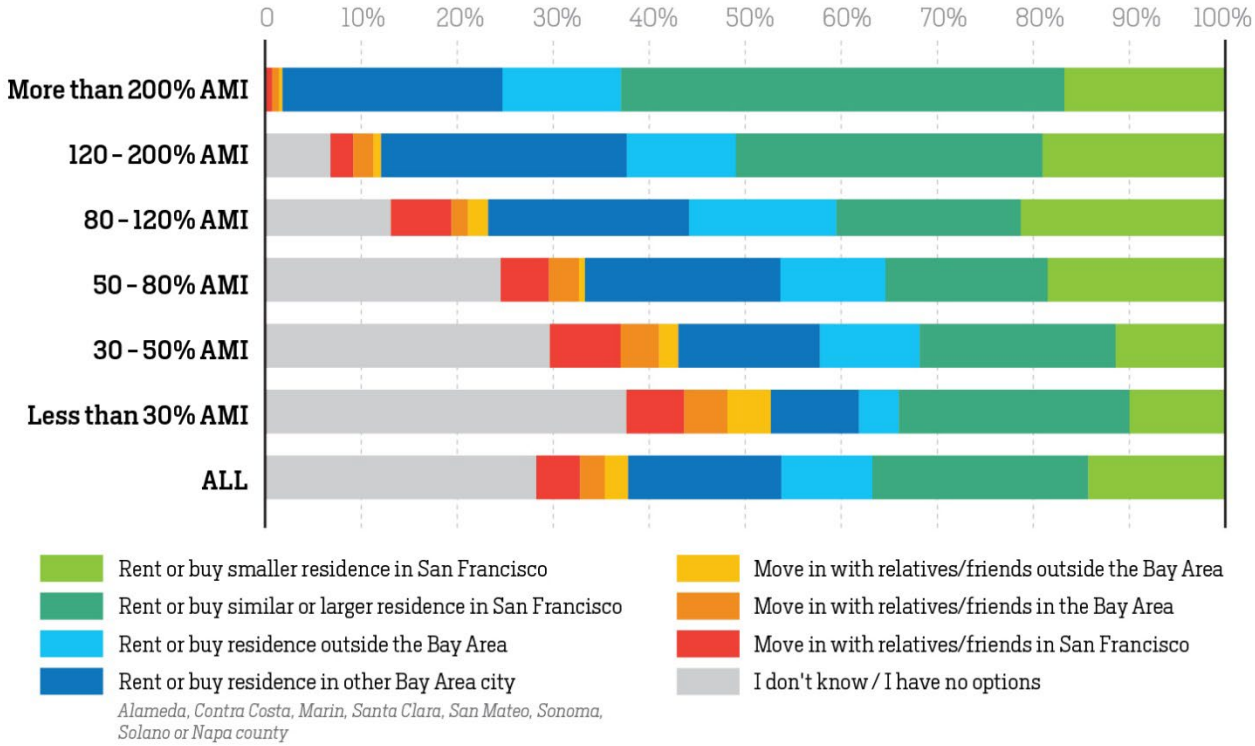
Area median income (AMI) is a normalized measure of income in a geography. 100% AMI is the median income for SF.



Source: San Francisco Housing Needs and Trends Report; 1990 Decennial Census (IPUMS-USA); ACS 2015 5-year Estimates IPUMS-USA).

Figure 5. Housing choices for 2018 San Francisco Housing Survey respondents if forced out of their current residence by income group.

Area median income (AMI) is a normalized measure of income in a geography. 100% AMI is the median income for SF.



Source: San Francisco Housing Needs and Trends Report; San Francisco Planning Department 2018 Housing Survey.

POLICIES AND ACTIONS

Policy 1: Minimize all no-fault and at-fault evictions for all tenants, and elevate direct rental assistance as an eviction protection strategy.

a. Prioritize the creation of a digital Rental Housing Inventory to collect data that informs the evaluation of anti-displacement programs, including rental rates, rent control status, vacancy, and services provided. (Rent Board; Short)
b. Fully fund the Tenant Right-to-Counsel program to match the need for eviction defense. (MOHCD, Mayor/BOS; Medium)
c. Expand rental assistance programs, including those designed for emergency response, for population-specific assistance, ongoing tenant-based support, and time-limited assistance (such as Rapid Rehousing), as also referenced in Policy 9, action (d) as a homelessness prevention tool. Consider a goal of capping rent payments at 30% of household income for extremely and very-low income households. (Mayor/BOS, MOHCD, HSH,; Medium)
d. Provide a priority in the allocation of Direct Rental Assistance to populations and in areas vulnerable to displacement. (MOHCD, HSH; Short)
e. Dedicate sufficient rental assistance funding to cap rent payments at 30% of household income for SRO residents. (MOHCD, Mayor/BOS; Medium)
f. Increase relocation assistance for tenants experiencing either temporary or permanent evictions. (Mayor/BOS, Rent Board; Short)

g. Increase the time period during which relocation compensation is required when using temporary evictions from three to six months. (Mayor/BOS, Rent Board; Short)
h. Clarify and limit the definition of nuisance or other just cause evictions as needed to limit abuse. (Mayor/BOS, Rent Board; Short)
i. Pursue proactive and affirmative enforcement of eviction protections programs, especially for Owner Move-in and Ellis Act evictions, including annual reporting by owners that is enforced by site inspections and confirmation of owner occupancy and funded through owner fees. (Rent Board, MOHCD; Medium)
j. Proactively enforce eviction protection and avoid predatory practices or tenant harassment by pursuing affirmative litigation models.[9] (MOHCD; Medium)
k. Adopt incentives for property owners to rebuild buildings struck by fire within two years to house prior tenants by when the transitional housing program timeline expires (HSA, DBI, Planning, Mayor/BOS; Short)
l. As informed by Policy 21, action (d) and in coordination with community liaisons referenced under Policy 14, action (b), support and expand community-led navigation services and systems to provide tenants' rights education, similar to the existing culturally competent Code Enforcement Outreach Program that is offered within the Department of Building Inspection; and consider expanding this culturally competent program to other disadvantaged communities. (MOHCD; Medium)
m. Advocate for State legislation to reform the Ellis Act (Government Code Chapter 12.75) to stabilize rental housing by, for example, imposing a minimum holding period of five years before the Act can be used to evict tenants. (Planning, Mayor/BOS; Medium)
n. Advocate for State legislation to reform the Costa-Hawkins Housing Law to allow cities to better stabilize tenants by, for example, allowing cities to extend rent control to multifamily housing that is at least 25 years old. (Planning, Mayor/BOS; Medium)

Policy 2: Preserve affordability of existing subsidized housing, government-owned or cooperative-owned housing, or SRO hotel rooms where the affordability requirements are at risk or soon to expire.

a. Conduct a comprehensive needs assessment of existing housing cooperatives to identify impediments to success and need for support (MOHCD; Short).
b. Expand resources for preservation, rehabilitation, or rebuilding of cooperative buildings, and adopt requirements such as one-to-one replacement of affordability rates, right-to-return, and relocation plans as informed by the needs assessment referenced under Policy 2, action (a). (MOHCD; Medium)
c. Expand technical assistance and support to limited equity cooperatives regarding governance, finance, management, and marketing. (MOHCD; Short)
d. Expand resources to continue to negotiate preservation agreements for properties with expiring affordability restrictions to ensure permanent affordability and housing stability for tenants to the greatest extent possible. (MOHCD; Medium)
e. Identify units in permanently affordable projects that can be used as temporary housing for those temporarily displaced by affordable housing rehabilitation or

[9] Examples of similar programs in effect in 2021 include Oakland's Community Lawyering & Civil Rights program or Chicago's Residential Landlord and Tenant Ordinance.

redevelopment. (MOHCD, Mayor/BOS; Medium)

f. Identify SRO residential hotels in advanced states of disrepair where demolition and construction of new Permanent Supportive Housing is more cost-effective than rehabilitation and requiring tenant relocation plans during construction and a right to return for tenants. (DBI, HSH, Planning; Medium)
g. Increase fines for illegally converting SROs to new uses or illegally preventing residents from establishing tenancy by forcing short-term stays. (DBI; Short)

Policy 3: Reform and support the City's acquisition and rehabilitation program to better serve areas and income ranges underserved by affordable housing options and areas vulnerable to displacement.

a. Prioritize building purchases for the acquisition and rehabilitation program that serve extremely- and very-lowincome and unhoused populations including purchase of SRO residential hotels. (MOHCD, DBI; Medium)
b. Increase non-profit capacity-building investments to purchase and operate existing tenant-occupied buildings as permanent affordable housing in western neighborhoods, particularly for populations and areas vulnerable to displacement, and to support Community Opportunity to Purchase Act (COPA). (MOHCD; Medium)
c. Evaluate the feasibility of utilizing the small-sites program to increase shared equity or cooperative ownership opportunities for tenants. This study would also inform expansion of shared equity homeownership models cited in Policy 11, action (f) and Policy 23, action (a). (MOHCD, Planning; Short)
d. Incentivize private owners to sell residential buildings to non-profit affordable housing developers via transfer tax exemptions or other financial measure. (Planning, MOHCD, Mayor/BOS; Medium)

Policy 4: Preserve the affordability of unauthorized dwelling units while improving their safety and habitability.

a. Facilitate and encourage more legalizations through financial support such as low-interest or forgivable loans for property owners. (MOHCD, Mayor/BOS, DBI; Medium)
b. Update the Conditional Use findings requirements for removal of unauthorized dwelling units to account for tenancy and to identify alternative findings to financial hardship findings that account for the cost and construction burdens of legalization. (Planning, DBI, Mayor/BOS; Short)
c. Reduce cost of legalization by removing Planning and Building Code requirements that are not critical for health or safety. (Planning, DBI, Mayor/BOS; Medium)

Policy 9: Prevent homelessness and eviction through comprehensive evidence-based systems, including housing and other services, targeted to serve those at risk of becoming unhoused[10] and the most vulnerable groups.

a. Prioritize those at risk of becoming unhoused for homeless prevention investments, such as flexible financial assistance or Step Up to Freedom[11] program and other programs that

[10] People with prior experience of homelessness, with involvement with the criminal justice, system, extremely-low and very-low income American Indian, Black, and Latino/es, domestic violence victims, transgender people, and those at imminent risk of losing housing (e.g. tenants with an eviction notice or subject to landlord harassment).

[11] Step Up to Freedom is a reentry rapid rehousing and rental subsidy program for justice involved unstably housed/homeless adults who are between the ages of 18 – 35 years on parole or post release supervision.

offer a continuum of care and wrap around services in addition to housing. Highest risk is currently known to apply to: those with prior experience of homelessness, with involvement with the criminal justice system, extremely low and very low-income American Indian, Black, and Latino/es, domestic violence victims, transgender people, and those at imminent risk of losing housing (i.e., an eviction notice, or subject to landlord harassment). (HSH, MOHCD, APD; Short)

b. Increase the timeframe during which time-limited rental assistance is offered, through programs such as Rapid Rehousing,[12] to enable households to secure stable employment. (HSH, MOHCD; Short)
c. Ensure adequate legal services to support eviction prevention including support for rent increase hearings, habitability issues, or tenancy hearings with the Housing Authority. (MOHCD; Short)
d. Expand tenant and project-based rental assistance programs, including federal, state and local operating subsidy programs, to meet the needs of extremely and very low-income households and households with fixed incomes, such as seniors and people with disabilities, as also referenced in Policy 1, actions (c), (d), and (e). (HSH, SFHA, MOHCD; Short)
e. Expand the timeline during which transitional housing programs[13] are offered for people coming out of jails, prisons, immigration detention centers, and substance use treatment. (APD, HSH, DPH, MOHCD; Short)
f. Expand and improve services for mental health and substance use care, social work, and other supportive services for residents of Permanent Supportive Housing, and those at risk of becoming unhoused.[14] (HSH, DPH; Medium)
g. Expand on-site case management services that focus on removing barriers to housing stability to support non-profit housing providers in preventing evictions of their tenants. (HSH, MOHCD, APD ; Medium)
h. Expand housing retention requirements to prevent evictions and support tenants of non-profit housing. (MOHCD, HSH; Short)
i. Continue to provide mobile services for residents in scattered-site supportive housing, for example the new Flexible Housing Subsidy Pool program. (HSH, DPH; ongoing)
j. Adopt Trauma-Informed Systems[15] with robust training resources and increase cultural competency training specific to transgender and LGBTQ+ populations for all service providers and property managers in the City's affordable housing projects and Homeless Response System. (DPH, HSH, MOHCD, APD; Medium)
k. Improve programs intended to transfer people experiencing violent crime and domestic violence to safe housing. (HSH, MOHCD, Department on Status of Women, SFHA; Short)
l. Strengthen the housing navigation services by assigning a support counselor, with similar lived experience, to an individual regardless of where that person lives instead of being tied to a particular location, so that consistent support

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[12] A set of interventions that provides people with grants to pay for living expenses like first and last month's rent managed by the SF Department of Homelessness and Supportive Housing.

[13] A list of transitional housing programs run by the San Francisco Adult Probation Office is catalogued here.

[14] People with prior experience of homelessness, with involvement with the criminal justice, system, extremely-low and very-low income American Indian, Black, and Latinos/es/x, domestic violence victims, those at imminent risk of losing housing (for example with an eviction notice, or subject to landlord harassment).

[15] The TIS Initiative at the San Francisco Department of Public Health (SFDPH) is an organizational change model to support organizations to respond to and reduce the impact of trauma.

continues through residential transitions. (HSH, APD; Short)

m. As a prevention partner to the regional All Home Plan16, help create a regional homeless response system to share data across systems, and administer the increased funds from local, State, and federal agencies. (HSH, MOHCD; Short)
n. Expand short term medical recovery housing programs for unhoused transgender people, such as is offered by Maitri, so that transgender people can access medical care by meeting the public health system requirement for stable housing prior to undergoing gender-affirming surgeries. (HSH; Short)
o. Allocate resources to population-specific programs outside of the Homelessness Response System in acknowledgement that transgender and LGBTQ+ communities do not currently access the system because of safety and discrimination concerns. (HSH; Short)

Objective 1.b: Advance equitable housing access

Challenge- Federal fair housing laws prohibit discrimination based on race, ability, sexual orientation, gender identity,and household type. Despite these laws, racial and social disparities in housing access are stark. A major hurdle to housing equity is housing cost. More than half of Black households are rent burdened (paying more than 30% of their income on rent), and households of color overall are more likely to be rent burdened compared to white households (see Figure 6). The American Indian population is 17 times more likely to be homeless compared to their share of population, and Black households are seven times more likely (see Figure 7). The transgender and gender non-conforming (TGNC) community in San Francisco faces specific, heightened, and disproportionate challenges in accessing fair housing opportunities. Half of respondents to the US Transgender Survey report having experienced homelessness in their lifetime, and approximately fifty percent (50%) of transitional aged youth experiencing homelessness in the 2019 point in time count identified as LGBTQ+. Seventy percent (70%) of transgender people living in shelters nationally have reported being harassed,[17] contributing to the 24% of homeless transgender people in California that have reported avoiding in staying in a shelter for fear of mistreatment.[18] Seniors and transitional aged youth (between the ages of 18 to 24) collectively made up more than half of the homeless population in 2019 (see Figure 8). Seventy-four percent (74%) of respondents of the 2019 Point-In-Time Homeless Count and Survey[19] reported living with chronic physical illnesses, physical disabilities, chronic substance use, and severe mental health conditions (see Figure 9). Amongst tenants, renters of color continue to be disproportionately affected by evictions in San Francisco. In a survey of around 3,200 renters, 24% of Latino/e/x renters and 21% of Black renters reported being threatened with eviction as opposed to only 9% of white renters (see Figure 2). While Black, American

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[16] Reference to: 210413_Regional_Action_Plan_Final.pdf (allhomeca.org)

[17] National Center for Transgender Equality (2016). 2015 US Transgender Survey: Executive Summary. Washington, DC. Accessible at: http://www.transequality.org/sites/default/files/docs/USTS-Executive-Summary-FINAL.PDF

[18] National Center for Transgender Equality (2017). 2015 US Transgender Survey: California State Report. Washington, DC. Accessible at: http://www.transequality.org/sites/default/files/docs/usts/USTSCAStateReport%281017%29.pdf

[19] Due to COVID-19, San Francisco did not conduct a PIT Count in 2021. The most recently available data at the time of this report is from 2019. New data from the 2022 PIT Count will be available in the summer of 2022. The final version of this report will be updated to contain the 2021 counts.

Indian, and other people of color would most benefit from greater affordable housing access, federal regulations and California Proposition 209, which bans institutions from affirmative action based on race, sex, or ethnicity, pose a challenge to the City to implement preference programs for the communities of color most affected by homelessness, eviction and displacement, such as the American Indian, Black and Latino(a,e) communities.

Path forward- San Francisco has adopted various strategies including programs designed to ensure access for historically disadvantaged or currently vulnerable households in awarding below market rate units. These programs include the Displaced Tenant Housing Preference Program, Neighborhood Preference Program, and the Certificate of Preference Program. To effectively advance equity, the City will revise existing and implement other programs to improve access to permanently affordable housing for underserved racial and social groups. The City will identify clearer strategies to remove barriers to housing access for transgender, LGBTQ+, seniors, people with disabilities, formerly incarcerated individuals, and other specific vulnerable populations, to inform and strengthen current and new programs

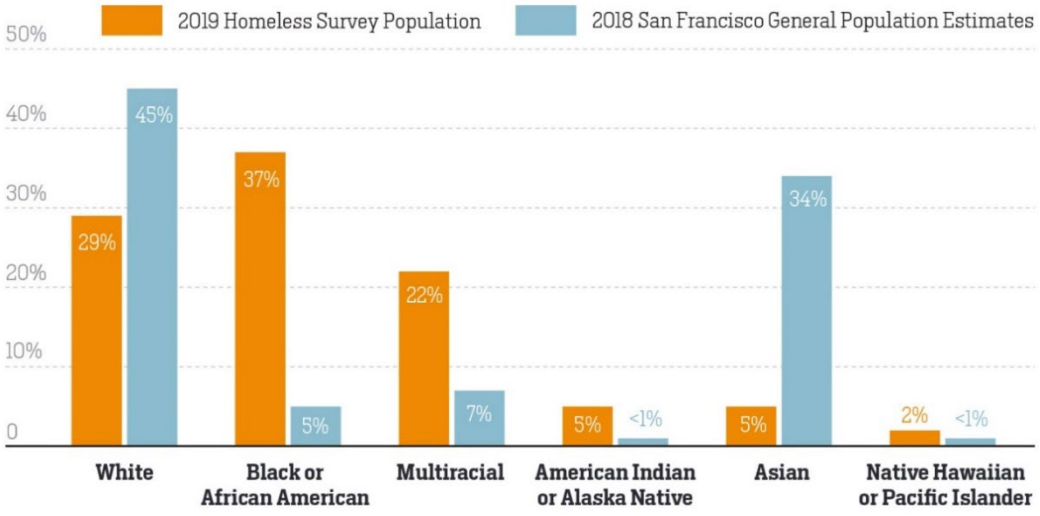
Figure 6. Percentage of households that are rent burdened* by race and ethnicity (2018).

*Rent burden means paying between 30% and 50% of the household's income in rent; severe cost burden means paying more that 50% of the household's income in rent.



Source: ACS 2018 5 Year Estimates (IPUMS-USA).

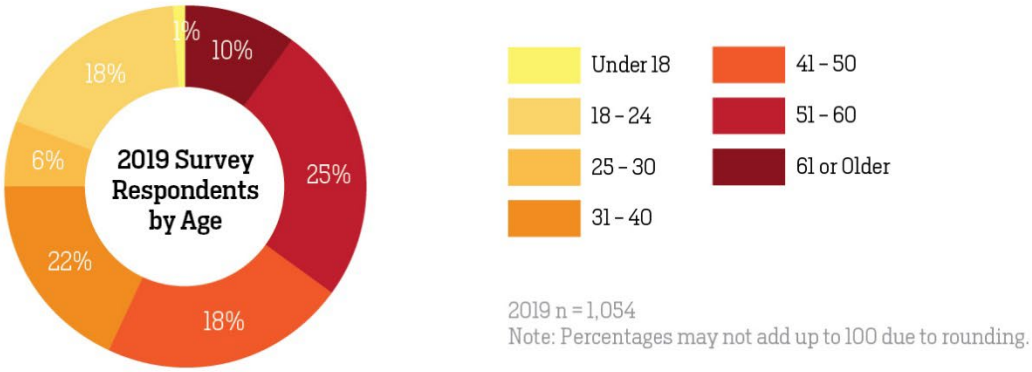
Figure 7. Percentage of people experiencing homelessness by race and ethnicity (2019).



Homeless Survey Population n = 1,025
Note: Percentages may not add up to 100 due to rounding.

Source: San Francisco 2019 Point-In-Time Homeless Count and Survey Report, Department of Homeless and Supportive Housing.
Note: Hispanic/Latino/e/x was represented in a separate chart: 18% of respondents identified as Hispanic/Latino/e/x for 2019 Homeless Survey Population, 15% identified as Hispanic/Latino/e/x for the 2019 San Francisco General Population Estimates.

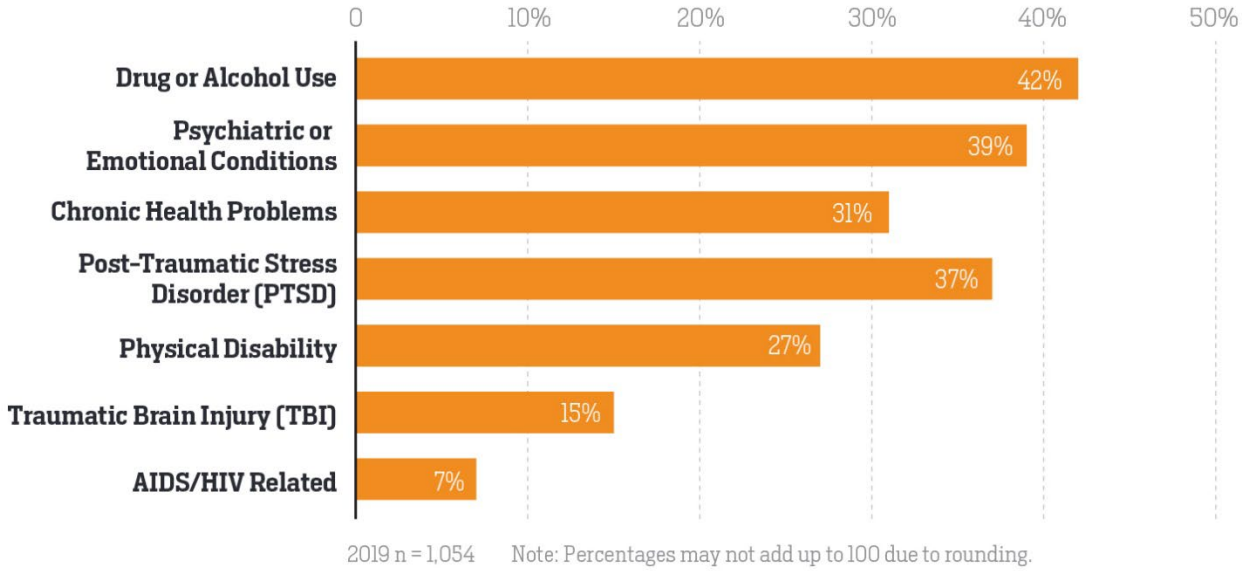
Figure 8. Percentage of people experiencing homelessness by age group (2019).



2019 n = 1,054
Note: Percentages may not add up to 100 due to rounding.

Source: San Francisco 2019 Point-In-Time Homeless Count and Survey Report, Department of Homeless and Supportive Housing.

Figure 9. Percentage of people experiencing homelessness with different health conditions (2019).



Source: San Francisco 2019 Point-In-Time Homeless Count and Survey Report, Department of Homeless and Supportive Housing.

POLICIES AND ACTIONS

Policy 5: Improve access to the available Affordable Rental and Homeownership units especially for racial and social groups who have been disproportionately underserved or for American Indian, Black, Japanese, Filipino, and other communities directly harmed by past discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act or WWII Japanese incarceration based on a reparations framework.

a. Identify racial, ethnic, and social groups who have been disproportionately underserved by MOHCD's available Affordable Rental and Homeownership units and the underlying reasons why those groups are underrepresented in obtaining such housing. These groups include but are not limited to previously identified groups such as American Indian, Black, Latinos, and other people of color, transgender and LGBTQ+ people, transitional aged youth, people with disabilities, and senior households. This study can inform the housing portal cited in Policy 14 (f). (MOHCD, Planning; Short)

b. Through the Inclusionary Technical Analysis Committee, assess whether affordability levels of rental and ownership units created through the Affordable Inclusionary Housing Program are accessible to groups underserved as studied in Policy 5, action (a), update those requirements in balance with ensuring financial feasibility as referenced in Policy 24 (a). (Planning, MOHCD; Mayor/BOS; Short)

c. Evaluate and update existing policies and programs to increase the percentage of Affordable Rental and Homeownership units awarded to underserved groups identified through the studies referenced in Policy 5, action (a) and (g), including but not limited to preferences, strengthening targeted outreach, education, housing readiness counseling, and other services specific to the needs of each group, ensuring accessible accommodations in these services, as well as increasing production of units affordable to extremely low, very low, and moderate income households as

referenced under Policy 15, action (a), Policy 19, action (b), and Policy 23, action (b). (MOHCD; Short)

d. Evaluate area median incomes and unit types and identify strategies to secure housing for applicants to the Affordable Rental and Homeownership unit lottery program who have not won the lottery after more than five years of submitting applications. (MOHCD, Mayor/BOS; Short)
e. Create and pilot programs based on a reparations framework to increase access to Affordable Rental and Homeownership units for American Indian, Black, Japanese, Filipino, and other communities directly harmed by past discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act, or WWII Japanese incarceration have been harmed by past discriminatory government actions. (MOHCD, Planning, HRC; Short)
f. Expand the Certificates of Preference program as allowed per recent State Law 1584, and conduct comprehensive outreach and engagement to identify the descendants of households who have been displaced. Expanding this program should rely on strategies that ensure such units meet the preferences and needs of eligible households as informed by Policy 5, action (g) below. (OCII, MOHCD; Short)
g. Conduct a study to engage with Certificates of Preference holders and their descendants to identify their housing needs, preferences, and income levels and create a tracking system to better monitor who has obtained or passed on affordable rental and homeownership opportunities and why. (OCII, MOHCD; Short)
h. Expand and fund community capacity for housing programs and investments for American Indian residents as one strategy to redress the historic dispossession of resources affecting these communities, such as the Indian Relocation Act, and other government actions that broke the cohesion of this community. (Planning, MOHCD; Short)
i. Identify and adopt local strategies to remove barriers to access permanently affordable housing for immigrants; people who lack documentation such as credit histories, bank accounts, or current leases; and for transgender people whose documentation may need corrections not possible due to immigration status, and/or non-California state laws; such local strategies should complement State legislation solutions referenced in Policy 6, action (d). (MOHCD, Mayor/BOS, Short)
j. Expand the Senior Operating Subsidy (SOS) program to allow extremely and very low-income seniors to be eligible for the senior Below Market Rate rental units. (MOHCD; Short)
k. Expand existing culturally responsive housing counseling to applicants to MOHCD Affordable Rental and Homeownership Opportunities through a network of community-based housing counseling agencies and Cultural Districts, and as informed by the needs identified under Policy 5, actions (a), (c), and (g); These programs include financial counseling, market-rate and below market rate rental readiness counseling, and other services that lead to finding and keeping safe and stable housing; expansion of such services should in coordination with Policy 21, action (d), and informed by community priorities working with liaisons referenced under Policy 14, action (b). (MOHCD; Short)
l. Strengthen monitoring and enforcement of Below Market Rate units to avoid fraud and abuse of units and to unlock more units for those eligible and in need, through active enforcement of existing obligations, expedited leasing of new and turnover units, and completing the build out of DAHLIA partners database. (MOHCD; Medium)

m. Amend the Inclusionary Housing Program regulations to allow existing homeowners of Below Market Rate units to purchase another Below Market Rate unit and sell their current unit in cases where household size changes or another reasonable accommodation is required, in order to respond to changing household needs. (MOHCD; Planning; Short)

Policy 6: Advance equal housing access by eliminating discrimination based on race, ethnicity, immigration status, HIV+ status, gender identity, sexual orientation, disabilities, age, prior incarceration, or mental health.

a. Identify and implement strategies to increase placement in Permanent Supportive Housing through the Coordinated Entry assessment for racial and social groups who are overrepresented in the unhoused population, such as extremely and very-low income American Indian, Black, and Latino(a/e) people, transgender people, or people with prior involvement in the criminal justice system. (HSH, MOHCD; Short)
b. Evaluate and identify common cases of discrimination and violation of fair housing law and groups who continuously face such discrimination, including transgender and LGBTQ+, or people with disabilities, and implement solutions to strengthen enforcement of fair housing law in those cases. (HRC; Medium)
c. Amend the City's Fair Chance Ordinance to incorporate best practices to expand housing access for people with criminal records to privately-owned units, Housing Choice Voucher units, and other federally funded units.[20] (HRC, MOHCD, APD; Short)
d. Advocate for State legislation to help remove barriers to access permanently affordable housing for immigrants or people who lack documentation such as credit histories, bank accounts, or current leases or, for transgender people whose documentation may need corrections not possible due to immigration status and/or non-California State laws, to complement local strategies referenced in Policy 5, action (i). (Planning, MOHCD; Medium)
e. Study and remove barriers to entry for temporary shelters, transitional and Permanent Supportive Housing for unhoused individuals and families, particularly for individuals with mental health or substance abuse issues, and prior involvement with the criminal justice system. (HSH, DPH, APD; Medium)
f. Conduct a Housing Needs Assessment[21] for seniors and people with disability every three years to inform strategies that meet their housing needs, as referenced in Policy 6, action (g) below, as well as in Policy 27. (HSA, Planning; ongoing)
g. Identify new strategies to address the unique housing and service needs of specific vulnerable populations toimprove housing access and security for each group, using the findings from the City's housing Consolidated Plans and through direct engagement of these populations. Studies should address the needs of veterans, seniors, people with disabilities, youth, transgender and LGBTQ+ populations. (MOHCD, HSH, Planning; Medium)

Policy 7: Pursue investments in permanently affordable housing that are specific to neighborhoods that serve as entry points to recently arrived residents from certain groups,

[20] Examples of similar programs can be found in affect in Oakland, CA and Seattle, WA in 2021.

[21] These studies were required by Ordinance 266-20, passed by San Francisco Board of Supervisors in December 2020.

such as transgender and LGBTQ+ refugees or immigrants, or specific to populations such as transitional aged youth or transgender people.

a. Study and identify programs that respond to the needs of transgender and LGBTQ+ groups, particularly those who are refugees, lack family connections, or previously incarcerated, to incorporate into permanently affordable housing investments that are concentrated in the neighborhoods where they have historically found community, such as the Castro for LGBTQ+ communities or the Tenderloin for transgender people of color, building upon research spearheaded by the Castro LGBTQ Cultural District. (MOHCD, Planning; Short)
b. Support implementing San Francisco's "Ending Trans Homelessness Plan" as referenced under Policy 8, action (o), as well as the ongoing housing placement for the transgender community. (HSH, OTI, MOHCD; Medium)
c. Continue to provide housing affordable to applicants on the Plus Housing List. (MOHCD; ongoing)
d. Expand housing for transitional aged-youth in permanently affordable housing including supportive programs that address their unique needs such as a past criminal record, substance abuse, sexual orientation, gender identity, or other specific needs, as informed by the strategies referenced in Policy 7, action (g). (MOHCD, HSH; Medium)
e. Study and identify programs and building types that respond to the needs of recently arrived immigrants and to incorporate them into permanently affordable housing investments that are concentrated in the neighborhoods in which they initially settle, such as Chinatown, the Tenderloin, the Mission, and other gateway neighborhoods. (MOHCD, Planning, Short)

Policy 27: Promote and facilitate aging in place for seniors and multi-generational living that supports extended families and communal households.

a. Increase permanently affordable senior housing along transit corridors to improve mobility of aging adults and seniors, particularly for extremely- and very-low income households including through expansion of Senior Operating Subsidies as referenced in Policy 5, action (j). (MOHCD; Long)
b. Pursue multi-generational living for extended families and communal households that have space and amenities for children, working-age adults, seniors and persons with disabilities, when building permanently affordable senior housing referenced under Policy 27, action (a) above, or cooperative housing referenced in Policy 23, action (a). (MOHCD; Long)
c. Create or support financing programs that support aging in place, including improvements to accessibility through home modifications or building ADUs, and supported by technical assistance programs referenced in Policy 26, action (c). (Planning, HSA, MOHCD; Short)
d. Implement new strategies to support and prevent the loss of residential care facilities, using the recommendations of the Assisted Living Working Group of the Long-term Care Coordinating Council,[22] including business support services, as well as City-funded subsidies for affordable placement of low-income residents (DPH, HSA; Medium)

[22] Supporting Affordable Assisted Living in San Francisco, January 2019, Assisted Living Facility (ALF) Workgroup | San Francisco Human Services Agency (sfhsa.org)

e. Support and explore expanding the Home Match Program to match seniors with people looking for housing that can provide home chore support in exchange for affordable rent. (HSA, MOHCD; Medium)
f. Permit uses and eliminate regulatory limitations, such as conditional use authorizations, that discourage innovative, smaller housing types where licensing is not required, such as co-housing[23] with amenities that support seniors and those with disabilities. (Planning; Medium)
g. Strengthen interagency coordination to identify and implement strategies to address the housing needs of seniors and people with disabilities, informed by the Housing Needs Assessments referenced in Policy 6, action (f). (HSA, Planning, MOHCD, MOD; Short)

Policy 3: Reform and support the City's acquisition and rehabilitation program to better serve areas and income ranges underserved by affordable housing options and areas vulnerable to displacement.

a. Prioritize building purchases for the acquisition and rehabilitation program that serve extremely- and very-lowincome and unhoused populations including purchase of SRO residential hotels. (MOHCD, DBI; Medium)
b. Increase non-profit capacity-building investments to purchase and operate existing tenant-occupied buildings as permanent affordable housing in western neighborhoods, particularly for populations and areas vulnerable to displacement, and to support Community Opportunity to Purchase Act (COPA). (MOHCD; Medium)
c. Evaluate the feasibility of utilizing the small-sites program to increase shared equity or cooperative ownership opportunities for tenants. This study would also inform expansion of shared equity homeownership models cited in Policy 11, action (f) and Policy 23, action (a). (MOHCD, Planning; Short)
d. Incentivize private owners to sell residential buildings to non-profit affordable housing developers via transfer tax exemptions or other financial measure. (Planning, MOHCD, Mayor/BOS; Medium)

Objective 1.c: Eliminate homelessness

Challenge- From 2005 to 2019,[24] the biennial Point-in-Time (PIT) Count of people experiencing homelessness increased from just over 5,400 individuals to approximately 8,000 individuals. Compared to 2015, homelessness increased by 17% (see Figure 10). Of these, 64% were unsheltered and 38% were experiencing chronic homelessness. Since 2015, the City has expanded considerably the number of Permanent Supportive Housing units, subsidies for operation, and temporary shelters. This will include approximately 4,000 units of additional Permanent Supportive Housing by end of 2022. The City has also reduced the number of unsheltered families. In 2016, the City and County of San Francisco created a new department, the Department of Homelessness and Supportive Housing (HSH), to make a significant and sustained reduction in homelessness in San Francisco through the

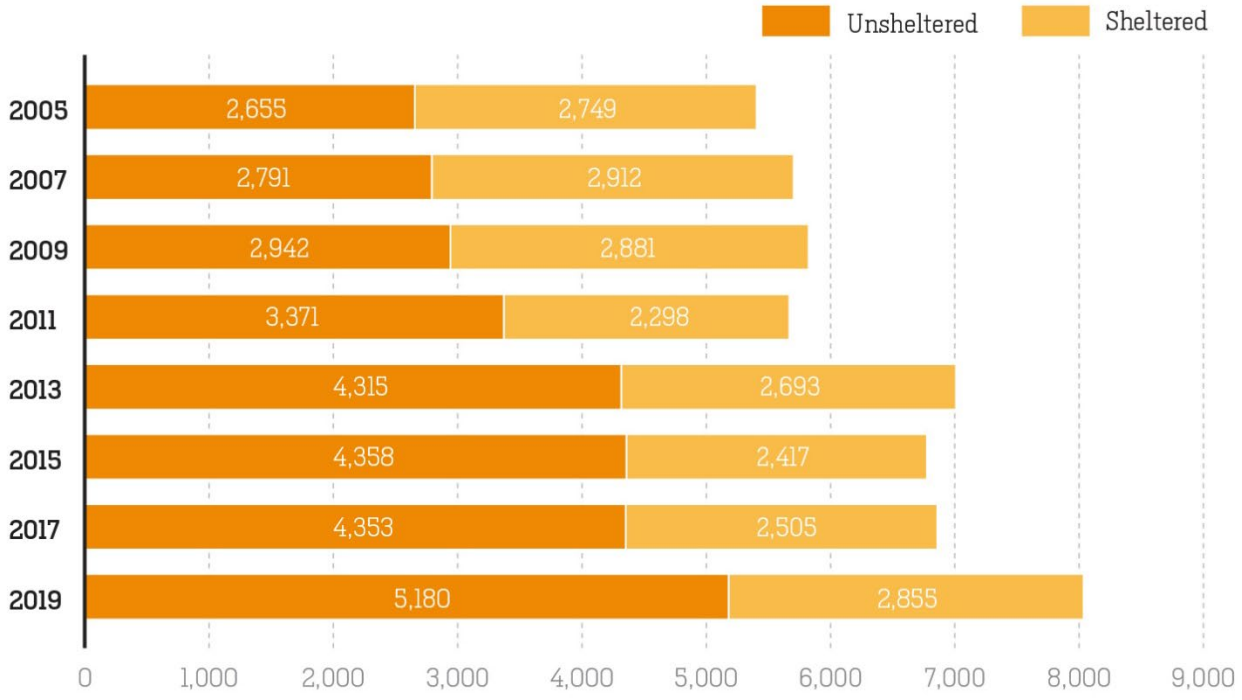
[23] Co-housing, group housing, or co-living rooms are a type of housing that may have limited cooking facilities and do not contain a full kitchen in each room. Co-housing may include (but is not limited to) communes, fraternities and sororities, or Residential Hotels.

[24] Due to COVID-19, San Francisco did not conduct a PIT Count in 2021. The most recently available data at the time of this report is from 2019. New data from the 2022 PIT Count will be available in the summer of 2022. The final version of this report will be updated to contain the 2021 counts.

coordinated provision of services. While improvements have been made at multiple levels, the number of unhoused residents has continuously grown over the years. Moreover, homelessness disproportionately impacts specific populations, such as Black and American Indian residents, transgender and LGBTQ+ people, people with disabilities, domestic violence survivors, and veterans. These inequities require targeted and tailored solutions to effectively meet their housing needs.

Path Forward- Recognizing the right to housing means providing basic access to healthy and dignified living for everyone. Eliminating homelessness is a foundation for this goal, which relies on a comprehensive set of strategies. The City will scale up investments in Permanent Supportive Housing and services, in addition to supporting and promoting other solutions such as housing vouchers, short and long-term rental assistance. For example, in July 2020, the city launched the Flexible Housing Subsidy Pool, a scattered-site Permanent Supportive Housing strategy that matches people experiencing homelessness to private market apartments across the city and provides supportive services so that they remain stably housed. The City will also increase the supply of deeply affordable housing as a homelessness prevention strategy for extremely low- and very low-income households as those households bear a higher risk of homelessness. The City prioritizes addressing chronic homelessness. San Francisco's current goal is to end family homelessness and reduce chronic homelessness by 50% by December 2022. Eliminating homelessness goes beyond focusing on what is urgent. In the long-term, meeting this objective means securing investments and solutions to also prevent households with less severe vulnerabilities from falling into homelessness.

Figure 10. Number of counted people experiencing homelessness in San Francisco by shelter status from 2005 to 2019.



Source: San Francisco 2019 Point-In-Time Homeless Count and Survey Report, Department of Homeless and Supportive Housing.

POLICIES AND ACTIONS

Policy 8: Expand permanently supportive housing and services for individuals and families experiencing homelessness as a primary part of a comprehensive strategy to eliminate homelessness.

a. Identify a numerical target for building Permanently Supportive Housing based on the upcoming Point-in-Time Counts in 2022, to approximately house a third of the total unhoused population in Permanent Supportive Housing and services, and update this target based on the 2022 Strategy completed by the Department of Homelessness and Supportive Housing. (HSH; Short)
b. Using the annual budget for capital, operating and services costs, increase funding needed to meet the targets set in Policy 8, action (a), in balance with funding needed for the actions in this policy including short and long-term rental subsidies. (Mayor/BOS, HSH, MOHCD; Medium)
c. Prioritize Housing Choice Vouchers paired with social services for people who are unhoused. (SFHA, HSH; Short)
d. Increase the share of non-lottery housing for the unhoused within City-funded permanently affordable housing projects to 30% or greater. (MOHCD; Medium)
e. Expand and improve on-site supportive services within Permanent Supportive Housing projects including sustained care for mental health or substance abuse issues, case management, and childcare. (HSH, HSA, DPH; Medium)
f. Utilize the state-wide streamlining opportunities to expedite and increase the production of Permanent Supportive Housing. (MOHCD, Planning; Short)
g. Evaluate the current prioritization system of the Coordinated Entry System for housing placement and services for unhoused residents that currently focuses only on chronic homelessness; and adopt additional levels of priorities for other vulnerable applicants to avoid worsening their situation while waiting for housing and services, and to substantially reduce the vacancy rates of housing available. (HSH; Short)
h. Expand temporary shelter capacity models that are low-barrier and high service such as non-congregate shelter options and Navigation Center beds to eliminate unsheltered homelessness moving away from traditional shelters with high barriers, with a focus on expanding temporary shelter in proportion[25] to Permanent Supportive Housing and homelessness prevention investments in order to improve the successful exist to stable housing. (HSH; Medium)
i. Evaluate the needs for and create more types of shelters in the system with amenities and services tailored to their residents, examples could include 'clean and sober' shelters, safe consumption shelters for legal and illegal substances, non-congregate shelters, transgender shelters, and off-street safe parking sites for those vehicle dwellers seeking conventional housing. (HSH; Medium)
j. Remove Planning Code limitations to building homeless shelters and navigation centers throughout the city. (Planning; Short)
k. Secure and advocate for additional funding for building and operation of Permanent Supportive Housing from State and federal sources, such as the state's Project Homekey

[25] All Home Plan recommends a proportion of 1-2-4 where for each four units of permanently supportive housing, two shelter beds and interim-housing options are added, along with homelessness prevention services for one individual. 210413_Regional_Action_Plan_Final.pdf (allhomeca.org)

and the federal HOME program. (HSH; Medium)

l. Provide housing navigation services and stability case management to people experiencing homelessness using rental assistance programs (e.g., Housing Choice Vouchers) during the housing search stage and ongoing to ensure tenant retention. (MOHCD, HSH; Short)

m. Create and expand incentives for private landlords to use rental assistance programs (e.g., Housing Choice Vouchers) to rent their units to extremely and very low-income households. Incentives could include covering lease up fees, rent payment during the inspection period, providing tenant support for housing retention, and covering unit damage upon separation, as well as establishing a fund to support these incentives. (SFHA, MOHCD, HSH; Short)

n. Strengthen the Housing Ladder[26] strategy to support residents of Permanent Supportive Housing to move to less-supportive settings, freeing up supportive housing units for unhoused people. Actions include revising San Francisco Housing Authority preference system to grant higher preference to these households in using Housing Choice Vouchers or other available subsidies or creating a new City-supported shallow subsidy for these households. (SFHA,HSH, MOHCD; Medium)

o. Support and fund the San Francisco Ending Trans Homelessness Plan to end homelessness for transgender people in recognition of the severe disparities in housing access and safety experienced by this group. (HSH, OTI, MOHCD; Short)

Policy 9: Prevent homelessness and eviction through comprehensive evidence-based systems, including housing and other services, targeted to serve those at risk of becoming unhoused[27] and the most vulnerable groups.

a. Prioritize those at risk of becoming unhoused for homeless prevention investments, such as flexible financial assistance or Step Up to Freedom[28] program and other programs that offer a continuum of care and wrap around services in addition to housing. Highest risk is currently known to apply to: those with prior experience of homelessness, with involvement with the criminal justice system, extremely low and very low-income American Indian, Black, and Latino/es, domestic violence victims, transgender people, and those at imminent risk of losing housing (i.e., an eviction notice, or subject to landlord harassment). (HSH, MOHCD, APD; Short)

b. Increase the timeframe during which time-limited rental assistance is offered, through programs such as Rapid Rehousing, to enable households to secure stable employment. (HSH, MOHCD; Short)

c. Ensure adequate legal services to support eviction prevention including support for rent increase hearings, habitability issues, or tenancy hearings with the Housing Authority. (MOHCD; Short)

d. Expand tenant and project-based rental assistance programs, including federal, state and local operating subsidy programs, to meet

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[26] A rehousing approach that offers opportunities for residents of Permanent Supportive Housing (PSH) to move from intensive supportive housing to more independent living, thus freeing up their PSH unit for others.

[27] People with prior experience of homelessness, with involvement with the criminal justice, system, extremely-low and very-low income American Indian, Black, and Latino/es, domestic violence victims, transgender people, and those at imminent risk of losing housing (e.g. tenants with an eviction notice or subject to landlord harassment).

[28] Step Up to Freedom is a reentry rapid rehousing and rental subsidy program for justice involved unstably housed/homeless adults who are between the ages of 18 – 35 years on parole or post release supervision.

the needs of extremely and very low-income households and households with fixed incomes, such as seniors and people with disabilities, as also referenced in Policy 1, actions (c), (d), and (e). (HSH, SFHA, MOHCD; Short)

e. Expand the timeline during which transitional housing programs[29] are offered for people coming out of jails, prisons, immigration detention centers, and substance use treatment. (APD, HSH, DPH, MOHCD; Short)
f. Expand and improve services for mental health and substance use care, social work, and other supportive services for residents of Permanent Supportive Housing, and those at risk of becoming unhoused.[30] (HSH, DPH; Medium)
g. Expand on-site case management services that focus on removing barriers to housing stability to support non-profit housing providers in preventing evictions of their tenants. (HSH, MOHCD, APD ; Medium)
h. Expand housing retention requirements to prevent evictions and support tenants of non-profit housing. (MOHCD, HSH; Short)
i. Continue to provide mobile services for residents in scattered-site supportive housing, for example the new Flexible Housing Subsidy Pool program. (HSH, DPH; ongoing)
j. Adopt Trauma-Informed Systems[31] with robust training resources and increase cultural competency training specific to transgender and LGBTQ+ populations for all service providers and property managers in the City's affordable housing projects and Homeless Response System. (DPH, HSH, MOHCD, APD; Medium)
k. Improve programs intended to transfer people experiencing violent crime and domestic violence to safe housing. (HSH, MOHCD, Department on Status of Women, SFHA; Short)
l. Strengthen the housing navigation services by assigning a support counselor, with similar lived experience, to an individual regardless of where that person lives instead of being tied to a particular location, so that consistent support continues through residential transitions. (HSH, APD; Short)
m. As a prevention partner to the regional All Home Plan, help create a regional homeless response system to share data across systems, and administer the increased funds from local, State, and federal agencies. (HSH, MOHCD ; Short)
n. Expand short term medical recovery housing programs for unhoused transgender people, such as is offered by Maitri, so that transgender people can access medical care by meeting the public health system requirement for stable housing prior to undergoing gender-affirming surgeries. (HSH; Short)
o. Allocate resources to population-specific programs outside of the Homelessness Response System in acknowledgement that transgender and LGBTQ+ communities do not currently access the system because of safety and discrimination concerns. (HSH; Short)

Policy 22: Create a dedicated and consistent local funding stream and advocate for State and Federal funding to support building permanently affordable housing for very low-, low-, and

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[29] A list of transitional housing programs run by the San Francisco Adult Probation Office is catalogued here.

[30] People with prior experience of homelessness, with involvement with the criminal justice, system, extremely-low and very-low income American Indian, Black, and Latinos/es/x, domestic violence victims, those at imminent risk of losing housing (for example with an eviction notice, or subject to landlord harassment).

[31] The TIS Initiative at the San Francisco Department of Public Health (SFDPH) is an organizational change model to support organizations to respond to and reduce the impact of trauma.

moderate-income households that meets the Regional Housing Needs Allocation targets.

a. Using the budget tool from Policy 14, action (e), support new and consistent sources of local funding in the City's Capital Planning process for permanently affordable housing including local bonds or other new funding sources that require voter approval. (MOHCD; Medium)
b. Dedicate funding within the 10-year Capital Planning process for permanently affordable housing in Priority Equity Geographies with a goal of building planned projects, while reaching the minimum targets in Well-resourced Neighborhoods as referenced in Policy 19, action (a). (Mayor/BOS, MOHCD; Long)
c. Explore the development of public financing tools such as Infrastructure Finance Districts to leverage the City's co-investments in order to lower direct City subsidy for permanently affordable housing. (OEWD; Medium)
d. Develop and support alternative and philanthropic funding sources to deliver permanently affordable housing faster and at a cheaper per unit cost through tools such as the Housing Accelerator Fund. (Planning, MOHCD; Medium)
e. Support the Bay Area Housing Financing Authority's expected efforts to secure voter approval for a regional tax measure to fund permanently affordable housing. (MOHCD, Planning; Medium)
f. Advocate for federal legislation to increase Low-Income Housing Tax Credits and Private Activity Bonds, for example, by changing federal rules to lower the minimum bond financing needed to access 4% LIHTC (currently 50 percent) to help unlock more LIHTC in San Francisco and statewide. (MOHCD, Planning; Short)
g. Advocate for State legislation to change the voter approval threshold for General Obligation Bonds from two-thirds to 55 percent. (Planning, Mayor/BOS; Medium)
h. Advocate for State legislation to expand non-competitive permanently affordable housing funding sources. (Planning, Mayor/BOS; Medium)
i. Collaborate with key organizations to reform Proposition 13[32] for commercial property to provide funding support for local jurisdictions to meet their permanently affordable housing targets. (Planning, Mayor/BOS; Medium)

[32] A 1978 ballot measure that reduced property tax rates on homes, businesses and farms, and capped assessed property taxes at 1% for assessed values with no more than 2% annual increase. Prop 13 significantly reduced the tax revenue of local jurisdictions to fund schools, services, and infrastructure.

Goal 2. Repair the harms of racial and ethnic discrimination against American Indian, Black, and other people of color.

Challenge- Our nation, from its inception, has initiated and perpetuated harm against people of color, including the genocide, exploitation, and dispossession of American Indian people, the enslavement of Black people, and the systematic denial of suffrage and civil rights to American Indian, Black, and other people of color. San Francisco has participated in this national legacy by creating or enforcing laws, policies, actions, and institutions that have perpetuated racial discrimination and led to disparate outcomes for American Indian, Black, and other people of color (see Figure 11). In San Francisco land use, racial discrimination is evident in the City's 1870 Cubic Air Ordinance and 1880 Laundry Ordinance which targeted San Francisco's Chinese population by limiting where they could live or work. In the 20th Century, housing discrimination in San Francisco occurred through direct government action such as urban renewal or redevelopment and through a failure of the City to act to provide equal protection to all San Francisco's residents in the face of private instruments of racial discrimination including bank redlining (see Figure 12), racial covenants, and predatory subprime loans. Furthermore, the City has at times directly removed targeted communities from their homes through local use of eminent domain or stood quietly by while federal actions like WWII Japanese American incarceration injustly targeted San Francisco citizens based on their race. Lastly, the majority of American Indian people who live in San Francisco today are here due to the Indian Relocation Act of the 1950s.[33] This policy removed American Indian peoples from their reservations and relocated them to cities nationwide. The policy enticed American Indian youth to come to seven large urban areas, including the San Francisco Bay, with promises of job training, housing, and stipends. The promises often fell short; checks did not arrive, job training was for menial labor, and people were housed in inferior housing, separated from their families and extended tribal communities.The cumulative effects of these discriminatory acts have contributed to the economic oppression that pushed and continues to push American Indian, Black and other people of color out of San Francisco. As a result, American Indian, Black, and other people of color continue to face significant income inequality, poor health outcomes, exposure to environmental pollutants, low homeownership rates, high eviction rates, and poor access to healthy food, quality and well-resourced schools, and infrastructure.

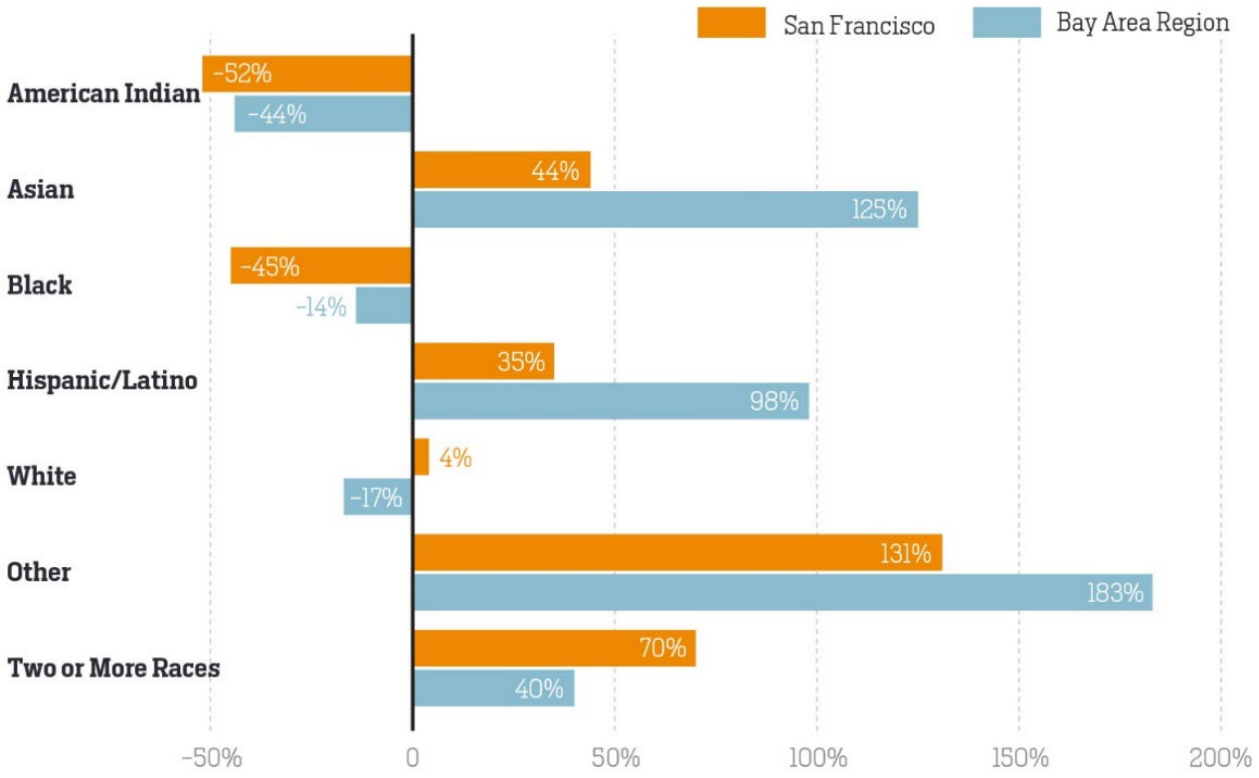
Path forward- San Francisco has a role to play in redressing the compounding effects of racial discrimination against American Indian, Black, and other people of color perpetuated at all levels of government and throughout American society. While federal action is required to redress the harms of American Indian genocide or the enslavement of Black people, San Francisco can incrementally work towards healing these deep wounds and the disparities that have resulted from centuries of oppression. The San Francisco Planning Commission passed a resolution on June 11, 2020, that acknowledges and apologizes for the history of racist, discriminatory, and inequitable

[33] SF Human Rights Commission. Discrimination by Omission: Issues of Concern for Native Americans in San Francisco. August 23, 2007. Accessed online March 16, 2022 at: https://sf-hrc.org//sites/default/files/Documents/HRC_Publications/Articles/Discrimination_by_Omission_Issues_of_Concern_for_Native_Americans_in_San_Francisco.pdf

planning policies and practices that have resulted in racial disparities. The resolution provides direction for the Planning Department to develop proactive strategies to address and redress structural and institutional racism. The resolution explicitly directs the Planning Department to redress the consequences of government-sanctioned racial harm via meaningful City-supported, community-led processes.

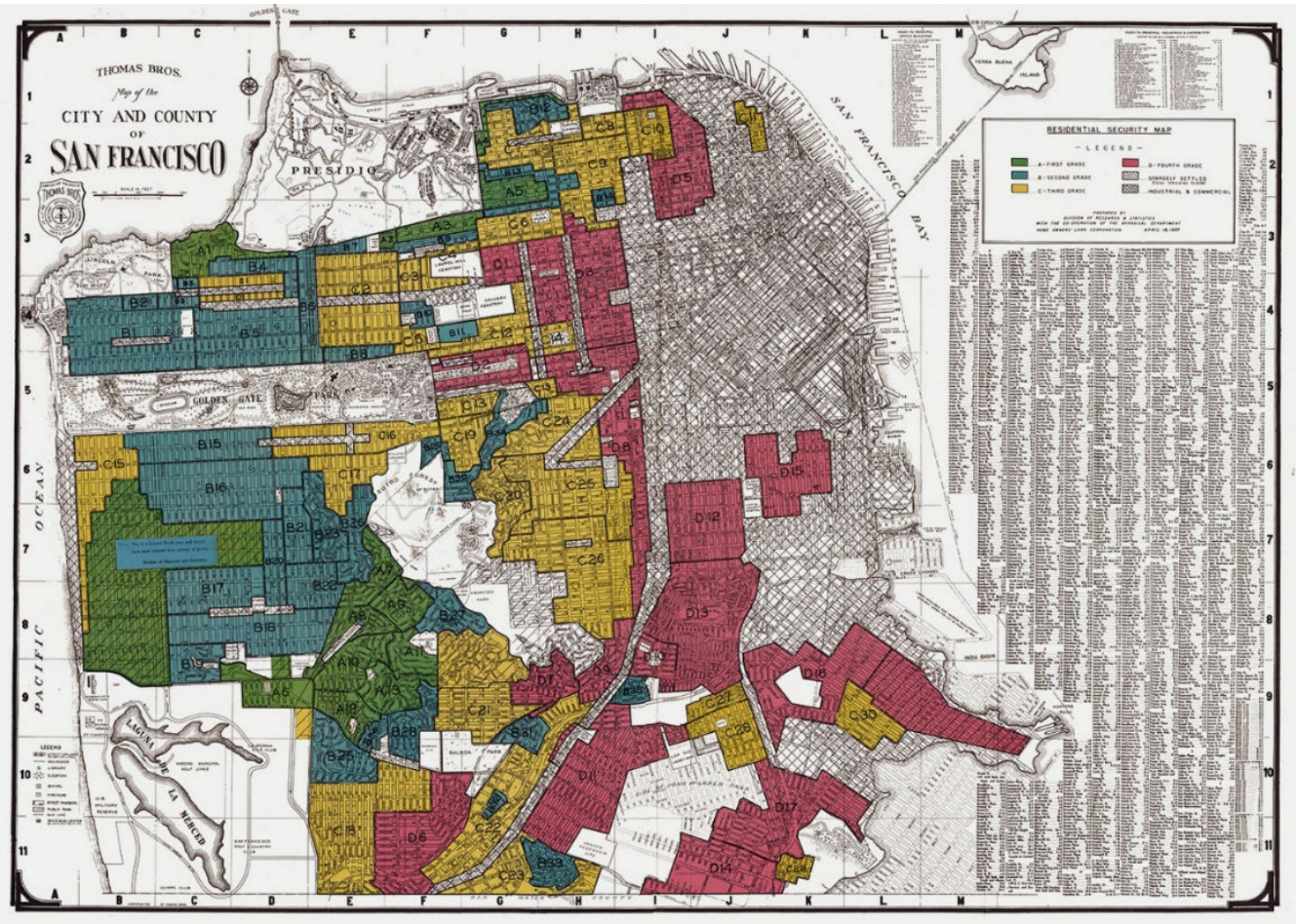
To advance this transformative work, the City must deepen its understanding of the direct harm that discriminatory housing programs and policies caused to American Indian, Black, Japanese, Filipino, and other communities of color in San Francisco. It must also understand the multiple ways in which broader mechanisms of racial and social discrimination reduce a person's access to housing, such as job discrimination or racial disparities within the criminal justice system. The City must actively dismantle these discriminatory policies by reallocating resources to increase housing access, financial stability, economic opportunities, and community building investments for these communities. Lastly, the City must remain accountable to these communities and transparent in the processes it undertakes to redress harm.

Figure 11. Percentage change of population by race and ethnicity from 1990 to 2015.



Source: 1990 Decennial Census (IPUMS-USA); ACS 2015 5-year Estimates (IPUMS-USA).

Figure 12. Redlining map shows in red neighborhoods that were discriminated for home and improvement loans.



Source: The University Of Richmond's Mapping Inequality Project.

Objective 2.a Make amends and inform reparative actions by telling the truth about discriminatory actions and the resulting harm

Challenge- Throughout history, communities of color have been the targets of federal, state and locally sponsored and supported programs which have segregated neighborhoods, displaced, and stripped wealth from communities, and undermined their general health and well-being. The impact of these discriminatory actions on American Indian, Black and other communities of color has yet to be fully documented or understood. While historians have described national events such as the Japanese Internment Bill of 1942 or the Indian Relocation Act of 1956, or government endorsed practices such as redlining (see Figure 12), racially restrictive covenants, and urban renewal, the City needs to study and understand how these actions specifically impacted the residents of San Francisco in order to take reparative action. The City cannot make amends or take steps to repair past harm without identifying the persons who suffered these acts of discrimination and, by speaking with them, documenting the nature and magnitude of the harm. In many cases, this will mean tracking how harm to an individual repercussed through generations and communities. This level of

investigation and documentation, centering the voices of the American Indian, Black and other communities of color, has been limited in San Francisco to date. For example, the Planning Department has constructed historical narratives to explain segregation in public housing or development patterns resulting from redlining and urban renewal to inform the department's regulatory review; however, the department is only just beginning to apply this information in a reparative framework to ask, "What actions must we take as a department and a city to redress the harm that resulted from these events?" This is a challenging and urgent task because truth-telling will necessarily rely on oral histories to reveal the largely undocumented stories of impacted communities, and first-hand accounts of these events will become rarer as members of those communities pass on. Moreover, the opportunity to repair harm for those individuals will be lost.

Path forward- To begin to repair and redress the harm, it is crucial that the City undergoes a truth-telling process to acknowledge the impacts government-sanctioned actions that led to wealth loss, disparate housing outcomes and displacement in the American Indian, Black, Japanese, Filipino and other communities of color. This process of investigation, documentation, and acknowledgment is essential for establishing accountability, raising consciousness, and informing the mechanisms and magnitude of resources required to repair the harm. The City must support the affected communities to lead this investigation and documentation, and acknowledgement of harms and their disparate outcomes must be communicated at all levels of power. This truth-telling can illuminate how City agencies build programs that are harm reductive, culturally competent, accessible, and that do not reproduce racist practices from the past. Lastly, truth-telling can begin to correct the erasure from the historic record, both in its written form and in the city's built-form, that these communities have suffered.

POLICIES AND ACTIONS

Policy 10: Acknowledge the truth about discriminatory practices and government actions[34] as told by American Indian, Black, and other communities of color to understand the root causes of the housing disparities in these communities and to inform how to redress the harms.

a. Commission an American Indian community-led study to document the discriminatory practices and government actions against American Indian communities including the Indian Relocation Act of 1956 and the cumulative impacts of genocide, exploitation, and dispossession of resources in terms of wealth loss, disparate housing outcomes, and scale of displacement. (Planning, HRC ; Short)
b. Commission a community-led study by affected communities, including American Indian, Black, and other communities of color, to document the history of redlining, racial covenants, and exclusionary zoning practices in San Francisco and their cumulative impacts, particularly on Black households, in terms wealth-loss, disparate housing outcomes, and scale of displacement. (Planning; Short)
c. Commission a community-led study by affected communities, including American Indian, Black, and other communities of color, to document the history of urban renewal in

[34] Discriminatory programs include, but are not limited to, redlining, urban renewal, segregated public housing, and exclusionary zoning regulations, such as single-family zoning.

San Francisco and its cumulative impacts, particularly on Black households, in terms wealth-loss, disparate housing outcomes, and scale of displacement. (Planning; Short)

d. Commission a community-led study by affected communities to document the history of public housing replacement in San Francisco and its impacts, particularly on Black households, in terms of wealth loss, disparate housing outcomes, and scale of displacement. (Planning; Short)
e. Commission a community-led study by affected communities to document the history of predatory lending practices in San Francisco and its impacts in terms of wealth loss, disparate housing outcomes, and scale of displacement. (Planning; Short)
f. Incorporate the findings of these studies including the resulting disparities and inequities when applying the racial and social equity assessment tool[35] to applicable projects (Planning; Short).

Objective 2.b Offer reparations for communities directly harmed by discriminatory action and bring back their displaced people

Challenge- Racial discrimination has led to disparate outcomes in income for American Indian, Black and other communities of color, leaving them vulnerable to housing insecurity and limiting their ability to build intergenerational wealth. The median income for Black households was $30,442 in 2018, 23% of median income for a white household, and for American Indian households' median income was $61,250 (see Figure 13), 46% of a white household's median income. As a result, these communities are far more impacted by displacement as discussed also in objective 2.b. San Francisco has a moral obligation to repair the harms of racial discrimination, especially those harms for which it holds the greatest responsibility. Calls for reparations from the federal government have occurred since the Civil War, but it was only in 2021 that House Resolution 40, first introduced in 1989 to create a commission to study slavery and discrimination and potential reparations, moved out of committee. In California, Assembly Bill 3121 was enacted on September 30, 2020 to establish the Task Force to Study and Develop Reparation Proposals for Black Americans. And in May 2021, San Francisco's Board of Supervisors appointed the city's African American Reparations Advisory Committee, described as the first body of its kind to create a comprehensive reparations plan for Black Americans.

Path forward- The City can build on current and past local and state initiatives to pursue reparations for American Indian, Black, as well as Japanese American and Filipinos harmed by government actions to create local programs that use housing as tool of repair that addresses persistent housing disparities for these groups and continued community displacement. Reparative acts through housing tools targeted to harmed communities could include dedicating land or housing, offering homeownership loans and grants, ensuring access to below market rate units, facilitating communal forms of land or housing ownership, creating pathways for displaced people and their descendants to return, and strengthening and sustaining their cultural

[35] An analysis approach to assessing the potential racial and social equity impacts of a proposed action. This tool is part of San Francisco Planning's Racial and Social Equity Action Plan, which aims to pro-actively advance equity in the Department's internal and external work such as community planning, community engagement, policy/laws development, hiring, and process improvements. At the time of publication (March 2022), this tool is still being developed.

anchors, such as businesses, community and cultural centers, and historic sites.

The city should use the Cultural District program to help anchor and stabilize American Indian, Black and other communities of color by leveraging the community-government partnerships the program has created to lead community planning and guide resource allocation. The program's mandate requires that the City coordinate resources to assist in stabilizing the districts, which house and provide for vulnerable communities facing, or at risk of, displacement or gentrification. Their community-led processes such as their Cultural History, Housing, and Economic Sustainability Strategies (CHHESS) and direct services, provide a culturally competent framework for stabilizing harmed communities and devising ways to bring back their displaced members.

To incrementally repair the harm inflicted on American Indian and Black people throughout our nation's history and to reverse the displacement and overrepresentation in homelessness of American Indian and Black residents, the City should support these groups for homeownership opportunities, rental housing assistance and other housing services programs. Similarly, to address direct displacement caused by government actions, the City will explore implementing the newly passed State Assembly Bill 1584 that expands the Certificate of Preference program to serve the descendants of households displaced.

The goal of such actions is to erase racial and ethnic disparities across indicators such as homelessness, homeownership, and rent burden, to improve life outcomes for residents in vulnerable communities, and to grow the city's communities of color whose populations have been diminished by displacement. Housing reparative acts should work in concert with more comprehensive local, state, and federal efforts to redress the nation's history of harm against American Indian, Black and other communities of color.

Figure 13. Median household income by race and ethnicity (2018).

SAN FRANCISCO	$104,552
American Indian / Alaskan Native	$61,250
Black or African American	$30,442
Hispanic or Latino/e/x (Any Race)	$72,578
Native Hawaiian and Other Pacific Islander	$76,333
Some Other Race	$ 59,497
Two or More Races	$114,399
White (Non-Hispanic)	$132,154

Source: ACS 2018 5-year Estimates (IPUMS-USA).

POLICIES AND ACTIONS

Policy 11: Establish and sustain homeownership housing programs designed around a reparations framework for American Indian, Black, Japanese, Filipino, and other communities directly harmed by past discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act, or WWII Japanese incarceration, as a means of redressing the harms and with the goal of stabilizing these communities and bringing back those who have been displaced from the city.

a. Establish pilot and permanent programs that offer homeownership opportunities targeted to Black communities harmed through redlining or urban renewal, and to certificate of preference holders and their descendants as informed by the studies referenced in Policy 5, action (g); Building on programs such as the Dream Keeper initiative. Such programs should include features such as silent second loans or grants for down payment assistance, as well as other financial assistance to reduce income eligibility as a barrier to access homeownership opportunities. (MOHCD; Medium)
b. Upon completion of the pilot program for Black communities cited in Policy 11, action (a), evaluate and extend the program to other communities directly harmed by discriminatory government actions.[36] (MOHCD; Short)
c. Target increased investment in the Down Payment Assistance Loan Program to communities harmed by discriminatory government actions as listed in this policy. (MOHCD; Short)
d. Prioritize American Indian residents for housing opportunities to redress the historic dispossession of resources affecting these communities, such as by the Indian Relocation Act, and other government actions that broke the cohesion of this community. (Mayor/BOS; Short)
e. Implement the right to return legislation for residents of public housing including opportunities to those previously displaced. (MOHCD; Medium)
f. Pursue expanding and modifying the shared equity homeownership and land trust models, to address their effectiveness and scalability, for communities harmed by past discrimination. Use the findings of the study referenced in Policy 3, action (c) to inform expansion of these models. (MOHCD, Planning; Medium)

Policy 12: Invest in cultural anchors and expand access to land and spaces that hold cultural importance for American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act or WWII Japanese incarceration as a means of redressing histories of dispossession, social disruption, and physical displacement based on a reparations framework.

a. In recognition of the removal of American Indians from their ancestral lands, identify opportunities to restore access to land for traditional cultural uses and to invest in spaces for the American Indian community to participate in traditional cultural practices and convene community gatherings. (MOHCD, Mayor/Board, RED; Short)
b. In recognition of the disproportionate loss of Black residents from San Francisco in recent

[36] Discriminatory programs by government action affecting housing, including government sanctioned programs, include but are not limited to urban renewal, redlining, segregated public housing, racial covenants, and exclusionary zoning regulations, such as single-family zoning.

decades resulting from a culmination of discriminatory government actions, identify opportunities to donate or dedicate land for use by Black-led, community-serving organizations. (MOHCD, Mayor/Board, RED; Short)

c. Strengthen interagency coordination to ensure that Cultural District strategies related to the creation or improvement of cultural anchors and spaces are integrated into planning, funding, and construction and/or rehabilitation of public projects (e.g., parks and open spaces, street improvements, libraries, and transit facilities). (Planning, MOHCD, OEWD; Short)
d. Fund the development and implementation of community-developed strategies in Cultural Districts to retain and grow culturally associated businesses and services that attract residents back to the area. (MOHCD, OEWD, OSB, Planning; Short)
e. Recognize spaces of cultural importance identified by American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions in community planning and regulatory review for development projects, consult them in decisions affecting those spaces, and direct resources towards their preservation and management. (Planning, OEWD, OSB; Short)
f. Fund the development of cultural spaces that serve communities harmed as described under this policy, using potential new funding sources such as the mitigation fund referenced under Policy 37, action (c) or community facilities fees. (MOHCD, Planning, OEWD; Medium)
g. Explore utilizing the Legacy Business Registry program to direct resources to businesses and not-for-profit organizations associated with American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions. (OSB, OEWD; Short)

Policy 5: Improve access to the available Affordable Rental and Homeownership units especially for racial and social groups who have been disproportionately underserved or for American Indian, Black, Japanese, Filipino, and other communities directly harmed by past discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act or WWII Japanese incarceration based on a reparations framework.

a. Identify racial, ethnic, and social groups who have been disproportionately underserved by MOHCD's available Affordable Rental and Homeownership units and the underlying reasons why those groups are underrepresented in obtaining such housing. These groups include but are not limited to previously identified groups such as American Indian, Black, Latinos, and other people of color, transgender and LGBTQ+ people, transitional aged youth, people with disabilities, and senior households. This study can inform the housing portal cited in Policy 14 (f). (MOHCD, Planning; Short)
b. Through the Inclusionary Technical Analysis Committee, assess whether affordability levels of rental and ownership units created through the Affordable Inclusionary Housing Program are accessible to groups underserved as studied in Policy 5, action (a), update those requirements in balance with ensuring financial feasibility as referenced in Policy 24 (a). (Planning, MOHCD; Mayor/BOS; Short)
c. Evaluate and update existing policies and programs to increase the percentage of Affordable Rental and Homeownership units awarded to underserved groups identified through the studies referenced in Policy 5,

action (a) and (g), including but not limited to preferences, strengthening targeted outreach, education, housing readiness counseling, and other services specific to the needs of each group, ensuring accessible accommodations in these services, as well as increasing production of units affordable to extremely low, very low, and moderate income households as referenced under Policy 15, action (a), Policy 19, action (b), and Policy 23, action (b). (MOHCD; Short)

d. Evaluate area median incomes and unit types and identify strategies to secure housing for applicants to the Affordable Rental and Homeownership unit lottery program who have not won the lottery after more than five years of submitting applications. (MOHCD, Mayor/BOS; Short)
e. Create and pilot programs based on a reparations framework to increase access to Affordable Rental and Homeownership units for American Indian, Black, Japanese, Filipino, and other communities directly harmed by past discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act, or WWII Japanese incarceration have been harmed by past discriminatory government actions. (MOHCD, Planning, HRC; Short)
f. Expand the Certificates of Preference program as allowed per recent State Law 1584, and conduct comprehensive outreach and engagement to identify the descendants of households who have been displaced. Expanding this program should rely on strategies that ensure such units meet the preferences and needs of eligible households as informed by Policy 5, action (g) below. (OCII, MOHCD; Short)
g. Conduct a study to engage with Certificates of Preference holders and their descendants to identify their housing needs, preferences, and income levels and create a tracking system to better monitor who has obtained or passed on affordable rental and homeownership opportunities and why. (OCII, MOHCD; Short)
h. Expand and fund community capacity for housing programs and investments for American Indian residents as one strategy to redress the historic dispossession of resources affecting these communities, such as the Indian Relocation Act, and other government actions that broke the cohesion of this community. (Planning, MOHCD; Short)
i. Identify and adopt local strategies to remove barriers to access permanently affordable housing for immigrants; people who lack documentation such as credit histories, bank accounts, or current leases; and for transgender people whose documentation may need corrections not possible due to immigration status, and/or non-California state laws; such local strategies should complement State legislation solutions referenced in Policy 6, action (d). (MOHCD, Mayor/BOS, Short)
j. Expand the Senior Operating Subsidy (SOS) program to allow extremely and very low-income seniors to be eligible for the senior Below Market Rate rental units. (MOHCD; Short)
k. Expand existing culturally responsive housing counseling to applicants to MOHCD Affordable Rental and Homeownership Opportunities through a network of community-based housing counseling agencies and Cultural Districts, and as informed by the needs identified under Policy 5, actions (a), (c), and (g); These programs include financial counseling, market-rate and below market rate rental readiness counseling, and other services that lead to finding and keeping safe and stable housing; expansion of such services should in coordination with Policy 21, action (d), and informed by community priorities working with liaisons referenced under Policy 14, action (b). (MOHCD; Short)

l. Strengthen monitoring and enforcement of Below Market Rate units to avoid fraud and abuse of units and to unlock more units for those eligible and in need, through active enforcement of existing obligations, expedited leasing of new and turnover units, and completing the build out of DAHLIA partners database. (MOHCD; Medium)
m. Amend the Inclusionary Housing Program regulations to allow existing homeowners of Below Market Rate units to purchase another Below Market Rate unit and sell their current unit in cases where household size changes or another reasonable accommodation is required, in order to respond to changing household needs. (MOHCD; Planning; Short)

Objective 2.c Increase accountability to American Indian, Black and other communities of color

Challenge- Limited commitment at the local, state, and federal levels to adequately fund housing programs to meet the City's existing housing need has contributed to profound public frustration and distrust in the agencies that are meant to serve them. In focus groups for the Housing Element with communities of color and vulnerable groups in 2021, participants reported the sense of powerlessness that they have experienced when attempting to access city programs and resources. Participants shared housing-related experiences that have left them feeling unheard, overwhelmed, exhausted, and powerless to improve housing challenges that seem insurmountable. Participants expressed that existing housing programs and systems sometimes contribute to this sense of powerlessness by de-humanizing already vulnerable community members, and by operating without enough transparency, or accountability to the communities served.

More needs to be done to improve information sharing with the public about why their needs are not being met, how decisions are being made, and why resources have been inadequate. Unmet housing needs for low-income people are the norm around the state and nation as represented by only one Section 8 voucher available for every four qualified households, and very-low-income renters everywhere face cost burdens and a scarcity of affordable housing. Locally, hundreds of households apply for each new affordable housing unit (see Figure 14). American Indian, Black and other people of color are disproportionately impacted by the failure to adequately fund our housing systems. These are the same communities that are most marginalized from the electoral process and therefore, have fewer means to impact political and government decisions regarding housing policy and resource allocation and to hold those in power accountable to their needs. Likewise, communities of color have not been sufficiently elevated in the City's outreach and engagement efforts or adequately represented in decision-making bodies, further marginalizing their voices.

Path forward- The City must create systems of accountability that empower American Indian, Black and other communities of color with the knowledge and means to effect positive change for their communities. Elevating the voices of communities of color and other marginalized groups will require that the City proactively support community-based organizations in leading community engagement, and planning. Working with community organizations that serve American Indian, Black and other people of color will help expand access to housing programs and ensure that new policies and larger programmatic changes effectively meet the housing needs of these communities. Outreach and engagement processes should be community-led, culturally appropriate, long-term, and with clear

expectations about the outcome of the engagement.Whenever possible, the time and knowledge shared by community advisors should be compensated. Elevating the voices of communities of color also means increasing representation of American Indian, Black, and other people of color in advisory and decision-making bodies.

Improving accountability to advance racial and social equity in housing outcomes will require identifying priorities in this housing plan. While the City needs to significantly expand its resources, priority actions will guide City agencies to prioritize their existing limited resources into actions that carry the highest impact in serving the needs of communities of color, and improving housing affordability for all. Working with bodies and organizations that represent American Indian, Black, and other Communities of color, such as the Community Equity Advisory Council, the African American Reparations Committee, or Cultural Districts, the City will update those priorities frequently, and report on their performance. This process will equip communities of color with more knowledge of the functions and performance of housing programs and policies and the means to hold agencies accountable and support efforts to hold greater power in the decisions that affect their communities. The dissemination of information to and capacity building with American Indian, Black, and other communities of color should expand access to housing programs and result in more effective policies and strategies for meeting the housing needs of their communities.

Additionally, transparent processes and interagency coordination will support the City to continuously identify the funding gaps to implement those priorities and inform the City's budgeting process. A new racial and social equity analysis framework will help evaluate the impact of the Housing Element's policies and programs to ensure timely adjustments to increase accountability and effectiveness in advancing racial and social equity. This new framework will include metrics to evaluate progress, and investment solutions to prevent and reverse adverse impacts and to advance equity. Overall, these new tools should make possible a healthier democratic system in which the needs of all residents are more equitably addressed.

Figure 14. BMR Rental Applicants vs Occupants by Race and Ethnicity.

Demographics for BMR Rentals*		
589 units (new and re-rental)	Applicants	Occupants
American Indian or Alaska Native	*1,818*	4
Asian	*36,301*	214
Black or African American	*19,045*	71
Hispanic or Latino	*28,005*	140
Native Hawaiian or Other Pacific Islander	*1,710*	6
White	*18,392*	90
Other or Multi-Racial	*6,597*	24
Unknown	*8,169*	51
Total	***120,037***	**602**

Source: 2019-2020 MOCHD Progress Report

POLICIES AND ACTIONS

Policy 13: Amplify and prioritize voices of American Indian, Black, and other people of color, and other disadvantaged communities, and embrace the guidance of their leaders throughout the engagement and planning processes for housing policy, planning, programs, and developments.

a. Develop and implement community engagement strategies that center racial and social equity and cultural competency to be used by Planning Department staff as well as developers or community groups. (Planning; Short)
b. Update the Planning Code and Planning Department protocols where necessary to reflect strategies developed in Policy 13, action (a), this includes updating Planning Department requirements for project sponsors to engage with interested Cultural Districts to allow these communities to provide input upon initiation of a project application and to allow the project sponsor adequate time to address the input through dialogue or project revisions. (Planning; Short)
c. Increase resources and funding to partner with community-based organizations primarily serving and representing American Indian, Black, other people of color for inclusive outreach and engagement and meaningful participation in planning processes related to housing through focus groups, surveys, and other outreach events (Planning, Mayor/BOS; Medium)
d. Develop and implement guidelines, and update the municipal codes where needed, to ensure elevated representation of American Indian, Black, and other communities of color in decision-making or advisory bodies such as Community Advisory Councils (CACs). (Planning; Medium)

e. Prioritize and improve consultation with local Native Ohlone representatives, including the Association of Ramaytush Ohlone representatives, and American Indian residents in policy development and project review regarding tribal and cultural resource identification, treatment, and management while compensating them for their knowledge and efforts. Improvements should include commissioning the development of community-led, culturally relevant guidelines for identifying and protecting tribal and cultural resources and identifying funding sources for cultural resource identification, treatment and management. (Planning; Short)
f. Identify and implement priority strategies recommended by advisory bodies primarily serving and representing American Indian, Black, and other people of color such as the African American Reparations Advisory Committee and the Transgender Advisory Committee. (Planning, MOHCD; Medium)

Policy 14: Establish accountability tools to advance racial and social equity in housing access with measurable progress.

a. Develop and align department-wide metrics that measure progress towards beneficial outcomes for American Indian, Black, and other people of color resulting from housing policies using methods consistent with the San Francisco Equity Index prepared by the Office of Racial Equity. (Planning, ORE; Medium)
b. Identify and fund liaisons within key City agencies such as MOHCD and Planning to support the housing needs and priorities of American Indian, Black, other people of color, and other disadvantaged communities; such liaison should provide regular check-ins with the community at centralized community spaces and reporting on program performance. (Planning, MOHCD; Short)
c. Identify priority actions in the Housing Element specific to different communities, through collaboration with Cultural Districts or other racial and social equity-focused community bodies such as the Community Equity Advisory Council or the African American Reparations Committee, and report back to communities on those priorities and update every two years. (Planning; Medium)
d. Establish an inter-agency Housing Element implementation committee, who convenes meetings with community advisor members representing racial and social equity-focused bodies as cited in Policy 14, action (c), to inform the City's budget and work program on housing equity. The committee would be responsible for reporting progress measured in actions (a) and (c) to the Planning Commission and Mayor's Office and for identifying financial or legal challenges to progress. (Planning, MOHCD, HRC; Short)
e. Create a budgeting tool for housing investments, including permanently affordable housing production, preservation, and housing services, to implement the priorities identified in Policy 14, actions (b) and (c), and inform the Capital Planning process as cited in Policy 22, action (a). The tool would identify existing and consistent sources of funding as well as funding gaps to inform the annual funding and Capital Planning process. (Planning, MOHCD; Short)
f. Develop a housing portal, expanding DAHLIA, to improve data collection on communities being served by various housing services, and to also provide a hub for applicants to all housing programs and services including rental assistance, affordable housing lotteries, vouchers, and public housing. (MOHCD, Digital Services, SFHA, HSH; Short)

Policy 21: Prevent the potential displacement and adverse racial and social equity impacts of zoning

changes, planning processes, or public and private investments especially for populations and in areas vulnerable to displacement.

a. Based on the Racial and Social Equity Impact Analysis for the Housing Element,[37] measure and quantify levels of investments to prevent community displacement through increased permanently affordable housing production, equitable access to housing, and other community stabilization strategies for vulnerable populations. (Planning; Short)
b. Create benchmarks for affordable housing production and preservation investments to avoid displacement and other adverse racial and social equity impacts for future zoning changes, development projects and infrastructure projects according to the scale and location of the proposal, as informed by the Racial and Social Equity Impact Analysis for the Housing Element. (Planning; Short)
c. Invest public funding or direct private investment to implement the anti-displacement investments identified in Policy 21, action (b) for zoning changes, development projects, or infrastructure projects of certain scale or intensity, in parallel with the project timeline. (MOHCD, SFMTA, OEWD, DPW; Medium)
d. Increase funding to expand the services of community-based organizations and providers for financial counseling services listed under Policy 5, action (k), as well as tenant and eviction protection services listed under Policy 1, to better serve populations and areas vulnerable to displacement; tenant and eviction protection services include legal services, code enforcement outreach, tenant counseling, mediation, and housing-related financial assistance; expansion of such services should be informed by community priorities working with liaisons referenced under Policy 14, action (b). (MOHCD, Mayor/BOS; Short)

[37] The Racial and Social Equity Impact analysis of the Housing Element will be completed prior to the adoption of the Housing Element 2022, and this action will be updated based on the findings accordingly.

Goal 3. Foster racially and socially inclusive neighborhoods through equitable distribution of investment and growth.

Challenge- Racial and economic segregation is defined by the UC Berkeley Othering and Belonging Institute (OBI) as "an attempt to deny and prevent association with another group, and a strategy that institutionalizes othering of racial or social groups through inequitable resource distributions."[38]

Racial concentrations overlapped with concentration of low-income households are strongly visible in San Francisco (Mission, Fillmore and Bayview, Chinatown, SoMA) indicating segregated living patterns (Figure 15). Many of these neighborhoods have hosted most of the new growth, with 85% of new housing built since 2005 concentrated in the eastern and central parts of the city: Downtown/South Beach, SoMa, Mission Bay, Potrero Hill/ Dogpatch, Bayview Hunters Point, the Mission, Tenderloin, and Hayes Valley (see Figure 16). While these investments in housing development brought new infrastructure, jobs, and residents to the east side, many lower income communities of color were locked out of access to these benefits and are still contending with the lingering effects of discrimination that make them more vulnerable to homelessness, evictions, and displacement. At the same time, well-resourced neighborhoods with greater access to parks, quality schools, better environmental conditions, and with higher median incomes have experienced the lowest rates of new housing development over the last few decades. Multi-family homes in these neighborhoods are either not currently allowed or zoning restrictions render them too expensive to deliver. These restrictions have the effect of excluding low- and moderate-income households from being able to live in these neighborhoods and in that way serve to maintain racial and economic segregation in San Francisco (see Figure 17).

Path forward- A new state law, Affirmatively Furthering Fair Housing (AFFH), requires that all public agencies administer programs and activities related to housing and community development in a manner that promotes fair housing. Affirmatively furthering fair housing means "taking meaningful actions, in addition to combating discrimination, that overcome patterns of segregation and foster inclusive communities free from barriers that restrict access to opportunity."[39] The California Department of Housing and Community Development (HCD) prescribes that in order to prevent further segregation and concentration of poverty, and to increase access to opportunity and redress past actions that led to current inequities, city agencies and decision-makers "must create land-use and funding policies to increase affordable housing in high resource neighborhoods that have often been exclusionary (explicitly or indirectly due to costs or zoning policies) and bring additional resources to traditionally under-resourced neighborhoods."[40]

The goal of greater integration, and racially and socially inclusive neighborhoods, relies on building intergenerational wealth within areas[41] with high concentration of American Indian, Black, or other

[38] https://www.otheringandbelonging.org/the-problem-of-othering/

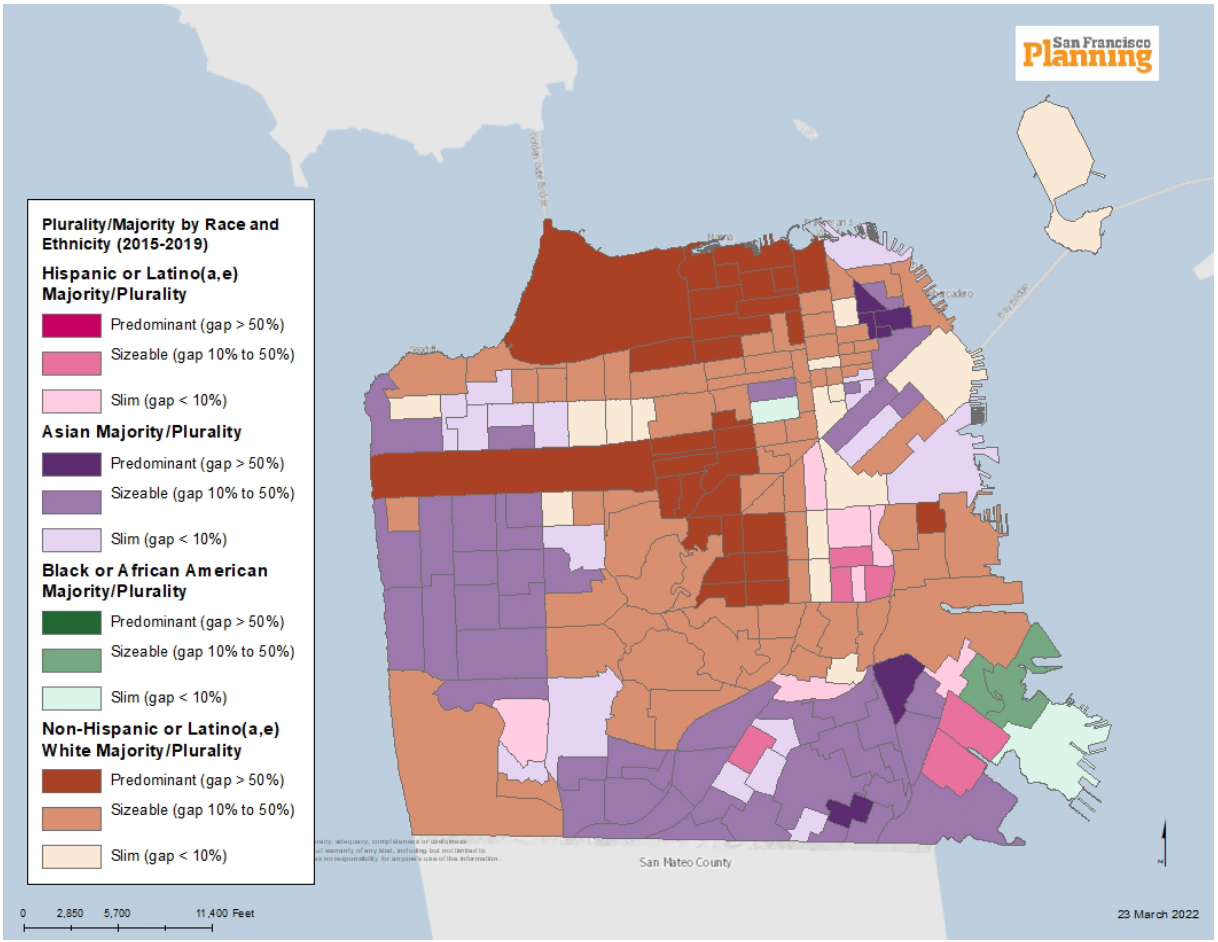
[39] AB 686 https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB686

[40] https://www.hcd.ca.gov/community-development/affh/docs/affh_document_final_4-27-2021.pdf#page=16

[41] Ibram Kendi, "How to Be an Antiracist" (One World, August 13, 2019).

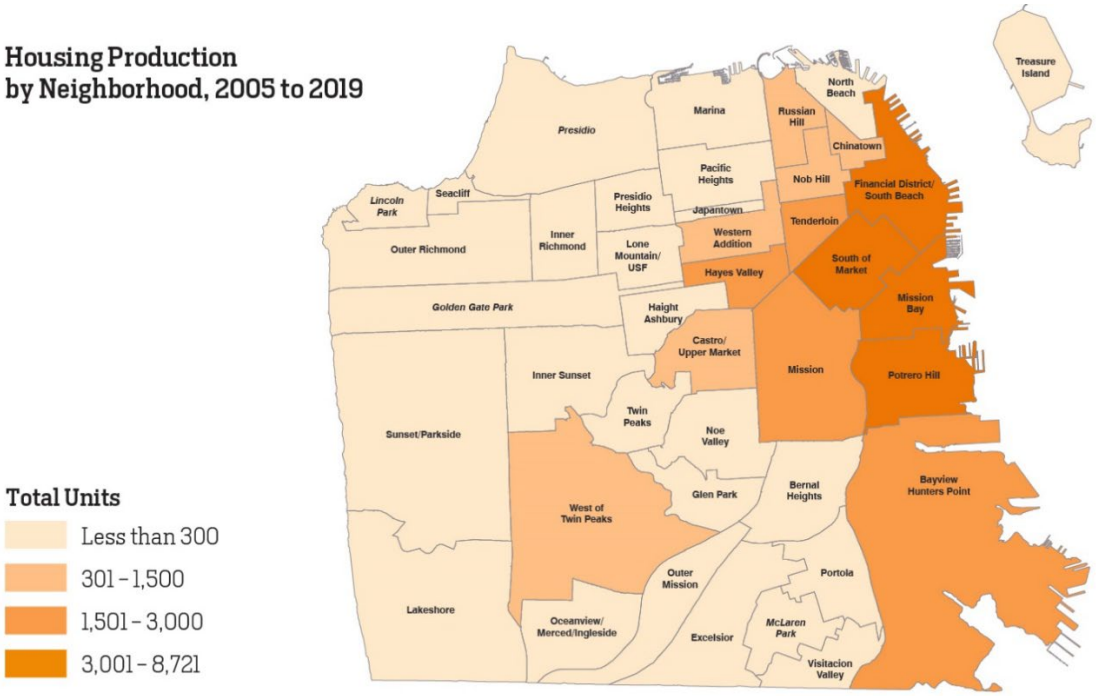
communities of color. This goal requires the City to ensure low-income communities and communities of color can also benefit from investment in housing, including the opportunity to build wealth. The goal also requires the City to open wealthy, white, and well-resourced neighborhoods to all communities of color and low-income households in order provide access to high-quality neighborhood resources that foster positive economic and health outcomes. To prevent further inequities as an unintended impact of investments, targeted anti-displacement investments are needed to stabilize existing racially and socially inclusive communities.

Figure 15. Map of predominant racial and ethnic concentrations and Racially and Ethnically Concntrated Areas of Proverty (R/ECAP) (2017).



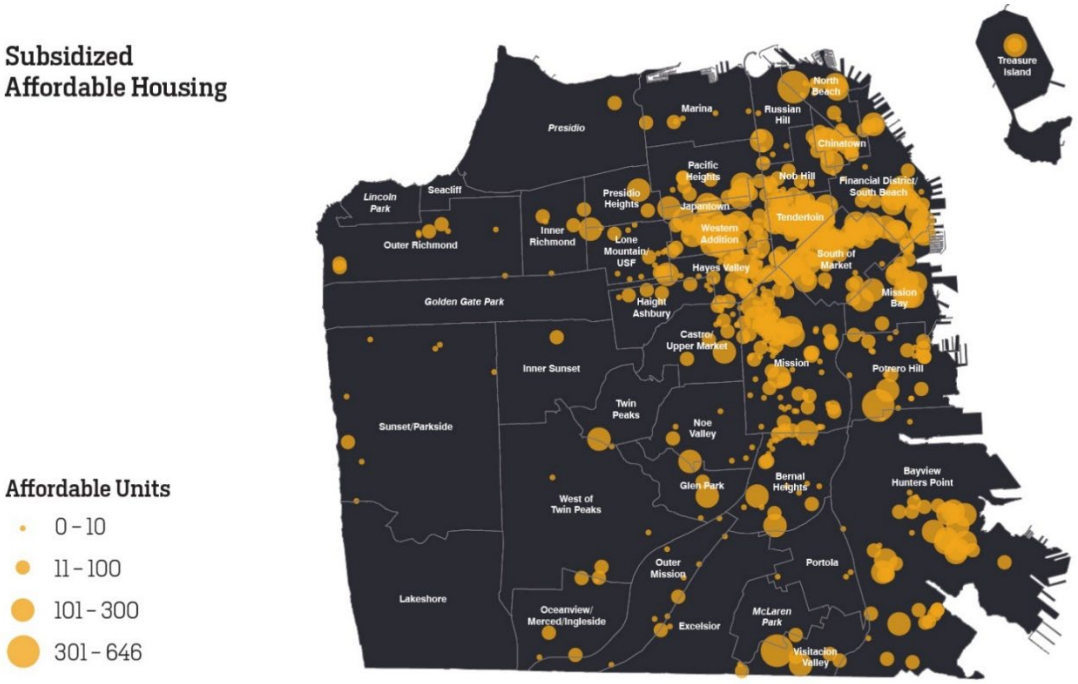
Source: Esri, Predominant Race/Ethnicity by Block Group, 2013-2017 (2013-2017 American Community Survey 5 Year)

Figure 16. Map of housing production by neighborhood from 2005 to 2019.



Source: San Francisco Housing Affordability Strategies (2020).

Figure 17. Map of permanent affordable housing by units per building (2018).



Source: San Francisco Housing Affordability Strategies (2020) with data from the San Francisco's Mayor's Office of Housing and Community Development (2018).

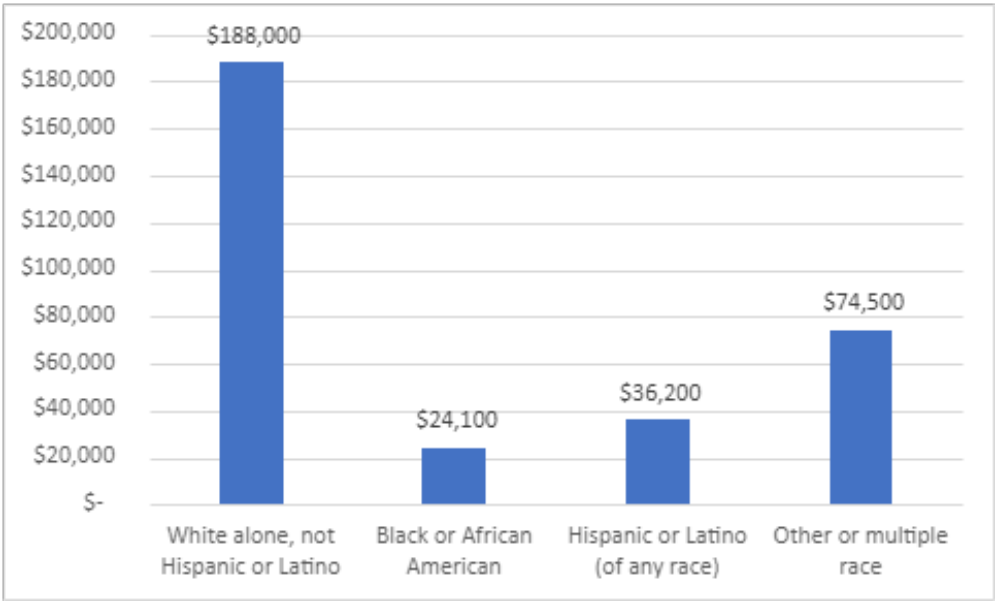
Objective 3.a Build intergenerational wealth for American Indian, Black, and other communities of color.

Challenge- Government actions in the form of redevelopment and urban renewal have dispossessed specific communities in San Francisco, such as American Indian, Black, Japanese, Filipino, and other communities, of homes and entire neighborhoods. The median household wealth (the difference between total assets and total debts) for white households is more than five times greater than Latino/e/x households and more than seven times greater than Black households (see Figure 18). Income data from San Francisco echoes these national trends (see Figure 13). The median income for Black households is less than one fourth of non-Hispanic white households. Similarly, the median household income for American Indians ($61,250), Latinos/es/x ($72,578), and Asians ($88,016) was also lower than non-Hispanic white households.

These wealth gaps have left households of color more likely to experience housing instability and cycles of intergenerational poverty, and often unable to build wealth to pass down to their children over decades. Wealth allows people and families to secure safe and healthy housing, open businesses, sustain themselves in retirement, and facilitate education and access to homeownership for their children. Homeownership is one of the primary sources of building wealth for most U.S. families. But decades of lost opportunity due to housing discrimination and neighborhood disinvestment, along with educational and workplace discrimination, have locked many people of color out of homeownership and contributed to the racial wealth gaps we see today. While some neighborhoods with the high concentration of low-income American Indian, Black, and other communities of color in San Francisco have experienced significant housing and infrastructure investments in the past two decades, these communities have experienced limited benefits and, in some cases, experienced displacement of residents and businesses. In addition, these low-income communities of color have had limited access to the new permanently affordable housing units due to income or credit requirements beyond their reach.

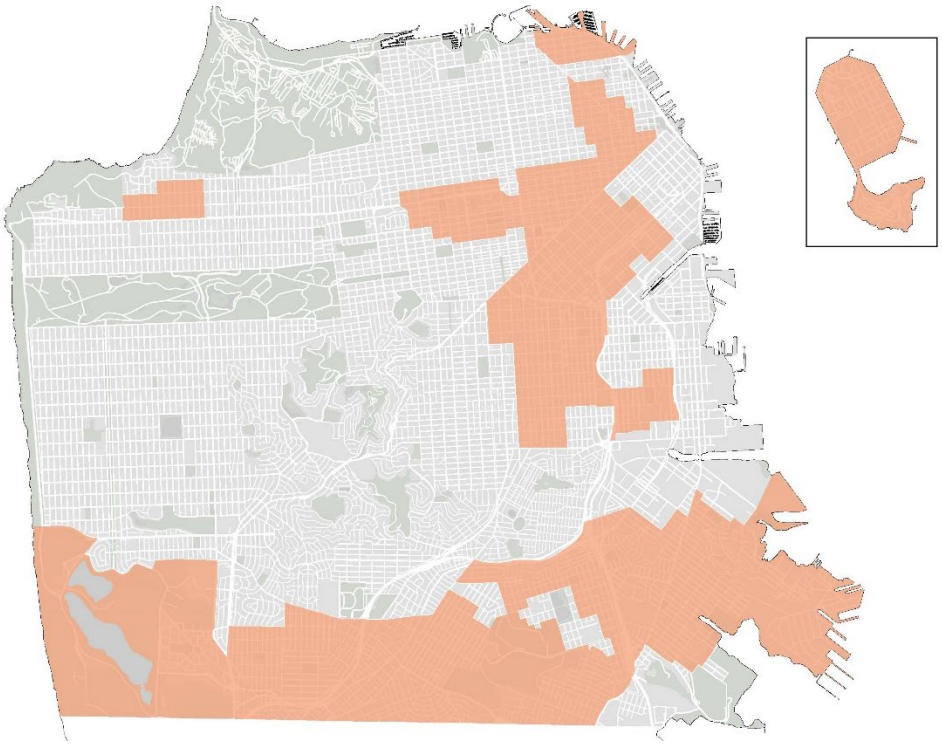
Path forward- Racially and socially inclusive neighborhoods rely on low-income American Indian, Black, and other communities of color having the opportunity to build wealth to pass on to future generations. This Housing Element defines Priority Equity Geographies, as places where the city will target direct investments to achieve this outcome and implement reparative strategies described in the previous goal (see Figure 19). Wealth building strategies should start with a people-based approach and include access to affordable housing and homeownership, as well as trainings for well-paid jobs, business ownership, and fostering financial literacy and readiness. Wealth building strategies will also include place-based strategies to improve access to opportunity: resources in one's neighborhood that are linked to positive economic, social and health outcomes for communities, such as quality public schools, affordable and accessible transportation options that connect residents to educational and economic development opportunities, affordable community serving businesses, and a healthy environment. These resources create the conditions for thriving neighborhoods that, along with people-based approaches, can build lasting wealth that can be passed on from one generation to the next.

Figure 18. National median household wealth (2019).



Source: US Federal Reserve (2019)

Figure 19. Map of Priority Equity Geographies



Source: San Francisco Department of Public Health's Areas of Vulnerability map.
Note: Priority Equity Geographies are areas with a higher density of vulnerable populations as defined by the San Francisco Department of Health, including but not limited to people of color, seniors, youth, people with disabilities, linguistically isolated households, and people living in poverty or unemployed.

POLICIES AND ACTIONS

Policy 15: Expand permanently affordable housing investments in Priority Equity Geographies to better serve American Indian, Black, and other People of color within income ranges underserved, including extremely-, very low-, and moderate-income households.

a. Increase production of housing affordable to extremely and very low-income households including identifying and deploying subsidy resources necessary to serve these income groups. (MOHCD, HSH; Medium)
b. Maximize the use of ongoing tenant-based rental assistance to expand eligibility for extremely and very low-income households who otherwise do not qualify for Below Market Rate units. (MOHCD; Short)
c. Evaluate increasing neighborhood preference allocation for Below Market Rate units in Priority Equity Geographies to better serve American Indian, Black, and other communities of color, if possible, per the Federal Fair Housing regulations, as informed by Policy 5 and underlying actions. (MOHCD; Short)
d. Support the development and implementation of community-led plans in the Tenderloin and the Fillmore (Planning, MOHCD; Short)
e. Support implementation of Mission Action Plan 2020 (MAP2020) and Sustainable Chinatown and as updated from time to time in order to meet its affordable housing production and preservation targets. (MOHCD, Planning; Short)
f. Continue to support and expedite delivery of the permanently affordable housing projects in Redevelopment Areas led by the Office of Community Investment and Infrastructure (OCII). (Planning; ongoing)
g. Continue to rebuild and replace public housing units at HOPE SF sites without displacement of the current residents. (MOHCD; Medium)

Policy 5: Improve access to the available Affordable Rental and Homeownership units especially for racial and social groups who have been disproportionately underserved or for American Indian, Black, Japanese, Filipino, and other communities directly harmed by past discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act or WWII Japanese incarceration based on a reparations framework.

a. Identify racial, ethnic, and social groups who have been disproportionately underserved by MOHCD's available Affordable Rental and Homeownership units and the underlying reasons why those groups are underrepresented in obtaining such housing. These groups include but are not limited to previously identified groups such as American Indian, Black, Latinos, and other people of color, transgender and LGBTQ+ people, transitional aged youth, people with disabilities, and senior households. This study can inform the housing portal cited in Policy 14 (f). (MOHCD, Planning; Short)
b. Through the Inclusionary Technical Analysis Committee, assess whether affordability levels of rental and ownership units created through the Affordable Inclusionary Housing Program are accessible to groups underserved as studied in Policy 5, action (a), update those requirements in balance with ensuring financial feasibility as referenced in Policy 24 (a). (Planning, MOHCD; Mayor/BOS; Short)
c. Evaluate and update existing policies and programs to increase the percentage of Affordable Rental and Homeownership units awarded to underserved groups identified through the studies referenced in Policy 5, action (a) and (g), including but not limited to preferences, strengthening targeted outreach, education, housing readiness counseling, and

other services specific to the needs of each group, ensuring accessible accommodations in these services, as well as increasing production of units affordable to extremely low, very low, and moderate income households as referenced under Policy 15, action (a), Policy 19, action (b), and Policy 23, action (b). (MOHCD; Short)

d. Evaluate area median incomes and unit types and identify strategies to secure housing for applicants to the Affordable Rental and Homeownership unit lottery program who have not won the lottery after more than five years of submitting applications. (MOHCD, Mayor/BOS; Short)
e. Create and pilot programs based on a reparations framework to increase access to Affordable Rental and Homeownership units for American Indian, Black, Japanese, Filipino, and other communities directly harmed by past discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act, or WWII Japanese incarceration have been harmed by past discriminatory government actions. (MOHCD, Planning, HRC; Short)
f. Expand the Certificates of Preference program as allowed per recent State Law 1584, and conduct comprehensive outreach and engagement to identify the descendants of households who have been displaced. Expanding this program should rely on strategies that ensure such units meet the preferences and needs of eligible households as informed by Policy 5, action (g) below. (OCII, MOHCD; Short)
g. Conduct a study to engage with Certificates of Preference holders and their descendants to identify their housing needs, preferences, and income levels and create a tracking system to better monitor who has obtained or passed on affordable rental and homeownership opportunities and why. (OCII, MOHCD; Short)
h. Expand and fund community capacity for housing programs and investments for American Indian residents as one strategy to redress the historic dispossession of resources affecting these communities, such as the Indian Relocation Act, and other government actions that broke the cohesion of this community. (Planning, MOHCD; Short)
i. Identify and adopt local strategies to remove barriers to access permanently affordable housing for immigrants; people who lack documentation such as credit histories, bank accounts, or current leases; and for transgender people whose documentation may need corrections not possible due to immigration status, and/or non-California state laws; such local strategies should complement State legislation solutions referenced in Policy 6, action (d). (MOHCD, Mayor/BOS, Short)
j. Expand the Senior Operating Subsidy (SOS) program to allow extremely and very low-income seniors to be eligible for the senior Below Market Rate rental units. (MOHCD; Short)
k. Expand existing culturally responsive housing counseling to applicants to MOHCD Affordable Rental and Homeownership Opportunities through a network of community-based housing counseling agencies and Cultural Districts, and as informed by the needs identified under Policy 5, actions (a), (c), and (g); These programs include financial counseling, market-rate and below market rate rental readiness counseling, and other services that lead to finding and keeping safe and stable housing; expansion of such services should in coordination with Policy 21, action (d), and informed by community priorities working with liaisons referenced under Policy 14, action (b). (MOHCD; Short)
l. Strengthen monitoring and enforcement of Below Market Rate units to avoid fraud and abuse of units and to unlock more units for

those eligible and in need, through active enforcement of existing obligations, expedited leasing of new and turnover units, and completing the build out of DAHLIA partners database. (MOHCD; Medium)

m. Amend the Inclusionary Housing Program regulations to allow existing homeowners of Below Market Rate units to purchase another Below Market Rate unit and sell their current unit in cases where household size changes or another reasonable accommodation is required, in order to respond to changing household needs. (MOHCD; Planning; Short)

Policy 23: Retain and increase the number of moderate- and middle-income households through building permanently affordable workforce housing and reversing the shortage in affordable housing built for these households.

a. Study and implement expansion of shared equity models to leverage more non-City financing tools that offer moderate- and middle-income homeownership (such as Shared Equity, land trusts, or cooperative ownership) through development of smaller sized lots. Use the studies cited in Policy 3, action (c), and Policy 11, action (f) to inform expansion of these models and pursue partnership with private and philanthropic property owners referenced under Policy 19, action (d). (MOHCD, Planning; Short)
b. Study and implement expansions to programs that create workforce housing for educators to serve other public-sector essential workers such as transit operators and hospital workers. (Planning, MOHCD, Mayor/BOS; Short)
c. Continue funding for the First Responders Down Payment Assistance Loan Program and the SFUSD Educators Down Payment Assistance Loan Program. (MOHCD; ongoing)

Policy 11: Establish and sustain homeownership housing programs designed around a reparations framework for American Indian, Black, Japanese, Filipino, and other communities directly harmed by past discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act, or WWII Japanese incarceration, as a means of redressing the harms and with the goal of stabilizing these communities and bringing back those who have been displaced from the city.

a. Establish pilot and permanent programs that offer homeownership opportunities targeted to Black communities harmed through redlining or urban renewal, and to certificate of preference holders and their descendants as informed by the studies referenced in Policy 5, action (g); Building on programs such as the Dream Keeper initiative. Such programs should include features such as silent second loans or grants for down payment assistance, as well as other financial assistance to reduce income eligibility as a barrier to access homeownership opportunities. (MOHCD; Medium)
b. Upon completion of the pilot program for Black communities cited in Policy 11, action (a), evaluate and extend the program to other communities directly harmed by discriminatory government actions.[42] (MOHCD; Short)
c. Target increased investment in the Down Payment Assistance Loan Program to communities harmed by discriminatory government actions as listed in this policy. (MOHCD; Short)

[42] Discriminatory programs include, but are not limited to, redlining, urban renewal, segregated public housing, and exclusionary zoning regulations, such as single-family zoning.

d. Prioritize American Indian residents for housing opportunities to redress the historic dispossession of resources affecting these communities, such as by the Indian Relocation Act, and other government actions that broke the cohesion of this community. (Mayor/BOS; Short)
e. Implement the right to return legislation for residents of public housing including opportunities to those previously displaced. (MOHCD; Medium)
f. Pursue expanding and modifying the shared equity homeownership and land trust models, to address their effectiveness and scalability, for communities harmed by past discrimination. Use the findings of the study referenced in Policy 3, action (c) to inform expansion of these models. (MOHCD, Planning; Medium)

Policy 16: Improve access to well-paid jobs and business ownership for American Indian, Black and other communities of color, particularly those who live in Priority Equity Geographies, to build the wealth needed to afford and meet their housing needs.

a. Expand and target job training, financial readiness education programs to residents of Priority Equity Geographies including youth from American Indian, Black and other communities of color. (OEWD, MOHCD, ORE; Medium)
b. Support developers of new permanently affordable housing developments in Priority Equity Geographies through dedicated funding from GO Bonds and other eligible funding sources to include affordable community serving uses such as grocery stores, healthcare clinics, or institutional community uses such as child-care facilities, community facilities, job training centers, social services as part of their ground floor use programming. (MOHCD, Mayor/BOS/BOS; Medium)
c. Adopt commercial space guidelines to encourage the development of businesses owned by American Indian, Black and other people of color in permanently affordable housing buildings. (MOHCD, OEWD, ORE; Short)
d. Provide resources for warm-shell buildout and tenant improvements for businesses owned by American Indian, Black, and other people of color in permanently affordable housing buildings. (OEWD, MOHCD, ORE; Medium)
e. Expand capacity-building, job training, start-up, and business development resources for Black business owners in development and contracting construction trades in support of building housing. (OEWD, MOHCD, ORE; Medium)
f. Grow a range of business and career-building opportunities in Priority Equity Geographies through resources to support affordable Production, Distribution, and Repair (PDR) space, protections and incentives for PDR in the Planning Code, enforcement of PDR zoning, and industrial (or commercial) design guidelines. (OEWD; Planning; Medium)

Policy 17: Expand investments in Priority Equity Geographies to advance equitable access to resources while ensuring community stability.

a. Apply equity metrics identified under Policy 14 (a) in identifying necessary infrastructure improvements for Priority Equity Geographies and to guide all City investment decisions, including but not limited to: Capital Planning, General Plan Elements, Interagency Plan Implementation Committee or Citizen Advisory Council review, in coordination with Policy 33 actions (a) through (c). (Planning; Short)
b. Prioritize Priority Equity Geographies in investments to improve transit service, as well as other community improvements to parks, streetscape, and neighborhood amenities, in coordination with the investments referenced

under Policy 33, action (c). (SFMTA, RPD, DPW, Planning; Medium)

c. Invest in and implement anti-displacement measures in parallel with major infrastructure improvements in areas undergoing displacement, as informed by Policy 21, actions (a) and (b). (Planning, SFMTA, RPD, DPW; Medium)

Policy 33: Ensure transportation investments advance equitable access to transit and are planned in parallel with increase in housing capacity to create well-connected neighborhoods consistent with the City's Connect SF vision, and encourage sustainable trips[43] in new housing.

a. Strengthen interagency coordination for transportation, evaluating the existing and future needs of Priority Equity Geographies, Environmental Justice Communities, and Well-resourced Neighborhoods targeted for increased housing capacity, and plan for staffing and funding needed for these investments (e.g., general obligation bonds, federal grants). This includes delivering a network such that transit vehicles come every five minutes[44] along certain corridors, and for rail consistent with the city's Connect SF vision and its Transit Strategy (SFMTA, Planning, SFCTA; Medium)

b. Restore, maintain, and optimize the existing transit system, particularly prioritize implementation of SFMTA's 5-year Capital Improvement Program's Transit Optimization and Expansion Projects in Well-resourced Neighborhoods targeted for increased housing capacity. (SFMTA, Planning; Short)

c. Restore and improve transit service as identified in the city's Transit Strategy, particularly for essential workers, transit-dependent people, and in Priority Equity Geographies and Environmental Justice communities (SFMTA; Short)

d. Adopt requirements that encourage sustainable trip choices[45] in new housing and reduce transportation impacts from new housing. Such amendments may require certain new housing to include additional transportation demand management measures and driveway and loading operations plans, protect pedestrian, cycling, and transit-oriented street frontages from driveways, and reduce vehicular parking. (Planning, SFMTA; Short)

Policy 18: Tailor zoning changes within Priority Equity Geographies and intersecting Cultural Districts to serve the specific needs of American Indian, Black, and other communities of color.

a. Identify and adopt zoning changes that implement priorities of American Indian, Black, and other communities of color identified in Cultural District or other community-led processes. (Planning; Medium)

b. Consult with related Cultural Districts or other racial equity-focused community bodies such as the Community Equity Advisory Council to evaluate the racial and social equity impacts of proposed zoning changes in these areas and using the framework identified under Policy 21, actions (a) and (b). (Planning; Medium)

c. Allocate resources and create an implementation plan for any applicable anti-displacement measures parallel with the

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[43] Sustainable trip choices mean walking, bicycling, transit, and carpooling.

[44] A conceptual network of high-frequency transit lines, where a substantial investment in on-street improvements would markedly increase the routes' speed and reliability. These improvements include bus-only lanes, traffic signal adjustments, and queue jumps, and can be installed relatively quickly. Lines on the five-minute network include routes in the Rapid Network.

[45] Sustainable trip choices mean walking, bicycling, transit, and carpooling.

adoption of those zoning changes. (Planning; Medium)

Policy 12: Invest in cultural anchors and expand access to land and spaces that hold cultural importance for American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act or WWII Japanese incarceration as a means of redressing histories of dispossession, social disruption, and physical displacement based on a reparations framework.

a. In recognition of the removal of American Indians from their ancestral lands, identify opportunities to restore access to land for traditional cultural uses and to invest in spaces for the American Indian community to participate in traditional cultural practices and convene community gatherings. (MOHCD, Mayor/Board, RED; Short)
b. In recognition of the disproportionate loss of Black residents from San Francisco in recent decades resulting from a culmination of discriminatory government actions, identify opportunities to donate or dedicate land for use by Black-led, community-serving organizations. (MOHCD, Mayor/Board, RED; Short)
c. Strengthen interagency coordination to ensure that Cultural District strategies related to the creation or improvement of cultural anchors and spaces are integrated into planning, funding, and construction and/or rehabilitation of public projects (e.g., parks and open spaces, street improvements, libraries, and transit facilities). (Planning, MOHCD, OEWD; Short)
d. Fund the development and implementation of community-developed strategies in Cultural Districts to retain and grow culturally associated businesses and services that attract residents back to the area. (MOHCD, OEWD, OSB, Planning; Short)
e. Recognize spaces of cultural importance identified by American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions in community planning and regulatory review for development projects, consult them in decisions affecting those spaces, and direct resources towards their preservation and management. (Planning, OEWD, OSB; Short)
f. Fund the development of cultural spaces that serve communities harmed as described under this policy, using potential new funding sources such as the mitigation fund referenced under Policy 37, action (c) or community facilities fees. (MOHCD, Planning, OEWD; Medium)
g. Explore utilizing the Legacy Business Registry program to direct resources to businesses and not-for-profit organizations associated with American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions. (OSB, OEWD; Short)

Policy 22: Create a dedicated and consistent local funding stream and advocate for State and Federal funding to support building permanently affordable housing for very low-, low-, and moderate-income households that meets the Regional Housing Needs Allocation targets.

a. Using the budget tool from Policy 14, action (e), support new and consistent sources of local funding in the City's Capital Planning process for permanently affordable housing including local bonds or other new funding sources that require voter approval. (MOHCD; Medium)
b. Dedicate funding within the 10-year Capital Planning process for permanently affordable housing in Priority Equity Geographies with a goal of building planned projects, while

reaching the minimum targets in Well-resourced Neighborhoods as referenced in Policy 19, action (a). (Mayor/BOS, MOHCD; Long)

c. Explore the development of public financing tools such as Infrastructure Finance Districts to leverage the City's co-investments in order to lower direct City subsidy for permanently affordable housing. (OEWD; Medium)
d. Develop and support alternative and philanthropic funding sources to deliver permanently affordable housing faster and at a cheaper per unit cost through tools such as the Housing Accelerator Fund. (Planning, MOHCD; Medium)
e. Support the Bay Area Housing Financing Authority's expected efforts to secure voter approval for a regional tax measure to fund permanently affordable housing. (MOHCD, Planning; Medium)
f. Advocate for federal legislation to increase Low-Income Housing Tax Credits and Private Activity Bonds, for example, by changing federal rules to lower the minimum bond financing needed to access 4% LIHTC (currently 50 percent) to help unlock more LIHTC in San Francisco and statewide. (MOHCD, Planning; Short)
g. Advocate for State legislation to change the voter approval threshold for General Obligation Bonds from two-thirds to 55 percent. (Planning, Mayor/BOS; Medium)
h. Advocate for State legislation to expand non-competitive permanently affordable housing funding sources. (Planning, Mayor/BOS; Medium)
i. Collaborate with key organizations to reform Proposition 13[46] for commercial property to provide funding support for local jurisdictions to meet their permanently affordable housing targets. (Planning, Mayor/BOS; Medium)

Objective 3.b Create a sense of belonging for all communities of color within Well-resourced Neighborhoods through expanded housing choice

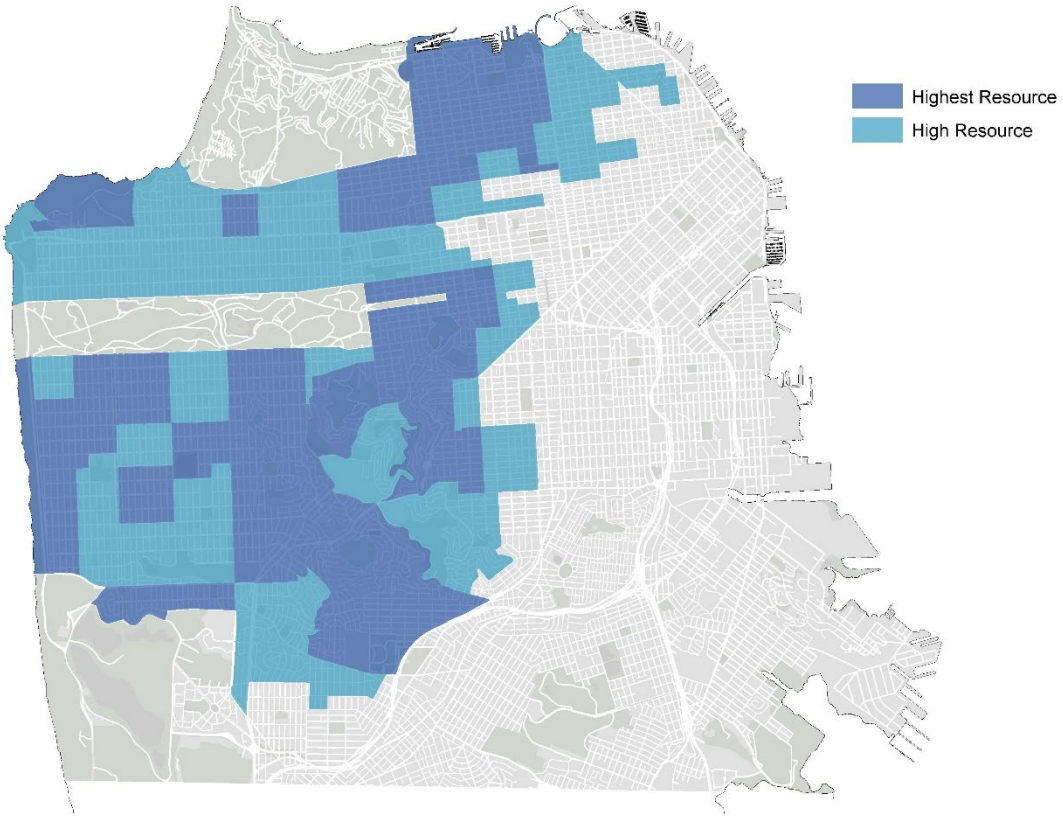
Challenge- Well-resourced Neighborhoods are areas the state has identified in each jurisdiction as places that have a high concentration of resources that have been shown to support positive economic, educational, and health outcomes for low-income families — particularly long-term outcomes for children (see Figure 20). Since 2005, just 10% of all new housing in San Francisco and 10% new affordable housing has been built in Well-resourced Neighborhoods though these areas cover nearly 52% of the residential land in the city (see Figures 16 & 17). In part this is because 65% of land in these areas is limited to one or two units and most of the rest also has fixed restrictions on the number of units allowed- even near major commercial districts and transit lines (see Figure 21). This pattern of development has had a two-fold effect on low-income communities and communities of color which mostly reside outside of these neighborhoods. First, these communities disproportionately carry the burden of accommodating growth in our city. Second, a lack of new housing, particularly affordable housing, in neighborhoods with better services and amenities means those neighborhoods remain largely inaccessible to low-income communities and communities of color.

[46] A 1978 ballot measure that reduced property tax rates on homes, businesses and farms, and capped assessed property taxes at 1% for assessed values with no more than 2% annual increase. Prop 13 significantly reduced the tax revenue of local jurisdictions to fund schools, services, and infrastructure.

Current restrictions on the number of homes that can be built on most of the city's residential land date largely to the 1970s, when the city faced a substantially different housing context. The city had lost population from 1950 to 1980 as many middle- and high-income households, who were typically white, moved to rapidly growing suburban communities of single-family homes. Jobs were also growing quickly in suburban areas including manufacturing, logistics, and new suburban office parks. The amount of housing produced regionally was significantly higher than today and housing costs were lower to what people earned at the time. These zoning changes from the 1970s often were an indirect way to institutionalize and perpetuate racial and social exclusion from affluent, white neighborhoods in San Francisco. These practices and regulations are known as exclusionary zoning.

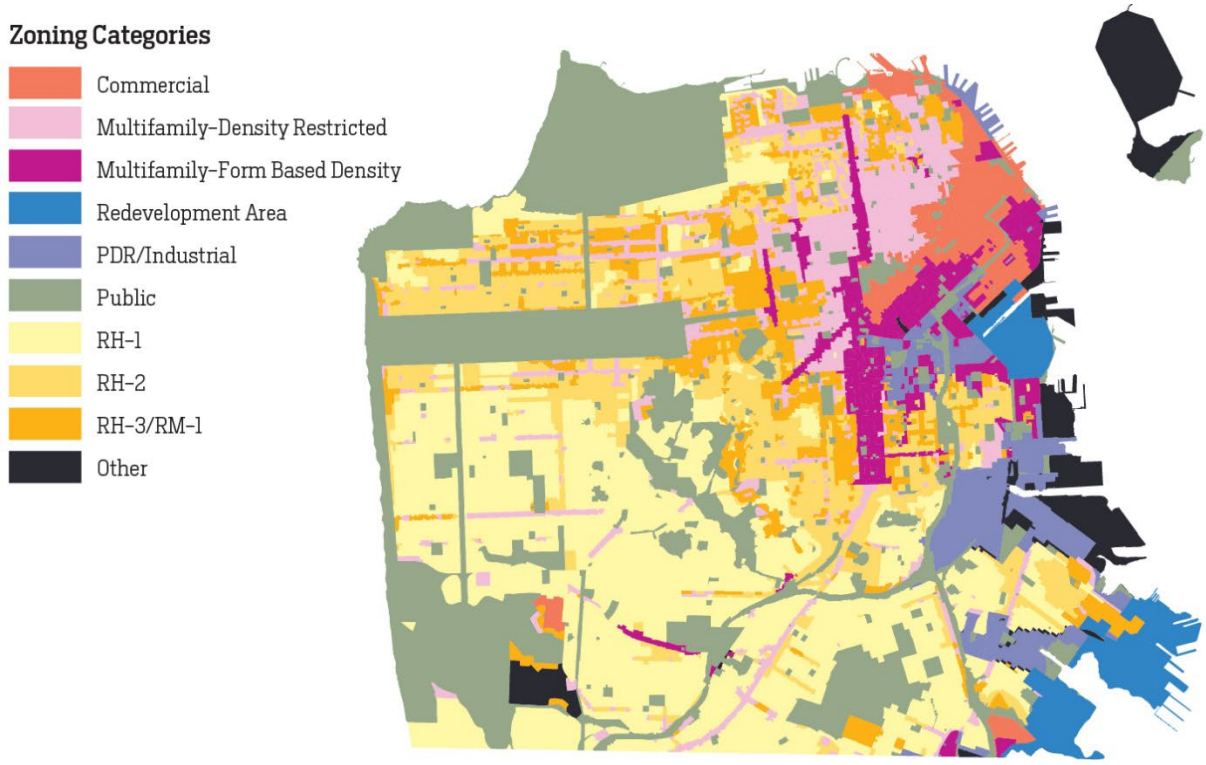
Path forward- Fostering racially and socially inclusive neighborhoods throughout the city means increasing housing choice for all in all neighborhoods. It means ensuring access to housing for American Indian, Black, and other communities of color across all neighborhoods. To promote a sense of belonging for all communities in Well-resourced Neighborhoods, the City needs to shift course regarding where new housing is built, so more diverse communities can call these neighborhoods home. The new Affirmatively Furthering Fair Housing Law also requires local jurisdictions to create programs that would reverse segregation and promote inclusive neighborhoods, including allowing for more housing, particularly affordable housing, to be built in Well-resourced Neighborhoods. Increasing housing development capacity through changes to zoning in Well-resourced Neighborhoods, focusing on small- to mid-rise multifamily buildings is the first step the City must pursue to shift development patterns. Increasing housing choice in these areas also will rely on Incentives and community benefits in order to provide housing choices affordable to not just to low-income residents, but also to middle-income residents, families with children, seniors and people with disabilities. Opening access to housing choices in the Well-resourced Neighborhoods must be supplemented with strategies to foster openness to new neighbors, support to those previously excluded in accessing new neighborhoods, and financial strategies for affordable housing.

Figure 20. Map of Well-resourced Neighborhoods



Source: 2020 TCAC/HCD Opportunity Map.
Note: Well-resourced Neighborhoods are shown below and defined as “High Resource/Highest Resource" by the California Fair Housing Task Force. The purpose of this map is to identify every region of the state whose characteristics have been shown by research to support positive economic, educational, and health outcomes for low-income families—particularly long-term outcomes for children.

Figure 21. Map of simplified zoning categories for the Housing Affordability Strategies analysis.



Source: San Francisco Housing Affordability Strategies.

POLICIES AND ACTIONS

Policy 19: Enable low and moderate-income households, particularly American Indian, Black, and other people of color, to live and prosper in Well-resourced Neighborhoods by increasing the number of permanently affordable housing units in those neighborhoods.

a. Build between 25% and 50% of the City's new permanently affordable housing within Well-resourced Neighborhoods within the next two RHNA cycles, implementing the zoning strategies of Policy 20, actions (a) through (d). (MOHCD, Planning; Medium)
b. Increase housing that is affordable to extremely low and very low-income households in Well-resourced Neighborhoods through City funded permanently affordable housing projects. (MOHCD; Long)
c. Create a funded land banking program to purchase sites that could accommodate at least 50 units on sites in Well-resourced Neighborhoods, such as sites owned by religious institutions, parking on public land, or underutilized sites. (Planning, MOHCD, Mayor/BOS; Medium)
d. Pursue partnerships with religious institutions, or other philanthropic or private property owners, and non-profit developers to identify and support development of sites that could accommodate new permanently affordable housing, shared equity or cooperative models as referenced under Policy 23, action (a). (Planning, MOHCD, OEWD; Medium)
e. Reduce costs of building permanently affordable housing by supporting engagement processes identified under Policy 20, action (e) that recognize that mid-rise buildings are

needed to accommodate new permanently affordable housing; cost reduction strategies include but are not limited to expanding ministerial review[47] of permanently affordable housing on smaller sized residentially zoned parcels. (Planning; Short)

f. Create and expand funding for programs that provide case management, financial literacy education, and housing readiness to low-income American Indian, Black and other people of color households who seek housing choices in Well-resourced Neighborhoods, and provide incentives and counseling to landlords in Well-resourced Neighborhoods to offer units to low-income households. Consider similar incentives referenced in Policy 8, action (m). (MOHCD; Medium)

Policy 20: Increase mid-rise and small multi-family housing types in Well-resourced Neighborhoods near transit, including along SFMTA Rapid Network[48] and other transit, and throughout lower-density areas, by adopting zoning changes or density bonus programs.

a. Increase the opportunity for mid-rise multi-family buildings through changes to height limits, removal of density controls, and other zoning changes along SFMTA's Muni Forward Rapid Network[49] and other transit lines such as California Street, Union Street, Lombard Street, Geary Blvd, Judah Street, Noriega Street, Ocean Ave, Taraval Street, Sloat Blvd, 19th Ave, Park Presidio Blvd, West Portal Ave, Junipero Serra Blvd, Church Street, Divisadero Street, 17th and Market/Castro, and Van Ness Ave. (Planning, Mayor/BOS; Short)

b. Increase the opportunity to create more small multi-family buildings by replacing lot-based unit maximum zoning controls with form-based residential or mixed-use zoning in Well-resourced Neighborhoods near transit. (Planning, Mayor/BOS; Short)

c. Allow a minimum of four units on all residential lots, expanding the State duplex/lot split program (SB 9), and include programs and incentives that target these new homes to moderate- and middle-income households as described in Policy 26. (Planning, Mayor/BOS; Short)

d. Create a rezoning program to meet the requirements of San Francisco's Regional Housing Needs Allocation and Affirmatively Furthering Fair Housing laws, relying on a combination of strategies in actions (a) through (c) above to accommodate approximately 20,000 units. (Planning, Mayor/BOS; Short)

e. Engage with communities living in Well-resourced Neighborhoods to nurture enhanced openness for all through educational material and community conversations that highlight how locating new housing and permanently affordable housing in every neighborhood can address historic inequity and injustice and build more vibrant neighborhoods that improve everyone's quality of life. (Planning; Short)

Policy 22: Create a dedicated and consistent local funding stream and advocate for State and Federal funding to support building permanently affordable housing for very low-, low-, and

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[47] A governmental decision involving little or no personal judgment by the public official; it involves only the use of fixed standards or objective measurements, and the public official cannot use personal, subjective judgment in deciding whether or how the project should be carried out.

[48] The 13 rail and bus lines that account for the majority of Muni's ridership. Before the pandemic, Rapid Network lines were scheduled to operate every 10 minutes or better all day on weekdays.

[49] The 13 rail and bus lines that account for the majority of Muni's ridership. Before the pandemic, Rapid Network lines were scheduled to operate every 10 minutes or better all day on weekdays.

moderate-income households that meets the Regional Housing Needs Allocation targets.

a. Using the budget tool from Policy 14, action (e), support new and consistent sources of local funding in the City's Capital Planning process for permanently affordable housing including local bonds or other new funding sources that require voter approval. (MOHCD; Medium)
b. Dedicate funding within the 10-year Capital Planning process for permanently affordable housing in Priority Equity Geographies with a goal of building planned projects, while reaching the minimum targets in Well-resourced Neighborhoods as referenced in Policy 19, action (a). (Mayor/BOS, MOHCD; Long)
c. Explore the development of public financing tools such as Infrastructure Finance Districts to leverage the City's co-investments in order to lower direct City subsidy for permanently affordable housing. (OEWD; Medium)
d. Develop and support alternative and philanthropic funding sources to deliver permanently affordable housing faster and at a cheaper per unit cost through tools such as the Housing Accelerator Fund. (Planning, MOHCD; Medium)
e. Support the Bay Area Housing Financing Authority's expected efforts to secure voter approval for a regional tax measure to fund permanently affordable housing. (MOHCD, Planning; Medium)
f. Advocate for federal legislation to increase Low-Income Housing Tax Credits and Private Activity Bonds, for example, by changing federal rules to lower the minimum bond financing needed to access 4% LIHTC (currently 50 percent) to help unlock more LIHTC in San Francisco and statewide. (MOHCD, Planning; Short)
g. Advocate for State legislation to change the voter approval threshold for General Obligation Bonds from two-thirds to 55 percent. (Planning, Mayor/BOS; Medium)
h. Advocate for State legislation to expand non-competitive permanently affordable housing funding sources. (Planning, Mayor/BOS; Medium)
i. Collaborate with key organizations to reform Proposition 13[50] for commercial property to provide funding support for local jurisdictions to meet their permanently affordable housing targets. (Planning, Mayor/BOS; Medium)

Policy 26: Facilitate small and mid-rise multi-family buildings as a prominent housing type that private development can deliver to serve middle-income households without deed restriction, including through expansion or demolition of existing lower density housing, or by adding Accessory Dwelling Units (ADUs).

a. Identify and adopt incentives or abatements that could make small multi-family buildings feasible and accessible to middle-income households without deed restriction, such as exemptions from some fees, modified inclusionary requirements, or streamlined approval criteria as defined in Policy 25, action (a). (Planning, Mayor/BOS; Medium)
b. Create low-interest construction loan programs for eligible lower-income homeowners, to expand their existing homes with additional units or demolish and replace their homes with more units up the allowable maximum density. (MOHCD, Mayor/BOS; Medium)

[50] A 1978 ballot measure that reduced property tax rates on homes, businesses and farms, and capped assessed property taxes at 1% for assessed values with no more than 2% annual increase. Prop 13 significantly reduced the tax revenue of local jurisdictions to fund schools, services, and infrastructure.

c. Create and fund technical assistance programs, as well as outreach and education programs for eligible homeowners interested in updating their property from single- to multi-family housing (through ADUs or demolitions) particularly targeting low-income property owners, households of color, seniors and people with disabilities, such as the Housing Development Incentive Program for Homeowners[51] that would also incorporate financing programs as referenced under Policy 26, action (b). Such programs should ensure accessible accommodations for aging adults and people with disabilities. (Planning, HSA; Short)
d. Update the Planning Code requirements to remove the Conditional Use processes for demolition of single-family or multi-unit buildings that are not tenant occupied and without history of tenant evictions, that are not historic resources, when increased density is proposed, and in accordance with the requirements of State Law (Housing Crisis Act) to replace rent controlled and permanently affordable units at equivalent affordability rates of the unit prior to demolition. Continue to apply Conditional Use requirements to demolition of tenant occupied buildings. (Planning; Short)
e. Support projects that maximize density within low-density zoning areas through processes referenced in Policy 25, action (a), and explore new fees on single-family housing applications where more density is permitted. (Planning; Short)
f. Create and adopt new design standards that align with rear yard, height, and other physical code standards; where small multi-unit buildings are proposed such design standards should eliminate guidelines that subjectively and significantly restrict the massing of housing contrary to those regulatory standards in accordance with the State's Housing Accountability Act. (Planning; Short)
g. Prioritize City permitting staff resources for the review of ADUs that do not displace tenants. (DBI; Planning, Short)
h. Continue to strengthen the interagency coordination (e.g. Roundtable Review) for permit processing of ADUs and implement an integrated online permitting system and permitting governance structure to support permit streamlining and government transparency. (Planning, DBI; ongoing)
i. Create an affordable ADU program that provides financial support for professional services and construction of units that serve low-income households. (Planning, MOHCD; Short)
j. Encourage Junior ADUs (JADUs) as an effective and low-cost way of adding habitable space within existing single-family homes, as JADUs also expand opportunities for multi-generational living. (Planning; Short)

[51] Ordinance 69-22 passed on March 11, 2022

Objective 3.c Eliminate displacement of vulnerable communities and communities of color

Challenge - Due to social and economic inequities, low-income households and households of color are particularly vulnerable to displacement. The impacts of displacement, the involuntary or forced movement of households due to causes outside of the household's ability to control on communities are deep and destabilizing. Members of displaced communities report feelings of loss, anxiety, and fear,[52] experience the disintegration of social fabrics,[53] face greater food insecurity,[54] and self-report poorer health outcomes.[55] In San Francisco, economic booms are often accompanied with an increase in eviction rates (see Figure 22).

Eviction notices are only one metric to measure displacement. The Urban Displacement Project has measured displacement through a variety of social and economic indicators (see Figure 23),[56] including new metrics such as in and out migration to neighborhoods.[57] Displacement constitutes not only loss of people but also cultural heritage, businesses and services, and social networks, all of which provide vital spaces for immigrants, transgender and LGBTQ+ residents, people of color, and other groups. These resources are also essential to the fabric of San Francisco. Displacement is more likely to occur in neighborhoods with high populations of seniors, low-income households, and Black, American Indian, and other communities of color, making thesepopulations even more vulnerable and disadvantaged. Studies have suggested that major infrastructure improvements, such as new rail or major transit investments, could result in displacement impacts if parallel anti-displacement investments have not been made.[58] Low-income communities of color also have expressed concerns about displacement due to rental and price adjustments which can occur along with major zoning changes, or major new market-rate buildings. At the same time neighborhoods without such investments have also experienced high eviction rates and have been identified as vulnerable to displacement, such as places in the Richmond and Sunset.

Path forward- Preventing further displacement is key to the goal of racial and socially inclusive neighborhoods as it contributes to greater neighborhood and individual stability and cultivates culturally appropriate commercial and social spaces for the most vulnerable communities. The City must understand and measure displacement impacts more clearly and directly to prevent further displacement. Upcoming analyses will identify metrics to measure displacement, especially in geographies identified as vulnerable to displacement. The findings of that analysis will inform anti-displacement investments that will ameliorate, and ideally reverse the displacement impacts. Anti-displacement

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[52] Atkinson, Rowland, Maryann Wulff, Margaret Reynolds, and Angela Spinney. "Gentrification and displacement: the household impacts of neighborhood change." AHURI Final Report 160 (2011): 1-89.

[53] Betancur, John. "Gentrification and community fabric in Chicago." Urban studies 48, no. 2 (2011): 383-406.

[54] Whittle, Henry J., Kartika Palar, Lee Lemus Hufstedler, Hilary K. Seligman, Edward A. Frongillo, and Sheri D. Weiser. "Food insecurity, chronic illness, and gentrification in the San Francisco Bay Area: an example of structural violence in United States public policy." Social science & medicine 143 (2015): 154-161.

[55] Izenberg, Jacob M., Mahasin S. Mujahid, and Irene H. Yen. "Health in changing neighborhoods: A study of the relationship between gentrification and self-rated health in the state of California." Health & place 52 (2018): 188.

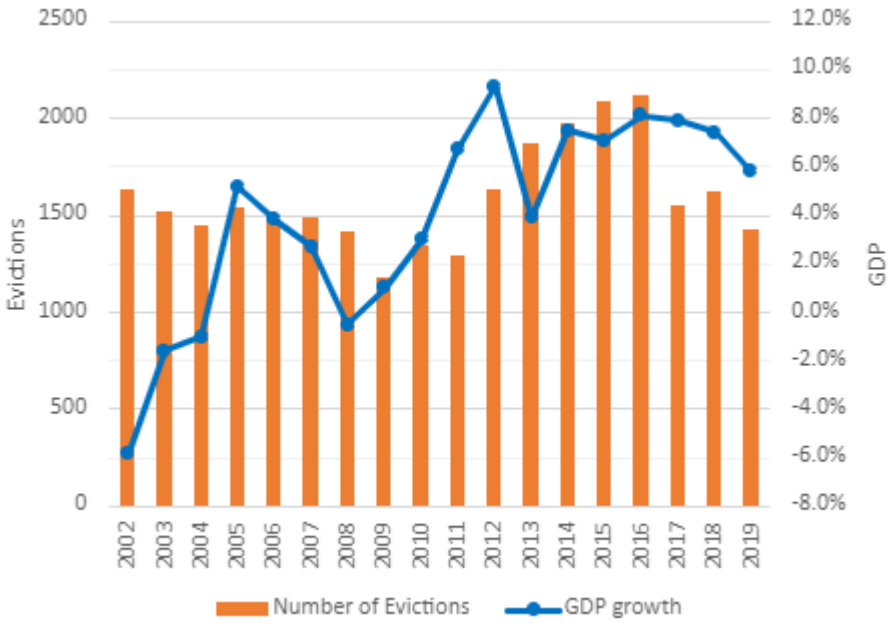
[56] Social and economic indicators include: household income, change in household income, housing costs, rent increases, and housing affordability

[57] Chapple, K., & Thomas, T., and Zuk, M. (2021). Urban Displacement Project website. Berkeley, CA: Urban Displacement Project.

[58] Zuk, Miriam, Ariel H. Bierbaum, Karen Chapple, Karolina Gorska, and Anastasia Loukaitou-Sideris. "Gentrification, displacement, and the role of public investment." Journal of Planning Literature 33, no. 1 (2018): 31-44.

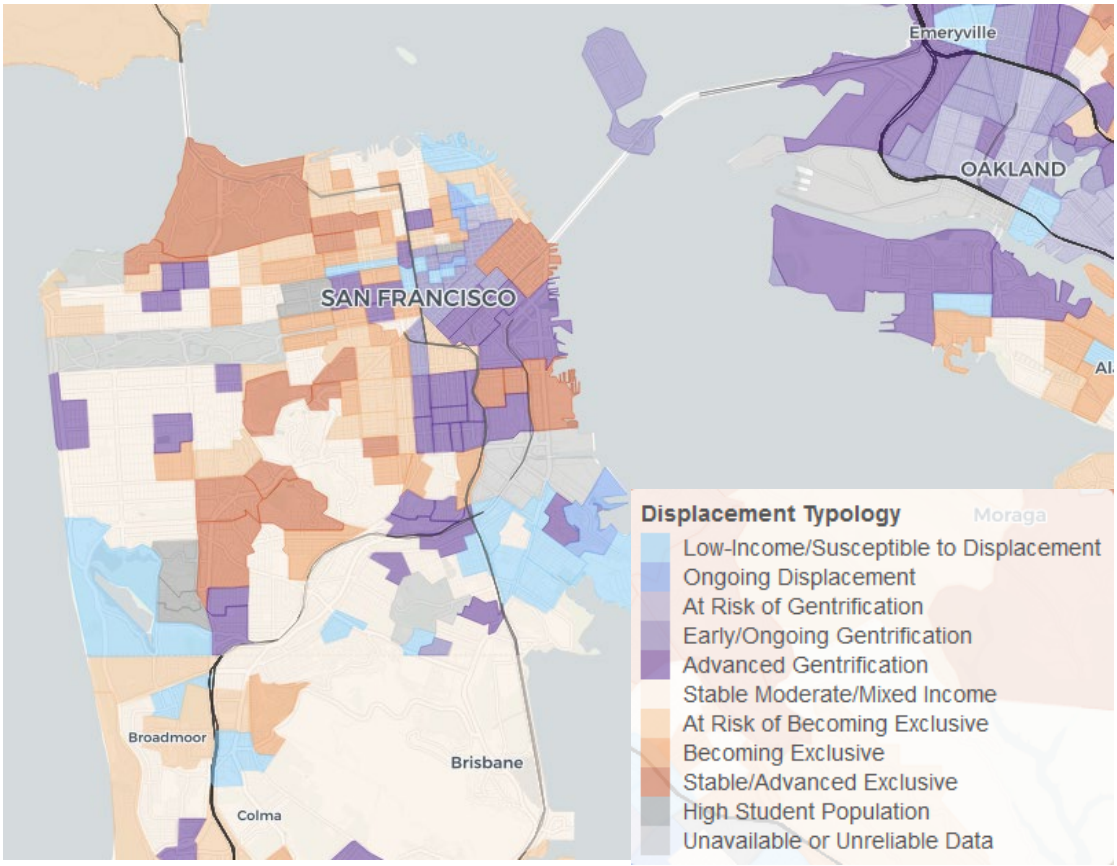
investments include funding eviction defense programs, such as right to counsel and tenant rights education, bolstering and enforcing existing eviction protections and rent stabilization laws, and providing relief through emergency or targeted rent subsidies, as well as medium- to long-term investments such as preservation of affordability of existing housing that primarily house low-income households and households of color, and building new permanently affordable housing targeted to communities vulnerable to displacement.

Figure 22. GDP growth and eviction notices in San Francisco from 2002 to 2019.



Source: San Francisco Rent Board, US Bureau of Economic Analysis

Figure 23. San Francisco Bay Area gentrification and displacement map.



Source: San Francisco Bay Area Gentrification and Displacement Map, Urban Displacement Project; accessed in January 2022.

POLICIES AND ACTIONS

Policy 21: Prevent the potential displacement and adverse racial and social equity impacts of zoning changes, planning processes, or public and private investments especially for populations and in areas vulnerable to displacement.

a. Based on the Racial and Social Equity Impact Analysis for the Housing Element,[59] measure and quantify levels of investments to prevent community displacement through increased permanently affordable housing production, equitable access to housing, and other community stabilization strategies for vulnerable populations. (Planning; Short)

b. Create benchmarks for affordable housing production and preservation investments to avoid displacement and other adverse racial and social equity impacts for future zoning changes, development projects and infrastructure projects according to the scale and location of the proposal, as informed by the Racial and Social Equity Impact Analysis for the Housing Element.(Planning; Short)

c. Invest public funding or direct private investment to implement the anti-displacement investments identified in Policy 21, action (b) for zoning changes, development projects, or infrastructure projects of certain scale or

[59] The Racial and Social Equity Impact analysis of the Housing Element will be completed prior to the adoption of the Housing Element 2022, and this action will be updated based on the findings accordingly.

intensity, in parallel with the project timeline. (MOHCD, SFMTA, OEWD, DPW; Medium)

d. Increase funding to expand the services of community-based organizations and providers for financial counseling services listed under Policy 5, action (k), as well as tenant and eviction protection services listed under Policy 1, to better serve populations and areas vulnerable to displacement; tenant and eviction protection services include legal services, code enforcement outreach, tenant counseling, mediation, and housing-related financial assistance; expansion of such services should be informed by community priorities working with liaisons referenced under Policy 14, action (b). (MOHCD, Mayor/BOS; Short)

Policy 1: Minimize all no-fault and at-fault evictions for all tenants, and elevate direct rental assistance as an eviction protection strategy.

a. Prioritize the creation of a digital Rental Housing Inventory to collect data that informs the evaluation of anti-displacement programs, including rental rates, rent control status, vacancy, and services provided. (Rent Board; Short)

b. Fully fund the Tenant Right-to-Counsel program to match the need for eviction defense. (MOHCD, Mayor/BOS; Medium)

c. Expand rental assistance programs, including those designed for emergency response, for population-specific assistance, ongoing tenant-based support, and time-limited assistance (such as Rapid Rehousing), as also referenced in Policy 9, action (d) as a homelessness prevention tool. Consider a goal of capping rent payments at 30% of household income for extremely and very-low income households. (Mayor/BOS, MOHCD, HSH,; Medium)

d. Provide a priority in the allocation of Direct Rental Assistance to populations and in areas vulnerable to displacement. (MOHCD, HSH; Short)

e. Dedicate sufficient rental assistance funding to cap rent payments at 30% of household income for SRO residents. (MOHCD, Mayor/BOS; Medium)

f. Increase relocation assistance for tenants experiencing either temporary or permanent evictions. (Mayor/BOS, Rent Board; Short)

g. Increase the time period during which relocation compensation is required when using temporary evictions from three to six months. (Mayor/BOS, Rent Board; Short)

h. Clarify and limit the definition of nuisance or other just cause evictions as needed to limit abuse. (Mayor/BOS, Rent Board; Short)

i. Pursue proactive and affirmative enforcement of eviction protections programs, especially for Owner Move-in and Ellis Act evictions, including annual reporting by owners that is enforced by site inspections and confirmation of owner occupancy and funded through owner fees. (Rent Board, MOHCD; Medium)

j. Proactively enforce eviction protection and avoid predatory practices or tenant harassment by pursuing affirmative litigation models.[60] (MOHCD; Medium)

k. Adopt incentives for property owners to rebuild buildings struck by fire within two years to house prior tenants by when the transitional housing program timeline expires (HSA, DBI, Planning, Mayor/BOS; Short)

l. As informed by Policy 21, action (d) and in coordination with community liaisons referenced under Policy 14, action (b), support

[60] Examples of similar programs in effect in 2021 include Oakland's Community Lawyering & Civil Rights program or Chicago's Residential Landlord and Tenant Ordinance.

and expand community-led navigation services and systems to provide tenants' rights education, similar to the existing culturally competent Code Enforcement Outreach Program that is offered within the Department of Building Inspection; and consider expanding this culturally competent program to other disadvantaged communities. (MOHCD; Medium)

m. Advocate for State legislation to reform the Ellis Act (Government Code Chapter 12.75) to stabilize rental housing by, for example, imposing a minimum holding period of five years before the Act can be used to evict tenants. (Planning, Mayor/BOS; Medium)
n. Advocate for State legislation to reform the Costa-Hawkins Housing Law to allow cities to better stabilize tenants by, for example, allowing cities to extend rent control to multifamily housing that is at least 25 years old. (Planning, Mayor/BOS; Medium)

Policy 3: Reform and support the City's acquisition and rehabilitation program to better serve areas and income ranges underserved by affordable housing options and areas vulnerable to displacement.

a. Prioritize building purchases for the acquisition and rehabilitation program that serve extremely- and very-lowincome and unhoused populations including purchase of SRO residential hotels. (MOHCD, DBI; Medium)
b. Increase non-profit capacity-building investments to purchase and operate existing tenant-occupied buildings as permanent affordable housing in western neighborhoods, particularly for populations and areas vulnerable to displacement, and to support Community Opportunity to Purchase Act (COPA). (MOHCD; Medium)
c. Evaluate the feasibility of utilizing the small-sites program to increase shared equity or cooperative ownership opportunities for tenants. This study would also inform expansion of shared equity homeownership models cited in Policy 11, action (f) and Policy 23, action (a). (MOHCD, Planning; Short)
d. Incentivize private owners to sell residential buildings to non-profit affordable housing developers via transfer tax exemptions or other financial measure. (Planning, MOHCD, Mayor/BOS; Medium)

Goal 4. Provide sufficient housing for existing residents and future generations for a city with diverse cultures, family structures, and abilities.

Challenge- San Francisco has been in a state of affordability crisis in the past couple of decades, a crisis felt by low-, moderate-, and, more recently, middle-income households. Current residents or workers wanting to call San Francisco home cannot afford the housing they need. While this crisis is fueled by the consistent housing shortage throughout the state, San Francisco has become one of the least affordable cities in the nation. The median condominium price of $1.2 million is affordable to households making $222,000 annually. Less than 25% of San Francisco households earn this income and less than 10% of San Francisco workers have this salary. In 2022, median rent was $3,800 for a 2-bedroom apartment, affordable to a household earning $137,000, that is less than 40% of our households.

During the economic boom of the last decade, the city attracted major job growth particularly high salaried jobs. The increasing demand for city linving by high earning households, along with historic low housing production rates drove up the rental and sales prices (see Figure 24), and triggered waves of displacement especially in low-income communities of color (see Figure 4). This challenge has been compounded by a significant decline of public funding for affordable housing from the Federal and State governments over the past four decades. High housing costs in our region mean that this disinvestment has had an even greater impact. Securing State affordable housing funds has become more competitive recently, and San Francisco does not fare well due to high costs of construction. Staggeringly high costs of housing development also mean that new homes delivered by private investment are only affordable to higher-income earners, further aggravating the affordability crisis. High costs of construction material, skilled labor priced out of living in the region, and complex review and permitting processes, and with increased investment risk all contribute to increases in the cost of building homes.

As the cost of living in San Francisco has ballooned over the years, the city has lost much of the diversity that once defined its identity. Seniors, families with children and middle-wage workers are confronted with very limited choices. Many are forced to find housing choices that meet their needs across the bay or further away and endure long commute hours. Many are forced to leave the Bay Area or California completely. The City has been unable to provide the needed housing for the diversity of workers that our economy requires and most importantly the housing for our diverse cultures and communities that define the essential values of San Francisco.

Path forward- There has been a growing commitment to address housing scarcity in California. Cities throughout the state are required to facilitate sufficient housing that not only responds to natural population growth but also address existing housing needs. These needs are measured by the share of households who bear high housing cost burden (paying more than 30% of their income on rent), or by those living in overcrowded conditions (more than one person per room, including the living room), or by low rates of available units on the market for rent or sale. San Francisco's Regional Housing Needs

Allocationfor the 2023-2031 cycle is 82,069 units, over three times the targets of the most recent regional planning cycle (2014-2022) (See Figure 25).

Many studies illustrate the importance of increasing the supply of housing to address the affordability crisis throughout California. New market-rate housing is generally only affordable to high-income earners. In San Francisco, new housing is also mostly limited to certain neighborhoods, and often in certain typologies within high-rise or mid-rise buildings that may not serve families with children, multi-generational living, or seniors.

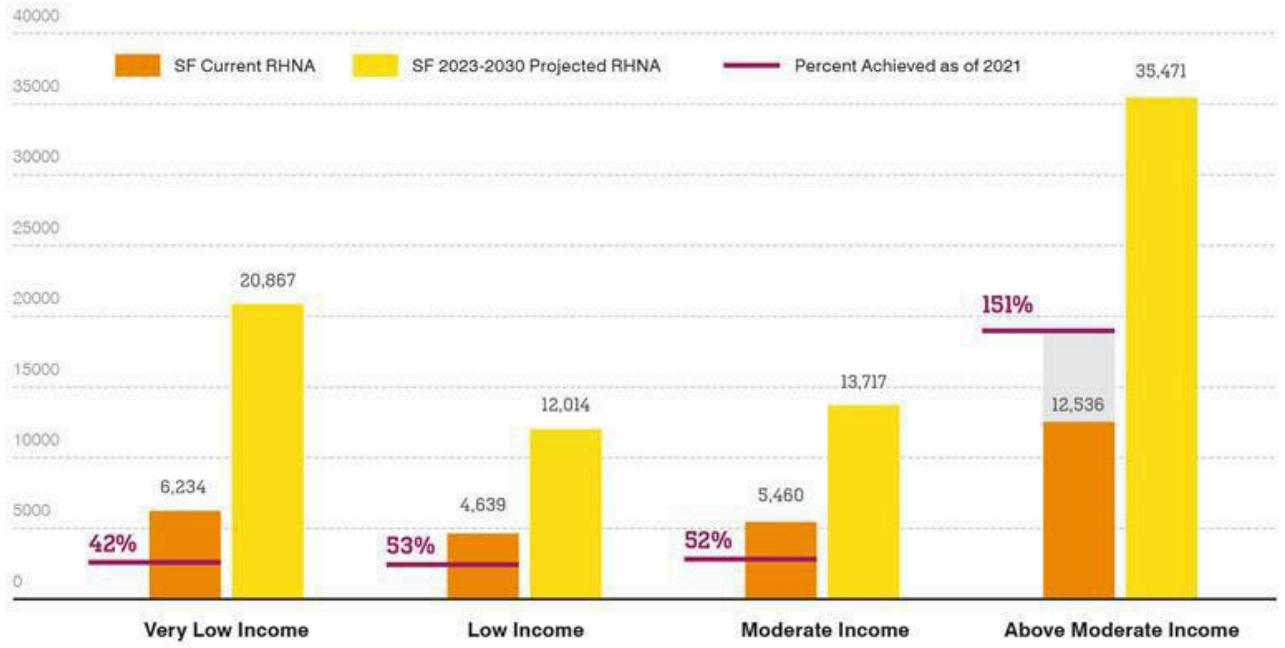
Achieving the goal of providing sufficient housing will require providing an abundance of permanently affordable housing, which requires a substantial increase in public funding. It also means continuing production of market-rate housing for all segments of San Francisco's workforce. It means supporting private investments to build housing for middle-income households. Small and mid-rise multi-family buildings have been a typology that historically played this role without public subsidies or income restrictions. This is a typology that fits the scale of most of San Francisco's neighborhoods, and new strategies can promote the feasibility of these buildings. The City's future diversity also relies on ensuring that new housing responds to the needs of a diversity of cultures, incomes, household types and family structures, age, and abilities.

Figure 24. Percentage change in job growth compared to percentage change in housing unit production from 2010 to 2019.



Source: 2010, 2019 BLS QCEW; ACS 2010 and 2019 1-Year Estimates.

Figure 25. San Francisco Regional Housing Needs Allocation by income level (Cycle 5 vs Cycle 6).



Source: ABAG

Objective 4.a Substantially expand the amount of permanently affordable housing for extremely low- to moderate-income households.

Challenge- Building housing permanently affordable to people with extremely low- to moderate- incomes requires subsidy to cover the gap between the cost of development and operations and the reduced revenue due to lower rents and prices. Annual affordable housing production has varied from year to year over the past decade, generally following overall housing production (see Figure 26). Federal funding for affordable housing has continually decreased for the past several decades. In the past 15 years, San Francisco has only built or preserved 13,320 units permanently affordable to extremely low- to moderate-income households, 33% of our regional targets. San Francisco also lost a significant and continuous source of funding due to State dissolution of Redevelopment Agencies in 2011. To continue building affordable housing, non-profit developers piece together a variety of public and private funding sources. The City also created new sources of local funding to make up for the loss of redevelopment funds. These include:

- Affordable housing trust fund, established in 2012, a general fund set aside of approximately $50 million/yr for 30 years.
- Employer gross receipts tax, established in 2018, expected to create $300 million per year for supportive housing

- Real Estate Transfer tax for properties valued at $10 million or higher, expected to create $196 million per year[61]
- Affordable Housing General Obligation Bonds, $310 million in 2015, and $600 million in 2019, and $147 million in the Health and Recovery G.O. Bond in 2020.

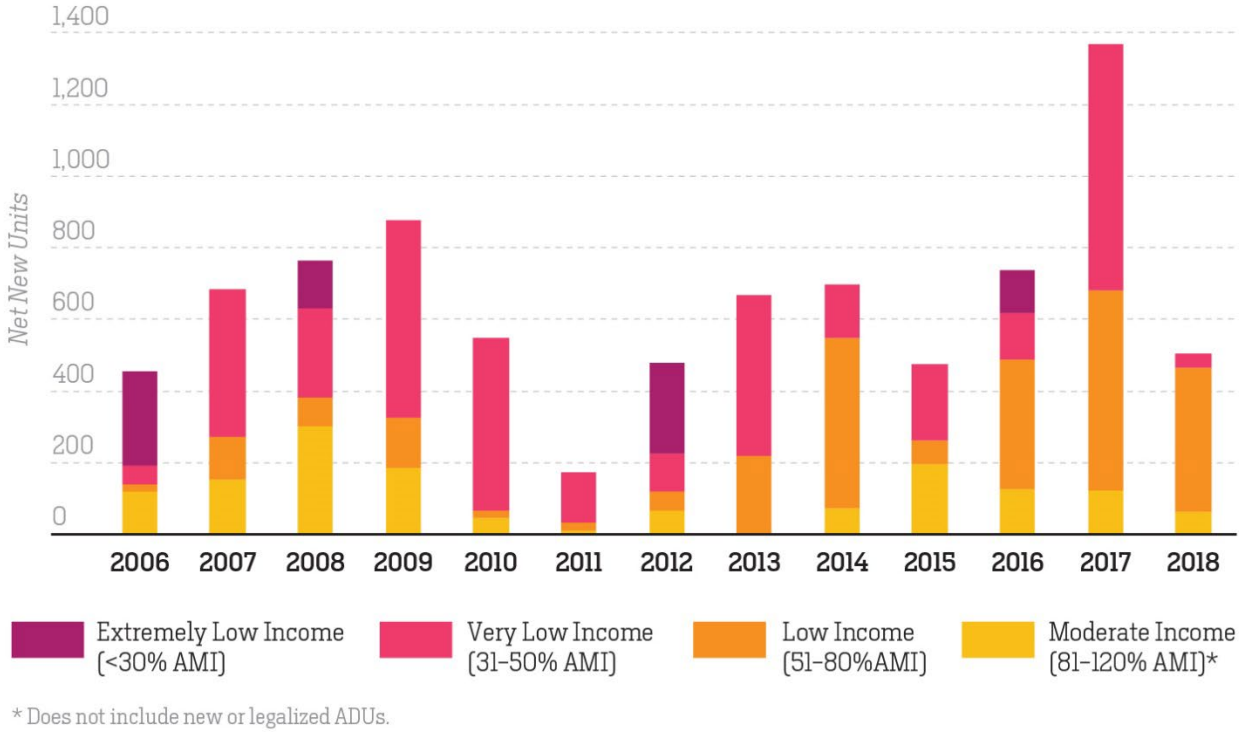
Despite limited funding sources, San Francisco continues to build affordable housing at a faster rate than most other cities. According to the Housing Affordability Strategies report, the City needs to spend over $517 million per year on building or preserving permanently affordable housing to secure 30 percent affordability of 5,000 new or preserved units (see Figure 27a). This study assumed an average cost of construction of $700,000 per unit and a subsidy of $350,000. The City was able to reach the high funding target in 2019. With the additional funding from the new gross receipts tax for Permanent Supportive Housing, the City reached approximately $650 million in 2021 for production and preservation of affordable housing. However, the new RHNA goals have increased significantly and will require substantially larger investments. Initial analysis shows a significant deficit per year to meet the affordability targets ranging from $1.3 billion in the 2023 to $2.5 billion in 2031. This gap also relies on private development providing a portion of our affordable housing units through inclusionary requirements, and contributing to housing related fees such as jobs housing linkage fees.

Path forward- Substantial expansion of permanently affordable housing for extremely low to moderate-income households is a critical pillar of addressing housing needs and housing our workforce. Without that investment the City will continue to lose its racial, social and cultural diversity. To achieve this objective, the City must seek new paths to substantially expand funding sources for affordable housing whether through new local sources, or expanded State and Federal funding. Figure 27(b) shows projected funding that is fairly certain. The City should utilize the two new sources of funding, gross receipts tax, and the Real Estate Transfer tax, to partially meet our funding gap, and consider new funding sources such as a new affordable housing bond, and other sources to meet the gap. Reducing the cost per unit for building affordable housing is also a critical path forward, which can be possible with streamlined review, and neighborhood support of mid-rise buildings for permanently affordable housing in all neighborhoods. The City will continue and expand streamlined review of all permanently affordable housing, reduce the cost of construction in regulatory review processes, and rely on innovative materials to make more efficient use of limited public funds. The City must also distribute affordable housing investments across all neighborhoods, including investments in Well-resourced Neighborhoods where the production of affordable housing has been limited. Expanding the types of permanently affordable housing beyond non-profit owned and operated or privately-owned below market rate rental units into cooperative housing, shared equity models, and land trusts will expand paths to increase affordable homeownership opportunities. The City must also target its investment to provide permanently affordable housing that serves the particular needs of vulnerable groups, such as transgender and LGBTQ+, transitional-aged youth, seniors and people with disabilities, and families with children. As the City, state and federal governments, continue to expand investment in affordable housing, it is important to recognize the role of

[61] This funding source is for the general fund and is subject to annual appropriation. For FY20-21, $10M of supplemental appropriation was approved for affordable housing

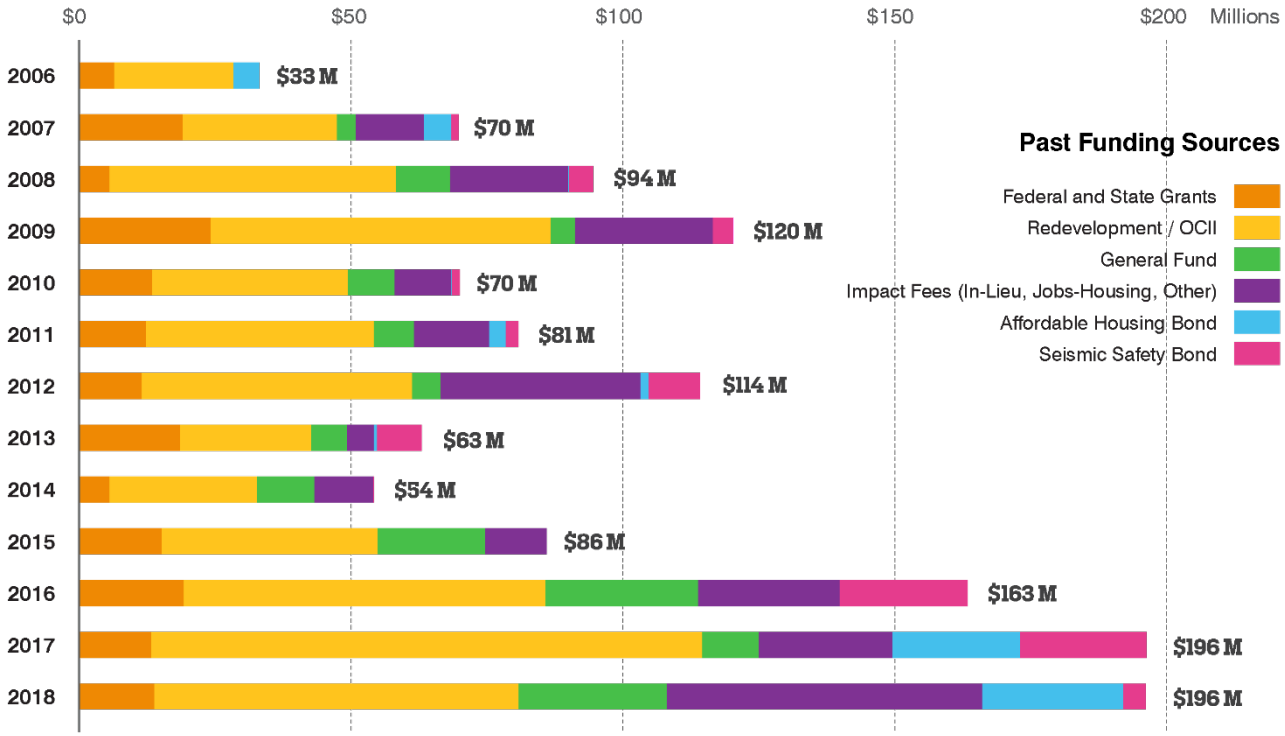
private housing developers in building permanent affordable housing, through inclusionary requirements, or affordable housing fees. Beyond the distinct contributions of the government and private sectores, the City must continue to support public-private partnerships to leverage public funds with private investments to maximize the number of affordable housing units produced.

Figure 26. Affordable housing production by income level from 2006 to 2018.



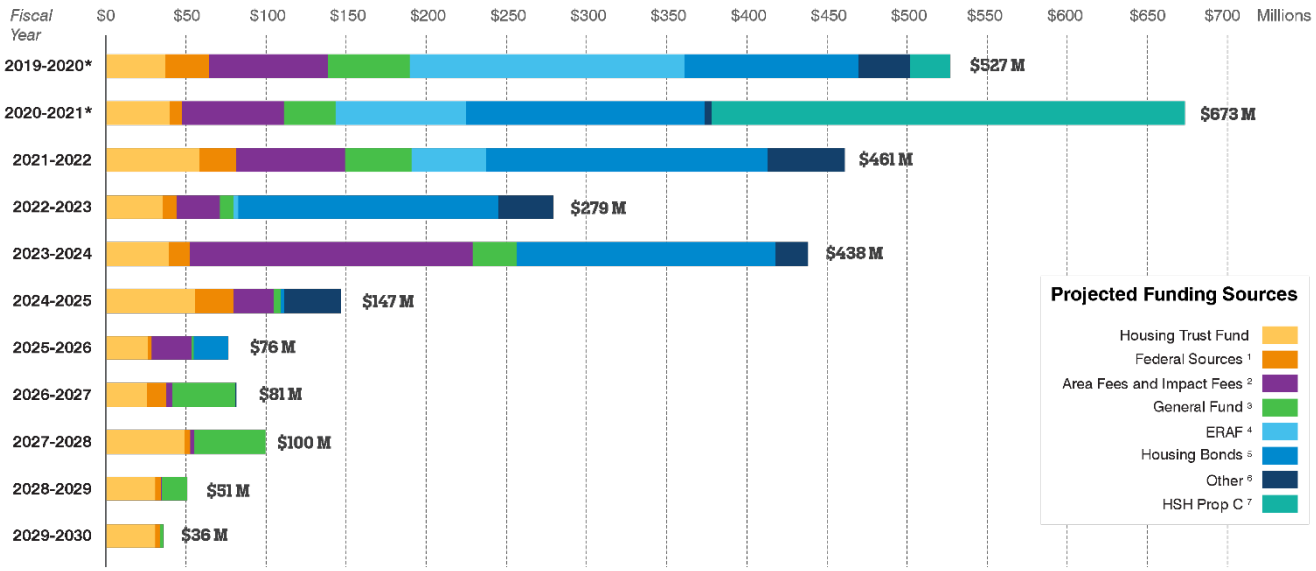
Source: City of San Francisco Planning Department Housing Inventory Reports, 2006 to 2018; Strategic Economics, 2020.

Figure 27a. Affordable housing past expenditures (2006-2018) by source.



Source: Mayor's Office of Housing and Community Development, San Franisco Planning Department, and Strategic Economics, 2020.

Figure 27b. Projected funding for permanently affordable housing (2021-2030) by source.
This figure does not reflect the new funding sources such as the new gross receipts tax for Permanent Supportive Housing, as well as the Real Estate Transfer tax for 2023 onwards.



* The funding on FY20 and FY 21 is still being presented as projected. This data will be updated with MOHCD and HSH.
(1) Includes HOME and CDBG
(2) Includes area-specific fees, inclusionary housing fees, and jobs-housing linkage fees
(3) Includes land sales and Certificates of Participation (COPs)
(4) In 2019, the Board of Supervisors passed an ordinance to establish the use of excess Education Revenue Augmentation Fund (ERAF) revenue for affordable housing production and preservation
(5) Includes 2015 Propositon A and 2019 Proposition A housing bonds
(6) Includes Citywide Development Agreements, Condominium Conversions fees, Low and Moderate Income Housing Asset Fund (LMIHAF), and other project-specific revenue)
(7) In 2018, San Francisco voters passed Prop C. This ballot measure provides significant new funding for homelessness and mental health services. HSH is using Prop C funding to enhance resources across their system of care, with a focus on acquiring new Permanent Supportive Housing. This chart does not incorporate a projected funding on Prop C funds yet.

Source: Mayor's Office of Housing and Community Development, San Fransico Planning Department, and Strategic Economics, 2020.

POLICIES AND ACTIONS

Policy 22: Create a dedicated and consistent local funding stream and advocate for State and Federal funding to support building permanently affordable housing for very low-, low-, and moderate-income households that meets the Regional Housing Needs Allocation targets.

a. Using the budget tool from Policy 14, action (e), support new and consistent sources of local funding in the City's Capital Planning process for permanently affordable housing including local bonds or other new funding sources that require voter approval. (MOHCD; Medium)
b. Dedicate funding within the 10-year Capital Planning process for permanently affordable housing in Priority Equity Geographies with a goal of building planned projects, while reaching the minimum targets in Well-resourced Neighborhoods as referenced in Policy 19, action (a). (Mayor/BOS, MOHCD; Long)
c. Explore the development of public financing tools such as Infrastructure Finance Districts to leverage the City's co-investments in order to lower direct City subsidy for permanently affordable housing. (OEWD; Medium)
d. Develop and support alternative and philanthropic funding sources to deliver permanently affordable housing faster and at a cheaper per unit cost through tools such as the Housing Accelerator Fund. (Planning, MOHCD; Medium)
e. Support the Bay Area Housing Financing Authority's expected efforts to secure voter

approval for a regional tax measure to fund permanently affordable housing. (MOHCD, Planning; Medium)

f. Advocate for federal legislation to increase Low-Income Housing Tax Credits and Private Activity Bonds, for example, by changing federal rules to lower the minimum bond financing needed to access 4% LIHTC (currently 50 percent) to help unlock more LIHTC in San Francisco and statewide. (MOHCD, Planning; Short)

g. Advocate for State legislation to change the voter approval threshold for General Obligation Bonds from two-thirds to 55 percent. (Planning, Mayor/BOS; Medium)

h. Advocate for State legislation to expand non-competitive permanently affordable housing funding sources. (Planning, Mayor/BOS; Medium)

i. Collaborate with key organizations to reform Proposition 13[62] for commercial property to provide funding support for local jurisdictions to meet their permanently affordable housing targets. (Planning, Mayor/BOS; Medium)

Policy 8: Expand permanently supportive housing and services for individuals and families experiencing homelessness as a primary part of a comprehensive strategy to eliminate homelessness.

a. Identify a numerical target for building Permanently Supportive Housing based on the upcoming Point-in-Time Counts in 2022, to approximately house a third of the total unhoused population in Permanent Supportive Housing and services, and update this target based on the 2022 Strategy completed by the Department of Homelessness and Supportive Housing. (HSH; Short)

b. Using the annual budget for capital, operating and services costs, increase funding needed to meet the targets set in Policy 8, action (a), in balance with funding needed for the actions in this policy including short and long-term rental subsidies. (Mayor/BOS, HSH, MOHCD; Medium)

c. Prioritize Housing Choice Vouchers paired with social services for people who are unhoused. (SFHA, HSH; Short)

d. Increase the share of non-lottery housing for the unhoused within City-funded permanently affordable housing projects to 30% or greater. (MOHCD; Medium)

e. Expand and improve on-site supportive services within Permanent Supportive Housing projects including sustained care for mental health or substance abuse issues, case management, and childcare. (HSH, HSA, DPH; Medium)

f. Utilize the state-wide streamlining opportunities to expedite and increase the production of Permanent Supportive Housing. (MOHCD, Planning; Short)

g. Evaluate the current prioritization system of the Coordinated Entry System for housing placement and services for unhoused residents that currently focuses only on chronic homelessness; and adopt additional levels of priorities for other vulnerable applicants to avoid worsening their situation while waiting for housing and services, and to substantially reduce the vacancy rates of housing available. (HSH; Short)

h. Expand temporary shelter capacity models that are low-barrier and high service such as non-congregate shelter options and Navigation Center beds to eliminate unsheltered homelessness moving away from

[62] A 1978 ballot measure that reduced property tax rates on homes, businesses and farms, and capped assessed property taxes at 1% for assessed values with no more than 2% annual increase. Prop 13 significantly reduced the tax revenue of local jurisdictions to fund schools, services, and infrastructure.

traditional shelters with high barriers, with a focus on expanding temporary shelter in proportion[63] to Permanent Supportive Housing and homelessness prevention investments in order to improve the successful exist to stable housing. (HSH; Medium)

i. Evaluate the needs for and create more types of shelters in the system with amenities and services tailored to their residents, examples could include 'clean and sober' shelters, safe consumption shelters for legal and illegal substances, non-congregate shelters, transgender shelters, and off-street safe parking sites for those vehicle dwellers seeking conventional housing. (HSH; Medium)

j. Remove Planning Code limitations to building homeless shelters and navigation centers throughout the city. (Planning; Short)

k. Secure and advocate for additional funding for building and operation of Permanent Supportive Housing from State and federal sources, such as the state's Project Homekey and the federal HOME program. (HSH; Medium)

l. Provide housing navigation services and stability case management to people experiencing homelessness using rental assistance programs (e.g., Housing Choice Vouchers) during the housing search stage and ongoing to ensure tenant retention. (MOHCD, HSH; Short)

m. Create and expand incentives for private landlords to use rental assistance programs (e.g., Housing Choice Vouchers) to rent their units to extremely and very low-income households. Incentives could include covering lease up fees, rent payment during the inspection period, providing tenant support for housing retention, and covering unit damage upon separation, as well as establishing a fund to support these incentives. (SFHA, MOHCD, HSH; Short)

n. Strengthen the Housing Ladder[64] strategy to support residents of Permanent Supportive Housing to move to less-supportive settings, freeing up supportive housing units for unhoused people. Actions include revising San Francisco Housing Authority preference system to grant higher preference to these households in using Housing Choice Vouchers or other available subsidies or creating a new City-supported shallow subsidy for these households. (SFHA,HSH, MOHCD; Medium)

o. Support and fund the San Francisco Ending Trans Homelessness Plan to end homelessness for transgender people in recognition of the severe disparities in housing access and safety experienced by this group. (HSH, OTI, MOHCD; Short)

Policy 15: Explore utilizing the Legacy Business Registry program to direct resources to businesses associated with communities impacted by displacement. (OEWD, OSB; Short) Expand permanently affordable housing investments in Priority Equity Geographies to better serve American Indian, Black, and other People of color within income ranges underserved, including extremely-, very low-, and moderate-income households.

a. Increase production of housing affordable to extremely and very low-income households including identifying and deploying subsidy

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[63] All Home Plan recommends a proportion of 1-2-4 where for each four units of permanently supportive housing, two shelter beds and interim-housing options are added, along with homelessness prevention services for one individual. 210413_Regional_Action_Plan_Final.pdf (allhomeca.org)

[64] A rehousing approach that offers opportunities for residents of Permanent Supportive Housing (PSH) to move from intensive supportive housing to more independent living, thus freeing up their PSH unit for others.

resources necessary to serve these income groups. (MOHCD, HSH; Medium)

b. Maximize the use of ongoing tenant-based rental assistance to expand eligibility for extremely and very low-income households who otherwise do not qualify for Below Market Rate units. (MOHCD; Short)
c. Evaluate increasing neighborhood preference allocation for Below Market Rate units in Priority Equity Geographies to better serve American Indian, Black, and other communities of color, if possible, per the Federal Fair Housing regulations, as informed by Policy 5 and underlying actions. (MOHCD; Short)
d. Support the development and implementation of community-led plans in the Tenderloin and the Fillmore (Planning, MOHCD; Short)
e. Support implementation of Mission Action Plan 2020 (MAP2020) and Sustainable Chinatown and as updated from time to time in order to meet its affordable housing production and preservation targets. (MOHCD, Planning; Short)
f. Continue to support and expedite delivery of the permanently affordable housing projects in Redevelopment Areas led by the Office of Community Investment and Infrastructure (OCII). (Planning; ongoing)
g. Continue to rebuild and replace public housing units at HOPE SF sites without displacement of the current residents. (MOHCD; Medium)

Policy 19: Enable low and moderate-income households, particularly American Indian, Black, and other people of color, to live and prosper in Well-resourced Neighborhoods by increasing the number of permanently affordable housing units in those neighborhoods.

a. Build between 25% and 50% of the City's new permanently affordable housing within Well-resourced Neighborhoods within the next two RHNA cycles, implementing the zoning strategies of Policy 20, actions (a) through (d). (MOHCD, Planning; Medium)
b. Increase housing that is affordable to extremely low and very low-income households in Well-resourced Neighborhoods through City funded permanently affordable housing projects. (MOHCD; Long)
c. Create a funded land banking program to purchase sites that could accommodate at least 50 units on sites in Well-resourced Neighborhoods, such as sites owned by religious institutions, parking on public land, or underutilized sites. (Planning, MOHCD, Mayor/BOS; Medium)
d. Pursue partnerships with religious institutions, or other philanthropic or private property owners, and non-profit developers to identify and support development of sites that could accommodate new permanently affordable housing, shared equity or cooperative models as referenced under Policy 23, action (a). (Planning, MOHCD, OEWD; Medium)
e. Reduce costs of building permanently affordable housing by supporting engagement processes identified under Policy 20, action (e) that recognize that mid-rise buildings are needed to accommodate new permanently affordable housing; cost reduction strategies include but are not limited to expanding ministerial review[65] of permanently affordable housing on smaller sized residentially zoned parcels. (Planning; Short)
f. Create and expand funding for programs that provide case management, financial literacy education, and housing readiness to low-

[65] A governmental decision involving little or no personal judgment by the public official; it involves only the use of fixed standards or objective measurements, and the public official cannot use personal, subjective judgment in deciding whether or how the project should be carried out.

income American Indian, Black and other people of color households who seek housing choices in Well-resourced Neighborhoods, and provide incentives and counseling to landlords in Well-resourced Neighborhoods to offer units to low-income households. Consider similar incentives referenced in Policy 8, action (m). (MOHCD; Medium)

Policy 23: Retain and increase the number of moderate- and middle-income households through building permanently affordable workforce housing and reversing the shortage in affordable housing built for these households.

a. Study and implement expansion of shared equity models to leverage more non-City financing tools that offer moderate- and middle-income homeownership (such as Shared Equity, land trusts, or cooperative ownership) through development of smaller sized lots. Use the studies cited in Policy 3, action (c), and Policy 11, action (f) to inform expansion of these models and pursue partnership with private and philanthropic property owners referenced under Policy 19, action (d). (MOHCD, Planning; Short)
b. Study and implement expansions to programs that create workforce housing for educators to serve other public-sector essential workers such as transit operators and hospital workers. (Planning, MOHCD, Mayor/BOS; Short)
c. Continue funding for the First Responders Down Payment Assistance Loan Program and the SFUSD Educators Down Payment Assistance Loan Program. (MOHCD; ongoing)

Policy 24: Support mixed-income development projects to maximize the number of permanently affordable housing constructed, in balance with delivering other permanent community benefits that advance racial and social equity.

a. Through the Inclusionary Technical Analysis Committee, review the inclusionary rates on a regular basis to ensure development projects maintain financial feasibility in all neighborhoods in order to maximize total number of Below Market Rate units delivered without public subsidy, and in balance with the directions of Policy 5, action (b). (Planning, MOHCD; Long)
b. Expand density bonus programs to allow additional Below Market Rate units in exchange for Planning Code modifications or exemptions. (Planning; Medium)
c. Explore the possibility of additional height increases and density limit removal at major transit nodes along Rapid bus and rail corridors, in addition to areas referenced in Policy 20, in parallel with needed infrastructure improvements and maximize permanently affordable housing units. (Planning; Medium)
d. Support approval of housing project applications that maximize density and height under existing zoning and regulatory programs as that will result in the production of more permanently affordable housing units, as informed by the racial and social equity impact analysis referenced in Policy 21, actions (a) and (b). (Planning; Short)
e. Expand the Public Sites for Housing Program through public-private partnerships and prioritize City resources to support the maximum number of permanently affordable housing units on underutilized publicly owned and surplus sites, balancing the financial needs of enterprise agencies, and ensuring adequate space and resources to address the gaps in community infrastructure, services and amenities. (Planning, OEWD, MOHCD; Long)
f. Support the maximum number of permanently affordable housing units as well as improved transit facilities on SFMTA owned sites slated for development through leveraging private investment in market-rate units with public

funding. (Planning, OWED, SFMTA, MOHCD; Medium)

g. Support maximum permanently affordable housing as an essential benefit of new mixed-use development agreements alongside other benefits such as community facilities and transit investments. (OEWD, Planning; ongoing)
h. Incentivize development projects to exceed the required inclusionary percentages to maximize the total number of Below Market Rate units via density bonus programs or regulatory paths through streamlined approval as defined in Policy 25, action (c). (Planning; Short)
i. Explore public-private partnership solutions for front-ending the necessary funding for infrastructure investments to expedite housing for large master plans and development agreements with major up front infrastructure needs, such as Treasure Island, Candlestick Park, Hunters Point Shipyard, Parkmerced, HOPE SF projects, and Schlage Lock, such as direct City investment in infrastructure, allocation of public financing for infrastructure improvements, or issuance of other public debt to fund infrastructure improvements. (OEWD, DPW; Medium)
j. Partner with affordable housing developers to purchase privately-owned entitled sites where construction may be stalling. (MOHCD,Mayor/BOS; Short)
k. Advocate for regional and State funds through the existing infrastructure bank or other paths to help finance the infrastructure needs of large urban infill and redevelopment projects. (Planning, OEWD, Mayor/BOS; Medium)

Objective 4.b Expand small and mid-rise multi-family housing production to serve our workforce, prioritizing middle-income households.

Challenge- While middle income households in San Francisco were not cost burdened (paying more than 30 percent of their income for housing) at all in 1990 more recent data shows that middle-income households are now cost-burdened (see Figure 3). San Francisco's housing costs are so high that even middle-income households – such as teachers, nurses, or first responders - are increasingly finding it hard to remain in the city. Data from the San Francisco Unified School District, for example, shows that anywhere from 300 to 700 educators leave San Francisco every year, leading to a shortage of teachers. While middle-income households may find rental housing affordable in many neighborhoods, median sales prices are completely out of reach. Middle-income households can find homeownership opportunities more easily across the bay, and that alone presents an incentive to leave the city.

Middle-income households have been increasingly left out as a target for newly built private market housing. While San Francisco has consistently met or exceeded regional housing targets for "above moderate-income households," this housing is not affordable to middle-income households. Factors contributing to this high cost include: land value, construction material costs, labor shortages, a complex regulatory environment, lengthy permitting processes, as well as uncertainties of discretionary approval processes. The high cost of developing housing increases investment risk and focus on projects that can endure uncertainty and yield higher rents and sales prices.

The cost of housing is also conditioned by the city's attractiveness to workers, businesses and investors from the region, the country and the

world[66]. San Francisco has been an attractive place for many high-income workers and investors around the world. This attractiveness makes housing in San Francisco a valuable global commodity. The availability of resources to pay for housing partially defines what is being produced by the private market for new housing and drives the market for renovations and modification to existing housing stock. These trends have resulted in market rate housing that is only affordable to higher-income earners.

These pressures leave middle-income households with very limited choices, as federal and state funding resources only target lower income households for affordable housing. The City has recently created programs, such as educator housing, that would produce deed restricted units for eligible middle-income households. Inclusionary requirements for market rate housing have also been updated to include below market rate units that are affordable to households earning up to 150% of AMI, or $179,850 for a three-person household. Relying on City housing subsidies to serve middle-income households would certainly mean taking away limited public funding resources from moderate-, low-, and very low-income households who are left without choices in most of the region.

Path forward- Finding new paths to ensure that the private housing market serves the middle-income workforce is key to maintaining our city's diversity. Expanding where small and mid-rise buildings can be constructed throughout the city provides a path for the market to provide more middle-income housing opportunities without public subsidy. This objective will be met not only by increasing development capacity for small and mid-rise buildings in areas where they are not currently allowed, but also by removing uncertainty from regulatory review processes, streamlining review, and cost abatements. The smaller scale of these buildings fit within the existing scales of most of the neighborhoods in the city which provides better opportunities for a clearer regulatory framework and streamlined processes, including units that serve middle-income households without deed restrictions. Adding new units to our existing housing stock on vacant lots, and through demolition and reconstruction is a critical strategy to increase small multi-family homes particularly for middle income households. However, new units should meet the affordability rates of existing units and tenants should be offered competitive relocation programs during construction. As building multi-unit buildings has been legalized in areas designated for single-family homes throughout the city and the State, the City must encourage multi-family buildings whenever possible. The retention of single-family homes should include contributions towards affordable multi-family housing given the missing opportunities and high use of land and infrastructure resources by a single household.

POLICIES AND ACTIONS

Policy 20: Increase mid-rise and small multi-family housing types in Well-resourced Neighborhoods near transit, including along SFMTA Rapid Network[67] and other transit, and throughout lower-

[66] San Francisco is the third city in the world with the highest concentration of billionaires Source and the Bay Area has concentrated around 20 percent of global venture capital, half of 'unicorn' companies and 8 out of 13 valued over $10 billion.

[67] The 13 rail and bus lines that account for the majority of Muni's ridership. Before the pandemic, Rapid Network lines were scheduled to operate every 10 minutes or better all day on weekdays.

density areas, by adopting zoning changes or density bonus programs.

a. Increase the opportunity for mid-rise multi-family buildings through changes to height limits, removal of density controls, and other zoning changes along SFMTA's Muni Forward Rapid Network[68] and other transit lines such as California Street, Union Street, Lombard Street, Geary Blvd, Judah Street, Noriega Street, Ocean Ave, Taraval Street, Sloat Blvd, 19th Ave, Park Presidio Blvd, West Portal Ave, Junipero Serra Blvd, Church Street, Divisadero Street, 17th and Market/Castro, and Van Ness Ave. (Planning, Mayor/BOS; Short)
b. Increase the opportunity to create more small multi-family buildings by replacing lot-based unit maximum zoning controls with form-based residential or mixed-use zoning in Well-resourced Neighborhoods near transit. (Planning, Mayor/BOS; Short)
c. Allow a minimum of four units on all residential lots, expanding the State duplex/lot split program (SB 9), and include programs and incentives that target these new homes to moderate- and middle-income households as described in Policy 26. (Planning, Mayor/BOS; Short)
d. Create a rezoning program to meet the requirements of San Francisco's Regional Housing Needs Allocation and Affirmatively Furthering Fair Housing laws, relying on a combination of strategies in actions (a) through (c) above to accommodate approximately 20,000 units. (Planning, Mayor/BOS; Short)
e. Engage with communities living in Well-resourced Neighborhoods to nurture enhanced openness for all through educational material and community conversations that highlight how locating new housing and permanently affordable housing in every neighborhood can address historic inequity and injustice and build more vibrant neighborhoods that improve everyone's quality of life. (Planning; Short)

Policy 25: Reduce development constraints such as lengthy City-permitting process and high construction costs to increase housing choices and improve affordability.

a. Establish streamlined or ministerial approval[69] to increase housing choices as identified in Policy 25, actions (a) thru (b); streamlining processes include reducing neighborhood notification requirements where community-informed community benefits are provided, allowing Department approval instead of Planning Commission approvals for projects that provide increased on-site affordability, consolidating appeal hearings to facilitate certainty in the development process and enable a comprehensive appeal discussion of all community concerns, or adoption of Housing Sustainability Districts within Well-resourced Neighborhoods outside of areas vulnerable to displacement. (Planning, Mayor/BOS; Medium)
b. Support mid-rise and small multi-family buildings through streamlining processes referenced in Policy 25, action (a) above, where community benefits such as certain portion of units serving middle-income households without deed restriction, designating commercial space as a Community Benefit Use, as defined in Policy

[68] The 13 rail and bus lines that account for the majority of Muni's ridership. Before the pandemic, Rapid Network lines were scheduled to operate every 10 minutes or better all day on weekdays.

[69] A governmental decision involving little or no personal judgment by the public official; it involves only the use of fixed standards or objective measurements, and the public official cannot use personal, subjective judgment in deciding whether or how the project should be carried out.mini

32, action (d), offering reduced rent for community-serving purposes via a development agreement or deed-restrictions, or meeting family-friendly criteria as referenced in Policy 28, action (d). Such processes should consider other incentives referenced in Policy 26, action (a) for mid-rise and small multi-family buildings. (Planning, Mayor/BOS; Short)

c. Support projects that include higher rates of below market rate units beyond required, using streamlining models referenced in Policy 25, action (a) as informed by racial and social equity impact analysis under Policy 21, actions (a) and (b). (Planning, Mayor/BOS; Short)
d. Pursue California Environmental Quality Act (CEQA) streamlining for projects through Community Plan Exemptions or by adopting Housing Sustainability Districts within Well-resourced Neighborhoods outside of areas vulnerable to displacement. (Planning, Mayor/BOS; Medium)
e. Continue to strengthen coordination of interagency permitting review and approval processes for implementation of approved large master planned projects to accelerate construction timelines of infrastructure improvements. (OEWD, Planning; ongoing)
f. Continue to implement the Mayor Executive Directives to accelerate creating new housing and expand City department's compliance with the directives (Mayor Breed's Executive Directive 18-01 and Mayor Lee's Executive Directive 17-02). (Planning, DBI, OEWD, DPW, SFPUC, SFMTA, SF Port, OCII, MOHCD, MOD, SFFD; ongoing)
g. Reduce review and notification requirements of the Planning Code for small projects such as rear additions, and reallocate the Planning Department's staff resources to support low-income homeowners with technical assistance as identified under Policy 26, action (c), using the Department's Racial and Social Equity Assessment tool.[70] (Planning; Short)
h. Prioritize Department's staff and resources to review Discretionary Review applications that are filed by tenants and those within Priority Equity Geographies and reallocate the Planning Department's staff resources from other Discretionary Review applications to support low-income homeowners with technical assistance as identified under Policy 26, action (c), using the Department's Racial and Social Equity Assessment tool.[71] (Planning; Short)
i. Develop Objective Design Standards that reduce subjective design review of housing projects while ensuring that new development in existing neighborhoods support livability, building durability, access to light and outdoor space, and creative expression. (Planning; Short)
j. Expand the use of cost-efficient construction types and materials such as cross laminated timber[72] and modular construction,[73] especially where local jobs are supported. (DBI; Medium)
k. Support more efficient construction process by maintaining or increasing flexibility of lot size

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[70] An analysis approach to assessing the potential racial and social equity impacts of a proposed action. This tool is part of San Francisco Planning's Racial and Social Equity Action Plan, which aims to pro-actively advance equity in the Department's internal and external work such as community planning, community engagement, policy/laws development, hiring, and process improvements. At the time of publication (March 2022), this tool is still being developed.

[71] An analysis approach to assessing the potential racial and social equity impacts of a proposed action. This tool is part of San Francisco Planning's Racial and Social Equity Action Plan, which aims to pro-actively advance equity in the Department's internal and external work such as community planning, community engagement, policy/laws development, hiring, and process improvements. At the time of publication (March 2022), this tool is still being developed.

[72] An engineered wood building material that can be used in walls, roofs or ceilings, may be eco-friendly, and could lower construction cost through decreased lead times.

[73] A type of prefabricated housing, where the pieces of the building are usually built in one place using a factory assembly line, shipped to a construction site, and then assembled. Using this housing production method reduces construction costs through its building process and through decreased lead times.

limits, allowing the development of small lots and reducing Conditional Use Authorizations or other barriers for lot consolidation. (Planning; Short)

l. Expand Impact Fee exemption to a broader range of permanently affordable housing projects including those with units affordable up to 120 percent of Area Median Income or projects that rely on philanthropic subsidies. (Planning, MOHCD, Mayor/BOS; Short)

m. Strengthen the interagency coordination for the associated approvals for publicly funded affordable housing; examples of associated approvals include the PG&E requirements to accommodate Public Utilities Commission (PUC) low-cost electric service, or the multi-agency review of disability access, in order to reduce per-unit construction costs. (SFPUC, MOHCD; Medium)

n. Expand the construction workforce through training programs in partnership with non-City apprenticeship programs and expand the Local Hire program to allow more projects to participate. (OEWD; Medium)

Policy 26: Facilitate small and mid-rise multi-family buildings as a prominent housing type that private development can deliver to serve middle-income households without deed restriction, including through expansion or demolition of existing lower density housing, or by adding Accessory Dwelling Units (ADUs).

a. Identify and adopt incentives or abatements that could make small multi-family buildings feasible and accessible to middle-income households without deed restriction, such as exemptions from some fees, modified inclusionary requirements, or streamlined approval criteria as defined in Policy 25, action (a). (Planning, Mayor/BOS; Medium)

b. Create low-interest construction loan programs for eligible lower-income homeowners, to expand their existing homes with additional units or demolish and replace their homes with more units up the allowable maximum density. (MOHCD, Mayor/BOS; Medium)

c. Create and fund technical assistance programs, as well as outreach and education programs for eligible homeowners interested in updating their property from single- to multi-family housing (through ADUs or demolitions) particularly targeting low-income property owners, households of color, seniors and people with disabilities, such as the Housing Development Incentive Program for Homeowners[74] that would also incorporate financing programs as referenced under Policy 26, action (b). Such programs should ensure accessible accommodations for aging adults and people with disabilities. (Planning, HSA; Short)

d. Update the Planning Code requirements to remove the Conditional Use processes for demolition of single-family or multi-unit buildings that are not tenant occupied and without history of tenant evictions, that are not historic resources, when increased density is proposed, and in accordance with the requirements of State Law (Housing Crisis Act) to replace rent controlled and permanently affordable units at equivalent affordability rates of the unit prior to demolition. Continue to apply Conditional Use requirements to demolition of tenant occupied buildings. (Planning; Short)

e. Support projects that maximize density within low-density zoning areas through processes

[74] Ordinance 69-22 passed on March 11, 2022

referenced in Policy 25, action (a), and explore new fees on single-family housing applications where more density is permitted. (Planning; Short)

f. Create and adopt new design standards that align with rear yard, height, and other physical code standards; where small multi-unit buildings are proposed such design standards should eliminate guidelines that subjectively and significantly restrict the massing of housing contrary to those regulatory standards in accordance with the State's Housing Accountability Act. (Planning; Short)

g. Prioritize City permitting staff resources for the review of ADUs that do not displace tenants. (DBI; Planning, Short)

h. Continue to strengthen the interagency coordination (e.g. Roundtable Review) for permit processing of ADUs and implement an integrated online permitting system and permitting governance structure to support permit streamlining and government transparency. (Planning, DBI; ongoing)

i. Create an affordable ADU program that provides financial support for professional services and construction of units that serve low-income households. (Planning, MOHCD; Short)

j. Encourage Junior ADUs (JADUs) as an effective and low-cost way of adding habitable space within existing single-family homes, as JADUs also expand opportunities for multi-generational living. (Planning; Short)

Policy 21: Prevent the potential displacement and adverse racial and social equity impacts of zoning changes, planning processes, or public and private investments especially for populations and in areas vulnerable to displacement.

a. Based on the Racial and Social Equity Impact Analysis for the Housing Element,[75] measure and quantify levels of investments to prevent community displacement through increased permanently affordable housing production, equitable access to housing, and other community stabilization strategies for vulnerable populations. (Planning; Short)

b. Create benchmarks for affordable housing production and preservation investments to avoid displacement and other adverse racial and social equity impacts for future zoning changes, development projects and infrastructure projects according to the scale and location of the proposal, as informed by the Racial and Social Equity Impact Analysis for the Housing Element. (Planning; Short)

c. Invest public funding or direct private investment to implement the anti-displacement investments identified in Policy 21, action (b) for zoning changes, development projects, or infrastructure projects of certain scale or intensity, in parallel with the project timeline. (MOHCD, SFMTA, OEWD, DPW; Medium)

d. Increase funding to expand the services of community-based organizations and providers for financial counseling services listed under Policy 5, action (k), as well as tenant and eviction protection services listed under Policy 1, to better serve populations and areas vulnerable to displacement; tenant and eviction protection services include legal services, code enforcement outreach, tenant counseling, mediation, and housing-related financial assistance; expansion of such services should be informed by community priorities working with liaisons referenced under Policy 14, action (b). (MOHCD, Mayor/BOS; Short)

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[75] The Racial and Social Equity Impact analysis of the Housing Element will be completed prior to the adoption of the Housing Element 2022, and this action will be updated based on the findings accordingly.

Objective 4.c Expand and diversify housing types for all

Challenge- San Francisco is home to a diverse range of family and household structures including multigenerational families, LGTBQ+ families, single parents, roommate living, artist co-ops, single-person households, couples, or families with multiple children among many others. As people's lifestyles change, children move out, families grow, partners move in or out, or physical abilities change, their housing needs change as well. San Francisco residents are finding it increasingly challenging to find housing that meets their changing needs, either within their current neighborhood, or anywhere in the city. Households with children, particularly those with two or more children are having an increasingly hard time staying in San Francisco (see Figure 28), and households with children in San Francisco experience high rates of overcrowding (more than 1 person per room, including the living room) as well (see Figure 29). Other household types are also experiencing pressure: many have been doubling or tripling up to live in the City as roommates or related adults (see Figure 29). Many are forced to live in these arrangements or leave the City because they cannot find housing that is within their financial reach and meets their needs. Seniors, aging adults, and people with disabilities are unable to afford living conditions that match their abilities. A two-person educator household is likely cost burdened (paying more than 30% of their income on rent) or may not live in housing that meets their needs if interested in growing their family. Artists who once found a haven in San Francisco, and who are often the promoters of the city's diverse cultures, are turned away without viable housing choices.

Path forward- Ensuring a diversity of housing types at various affordability levels is critical to maintaining and advancing the diversity that once defined San Francisco. The City must employ targeted programs and products that serve the particular needs of seniors, people with disabilities, transgender and LGBTQ+, transitional aged youth, or families with children. To meet these unique needs, new housing must offer varying design and amenities, promote certain typologies, be located in certain neighborhoods, or in proximity to transit amenities. For example, promoting co-housing[76] will address the growing interest among some communities in living in small rooms with shared amenities (kitchen, living room, etc.). Housing for seniors and people with disabilities, at variety of income levels, must be promoted along transit corridors to address limited mobility issues. Trangender and LGBTQ+ households are interested in living in neighborhoods where they have built a community over decades. Families with children, at a variety of income levels, need improved access to child friendly amenities, and shared open spaces. All neighborhoods should provide a range of housing types, at a range of affordability levels, as well as amenities that serve the changing needs of seniors, children, people with disabilities, young individuals, and various family structures.

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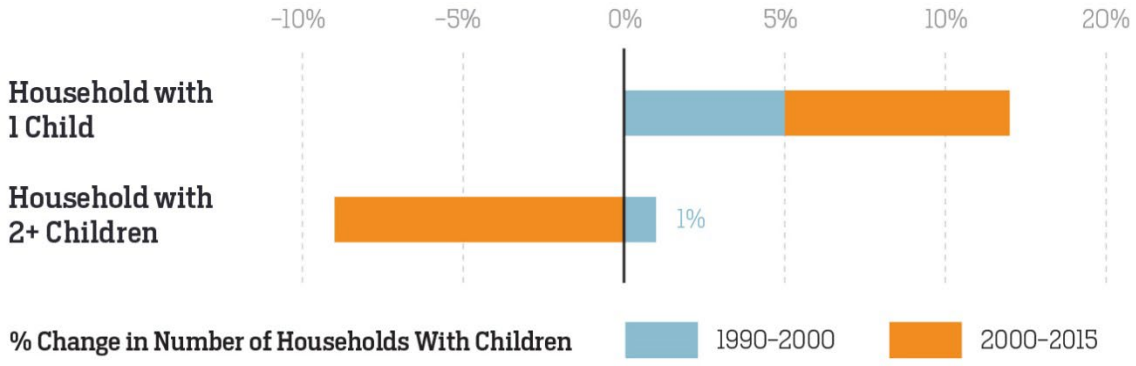
[76] Co-housing, group housing, or co-living rooms are a type of housing that may have limited cooking facilities and do not contain a full kitchen in each room. Co-housing may include (but is not limited to) communes, fraternities and sororities, or Residential Hotels.

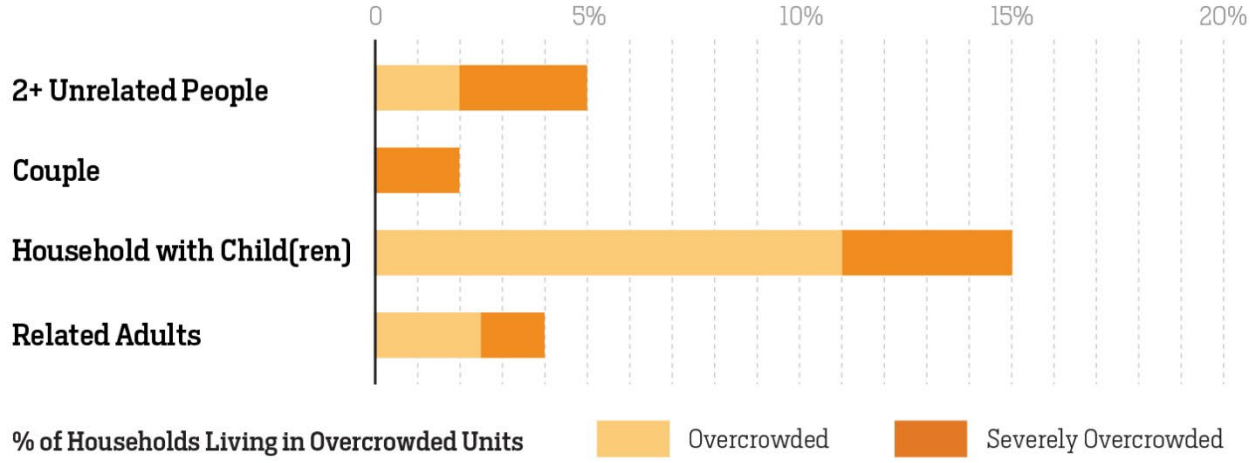
Figure 28. Percentage change in number of households with children from 1990 to 2015.



Source: San Francisco Housing Needs and Trends Report. Data: Decennial Census (1990 and 2000) and ACS (2015)

Figure 29. Percentage of households living in overcrowded* units by household type (2015).

* Overcrowded conditions are defined as more than one person per room, including the living room.



Source: San Francisco Housing Needs and Trends Report. Data: ACS 2015 5-year Estimates.

POLICIES AND ACTIONS

Policy 27: Promote and facilitate aging in place for seniors and multi-generational living that supports extended families and communal households.

a. Increase permanently affordable senior housing along transit corridors to improve mobility of aging adults and seniors, particularly for extremely- and very-low income households including through expansion of Senior Operating Subsidies as referenced in Policy 5, action (e). (MOHCD; Long)
b. Pursue multi-generational living for extended families and communal households that have space and amenities for children, working-age adults, seniors and persons with disabilities, when building permanently affordable senior housing referenced under Policy 27, action (a) above, or cooperative housing referenced in Policy 23, action (a). (MOHCD; Long)
c. Create or support financing programs that support aging in place, including improvements to accessibility through home modifications or building ADUs, and supported by technical assistance programs referenced in Policy 26, action (c). (Planning, HSA, MOHCD; Short)

d. Implement new strategies to support and prevent the loss of residential care facilities, using the recommendations of the Assisted Living Working Group of the Long-term Care Coordinating Council,[77] including business support services, as well as City-funded subsidies for affordable placement of low-income residents (DPH, HSA; Medium)
e. Support and explore expanding the Home Match Program to match seniors with people looking for housing that can provide home chore support in exchange for affordable rent. (HSA, MOHCD; Medium)
f. Permit uses and eliminate regulatory limitations, such as conditional use authorizations, that discourage innovative, smaller housing types where licensing is not required, such as co-housing[78] with amenities that support seniors and those with disabilities. (Planning; Medium)
g. Strengthen interagency coordination to identify and implement strategies to address the housing needs of seniors and people with disabilities, informed by the Housing Needs Assessments referenced in Policy 6, action (f). (HSA, Planning, MOHCD, MOD; Short)

Policy 28: Prevent the outmigration of families with children and support the needs of families to grow.

a. Identify neighborhoods with a higher concentration of low-income, immigrant, and rent- burdened[79] families with children, such as Tenderloin, Mission, Chinatown, and/or SoMA, and allocate resources to increase permanently affordable housing that addresses their income and needs in those neighborhoods. (MOHCD, Planning; Medium)
b. Establish programs to assist extremely low and very low-income families with children to relocate from SROs and overcrowding living conditions to appropriate permanently affordable housing. (MOHCD, Planning; Medium)
c. Develop objective design standards for child-friendly amenities within new buildings particularly for small and mid-rise multi-family buildings. (Planning; Short)
d. Establish criteria for family-friendly housing to support these projects through processes referenced in Policy 25, action (b). Such criteria can include development projects with substantially higher number of two- or three-bedroom units than required; that are affordable to a wide range of low- to middle-income households and meet the child-friendly design standards established in Policy 28, action (b). (Planning; Medium)
e. Collaborate with the San Francisco Unified School District to evaluate the feasibility of providing a priority in the school assignment process for low-income families and those living in permanently affordable housing. (Planning, SFUSD, MOHCD; Medium)
f. Continue to require multi-bedroom unit mixes. (Planning; ongoing)

Policy 7: Pursue investments in permanently affordable housing that are specific to neighborhoods that serve as entry points to recently arrived residents from certain groups, such as transgender and LGBTQ+ refugees or immigrants, or specific to populations such as transitional aged youth or transgender people.

a. Study and identify programs that respond to the needs of transgender and LGBTQ+

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[77] Supporting Affordable Assisted Living in San Francisco, January 2019, Assisted Living Facility (ALF) Workgroup | San Francisco Human Services Agency (sfhsa.org)

[78] Co-housing, group housing, or co-living rooms are a type of housing that may have limited cooking facilities and do not contain a full kitchen in each room. Co-housing may include (but is not limited to) communes, fraternities and sororities, or Residential Hotels.

[79] Households that pay more than 30 percent of their income for housing.

groups, particularly those who are refugees, lack family connections, or previously incarcerated, to incorporate into permanently affordable housing investments that are concentrated in the neighborhoods where they have historically found community, such as the Castro for LGBTQ+ communities or the Tenderloin for transgender people of color, building upon research spearheaded by the Castro LGBTQ Cultural District. (MOHCD, Planning; Short)

b. Support implementing San Francisco's "Ending Trans Homelessness Plan" as referenced under Policy 8, action (o), as well as the ongoing housing placement for the transgender community. (HSH, OTI, MOHCD; Medium)
c. Continue to provide housing affordable to applicants on the Plus Housing List. (MOHCD; ongoing)
d. Expand housing for transitional aged-youth in permanently affordable housing including supportive programs that address their unique needs such as a past criminal record, substance abuse, sexual orientation, gender identity, or other specific needs, as informed by the strategies referenced in Policy 7, action (g). (MOHCD, HSH; Medium)
e. Study and identify programs and building types that respond to the needs of recently arrived immigrants and to incorporate them into permanently affordable housing investments that are concentrated in the neighborhoods in which they initially settle, such as Chinatown, the Tenderloin, the Mission, and other gateway neighborhoods. (MOHCD, Planning, Short)

Policy 29: Encourage co-housing[80] to support ways for households to share space, resources, and responsibilities, especially to reinforce supportive relationships within and across communities and generations.

a. Eliminate the definition of "group housing" and modify "dwelling unit" to include "more than one" family in the Planning Code and to include minimum quality of life standards, such as cooking facilities and common space. (Planning, Mayor/BOS; Short)
b. Support process and code changes in Priority Equity Geographies that seek to define specific needs or limits around co-housing types, as informed by Policy 18. (Planning, Mayor/BOS; Short)
c. Create a co-housing informational program that provides ideas and recommendations on types, financing structures, precedents, and technical guidance to support their creation in Cultural Districts and Priority Equity Geographies to meet community needs. (Planning, Short)
d. Support co-housing developments on parcels owned by non-profits, like sites owned by religious institutions, to further encourage philanthropically financed affordable housing. (Planning; Short)

Policy 30: Require new commercial developments and large employers, hospitals, and educational institutions to help meet housing demand generated by anticipated job growth to maintain an appropriate jobs-housing fit, and address housing needs of students.

a. Conduct a feasibility study to assess large employers affordable housing funding on an ongoing-basis to complement the jobs

[80] Co-housing, group housing, or co-living rooms are a type of housing that may have limited cooking facilities and do not contain a full kitchen in each room. Co-housing may include (but is not limited to) communes, fraternities and sororities, or Residential Hotels.

housing linkage requirements. (Planning, OEWD, Mayor/BOS; Medium)

b. Encourage and provide opportunities for large commercial developments to build housing or dedicate land in lieu of their jobs housing linkage fee with affordability requirements that align with the income levels of the households anticipated to fill new jobs. (Planning, OEWD, Mayor/BOS; Medium)
c. Provide paths for large employers to contribute funding to and/or partner with non-profit developers to provide homeownership opportunities. (Planning; Medium)
d. Maintain the jobs housing linkage program and adjust the fee levels based on an updated nexus study and feasibility study on a regular basis. (Planning; Long)
e. Explore expanding jobs housing linkage fees to large employer institutional developments (medical and educational) who are currently not subject to jobs housing linkage fees. (Planning, OEWD, Mayor/BOS; Medium)
f. Pursue partnerships that commit large employer institutions who are not subject to job housing linkage fees (hospitals and educational institutions) to conduct an analysis of the housing demand of their employees and to meet that demand within institutional master plans or equivalent documents. (Planning, OEWD, Mayor/BOS; Medium)
g. Pursue partnerships with educational institutions to identify the housing needs of students, monitor implementation of planned student housing in institutional master plans, and promote strategies to address the unmet housing needs of students. (Planning; Medium)

Policy 31: Maximize the use of existing housing stock for res3idential use by discouraging vacancy, short-term use, and speculative resale.

a. Explore legislating a vacancy tax for residential units that stay empty for long periods of a year or used as secondary or vacation homes. (Planning, Mayor/BOS; Medium)
b. Explore regulatory paths, including a tax or other regulatory structures, for short term speculative resale of residential units, particularly those which seek to extract value out of evicting tenants, or rapid reselling to more lucrative markets. (Planning; Medium)
c. Continue to improve compliance, enforcement, and restrictions on short-term rentals. (Planning; ongoing)

Goal 5. Promote neighborhoods that are well-connected, healthy, and rich with community culture.

Challenge- San Francisco's neighborhoods have unique qualities and histories that enrich their residents and communities, but they also are the result of incremental decision-making and discriminatory practices that have left disparities in public services, resources, and impacts from environmental damage. Government agencies have sometimes organized past public investment around the location of new housing or land-use changes rather than an accounting for equity, which may consider needs, and quality of public investments.

Additionally, private enterprise that supports essential services like healthy food, healthcare, laundry, or childcare, has become increasingly pushed to serve high earners as their economic margins have dropped, even prior to the pandemic. Small businesses provide some of these essential services in addition to serving as neighborhood centers. However, according to the California Employment Development Department, the number of retail establishments with fewer than 10 employees in San Francisco dropped over 8%, between 2007 and 2017. As land values and online shopping and delivery services have increased and brick-and-mortar retail declined, the health of neighborhood commercial corridors varied with some corridors struggling, reducing residents' access to nearby services and opportunities to support community culture and cohesion.

Path forward- Having a safe, sustainable, nurturing home means more than inhabiting an indoor structure, it must be in and connected to a larger place that fulfills residents' social, cultural, and physical growth. For a neighborhood to house people, it must provide access to good quality grocery stores, healthcare, schools, community services, arts and cultural institutions. It must create a healthy environment with clean air, water, and soil and be prepared for the heightened impacts of the climate crisis, especially protecting those most at-risk. It must connect us to areas and resources beyond the neighborhood and across the city and region through equitable transit and transportation infrastructure. While a set of amenities may not be the same across neighborhoods, the City should support the unique ecosystem of each one that will nourish its communities and center equity in government investments.

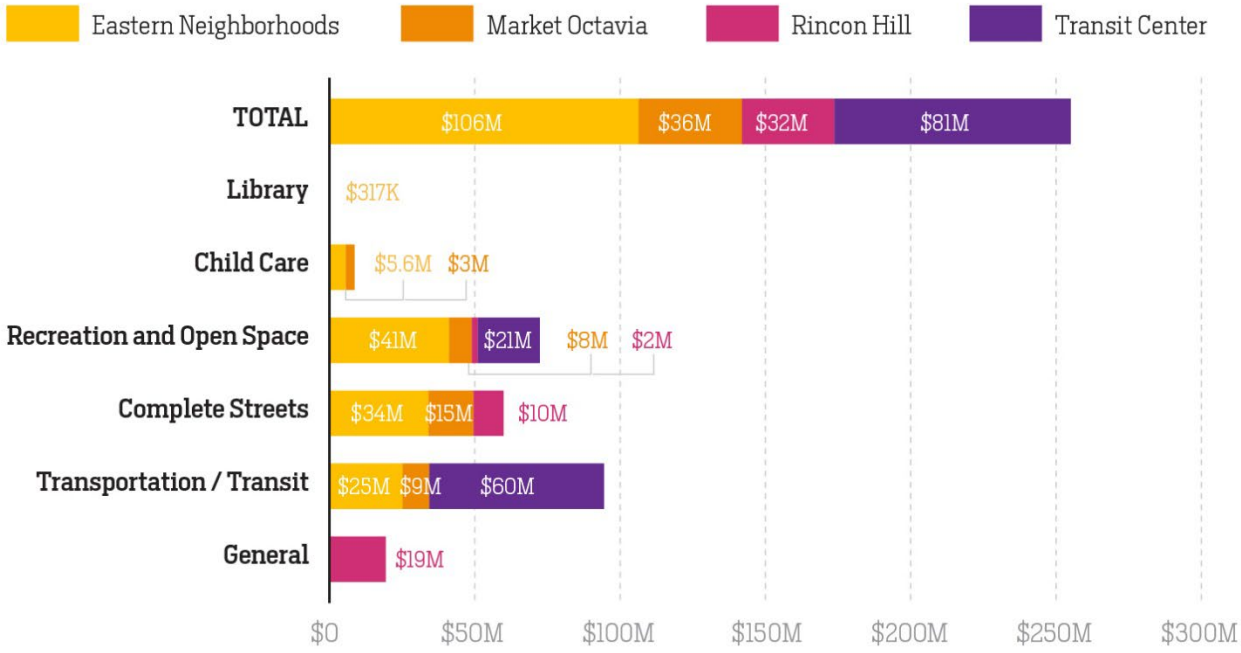
This Goalprovides a solid framework for the allocation of resources where changes are more urgent. To achieve healthy neighborhoods for housing residents, the City must focus on repairing past harms through environmental justice and equitable mobility strategies to address the disparate outcomes in wealth and health in Priority Equity Geographies while protecting these communities against displacement.

At the same time, as San Francisco population grows the existing community facilities and services, including parks, schools, libraries, police and fire departments, must address the growing need. Recent neighborhood zoning changes have included planning for infrastructure such as transit, open space, and street improvements using development impact fees to help fund such infrastructure, such as the Southeast Framework and Greater SoMa Community Facilities Needs Assessment (see Figures 30 to 32).

Housing in a neighborhood can foster relationships, identities, creativity, and individual well-being. Neighborhoods that express individual personalities and shared connections across cultures, race, and ethnicity, or art and

architectural heritage provide a sense of community. Considering housing proximity and access to goods and services can reduce burdens, enhance the experience, or encourage healthy habits in daily life. Each neighborhood is a result of its people and histories and their efforts and challenges and should reflect these specific experiences, undo past harms and adapt to changing conditions.

Figure 30. Infrastructure impact fees generated from development in Area Plans.



Source: SF Planning and DBI.

Figure 31. Nearly half of the cost of, In Chan Kaajal Park, a park bulit in 2017 in the Mission was funded by development impact fees.



Photo: San Francisco Recreation & Parks

Figure 32. Streetscape improvements along 22nd street to improve pedestrian safety was largely funded by development impact fees.



Rendering: San Francisco Public Works

Objective 5.a Connect people to jobs and their neighborhood with numerous, equitable, and healthy transportation and mobility options

Challenge- As the city and region have developed through decades of changes in economic, living, and land use patterns, transportation infrastructure has often been deployed to reconnect people's

needs, primarily around jobs and housing. However, local governmental agencies often focused on the needs of middle- and high-income workers (e.g, freeways, regional commuter transit) and left many populations, especially those of color or with low-wage jobs or those outside the workforce or with other needs, with few or burdensome options. For example, Golden Gate Park, with its world-class cultural institutions and well-maintained open space full of programs and activities, is an hour-long bus ride from the areas in the city with the highest percentage of children, including Bayview, Outer Mission, and the Excelsior.

It has become increasingly difficult and more expensive to complete new infrastructureprojects, including transportation projects. Thus the City is challenged to keep up with growth, which, limitspersons quality and life and access to opportunities (e.g., jobs, parks, schools, etc.). Those living in historically underserved communities and those with limited mobility options continue to face greater challenges than those able-bodied persons with more resources.

Additionally, the past two decades have transformed former mostly industrial neighborhoods into more mixed-use neighborhoods, including with housing. This has occurred primarily in the southeast portion of the city where historically there was less investment and stability in the types of small businesses that serve residents. These redeveloping areas include public benefits such as new or improved infrastructure. However, some residents may feel some benefits are oriented to future residents rather than supporting the needs of existing residents and businesses.

Path forward- A more equitable San Francisco requires planning for how housing, jobs, services, institutions, and resources are interconnected in and between vibrant neighborhoods.

Some areas of the city, primarily lower density neighborhoods in the middle, western, and northern neighborhoods, have had greater per capital public investment in infrastructure This includes more per capita investments in schools, transit, parks, and other community facilities. Providing more housing in these locations opens access to these benefits to more people. The City will address how new housing impacts existing neighborhoods depending on their geography, history, cultural identity, and past discrimination. These efforts address and support neighborhood life, such as economic development, facility planning, collaboration across agencies, and community-based organizations. The priority is to help people thriveby meeting their needs and providing opportunities that are easily accessible , which also supports San Francisco's goals for of healthier transportation and climate .

San Francisco has been a Transit First City for 45+ years, with a clear intention of supporting public transportation and walkable and bikeable neighborhoods. In the past decade, it has also significantly invested in Vision Zero, a program to get to zero traffic fatalities by 2024; the Climate Action Plan 2021, to reduce carbon emissions; and ConnectSF a fifty-year vision for San Francisco's mobility. ConnectSF relates directly to housing considerations, for example that we should preserve permanently affordable housing. Maintaining – and increasing – the City's stock of permanently affordable housing is critical,especially in areas receiving new infrastructure investment and add new low- and moderate-income housing near essential services and schools. The city's transportation policies will also be anchored in the upcoming Transportation Element Update which will be designed to center racial and social equity to redress historic harms, prioritize undoing damage, promote equity, and

prioritize those most at-risk of being excluded from transportation resources.

One of the City's climate goal is to have 80% of trips be sustainable, low carbon, by 2030 – such as transit, walking, or biking. Building multi-family housing near transit helps the City meet these goals. It helps the City meet climate goals by providing access to transit for more people; it improves the cost-effectiveness of existing transit investments and makes the City more competitive for regional, state, and federal funds to expand transit; and it provides a larger customer base for businesses located along or nearby transit lines.

POLICIES AND ACTIONS

Policy 17: Expand investments in Priority Equity Geographies to advance equitable access to resources while ensuring community stability.

a. Apply equity metrics identified under Policy 14 (a) in identifying necessary infrastructure improvements for Priority Equity Geographies and to guide all City investment decisions, including but not limited to: Capital Planning, General Plan Elements, Interagency Plan Implementation Committee or Citizen Advisory Council review, in coordination with Policy 33 actions (a) through (c). (Planning; Short)
b. Prioritize Priority Equity Geographies in investments to improve transit service, as well as other community improvements to parks, streetscape, and neighborhood amenities, in coordination with the investments referenced under Policy 33, action (c). (SFMTA, RPD, DPW, Planning; Medium)
c. Invest in and implement anti-displacement measures in parallel with major infrastructure improvements in areas undergoing displacement, as informed by Policy 21, actions (a) and (b). (Planning, SFMTA, RPD, DPW; Medium)

Policy 32: Facilitate neighborhoods where proximity to daily needs and high-quality community services and amenities promotes social connections, supports caregivers, reduces the need for private auto travel, and advances healthy activities.

a. Develop or adopt certification programs for community-serving businesses, such as grocery stores, childcare centers, healthcare clinics, and laundromats. Eliminate conditional use authorizations or reduce entitlement requirements related to lot size or commercial uses for new housing developments that include businesses that meet such requirements, allow them to participate in a Community Benefit Use program as described in Policy 32, action (d), or provide rental subsidies to them. (Planning, OEWD; Medium)
b. In Cultural Districts, reduce conditional use authorizations or other entitlement barriers for mixed-use buildings that can commit via deed restriction or other legal agreement to the inclusion of businesses, institutions, or services that support Cultural District needs and identity for a minimum of ten years. (Planning; Short)
c. Incentivize new housing to commit via deed restrictions or other legal agreement to below market rate commercial leases for community-based organizations serving the neighborhood community for a minimum of ten years by providing fee waivers, especially in Cultural Districts. (Planning; Medium)
d. Study the creation of a Community Benefit Use program, referenced in Policy 25, action (b)

and Policy 32, action (i), that allows new housing developments to have a highly flexible ground floor use entitlement and tenants to be eligible for rent subsidy in exchange for community participation in tenant selection or for businesses that obtain certifications as described in Policy 32, action (a). (Planning; Short)

e. Strengthen interagency coordination, review, and compliance processes to ensure that walking and biking infrastructure and safety improvements are integrated into planning, funding, and construction and/or rehabilitation of public projects (e.g., parks and open spaces, libraries, and transit facilities) in addition to private development projects. (Planning, MTA, DPW; Short)
f. Organize housing and neighborhood business and service areas to prioritize proximity in neighborhood planning or development agreement projects that propose land use changes. (Planning; Medium)
g. Create and a long-range community facilities plan, and update every 5-10 years, for public facilities including parks, recreation centers, schools, libraries, to accommodate a thirty-year projected population growth, informed by equity metrics in a manner that secures equitable access in Priority Equity Geographies, Environmental Justice Communities, and Well-resourced Neighborhoods that are targeted for increased housing capacity, building on processes such as the Community Facilities Framework, and in collaboration with Interagency Plan Implementation Committee. (Planning, SFRPD, LIB, SFUSD; Medium)
h. Develop a comprehensive and regularly updated map of daily needs, amenities, and community facilities, to inform the work of the interagency coordination under action (e) as well as community-based organizations in planning for services, resources, open space, and businesses to be near each other and supportive to communities. (Planning, MTA, DPW, OEWD, DYCF, HSA; Medium)
i. Expand and allow community serving uses, such as retail, restaurants, and personal services within areas that are primarily residential especially on corner parcels, especially uses under the Community Benefit Use program defined under Policy 32 action (d). (Planning; Short)
j. Change regulations and definitions in current Planning code to improve flexibility on allowing home-based businesses and work from home in residential districts, for example, create an accessory entrepreneurial use that allows up to two employees. (Planning; Short)
k. Continue to adhere to guidelines in the Better Streets Plan when new housing creates improvements to sidewalks, streets, and other public spaces. (Planning; ongoing)
l. Prioritize uses in the ground floor of buildings that support housing, neighborhood activity and identity, especially in Cultural Districts, over inclusion of utility infrastructure, such as transformer vaults. (Planning, DPW; Short)

Policy 33: Ensure transportation investments create equitable access to transit and are planned in parallel with increase in housing capacity to advance well-connected neighborhoods consistent with the City's Connect SF vision, and encourage sustainable trips[81] in new housing.

a. Strengthen interagency coordination for transportation, evaluating the existing and future needs of Priority Equity Geographies,

[81] Sustainable trip choices mean walking, bicycling, transit, and carpooling.

Environmental Justice Communities, and Well-resourced Neighborhoods targeted for increased housing capacity, and plan for staffing and funding needed for these investments (e.g., general obligation bonds, federal grants). This includes delivering a network such that transit vehicles come every five minutes[82] along certain corridors, and for rail consistent with the city's Connect SF vision and its Transit Strategy (SFMTA, Planning, SFCTA; Medium)

b. Restore, maintain, and optimize the existing transit system, particularly prioritize implementation of SFMTA's 5-year Capital Improvement Program's Transit Optimization and Expansion Projects in Well-resourced Neighborhoods targeted for increased housing capacity. (SFMTA, Planning; Short)
c. Restore and improve transit service as identified in the city's Transit Strategy, particularly for essential workers, transit-dependent people, and in Priority Equity Geographies and Environmental Justice communities (SFMTA; Short)
d. Adopt requirements that encourage sustainable trip choices[83] in new housing and reduce transportation impacts from new housing. Such amendments may require certain new housing to include additional transportation demand management measures and driveway and loading operations plans, protect pedestrian, cycling, and transit-oriented street frontages from driveways, and reduce vehicular parking. (Planning, SFMTA; Short)

Policy 20: Increase mid-rise and small multi-family housing types in Well-resourced Neighborhoods near transit, including along SFMTA Rapid Network[84] and other transit, and throughout lower-density areas, by adopting zoning changes or density bonus programs.

a. Increase the opportunity for mid-rise multi-family buildings through changes to height limits, removal of density controls, and other zoning changes along SFMTA's Muni Forward Rapid Network[85] and other transit lines such as California Street, Union Street, Lombard Street, Geary Blvd, Judah Street, Noriega Street, Ocean Ave, Taraval Street, Sloat Blvd, 19th Ave, Park Presidio Blvd, West Portal Ave, Junipero Serra Blvd, Church Street, Divisadero Street, 17th and Market/Castro, and Van Ness Ave. (Planning, Mayor/BOS; Short)
b. Increase the opportunity to create more small multi-family buildings by replacing lot-based unit maximum zoning controls with form-based residential or mixed-use zoning in Well-resourced Neighborhoods near transit. (Planning, Mayor/BOS; Short)
c. Allow a minimum of four units on all residential lots, expanding the State duplex/lot split program (SB 9), and include programs and incentives that target these new homes to moderate- and middle-income households as described in Policy 26. (Planning, Mayor/BOS; Short)
d. Create a rezoning program to meet the requirements of San Francisco's Regional Housing Needs Allocation and Affirmatively Furthering Fair Housing laws, relying on a

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[82] A conceptual network of high-frequency transit lines, where a substantial investment in on-street improvements would markedly increase the routes' speed and reliability. These improvements include bus-only lanes, traffic signal adjustments, and queue jumps, and can be installed relatively quickly. Lines on the five-minute network include routes in the Rapid Network.

[83] Sustainable trip choices mean walking, bicycling, transit, and carpooling.

[84] The 13 rail and bus lines that account for the majority of Muni's ridership. Before the pandemic, Rapid Network lines were scheduled to operate every 10 minutes or better all day on weekdays.

[85] The 13 rail and bus lines that account for the majority of Muni's ridership. Before the pandemic, Rapid Network lines were scheduled to operate every 10 minutes or better all day on weekdays.

combination of strategies in actions (a) through (c) above to accommodate approximately 20,000 units. (Planning, Mayor/BOS; Short)

e. Engage with communities living in Well-resourced Neighborhoods to nurture enhanced openness for all through educational material and community conversations that highlight how locating new housing and permanently affordable housing in every neighborhood can address historic inequity and injustice and build more vibrant neighborhoods that improve everyone's quality of life. (Planning; Short)

Objective 5.b Advance environmental justice, climate, and community resilience

Challenge – Many environmental perils exist for residents of San Francisco, some natural and others exacerbated by human action, resulting in inequitable consequences. In San Francisco, as in many other cities, low-income households and people of color are more likely to live in neighborhoods with environmental hazards, such as toxic groundwater, polluting industrial activities, congested freeways, and hazardous and solid waste facilities. In large part, this is the direct result of racial covenants, redlining, urban renewal and other discriminatory programs that have historically restricted where people of color may live. Furthermore, these communities may be less likely to have access to health-supportive resources, such as grocery stores, safe parks and open spaces, adequate and stable employment, health facilities, and frequent public transit. These disparities result in worse health outcomes and shortened life expectancy for our most vulnerable populations. For instance, in San Francisco, the average life expectancy for Black men (68 years) is more than a decade shorter than the citywide average (80 years), and 15 years shorter than the group with the longest life expectancy, Asian men (83 years).[86]

The COVID-19 pandemic has exacerbated the consequences of these existing health disparities. To date, the pandemic has disproportionately impacted communities of color, with those in the Latino/e/x and Black communities at highest risk (see Figure 33). The same health conditions that are more prevalent in neighborhoods most impacted by environmental injustice – asthma, heart disease, diabetes, hypertension – have also been identified as major risk factors for COVID-19.

San Francisco is increasingly vulnerable to climate crisis-related hazards like sea level rise, poor air quality, and extreme heat events. For example, approximately 37,200 people in San Francisco live in areas vulnerable to flooding from sea level rise (see Figure 34) and recent wildfires have shown that the entire city is vulnerable to poor air quality. Environmental pollution also affects certain neighborhoods that are identified by the State as "disadvantaged communities."[87] Similarly, earthquakes have been a historic hazard to San Francisco residents despite the city having the highest building code rating for structural safety required in new buildings. The city has had programs that require or encourage seismic upgrades to existing buildings, with the aim of

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[86] "Mortality." SFHIP. San Francisco Health Improvement Partnership. Accessed January 14, 2022. http://www.sfhip.org/chna/community-health-data/mortality/.

[87] "Disadvantaged communities" is an area identified by the California Environmental Protection Agency pursuant to Section 39711 of the Health and Safety Code or an area that is a low-income area that is disproportionately affected by environmental pollution and other hazards that can lead to negative health effects, exposure, or environmental degradation." Source: CA Office of Planning and Research, General Plan Guidelines, Chapter 4: Required Elements, June 2020

fostering a housing stock resilient to possible future earthquakes. This continues to be a challenge, along with the possible massive disruptions to infrastructure.

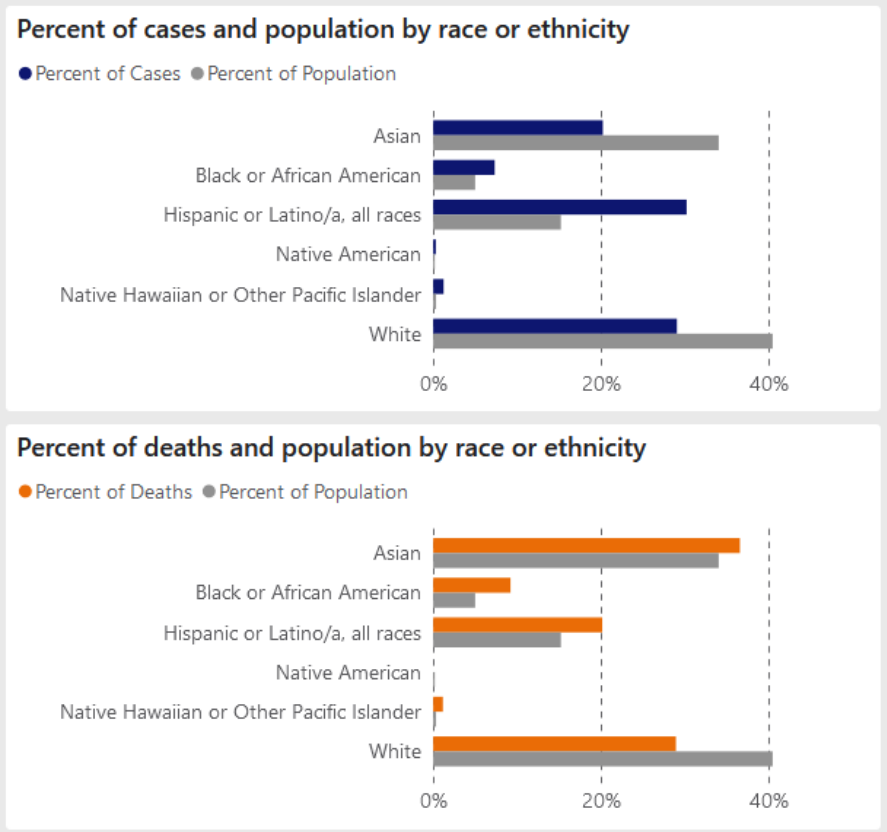
Even under normal conditions, housing is in constant need of repair and rehabilitation to remain safe and supportive. Those who have housing instability are more likely to stay in housing that is unsafe or inadequate where either landlords or low-income homeowners defer improvements, with the latter facing increasing pressure to sell and leave the city altogether. Or in cases where the housing is maintained, households may have a higher occupancy than is safe, rendering fire codes insufficient in case of emergency.

Path forward- Addressing both safe housing and a safe environment for neighborhoods requires substantial investment, planning, and inter-agency coordination. The City's Climate Action Plan 2021, Earthquake Safety Implementation Program, and the Environmental Justice Framework (see Figure 35) currently in process are three significant efforts across the city to address the many environmental challenges in relation to housing. In 2019, San Francisco declared a climate emergency in accordance with the Paris Climate Agreement and committed to eliminating greenhouse gas emissions by 2050. This commitment relies on the transformation of energy supply, buildings, transportation and waste system to reduce emissions. New housing development can help contribute to these goals by meeting the City's Green Building Code standards. Emissions from buildings stem mostly from the use of natural gas for water and from space heating, recently eliminated as an option through the City's New Construction Ordinance. San Francisco has committed to zero emissions in new construction by no later than 2030.

As most of San Francisco's housing was built before the middle of the last century, many buildings may require upgrades to improve resiliency against these hazards as well as general habitability. Older and inadequately maintained buildings are less able to weather the impacts of these climate and environmental challenges. When these buildings fail, the outcomes are worse for lower-income households and those with health conditions and other existing vulnerabilities. As local, state, and federal resources are made available to address efficiency and resiliency of residential buildings, for example the State-funded and locally run CALHome program, and the Capital Improvement Program, these resources should be prioritized to address existing inequities faced in vulnerable neighborhoods. The city should continue to support seismic upgrades and lead remediation, in such programs as DPH's ChildHood Prevention Lead Program, prioritizing homeowners in Environmental Justice communities.

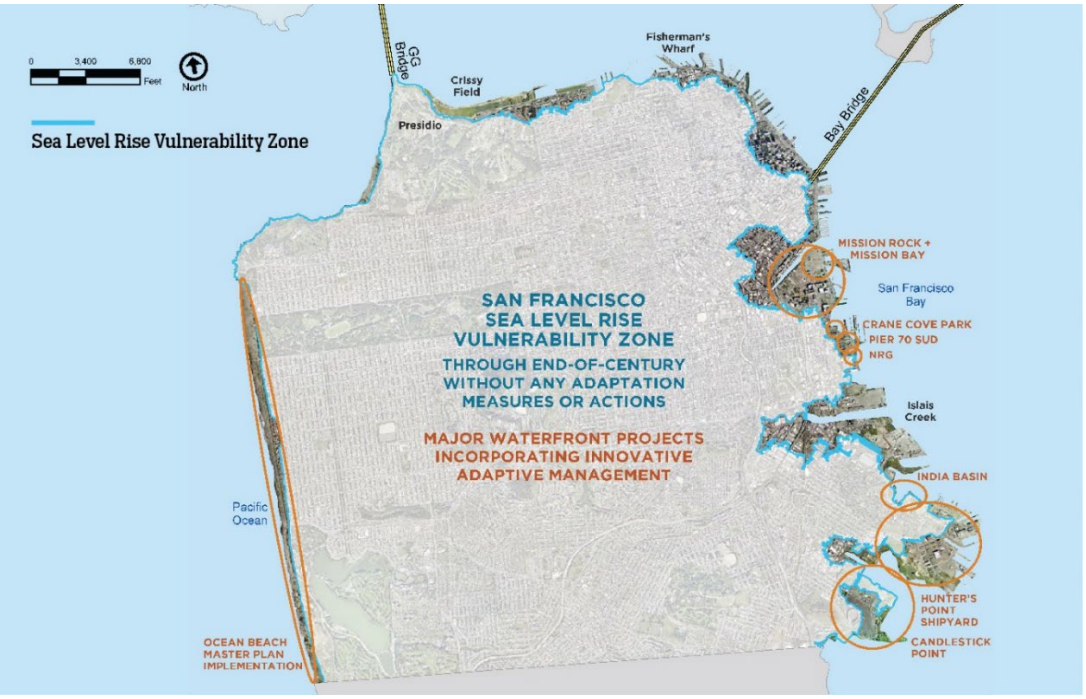
New housing development can also include neighborhood retail and other services on the ground floor, such as grocery stores, childcare, stores, restaurants, community centers, health facilities, etc. that meet the needs of residents. Finally, new housing can provide open space as required by SF Planning Code, community gardens, living roofs as required by the SF Better Roofs Ordinance (see Figure 36), and street trees as required by the SF Better Streets Plan that benefit existing and new neighbors. Integrating and designing sites to accommodate nature, through requirements such as Bird Safe Building Standards, throughout our streets and buildings improves air quality, plant and wildlife health, human wellness, and climate adaptation.

Figure 33. Percent of cases and death by race or ethnicity.



Source: Data SF; extracted January 14, 2022.

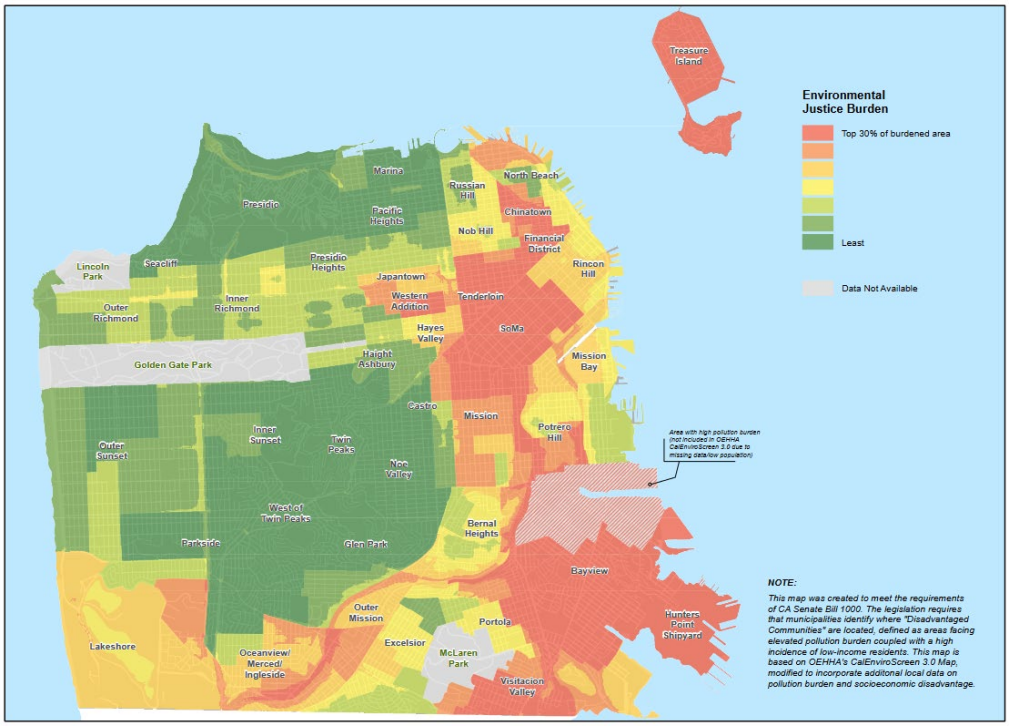
Figure 34. Areas vulnerable to sea level rise.



Source: San Francisco Sea Level Rise Action Plan

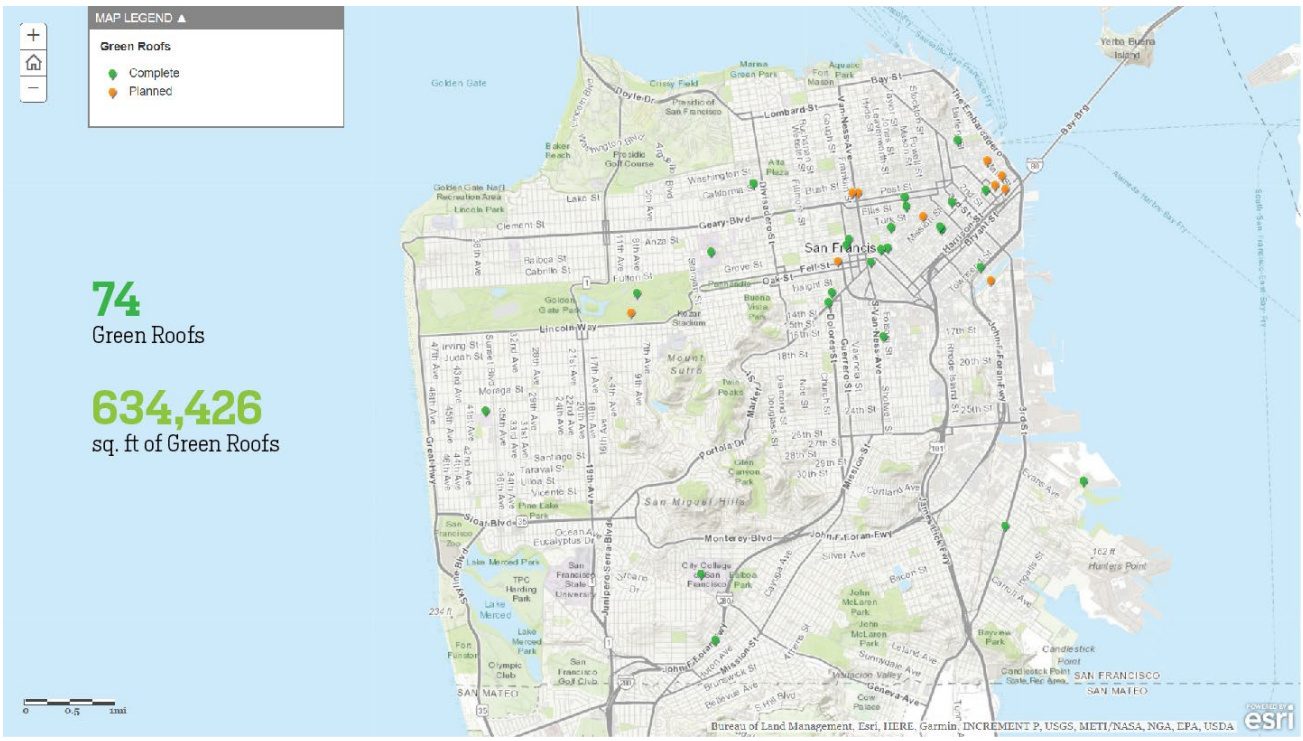
Figure 35. Draft Environmental Justice Communities (2021).

Areas of San Francisco that have higher pollution and are predominately low-income. This map is based on CalEnviroScreen, a tool created by CalEPA& OEHHA that maps California communities that are most affected by pollution and other health risks. "EJ Communities" are defined as the census tracts with the top 30% of cumulative environmental and socioeconomic vulnerability across the city.



Source: SF Planning's Environmental Justice Framework.

Figure 36. San Francisco has recently required certain development projects to provide a 'living roof'.



Source: San Francisco Planning

POLICIES AND ACTIONS

Policy 34: Support the repair and rehabilitation of housing to ensure life safety, health, and well-being of residents, especially in Environmental Justice Communities, and to support sustainable building practices.

a. Create and expand programs to improve indoor air quality for existing housing, particularly in Environmental Justice Communities, such as applying the standards in Article 38 of SF Health Code to such housing. (Planning, DPH; Short)
b. Create electric conversion policies and programs for existing housing that decrease the use of gas appliances in homes to support respiratory health in children, prioritizing Environmental Justice Communities. (DOE, Mayor/BOS; Short)
c. Support and streamline permits for energy retrofit, heating, ventilation and air conditioning (HVAC), and weatherization upgrades. (DBI, Planning; Short)
d. Expand funding for acquisition and rehabilitation programs to remove mold, lead, and other health hazards through programs such as Fix Lead SF and CALHome. (Mayor/BOS; Medium)
e. Continue to connect residents and housing developments with technical support and financing programs for earthquake safety retrofits such as the Mandatory Soft Story Retrofit Program. (DBI, ORCP; ongoing)
f. Create programs to provide rehabilitation assistance to qualified homeowners to maintain exterior cladding, rooves, and essential building utilities in housing in Environmental Justice Communities. (DBI; Medium)

Policy 35: Enforce and improve planning processes and building regulations to ensure a healthy environment for new housing developments, especially in Environmental Justice Communities.

a. Identify the public health needs of neighborhoods through community planning processes or large-scale development projects by engaging community-based organizations; public health needs include addressing air, soil, groundwater contamination, and noise pollution (Planning, DPH, PUC, ORCP, PORT; Medium)
b. Ensure and reinforce that all community planning efforts meet the City's 2021 Climate Action Plan, and future updates to this plan, to prepare neighborhoods and future housing projects for sea level rise impacts, especially in Priority Equity Geographies and Environmental Justice Communities. (Planning; Short)
c. Provide neighborhood and infrastructure planning to mitigate flooding risk during weather events or due to climate crisis impacts. (Planning, SFPUC; Medium)
d. Enhance high-pressure fire protection for the Westside of San Francisco by implementing and constructing Phase 1 of the Westside Potable Emergency Firefighting Water System (PEFWS) and continue to work with the community, and obtain funding to implement and construct Phase 2 of the PEFWS. (SFPUC, Mayor/BOS; Medium)
e. Develop and require community accountability measures, including notification and engagement of residents, when building housing on environmentally contaminated sites located in Environmental Justice Communities and Priority Equity Geographies. (Planning; Short)
f. Develop notification processes in planning efforts in geographies that include polluting sources, such as freeways, to anticipate solutions for potential future sensitive

populations such as seniors, children, and those with disabilities. (Planning; Short)

g. Strengthen building standards to ensure that new housing developments limit sound intrusion from exterior and interior sources. (DBI, Planning; Short)
h. Explore whether certification or building codes effectively incentivize the use of low VOC (volatile organic compounds) materials in new construction to reduce exposure. (DBI, Planning; Short)
i. Maximize the installation of site-appropriate, native trees and vegetation at grade and on roofs in new residential development, especially in neighborhoods with less tree canopy coverage as per the SF Better Streets Plan, the SF Green Landscaping Ordinance, and the SF Better Roofs Ordinance. (Planning, DPW; Short)
j. Update Planning Code requirements, such as the SF Green Landscaping Ordinance, to reduce paved surfaces and underground enclosed space in rear and side yards to specifically retain deep soil for trees and more sustainable vegetation. (Planning; Short)
k. Study and document the impact of open space and housing based on scientific analysis for people's health, especially for children, for the Commission's use in evaluating development agreements that include housing and rear yard variances in housing applications (Planning, DPH, RPD; Short)
l. Enforce compliance with existing requirements in the SF Stormwater Management Ordinance to incorporate on-site stormwater management and flood resilience. (SFPUC, Planning; ongoing)

Objective 5.c Elevate expression of cultural identities through the activation and design of neighborhood buildings and spaces

Challenge- The cultural diversity of San Francisco's neighborhoods is threatened by the displacement of racial, ethnic and other marginalized cultural groups, such as transgender and LGBTQ+ residents. While San Francisco's neighborhoods still retain a high level of cultural identity which contributes to their sense of place and to the residents' sense of belonging, this aspect of community stability is hard to sustain when the culture bearers and community members that embody that identity can no longer afford to live in the neighborhood. Across communities of color and other marginalized groups, the forces of displacement are making it difficult for cultural groups to transmit the traditions, practices, and artistic expressions that define them and their heritage. This erodes the health and cultural richness of the community, which can be witnessed through the loss of culturally significant businesses, community spaces, art and cultural programming.

As an example of this challenge to retain the city's cultural diversity, the city has lost significant Legacy Businesses[88] over the past decade due to displacement pressures and lower income communiteis of color have been hit particularly hard. A 2014 report by the City's Budget and Legislative Analyst's Office showed the closure of small businesses in San Francisco had reached record numbers with

[88] In order to be designated by the Board of Supervisors as a Legacy Business, businesses must generally have operated in San Francisco for 30 or more years, have contributed to the city's history and/or the identity of a particular neighborhood or community, and be committed to maintaining the physical features and traditions that define the business, including crafts, cuisines, art forms, or activities.

almost 4,000 small businesses closing in 2014 alone. In contrast, only 693 small businesses closed in 1994, the first year of the study. The report drew connections to San Francisco's skyrocketing rents and the high level of commercial evictions, which continue today. The Legacy Business Registry and corresponding fund were created in 2015 in recognition of this loss and to mitigate or reverse the trend.

Similarly, the city's Cultural Districts Initiative was formalized in 2018 with the aim of stabilizing vulnerable communities facing or at risk of displacement or gentrification, and to preserve, strengthen and promote our cultural assets and diverse communities. While both of these innovative programs provide potentially effective models for government interventions to fight community displacement and elevate expressions of cultural identity, the funding needs of both programs to date have far exceeded the allocated resources.

While many parts of the city, such as the Cultural Districts, aim to reinforce cultural identities that are at-risk, other parts of the city not identified as such may expect new housing opportunities to arrive subject to more general design guidance. Historically, San Francisco design guidance has reinforced existing patterns, whether in massing or façade or roofline expression, even though some of the original housing stock was mass-produced with little individual character or architectural quality. While this desire for compatibility was intended to prevent vast and dramatic changes in scale, in practice over time scale has mostly been addressed through code or zoning requirements and these have mostly limited creativity, architectural expression, and muted the voices of an expanding diversity of residents. While continuity of place is essential in cities, public space, facades, and street environments should also reflect the evolutions in personal and cultural expression.

Path forward- As new development comes to San Francisco's neighborhoods, good building design should remain sensitive to the unique neighborhood context while enhancing these neighborhoods. New buildings can improve the experience of existing and new neighbors through architecture, services or retail provided on the ground floor, or the streetscape improvements on the fronting street. New development should help maintain neighborhoods' historic architectural heritage and landmarks as well as their cultural heritage: objects, beliefs, traditions, practices, artistic interpretation, and significant places that develop a sense of belonging and identity. New development must also recognize the erased histories and heritage from American Indian, Black and other communities of color.

Cultural Districts will be an important platform to move forward; they have been defined by the city as areas containing a concentration of cultural and historic assets, culturally significant enterprise, arts, services, or businesses and a significant portion of its residents or people who spend time in the area, are members of a specific cultural community or ethnic group that historically has been discriminated against, displaced or oppressed.By reflecting the cultural identities of their residents in new development, building design can create environments that cultivate understanding and appreciation of diverse peoples, that honor the stories of all communities, and that foster a sense of belonging for all residents. This can be achieved through design and artistic expression in the built environment – buildings, parks, sidewalks, streets, structures, and other public spaces – and through the activation and use of public and private spaces. By elevating expression of cultural identities, the City can

encourage more equitable local economies, and advance social justice. In this way, this objective also furthers Objective 3a to "Build intergenerational wealth for American Indian, Black, and other communiteis of color." The creativity and sense of belonging resulting from this work will promote mental health while resulting in layered cultural landscapes and experiences for residents, workers, and visitors.

Achieving this objective will mean re-evaluating how existing and new design guidelines can be utilized to foster creativity while implementing foundational design principals and ensuring durable building materials. It also requires the Planning Department to explore how design, especially at the ground floor, supports social engagement and the vibrancy of neighborhoods. At the same time, it requires tools that ensure that existing expressions of cultural identity and places that hold cultural and historic meaning are respected. In other cases, the city should explore limiting or revising discretionary guidelines to balance the needs of new housing and neighborhood scale, which is already governed by definitive height and bulk controls. By creating and adopting objective standards that focus on the major concerns—light and air, dramatic shifts in scale— the city can allow for more flexibility in how neighborhoods look and feel, inviting new residents to join in and creative disciplines to deploy their talents.

The management of culturally and historically significant spaces must be guided by the culture bearers and descendants of those cultural groups, and special attention should be paid to those groups that have been marginalized from these decisions in the past. Ramaytush descendants and the American Indian community more broadly both hold special roles in guiding how the city manages tribal cultural resources and places significant for American Indian cultural practices. Consultation methods and information systems must be improved to ensure their full participation in decisions affecting the Ramaytush and American Indian community.

The City can utilize and expand existing historic preservation tools such as protective ordinances, rehabilitation incentives, and environmental laws to improve the management of places that express cultural identity. And the City can grow new and innovative programs such as the Legacy Business Registry, the Citywide Retail Strategy, and Cultural District program to guide cultural resource management and programs intended to support cultural uses and activities throughout the city.

POLICIES AND ACTIONS

Policy 36: Shape urban design policy, standards, and guidelines to enable cultural and identity expression, advance architectural creativity and durability, and foster neighborhood belonging.

a. Create and adopt a new objective design standard to require the use of natural and durable materials for front façade and windows, for example stucco, stone, concrete, wood, and metal, subject to periodic, amended revision and eliminate existing design guidelines, except in Special Area Design Guidelines or adopted or listed Historic Districts, that require detailed front façade compatibility with surrounding neighborhood architectural patterns, for

example window proportions, roof shape, or type of entry. (Planning; Short)

b. Complete, adopt, and apply the Ground Floor Residential Design Guidelines to housing projects, in coordination with State requirements. These recommend porches, stoops, and accessible open space near sidewalks to invite social engagement and belonging. (Planning; Medium)
c. Create Special Area Design Guidelines if requested by communities in Cultural Districts and Priority Equity Geographies where the design of public space and architecture could help reinforce cultural identities, and in coordination with State requirements. (Planning; Medium)

Policy 37: Support cultural uses, activities, and architecture that sustain San Francisco's dynamic and unique cultural heritages.

a. Utilize the Cultural Districts program to support building permanently affordable housing, along with other housing development and neighborhood investments that include cultural activities, uses, traditions, and spaces, in coordination with Policy 12. (Planning, MOHCD, OEWD, ARTS, DPW; Medium)
b. Increase staff allocation within MOHCD, OEWD, DPW, ARTS, and Planning to create a more robust, sustained, and effective Cultural Districts program, provide more direct support for the development and implementation of their respective Cultural History Housing and Economic Sustainability Strategies (CHHESS). (MOHCD, Planning, OEWD, ARTS, DPW; Medium)
c. Study creation of a cultural resource mitigation fund that could be paid into by projects that impact cultural resources to support cultural resource protection and preservation throughout the city, prioritizing funding the development of cultural spaces as described in Policy 12, action (f). (MOHCD/Planning/OEWD; Medium)
d. Designate historically and culturally significant buildings, landscapes, and districts for preservation using the Citywide Cultural Resource Survey, Planning Code Articles 10 and 11, and state and national historic resource registries to ensure appropriate treatment of historic properties that are important to the community and unlock historic preservation incentives for more potential housing development sites. (Planning; Short)
e. Promote the use of the Retained Elements Special Topic Design Guidelines to development applicants to address sites where conserving parts of buildings sustains cultural identity and proposed housing serves the community. (Planning; Short)
f. Establish priority building permit and entitlement Planning Department review processes for multi-family residential development projects that rehabilitate or adaptively reuse existing buildings to support sustainable building practices, per Policy 34, while preserving cultural resources. (Planning; Short)
g. Develop objective design standards for the treatment of historic buildings and districts to provide consistent and efficient regulatory review that facilitates housing development approvals and protects the City's cultural and architectural heritages. (Planning; Short)
h. Promote historic preservation and cultural heritage incentives, such as tax credit programs and the State Historical Building Code, for use in residential rehabilitation projects through general outreach, interagency collaboration with MOHCD and OEWD, building trades collaboration, educational materials, community capacity building efforts, and through the regulatory

review process. (Planning, MOHCD, OEWD; Medium)

i. Revise Urban Design Guidelines to provide guidance on including signage, lighting, public art, historical interpretation and educational opportunities in housing development projects in a manner that reflects neighborhood history and culture, prioritizing the acknowledgement and representation of American Indian history and culture, in coordination with State requirements. (Planning, ART; Short)

j. Complete the Citywide Cultural Resources Survey, including the citywide historic context statement, with ongoing community engagement to identify important individual historic or cultural resources and districts. (Planning; Medium)

k. Complete the Heritage Conservation Element of the General Plan in order to bring clarity and accountability to the City's role in sustaining both the tangible and intangible aspects of San Francisco's cultural heritage. (Planning; Ongoing)

Policy 12: Invest in cultural anchors and expand access to land and spaces that hold cultural importance for American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions in the past including redlining, Redevelopment and Urban Renewal, the Indian Relocation Act or WWII Japanese incarceration as a means of redressing histories of dispossession, social disruption, and physical displacement based on a reparations framework.

a. In recognition of the removal of American Indians from their ancestral lands, identify opportunities to restore access to land for traditional cultural uses and to invest in spaces for the American Indian community to participate in traditional cultural practices and convene community gatherings. (MOHCD, Mayor/Board, RED; Short)

b. In recognition of the disproportionate loss of Black residents from San Francisco in recent decades resulting from a culmination of discriminatory government actions, identify opportunities to donate or dedicate land for use by Black-led, community-serving organizations. (MOHCD, Mayor/Board, RED; Short)

c. Strengthen interagency coordination to ensure that Cultural District strategies related to the creation or improvement of cultural anchors and spaces are integrated into planning, funding, and construction and/or rehabilitation of public projects (e.g., parks and open spaces, street improvements, libraries, and transit facilities). (Planning, MOHCD, OEWD; Short)

d. Fund the development and implementation of community-developed strategies in Cultural Districts to retain and grow culturally associated businesses and services that attract residents back to the area. (MOHCD, OEWD, OSB, Planning; Short)

e. Recognize spaces of cultural importance identified by American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions in community planning and regulatory review for development projects, consult them in decisions affecting those spaces, and direct resources towards their preservation and management. (Planning, OEWD, OSB; Short)

f. Fund the development of cultural spaces that serve communities harmed as described under this policy, using potential new funding sources such as the mitigation fund referenced under Policy 37, action (c) or community facilities fees. (MOHCD, Planning, OEWD; Medium)

g. Explore utilizing the Legacy Business Registry program to direct resources to businesses and not-for-profit organizations associated with American Indian, Black, Japanese, Filipino, and other communities directly harmed by discriminatory government actions. (OSB, OEWD; Short)

Policy 32: Facilitate neighborhoods where proximity to daily needs and high-quality community services and amenities promotes social connections, supports caregivers, reduces the need for private auto travel, and advances healthy activities.

a. Develop or adopt certification programs for community-serving businesses, such as grocery stores, childcare centers, healthcare clinics, and laundromats. Eliminate conditional use authorizations or reduce entitlement requirements related to lot size or commercial uses for new housing developments that include businesses that meet such requirements, allow them to participate in a Community Benefit Use program as described in Policy 32, action (d), or provide rental subsidies to them. (Planning, OEWD; Medium)
b. In Cultural Districts, reduce conditional use authorizations or other entitlement barriers for mixed-use buildings that can commit via deed restriction or other legal agreement to the inclusion of businesses, institutions, or services that support Cultural District needs and identity for a minimum of ten years. (Planning; Short)
c. Incentivize new housing to commit via deed restrictions or other legal agreement to below market rate commercial leases for community-based organizations serving the neighborhood community for a minimum of ten years by providing fee waivers, especially in Cultural Districts. (Planning; Medium)
d. Study the creation of a Community Benefit Use program, referenced in Policy 25, action (b) and Policy 32, action (i), that allows new housing developments to have a highly flexible ground floor use entitlement and tenants to be eligible for rent subsidy in exchange for community participation in tenant selection or for businesses that obtain certifications as described in Policy 32, action (a). (Planning; Short)
e. Strengthen interagency coordination, review, and compliance processes to ensure that walking and biking infrastructure and safety improvements are integrated into planning, funding, and construction and/or rehabilitation of public projects (e.g., parks and open spaces, libraries, and transit facilities) in addition to private development projects. (Planning, MTA, DPW; Short)
f. Organize housing and neighborhood business and service areas to prioritize proximity in neighborhood planning or development agreement projects that propose land use changes. (Planning; Medium)
g. Create and a long-range community facilities plan, and update every 5-10 years, for public facilities including parks, recreation centers, schools, libraries, to accommodate a thirty-year projected population growth, informed by equity metrics in a manner that secures equitable access in Priority Equity Geographies, Environmental Justice Communities, and Well-resourced Neighborhoods that are targeted for increased housing capacity, building on processes such as the Community Facilities Framework, and in collaboration with Interagency Plan Implementation Committee. (Planning, SFRPD, LIB, SFUSD; Medium)

h. Develop a comprehensive and regularly updated map of daily needs, amenities, and community facilities, to inform the work of the interagency coordination under action (e) as well as community-based organizations in planning for services, resources, open space, and businesses to be near each other and supportive to communities. (Planning, MTA, DPW, OEWD, DYCF, HSA; Medium)

i. Expand and allow community serving uses, such as retail, restaurants, and personal services within areas that are primarily residential especially on corner parcels, especially uses under the Community Benefit Use program defined under Policy 32 action (d). (Planning; Short)

j. Change regulations and definitions in current Planning code to improve flexibility on allowing home-based businesses and work from home in residential districts, for example, create an accessory entrepreneurial use that allows up to two employees. (Planning; Short)

k. Continue to adhere to guidelines in the Better Streets Plan when new housing creates improvements to sidewalks, streets, and other public spaces. (Planning; ongoing)

l. Prioritize uses in the ground floor of buildings that support housing, neighborhood activity and identity, especially in Cultural Districts, over inclusion of utility infrastructure, such as transformer vaults. (Planning, DPW; Short)

Appendix A: Glossary

Term	Definition	Link
Accessory Dwelling Units (ADUs)	Housing units added to existing or proposed residential buildings. ADUs are also often called in-law units, granny flats, secondary units, or basement or garage apartments.	http://projects.sfplanning.org/community-stabilization/accessory-dwelling-units.htm
Administrative (or "ministerial") approval	A governmental decision involving little or no personal judgment by the public official; it involves only the use of fixed standards or objective measurements, and the public official cannot use personal, subjective judgment in deciding whether or how the project should be carried out.	
Affirmatively Further Fair Housing (AFFH)	Enacted by AB 686 in 2018, this California law strengthens existing fair housing requirements and protections. AFFH contains requirements state and local governments must follow to ensure inclusive communities, including new requirements for municipal housing element updates.	https://www.hcd.ca.gov/community-development/affh/index.shtml; https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB686
All-Home Plan	All Home Plan recommends a proportion of 1-2-4 where for each four units of permanently supportive housing, two shelter beds and interim-housing options are added, along with homelessness prevention services for one individual.	210413_Regional_Action_Plan_Final.pdf (allhomeca.org)
At-risk of becoming unhoused	People with prior experience of homelessness, with involvement with the criminal justice, system, extremely-low and very-low income American Indian, Black, and Latinos/es/x, domestic violence victims, those at imminent risk of losing housing (for example with an eviction notice, or subject to landlord harassment).	
Cost burdened	Households that pay more than 30 percent of their income for housing.	
Cross-laminated timber	An engineered wood building material that can be used in walls, roofs or ceilings, may be eco-friendly, and could lower construction cost through decreased lead times.	
Cultural anchors	Businesses, community and cultural centers, and other spaces of cultural importance for communities.	
Cultural Districts	A geographic area or location within San Francisco that embodies a unique cultural heritage. Through a formalized, collaborative partnership between the City and communities, the mandate requires that the City coordinate resources to assist in stabilizing vulnerable communities facing, or at risk of, displacement or gentrification.	http://projects.sfplanning.org/community-stabilization/cultural-districts-initiative.htm
Discriminatory programs	Discriminatory programs by government action affecting housing, including government sanctioned programs, include but are not limited to urban renewal, redlining, segregated public housing, racial covenants, and exclusionary zoning regulations, such as single-family zoning.	
Ellis Act Evicitons	Evictions for which landlords have the right to evict tenants to remove all the units in the building from the rental market for at least 10 years. Units that have been recovered due to an Ellis Act eviction have restrictions on its future use, including conversions into condos and rentals.	https://projects.sfplanning.org/community-stabilization/rent-stabilization-eviction-protection.htm#:~:text=%28OMI%29.-,Ellis%20Act,evictions,-landlords
Environmental Justice Communities Map	The draft Environmental Justice Communities Map (EJ Communities Map) describes areas of San Francisco that have higher pollution and are predominately low-income. This map is based on CalEnviroScreen, a tool created by CalEPA & OEHHA that maps California communities that are most affected by pollution and other health risks. This draft EJ Communities Map includes additional local data on pollution and demographics. The draft map received public feedback	

	for refinement, through a community engagement process, and is expected to be finalized in Fall 2022, as part of the Environmental Justice Framework. Environmental Justice Communities (EJ Communities) are defined as the census tracts with the top 30% of cumulative environmental and socioeconomic vulnerability across the city.	
Exclusionary zoning practices	Land use regulations that through their design and effect perpetuate racial and social exclusion. Early zoning regulations including single-family zoning often institutionalized racially exclusive practices for real estate profits.	https://belonging.berkeley.edu/rootsraceplace#:~:text=Explicitly%20Racial,Exclusionary%20Zoning,-Many
Five-Minute Network (MUNI)	A conceptual network of high-frequency transit lines, where a substantial investment in on-street improvements would markedly increase the routes' speed and reliability. These improvements include bus-only lanes, traffic signal adjustments, and queue jumps, and can be installed relatively quickly. Lines on the five-minute network include routes in the Rapid Network.	https://connectsf.org/wp-content/uploads/ConnectSF_Transit_Strategy_FINAL-20211209-1.pdf (pg. 24)
Group housing, co-housing, or co-living	Co-housing, group housing, or co-living rooms are a type of housing that may have limited cooking facilities and do not contain a full kitchen in each room. Co-housing may include (but is not limited to) communes, fraternities and sororities, or Residential Hotels.	
High opportunity areas	Areas in every region of the state whose characteristics have been shown by research to support positive economic, educational, and health outcomes for low-income families—particularly long-term outcomes for children. SF Planning used this same index to identify "Well-resourced neighborhoods."	https://www.treasurer.ca.gov/ctcac/opportunity.asp
Housing accelerator fund	This fund offers affordable housing developers lending opportunities to bridge permanent financing programs offered by MOHCD for production and preservation of affordable housing. The speed of execution, flexible terms, and ability to coordinate with public funders helps borrowers acquire sites quickly. It also allowed investors to provide grants, equity-like investments, program-related investments (PRIs), and secured and unsecured debt for funding affordable housing.	https://www.sfhaf.org/
Housing Ladder strategy	A rehousing approach that offers opportunities for residents of Permanent Supportive Housing (PSH) to move from intensive supportive housing to more independent living, thus freeing up their PSH unit for others.	https://hsh.sfgov.org/services/the-homelessness-response-system/housing-ladder/
Inclusionary units	San Francisco requires new residential buildings of 10 or more units to include on-site affordable units (called inclusionary housing). Other options to meet this requirement include the payment of in-lieu fees (that fund 100 percent affordable housing), off-site affordable units, and land dedication.	http://projects.sfplanning.org/community-stabilization/inclusionary-housing.htm
Inventory of rental housing units	A registry of rent controlled units that could provide policy makers and advocacy organizations greater insight into occupancy status, rental rates, or eviction history.	http://projects.sfplanning.org/community-stabilization/rent-stabilization-eviction-protection.htm#C-3
Junior Accessory Dwelling Units (JADUs)	A type of ADU that is generally smaller than average ADUs and shares a restroom and/or kitchen with the main home.	https://projects.sfplanning.org/community-stabilization/accessory-dwelling-units.htm#:~:text=program%20for-,junior%20ADUs%2C,that%20home.,-However
Mid-rise multifamily buildings	Buildings of 5 to 8 stories	

Modular housing	A type of prefabricated housing, where the pieces of the building are usually built in one place using a factory assembly line, shipped to a construction site, and then assembled. Using this housing production method reduces construction costs through its building process and through decreased lead times.	
Navigation centers	Low-threshold, high-service temporary shelter programs for adults experiencing homelessness in San Francisco. Services include case management, housing navigation, DPH health services, HSA benefits enrollment, SSI advocacy, and harm reduction therapy.	https://hsh.sfgov.org/services/the-homelessness-response-system/shelter/navigation-centers/
No-fault evictions	Evictions that allow landlords to take possession of their property from the tenant and are not due to tenant actions. These evictions include Ellis Act, owner move-in, demolition, capital improvement, substantial rehabilitation, sale of unit converted to condo, and lead paint abatement.	https://projects.sfplanning.org/community-stabilization/rent-stabilization-eviction-protection.htm#:~:text=%27No-fault%27,evictions,-allow
Overcrowding	More than 1 person per room (including living rooms) for overcrowding, and more than 1.5 persons per room for severe overcrowding.	
Owner Move-In (OMI) Eviction	Evictions that allow owners to evict the tenant for the owner or their family to live in the unit as their principal place of residence. It is generally restricted to one OMI eviction per building.	https://projects.sfplanning.org/community-stabilization/rent-stabilization-eviction-protection.htm#:~:text=years.-,Owner,evictions,-allow
Payments of relocation assitance	Payments that landlords must provide tenants that are evicted through no-fault evictions. At the time of publication (Jan 2022) payments are set between $7,200 to $12,000 per tenant.	https://sfrb.org/sites/default/files/Document/Form/579%20Multilingual%20Relocation%20Payments%2037.9C%2020-21.pdf
Preference programs	Lottery preference programs provide priority for specific housing projects or affordable housing to households qualifying for each program. Having lottery preference improves a household's chances in a housing lottery for affordable housing and gives current and former San Francisco residents a chance to continue living in the City.	http://projects.sfplanning.org/community-stabilization/lottery-preference-programs.htm
Proposition 13	A 1978 ballot measure that reduced property tax rates on homes, businesses and farms, and capped assessed property taxes at 1% for assessed values with no more than 2% annual increase. Prop 13 significantly reduced the tax revenue of local jurisdictions to fund schools, services, and infrastructure.	
Racial and social equity assessment tool	An analysis approach to assessing the potential racial and social equity impacts of a proposed action. This tool is part of San Francisco Planning's Racial and Social Equity Action Plan, which aims to pro-actively advance equity in the Department's internal and external work such as community planning, community engagement, policy/laws development, hiring, and process improvements. At the time of publication (March 2022), this tool is still being developed.	https://sfplanning.org/project/racial-and-social-equity-action-plan#about
Racially restrictive covenants	Throughout the late-nineteenth and mid-twentieth centuries, white property owners and subdivision developers wrote clauses into their property deeds forbidding the resale and sometimes rental of such property to non-whites, particularly African Americans. This approach was endorsed by the federal government and the real estate industry at least through the 1940s, and in many cases was required by banks and other lending institutions.	https://belonging.berkeley.edu/rootsraceplace#:~:text=138-,Racially%20Restrictive,Association%20Bylaws,-Throughout

Rapid Network (MUNI)	The 13 rail and bus lines that account for the majority of Muni's ridership. Before the pandemic, Rapid Network lines were scheduled to operate every 10 minutes or better all day on weekdays. The lines in the Rapid network consist of J Church; KT: K Ingleside; T Third Street; M Ocean View; N Judah; 5 Fulton; 5R Fulton Rapid; 7 Haight/Noriega; 9 San Bruno; 9R San Bruno Rapid; 14 Mission; 14R Mission Rapid; 28 19th Avenue; 28R 19th Avenue Rapid; 38 Geary; and 38R Geary Rapid.	https://connectsf.org/wp-content/uploads/ConnectSF_Transit_Strategy_FINAL-20211209-1.pdf (pg. 24)
Rapid rehousing	A set of interventions that provides people with grants to pay for living expenses like first and last month's rent managed by the SF Department of Homelessness and Supportive Housing.	https://hsh.sfgov.org/services/the-homelessness-response-system/housing/
Redlining	An explicitly discriminatory federal policy that color-coded Black and nearby neighborhoods in red, deeming them "hazardous" to potential mortgage lenders. This systematically denied residents in these neighborhoods loans for homeownership or maintenance, leading to segregation and cycles of disinvestment in primarily Black and other communities of color.	https://www.urbandisplacement.org/about/what-are-gentrification-and-displacement/
Rent control	Rent Ordinance (1979) that restricts annual rent increases, ensures tenants can only be evicted for "just causes," and restricts evictions of tenants occupying a qualifying unit built prior to June 13, 1979. Once tenants vacate the rent-stabilized unit, landlords can raise its rent to market rate (otherwise known as vacancy decontrol).	http://projects.sfplanning.org/community-stabilization/rent-stabilization-eviction-protection.htm
Severely cost burdened	Households that pay more than 50 percent of their income for housing.	
Short-term rentals	A rental of all or a portion of a home for periods of less than 30 nights (for example, Airbnb rentals).	http://projects.sfplanning.org/community-stabilization/short-term-rental-regulations.htm
Single Room Occupancy	A form of housing that serves low-income residents. A typical room in an SRO residential hotel is a single eight (8) x ten (10) foot room with shared toilets, kitchens and showers on each floor.	http://projects.sfplanning.org/community-stabilization/sro-hotel-protections.htm
Small multifamily building	Buildings of 4 or less stories that include between 4 and 19 units	
Small Sites Acquisition	An acquisition and rehabilitation loan program for small multifamily rental buildings to protect and establish long-term affordable housing throughout San Francisco, launched in 2014.	http://projects.sfplanning.org/community-stabilization/small-sites-program.htm
Supportive housing	A type of housing managed by the SF Department of Homelessness and Supportive Housing that offers tenants long-term affordable housing with on-site services, such as case management, mental health services,etc.	https://hsh.sfgov.org/services/the-homelessness-response-system/housing/
Trauma-informed systems	The TIS Initiative at the San Francisco Department of Public Health (SFDPH) is an organizational change model to support organizations to respond to and reduce the impact of trauma.	https://www.sfdph.org/dph/comupg/oprograms/TIS/default.asp
Urban renewal	A federally funded program that acquired, razed, and redeveloped areas of cities condemned as "blighted." In practice, redevelopment areas often followed redlining, and property was often taken from people of color by eminent domain for minimal compensation creating massive displacement of those communities.	https://belonging.berkeley.edu/rootsraceplace#:~:text=The%20Beginnings,Suburban%20Revolt

APPENDIX C

Housing Element 2022 Update Modeling and Projections

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

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HOUSING ELEMENT 2022 UPDATE MODELING AND PROJECTIONS

Date: April 6, 2022
Case Number: 2019-016230ENV
Project Name: San Francisco Housing Element 2022 Update
Zoning: VAR
Block/Lot: VAR
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PURPOSE

The purpose of this memorandum is to describe the modeling processes and assumptions that the San Francisco Planning Department (planning department) used to inform the projections in the San Francisco Housing Element 2022 Update's environmental impact report (EIR). The overarching goal of the Housing Element 2022 Update is to produce an average of 5,000 housing units per year through 2050, or approximately 150,000 units. Policies and objectives in the Housing Element 2022 Update have been drafted to achieve this goal.

In addition to the Housing Element 2022 Update, the department analyzed four alternative development patterns as part of the EIR's alternative's analysis: Preservation Alternative, Eastside, Dispersed Growth, and Plan Bay Area 2050.

As described in the Housing Element 2022 Update EIR, growth in San Francisco will continue to occur regardless of whether the Housing Element 2022 Update is adopted. As such, the department also developed a 2035 midpoint condition (see '2035 Analysis' under 'UrbanSim Modeling' section) and a 2050 environmental baseline condition that assumes a continuation of the 2014 Housing Element plans and policies. The impacts of the Housing Element 2022 Update are compared against these baseline conditions. Table 1 summarizes the total housing units and jobs anticipated under 2020, 2035, and 2050 conditions in San Francisco from the evaluated development patterns, the 2035 midpoint condition, and the 2050 environmental baseline.

Descriptions of the development patterns are explained further under the 'Projected Development Patterns' or the 'Plan Bay Area 2050 Modeling' sections of this memo.

Table 1. Summary of Existing and Projected Housing Units and Jobs by Development Pattern and Year

	Total Housing Units	Total Jobs
2020 (existing)		
	407,000	771,000
2035		
Midpoint Condition (continuation of the 2014 Housing Element policies)	462,000	849,000
Housing Element 2022 Update (Proposed Action)	484,000	849,000
Eastside Development Pattern	484,000	849,000
Dispersed Growth Development Pattern	484,000	849,000
Plan Bay Area 2050	485,000	799,000
2050		
Environmental Baseline (continuation of the 2014 Housing Element policies)	509,000	882,000
Housing Element 2022 Update (Proposed Action)	559,000	879,000
Eastside Development Pattern	562,000	890,000
Dispersed Growth Development Pattern	562,000	887,000
Preservation Alternative Development Pattern	559,000	879,000
Plan Bay Area 2050	596,000	888,000

NOTES:

1. Numbers have been rounded.

2. 2020 conditions are based on the Planning Department's 2017 Land Use Allocation (LUA) projected to year 2020.

3. The Metropolitan Planning Commission provided data used for the Plan Bay Area 2050 analysis.

4. The department did not conduct a 2035 analysis for the Preservation Alternative.

BACKGROUND

Housing Element of the San Francisco General Plan

Every eight years, San Francisco is required to update the housing element of the general plan. The housing element is prepared in response to California's housing element law, Government Code section 65580 et seq. This law requires local jurisdictions to adequately plan for and address the housing needs of all

segments of their populations such that all communities contribute to attainment of the state's housing goals. San Francisco last updated the housing element in 2014.

To help inform the goals and policies to be included in the Housing Element 2022 Update, the planning department separately prepared the Housing Affordability Strategies report, which evaluated how to improve housing affordability in San Francisco over the next 30 years.[1] This report analyzed development feasibility,[2] city policies, and public investments needed to achieve housing target to construct 5,000 new housing units per year for 30 years.[3,4] The report examined three possible land use development patterns that could accomplish this goal:

- An Eastside Focus development pattern that expands housing capacity around Downtown and in light industrial areas;
- A Transit Corridor Focus development pattern that expands housing capacity along transit corridors on the west, south, and north sides of the city; and
- A Residential Growth development pattern that expands housing capacity by relaxing density restrictions in all residential districts but without changing height limits.

The planning department used the BlueSky Model[5] for the Housing Affordability Strategies report to estimate the likelihood of each of the three development patterns to produce 150,000 units by 2050; the model accomplishes this by analyzing the probability of development on individual parcels under specific zoning controls applied in each development pattern. To determine the probability of development, the model relies on several key explanatory variables, including home prices, historic resource status,[6] historic production trends, construction costs, land use and zoning regulations, and the "softness"[7] of individual sites. The calculation of residential capacity (i.e., the number of units theoretically possible under zoning controls) is based on height, lot size, average floor height, and average household size. As an input to the BlueSky model, the planning department defined preliminary zoning controls (i.e., height and density controls) consistent with the plans and policies anticipated under each of the development patterns studied as part of the Housing Affordability Strategies report.

For each development pattern (Eastside Focus, Transit Corridor Focus, and Residential Growth), the planning department modified the zoning controls (i.e., increased the allowable height or density) through

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[1] City and County of San Francisco, Planning Department, *San Francisco Housing Affordability Strategies*, March 2020, https://default.sfplanning.org/publications_reports/Housing_Affordability_Strategies_Report.pdf. Accessed January 4, 2022.

[2] City and County of San Francisco, Planning Department, *San Francisco Housing Affordability Strategies: Housing Development Feasibility and Development*, March 2020, Housing Development Feasibility and Costs (sfplanning.org), accessed March 15, 2022.

[3] Mayor Edwin Lee's Executive Directive 17-02 (September 27, 2017) set a goal of achieving 5,000 units per year as a target for the city to achieve. Source: https://www.docdroid.net/9Y2oYZl/17-02-housing-pdf. Accessed March 11, 2022.

[4] Mayor London Breed's Executive Directive 18-02 (August 30, 2018) continued the goal of achieving 5,000 units per year as a target for the city. Source: https://sfplanning.org/sites/default/files/resources/2018-08/ADU_ExecutiveDirective18_01_FINAL.pdf. Accessed March 11, 2022.

[5] The BlueSky Model is a regression analysis used to estimate the likelihood of development (unit production) based on variables such as construction cost, land use and zoning, and the development potential of individual parcels. Source: https://www.blueskyconsultinggroup.com/. Accessed March 15, 2022.

[6] Defined as whether the building is identified as a Category A resource according to the San Francisco Property Information Map. Refer to San Francisco Preservation Bulletin Number 16: https://sfplanning.org/sites/default/files/documents/preserv/bulletins/HistPres_Bulletin_16.PDF

[7] Softness calculation is based on the ratio of the building size (in square feet and units) possible under the existing zoning controls over maximum building size possible under the proposed zoning controls.

an iterative process until the BlueSky model projected that the tested zoning controls would produce 150,000 units by 2050.

In addition to the three land use development patterns tested in the Housing Affordability Strategies report, the planning department also modeled a development pattern that assumes a continuation of the existing 2014 Housing Element policies over the next 30 years (i.e., the 2050 environmental baseline used for project's environmental review). For the 2050 environmental baseline, the planning department did not modify the existing zoning controls; in other words, the 2050 environmental baseline relies on zoning controls[8] in effect as of 2020. The BlueSky model predicted that under the 2050 environmental baseline, San Francisco would be expected to produce[9] an additional 102,000 housing units, falling short of the Housing Element 2022 Update's goal of producing 150,000 units by 2050. The BlueSky model predicted that, under the changes to zoning controls identified for each of the three development patterns evaluated in the housing affordability strategies report, San Francisco could meet the goal of producing 150,000 housing units in San Francisco by 2050.

The development patterns evaluated in the Housing Affordability Strategies Report informed the Housing Element 2022 Update and the alternatives considered in the Housing Element 2022 Update's environmental impact report.

Regional Planning Process

The Association of Bay Area Government (ABAG) and the Metropolitan Transportation Commission conduct regional planning for the nine-county San Francisco Bay Area. These agencies are responsible for developing Plan Bay Area, the region's integrated transportation and land-use/housing strategy; the plan combines three initiatives into a single integrated regional plan: Sustainable Communities Strategy, Regional Transportation Plan, and Regional Housing Need Allocation. The ABAG Executive Board and the Metropolitan Transportation Commission jointly approved Plan Bay Area 2050 on October 21, 2021.

Both the local and regional planning processes recognize that San Francisco is anticipated to grow substantially over the next 30 years. Details regarding the Plan Bay Area 2050 modeling projections are included below under 'Plan Bay Area 2050 Modeling.'

FRAMEWORK FOR PROJECTING THE HOUSING ELEMENT DEVELOPMENT PATTERNS

The planning department built on the work conducted under the Housing Affordability Strategies report to inform the Housing Element 2022 Update. The Housing Element 2022 Update was also informed by extensive public outreach and public review and comment on three drafts of policies, goals, and actions between April 2020 to April 2022. These efforts resulted in goals, plans, policies, and actions that would increase housing production and shift a greater share of anticipated growth from the eastside of the city to well-resourced neighborhoods[10] along transit corridors and in low-density areas; these areas are primarily

[8] The Market and Octavia Plan Amendments are the last amendments considered as part of the 2020 zoning controls.

[9] The likelihood of production depends on many factors that may include, but would not be limited to the cost of land, labor, and zoning controls. While the likelihood of production under existing zoning controls is an additional 102,000 units by 2050, San Francisco's existing zoning controls have sufficient capacity to accommodate 150,000 new units by 2050 (i.e., if all parcels were built out to their maximum height and density controls).

[10] Well-resourced areas or neighborhoods are identified by the State of California as areas that provide strong economic, health, and educational

located on the west and north parts of the city. The Housing Element 2022 Update does not recommend specific changes to existing land use controls (e.g., zoning) and does not approve any physical development (e.g., construction of housing or infrastructure); however, the planning department assumes that future actions, such as rezoning actions, would be enacted to implement the Housing Element 2022 Update.

The planning department relied on the work completed for the Housing Affordability Strategies report to inform zoning control changes that would be necessary to implement the Housing Element 2022 Update's goals, plans, policies, and actions. The planning department projected how these zoning changes could affect future housing development patterns over a 30-year period using UrbanSim, a computer program (described in further detail below under 'UrbanSim Modeling'). The planning department also used UrbanSim to model a development pattern under a continuation of the existing 2014 housing element's plans and policies (i.e., the 2050 environmental baseline) and two alternative development patterns: an Eastside development pattern and a Dispersed Growth development pattern. These development patterns informed the project's environmental analysis.

The department also developed a Preservation Alternative as part of the alternatives analysis for the project's environmental impact report. The Preservation Alternative is a refinement of the Housing Element 2022 Update's projected development pattern and aims to reduce impacts to built-environment historic resources. Given that the Preservation Alternative's land use pattern is a refinement of the Housing Element 2022 Update, the department did not complete an UrbanSim model run for this alternative. A description of the Preservation Alternative's development is described below under 'Projected Development Patterns.'

See Appendix A for a comparison of the total housing units by planning district for the modeled development patterns.

URBANSIM MODELING

UrbanSim is a computer model that simulates patterns of development and anticipated changes in population and employment levels based on changes to zoning and future targeted unit growth. The model uses variables such as past housing production trends, land use and zoning regulations, proximity of housing to retail, job, and transit access to job centers.[11] While the BlueSky model used in the Housing Affordability Strategies report is appropriate for a citywide scale, the UrbanSim model is more appropriate for modeling smaller geographies, such as transportation analysis zones.[12]

The department modeled various growth development patterns over the next 30 years using UrbanSim.[13] Except for the 2050 environmental baseline, the Housing Affordability Strategies report informed all the modeled development patterns. The modeled development patterns consisted of:

outcomes for its residents. Source: https://www.sfhousingelement.org/well-resourced-neighborhoods. Accessed March 28, 2022.

[11] For additional information about the UrbanSim simulation, refer to https://urbansim.com/urbansim. Accessed March 15, 2022.

[12] Planners use transportation analysis zones as part of transportation planning models for transportation analyses and other planning purposes. The zones vary in size from single city blocks in the downtown core, multiple blocks in outer neighborhoods, to even larger zones in historically industrial areas such as the Hunters Point Shipyard area.

[13] Given that the Preservation Alternative's land use pattern is a refinement of the Housing Element 2022 Update, the department did not complete an UrbanSim run for this alternative.

- Continuation of the 2014 Housing Element (i.e., 2050 environmental baseline)
- Housing Element 2022 Update (Proposed Action)
- Eastside[14]
- Dispersed Growth[15]

The planning department determined two main factors as inputs to the UrbanSim model: how many units to allocate over a specific time period and changes to San Francisco zoning controls as of 2020. As a result of these inputs, each UrbanSim model run estimates future housing and employment patterns in San Francisco. The output of each model run is the total number of housing units and jobs[16] for each of San Francisco's 981 transportation analysis zones.

Known Unit Assignment (Force Allocation)

As part of the modeling process, the department assigned units to specific transportation analysis zones to reflect known information: the number of housing units in 2020 (407,000 units) and the number of housing units estimated in pipeline and other reasonably foreseeable projects (77,100 units). These assignments result in a total of 484,100 housing units and were consistently assigned across all future year model runs. These assignments are described below:

2020 Units: Given various provisions in the planning code and state law protecting existing housing stock, the department assumed no net housing units would be lost from 2020 conditions. Therefore, the department refined the Urban Sim model by assigning the city's existing 407,000 units to accurately reflect the location and number of housing units that exist in transportation analysis zones.

Pipeline and Reasonably Foreseeable projects: Pipeline projects are reasonably foreseeable projects at various stages of development within the planning department but are not yet constructed or occupied, including projects that have filed development applications, or secured entitlements or building permits. At the time modeling for the Housing Element 2022 Update began in late 2019, the planning department estimated there were approximately 70,800 units in the department's pipeline. Seven major projects (i.e., Hunters Point Shipyard and Candlestick Point, Treasure Island and Yerba Buena Island Development Project, Park Merced, Potrero Power Station, India Basin, Pier 70, and Balboa Reservoir Development) compose approximately 38 percent of the housing units in the city's pipeline. In addition to the city's pipeline projects, the department identified the following additional reasonably foreseeable housing projects that are not included in the pipeline,[17] but were in the early stages of planning review: Stonestown,

[14] Referred to as the Eastside Focus in the Housing Affordability Strategies report.

[15] Referred to as the Residential Growth Development in the Housing Affordability Strategies report.

[16] UrbanSim further classifies jobs into the following six categories: Cultural, Institution, and Education (CIE), office (MIPS), retail (RET), visitor (VIS), medical (MED), and production, distribution and repair (PDR).

[17] At the time modeling for the Housing Element 2022 Update commenced, the department was aware of several large-scale residential (500 units or more) projects anticipated to begin environmental review. The department included these projects in the Housing Element 2022 Update modeling.

Freedom West, Treasure Island Amendments, and Municipal Transportation Agency (MTA) Presidio Yard. Together, these projects would contribute approximately 6,300 units to San Francisco's housing stock. Combined with the 70,800 units noted above, these 6,300 units brought the total number of housing pipeline and foreseeable units to 77,100.

As part of the UrbanSim modeling refinements, the department assigned, or force allocated, these approximately 77,100 housing units to the transportation analysis zones where the projects are anticipated. For example, the Balboa Reservoir Project, located off Ocean Avenue and Frida Kahlo Way, proposes to construct 1,100 units. The department assigned these 1,100 units attributed to the Balboa Reservoir Project to the transportation analysis zone located off Ocean Avenue and Frida Kahlo Way as part of the UrbanSim model runs.

Jobs

Policies in the Housing Element 2022 Update would not directly change the pattern of jobs anticipated in San Francisco over the next 30 years. The Housing Element 2022 Update focuses on housing production and distribution; it does not include policies or actions that would substantially change the number or location of jobs in the city relative to the 2050 environmental baseline. While there are differences between the number and distribution of total jobs across the various land use patterns, the overall number and distribution of total jobs across planning districts would be similar.[18] See Appendix B for a comparison of the total jobs by planning district for the modeled development patterns.

The department used the Land Use Allocation[19] projected to 2050 to inform the job distribution for all modeled land use patterns (e.g., 2050 environmental baseline, Housing Element 2022 Update[20], Eastside Land Use Pattern, and Dispersed Growth). In addition to the Land Use Allocation, the department included specific job information provided by the Port of San Francisco based on information from the Waterfront Plan Update Project. The port estimated that approximately 33,100 jobs would exist in port transportation analysis zones[21] in 2050 without an update to the Waterfront Plan.[22]

Finally, while the overall number and distribution of total jobs across each planning district would be substantially similar across all land use patterns, the department refined the number and location of retail jobs to reflect the need for increased services due to increased residential growth in the northern and western areas of San Francisco under the Housing Element 2022 Update and Dispersed Growth Land Use Patterns. Further details are discussed below in under 'Projected Development Patterns.'

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[18] Total jobs by planning district vary by development pattern but are all within half a percent of one another.

[19] The planning department's Land Use Allocation is the long-range growth forecast (usually 25-30 years out) and is typically consistent with the most recently adopted regional plan; at the time modeling for the Housing Element 2022 Update began, the adopted regional plan for San Francisco was Plan Bay Area 2040. Land Use Allocation is the process by which the planning department distributes citywide housing and job growth to San Francisco's 981 transportation analysis zones.

[20] The Preservation Alternative is a refinement of the Housing Element 2022 Update; the jobs are assumed to be the same between these two land use patterns.

[21] The transportation analysis zones with port-specific information are 444, 492, 493, 521, 559, 633, 649, 650, 655, 723, 725, 808, 828, 830, 835, 851, 854, 855, 882, 926, and 958.

[22] The department included reasonably foreseeable housing projects as part of the UrbanSim modeling as these housing projects could occur under the existing 2014 Housing Element to fulfill San Francisco's housing production goals. In contrast, the department did include other reasonably foreseeable projects that do not focus on housing production as part of the UrbanSim model (e.g., the Waterfront Plan Update Project, which is focused on jobs).

2035 Analysis

The environmental review for the Housing Element 2022 Update analyzes a 2035 midpoint for transportation (transit delay and vehicle miles traveled), air quality, and noise impacts. The 2035 midpoint analysis is only conducted for these topics because there is a potential for impacts to be worse in 2035 compared to 2050 due to planned transportation improvements and increasingly stringent emissions standards that could occur after 2035. Like the transit delay and vehicle miles traveled analysis in transportation, air quality and noise impacts are also substantially derived from the vehicle data.

The UrbanSim model produces outputs at 5 year increments and accordingly, the department relied on the UrbanSim's 2035 model output for the 2035 midpoint condition (a continuation of the 2014 Housing Element), the 2035 Housing Element 2022 Update, the 2035 Eastside Land Use Pattern, and the 2035 Dispersed Growth Land Use Pattern.[23]

PROJECTED DEVELOPMENT PATTERNS

To assess environmental impacts, the department used UrbanSim to model four development patterns: 2050 Environmental Baseline, the 2050 Housing Element 2022 Update, 2050 Eastside, and 2050 Dispersed Growth. In addition, the department developed a 2050 Preservation Alternative to reduce future impacts to built-environment historic resources; the department did not conduct UrbanSim model for the Preservation Alternative. The following describes the modeling details for each development pattern.

2050 Environmental Baseline

For the 2050 environmental baseline, the department assumed no modifications to existing zoning controls, and relied on existing (2020) zoning.[24] As noted above in Table 1, the planning department estimated there would be a total of 509,000 units in San Francisco under the 2050 environmental baseline conditions, or approximately 102,000 units above 2020 conditions. In addition to the 484,100 units (407,000 units in the year 2020 combined with 77,100 units from the pipeline and other reasonably foreseeable projects) assigned consistently under all modeled development patterns, the department assigned an additional 6,000 units[25] to transportation analysis zones, proportionally based on the number of parcels that could reasonably accommodate an accessory dwelling unit within those zones. The department assumed an additional 6,000 accessory dwelling units under the 2050 environmental baseline based on 2014 Housing Element policies identifying accessory dwelling units as a key component to increasing housing stock, as well as past accessory dwelling unit production trends. This brought the total to 490,100 housing units.

Of the 509,000 units projected to occur in San Francisco under the 2050 environmental baseline, the UrbanSim model allocated the remaining 18,900 units (509,000-490,100 =18,900 units) based on the

[23] The department did not conduct a 2035 analysis for the Preservation Alternative as it is a refinement of the Housing Element 2022 Update that aims to reduce impacts to built-environment historic resources.

[24] The Market and Octavia Plan Amendments are the last amendments considered as part of the 2020 zoning controls.

[25] This number was derived using the Accessory Dwelling Unit (ADU) legislation analysis Geographic Information System (GIS) layer called "CWADU_08_Condo_filter". This GIS layer was used to identify parcels that are most likely to have ADUs, and then calculated how many of those ADU-suitable parcels were in each Transportation Analysis Zone (TAZ) and then proportionally distributed 6,000 ADUs across those TAZ.

variables previously discussed namely, past housing production trends, land use and zoning regulations, and proximity of housing to retail, jobs, and transit with access to job centers.

Table 2 summarizes the 2050 environmental baseline unit assignment and UrbanSim allocation.

Table 2. 2050 Environmental Baseline Assignment and UrbanSim Allocation

Unit Assignment	Units
2020 Conditions	407,000
Pipeline and Other Reasonably Foreseeable Projects	77,100
Accessory Dwelling Unit Assignment	6,000
UrbanSim Allocation	18,900
Total	509,000

2050 Housing Element 2022 Update

The Housing Element 2022 Update would shift an increased share of San Francisco's future housing growth to transit corridors and low-density residential districts within well-resourced areas[26], facilitating small multi-family buildings in these areas. In modeling the 2050 Housing Element 2022 Update, the planning department projected changes to zoning controls (e.g., height and density changes) in these areas. The planning department estimated there would be a total of 559,000 units in San Francisco in 2050 under the Housing Element 2022 Update. This would be approximately 150,000 units above 2020 conditions, or 50,000 more units above 2050 baseline conditions.

The department used the following methodology to identify areas of San Francisco that would receive an increased share of future housing growth:

- Defined a geography (well-resourced areas) based on areas determined to be "High Resource/Highest Resource" by the California Fair Housing Task Force.[27, 28]
- Removed Priority Equity Geographies that are identified as Areas of Vulnerability[29] by the San Francisco Department of Public Health (with the exception of one area located near Clement Street between 19th and 33rd Avenues in the Outer Richmond that overlapped with high opportunity areas).
- Removed public schools, parks, and other critical public infrastructure sites (e.g., Sunset and Merced Manor reservoirs) with low probability of redevelopment.

To identify neighborhood commercial districts in which to add height to existing controls, the planning department considered the Transit Corridor Focus and Residential Growth development patterns studied

[26] Well-resourced areas are neighborhoods identified by the State of California that provide strong economic, health, and educational outcomes for its residents. Source: https://www.sfhousingelement.org/well-resourced-neighborhoods. Accessed March 27, 2022.

[27] Ibid

[28] The well-resourced area boundary excluded a high opportunity area in Potrero Hill neighborhood due to its production, distribution, and repair sensitivity (i.e., at risk of displacement due to higher paying uses such as laboratory or office). This area is roughly located between 17th and 22nd streets, Interstate 80, and Interstate 280.

[29] Areas of Vulnerability are areas with higher density of vulnerable populations which may include, but are not limited to people of color, seniors youth, people with disabilities, linguistically isolated households, and people living in poverty or unemployed. Areas of Vulnerability. San Francisco Department of Public Health. https://data.sfgov.org/Geographic-Locations-and-Boundaries/Areas-of-Vulnerability-2016/kc4r-y88d. Accessed March 15, 2022.

in the Housing Affordability Strategies as well as ConnectSF transit concepts.[30] ConnectSF is a multi-agency collaborative process tasked with building an effective, equitable, and sustainable transportation system for San Francisco's future. In modeling 2050 conditions with the Housing Element 2022 Update, the planning department increased heights along neighborhood commercial district streets, adding the highest heights directly along neighborhood commercial streets, with some additional height on streets farther away from neighborhood commercial streets.

The planning department modified land use patterns consistent with the Housing Element 2022 Update's goals, plans, policies, and actions. Based on these patterns and goals, the planning department:

- Removed density limits in all Neighborhood Commercial districts.
- Removed density limits in Residential Districts within 800 feet of transit corridors including California Street, Union Street, Lombard Street, Geary Blvd, Judah Street, Noriega Street, Ocean Avenue, Taraval Street, Sloat Boulevard, 19th Avenue, Park Presidio Boulevard, West Portal Avenue, Junipero Serra Boulevard, Church Street, Divisadero Street, 17th and Market/Castro, and Van Ness Avenue.
- Increased density maximums in RH1, RH2, RH3, and RM1 districts to four units in areas outside of the area within the 800-foot transit corridor buffer.

The representative pattern of growth depicted in the department's projection of future housing units under the Housing Element 2022 Update takes into account the presence of individual built-environment historic resources and historic districts identified as of 2021 (including resources designated or found eligible for listing in local, state, and federal historic resource registers). Specifically, the projection assumes future housing construction would be less likely to occur on parcels that currently contain Category A resources (i.e., properties that are already known to qualify as historic resources), with the exception of several Category A resources located on larger parcels that could include 100 or more housing units, based on parcel existing conditions and height and density criteria. This assumption reflects that Category A resource status would act as a development constraint for future housing development construction. Additionally, the planning department did not increase height limits in historic districts identified in Planning Code article 10[31] and 11[32].

The methodology for predicting development under the Housing Element 2022 Update included the following refinements to the anticipated land use pattern:

Retail Jobs

The department increased the number of retail jobs from 2050 environmental baseline conditions by approximately 18-33% along the 19th Avenue, Geary, Judah, Lombard, Ocean Avenue, and Taraval corridors and proportionally reduced retail jobs for rest of city; the overall 2050 retail job total for the city did not change. The department made this refinement as it expects an increased demand in retail services from the increased residential growth under the Housing Element 2022 Update near these corridors, but

[30] ConnectSF. Source: https://connectsf.org/wp-content/uploads/ConnectSF_Transit_Strategy_FINAL-20211209-1.pdf. Accessed March 4, 2022.

[31] San Francisco Planning Department. Historic Landmarks Map. Source: https://sfplanning.org/resource/historic-landmarks-map. Accessed March 3, 2022

[32] San Francisco Planning Department. Downtown Conservation Districts. Source: https://sfplanning.s3.amazonaws.com/archives/documents/3888-Downtown%20Conservation%20Districts_October_2008.pdf. Accessed March 3, 2022.

otherwise does not anticipate a change in the total number of retail jobs in 2050; therefore, the department proportionally reduced jobs citywide.

Well-Resourced Areas Unit Assignment

The Housing Element 2022 Update guides development differently than what would be expected from the past trends that inform the UrbanSim model. Past market trends in San Francisco have predominately resulted in housing growth on the eastside of San Francisco due to previous area planning and zoning changes, and due to single-family zoning restrictions and other density controls in other parts of the city. The Housing Element 2022 Update encourages a different development pattern (e.g., more housing in the northern and western part of San Francisco) than the previous trends that inform the UrbanSim model. As a result, the department refined the methodology so that future housing projections better reflect the Housing Element 2022 update policies. This development pattern proposes mid-rise and small-scale, multi-unit buildings in areas that have not typically seen this type of housing; therefore, the department analyzed likelihood of development differently and assigned 64,500 units to sites within well-resourced areas based on the following methodology:

Parcels with projected heights of 85 feet or less

The department assigned units to parcels with proposed heights of 85 feet or less using the following criteria:

- Included only parcels within the well-resourced areas;
- Removed parcels with state or local landmarks or Category A resources unless net capacity would be above 100 units;
- Removed parcels with public infrastructure including parks, hospitals, government buildings, and public schools;
- Removed parcels that included two or more rent-controlled units, or, for larger parcels, four rent-controlled units;
- Removed parcels where the existing building envelope was more than 0.3 of the potential developable capacity;
- Applied a likelihood factor based on project type to represent the intangibles of site development, including factors such as owner choice, type of construction, existing uses.

Parcels with projected heights of 85 feet or more

The department allocated units to sites proposed with heights above 85 feet or with anticipated unit capacity above 100 units via a site-by-site analysis that considered site shape, existing units or historic resources, likelihood of lot consolidation, and nearby development patterns.

Steep Topography & Excess Pipeline Unit Reassignment

Transportation analysis zones in areas with extremely steep slopes (such as areas near Twin Peaks and Mount Davidson) are less likely to develop to the maximum allowable capacity, as topography constrains the number of housing units that is feasible to build. The department examined the total number of units

in these zones[33] and proportionally reduced the number of units that would otherwise be allocated to these zones under the Housing Element 2022 Update. This cap resulted in an excess of 3,800 units that required reassignment.

Review of the model also showed that there were a few large sites in the pipeline where the model assumed more units than currently proposed in long-term through entitled projects. For sites that are in the pipeline and are located within well-resourced areas, the department took the following approach:

- Pipeline projects that include 75 units or more were removed from the pool of sites that are available for additional units, because it is unlikely that larger development projects (75+ units) would be modified in the next 30 years based on the Housing Element 2022 Update. For example, the Balboa Reservoir site is currently projected to have 1,100 units based on its current approvals, and thus was removed.

- Pipeline sites with less than 75 units could potentially be developed or redeveloped based on the Housing Element 2022 Update. These sites were not removed and thus, could have more units assigned to them.

The removal of pipeline projects consisting of 75 units or more removed several sites eligible for unit assignment within the well-resourced areas; this resulted in approximately 1,500 units requiring re-assignment.

The department assigned these 5,300 units (3,800 units +1,500 units) to transportation analysis zones with projected height increases and transit proximity along Geary Boulevard, Judah Street, Taraval Street, Sunset Boulevard, and 19th Avenue, where housing units are more likely to be developed. The department assigned the 5,300 units to these specific corridors because the corridors are located in well-resourced areas, have existing low-density, have additional capacity for housing units under projected zoning controls, and are corridors with future planned transit improvements.

This process further refined the UrbanSim methodology to better reflect future projections based on the policies included in the housing element update.

These assignments total approximately 548,600 housing units (407,000 units under 2020 conditions +77,100 pipeline and reasonably foreseeable projects + 64,500 units assigned to well-resourced areas). The UrbanSim model then allocated the remaining 10,400 units (559,000 units-548,600 units=10,400 units) based on the variables previously discussed, namely land use and zoning regulations, proximity of housing to retail, jobs, and transit access to job centers.

Table 3 summarizes the Housing Element 2022 Update's unit assignment and UrbanSim allocation.

[33] Transportation analysis zones with reduced capacity included: 91, 118, 180, 405, 436, 437, 455, and 479.

Table 3. 2050 Housing Element 2022 Update Assignment and UrbanSim Allocation

Unit Assignment	Units
2020 conditions	407,000
Pipeline and Other Reasonably Foreseeable Projects	77,100
Well-Resourced Area Unit Assignment	64,500[1]
UrbanSim Allocation	10,400[1]
Total	559,000

NOTES:

1. This number includes accessory dwelling units.

2050 Preservation Alternative Land Use Pattern

The Preservation Alternative aims to reduce future action impacts to built-environment historic resources by revising some housing element update policies that could impact built-environment historic resources (specifically, those policies directing physical development). Potential revisions to housing element policies to preserve built-environment historic resources could include adding language to protect parcels with individual built-environment historic resources from redevelopment, promote the use of Secretary of the Interior Standards for Rehabilitation in redevelopment of parcels with historic resources, require development in historic districts to be compatible with historic districts, and develop objective historic resource design guidelines.

The 2050 Preservation Alternative Land Use Pattern refines housing growth projections within well-resourced areas by redistributing units to areas that are forecasted to have fewer built environment historic resources. This refinement is based on the 2050 Historic Resource Forecast Percentage in Section 4.02 Cultural Resources of the Housing Element 2022 Update EIR. Like the Housing Element 2022 Update, the planning department estimated there would be a total of 559,000 units in San Francisco under the 2050 Preservation Alternative. This would be approximately 150,000 units above 2020 conditions, or 50,000 more units above 2050 baseline conditions.

To develop the Preservation Alternative Land Use Pattern, the department first analyzed the likelihood of neighborhoods to contain built-environment historic resources over the next 30 years. The department used this historic resource forecasting to determine the amount of built-environment historic resources anticipated in various neighborhoods in the year 2050. Understanding the percentage of built-environment historic resources anticipated in each neighborhood guided the redistribution of units within well-resourced areas under the Preservation Alternative Land Use Pattern.

Once the department understood the percentage of built-environment historic resources anticipated in each neighborhood by 2050, the department developed a methodology to redistribute projected housing growth. In keeping with the overall goals of the Housing Element 2022 Update, the department redistributed projected housing growth within well-resourced areas, while also reducing impacts to built-environment historic resources. The redistribution methodology was based on the 2050 Historic Resource Forecast Percentage and a neighborhood historic resource pattern analysis[34]. The department applied an

[34] For more information about the 2050 Historic Resource Forecast Percentage and neighborhood resource pattern analysis, refer to section 4.02 Cultural Resources of the Housing Element 2022 Update EIR.

inverse percentage of the historic resource forecast percentage so that more units would be allocated to neighborhoods with fewer historic resources expected in the future. For example, the Marina and Western Addition planning districts have relatively higher concentrations of built-environment historic resources compared to other neighborhoods in the well-resources areas of the city (e.g., the Richmond and Inner Sunset planning districts), and therefore, less housing growth was distributed to the Marina and Western Addition under the Preservation Alternative Land Use Pattern than under the Housing Element 2022 Update.

For more information about the development of the Preservation Alternative, refer to Appendix C. Preservation Alternative Methodology.

2050 Eastside Land Use Pattern

The Eastside land use pattern is a continuation of the existing development pattern in San Francisco (i.e., focusing growth predominantly on the eastside of San Francisco) and would increase the number of units anticipated by 2050. The planning department estimated there would be a total of 562,000 units in San Francisco under the 2050 Eastside land use pattern; this is approximately 150,000 units above 2020 conditions or 50,000 units above the 2050 environmental baseline conditions.

Under the Eastside land use pattern, the department projected future housing growth in taller, multi-family buildings near Downtown and in light industrial areas, intensifying recent growth patterns in the city's eastern neighborhoods. In contrast to the Housing Element 2022 Update land use pattern, the department did not modify the assumptions in the methodology for the Eastside land use pattern, given that the eastside focus of this land use pattern is consistent with past market trends in San Francisco.

The department first assigned the 407,000 housing units to their respective locations under 2020 conditions and then assigned the 77,100 units anticipated under pipeline and reasonably foreseeable projects. With those assignments, 74,700 units remained (562,000 units[35] – 407,000 units – 77,100 units = 74,700 units). The UrbanSim model allocated the remaining 74,700 units based on the variables previously discussed, namely land use and zoning regulations, proximity of housing to retail, job, and transit access to job centers. No other refinements to the methodology were made.

Table 4 summarizes the Eastside land use pattern's unit assignment and UrbanSim allocation.

[35] The modeling of the Eastside land use pattern double counted existing units in approximately 41 TAZs resulting in an error of approximately 3,200 excess units, primarily located in northwest quadrant of San Francisco. Based on the small number of units that were double-counted (3,200 of 562,000, or .01%), this modeling error does not affect any of the conclusions presented in the EIR.

Table 4. 2050 Eastside Assignment and UrbanSim Allocation

Unit Assignment	Units
2020 Conditions	407,000
Pipeline and Other Reasonably Foreseeable Projects	77,100
UrbanSim Allocation	74,700[1]
Total	562,000[2]

NOTES:

1. This number includes accessory dwelling units.

2. The modeling of the Eastside land use pattern double counted existing units in approximately 41 TAZs resulting in an error of approximately 3,200 excess units, primarily located in northwest quadrant of San Francisco. Based on the small number of units that were double-counted (3,200 of 562,000, or .01%), this modeling error does not affect any of the conclusions presented in the EIR.

2050 Dispersed Growth Land Use Pattern

The Dispersed Growth land use pattern would allow the development of multi-family homes on the majority of the city's residential land currently zoned to allow only one single-family home (RH-1) or two-family homes (RH-2) per lot. Under this concept, there would be no change to limits on building height, but density controls would be removed. The planning department estimated there would be a total of 562,000 units in San Francisco under the 2050 Dispersed Growth land use pattern; this is approximately 150,000 units above 2020 conditions, or 50,000 units above 2050 environmental baseline conditions.

Under the Dispersed Growth Land Use Pattern, the department allocated more units to San Francisco's residential neighborhoods and neighborhood commercial corridors by changing density controls, but did not change existing zoned height controls.

The department further refined the inputs to the UrbanSim model for the Dispersed Growth land use pattern. Like the Housing Element 2022 Update, the Dispersed Growth development pattern is different than the trends informing the UrbanSim model as the Dispersed Growth development pattern directs growth to low-density neighborhoods, focusing on small, multi-family buildings. Past market trends in San Francisco have predominately resulted in housing growth on the eastside of San Francisco due to previous area planning and zoning changes, and due to single-family zoning restrictions and other density controls in other parts of the city. As a result, the department refined the methodology so that the modeled housing projections accurately reflect the Dispersed Growth's land use policies. The methodology for the Dispersed Growth land use pattern included the following refinements:

Retail Jobs

Similar to the refinement made for the Housing Element 2022 Update, the planning department increased the number of retail jobs by approximately 18-33% along 19th Avenue, Geary, Judah, Lombard, Ocean Avenue, and Taraval corridors and proportionally reduced retail jobs for rest of city. The department made this refinement as it expects an increased demand in retail services from the increased residential growth under the Dispersed Growth land use pattern near these corridors, and does not anticipate a change to the total jobs anticipated by 2050; therefore, the department proportionally reduced jobs citywide.

Topography

Similar to the refinement made for the Housing Element 2022 Update, transportation analysis zones with extremely steep slopes (such as those near Twin Peaks and Mount Davidson)[36] are less likely to develop to full capacity. Accordingly, the department examined the total number of units in these zones and proportionally reduced the number by estimated site limitations of units that would be allocated to these zones under the Dispersed Growth Land Use Pattern. Additionally, the department reduced capacity for transportation analysis zones that are close to transit, but are on extremely steep slopes.

Transit Travel Times

The planning department reduced transit travel time to jobs by 30 percent along corridors identified for transit concepts in ConnectSF. The department made this refinement because the department anticipates a larger share of residential growth as well as small-scale retail job growth to occur in areas near these transit corridors; therefore, there would be fewer trips to other job locations.

Residential Neighborhood Unit Assignment

The department assigned 39,600 units to primarily residential neighborhoods to simulate the development pattern proposed under the Dispersed Growth development pattern. Like the Housing Element 2022 Update, the Dispersed Growth's development pattern is different from past trends informing the UrbanSim model. The Dispersed Growth development pattern proposes small-scale, multi-unit buildings in areas that have not typically seen this type of housing due to single-family zoning restrictions and other density controls; therefore, the department assigned units to sites in primarily residential neighborhoods base on the following methodology:

- Selection of parcels that met the following criteria:
    - 12 percent "soft" or less, meaning that the existing number of units on the parcel is 12 percent or less of the total capacity under the proposed zoning controls
    - The site does not contain a known historic resource
    - Existing building is not subject to rent-control (based on the year the building was built and the type of structure)
    - Zoning height is below 66 feet
    - Zoning is either RH-1, RH-1(S), or RH-2
    - Total lot area between 3,000 - 10,000 square feet
    - The existing use (as defined by San Francisco Assessor Recorder's Land Use Designation[37]) is not:
        - City Property, Hospitals, Motels, Public Buildings (Govt), Schools, Vacant Lot –

[36] Transportation analysis zones with reduced capacity included: 95, 167, 178, 180, 400, 405, 436, 437, 455, 456, 463, and 517.

[37] San Francisco Assessor Recorder's Land Use Designation. Source: https://data.sfgov.org/Housing-and-Buildings/Assessor-Historical-Secured-Property-Tax-Rolls/wv5m-vpq2. Accessed March 31, 2022.

Restrictions

- Parcel is outside of the following planning districts:
- Northeast, Downtown, Mission, South of Market, South Bayshore

- Following the removal of density controls, but staying within the existing height limits, the number of parcels that meet the above criteria would produce approximately 158,500 units. The net new units resulting on each parcel were then aggregated up to the transportation analysis zone level and summed up by zone. A 25% ratio was then applied to the aggregated net new units per zone to arrive at total likely units per zone. This 25-percent development rate represents a reasonable estimation of the development potential over a 30-year time horizon based on past trends and taking into account the increased development ability if density controls are removed under this land use pattern. The total potential number of units came to 39,600 units.

These assignments total approximately 523,700 housing units (407,000 units under 2020 conditions +77,100 pipeline and reasonably foreseeable projects + 39,600 assigned to residential neighborhoods). The UrbanSim model then allocated the remaining 35,100 units (562,000 units[38]-523,700 units=35,100 units) based on the variables previously discussed, namely land use and zoning regulations, proximity of housing to retail and jobs, and transit access to job centers.

Table 5 summarizes the Dispersed Growth land use pattern's unit assignment and UrbanSim allocation.

Table 5. 2050 Dispersed Growth Assignment

Unit Assignment	Units
2020 conditions	407,000
Pipeline and Other Reasonably Foreseeable Projects	77,100
Residential Neighborhood Assignment	39,600[1]
UrbanSim Allocation	35,100[1]
Total	562,000[2]

NOTES:

1. This number includes accessory dwelling units.

2. The modeling of the Dispersed Growth land use pattern inadvertently double counted existing units in approximately 41 TAZs resulting in an error of approximately 3,200 excess units, primarily located in northwest quadrant of San Francisco. This modeling error does not affect any of the conclusions presented in the EIR.

PLAN BAY AREA 2050 MODELING

The department studied the amount of growth allocated to San Francisco pursuant to Plan Bay Area 2050 as part of the Housing Element 2022 Update's environmental review. Plan Bay Area 2050 assumes

[38] The modeling of the Dispersed Growth land use pattern inadvertently double counted existing units in approximately 41 TAZs resulting in an error of approximately 3,200 excess units, primarily located in northwest quadrant of San Francisco. This modeling error does not affect any of the conclusions presented in the EIR.

approximately 596,000 units in San Francisco by 2050, or approximately 189,000 units above 2020 conditions. Data was provided by the Metropolitan Transportation Commission in February 2021. The Metropolitan Transportation Commission provided Plan Bay Area 2050 households and jobs by San Francisco's 981 transportation analysis zones in March 2021.[39]

Plan Bay Area 2050 assumes growth on the eastside of the city, particularly in the Downtown and South of Market planning districts, and also in the Richmond planning district. Plan Bay Area 2050 would include approximately 87,600 net new housing units and 6,600 net new jobs by 2050 compared with the 2050 environmental baseline.

The department relied on the data provided from the Metropolitan Transportation Commission and made the following minor refinements to the Plan Bay Area 2050 dataset:

Conversion of Households to Units
To ensure a like-for-like comparison of Plan Bay Area 2050 to the modeled Housing Element land use patterns, the department converted the households provided by the Metropolitan Transportation Commission to housing units. Assuming a vacancy rate of 3%, the approximately 578,00 households would require approximately 596,600 housing units.

Assignment of 2020 units
The Plan Bay Area 2050 dataset did not accurately reflect the locations of units under 2020 conditions. Therefore, the department refined the Plan Bay Area 2050 dataset to ensure that all transportation analysis zones have at least the same number of units as 2020 conditions and to accurately reflect the location and number of housing units that currently exist in transportation analysis zones. Then the department proportionally adjusted units assigned to each transportation analysis zones above 2020 conditions to maintain the Plan Bay Area 2050 unit total.

Jobs
The Metropolitan Transportation Commission provided estimated total jobs to San Francisco for each of the 981 San Francisco transportation analysis zones. Jobs are further refined into the following six categories: Cultural, Institution, and Education (CIE), office (MIPS), retail (RET), visitor (VIS), medical (MED), and production, distribution and repair (PDR). To assign the jobs in each transportation analysis zone into the six job categories, the department used an approach called "iterative proportion fit." This approach resulted in transportation analysis job totals matching the job totals identified in the Plan Bay Area 2050 dataset and city-level job sector distributions matching the 2050 environmental baseline. Although this approach results in transportation-analysis zone-level jobs sector distributions that are different than the housing element baseline, the department determined that this approach would yield the most accurate distribution and categorization by incorporating the Plan Bay Area 2050 jobs totals as well as the city-level job sector distribution.

[39] Email from Dave Vautin (Metropolitan Transportation Commission) to Chris Kern (San Francisco Planning Department. March 10, 2021. SUBJ: "SF housing element EIR data request follow-up."

The planning department applied the iterative proportion fit to all transportation analysis zones, except for port-specific zones.[40] As described above, the department relied on job information provided by the Port of San Francisco for port-specific transportation analysis zones. The port estimated that approximately 33,100 jobs would exist on port properties in 2050 without an update to the Waterfront Plan.

APPENDICES

Appendix A: Total Housing Units by Planning District by Land Use Pattern

Appendix B: Total Jobs by Planning District by Land Use Pattern

Appendix C: Preservation Alternative Methodology

Appendix D: Transportation Analysis Zone Data for All Land Use Patterns

[40] The transportation analysis zones with port-specific information are 444, 492, 493, 521, 559, 633, 649, 650, 655, 723, 725, 808, 828, 830, 835, 851, 854, 855, 882, 926, and 958.

Appendix A: Total Housing Units by Planning District by Land Use Pattern

	2020		2050 Baseline		2050 Housing Element 2022 Update		2050 Preservation		2050 Eastside		2050 Dispersed Growth		2050 Plan Bay Area 2050	
Planning Districts	Total Units	% of Total	Total Units	% of Total	Total Units	% of Total	Total Units	% of Total	Total Units	% of Total	Total Units	% of Total	Total Units	% of Total
Bernal Heights	9,875	2.4%	10,136	2.0%	9,919	1.8%	9,919	1.8%	10,081	1.9%	10,608	1.9%	11,106	1.9%
Buena Vista	16,921	4.2%	18,253	3.6%	19,830	3.5%	19,819	3.5%	18,438	3.8%	18,551	3.3%	22,618	3.8%
Central	25,544	6.3%	25,782	5.1%	28,716	5.2%	30,744	5.5%	25,999	5.1%	29,548	5.3%	30,510	5.1%
Downtown	37,453	9.2%	44,450	8.7%	42,685	7.6%	42,685	7.6%	55,967	8.7%	48,056	8.6%	52,103	8.7%
Golden Gate Park	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Ingleside	27,220	6.7%	40,285	7.9%	47,079	8.8%	45952	8.2%	38,838	7.0%	45,735	8.1%	41,867	7.0%
Inner Sunset	18,421	4.5%	18,973	3.7%	29,995	5.5%	30,318	5.4%	18,813	3.7%	22,861	4.1%	22,243	3.7%
Marina	25,089	6.2%	25,401	5.0%	29,594	5.3%	29,161	5.2%	30,746	4.9%	26,412	4.7%	29,441	4.9%
Mission	27,546	6.8%	37,682	7.4%	36,419	6.5%	36,419	6.5%	45,046	7.9%	39,668	7.1%	46,913	7.9%
Northeast	38,438	9.4%	39,089	7.7%	39,762	7.1%	40,837	7.3%	41,238	8.6%	39,530	7.0%	51,002	8.6%
Outer Sunset	27,012	6.6%	27,962	5.5%	42,305	7.0%	42,645	7.6%	27,396	5.3%	38,974	6.9%	31,612	5.3%
Presidio	1,214	0.3%	1,215	0.2%	1,214	0.2%	1,214	0.2%	1,237	0.2%	1,276	0.2%	1,214	0.2%
Richmond	36,821	9.0%	39,186	7.7%	51,728	9.2%	52,486	9.4%	40,751	8.5%	45,795	8.2%	50,907	8.5%
South Bayshore	17,058	4.2%	32,330	6.4%	31,745	5.7%	31,745	5.7%	35,512	7.7%	31,590	5.6%	46,167	7.7%
South Central	29,237	7.2%	31,460	6.2%	30,864	5.5%	30,864	5.5%	30,358	6.1%	36,841	6.6%	36,131	6.1%
South of Market	36,882	9.1%	68,305	13.4%	62,429	11.2%	62,429	11.2%	86,097	11.7%	75,255	13.4%	69,779	11.7%
Treasure Island	682	0.2%	10,927	2.1%	10,911	2.0%	10,911	2.0%	11,072	1.9%	11,078	2.0%	11,470	1.9%
Western Addition	31,631	7.8%	37,294	7.3%	43,405	7.8%	40,449	7.2%	44,278	6.9%	40,091	7.1%	41,264	6.9%
Total	**407,044**	**100.0%**	**508,730**	**100.0%**	**558,600**	**100.0%**	**558,600**	**100.0%**	**561,869[1]**	**100.0%**	**561,869[1]**	**100.0%**	**596,348**	**100.0%**

Notes:

1. The modeling of the Eastside and Dispersed Growth land use patterns inadvertently double counted existing units in approximately 41 TAZs resulting in an error of approximately 3,200 excess units, primarily located in northwest quadrant of San Francisco. This modeling error does not affect any of the conclusions presented in the EIR.

Appendix B: Total Jobs by Planning District by Land Use Pattern

	2020		2050 Baseline		2050 Housing Element 2022 Update		Preservation		Eastside		Dispersed Growth		Plan Bay Area 2050	
Planning Districts	Total Jobs	% of Total	Total Jobs	% of Total	Total Jobs	% of Total	Total Jobs	% of Total	Total Jobs	% of Total	Total Jobs	% of Total	Total Jobs	% of Total
Bernal Heights	6,224	0.8%	5,891	0.7%	5,784	0.7%	5,784	0.7%	5,889	0.7%	5,787	0.7%	5,421	0.6%
Buena Vista	10,813	1.4%	10,482	1.2%	10,313	1.2%	10,313	1.2%	10,484	1.2%	10,314	1.2%	11,289	1.3%
Central	13,274	1.7%	13,707	1.6%	13,544	1.5%	13,544	1.5%	13,712	1.5%	13,545	1.5%	11,892	1.3%
Downtown	259,845	33.7%	288,694	32.7%	287,808	32.7%	287,808	32.7%	288,703	32.4%	287,772	32.4%	287,909	32.4%
Golden Gate Park	1,326	0.2%	1,108	0.1%	1,108	0.1%	1,108	0.1%	1,108	0.1%	1,108	0.1%	6,978	0.8%
Ingleside	17,919	2.3%	20,457	2.3%	20,870	2.4%	20,870	2.4%	20,440	2.3%	20,856	2.4%	35,084	4.0%
Inner Sunset	25,100	3.3%	26,182	3.0%	26,431	3.0%	26,431	3.0%	26,178	2.9%	26,436	3.0%	33,480	3.8%
Marina	28,466	3.7%	27,884	3.2%	28,328	3.2%	28,328	3.2%	27,873	3.1%	28,326	3.2%	23,012	2.6%
Mission	52,852	6.9%	50,968	5.8%	50,079	5.7%	50,079	5.7%	50,993	5.7%	50,094	5.6%	58,496	6.6%
Northeast	78,763	10.2%	81,614	9.3%	80,645	9.2%	80,645	9.2%	81,637	9.2%	80,642	9.1%	87,643	9.9%
Outer Sunset	14,766	1.9%	14,092	1.6%	14,562	1.7%	14,562	1.7%	14,099	1.6%	14,562	1.6%	10,605	1.2%
Presidio	6,767	0.9%	7,095	0.8%	7,074	0.8%	7,074	0.8%	13,862	1.6%	13,841	1.6%	1,625	0.2%
Richmond	25,479	3.3%	23,875	2.7%	24,607	2.8%	24,607	2.8%	25,249	2.8%	25,997	2.9%	23,766	2.7%
South Bayshore	51,949	6.7%	67,539	7.7%	67,665	7.7%	67,665	7.7%	67,545	7.6%	67,672	7.6%	69,138	7.8%
South Central	16,976	2.2%	16,891	1.9%	16,392	1.9%	16,392	1.9%	16,870	1.9%	16,385	1.8%	18,193	2.0%
South of Market	117,232	15.2%	183,858	20.9%	183,192	20.8%	183,192	20.8%	183,842	20.7%	183,278	20.7%	159,168	17.9%
Treasure Island	1,214	0.2%	2,956	0.3%	2,974	0.3%	2,974	0.3%	2,965	0.3%	2,963	0.3%	974	0.1%
Western Addition	41,917	5.4%	38,253	4.3%	37,817	4.3%	37,817	4.3%	38,246	4.3%	37,808	4.3%	43,517	4.9%
Total	**770,882**	**100.0%**	**881,546**	**100.0%**	**879,193**	**100.0%**	**879,193**	**100.0%**	**889,695**[1]	**100.0%**	**887,386**[1]	**100.0%**	**888,190**	**100.0%**

Notes:

1. The modeling of the Eastside and Dispersed Growth land use patterns inadvertently double counted existing jobs in approximately 41 transportation analysis zones resulting in an error of approximately 8,100 excess jobs, primarily located in the Presidio and Richmond planning districts (northwest quadrant) of San Francisco. This modeling error does not affect any of the conclusions presented in the EIR.

Appendix C: Preservation Alternative Methodology

San Francisco Planning

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PRESERVATION ALTERNATIVE METHODOLOGY

Date: April 6, 2022
Case Number: 2019-016230ENV
Project Name: San Francisco Housing Element 2022 Update
Zoning: VAR
Block/Lot: VAR
Project Sponsor: San Francisco Planning Department, Community Equity Division
Kimia Haddadan, Kimia.haddadan@sfgov.org
Maia Small, maia.small@sfgov.org
Staff Contact: Allison Vanderslice, allison.vanderslice@sfgov.org
Elizabeth White, elizabeth.white@sfgov.org

Preservation Alternative

An Environmental Impact Report (EIR) requires a reasonable range of alternatives that meet most project objectives and reduce significant impacts, in this case, from the future development resulting from the Housing Element 2022 Update (housing element update). One preservation alternative is proposed for the Housing Element 2022 Update EIR (EIR). The aim of the Preservation Alternative is to reduce impacts to built-environment historic resources while still meeting most of the housing element update goals. The Preservation Alternative addresses minimizing or reducing effects on built-environment historic resources as a significant and unavoidable impact was identified for these resources in the EIR, see Section 4.02 Cultural Resources.[1] The Preservation Alternative aims to reduce impacts to built-environment historic resources but does not assume that the alternative will reduce all significant historic resource impacts to a less than significant level. To achieve this, draft policies of the housing element update under the Preservation Alternative would be modified to reduce physical development that could impact built-environment historic resources. The alternative assumes that built-environment historic resource mitigation measures proposed in the Section 4.02 Cultural Resource of the EIR would also be included in the Preservation Alternative to assist in reducing historic resource impacts.

This Preservation Alternative was brought to the historic preservation commission (HPC) for review and comment on October 20, 2021. The HPC found the preservation alternative to be adequate.

[1] Built-environment historic resources are generally above-ground buildings, structures and objects and are distinguished from archeological resources, refer to Section 4.02 Cultural Resources of the EIR. The use of historic resources in this memo refers to built-environment historic resources, which are the focus of the preservation alternative.

Preservation Alternative Goals and Policies

The Preservation Alternative includes revisions to draft housing element 2022 update goals and policies with the aim to reduce impacts to historic resources. The draft policies of the housing element update would be revised under the Preservation Alternative with the aim to preserve built-environment historic resources by protecting parcels with individually significant resources from future development, promoting the use of the Secretary of the Interior's Standards for Rehabilitation (secretary's standards) in the future development of parcels with historic resources, and requiring development in historic districts to be compatible with those districts.

Proposed policy changes, with revisions to policy language shown in ***bold italics***, are shown below. The below is based on the draft goals and policies released to the public on March 25, 2022.

Policy 19. Enable low and moderate-income households, particularly American Indian, Black, and other people of color, to live and prosper in Well-resourced Neighborhoods by increasing the number of permanently affordable housing units in those neighborhoods ***while preserving built-environment historic resources***

Policy 20. Increase mid-rise and small multi-family housing types in Well-resourced Neighborhoods near transit, including along SFMTA Rapid Network[2] and other transit, and throughout lower-density areas, by adopting zoning changes or density bonus programs ***while preserving built-environment historic resources***

Policy 24. Support mixed-income development projects to maximize the number of permanently affordable housing constructed, in balance with delivering other permanent community benefits that advance racial and social equity ***and preserve built-environment historic resources***

Policy 25. Reduce development constraints such as lengthy City-permitting process and high construction costs to increase housing choices and improve affordability ***while preserving built-environment historic resources***

Policy 26. Facilitate small and mid-rise multi-family buildings as a prominent housing type that private development can deliver to serve middle-income households without deed restriction, including through expansion or demolition of existing lower density housing, or by adding Accessory Dwelling Units (ADUs) ***while preserving built-environment historic resources***

Policy 36. Shape urban design policy, standards, and guidelines to enable cultural and identity expression, advance architectural creativity and durability, and foster neighborhood belonging ***while preserving built-environment historic resources***

Policy 37. Support cultural uses, activities, and architecture that sustain ***and preserve*** San Francisco's dynamic and unique cultural heritages.

[2] The 13 rail and bus lines that account for the majority of Muni's ridership. Before the pandemic, Rapid Network lines were scheduled to operate every 10 minutes or better all day on weekdays.

Preservation Alternatives Analysis

The goal of this analysis is to identify projected development that could occur if the revised Preservation Alternative polices were implemented in comparison to the proposed action. As noted above, the housing element update policies developed under the Preservation Alternative would aim to preserve built-environment historic resources. This would be achieved by protecting parcels with individual historic resources from future development, promoting the use of the secretary's standards in the future development of parcels with historic resources, and requiring development in historic districts to be compatible with historic districts. Under the Preservation Alternative, the revised policies would be implemented primarily though streamlining rehabilitation projects, site-specific design review, and the development of objective design guidelines that focus on protecting historic resources under this alternative.

The department anticipates the following project types would result from the revised policies of the Preservation Alternative:

- New construction in historic districts would prioritize development of small and midrise multi-family buildings on non-contributing parcels that would be compatible in scale, materials, and massing with the historic districts.
- On sites with properties that contribute to historic districts, housing density would be increased, primarily through the construction of accessory dwelling units, which would be designed to meet the secretary's standards.
- New development projects on parcels that contain built-environment historic resources would be sited and designed to reduce impacts on the resource, such as developing vacant or non-character-defining portions of the parcel.

To align with the objectives of the proposed action and reduce impacts on built-environment historic resources, the Preservation Alternative analysis redistributed units within well-resourced areas[3] to neighborhoods with potential to accommodate future development without resulting in significant impacts on historic resources.

The list of neighborhoods included in the Preservation Alternative is the following:

- Castro - Upper Market
- Glen Park
- Haight Ashbury
- Hayes Valley
- Inner Richmond
- Inner Sunset
- Japantown
- Lone Mountain - USF
- Marina
- Nob Hill
- Noe Valley
- Oceanview - Merced - Ingleside
- Outer Richmond
- Pacific Heights
- Presidio Heights
- Russian Hill
- Seacliff
- Sunset/Parkside
- Twin Peaks
- West of Twin Peaks
- Western Addition

[3] https://www.sfhousingelement.org/well-resourced-neighborhoods

The Preservation Alternative unit reallocation analysis was undertaken at the neighborhood scale matching the scale of analysis undertaken for the built-environment historic resource analysis for the proposed action. As discussed below, the unit reallocation was then converted from the neighborhood scale to the planning district scale. See Figure 2-2 in the EIR for boundaries of 41 neighborhoods and the 18 planning districts.

Preservation Alternative Analysis Methodology

The Preservation Alternative used the following methodology to determine unit calculations and unit reallocation from the proposed action. As noted above, this analysis only included neighborhoods in well-resourced areas.

Preservation Alternative Unit allocation calculation methodology

1. Identify the sites of known historic resources in the well-resourced areas by neighborhood.
2. Calculated the net unit capacity of the known historic resource sites in the well-resourced areas by neighborhood.
    a. Net capacity is the *potential units* that could be developed on a site with enacted zoning changes implied by the proposed project including height increases, density limit removal, or density increases minus the *existing units* on that site.
3. Retained sites that meet the soft site criteria as a proxy for development likelihood based on financial feasibility.
    a. Soft site is defined as any site where the *existing units* represent 30% or less of the *potential unit capacity* that would be possible under the Housing Element.
4. Applied an additional "likelihood" factor to estimate how many sites would actually be develop given a number of intangible and random factors, such as lot consolidation, owner choice, land basis variability, legal complications, difficult soil conditions, etc.
    a. Assumed that only 10% of projects with less than 100-unit net capacity and 50% of projects with equal to or more than 100-unit capacity will be developed.
    a. This ratio is based on the common types of applicants, industry practices, and construction challenges at the scale of these sites (e.g., larger sites are more likely to overcome such challenges).
5. Consolidated by neighborhood to produce a total number of units that would be reallocated to other places that have capacity and fewer known historic resource and future anticipated historic resource sites (see below).

Preservation Alternative projected development growth redistribution methodology

To meet the same unit count as the proposed action, under the Preservation Alternative the units would be redistributed to likely sites in other areas of the well-resourced neighborhoods. The redistribution process was done as follows:

1. Created a reallocation factor by neighborhood based on two pieces of analysis:
    a. 2050 Historic Resource Forecast Percentage.[4] This percentage was determined for the historic resource impact analysis. It factors in percentage of known historic resources, percentage of evaluated and unevaluated historic resources, the percentage of historic resources that will become age-eligible by 2050, and percentage of cultural districts and cultural enclaves

[4] See Section 4.2 Cultural Resources of the Housing Element 2022 Update EIR for additional information on the 2050 Historic Resource Forecast.

identified in historic context statements within each neighborhood to predict the percentage of parcels with historic resources by 2050. This percentage was inversed to create an allocation factor so that more units would be allocated to neighborhoods expected to have fewer future resources.

b. Neighborhood Historic Resource Pattern Analysis. This analysis refined the reallocation factor above and is described in more detail below. The outcome of the analysis was identification of neighborhoods that should not be part of the reallocation, this included: Castro-Upper Market, Haight-Ashbury, and Noe Valley. And the identification of neighborhoods where the above reallocation factor should be modified: Japantown, Inner Richmond, and Inner Sunset.

2. Removed neighborhoods indicated for removal under b. above from reallocation.
3. Applied the allocation factor determined in a. above, to total units indicated by neighborhood with the modifications identified under b.

Neighborhood Historic Resource Pattern Analysis

This analysis sought to refine the reallocation factor that was based on the 2050 historic resource forecast, see 1.a above. The goal of this analysis was to determine if the reallocation factor needed refinement for each neighborhood based on the following: general capacity of known historic districts to absorb additional housing development without resulting in a significant impact on the district; projected distribution of development under the proposed action in relationship to known individual historic resources and redistribution of those units to avoid individual built-environment historic resources; and projected distribution of development under the proposed action in relationship to potential historic resources, such as those identified in final historic context statements or locations of cultural districts. This analysis took into consideration for each neighborhood the total net unit capacity (defined above), number of units allocated in the proposed action, relationship of proposed units in regard to known historic districts and individual historic resources, and locations, and numbers of potential historic resources, along with the 2050 historic resource forecast.

For the Castro-Upper Market, Haight-Ashbury, and Noe Valley neighborhoods this analysis determined that Preservation Alternative policies would adequately reduce the impacts of the units allocated to these neighborhoods under the proposed action. It was also determined that due to the number of proposed units in the neighborhood under the proposed action, the number of units in the pipeline and proposed between 2020-2050, the number and location of known resources, the number and location of potential resources identified in adopted context statements, and the 2050 forecast, that these neighborhoods had limited capacity for additional development beyond what is projected under the proposed action without resulting in a significant impact to historic resources. Therefore, the reallocation factor was modified so that no additional projected growth was added to these neighborhoods.

For the Japantown neighborhood, this analysis determined that due to the scale and location of known historic resources and potential historic resources, in relationship to unit allocation under the proposed action, additional units should be removed from this neighborhood to avoid historic resource impacts. Therefore, it was determined that half of the units from the difference in units of the proposed action and 2050 baseline would be removed from this neighborhood.

For the Inner Richmond and Inner Sunset neighborhoods, this analysis determined that both neighborhoods had capacity for additional development beyond the unit reallocation based on the 2050 historic resource forecast alone. This determination was based on the number of proposed units in the neighborhood under the

proposed action, the number of units in the pipeline and proposed between 2020-2050, the number and location of known built-environment historic resources, the number and location of potential historic resources, and the 2050 forecast. Therefore, in the unit reallocation, the unit reallocation factor was modified to add additional projected growth to these neighborhoods.

Methodology to Convert Neighborhood analysis to Planning Districts

The Housing Element 2022 Update EIR typically characterizes the growth anticipated under the studied land use patterns into 18 planning districts. However, the built-environmental historic resource analysis characterized growth by neighborhood, not planning district. Neighborhoods are a more granular way of examining various geographies of San Francisco – for reference, there are 41 different neighborhoods used in the analysis. Neighborhoods were determined to be a more appropriate scale for analyzing built resource impacts as opposed to planning districts. See Figure 2-2 in the EIR for boundaries of the neighborhoods and planning districts.

The planning department converted the Preservation Alternative's projected growth from neighborhoods into planning districts to ensure a "like for like" comparison to the proposed action. Not all of the 41 neighborhoods used for the built-environment historic resource analysis neatly fit into planning districts; for example, portions of the West of Twin Peaks neighborhood are located in both the Inner Sunset and Ingleside planning districts and portions of the Inner Sunset neighborhood are located in both the Inner Sunset and Central planning districts. Although some neighborhoods do not neatly fit into planning districts, both planning districts and neighborhoods can be further broken down into a common denominator: transportation analysis zones. For example, the Inner Sunset neighborhood consists of 28 transportation analysis zones, each of which is classified as located in either the Inner Sunset or Central planning district. Using the transportation analysis zones, the department applied the methodology described below to convert new units projected under the Preservation Alternative from neighborhoods into planning districts. The department applied this methodology to neighborhoods that are split among multiple planning districts located in well-resourced areas and where the growth projected under the Preservation Alternative differed from the proposed action.

- First, the department examined the net new units projected in each neighborhood under the proposed action. For example, under the proposed action, the Inner Sunset neighborhood is projected to have approximately 18,100 more new units by 2050 when compared to 2020 conditions. The Inner Sunset neighborhood is split between two planning districts: Central and Inner Sunset. Using the transportation analysis zone data, the department determined that 5% of units, or 825 units of the Inner Sunset neighborhood's projected 18,100 units, are located in the Central planning district and that 95%, or approximately 17,264 units of the Inner Sunset neighborhood's projected 18,100 projected units, are located in the Inner Sunset planning district.

- Next, the department compared the number of units anticipated under the Preservation Alternative to the proposed action. For example, under the Preservation Alternative, the Inner Sunset neighborhood is projected to have approximately 19,500 more new units above 2020 conditions; the projected 19,500 units is approximately 1,400 more units when compared to the proposed action (19,500 units under Preservation Alternation -18,100 units under the Proposed Action = 1,400 units).

- Finally, the department applied the percentage calculated from the proposed action to the net units anticipated in the Preservation Alternative. For example, given that 1,400 more units are anticipated in the

Inner Sunset neighborhood under the Preservation Alternative, it is anticipated that 95% of those net new units, or approximately 1,300 units (1,400 units *0.95 = 1,300 units), would occur in the Inner Sunset planning district and that 5% of the net new units and 5% of the net new units, or approximately 100 units (1,400*.05=100), would occur in the Central planning district.

The department either added or subtracted the projected net new units or net lost units to the proposed action's planning district unit totals. In summary, the department applied this methodology for all neighborhoods located in well-resourced areas that are split between multiple planning districts. These neighborhoods included: Hayes Valley, Inner Sunset, Twin Peaks, Sunset/Parkside, West of Twin Peaks, Pacific Heights, and Lone Mountain.

Conclusion of the Preservation Alternative Analysis

Based on the above analysis, the Housing Units by Planning District for all Land Use Patterns table in Appendix A (of this Housing Element 2022 Update Modeling and Projections memo) shows the projected development under the Preservation Alternative compared to the proposed action, the 2050 environmental baseline, and the land use patterns of the other alternatives analyzed for the EIR. This table shows the minimal redistribution of units between the proposed action and the projected development under the Preservation Alternative. As the Preservation Alternative analysis assumes that policies revised under this alternative would be implemented primarily through a variety of site-specific reviews, development of design guidelines, and implementation of mitigation measures, this alternative did not include revisions to height limits or density controls projected under the proposed action. As discussed above, development under the Preservation Alternative would aim to preserve built-environment historic resources by protecting parcels with individually significant resources from future development, promoting the use of the secretary's standards in the future development of parcels with historic resources, and require development in historic districts to be compatible with historic districts.

Appendix D: Transportation Analysis Zone Data for All Land Use Patterns

APPENDIX D

Aesthetics Supporting Information

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

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SF LIGHT POLLUTION ANALYSIS – LIGHTING METHODOLOGY

January 3, 2022

To study the potential impact of the addition of new housing units with respect to nighttime sky brightness in San Francisco, a computer simulation was run to establish a reasonable "typical" amount of exterior light that would be emitted by a residential unit. The simulation was prepared so that it could be compiled into a software process that would allow for the assumed light contribution on a per-unit basis to be overlaid onto a nighttime sky brightness map of San Francisco.

The purpose of this document is to provide background information on the methodology used to reach these assumed light output levels. Assumptions were made based on industry standards, similar projects, and previous experience by the lighting consultant.

ANALYSIS REQUIREMENTS AND ASSUMPTIONS:

- The light level output for the housing units being studied would need to be provided in a format that would be comparable to an existing city nighttime sky brightness map. The light measurement unit used at lightpollutionmap.info (the reference map), is Radiance, measured in watts per square centimeter per steradian (W/cm * sr).
    - The scale shown on the reference map began at 0 and reached a maximum of 150.
    - The units provided by the lighting consultant would need to be in a format compatible with the calculation software used (footcandles or lux)
- The average unit size for a one-bedroom apartment in San Francisco is roughly 800 square feet.
    - The dimensions of this apartment were assumed to be approximately 20' x 40' x 9'.
    - It was assumed that this apartment would have three outward-facing windows, each one 2'x4'.
- The average unit size for a two-bedroom apartment in San Francisco is 1004 square feet.
    - The dimensions of this apartment were assumed to be approximately 30' x 37' x 9'
    - It was assumed that this apartment would have two standard windows (2' x 4'), and one glass sliding door unit (74" x 74")
    - Additionally, this unit was assumed to have a patio (10' x 4').

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- Each unit was assumed to have multiple light sources, simulating interior lamps.
    - The assumed light source is an LED equivalent to a standard 75 watt incandescent light (approximately 1200 lumens). The manufacturer Green Creative provides a light that matches this, and their photometric file was used for the calculations.
    - In the single-bedroom unit, three light sources were assumed to be used in close proximity to the windows.
        - One source was placed in the side of the unit assumed to be a bedroom. The source was centered in the room at 3' above the floor, to provide a median value for possible locations (e.g. ceiling light, bedside lamp, etc.)
        - Two sources were placed in the side of the unit assumed to be a living space. These two sources were placed adjacent to the walls of the living space, to simulate floor mounted uplight lamps, at 5' above the floor.
    - In the two-bedroom unit, four light sources were used.
        - One source was placed in the bedroom, similar to the single-bedroom unit.
        - Two sources were placed in the living space, similar to the single-bedroom unit.
        - One source was placed on the exterior, above the patio, adjacent to the sliding door, to simulate a wall sconce placed 74" above the patio floor to the top of the source.
- To convert from the units shown in the reference map, the following assumptions were made:
    - For the calculation "surfaces", exit luminance is roughly equivalent to illuminance divided by pi, as those surfaces would be transparent.
    - 1 W/cm*sr is equivalent to 683 cd/cm^2. Converting this to meters (to match luminance units), the unit is 0.0683 cd/m^2.
    - The lowest light level point shown on the reference map legend is 0.1 W, which is equivalent to 0.00683 cd/m2. Using the equation cd/m2 * pi to convert to footcandles, the lowest measurement on the legend is approximately 0.2 footcandles.

(continued)

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- To confirm that the assumptions made were within reasonable assumptions, the LEED requirement for external signage (a luminous surface) is a maximum of 200 cd/m^2. 1 footcandle is roughly equivalent to .32 cd/m^2, so to exceed the 200 cd/m^2, a calculation point would have to show a level of 625 footcandles. Additionally, LEED looks for the maximum exitance at the boundary of a site to be 0.05 footcandles or less.

METHODS:

- Industry standard lighting calculation software was used for the modeling and calculation of the light levels. The product used was AGi32 by Lighting Analysts.
- Separate calculations were run for the following conditions:
  - Single Bedroom Unit, one unit
  - Single Bedroom Unit, multiple units in horizontal array
  - Two Bedroom Unit, one unit
  - Two Bedroom Unit, multiple units in horizontal array.
- For each calculation, an array of calculation points was prepared.
  - In the horizontal direction, the calculation grid was comprised of points that simulated a light meter facing the outer wall (the wall with windows) of the unit.
  - This plane of points was then arrayed both above and below the unit, to create an overall three-dimensional array of points.
  - Each calculation point was capable of measuring to 3 decimal places (e.g. 0.001 or greater), and were set to measure the amount of illuminance reaching each point.
- For one-unit calculations, a single unit with the appropriate number of light fixtures was used. For multiple-unit calculations, the apartment geometry and light sources were copied adjacent to the original unit, and the calculation array was expanded to capture the additional geometry.
- With the calculation array in place, the units built, and light fixtures inserted, the calculations were run to provide measurements throughout the array.
- Once the measurements were complete, the software was instructed to provide isolines between the calculation points within a given plane of the array that were within a set range, creating a shape visible in plan view that would illustrate the amount of light of a certain value that escaped to that location.
  - These isolines were based on values in the reference map legend.
  - Each plane provided isolines, for a composite overlay output map for the units.

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- The distance from the face of the building to the extent of the isolines (measured perpendicular to the face of the building) was noted, to provide an assumed maximum light pollution contribution at each of the steps on the reference map legend.
- To ensure that the scaling of units would follow a consistent pattern, calculations were run with 1, 3, 7, and 11 units and the resulting levels placed onto a graph. The values appeared to follow a consistent growth pattern, suggesting that scaling the units according to this growth pattern would be an appropriate method to simulate large volume housing units. However, since light intensity reduces as it moves away from its source according to the inverse square law, only using the direct linear scaling indicated above would result in continued growth that would not be accurate to real world situations. This was compensated by applying a logarithmic reduction factor to the results as they moved away from the building.

ADDITIONAL INFORMATION:

Apartment sizes were based on information found at:
https://www.rentcafe.com/blog/rental-market/real-estate-news/us-average-apartment-size-trends-downward/

LEED references are from LEED NC 4.1, credit SS8

Reference for relationship between radiance, luminance, and illuminance are per the IESNA Handbook Version 10 and related TM and LM documents.

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APPENDIX E

Biological Resources Supporting Information

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: County IS (San Francisco)

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
adobe sanicle *Sanicula maritima*	PDAPI1Z0D0	None	Rare	G2	S2	1B.1
alkali milk-vetch *Astragalus tener var. tener*	PDFAB0F8R1	None	None	G2T1	S1	1B.2
American badger *Taxidea taxus*	AMAJF04010	None	None	G5	S3	SSC
American peregrine falcon *Falco peregrinus anatum*	ABNKD06071	Delisted	Delisted	G4T4	S3S4	FP
Angel Island mole *Scapanus latimanus insularis*	AMABB02032	None	None	G5T1	SH	
ashy storm-petrel *Hydrobates homochroa*	ABNDC04030	None	None	G2	S2	SSC
bank swallow *Riparia riparia*	ABPAU08010	None	Threatened	G5	S2	
Bay checkerspot butterfly *Euphydryas editha bayensis*	IILEPK4055	Threatened	None	G5T1	S1	
beach layia *Layia carnosa*	PDAST5N010	Endangered	Endangered	G2	S2	1B.1
bent-flowered fiddleneck *Amsinckia lunaris*	PDBOR01070	None	None	G3	S3	1B.2
blue coast gilia *Gilia capitata ssp. chamissonis*	PDPLM040B3	None	None	G5T2	S2	1B.1
bristly sedge *Carex comosa*	PMCYP032Y0	None	None	G5	S2	2B.1
bumblebee scarab beetle *Lichnanthe ursina*	IICOL67020	None	None	G2	S2	
California black rail *Laterallus jamaicensis coturniculus*	ABNME03041	None	Threatened	G3G4T1	S1	FP
California red-legged frog *Rana draytonii*	AAABH01022	Threatened	None	G2G3	S2S3	SSC
California Ridgway's rail *Rallus obsoletus obsoletus*	ABNME05011	Endangered	Endangered	G3T1	S1	FP
California seablite *Suaeda californica*	PDCHE0P020	Endangered	None	G1	S1	1B.1
callippe silverspot butterfly *Speyeria callippe callippe*	IILEPJ6091	Endangered	None	G5T1	S1	
chaparral ragwort *Senecio aphanactis*	PDAST8H060	None	None	G3	S2	2B.2
Choris' popcornflower *Plagiobothrys chorisianus var. chorisianus*	PDBOR0V061	None	None	G3T1Q	S1	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
coastal triquetrella *Triquetrella californica*	NBMUS7S010	None	None	G2	S2	1B.2
compact cobwebby thistle *Cirsium occidentale var. compactum*	PDAST2E1Z1	None	None	G3G4T2	S2	1B.2
congested-headed hayfield tarplant *Hemizonia congesta ssp. congesta*	PDAST4R065	None	None	G5T2	S2	1B.2
dark-eyed gilia *Gilia millefoliata*	PDPLM04130	None	None	G2	S2	1B.2
Diablo helianthella *Helianthella castanea*	PDAST4M020	None	None	G2	S2	1B.2
double-crested cormorant *Phalacrocorax auritus*	ABNFD01020	None	None	G5	S4	WL
fragrant fritillary *Fritillaria liliacea*	PMLIL0V0C0	None	None	G2	S2	1B.2
Franciscan manzanita *Arctostaphylos franciscana*	PDERI040J3	Endangered	None	GHC	S1	1B.1
Franciscan thistle *Cirsium andrewsii*	PDAST2E050	None	None	G3	S3	1B.2
Guadalupe fur-seal *Arctocephalus townsendi*	AMAJC02010	Threatened	Threatened	G1	S1	FP
hardhead *Mylopharodon conocephalus*	AFCJB25010	None	None	G3	S3	SSC
hoary bat *Lasiurus cinereus*	AMACC05030	None	None	G3G4	S4	
Kellogg's horkelia *Horkelia cuneata var. sericea*	PDROS0W043	None	None	G4T1?	S1?	1B.1
longfin smelt *Spirinchus thaleichthys*	AFCHB03010	Candidate	Threatened	G5	S1	
Marin hesperian *Vespericola marinensis*	IMGASA4140	None	None	G2	S2	
Marin knotweed *Polygonum marinense*	PDPGN0L1C0	None	None	G2Q	S2	3.1
Marin western flax *Hesperolinon congestum*	PDLIN01060	Threatened	Threatened	G1	S1	1B.1
marsh microseris *Microseris paludosa*	PDAST6E0D0	None	None	G2	S2	1B.2
marsh sandwort *Arenaria paludicola*	PDCAR040L0	Endangered	Endangered	G1	S1	1B.1
Mission blue butterfly *Plebejus icarioides missionensis*	IILEPG801A	Endangered	None	G5T1	S1	
monarch - California overwintering population *Danaus plexippus pop. 1*	IILEPP2012	Candidate	None	G4T2T3	S2S3	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Mt. Tamalpais thistle *Cirsium hydrophilum var. vaseyi*	PDAST2E1G2	None	None	G2T1	S1	1B.2
North American porcupine *Erethizon dorsatum*	AMAFJ01010	None	None	G5	S3	
northern curly-leaved monardella *Monardella sinuata ssp. nigrescens*	PDLAM18162	None	None	G3T2	S2	1B.2
obscure bumble bee *Bombus caliginosus*	IIHYM24380	None	None	G4?	S1S2	
Opler's longhorn moth *Adela oplerella*	IILEE0G040	None	None	G2	S2	
Oregon polemonium *Polemonium carneum*	PDPLM0E050	None	None	G3G4	S2	2B.2
Point Reyes jumping mouse *Zapus trinotatus orarius*	AMAFH01031	None	None	G5T1T3Q	S1S3	SSC
Point Reyes salty bird's-beak *Chloropyron maritimum ssp. palustre*	PDSCR0J0C3	None	None	G4?T2	S2	1B.2
Presidio clarkia *Clarkia franciscana*	PDONA050H0	Endangered	Endangered	G1	S1	1B.1
Presidio manzanita *Arctostaphylos montana ssp. ravenii*	PDERI040J2	Endangered	Endangered	G3T1	S1	1B.1
robust spineflower *Chorizanthe robusta var. robusta*	PDPGN040Q2	Endangered	None	G2T1	S1	1B.1
rose leptosiphon *Leptosiphon rosaceus*	PDPLM09180	None	None	G1	S1	1B.1
round-headed Chinese-houses *Collinsia corymbosa*	PDSCR0H060	None	None	G1	S1	1B.2
saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	ABPBX1201A	None	None	G5T3	S3	SSC
San Francisco Bay Area leaf-cutter bee *Trachusa gummifera*	IIHYM80010	None	None	G1	S1	
San Francisco Bay spineflower *Chorizanthe cuspidata var. cuspidata*	PDPGN04081	None	None	G2T1	S1	1B.2
San Francisco campion *Silene verecunda ssp. verecunda*	PDCAR0U213	None	None	G5T1	S1	1B.2
San Francisco collinsia *Collinsia multicolor*	PDSCR0H0B0	None	None	G2	S2	1B.2
San Francisco forktail damselfly *Ischnura gemina*	IIODO72010	None	None	G2	S2	
San Francisco gumplant *Grindelia hirsutula var. maritima*	PDAST470D3	None	None	G5T1Q	S1	3.2
San Francisco lessingia *Lessingia germanorum*	PDAST5S010	Endangered	Endangered	G1	S1	1B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
San Francisco owl's-clover *Triphysaria floribunda*	PDSCR2T010	None	None	G2?	S2?	1B.2
San Francisco popcornflower *Plagiobothrys diffusus*	PDBOR0V080	None	Endangered	G1Q	S1	1B.1
sandy beach tiger beetle *Cicindela hirticollis gravida*	IICOL02101	None	None	G5T2	S2	
Santa Cruz microseris *Stebbinsoseris decipiens*	PDAST6E050	None	None	G2	S2	1B.2
Scouler's catchfly *Silene scouleri ssp. scouleri*	PDCAR0U1MC	None	None	G5T4T5	S2S3	2B.2
short-leaved evax *Hesperevax sparsiflora var. brevifolia*	PDASTE5011	None	None	G4T3	S3	1B.2
Stage's dufourine bee *Dufourea stagei*	IIHYM22010	None	None	G1G2	S1	
Steller (=northern) sea-lion *Eumetopias jubatus*	AMAJC03010	Delisted	None	G3	S2	
tidewater goby *Eucyclogobius newberryi*	AFCQN04010	Endangered	None	G3	S3	
Tomales isopod *Caecidotea tomalensis*	ICMAL01220	None	None	G2	S2S3	
Townsend's big-eared bat *Corynorhinus townsendii*	AMACC08010	None	None	G4	S2	SSC
water star-grass *Heteranthera dubia*	PMPON03010	None	None	G5	S2	2B.2
western bumble bee *Bombus occidentalis*	IIHYM24250	None	Candidate Endangered	G2G3	S1	
western pond turtle *Emys marmorata*	ARAAD02030	None	None	G3G4	S3	SSC
western red bat *Lasiurus blossevillii*	AMACC05060	None	None	G4	S3	SSC
western ridged mussel *Gonidea angulata*	IMBIV19010	None	None	G3	S1S2	

Record Count: 78

Inventory of Rare and Endangered Plants of California

Search Results

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Search Criteria: County is one of [**SFO**]

Scientific Name | Common Name | Family | Lifeform | Blooming Period | Fed List | State List | Global Rank | State Rank | CA Rare Plant Rank | General Habitats | Micro Habitats | Lowest Elevation | Highest Elevation | CA Endemic | Date Added | Photo

Search:

▲ SCIENTIFIC NAME	COMMON NAME	LIFEFORM	BLOOMING PERIOD	FED LIST	STATE LIST	CA RARE PLANT RANK	GENERAL HABITATS
Amsinckia lunaris	bent-flowered fiddleneck	annual herb	Mar-Jun	None	None	1B.2	Cismontane woodland, Coastal bluff scrub, Valley and foothill grassland
Arabis blepharophylla	coast rockcress	perennial herb	Feb-May	None	None	4.3	Broadleafed upland forest, Coastal bluff scrub, Coastal prairie, Coastal scrub
Arctostaphylos franciscana	Franciscan manzanita	perennial evergreen shrub	Feb-Apr	FE	None	1B.1	Coastal scrub
Arctostaphylos montana ssp. *ravenii*	Presidio manzanita	perennial evergreen shrub	Feb-Mar	FE	CE	1B.1	Chaparral, Coastal prairie, Coastal scrub
Arenaria paludicola	marsh sandwort	perennial stoloniferous herb	May-Aug	FE	CE	1B.1	Marshes and swamps
Astragalus nuttallii var. *nuttallii*	ocean bluff milk-vetch	perennial herb	Jan-Nov	None	None	4.2	Coastal bluff scrub, Coastal dunes
Astragalus tener var. *tener*	alkali milk-vetch	annual herb	Mar-Jun	None	None	1B.2	Playas, Valley and foothill grassland, Vernal pools
Carex comosa	bristly sedge	perennial rhizomatous herb	May-Sep	None	None	2B.1	Coastal prairie, Marshes and swamps, Valley and foothill grassland
Chloropyron maritimum ssp. *palustre*	Point Reyes salty bird's-beak	annual herb (hemiparasitic)	Jun-Oct	None	None	1B.2	Marshes and swamps
Chorizanthe cuspidata var. *cuspidata*	San Francisco Bay spineflower	annual herb	Apr-Jul(Aug)	None	None	1B.2	Coastal bluff scrub, Coastal dunes, Coastal prairie, Coastal scrub
Chorizanthe robusta var. *robusta*	robust spineflower	annual herb	Apr-Sep	FE	None	1B.1	Chaparral, Cismontane woodland, Coastal dunes, Coastal scrub

▲ SCIENTIFIC NAME	COMMON NAME	LIFEFORM	BLOOMING PERIOD	FED LIST	STATE LIST	CA RARE PLANT RANK	GENERAL HABITATS
Cirsium andrewsii	Franciscan thistle	perennial herb	Mar-Jul	None	None	1B.2	Broadleafed upland forest, Coastal bluff scrub, Coastal prairie, Coastal scrub
Cirsium hydrophilum var. *vaseyi*	Mt. Tamalpais thistle	perennial herb	May-Aug	None	None	1B.2	Broadleafed upland forest, Chaparral, Meadows and seeps
Cirsium occidentale var. *compactum*	compact cobwebby thistle	perennial herb	Apr-Jun	None	None	1B.2	Chaparral, Coastal dunes, Coastal prairie, Coastal scrub
Clarkia franciscana	Presidio clarkia	annual herb	May-Jul	FE	CE	1B.1	Coastal scrub, Valley and foothill grassland
Collinsia corymbosa	round-headed Chinese-houses	annual herb	Apr-Jun	None	None	1B.2	Coastal dunes
Collinsia multicolor	San Francisco collinsia	annual herb	(Feb)Mar-May	None	None	1B.2	Closed-cone coniferous forest, Coastal scrub
Equisetum palustre	marsh horsetail	perennial rhizomatous herb	Unk	None	None	3	Marshes and swamps
Erysimum franciscanum	San Francisco wallflower	perennial herb	Mar-Jun	None	None	4.2	Chaparral, Coastal dunes, Coastal scrub, Valley and foothill grassland
Fritillaria liliacea	fragrant fritillary	perennial bulbiferous herb	Feb-Apr	None	None	1B.2	Cismontane woodland, Coastal prairie, Coastal scrub, Valley and foothill grassland
Gilia capitata ssp. *chamissonis*	blue coast gilia	annual herb	Apr-Jul	None	None	1B.1	Coastal dunes, Coastal scrub
Gilia millefoliata	dark-eyed gilia	annual herb	Apr-Jul	None	None	1B.2	Coastal dunes
Grindelia hirsutula var. *maritima*	San Francisco gumplant	perennial herb	Jun-Sep	None	None	3.2	Coastal bluff scrub, Coastal scrub, Valley and foothill grassland
Helianthella castanea	Diablo helianthella	perennial herb	Mar-Jun	None	None	1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland, Valley and foothill grassland
Hemizonia congesta ssp. *congesta*	congested-headed hayfield tarplant	annual herb	Apr-Nov	None	None	1B.2	Valley and foothill grassland
Hesperevax sparsiflora var. *brevifolia*	short-leaved evax	annual herb	Mar-Jun	None	None	1B.2	Coastal bluff scrub, Coastal dunes, Coastal prairie
Hesperolinon congestum	Marin western flax	annual herb	Apr-Jul	FT	CT	1B.1	Chaparral, Valley and foothill grassland
Heteranthera dubia	water star-grass	perennial herb (aquatic)	Jul-Oct	None	None	2B.2	Marshes and swamps
Horkelia cuneata var. *sericea*	Kellogg's horkelia	perennial herb	Apr-Sep	None	None	1B.1	Chaparral, Closed-cone coniferous forest, Coastal dunes, Coastal scrub
Hosackia gracilis	harlequin lotus	perennial rhizomatous herb	Mar-Jul	None	None	4.2	Broadleafed upland forest, Cismontane woodland, Closed-cone coniferous forest, Coastal bluff scrub, Coastal prairie, Coastal

▲ SCIENTIFIC NAME	COMMON NAME	LIFEFORM	BLOOMING PERIOD	FED LIST	STATE LIST	CA RARE PLANT RANK	GENERAL HABITATS
							scrub, Marshes and swamps, Meadows and seeps, North Coast coniferous forest, Valley and foothill grassland
Iris longipetala	coast iris	perennial rhizomatous herb	Mar-May(Jun)	None	None	4.2	Coastal prairie, Lower montane coniferous forest, Meadows and seeps
Layia carnosa	beach layia	annual herb	Mar-Jul	FE	CE	1B.1	Coastal dunes, Coastal scrub
Leptosiphon grandiflorus	large-flowered leptosiphon	annual herb	Apr-Aug	None	None	4.2	Cismontane woodland, Closed-cone coniferous forest, Coastal bluff scrub, Coastal dunes, Coastal prairie, Coastal scrub, Valley and foothill grassland
Leptosiphon latisectus	broad-lobed leptosiphon	annual herb	Apr-Jun	None	None	4.3	Broadleafed upland forest, Cismontane woodland
Leptosiphon rosaceus	rose leptosiphon	annual herb	Apr-Jul	None	None	1B.1	Coastal bluff scrub
Lessingia germanorum	San Francisco lessingia	annual herb	(Jun)Jul-Nov	FE	CE	1B.1	Coastal scrub
Microseris paludosa	marsh microseris	perennial herb	Apr-Jun(Jul)	None	None	1B.2	Cismontane woodland, Closed-cone coniferous forest, Coastal scrub, Valley and foothill grassland
Monardella sinuata ssp. *nigrescens*	northern curly-leaved monardella	annual herb	(Apr)May-Jul(Aug-Sep)	None	None	1B.2	Chaparral, Coastal dunes, Coastal scrub, Lower montane coniferous forest
Plagiobothrys chorisianus var. *chorisianus*	Choris' popcornflower	annual herb	Mar-Jun	None	None	1B.2	Chaparral, Coastal prairie, Coastal scrub
Plagiobothrys diffusus	San Francisco popcornflower	annual herb	Mar-Jun	None	CE	1B.1	Coastal prairie, Valley and foothill grassland
Polemonium carneum	Oregon polemonium	perennial herb	Apr-Sep	None	None	2B.2	Coastal prairie, Coastal scrub, Lower montane coniferous forest
Polygonum marinense	Marin knotweed	annual herb	(Apr)May-Aug(Oct)	None	None	3.1	Marshes and swamps
Sanicula maritima	adobe sanicle	perennial herb	Feb-May	None	CR	1B.1	Chaparral, Coastal prairie, Meadows and seeps, Valley and foothill grassland
Senecio aphanactis	chaparral ragwort	annual herb	Jan-Apr(May)	None	None	2B.2	Chaparral, Cismontane woodland, Coastal scrub
Silene scouleri ssp. *scouleri*	Scouler's catchfly	perennial herb	(Mar-May)Jun-Aug(Sep)	None	None	2B.2	Coastal bluff scrub, Coastal prairie, Valley and foothill grassland
Silene verecunda ssp. *verecunda*	San Francisco campion	perennial herb	(Feb)Mar-Jul(Aug)	None	None	1B.2	Chaparral, Coastal bluff scrub, Coastal prairie, Coastal scrub, Valley and foothill grassland
Stebbinsoseris decipiens	Santa Cruz microseris	annual herb	Apr-May	None	None	1B.2	Broadleafed upland forest, Chaparral, Closed-cone coniferous forest, Coastal prairie, Coastal scrub, Valley and foothill grassland
Suaeda californica	California seablite	perennial evergreen shrub	Jul-Oct	FE	None	1B.1	Marshes and swamps

▲ SCIENTIFIC NAME	COMMON NAME	LIFEFORM	BLOOMING PERIOD	FED LIST	STATE LIST	CA RARE PLANT RANK	GENERAL HABITATS
Triphysaria floribunda	San Francisco owl's-clover	annual herb	Apr-Jun	None	None	1B.2	Coastal prairie, Coastal scrub, Valley and foothill grassland
Triquetrella californica	coastal triquetrella	moss		None	None	1B.2	Coastal bluff scrub, Coastal scrub

Showing 1 to 50 of 50 entries

CONTACT US

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: July 12, 2021
Consultation Code: 08ESMF00-2021-SLI-2305
Event Code: 08ESMF00-2021-E-06615
Project Name: San Francisco Housing Element 2022 Update

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to

utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
(916) 930-5603

Project Summary

Consultation Code: 08ESMF00-2021-SLI-2305
Event Code: 08ESMF00-2021-E-06615
Project Name: San Francisco Housing Element 2022 Update
Project Type: DEVELOPMENT
Project Description: The San Francisco Planning Department (department) is proposing to update the housing element of the San Francisco General Plan (general plan). This environmental impact report (EIR) evaluates the impacts that could result from adoption and implementation of the San Francisco Housing Element 2022 Update (housing element update), which is an update to the adopted 2014 Housing Element of the general plan.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.7587898,-122.44766409256204,14z



Counties: San Francisco County, California

Endangered Species Act Species

There is a total of 27 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Salt Marsh Harvest Mouse *Reithrodontomys raviventris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/613	Endangered
Southern Sea Otter *Enhydra lutris nereis* No critical habitat has been designated for this species. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/8560	Threatened

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered
Marbled Murrelet *Brachyramphus marmoratus* Population: U.S.A. (CA, OR, WA) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/4467	Threatened
Short-tailed Albatross *Phoebastria (=Diomedea) albatrus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/433	Endangered
Western Snowy Plover *Charadrius nivosus nivosus* Population: Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/8035	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: East Pacific DPS No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
San Francisco Garter Snake *Thamnophis sirtalis tetrataenia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5956	Endangered

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened
Tidewater Goby *Eucyclogobius newberryi* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/57	Endangered

Insects

NAME	STATUS
Bay Checkerspot Butterfly *Euphydryas editha bayensis* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/2320	Threatened
Callippe Silverspot Butterfly *Speyeria callippe callippe* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3779	Endangered
Mission Blue Butterfly *Icaricia icarioides missionensis* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/6928	Endangered

Flowering Plants

NAME	STATUS
California Seablite *Suaeda californica* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6310	Endangered
Franciscan Manzanita *Arctostaphylos franciscana* There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5350	Endangered
Marin Dwarf-flax *Hesperolinon congestum* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5363	Threatened
Marsh Sandwort *Arenaria paludicola* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2229	Endangered
Presidio Clarkia *Clarkia franciscana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3890	Endangered
Presidio Manzanita *Arctostaphylos hookeri var. ravenii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7216	Endangered
Robust Spineflower *Chorizanthe robusta var. robusta* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/9287	Endangered
San Francisco Lessingia *Lessingia germanorum (=L.g. var. germanorum)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8174	Endangered
Showy Indian Clover *Trifolium amoenum* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6459	Endangered
Sonoma Sunshine *Blennosperma bakeri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1260	Endangered
White-rayed Pentachaeta *Pentachaeta bellidiflora* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7782	Endangered

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Franciscan Manzanita *Arctostaphylos franciscana* https://ecos.fws.gov/ecp/species/5350#crithab	Final

United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
Phone: (916) 930-5603 Fax: (916) 930-5654
http://kim_squires@fws.gov

In Reply Refer To: July 12, 2021
Consultation Code: 08FBDT00-2021-SLI-0205
Event Code: 08FBDT00-2021-E-00498
Project Name: San Francisco Housing Element 2022 Update

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

San Francisco Bay-Delta Fish And Wildlife
650 Capitol Mall
Suite 8-300
Sacramento, CA 95814
(916) 930-5603

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08FBDT00-2021-SLI-0205
Event Code: 08FBDT00-2021-E-00498
Project Name: San Francisco Housing Element 2022 Update
Project Type: DEVELOPMENT
Project Description: The San Francisco Planning Department (department) is proposing to update the housing element of the San Francisco General Plan (general plan). This environmental impact report (EIR) evaluates the impacts that could result from adoption and implementation of the San Francisco Housing Element 2022 Update (housing element update), which is an update to the adopted 2014 Housing Element of the general plan.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@37.7587898,-122.44766409256204,14z



Counties: San Francisco County, California

Endangered Species Act Species

There is a total of 18 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Salt Marsh Harvest Mouse *Reithrodontomys raviventris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/613	Endangered
Southern Sea Otter *Enhydra lutris nereis* No critical habitat has been designated for this species. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/8560	Threatened

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered
Western Snowy Plover *Charadrius nivosus nivosus* Population: Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast) There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/8035	Threatened

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: East Pacific DPS No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened
Tidewater Goby *Eucyclogobius newberryi* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/57	Endangered

Flowering Plants

NAME	STATUS
California Seablite *Suaeda californica* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6310	Endangered
Franciscan Manzanita *Arctostaphylos franciscana* There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/5350	Endangered
Marin Dwarf-flax *Hesperolinon congestum* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5363	Threatened
Marsh Sandwort *Arenaria paludicola* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2229	Endangered
Presidio Clarkia *Clarkia franciscana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3890	Endangered
Presidio Manzanita *Arctostaphylos hookeri var. ravenii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7216	Endangered
San Francisco Lessingia *Lessingia germanorum (=L.g. var. germanorum)* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8174	Endangered
Sonoma Sunshine *Blennosperma bakeri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1260	Endangered
White-rayed Pentachaeta *Pentachaeta bellidiflora* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7782	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

CDFW SSC or FP

FP = Fully protected under the California Fish and Game Code.

SSC = California species of special concern.

NatureServe Global and State Rank

GH = Possibly Extinct (species)—Missing; known from only historical occurrences but still some hope of rediscovery.

G1 = Critically Imperiled—At very high risk of extinction because of extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 = Imperiled—At high risk of extinction because of very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

G3 = Vulnerable—At moderate risk of extinction because of a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern because of declines or other factors.

G5 = Secure—Common; widespread and abundant.

G#G# = Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community.

G#? = Question mark indicated uncertainty as to status of a species.

SH = Possibly Extirpated (Historical)—Species or community occurred historically in the state, and there is some possibility that it may be rediscovered.

S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.;

S2 = Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.

S3 = Vulnerable—Vulnerable in the state because of a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern because of declines or other factors.

S#S# = Range Rank—A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty in the status of a species or community.

S#? = Question mark indicates uncertainty as to status of a species.

T = Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank State Rank, lower numbers equate to higher vulnerability.

Q = Q following the T-rank denotes the taxon's information taxonomic status.

California Rare Plant Rank

1A = presumed extinct.

1B = rare, threatened, or endangered in California and elsewhere.

2B = rare, threatened, or endangered in California only.

3 = plants about which more information is needed to determine their status.

4 = plants of limited distribution.

.1 = seriously endangered in California.

.2 = fairly endangered in California.

.3 = not very endangered in California.

APPENDIX F

Cultural Resources Supporting Information

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

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Appendix F.2: San Francisco Housing Element Update 2022 Archaeological Sensitivity Assessment

APPENDIX F.1. BUILT-ENVIRONMENT RESOURCES TABLES

Table F-1. Final Neighborhood and EIR Surveys

Survey Name	Year Adopted	Thematic Scope and/or Geographic Extent	Details on Historic Context	Special Considerations for Evaluations
Here Today	1968	Resources citywide identified as having significance.	Provides general information on historic development and architectural patterns in neighborhoods containing surveyed resources.	Does not assign ratings to buildings or involve in-depth archival research or formal historical evaluations of the surveyed resources. All resources included in the survey are considered significant. Listed resources are presumed architecturally significant.
Downtown Plan Survey	1977–1983	Architecturally and historically significant buildings within the C-3 Downtown zoning district previously surveyed by the Department of City Planning and San Francisco Architectural Heritage.	None included.	Assigns resources to one of four ranked categories, I–IV, generally based on architectural and environmental importance; categories I and II represent the most significant buildings that require preservation, while categories III and IV represent "contributing" buildings whose preservation is encouraged.
North Beach Architectural, Historical Cultural Survey	1982	Commercial, residential, and industrial buildings within the North Beach neighborhood, generally following the Columbus Avenue corridor between Broadway and Francisco Street.	Addresses North Beach's architectural characteristics, general setting and physical development, and social and ethnic (specifically Italian-American) history from 1880 to 1920.	Assigns resources to numbered categories, 1–6; category 1 denotes individually significant resources, while categories 2 and 3 denote contributing resources.

Survey Name	Year Adopted	Thematic Scope and/or Geographic Extent	Details on Historic Context	Special Considerations for Evaluations
Chinatown Historic District Draft National Register Designation and Landmark District Survey	1985; 1991	Resources associated with San Francisco's significant Chinese urban enclave, including association buildings, various community organizations, newspaper buildings, religious buildings, commercial establishments, and schools.	Describes the growth and social dynamics of San Francisco's Chinatown beginning in the mid-19th century, covering anti-Chinese discrimination, labor history, the establishment of numerous types of community institutions, and the use of Chinese-derived architectural motifs.	Each survey and designation report proposes a single historic district associated with the significant social and urban history of the Chinatown neighborhood. The 1991 Landmark District survey proposed 1906–1930 as the period of significance and identified contributory, altered/contributory, and non-contributory properties to the district.
Central Waterfront Cultural Resources Survey and Context Statement	2001	Resources located along San Francisco's eastern waterfront south of 16th Street, east of Interstate 280, and north of Islais Creek.	Presents an overview of physical development of the central waterfront.	Uses standard evaluative approaches.
Inner Mission North Historic Context Statement and Survey	2004	Resources within three survey areas comprising the northern portion of the Inner Mission neighborhood.	Describes residential and commercial development and property types, as well as social and demographic history, in the Inner Mission North neighborhood; focuses on the period between the mid-19th and mid-20th centuries.	Uses standard evaluative approaches.
Transbay Terminal/Caltrain Downtown Extension/ Redevelopment Project Environmental Impact Report	2004	Resources within a defined area of potential effects surrounding the Transbay Terminal in the South of Market (SoMa) neighborhood.	None provided.	Uses standard evaluative approaches.

Survey Name	Year Adopted	Thematic Scope and/or Geographic Extent	Details on Historic Context	Special Considerations for Evaluations
Historic Context for the Bayview Waterfront Plan and Hunters Point Shipyard	2008	Resources located on the Hunters Point peninsula, generally southeast of Jennings Street and east of U.S. 101.	Focuses on several historical themes that influenced industrial development and social history in the Bayview-Hunters Point neighborhood, including pre–World War II development, operations of the Hunters Point Shipyard, large-scale construction of public housing, and development on Candlestick Point.	Uses standard evaluative approaches.
Visitacion Valley Redevelopment EIR Historic Resources Technical Report	2009	Resources located within an area generally following Leland Avenue and Bayshore Boulevard, including the Schlage Lock Company site.	Presents general development trends in the Visitacion Valley neighborhood, particularly early residential and transportation development, commercial development in the Leland Avenue Commercial District, and industrial operations at the Schlage Lock Company.	Uses standard evaluative approaches.
Historic Context Statement: Balboa Park Area Plan EIR and Historic Resource Survey	2009	Resources located within an area generally following Ocean Avenue from Manor Drive on the west to San Jose Avenue on the east, with additional parcels on Geneva Avenue and San Jose Avenue. Also includes the entirety of Balboa Park.	Describes historical themes and representative resource types associated with physical development of the Balboa Park Area Plan area, including transportation, real estate construction, commercial history, and recreational park planning.	Uses standard evaluative approaches.

Survey Name	Year Adopted	Thematic Scope and/or Geographic Extent	Details on Historic Context	Special Considerations for Evaluations
Japantown Historic Resources Survey	2009	Residential and commercial buildings, civic/community institutions, industrial buildings, public utilities, and open spaces associated with Japanese-American cultural heritage within an area containing the Japantown neighborhood.	Describes significant ethnic and cultural themes in the development of San Francisco's Japanese and Japanese-American communities in the Western Addition from the 1880s to the present, including late 19th- and early 20th-century community formation, World War II internment, postwar return, and urban redevelopment.	Provides guidance for evaluating the significance and integrity of various property types associated with San Francisco's Japanese and Japanese-American communities; integrity guidance stresses feeling and association as the most important aspects when considering properties with cultural and ethnic heritage significance.
Parkmerced EIR Historic Context Statement and Survey	2010	Resources within the Parkmerced residential complex, located between 19th Street and Lake Merced.	Describes the construction history, planning concepts, and architectural/ landscape design of the Parkmerced residential complex, in addition to biographical information on associated design professionals Leonard Schultze and Thomas Church.	Consideration of multi-component resources within the project site reflects cultural landscape documentation and evaluation methodologies within a historic district framework.
Market Octavia Area Plan Historic Context Statement and Historic Resource Survey	2010	Resources within an irregularly shaped survey area following the Market Street corridor between Ninth Street and Noe Street, extending north to Turk Street and south to 17th Street.	Describes patterns of residential real estate development, commercial construction, and industry and manufacturing in the survey area, with a focus on the late 19th century to the mid-20th century.	Establishes evaluative frameworks that consider the relative rarity of commercial, residential, and institutional resource types in evaluations as well as proposed integrity hierarchies for different resource types.

Survey Name	Year Adopted	Thematic Scope and/or Geographic Extent	Details on Historic Context	Special Considerations for Evaluations
Van Ness Auto Row Support Structures: A Survey of Automobile-Related Buildings along the Van Ness Avenue Corridor	2010	Resources located along the Van Ness Avenue corridor between Pacific and Market streets; surveyed resources are associated with San Francisco's early 20th-century automotive industry and include showrooms, public garages, repair/service shops, and supply stores.	Characterizes the development of automobile-related establishments near Van Ness Avenue between the turn of the 20th century and c. 1920 and describes common property types associated with this historic context.	Focuses on resources' potential architectural and historical significance associated with the context of San Francisco's early automotive industry.
Showplace Square/ Northeast Mission EIR Historic Context Statement and Survey	2011	Resources located within the Showplace Square neighborhood and northeast portion of the Mission.	Provides information on the industrial, residential, and commercial growth patterns and property types within the survey area, with a focus on the mid-19th century to 1980.	Uses standard evaluative approaches.
Treasure Island EIR Historic Context Statement and Survey	2011	Resources located on Yerba Buena Island and Treasure Island.	Presents an overview of construction and past uses of Yerba Buena Island and Treasure Island—specifically, the islands' military history, starting in the 19th century, and the 1939 Golden Gate International Exposition.	Consideration of multi-component resources within the project site reflects cultural landscape documentation and evaluation methodologies; cultural landscape features were considered potential contributors to new or existing historic districts as well as previously identified individual resources.

Survey Name	Year Adopted	Thematic Scope and/or Geographic Extent	Details on Historic Context	Special Considerations for Evaluations
Glen Park Community Plan EIR Historic Resource Survey	2011	Resources within the core of the Glen Park neighborhood.	Focuses on the Glen Park neighborhood's residential, commercial, and institutional development, starting in the second half of the 19th century, as well as 20th-century transportation and transit development; presents representative property types associated with these broad context themes.	Uses standard evaluative approaches.
South of Market Historic Context Statement and Historic Resource Survey	2011	Resources within the portion of the SoMa district bounded by Market Street, First Street, Mission Bay, 13th Street, and South Van Ness Avenue.	Addresses patterns of pre-1906 residential and industrial development, 20th-century reconstruction and industry, demographics and ethnic communities, labor history, and post–World War II urban redevelopment.	Establishes significance thresholds for four broad property types (i.e., residential, industrial, commercial, and public assembly/institutional buildings).
Transit Center EIR Historic Context Statement and Survey	2012	Resources within an area of the eastern SoMa neighborhood, generally bounded by Market Street, Main Street, Folsom Street, and Third Street.	Describes the historical development of the eastern section of San Francisco's SoMa district, specifically post-1906 reconstruction, working-class history during the Great Depression and World War II, financial investment and redevelopment in the postwar period, and the construction boom of the late 20th century.	Uses standard evaluative approaches.

Survey Name	Year Adopted	Thematic Scope and/or Geographic Extent	Details on Historic Context	Special Considerations for Evaluations
San Francisco Civic Center Historic District Cultural Landscape Inventory	2015	Cultural landscape features within the Civic Center Historic District.	Presents a detailed history of the urban and landscape evolution of the San Francisco Civic Center during multiple phases of development.	Inventory reflects cultural landscape documentation methodologies, which inform a recommendation that previously identified historic districts in the San Francisco Civic Center should be updated to recognize the site's landscape design significance in the City Beautiful and Modern eras, the contributions of master landscape designers, and the district's associations with 20th-century social themes, such as the gay rights movement.
Central SoMa Area Plan EIR Historic Context Statement and Survey	2016	Resources in the central SoMa neighborhood bounded by Market Street, Second Street, Townsend Street, and Sixth Street.	Describes various historic urban development and demographic patterns in the center of the SoMa district, including residential construction, religious institutions, transportation systems, post-earthquake residential and commercial reconstruction, ethnic and social groups (such as the Filipino and gay communities), and labor history.	Establishes significance thresholds for residential, industrial, and commercial buildings for the time periods 1906–1936 and 1937–1973.
Better Market Street Project EIR Historical Resource Survey	2019	Designed landscapes, small-scale features, and buildings within and adjacent to the Market Street corridor between The Embarcadero and Octavia Boulevard.	Describes the physical development of Market Street from the mid-19th century to post–World War II period, with a focus on the following: Market Street's contributions to San Francisco's urban and transportation development, its role in supporting protests and social movements, and its redevelopment using Modernist environmental design principles in the 1960s and 1970s.	Consideration of multi-component resources within the Market Street corridor reflects cultural landscape documentation and evaluation methodologies within a historic district framework.

Survey Name	Year Adopted	Thematic Scope and/or Geographic Extent	Details on Historic Context	Special Considerations for Evaluations
Hub Plan EIR Historical Resource Survey	2019	Resources within an irregularly shaped plan area surrounding the intersection of Market Street and Van Ness Avenue.	Presents a broad overview of the residential, commercial, industrial, and demographic trends in the Hub Plan area between the late 19th and late 20th centuries.	Evaluations considered potential historic significance related to social historical contexts, such as second-wave feminism and LGBTQ history, as applicable.

Source: Anne Bloomfield, Randolph Delehanty, and Nancy L. Olmsted, *North Beach San Francisco: An Architectural, Historical Cultural Survey*, prepared for the North Beach Historical Project, San Francisco, CA, 1982; Carey & Co., *Visitacion Valley Redevelopment EIR Historic Resources Technical Report*, prepared for Wagstaff and Associates, San Francisco, CA, 2008; Carey and Co., Inc., *Glen Park Community Historic Resources Evaluation*, prepared for PBS&J, San Francisco, CA, 2010; Philip Choy, et. al. *Chinatown Historic District Case Report*, prepared for the San Francisco Landmarks Preservation Advisory Board, San Francisco, CA, 1991; Circa: Historic Property Development, *Historic Context for the Bayview Waterfront Plan*, prepared for PBS&J, San Francisco, CA, 2008; City and County of San Francisco Department of City Planning, *The Downtown Plan Environmental Impact Report*, San Francisco, CA, 1984; Donna Graves and Page & Turnbull, *Historic Context: Japantown, San Francisco, California*, revised, prepared for the City and County of San Francisco Planning Department, San Francisco, CA, 2011; ICF, *Better Market Street Project Draft Environmental Impact Report*, case file no. 2014.0012E, San Francisco, CA, 2019; ICF, *The Hub Plan, 30 Van Ness Avenue Project, 98 Franklin Street Project and Hub HSD Draft Environmental Impact Report*, case file nos. 2015-000940ENV, 2017-008051ENV, 2016-014802ENV, San Francisco, CA, 2019; Kelley & VerPlank Historical Resources Consulting, *Showplace Square Survey Historic Context Statement*, prepared for the San Francisco Planning Department, San Francisco, CA, 2009; Kelley & VerPlank Historical Resources Consulting, *Transit Center District Survey Historic Context Statement*, prepared for the San Francisco Planning Department, San Francisco, CA, 2008; William Kostura, *Van Ness Auto Row Support Structures: A Survey of Automobile-Related Buildings along the Van Ness Avenue Corridor*, prepared for Department of City Planning, San Francisco, CA, 2010; MIG, *San Francisco Civic Center Historic District Cultural Landscape Inventory*, prepared for the City and County of San Francisco Planning Department, San Francisco, CA, 2015; Roger Olmsted and T.H. Watkins, *Here Today: San Francisco's Architectural Heritage*, San Francisco, CA: Chronicle Books, 1968; Page & Turnbull, *Market and Octavia Area Plan Historic Resource Survey Historic Context Statement*, prepared for the San Francisco Planning Department, San Francisco, CA, 2007; Page & Turnbull, *Market and Octavia Area Plan Historic Resource Survey Survey Report,* prepared for the San Francisco Planning Department, San Francisco, CA, 2007; San Francisco Planning Department, *Central SoMa Historic Context Statement and Historic Resource Survey*, San Francisco, CA, 2015; San Francisco Planning Department, *Central Waterfront Cultural Resources Survey Summary Report and Draft Context Statement*, San Francisco, CA, October 2001; San Francisco Planning Department, *Inner Mission North 1853-1943 Context Statement,* San Francisco, CA, 2005; TBA West, Inc., *Historic Context Statement: Balboa Park Area Plan and Historic Resource Survey*, prepared for the San Francisco Planning Department, San Francisco, CA, 2008; Turnstone Consulting, *Parkmerced Project Draft Environmental Impact Report*, case file no. 2008.0021E, San Francisco, CA, 2010; Turnstone Consulting., *Treasure Island/Yerba Buena Island Redevelopment Project Environmental Impact Report*, case file no. 2007.0903E, San Francisco, CA, 2011; U.S. Department of Transportation Federal Transit Administration, City and County of San Francisco, Peninsula Corridor Joint Powers Board, and San Francisco Redevelopment Agency, *Transbay Terminal/Caltrain Downtown Extension/ Redevelopment Project Final Environmental Impact Statement/Environmental Impact Report and Section 4(f) Evaluation*, case file no. 2000.048E, San Francisco, CA, 2004.

Table F-2. Analysis Neighborhood Summaries

Figure 2-2, p. 2-4, Chapter 2, Project Description, depicts the locations of each of the following neighborhoods.

Neighborhood	Built-Environment Summary
Bayview Hunters Point	Bayview Hunters Point is bound by 25th Street to the north, the San Francisco/San Mateo county line to the south, San Francisco Bay to the east, and U.S. 101 to the west. Although subdivided as early as 1862, Bayview was too far from the developed areas downtown to attract much concentrated residential development (beyond Third Street) until the early 20th century. However, the area's remote location made it ideal for industry, particularly shipbuilding and meatpacking plants. As the district's industrial and residential base grew throughout the 1910s and 1920s, most of the Islais Creek estuary was filled in to make room for new industrial sites and the neighborhood became an enclave for Italian and Maltese workers. However, it was not until World War II that Bayview leapfrogged into the top ranks of industrial zones on the West Coast, following acquisition of the Hunters Point Dry Dock by the U.S. Navy in 1940. During this period, the population of the district exploded as many African American residents moved to Hunters Point to take jobs in the naval shipyard. Thousands of housing units for workers were hastily constructed to meet demand, and development continued until Bayview approached build-out in the 1950s, although redevelopment has remained a constant presence in the neighborhood ever since. Because of systemic disinvestment, environmental degradation, and extensive job losses following closure of the Hunters Point Naval Shipyard in 1974, Bayview struggled economically during the latter half of the 20th century; yet, it has remained a significant hub for African American life and culture in the city. Today, Bayview is a mixed-use neighborhood, with industrial facilities concentrated along the waterfront and residences clustered around the Third Street commercial corridor.
Bernal Heights	Bernal Heights runs from Cesar Chavez Street to the north, Bayshore Boulevard to the east, John F. Foran Freeway (Interstate 280) to the south, and San Jose Avenue to the west. In its early years, Bernal Heights remained isolated from the more developed areas of San Francisco and was used primarily for ranching and small-scale farming. In 1864, however, the San Francisco – San Jose Railroad opened and passed through the western edge of Bernal Heights. By 1869, a few dozen buildings had been erected in the greater Bernal Heights area. Various transportation improvements during the late 19th century—especially streetcar lines running on Valencia and Mission Street—led to steady development along the lower slopes of Bernal Heights. As the neighborhood evolved, it assumed a primarily working-class character typified by the construction of modest wood-frame cottages and flats. After the 1906 earthquake and fire, Bernal Heights experienced a sustained period of development. Infill of the steep upper slopes of Bernal Heights followed, and the neighborhood was primarily built out by the 1960s. Today, Bernal Heights remains a solidly residential neighborhood with commercial districts on Mission Street and Cortland Avenue.

Neighborhood	Built-Environment Summary
Castro/Upper Market	Castro/Upper Market spans Dolores Street to the east, Duboce Avenue to the north, Clayton and Buena Vista Avenues to the west, and 21st Avenue to the south. The neighborhood was subdivided beginning in the 1850s but remained mostly farmland until the 1880s when the extension of the Market Street Railway cable car connected the neighborhood to employment opportunities downtown. By 1906, Castro/Upper Market was a thriving streetcar suburb. Following the earthquake, the neighborhood densified significantly. Single family homes remained the most common housing type, but new flats and apartment buildings appeared along the Market Street corridor. Meanwhile, single-family dwellings in Corbett Heights replaced the last vestiges of agriculture in the area. The completion of the Twin Peaks Tunnel in 1917 and the extension of Market Street past its previous terminus at Castro Street in 1918 better connected the area to emerging western neighborhoods. By 1930, Castro/Upper Market was essentially built out and remained relatively unchanged until after World War II when many longtime residents relocated to the western neighborhoods. Attracted by the newly abundant and inexpensive housing stock, members of the LGBTQ community began moving to the area. By the mid-1970s, the Castro was the cultural, economic, and political center for gay San Francisco. Although rising property values beginning in the 1980s made the neighborhood prohibitive for many, it remains an important hub for gay tourism. Today, Castro/Upper Market is a residential neighborhood mixed with the major commercial corridor Market Street and smaller, neighborhood-serving commercial corridors along Castro Street and 18th Street.
Chinatown	Chinatown is bound by Columbus and Pacific Avenues to the north, Mason Street to the west, Sacramento and California streets to the south, and Battery Street to the east. During the Gold Rush, most Chinese immigrants settled near Portsmouth Square in what is now Chinatown. As San Francisco expanded south and west during the 19th century, exclusionary laws and racial violence prevented the Chinese community from living elsewhere. By the beginning of the 20th century, Chinatown was one of the most segregated communities in the country. After the 1906 earthquake leveled the neighborhood, city officials pressured residents to relocate to Hunter's Point, but the Chinese community resisted and quickly rebuilt, using the earthquake as an opportunity to transform Chinatown into a tourist destination. During the rebuilding process, the addition of decorative pagodas, curved canopies, and dragon motifs generated a distinct architectural identity. Although Chinatown was fully rebuilt by 1915 and its tourism industry flourished, the cumulative impacts of redlining led to severe overcrowding and deteriorating conditions by the 1930s. After a prolonged advocacy campaign, Ping Yuen, the first federally funded public housing project for Chinese residents, opened in 1951. When barriers to residential integration began to fall in the 1950s, scores of families left Chinatown, yet the neighborhood remained the primary cultural and commercial center of the city's Chinese-American community until Chinese-American businesses established themselves in the western neighborhoods. In more recent decades, Chinatown has remained one of the city's premier tourist destinations, while emerging as a center for Asian-American activism and community organizing. Today, it is a dense, mixed-use neighborhood with ground floor commercial uses and residences on upper stories.

Neighborhood	Built-Environment Summary
Excelsior	The Excelsior is bound by Interstate 280 to the north, Mission Street to the west, the San Francisco/San Mateo county line to the south, and McLaren Park to the east. The area was used as farmland beginning in 1869 when German, Irish, Italian, and Swiss immigrants created agricultural communities that supplied produce to downtown markets. The Excelsior did not experience widespread residential development until after the 1906 earthquake and fire, when displaced residents relocated from burned areas of the city. These new inhabitants included many Italians from North Beach, whose legacy is evident in extant structures like the Sons of Italy Hall and the Italian-American Social Hall. Residential construction remained steady throughout the 1910s and 1920s as modest Queen Anne style cottages and Craftsman bungalows replaced existing farmland. Beginning in 1912, the Crocker Amazon subdivision marketed an affordable alternative to San Francisco's more expensive residence parks, offering a chance for working class people to own a house in the city with a garden. By the 1940s, the neighborhood was essentially built out. When the Italian community began to leave the Excelsior in the 1960s and 1970s, new residents of Latinx, Filipino, Chinese, Samoan, Cambodian, and Vietnamese ancestry migrated to the neighborhood where they remain in large numbers. Today, the Excelsior is a residential area with access to the Mission Street and Geneva Avenue commercial corridors.
Financial District/South Beach	The Financial District lies in the city's northeast quadrant and boarders the San Francisco Bay, North Beach, Chinatown, Nob Hill, the Tenderloin, SoMa, and Mission Bay. The neighborhood's original street grid was platted in 1847 and oriented around the Ferry Building and nearby piers. Although the initial hub of the district was located at Portsmouth Square in what is now Chinatown, the financial heart of the city had, by the 1860s, migrated to the intersection of Market Street and Montgomery Street where three- to five-story buildings fanned out for several blocks in all directions. After the 1906 earthquake and fire obliterated almost all the neighborhood's buildings, the Financial District experienced a sustained building boom. During this period, ornate, six- to 12-story masonry-clad offices populated the Market Street corridor until it was built out, while industrial buildings relocated to the South Beach or South of Market area. A few skyscrapers were added during the late 1920s, but the area saw almost no new construction from the onset of the Depression until after World War II, when International Style office towers were steadily added. During this period, the Financial District also underwent extensive infrastructure projects, including the addition of the Embarcadero Freeway (1959) and the Bay Area Rapid Transit (BART) lines (1960s), and the Redevelopment Agency's Golden Gateway (1960s) and Yerba Buena Center (1960s–1980s) projects. Beginning in the 1980s, the formerly industrial South Beach area was redeveloped as a mixed-used neighborhood. In more recent decades, the Financial District has remained an important hub for business and commerce, even as the emergence of the technology industry has seen many companies relocate jobs to SoMa or Silicon Valley. Today, it remains the city's densest cluster of office and commercial buildings.

Neighborhood	Built-Environment Summary
Glen Park	Glen Park spans Bosworth Street to the south, San Jose Avenue to the east, 30th Street, Diamond Heights Boulevard, and Turquoise Way to the north, and O'Shaughnessy Boulevard to the west. Concentrated development began in the 1890s following the construction of an interurban electric streetcar line and increased following the 1906 earthquake and fire. Popular architectural styles at that time included Craftsman and vernacular cottages, and dwellings influenced by Queen Anne–style precedents. Another wave of residential development occurred with the introduction of Federal Housing Administration long-term mortgage loans in 1934. The neighborhood was built out by mid-century, with the exception of Diamond Heights where steep topography deterred development until a confluence of factors, including a housing shortage following World War II, a newly empowered Redevelopment Agency, and a court ruling that allowed undeveloped areas to be considered "blighted" because of economic disuse, cleared the way for redevelopment. Construction in Diamond Heights began in 1962 and was completed by 1983. The development featured mostly Midcentury Modern, Second Bay Tradition, Third Bay Tradition, and Brutalist homes. Beginning in 1973, service at the Glen Park station of the BART system connected the neighborhood to the rest of the region. Today, Glen Park remains a primarily residential area with a small commercial district along Diamond Street.
Golden Gate Park	Golden Gate Park is bound by Fulton Street to the north, Stanyan Street to the east, Lincoln Way to the south, and the Pacific Ocean to the west. Originally part of San Francisco's western Outside Lands, the project of Golden Gate Park commenced in 1870. Inspired by New York City's Central Park, the park sought to offer a leisure location and natural oasis to city residents. The first structure in the park, the Conservatory of Flowers, was constructed in 1879. Other important cultural attractions in the park such as the Japanese Tea Garden were revealed in the California Midwinter International Exhibition of 1894. After the 1906 earthquake and fire, Golden Gate Park served as a crucial shelter for hundreds of thousands of displaced residents and once the city recovered, it resumed its identity as a hub of nature and culture. Throughout the 20th century, Golden Gate Park saw the addition of the de Young Museum, the California Academy of Sciences, the Hall of Flowers, and the San Francisco Botanical Garden, among others. Many of these structures were constructed as New Deal projects throughout the 1930s, with the current de Young Museum and California Academy buildings added in the early 2000s.
Haight Ashbury	Haight Ashbury spans Steiner Street to the east, Oak Street to the north, Stanyan Street to the west, and Upper Terrace and Buena Vista Avenue to the south. The neighborhood's development is closely tied with the development of Golden Gate Park. As the park began to take shape, real estate speculators and streetcar companies lobbied for the introduction of mass transit. The transit lines opened in the 1880s and touched off a sustained period of residential development in Haight Ashbury, which featured Stick/Eastlake and Queen Anne rowhouses, built primarily between 1890 and 1910. Originally, a larger area had been contemplated for Golden Gate Park but claims by land squatters resulted in a narrower boundary at the park's eastern end, now known as the Panhandle. The neighborhood experienced another pulse of development following the 1906 earthquake and fire when many residents relocated to areas outside the burned districts. By 1910, Haight Ashbury had been mostly built out and remained relatively unchanged until the 1950s when middle- and upper-class families moved into newer housing in the western neighborhoods. An abundance of inexpensive housing was left in their wake, which was filled with young artists, students, hippies, and migrants. By the middle of the 1960s, Haight-Ashbury had become the center of the counterculture movement, culminating in the Summer of Love. Today, Haight-Ashbury is a residential neighborhood with access to Buena Vista Park, the Panhandle, and the Haight Street commercial corridor where local businesses continue to pay tribute to the neighborhood's countercultural roots.

Neighborhood	Built-Environment Summary
Hayes Valley	Hayes Valley is bordered by Fulton Street to the north, Van Ness Avenue to the east, Market Street, Duboce Avenue, and Oak Street to the south, and Baker Street and Steiner Street to the west. The neighborhood was one of the first to develop in the broader Western Addition area after the 1855 Van Ness Ordinance. Colonel Thomas Hayes owned the primary tract in the area and sought to market the area to potential homeowners; after his efforts to construct a steam railroad line and, later, a horse-car line along Market Street, residential development took off in Hayes Valley in the 1860s. By 1869, the neighborhood's core was developed, and by the 1880s, a large commercial swath along Hayes between Laguna and Franklin arose. After the 1906 earthquake, much of the destroyed portion of the neighborhood was reconstructed with mixed-use buildings for newcomers. Most of the area was built out by the early 20th century. The remainder of the century saw the construction of the Central Freeway in the 1950s, which brought noise and pollution to the area, and its removal and replacement with a redesigned Octavia Boulevard in the 1990s. From its conception to now, Hayes Valley has served as a mixed-use area with residential, neighborhood commercial, and light industrial uses.
Inner Richmond	The Inner Richmond district lies between the Presidio to the north, Arguello Boulevard to the east, Fulton Street to the south, and Park Presidio Boulevard to the west. In the 1860s, the Clement Ordinance and Outside Lands Ordinance reserved land in the neighborhood for public parks, hospitals, cemeteries, and other civic needs. Golden Gate Park (1860s) and the Bay District Race Track (1874), were early developments; however, most of the land remained undeveloped prior to the turn of the century. In the late 1870s, streetcar lines connected the Inner Richmond to the downtown core; residential development soon arose in surrounding blocks. Development of the Inner Richmond increased at a feverish pace during the early 20th century, in large part due to the need for post-earthquake housing. Beginning in the interwar period, a large portion of San Francisco's Russian population relocated to the Richmond. Soon after, starting in the 1950s, many Chinese Americans relocated from Chinatown. With a large residential housing stock and convenient public transportation lines to Chinatown, the area became known as the "Second Chinatown." Throughout the 1970s and 1980s, the Inner Richmond welcomed a pan-Asian American/Pacific Islander community as well. Though the neighborhood was primarily built out by the 1920s, the increasing population of the neighborhood led to replacement of numerous single-family dwellings with larger multi-family properties—a process that has continued into the present. Today, the neighborhood is primarily residential, with neighborhood commercial districts and clusters on Geary Boulevard, Clement Street, California Street, and Balboa Street.
Inner Sunset	The Inner Sunset is borders Stanyan Street to the east, Lincoln Way to the north, 19th Avenue to the west, and Quintara Street and Clarendon Avenue to the south. Although the Inner Sunset was incorporated in the 1860s as part of the Outside Lands Ordinance, its rolling sand dunes were not platted until the 1890s. Residential development before the 1906 earthquake and fire was limited and largely contained to the neighborhood's northeast corner. Sporadic development continued following the earthquake when a mix of single-family and multi-family residences were constructed in various styles along the boundary with Golden Gate Park. At the time, the area was primarily Irish and Italian. The most robust period of residential construction occurred in the 1920s and 1930s when the newly constructed Duboce Tunnel improved access to downtown and the rise of private automobiles made the Inner Sunset a more attractive location for families. Tract developments soon filled out the neighborhood's remaining sections and the Inner Sunset approached build-out by 1940. When racial barriers to housing began to fall in the 1950s and 1960s, many Chinese immigrants and residents from Chinatown moved to the area where they remain in large numbers. The neighborhood experienced a final pulse of development in the 1970s when the Golden Gate Heights subdivision was constructed on the neighborhood's steepest slopes. Today, the Inner Sunset is a residential neighborhood that abuts Golden Gate Park and features a neighborhood-serving commercial district along Irving Street.

Neighborhood	Built-Environment Summary
Japantown	Japantown is bound by Sutter Street to the north, Gough Street to the east, Geary Boulevard to the south, and Baker Street to the west. It should be noted that these boundaries are different than those identified for the Japantown Cultural District. Though Japanese had begun to arrive in California in 1869, they did not settle in significant numbers in the area later known as Japantown until after the 1906 earthquake when Japanese enclaves in Chinatown and SoMa were destroyed. As the community settled, the presence of Japanese stores, personal services, and professionals grew, especially along Post, Buchanan, and Fillmore streets. By the 1930s, several dedicated structures, such as schools, churches, and cultural halls, were constructed and became fixtures of the neighborhood. After World War II and the forced internment of much of San Francisco's Japanese-American population, Japantown became more dispersed and ethnically mixed. Another change came to the neighborhood with the San Francisco Redevelopment Agency's clearance of the area in the 1950s and 1960s; from the 1960s to the 1980s, much of the heart of Japantown was reconstructed with Japanese culturally thematic designs and uses. The neighborhood was primarily built out by this period but still retained buildings from the early 20th century as well. Although most Japanese Americans no longer live within the boundaries of Japantown, it remains a culturally significant site and host to numerous cultural and educational events, such as the Cherry Blossom Festival. Today, Japantown is a mix of residential (mixed-use and medium-density) structures and neighborhood-serving commercial corridors within the Japantown complex and on Fillmore Street.
Lakeshore	Lakeshore is bound by Eucalyptus Drive, Lake Merced Boulevard, and Sloat Boulevard to the north, 19th Avenue to the east, the San Francisco/San Mateo county line to the south, and the Pacific Ocean to the west. Because of its remote location, the neighborhood saw little development prior to the 20th century. Originally envisioned as San Francisco's main reservoir, Lake Merced and the surrounding area was freed up for development only after the construction of Hetch Hetchy in 1908. Still, residential construction remained rare until the M-Oceanview streetcar connected the neighborhood to downtown in 1927. The most sustained period of development in Lakeshore occurred during the 1930s and 1940s, characterized by large subdivisions of detached single-family homes that were marketed to middle- and upper-class families. Beginning in 1939, San Francisco State University constructed a new campus on the eastern shores of Lake Merced. Parkmerced, San Francisco's first exclusively rental subdivision, was built between 1941 and 1951 to address a shortage of worker housing during and after World War II. Lakeshore acquired a major commercial center in 1952 with the introduction the Stonestown Mall. By the midcentury, the neighborhood was essentially built out and has remained relatively unchanged ever since. Today, Lakeshore features a mix of residential subdivisions, the Stonestown Mall, and popular recreation destinations, such as the San Francisco Zoo and Lake Merced.
Lincoln Park	Lincoln Park runs along the ocean to the north, the 32nd Avenue border of Sea Cliff to the east, Clement Street to the south, and the Outer Richmond to the west. From 1868 until 1909, the land now known as Lincoln Park was used as City Cemetery. In 1909, the Park Commission took over the land and dedicated it as Lincoln Park. Soon, in 1917, the golf course was expanded to an 18-hole facility. Also during this time, sections of the land were granted to the federal government for the adjacent Fort Miley Military Reservation. Another development came in 1923 with the construction of the Legion of Honor fine arts museum. Most recently, in 1984, artist George Segal designed the San Francisco Holocaust Memorial in the park. Today, Lincoln Park is zoned as public land and used primarily for recreational and cultural purposes.

Neighborhood	Built-Environment Summary
Lone Mountain/USF	Lone Mountain/USF spans Arguello Boulevard to the west, Geary Boulevard to the north, Baker Street to the east, and Fell Street to the south. The neighborhood was incorporated in 1856 but remained too far removed from built-up areas of the city to attract concentrated residential development. From the 1850s to the 1930s, the area was part of the Lone Mountain Cemetery complex, which consisted of four main cemeteries. As a result of transportation improvements beginning in the 1880s, some residential development occurred in the neighborhood's southern section along the border with the Panhandle. But the primary catalyst for development in Lone Mountain was the removal and relocation of most gravesites to Colma in the 1930s. The vacated cemetery made way for the construction of large institutional buildings, such as the San Francisco College for Women, which would later become part of the University of San Francisco (USF) campus. The remaining sections of the neighborhood, including Anza Vista, were built out in the 1950s and 1960s. Today Lone Mountain/USF is a mixed-use neighborhood that features residential enclaves, educational campuses, and medical facilities.
Marina	The Marina extends from the bay to the north, Van Ness Avenue to the east, Green Street and Vallejo Street to the south, and the Presidio to the west. In the 1860s, most of the Marina was either submerged beneath the bay or consisted of tidelands. In 1910, the land was acquired for the 1915 Panama-Pacific International Exposition (PPIE) and filled with sand and mud. Remaining PPIE buildings include the Yacht Harbor, the North Gardens (now Marina Green), and the Palace of Fine Arts. After the fair, property owners sought to create a high-class residential district, similar to St. Francis Wood. In 1922, the Marina Corporation was formed to develop 55 acres bounded by Fillmore, Scott, Chestnut, and Marina Boulevard. New houses, flats, and apartments were constructed in a variety of architectural styles, especially Mediterranean Revival and Classical Revival. Nearby public development included the Funston Playground (now called Moscone Recreation Center) and the Marina Junior High School (1937). During this time, portions of Chestnut Street evolved as the primary commercial corridor. By the late 1930s, the Marina was almost completely built out. During the mid-20th century, Lombard Street was developed with a large number of motels catering to auto tourists on their way to the Golden Gate Bridge. More recently, the Marina suffered severe damage during the 1989 Loma Prieta earthquake; liquefaction caused buildings to collapse and gas mains to burst. Today, the Marina is residential with commercial areas on Union, Fillmore, Chestnut, and Lombard streets.
McLaren Park	McLaren Park borders the neighborhoods of Visitacion Valley, the Excelsior, and Portola. Throughout the latter half of the 19th century, the area that is now McLaren Park was the subject of several unrealized subdivision schemes. In 1904, Daniel Burnham helped popularize the idea of using the land as a public park. His plan catalyzed a public campaign to bring more outdoor space to the city's southern neighborhoods, whose residents could not easily access Golden Gate Park. In 1926, the board of supervisors passed a resolution directing the purchase of a 550-acre park. When the bond resolution that would have funded the site's acquisition failed in 1928, the City instead acquired the parkland parcel by parcel over the next several decades, eventually reaching the park's present-day 318-acre footprint in 1958. Much of the park's infrastructure, trails, and tree plantings were established in the 1930s as part of the Works Progress Administration. The park experienced another pulse of development beginning in the late 1950s when new amenities were steadily added, including a swimming pool, amphitheater, and golf course. Today, McLaren Park remains one of the city's most popular outdoor spaces, attracting a mix of hikers, bikers, birders, naturalists, and families.

Neighborhood	Built-Environment Summary
Mission	The Mission District extends from Market Street, 11th Street, and Division Street to the north; Vermont Street and the James Lick Freeway (U.S. 101) to the east; Cesar Chavez Street to the south; and Dolores Street to the west. Throughout the late 18th century, the area was centered around Mission Dolores and existed as the center of Spanish proselytizing efforts and subjugation of the Native American community. It retained a pastoral identity until the late 19th century. During this time, Valencia Street, Mission Street, and the east side of 16th Street emerged as central commercial corridors, identities that they retain to this day. The 1906 earthquake and fire destroyed much of the neighborhood, excluding Mission Dolores; the Tanforan Cottages, two of the oldest residences in the city; and Dolores Park. Between 1907 and 1915, the majority of the neighborhood was rebuilt with low-rise, post-earthquake reconstruction-era flats and apartments. At the time, the neighborhood was associated primarily with Irish, German, and Polish residents. In the 1970s and 1980s, along with its rising punk nightlife scene, the area became known for its residents from Central and South America and soon became the city's nucleus of Latinx culture. More recently, the neighborhood has undergone a demographic shift with many new, younger people relocating there and sometimes displacing longtime residents. It is now a neighborhood with various uses, including residential areas, commercial corridors on Mission, Valencia, and 24th streets, transit-oriented districts, and production, distribution, and repair districts.
Mission Bay	Mission Bay is bounded by Townsend Street to the northwest, San Francisco Bay to the east, and 16th and 17th streets to the south. For much of its history, Mission Bay was a shallow inlet and marsh. Beginning in the 1850s, settlers began to use the area for shipbuilding, repairs, and clam and oyster collection. From 1860 to 1910, infill occurred and increased the amount of developable land in the area. Until the late 20th century, Mission Bay was primarily industrial, with warehouses, shipyards, slaughterhouses, factories, foundries, and tracks. In the late 1990s, the city devised the Mission Bay Project, which sought to convert the area into a planned community. The area soon welcomed the University of California, San Francisco Mission Bay campus as well as luxury apartment buildings and the Chase Center basketball stadium. Although some pier-related structures remain from the early 1900s, many properties in the area date to the first decade of the 21st century. Development is ongoing, and the neighborhood is still zoned as the Mission Bay Redevelopment Area.
Nob Hill	Nob Hill spans from Clay Street and Green Street to the north, Mason Street and Powell Street to the east, Post Street to the south, and Leavenworth Street and Van Ness Avenue to the west. Residential development commenced in Nob Hill in 1853 and increased throughout the late 19th century with the construction of the Clay Street cable car line. In its initial days, the neighborhood was primarily home to the extravagant residences of mining and railroad magnates. Much of the neighborhood was destroyed in the 1906 earthquake and fire. During reconstruction, a number of luxury apartment buildings were constructed in the upper portions of the neighborhood, including a cluster of Beaux Arts buildings on Sacramento Street. At the same time, portions of Lower Nob Hill were built up with three- to seven-story multi-unit residential buildings and hotels. Many of these structures now make up the historically intact Lower Nob Hill Apartment Hotel National Register District. Along with apartments, the neighborhood is well known for its collection of hotels, including the Fairmont and Mark Hopkins, as well as Huntington Park. Nob Hill shares a border with nearby Chinatown; there is overlap between the two neighborhoods. Nob Hill has a Chinese-American presence, and key institutions, such as the Chinatown Library, remain on the border of the two. The neighborhood was primarily built out by the 1920s. Today, it remains residential in character, with commercial areas on Polk Street (frequented by the LGBTQ community in the 1960s through 1970s), California Street, Larkin Street, Hyde Street, and Pacific Avenue.

Neighborhood	Built-Environment Summary
Noe Valley	Noe Valley is bound by 21st Street to the north, Market Street and Diamond Heights Boulevard to the west, 30th Street to the south, and Dolores Street to the east. The neighborhood's street grid was platted beginning in 1853 when John Horner purchased the land with the intention to create a residential suburb. However, the area remained too far removed from developed portions of the city to attract much interest. New horse carriage routes in the 1860s enabled limited residential construction at the eastern edge of the neighborhood, but the primary catalyst for the development of Noe Valley was the construction of new streetcar lines in the 1880s. By the mid-1890s, Noe Valley was rapidly developing as a streetcar suburb, with rows of semi-identical Queen Anne–style cottages, many constructed by merchant builders such as Fernando Nelson, Jonathon Anderson, and Joseph Comerford. These small, affordable cottages were designed for the neighborhood's working-class residents, who were primarily Irish, German, Scandinavian, Italian, and Russian immigrants. Noe Valley was relatively undamaged by the 1906 earthquake; the neighborhood escaped the fires that consumed much of the city. With its infrastructure intact, many displaced residents moved into the area, and Noe Valley experienced another surge of growth. Flats and multi-family dwellings became more common during this time. Noe Valley experienced gradual infill in the year prior to World War II. The neighborhood's southwestern hills remained mostly undeveloped until midcentury street improvements paved the way for a final pulse of development. By the 1970s, the neighborhood was built out. Today, Noe Valley is most residential with neighborhood serving commercial corridors along 24th Street and Church Street.
North Beach	North Beach spans from Pacific Avenue to the south, Sansome Street to the east, the San Francisco Bay to the north, and Columbus Avenue to the west. Originally known as the "Latin Quarter," North Beach was home to a variety of European and Latin American ethnic groups in the 1850s. The working-class community, which labored along the industrial waterfront and quarried on Telegraph Hill, was relatively isolated from the rest of the city until street grading and the construction of Montgomery Avenue (now Columbus Avenue) in the 1860s allowed for more direct access to downtown. Connectivity continued to improve with the introduction of cable car lines in the 1880s. By 1886, the neighborhood was essentially built out but continued to densify over the next 20 years as flats replaced some smaller residences. The 1906 earthquake leveled the neighborhood, but residents began rebuilding just days after the disaster. North Beach recovered faster than any other neighborhood in the city. It was during this reconstruction period that North Beach took on its primarily Italian character. Although the area was fully rebuilt by 1915, some additional residential development occurred in the 1920s farther up Telegraph Hill, capped by Coit Tower in 1933. The neighborhood remained relatively unchanged until after World War II when many Italians moved to the Excelsior or the suburbs. As Italians left North Beach, new residents of Chinese ancestry as well as members of the LGBTQ community and Beat generation moved in. Beginning in the 1970s, the neighborhood's rising property values and the reemergence of the Financial District transformed North Beach into a white-collar community. Today, North Beach is a mixed-use neighborhood with residential sections bounded by commercial districts along Columbus Avenue and the waterfront. The neighborhood remains a magnet for Italian American tourism and retains the city's largest concentration of pre-1870s structures on Telegraph Hill.

Neighborhood	Built-Environment Summary
Ocean View/Merced/Ingleside	The Ocean View/Merced/Ingleside neighborhood reaches from Ocean Avenue and Holloway Avenue to the north, the John F. Foran Freeway (Interstate 280) to the east and south, and Junipero Serra Boulevard to the west. The area was originally a ground for cattle grazing. The closest transportation route in the area was the San Jose Road (today's San Jose Avenue). The opening of the San Francisco and San Jose Railroad in 1864 catalyzed the development of the neighborhood, spurring the creation of several homestead associations which subdivided land near the new line. Throughout the 1870s, a cluster of buildings, including saloons, roadhouses, and lodging houses developed around the Ocean View station. Despite these developments, by the turn of the century, the area still remained relatively remote. More sustained residential development of the area followed the 1906 earthquake and fire. An added attraction during this time was Balboa Park, created in 1908. Then, in 1910, the former Ingleside Racetrack land was redeveloped as a residence park, designed in accordance with "City Beautiful" principals. The neighborhood experienced an even larger pulse of development—both residential and commercial—during the 1920s; by this point, most of the Ingleside portion of the neighborhood was built out. Access to the neighborhood also improved during this period with the M-Ocean View line. More infill occurred in the years before and after World War II, and by the 1950s, the final build-out was primarily complete. Initially populated by German, Swiss, and Italian blue-collar laborers, during the 1950s, middle-income African-American residents began moving to the area south of Ocean Avenue, which did not have restrictive racial covenants. Today, Ocean View/Merced/Ingleside is primarily residential, with commercial pockets on Ocean Avenue, 19th Avenue, Capitol Avenue, Plymouth Avenue, Holloway Avenue, and Randolph Street.
Outer Mission	The Outer Mission is bound by Mission Street to the east, Saint Mary's Avenue to the north, Interstate 280 to the west, and the San Francisco/San Mateo county line to the south. Construction of a railway line in 1864, today's Interstate 280 alignment, allowed agriculture to flourish in the Outer Mission, which was originally used for grazing, and connected Italian, Swiss, and German farmers to downtown markets. Other development remained rare until the 20th century, except for the 1859 construction of a large juvenile detention facility (now the site of City College). Following the 1906 earthquake and fire, worker housing was constructed at the northernmost section of the neighborhood, near the intersection of Mission Street and Geneva Avenue. Balboa Park, built in 1908, attracted additional new residents, initiating a steady wave of residential development that would continue over the next several decades, most often in Craftsman or Period Revival styles. By the onset of World War II, the neighborhood was essentially built out and remained relatively unchanged for several decades, until an influx of Asian and Latinx residents transformed the demographics of the area. Today, the Outer Mission is a residential neighborhood but mixed with commercial districts along Mission Street, Geneva Avenue, and Ocean Avenue.

Neighborhood	Built-Environment Summary
Outer Richmond	The Outer Richmond is bound by Fulton Street to the south, Park Presidio Boulevard to the east, Lake and Clement streets to the north, and the Pacific Ocean to the west. Originally used for grazing, the Outer Richmond experienced limited commercial development beginning in 1863 when Point Lobos Road (today's Geary Boulevard) connected downtown San Francisco to recreational destinations, such as the Cliff House. Along the thoroughfare, racetracks, restaurants, and saloons replaced ranches and catered to weekend travelers on their way to the ocean. Although there was some residential building between 20th and 26th avenues in the 1880s, most land remained undeveloped until the turn of the century. The most sustained period of construction in the Outer Richmond occurred following the 1906 earthquake when thousands of displaced residents (primarily Irish, German, and Jewish descent) relocated. During this period, merchant builders purchased large parcels of land and constructed residences that featured similar floor plans and architectural detailing. By 1930, the neighborhood was essentially built out and remained relatively unchanged until the 1960s when Chinese and Russian communities began migrating to the area. Today, the Outer Richmond is a residential neighborhood with commercial clusters along Geary Boulevard, Clement Street, and Balboa Street.
Pacific Heights	Pacific Heights spans Sutter Street to the south, Van Ness Avenue to the east, Green and Vallejo streets to the north, and Lyon Street to the west. The street grid for Pacific Heights was first platted during the 1850s as a result of the Van Ness Ordinance, but the primary catalyst for the development of Pacific Heights was the construction of cable car lines that connected the area to the rest of the city. By 1877, the eastern portion of Pacific Heights was within easy commuting distance of downtown, and by the 1890s the entire neighborhood was well-serviced by public transit. The development pattern in Pacific Heights during the late 19th and early 20th centuries was characterized by the construction of large, detached residences with ample front and side setbacks. The neighborhood largely escaped damage during the 1906 earthquake and fire and soon experienced a punctuated period of infill. Pacific Heights underwent another significant period of growth during the 1920s, when the advent of private automobiles facilitated the development of areas further away from streetcar lines. By 1930, the area was essentially built out; however, during World War II, many of the large, surviving Gilded Age rowhouses in Pacific Heights were subdivided into boarding houses to accommodate a huge influx of war workers. Today, Pacific Heights remains one of the most prestigious residential neighborhoods in the city, showcasing a mix of large apartment buildings and elegant single-family dwellings, with the neighborhood-serving commercial corridor along Filmore Street.
Portola	Portola spans Ward Street to the south, U.S. 101 to the east, Interstate 280 to the north, and Maclaren Park to the west. Initially a hub for vegetable farming and flower nurseries, the neighborhood experienced little development beyond farmhouses prior to the 1906 earthquake. A university college campus site was planned for the Portola area in the late 1800s, inspiring the streets to be named after prestigious colleges and universities. Spurred by the 1906 earthquake and sustained by the San Bruno Avenue streetcar line, residential development exploded in the area during the early 20th century. A large community of Russian Orthodox Jews relocated from South of Market neighborhood to Portola, which became known as "Little Jerusalem." The real estate boom continued throughout the 1910s and 1920s. By the Great Depression, the neighborhood had reached build-out, though a significant portion of Portola remained dedicated to agricultural uses. Following World War II, the neighborhood experienced a series of demographic shifts. Portola's Jewish community had dispersed by the 1950s, but the neighborhood soon attracted new residents: the Latinx and Ukrainian communities beginning in the 1960s, the African American community beginning in the 1970s, and the Chinese and Filipino communities beginning in the 1980s. Meanwhile, tract housing gradually replaced farms and greenhouses from the 1950s through the 1980s. Today, Portola is a residential community oriented around the San Bruno Avenue commercial corridor.

Neighborhood	Built-Environment Summary
Potrero Hill	Potrero Hill spans 17th Street to the north, U.S. 101 to the west, 26th Street to the south, and the San Francisco Bay to the east. Beginning in the 1860s, manufacturing companies gravitated to Potrero Hill's deep-water access and remote location. The neighborhood experienced its first sustained wave of development in 1867 when a wooden causeway known as "Long Bridge" (today's Third Street) connected Potrero Point to the South of Market area, catalyzing the construction of factories, ports, and worker housing in Dogpatch, which retains the largest concentration of Gilded Age–era worker housing in San Francisco. Meanwhile, large-scale earthmoving projects removed the eastern part of Potrero Hill that infilled nearby marshland and paved the way for further development. By the end of the 19th century, as land became limited along the waterfront, the neighborhood's working-class community (originally ethnically Irish and German but later increasingly Italian, Latinx, Scandinavian, Russian, and Japanese) settled on the slopes of Potrero Hill, creating a distinct residential section to the west. Most of these homes were built between 1895 and 1925 in the Italianate, Stick/Eastlake, or Queen Anne style and remain standing today. Potrero Hill grew for several reasons until reaching build-out in 1930. It avoided extensive damage during the 1906 earthquake, shared a boundary with the rapidly expanding Mission District, and thrived economically during World War I when ships and metal were in high demand. When its maritime economy faltered after World War II, numerous factories and homes were demolished to make way for trucking routes and new auto-oriented businesses. In more recent decades, the construction of live-work spaces has helped redefine Potrero Hill as a center for technology and innovation. Today, it remains a mixed-use neighborhood, with industrial facilities clustered along the eastern waterfront, residential areas to the west, and small neighborhood-serving commercial corridors along Third, 18th, and 20th streets.
Presidio	The Presidio is bound by Lyon Street to the east, West Pacific Avenue and Lake Street to the south, and San Francisco Bay to the north and west. The area was an important U.S. military base, beginning in 1847. During the gold rush era, the Army repurposed many buildings from the previous Spanish fort. Wood construction began to gradually replace the older adobe buildings, especially during the Civil War period. Following the war, a new road and entrance system was established, which is still used today. At the end of the 19th century, the Presidio was part of an extensive tree-planting initiative, transforming grassy hillsides into the dark eucalyptus forest seen today. The Presidio's most intense period of development occurred between the 1890s and the outbreak of World War I. During this time, the base's capacity increased fourfold as new barracks, a hospital, and training rooms were built in the Colonial Revival and Spanish Colonial Revival styles. Concrete, stucco, and brick were favored over wood, which established the unique architectural character seen today. The construction of the Golden Gate Bridge in the 1930s heavily affected the Presidio, requiring the demolition of many buildings to make way for new roadways and a toll plaza. An additional flurry of development occurred during World War II when wood-framed structures with minimal detailing were erected to expand capacity quickly. The Presidio remained relatively unchanged until it was decommissioned in 1994. Today, the Presidio is managed by the National Park Service and is one of San Francisco's most popular recreation destinations.

Neighborhood	Built-Environment Summary
Presidio Heights	Presidio Heights is bound by Geary Boulevard to the south, Arguello Boulevard to the west, West Pacific Avenue to the north, and Baker and Lyon streets to the east. For several decades following the Gold Rush, the area that comprises present-day Presidio Heights featured several large cemeteries and remained far removed from the more populous areas of the city. The primary catalyst for the sustained development of Presidio Heights was the installation of new transportation lines, beginning in 1879, which reduced travel times between the western portion of the city and downtown. By 1895, area residents had formed a neighborhood association to advocate for street paving and other infrastructure improvements. Minimal damage during the 1906 earthquake and fire made the neighborhood an attractive destination for residents seeking new housing, especially upper-class San Franciscans who wanted to settle near the already-wealthy Pacific Heights. Presidio Heights boasts many architect-designed, detached single-family homes, most constructed between 1905 and 1925, including large number of First Bay Area Style, Arts & Crafts, Classical Revival, Colonial Revival, Tudor Revival, French Provincial, and Mediterranean Revival designs. By the 1930s, most parcels in Presidio Heights had been built out, although the removal of the Laurel Heights cemetery in 1941 allowed for a final burst of infill development. Today, Presidio Heights remains a residential area with a small neighborhood-serving commercial corridor along Sacramento Street.
Russian Hill	Russian Hill spans from the bay to the north, Columbus Avenue and Leavenworth Street to the east, Clay Street to the south, and Van Ness Avenue to the west. The northwestern corner of Russian Hill developed very slowly during the 1850s and 1860s. At this time, most residences were modest dwellings occupied by blue-collar families. Most residents were natives of English-speaking countries, namely the United States, England, Ireland, Canada, and Australia. In the 1870s and 1880s, public transportation developments, such as a branch of the Clay Street Hill Railroad and the Presidio and Ferries Railroad, spurred further residential development. Soon, Lombard, Greenwich, and Polk streets were graded. Most of Russian Hill burned in the 1906 earthquake and fire; during reconstruction, the neighborhood saw a drastic increase in white-collar residents. This period of redevelopment stalled in the 1920s, and few buildings have been constructed since. Today, Russian Hill is residential (single-family and multi-family homes), with commercial areas on Hyde, Polk, Powell, and Stockton streets and surrounding Ghirardelli Square and Aquatic Park.
Sea Cliff	Sea Cliff extends from the ocean to the north, the Presidio to the east, Lake Street and California Street to the south, and Lincoln Park to the west. Sea Cliff was originally part of the Baker tract. In 1908, a number of Craftsman, Shingle, and Classical Revival style houses were erected along 32nd Avenue, north of California Street. Large-scale residential development followed, with plans for Sea Cliff to become a residence park in 1912. Many of the houses in the area were designed by architect Earle Bertz. Sea Cliff was popular because of its proximity to public transportation and the Golden Gate as well as its panoramic views. Development continued throughout the 20th century, and in 1951, the intersection of Sea Cliff Avenue and El Camino Del Mar was altered to grade an access road to China Beach where a public beach house was constructed. Most structures in Sea Cliff were constructed by the late 1920s, with a small number following in the 1940s and 1950s. Today, Sea Cliff remains an almost entirely residential neighborhood.

Neighborhood	Built-Environment Summary
SoMa	SoMa is bound by Market Street to the north, Third Street to the east, Townsend Street to the south, and 11th Street to the west. When the Gold Rush commenced in 1849, the majority of SoMa was tidal wetlands. Throughout the 1850s and 1860s, the area was graded and filled and surrounding sand dunes were leveled. The downtown portion of SoMa also remained initially undeveloped, despite its proximity to Portsmouth Square, the then-center of commercial and political activity. In the mid-19th century, development began, and the first department store opened in 1892. Also in the mid-19th century, SoMa arose as the city's primary industrial district, with pioneering foundries such as Union Iron Works and Pacific Iron Works. Warehouse construction in the area boomed. The completion of the Transcontinental Railroad in 1869 spurred an immigration wave and soon, Irish immigrants made up around half of SoMa's residents. Along with other European ethnic groups, African Americans lived in SoMa, especially around Minna, Natoma, and Tehama streets. With this influx of residents, boarding and lodging houses—many constructed during post-quake reconstruction and still extant today—emerged alongside industrial and warehouse facilities. In the years leading up to World War II, large numbers of Filipino residents settled in SoMa. Throughout the 20th century, Catholic churches initially frequented by Irish residents soon saw increasingly Filipino congregations. Although most of SoMa was built out by the mid-1930s, parts are still undergoing development. Today, it is a neighborhood with varied uses, including service, offices, redevelopment, mixed-use, industrial, commercial, residential, and production, distribution, and repair.
Sunset/Parkside	The Sunset/Parkside neighborhood extends from Lincoln Way to the north, 19th Avenue to the east, Sloat Boulevard and Lake Merced Boulevard to the south, and the ocean to the west. The neighborhood was the first permanent settlement in the western reaches of San Francisco. In 1883, a steam railway line was implemented along H Street (now Lincoln Way). Residential development followed in 1895 with the creation of Carville, a community of surplus cable cars and horse cars; it grew especially popular after the 1906 earthquake and fire. The primary catalyst for residential development and infrastructural improvement in the Parkside area was the formation of the Parkside Realty Company in 1905; however, the area remained sparsely settled throughout most of the 1910s. Besides these small developments, Sunset/Parkside remained relatively undeveloped until the 1920s, shortly after the completion of the Twin Peaks Tunnel. In time, the presence of the L-Taraval encouraged the development of a commercial strip along Taraval Street. From the 1920s through the 1950s, residential development in the area swiftly increased and the Sunset portion was primarily built out by the late 1940s. During this wave, merchant builders like Ray Galli, Henry Doelger, and the Lang Realty company developed the area in a range of styles, including Colonial Revival, Regency, and French Provincial. The final build-out of the Parkside portion followed in the 1960s. Originally inhabited by Russian, Irish, and Italian residents, the Sunset/Parkside became known as the "third Chinatown" as many Chinese Americans relocated from Chinatown between the 1960s and the 1980s. Today, the neighborhood is largely residential, with neighborhood commercial districts on Judah, Irving, Noriega, Taraval, and Vicente streets as well as Sloat Boulevard.

Neighborhood	Built-Environment Summary
Tenderloin	The Tenderloin spans from Post Street to the north, Powell Street to the east, Market Street to the south, and Van Ness Street to the west. The Tenderloin is a solidly mixed-use neighborhood, with multi-family apartment buildings, single-residency occupancy hotels, as well as restaurants, entertainment venues, and stores. By the beginning of the 20th century, the neighborhood was known as a prosperous hub with many entertainment venues, including theater and opera houses. The neighborhood was largely destroyed in the 1906 earthquake and fire but was shortly rebuilt with hotels and apartment buildings that remain extant; the majority of the Tenderloin was built out by the 1920s. The National Register-listed Uptown Tenderloin Historic District exhibits the largely intact, visually consistent high-density residential architecture of this era. In the 1960s, the Tenderloin was a hub of LGBTQ activism, including the Compton's Cafeteria Riot. Today, the Tenderloin is a high-density residential and commercial neighborhood and home to primarily Southeast Asian, African American, Latinx, Russian, Middle Eastern-North African, and Filipino residents.
Treasure Island	Treasure Island and Yerba Buena Island lie in the San Francisco Bay along the path of the Bay Bridge. Yerba Buena Island was subject to conflicting land claims until 1867 when the U.S. Army sent a small garrison of soldiers to establish a post on the island. The Army built several structures, including a lighthouse, but never housed more than 200 soldiers. When the Navy took control of the island in the 1890s, it undertook major grading work, enlarged the saddle of the island, and established barracks and service buildings for approximately 500 soldiers. World War I kicked off a period of intense development; by 1920, the island was home to almost 1,500 people. Use of Yerba Buena Island began to decline in 1922 when the Navy relocated most of its training exercises to San Diego. Beginning in 1936, Treasure Island was artificially constructed on the shallow shoals north of Yerba Buena Island, and in 1939, it was used as the site of the Golden Gate International Exposition. Following the expo, the island became a naval training ground and distribution center, with former exhibition structures retrofitted to accommodate the armed forces. The island continued to be used by the military until it was decommissioned in 1997. Today, the island is being redeveloped as a mixed-use neighborhood that will include thousands of dwelling units.
Twin Peaks	Twin Peaks is bound by Clarendon Avenue to the north and west, Twin Peaks Boulevard and 19th Street to the north, Grand View Avenue and Portola Drive to the east and south, Woodside Avenue to the south, and Laguna Honda Boulevard to the west. The Twin Peaks neighborhood refers to the primarily residential zone surrounding two of the city's highest peaks, Eureka and Noe. The area was very likely initially used as a hunting and lookout zone by Native American people. In the 1940s through 1960s, engineering advancements allowed development on the steeply sloped land. Notable Midcentury Modern, International Style, and Second Bay Tradition buildings can be found along the slopes of Twin Peaks. Midtown Terrace, developed by the Standard Building Company and the Panorama Development Company in 1956–1957, features Midcentury split-level designs. Large apartment buildings were also constructed in the area from 1935 to 1970 in primarily Streamline Moderne and Midcentury Modern styles. Other notable development in the area includes the Twin Peaks School, constructed in 1953. The neighborhood was primarily built out by the 1950s and 1960s. Today, it is largely residential (single-family and multi-family homes), with few businesses or recent development.

Neighborhood	Built-Environment Summary
Visitacion Valley	Visitacion Valley lies in the southern quadrant of San Francisco, extending from Bayshore Boulevard to the east, the city boundary to the south, and McLaren Park to the northwest. After Spanish occupation, it was used for agriculture and grazing purposes. Some of the earliest inhabitants included European immigrants cultivating the land; Italians were a large part of this group. The neighborhood remained rural until the late 19th century when a number of industries, such as silk, coal, and fertilizer businesses, moved in. After the 1906 earthquake and fire, the neighborhood experienced a slowly increasing residential population. The introduction of two streetcar lines in 1910 further paved the way for residential development, and in the 1930s, the first single-family houses were built, mimicking the modest stucco structures in the Sunset District. Over the next 15 years, the neighborhood experienced increasing residential and infrastructural development as well as the birth of a commercial corridor at Leland Avenue. From the 1940s through 1960s, Visitacion Valley was the site of a number of San Francisco Housing Authority initiatives such as the Geneva Towers (not extant), designed to house war workers. Little development has occurred since, and the area was overlooked by the building boom of the 1990s. Today, Visitacion Valley remains a low-density residential area home to a largely Asian American population, with commercial corridors on Bayshore Boulevard and Leland Avenue, a shopping center, and some production, distribution, and repair sites.
West of Twin Peaks	West of Twin Peaks is bound by Holloway and Ocean Avenues to the south, 19th Avenue to the west, Quintara Street to the north, and Woodside Avenue, O'Shaughnessy Boulevard, and Interstate 280 to the east. The neighborhood was mostly uninhabited and used as grazeland prior to the 20th century. In 1881, mining engineer Adolph Sutro purchased a substantial portion of the area and initiated a large-scale tree planting project stretching north from Ocean Avenue across Mount Davidson to the Inner Sunset, which became known as "Sutro Forest." The single greatest catalyst for development in the neighborhood was the opening of the Municipal Railroad's Twin Peaks Tunnel in 1918, which dramatically improved commute times between the western part of the city and downtown. In anticipation of the tunnel's opening, development of several residence parks, including St. Francis Wood, West Portal, Westwood Park, and Forest Hill, began in the 1910s. These planned subdivisions were marked by wide, curving boulevards, minimum building setbacks, buried utilities, as well as ornamental landscaping and other amenities designed to attract relatively affluent home buyers. Restrictions mandated only single-family residences, and many houses were designed by architects in the employ of development companies. Although some developments, such as Westwood Park, were dominated by bungalow designs, most of the residential parks were built out in Period Revival styles, including Mediterranean Revival, Tudor Revival, Colonial Revival, and French Provincial designs. Residential construction continued until the neighborhood was essentially built out by the 1960s. Today, West of Twin Peaks is a residential neighborhood, with small, neighborhood-serving commercial corridors along West Portal Avenue and Ocean Avenue.

Neighborhood	Built-Environment Summary
Western Addition	The Western Addition spans from Geary Boulevard and California Street to the north, Van Ness Avenue and Gough Street to the east, Fulton Street to the south, and Baker Street and St. Joseph Avenue to the west. The neighborhood was created in 1856 through the Van Ness Ordinance as the first major platted expansion to San Francisco's original city grid. The introduction of mass transit in the 1880s spurred a sustained period of development, and by the turn of the century most streets were lined with Gilded Age rowhouses, flats, and single-family residences. A new wave of development came after the 1906 earthquake and fire. Also during this time, the city's first and largest "auto row" developed along Van Ness Avenue and intersecting cross streets. During World War II, large numbers of African Americans moved into Western Addition into dwellings formerly occupied by Japanese residents, who had been forced into internment camps. The neighborhood emerged as a focal point of African American life in the city. Concurrently, however, a substantial portion of the neighborhood was targeted for redevelopment by the Redevelopment Agency—resulting in the clearance of dozens of blocks during the 1960s and the insertion of Geary Boulevard as an arterial corridor. Since the Redevelopment era, which saw build-out of the neighborhood, the area has experienced the addition of Westside Courts public housing, along with a renewed interest in the Fillmore Street commercial corridor and the neighborhood's historic jazz music scene. Today, the Western Addition neighborhood is a mix of residential (single-family and high-density) construction and numerous neighborhood-serving commercial corridors, including Fillmore Street, Divisadero Street, and Geary Boulevard.

Table F-3. Historic Context Statements Addressing Social History and Cultural Heritage

Context Name	Year Adopted	Thematic Scope and/or Geographic Extent	Time Period	Evaluative Frameworks
Sexing the City: The Development of Sexual Identity–Based Subcultures in San Francisco, 1933–1979	2004	Presents information on sexual and gender minority social history in San Francisco during the mid-20th century—specifically, queer community life, political organizing, and social institutions.	1933–1979	Promotes the consideration of queer identity formation and political mobilization during the resource evaluation process; proposes potentially significant individual properties and four historic districts associated with queer social history.
Japantown Historic Context Statement	2009	Describes significant ethnic and cultural themes in the development of San Francisco's Japanese and Japanese-American communities in the Western Addition, including late 19th- and early 20th-century community formation, World War II internment, postwar return, and urban redevelopment.	1880s–present	Provides guidance for evaluating the significance and integrity of various property types associated with San Francisco's Japanese and Japanese-American communities, such as residential, commercial, and religious properties; integrity guidance stresses feeling and association as the most important aspects when considering properties with cultural and ethnic heritage significance.
Filipino Heritage Addendum to the South of Market Historic Context Statement	2013	Expands upon the general neighborhood development history presented in the South of Market Historic Context Statement by describing Filipino immigration and settlement patterns, social/cultural institutions, and community formation in the SoMa district, primarily after World War II.	1910–2013	Does not present specific registration requirements but does provide information to inform future evaluations of resources associated with Filipino social and cultural heritage.

Context Name	Year Adopted	Thematic Scope and/or Geographic Extent	Time Period	Evaluative Frameworks
Citywide Historic Context Statement for LGBTQ History in San Francisco	2016	Describes the historical experiences of San Francisco's LGBTQ communities, covering thematic areas such as identity and community formation, policing, civil rights and protest, and health and medicine.	19th century through late 20th century	Presents evaluative frameworks for each thematic area the context statement covers. The evaluative frameworks provide examples of potentially eligible properties that may meet the requirements of Criteria A/1, B/2, C/3, and D/4. Furthermore, the historic context statement presents special considerations for the assessment of integrity for LGBTQ-associated resources.
Draft Chinese-American Historic Context Statement	In progress	Provides an overview of historical themes related to Chinese-American migration, discrimination, neighborhood and community development, religion/spirituality, and political mobilization in San Francisco.	1840s–1980s	Establishes significance thresholds and integrity considerations specific to 10 context themes within San Francisco's Chinese-American social history.
Draft African American Citywide Historic Context Statement	In progress	Presents historic themes associated with San Francisco's African American community members and social institutions, including early settlement patterns, economic and social life, churches, nightlife, World War II mobilization, the Civil Rights movement, and postwar redevelopment and displacement.	Early 19th century to 2014	Describes themes with the greatest likelihood to imbue significance upon a property associated with African American history and proposes guidelines for assessing integrity.

Context Name	Year Adopted	Thematic Scope and/or Geographic Extent	Time Period	Evaluative Frameworks
Draft Nuestra Historia: San Francisco Latino Citywide Historic Context Statement, Documenting Chicano, Latino, and Indígena Contributions to the Development of San Francisco	In progress	Includes a historical overview of Latin American descent populations in San Francisco, from the early indigenous era to the present, as well as thematic chapters on Latinx business and commerce, political and social organizations, religion and spirituality, newspapers and media, visual and performing arts, and LGBTQ spaces. It also offers evaluative frameworks for each theme and general preservation recommendations.	Early indigenous history to present	Describes important themes, significance thresholds, and integrity considerations. Provides examples of potentially eligible properties that may meet the requirements of Criteria A/1, B/2, C/3, or D/4.
Draft Counterculture National Register Multiple Property Documentation Form	In progress	Addresses resources associated with San Francisco counterculture movements citywide.	1965–1975	Provides examples of properties that may meet the requirements of Criteria A/1, B/2, and C/3; also provides guidance on evaluating association and integrity, given that many properties with counterculture associations have had multiple owners, tenants, and uses over time and associations to counterculture history may have been short lived.

Context Name	Year Adopted	Thematic Scope and/or Geographic Extent	Time Period	Evaluative Frameworks
Draft Women's Rights Historic Context Statement	In progress	Addresses properties citywide associated with successive women's rights contexts and themes: Women's Suffrage (1894–1911); Women in the Workplace (1900–1979); Women Providing Services to Recently Arrived Young Women (1874–1938); Civil Rights, Early Lesbian, and Trans Women Organizing and Self-Determination Struggles (1956–1971); Women's Movement, Second Wave Feminism, and the Sex Wars (1973–1989); Women of Color and Neighborhood Organizing (1970–1986); and Women on the Frontline of AIDS (1982–1995).	1896–1992	Provides examples of properties associated with the document's themes that may meet registration requirements, primarily Criteria A/1 and B/2. The draft notes few examples will meet the requirements of Criteria C/3.
American Indian Historic Context Statement	In progress	Resources associated with American Indian history and communities citywide.	Still to be developed.	Context statement content still to be developed in consultation with Native American representatives.

Source: Grant Din, Alvin Lin, Eric Mar, Willian Tran, Palma You, and ICF, *San Francisco Chinese American Historic Context Statement*, prepared for the City and County of San Francisco, San Francisco, CA, 2021; Donna Graves and Page & Turnbull, *Historic Context: Japantown, San Francisco, California*, revised, prepared for the City and County of San Francisco Planning Department, San Francisco, CA, 2011; Donna J. Graves and Shayne E. Watson, *Citywide Historic Context Statement for LGBTQ History in San Francisco*, prepared for the City and County of San Francisco, San Francisco, CA, 2016; Page & Turnbull, *San Francisco Filipino Heritage Addendum to the South of Market Historic Context Statement*, prepared for the San Francisco Planning Department, San Francisco, CA, 2013; San Francisco Planning Department, Historic Context Summaries, draft, October 2021; Damon Scott, *Sexing the City: The Development of Sexual Identity Based Subcultures in San Francisco, 1933- 1979*, prepared for the Friends of 1800, San Francisco, CA, 2004; Tim Kelley Consulting, The Alfred Williams Consultancy, VerPlanck Historic Preservation Consulting, and San Francisco Planning Department, *African American Citywide Historic Context Statement*, prepared for the City and County of San Francisco, San Francisco, CA, 2016.

Table F-4. Established Cultural Districts

Name	Year Established	Location	Thematic Scope
Japantown Cultural District	2013	Contains 36 blocks in the Western Addition neighborhood, bounded by California Street, Gough Street, O'Farrell Street, and Steiner Street.	Recognizes the long presence of Japanese-American community members in the Western Addition and their continued strong connections to the neighborhood for cultural identity; it remains one of the last Japantowns in the United States.
Calle 24 Latino Cultural District	2014	Aligns primarily with parts of the Mission District. Its boundaries include 22nd Street to the north, Potrero Street to the east, Cesar Chavez Street to the south, and Mission Street to the west. It also includes La Raza Park (also called Potrero del Sol) and Precita Park.	Represents the area with the largest concentration of Latinx-owned and operated businesses, arts and cultural organizations, community institutions, cultural landmarks, and festivals/routes in San Francisco. It also has a high Latinx residential population, one of the largest since the mid-20th century.
SoMa Pilipinas – Filipino Cultural Heritage District	2016	Aligns with a large portion of the SoMa neighborhood, bounded by Market Street, Second Street, Brannan Street, and 11th Street.	Represents the community of individuals with Filipino backgrounds who lived and established social and cultural institutions in SoMa beginning in the 1960s.
Transgender District (also known as the Compton's Transgender Cultural District)	2017	Located within the Tenderloin and SoMa neighborhoods. Bounded roughly by Ellis Street to the north, Mason Street to the east, Market Street to the south, and Jones Street to the west, with an extension along Sixth Street.	Honors San Francisco's communities that are Transgender, Gender-variant, Intersex, Lesbian, Gay, Bisexual (TGILGB) affirming. Recognizes historical sites/sites of important events, community and cultural spaces, nightlife spaces as centers of community building, social services, and housing associated with TGILGB communities.
Leather and LGBTQ Cultural District	2018	Located across much of the western SoMa neighborhood, generally bounded by Howard Street, Seventh Street, Interstate 80, and U.S. 101.	Recognizes the significant historic context of the LGBTQ enclave that developed in SoMa after 1950, with an important concentration of businesses, nightlife establishments, arts and health centers, and social institutions that served the needs of members of LGBTQ communities. In particular, many bars and bathhouses in SoMa catered to those who were affiliated with the gay male leather community.

Name	Year Established	Location	Thematic Scope
African American Arts and Cultural District	2018	Located within the Bayview Hunters Point neighborhood. Bounded by Cesar Chavez Street (projected through Pier 80) to the north, San Francisco Bay to the east and south (until Harney Way reaches U.S. 101), and U.S. 101 to the west.	Acknowledges and supports preservation of the African American cultural legacy in the district, particularly African American migrants from the South who came to San Francisco during World War II. Cultural assets include cultural and artistic traditions, community institutions, public realm elements, parks and recreational spaces, and small businesses.
Castro LGBTQ Cultural District	2019	Contains the Castro District, generally bounded by Market Street, Sanchez Street, Noe Street, and 22nd Street. Also includes an extension along the Upper Market Street commercial corridor.	Has pronounced political, social, economic, and historical significance to the LGBTQ community because it became a global focal point for the development of gay culture, community, and politics in the 1970s. LGBTQ culture and heritage is embedded in neighborhood sites, institutions, businesses, nonprofits, customs, and events.
American Indian Cultural District	2020	Encompasses an approximately 26-block area primarily within the Mission District. Bounded roughly by Duboce Avenue to the north, Folsom Street to the east, 17th Street to the south (with a small part projecting farther south to 18th Street), and Sanchez Street to the west.	Recognizes a geographic region that is of great historical and cultural significance to the American Indian community. It contains a unique concentration of historical events, cultural resources, programming, services, and gathering spaces that are historically and presently important to the American Indian community in the San Francisco Bay Area.
Sunset Chinese Cultural District	2021	Contains the Outer Sunset neighborhood, bounded by Lincoln Way to the north, 19th Avenue to the east, Sloat Boulevard to the south, and the Great Highway to the west.	Encompasses a neighborhood containing a working-class, multi-generational Chinese immigrant and Chinese-American community that has had a commercial and residential presence in the Sunset District since the immediate post–World War II period.

Source: City and County of San Francisco Board of Supervisors, Resolution 129-18, file no. 171019, May 1, 2018; City and County of San Francisco Board of Supervisors, Resolution 239-17, file no. 170131, June 13, 2017; City and County of San Francisco Board of Supervisors, Ordinance 316-18, file no. 1881080, December 11, 2018; City and County of San Francisco Board of Supervisors, Ordinance 160-19, file no. 190389, July 9, 2019; City and County of San Francisco Board of Supervisors, Case no. 2020-009508PCA, file no. 201088, November 4, 2020; City and County of San Francisco Board of Supervisors, Ordinance 121-21, file no. 210599, July 27, 2021; Garo Consulting, *Calle 24 Latino Cultural District Report on the Community Planning Process*, prepared for the Calle 24 Latino Cultural District Community Council, San Francisco, CA, 2014; Donna Graves, Japantown Task Force, Page & Turnbull, San Francisco Heritage, Seifel, Inc., *Japantown Cultural Heritage and Economic Sustainability Strategy*, prepared for the City and County of San Francisco, San Francisco, CA, 2013; San Francisco Planning Department and SoMa Pilipinas Working Group, *SoMa Pilipinas Progress Report*, San Francisco, CA, 2016.

Table F-5. Context Statements and Theme Studies Addressing Neighborhoods with Greatest Likelihood of Change under the Housing Element Update[1]

Context Name	Year Adopted	Thematic Scope and/or Geographic Extent	Time Period	Evaluative Frameworks
San Francisco Neighborhood Movie Theater Historic District Context Statement	2006	Describes small, midsize, and large movie theaters in San Francisco's neighborhood-focused commercial districts.	1906–1945	Provides statement of significance, interior and exterior character-defining features a property must meet to meet Criteria A and C, and examples properties of three San Francisco theater types (nickelodeons, neighborhood movie palaces, and combination houses).
Van Ness Auto Row Support Structures	2010	Describes the development of resources located along the Van Ness Avenue corridor between Pacific and Market streets associated with San Francisco's early 20th-century automotive industry, such as showrooms, public garages, repair/service shops, and supply stores.	1906-1930s	Presents historic context that informs resources' potential architectural and historical significance associated with San Francisco's early automotive industry, specifically focusing on Criteria A and C significance; guidance on integrity assessment of automobile-related properties is also included.
Sunset District Residential Builders, 1925–1950 Historic Context Statement	2013	Provides historic context for speculatively built single-family homes in Sunset District residential tracts constructed in the first half of the 20th century.	1925–1950	Presents significance and integrity thresholds for Sunset District residences for Criteria A/1, B/2, and C/3 and identifies typical character-defining features; district evaluation guidelines are also presented.
Draft Gardens in the City: San Francisco Residence Parks, 1906–1940 Historic Context Statement	In progress	Details the development of "residence parks," which are privately developed residential neighborhoods built in the first half of the 20th century that drew upon City Beautiful and 19th-century suburban planning ideals.	1906–1940	Establishes significance and integrity thresholds for residential properties within residence parks, as well as entire districts, including thresholds properties must meet to be eligible under Criteria A/1, B/2, and C/3; cultural landscape elements are among the character-defining features presented.

[1] Please also refer to Table F-3, Historic Context Statements Addressing Social History and Cultural Heritage, which address additional resource types anticipated for change under the proposed action but not repeated in this table.

Context Name	Year Adopted	Thematic Scope and/or Geographic Extent	Time Period	Evaluative Frameworks
Draft Neighborhood Commercial Buildings Historic Context Statement and Survey	In progress	Describes urban historical and aesthetic trends that influenced the development of San Francisco's neighborhood commercial districts and the physical forms of storefronts and signage.	1865–1965	For each time period covered in the context statement (1865–1905, 1906–1929, and 1930–1965), presents significance thresholds, associated property types, integrity guidance, and example character-defining features.
Flats and Small Apartment Buildings Theme Study	In progress	Explains the construction of small-scale multiple-residence buildings across San Francisco in the 20th century.	1915–1978	Establishes significance thresholds, integrity guidance, and district evaluation guidance for flats and small apartment buildings; also identifies the forms, features, and architectural styles commonly found on buildings of this type.
Draft Earthquake Shacks Theme Study	In progress	Describes the development of the earthquake shack typology citywide.	20th century, focus on reconstruction era (1906–1915)	Provides examples of potentially eligible extant earthquake shacks that may meet the requirements of Criteria A/1 and C/3; also focuses on how to identify extant earthquake shacks and provides integrity thresholds to assist the staff in determining eligibility.
Early Residential Development in San Francisco Theme Study	In progress	Provides information on San Francisco's 19th-century residential development and architectural trends that influenced housing construction citywide.	1848–1899	Establishes evaluation guidance that includes thresholds for significance under Criteria A/1, B/2, and C/3; guidance also emphasizes special considerations for relative rarity by era of construction and location in the city.
Private Institutions Theme Study	In progress	Broadly characterizes the development of religious, educational (private schools), recreation/cultural, and funerary institutions located citywide.	Focus on late 19th and 20th centuries	For each property type, establishes significance thresholds under Criteria A/1, B/2, and C/3 as well as integrity considerations and examples of eligible properties.
Draft Social Halls and Clubs Theme Study	In progress	Discusses social halls and clubs throughout the city, including those with ethnic or cultural associations.	1848–1989 (preliminary)	Provides examples of potentially eligible properties that may meet the requirements of Criteria A/1, B/2, and C/3.

Context Name	Year Adopted	Thematic Scope and/or Geographic Extent	Time Period	Evaluative Frameworks
Draft Developer Tracts Theme Study	In progress	Includes three thematic studies organized around identified periods of residential development citywide: streetcar suburbanization (1880–1920); automobile suburbanization (1920–1950); and post–World War II suburbanization (1950–1989). Discusses the history of the specific period of development, including property types that are most closely associated with the time period.	1880–1989	Presents an evaluative framework for each period of development that provides examples of potentially eligible properties that may meet the requirements of Criteria A/1, B/2, or C/3. Each thematic study will provide special considerations for the assessment of integrity for related resources.
Draft Redevelopment Theme Study	In progress	Defined redevelopment areas citywide. The theme study will discuss significant activities by the San Francisco Redevelopment Agency, as well as efforts by community leaders, groups, and organizations, to resist the redevelopment of their neighborhoods.	1948–2012	Presents a chronology of projects undertaken by the San Francisco Redevelopment Agency during its tenure from 1948 to 2012. Evaluative frameworks are under development.

Source: Richard Brandi and Denise Bradley, *Gardens in the City: San Francisco Residence Parks, 1906–1940 Historic Context Statement*, prepared for the Western Neighborhoods Project, 2016; Mary Brown, *Sunset District Residential Builders, 1925–1950 Historic Context Statement*, prepared for the City and County of San Francisco, San Francisco, CA, 2013; ICF, *Theme Study: Early Residential Development in San Francisco, 1848-1899*, prepared for the San Francisco Planning Department, San Francisco, CA, 2021; ICF, *Theme Study: Flats and Neighborhood-Scaled Apartment Buildings in San Francisco, 1915-1978*, prepared for the San Francisco Planning Department, San Francisco, CA, 2021; ICF, *Theme Study: San Francisco Private Institutions Sub-Themes: Religion, Education, Recreation/Culture, and Funerary*, prepared for the San Francisco Planning Department, San Francisco, CA, 2021; William Kostura, *Van Ness Auto Row Support Structures: A Survey of Automobile-Related Buildings along the Van Ness Avenue Corridor*, prepared for Department of City Planning, San Francisco, CA, 2010; Andrew Murray and Katie Tom, *San Francisco Neighborhood Movie Theater Non-Contiguous Multiple Property Historic District*, prepared for the City and County of San Francisco, San Francisco, CA, 2006; San Francisco Planning Department, Historic Context Summaries, draft, October 2021; San Francisco Planning Department, *San Francisco Neighborhood Commercial Buildings, Historic Context Statement 1865-1965*, San Francisco, CA, 2021.

APPENDIX F.2. SAN FRANCISCO HOUSING ELEMENT UPDATE 2022 ARCHAEOLOGICAL SENSITIVITY ASSESSMENT

SAN FRANCISCO HOUSING ELEMENT 2022 UPDATE

ARCHEOLOGICAL SENSITIVITY ASSESSMENT

ENVIRONMENTAL CASE NUMBER 2019-016230ENV

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List of Acronyms

AB	Assembly Bill
AIC	American Indian Center
AICC	American Indian Cultural Center
AICD	American Indian Cultural District
ASA	Archeological Sensitivity Assessment
BART	Bay Area Rapid Transit
Bay Bridge	San Francisco–Oakland Bay Bridge
cal BP	calibrated years before present (reference date, 1950)
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHSC	California Health and Safety Code
City	City of San Francisco
CRHR	California Register of Historical Resources
department	San Francisco Planning Department
Far Western	Far Western Anthropological Research Group
general plan	San Francisco General Plan
GIS	Geographic Information System
I-	Interstate
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
PRC	California Public Resources Code
SHPO	State Historic Preservation Officer
SoMa	South of Market
SR-	State Route
TCR	Tribal Cultural Resource
USCS	U.S. Coast and Geodetic Survey
USGS	U.S. Geological Survey
WSA	William Self Associates, Inc.

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1. INTRODUCTION

A. Overview

The San Francisco Planning Commission (planning commission, and project sponsor) is proposing to update the adopted 2014 housing element (existing 2014 housing element) of the San Francisco General Plan (general plan). The environmental impact report (EIR) evaluates the reasonably foreseeable environmental effects associated with adoption and implementation of the San Francisco Housing Element 2022 Update (housing element update or proposed action), which is an update to the existing 2014 housing element. The housing element update is mandated by state law, Government Code section 65583.

The housing element update establishes goals, policies, and actions to address the existing and projected housing needs of San Francisco. The goals, policies, and actions are required to plan for the regional housing targets allocated to San Francisco by regional agencies for the 2023–2031 cycle and meet future housing demand in San Francisco. The housing element update includes policies designed to improve housing affordability and advance racial and social equity in accordance with the directives from the planning commission and historic preservation commission in summer 2020.[1] The housing element update includes overarching goals for the future of housing in San Francisco that respond both to state law requirements as well as local community values. The underlying policies and actions would guide development patterns and the allocation of resources to San Francisco neighborhoods. In general, the housing element update would shift an increased share of the San Francisco's projected future housing growth to transit corridors and low-density residential districts within well-resourced areas.[2]

The housing element update would modify the policies of the general plan's housing element. It would not include specific changes to existing land use controls (e.g., zoning) or approve any physical development (e.g., construction of housing or infrastructure).[3] As such, the proposed action would not result in any direct physical changes to the environment, but would result in reasonably foreseeable indirect changes. Specifically, the San Francisco Planning Department (department) assumes that adoption of the housing element update would lead to future actions, such as planning code amendments to increase height limits along transit corridors and to modify density controls in low-density areas that are primarily located on the west and north sides of the city,

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1 San Francisco Planning Commission Resolution No. 20738, *https://sfplanning.org/sites/default/files/documents/admin/R-20738_Centering_Planning_on_Racial_and_Social_Equity.pdf*, June 11, 2020 and Historic Preservation Commission Resolution No. 1127, *https://sfplanning.org/sites/default/files/documents/admin/R-1127_HPC_Equity_Resolution.pdf*, July 15, 2020.

2 *Well-resourced areas* are high- and highest-resource areas, which are neighborhoods identified by the State of California that provide strong economic, health, and educational outcomes for its residents. More information is available at: *https://www.sfhousingelement.org/high-opportunity-areas*.

3 Any changes to existing land use controls would require related legislative processes including review and public hearings before the planning commission and/or the board of supervisors. Approval of housing development or infrastructure would require development applications and approval. The EIR analyzes the secondary physical environmental impacts that could occur as a result of the housing element update.

designation of housing sustainability districts, and approval of development projects consistent with the goals, policies, and actions of the housing element update.

Future development consistent with the housing element update would have the potential to affect known and unknown archeological sites. This Archeological Sensitivity Assessment (ASA) uses current archeological and geographical data from across the city to build a picture of where different types of archeological sites are expected to be located, both horizontally and vertically.

As illustrated in Figure 1, the department divides the city into planning districts[4] and neighborhoods.[5] Planning districts in the city were defined as a planning tool based on certain shared characteristics. However, each planning district includes one or more commonly recognized neighborhoods, and each neighborhood tends to have its own development history, and these histories vary within the planning district. Further, some neighborhoods are divided among multiple planning districts (Table 1). The ASA assesses the potential to encounter archeological resources in each of the city's planning districts. Each planning district in the city is discussed in terms of geography, existing building trends, history, known Native American and historical archeological sites, and the potential for encountering archeological resources in the future.

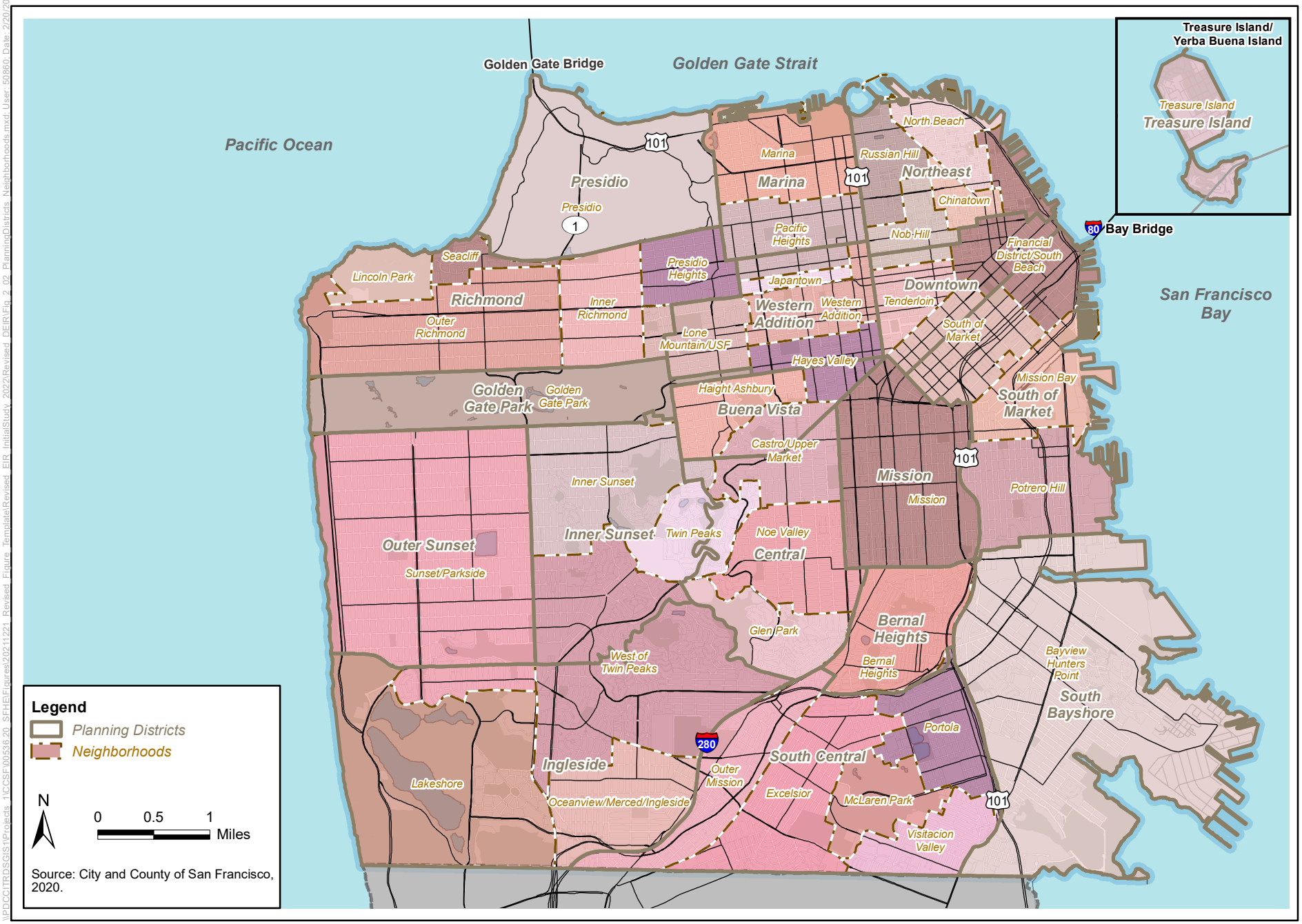
The ASA begins with an overview of the paleoenvironment of San Francisco that describes the geological development of the San Francisco Peninsula and environmental factors that may have influenced where Native American people lived in pre-European contact times. The ASA then summarizes the timeline of occupation of San Francisco from the earliest inhabitants through the arrival of Europeans to the present day. The ASA then reviews Native American and historical archeological research issues, including pertinent research questions, and data classes needed to address these research questions. A standalone ethnographic account of the Ohlone people, for whom San Francisco is traditional territory, is included in Section 4.3, Tribal Cultural Resources, of the EIR prepared for the housing element update to provide information about local Native American lifeways. The housing element update would increase housing production and shift a greater share of anticipated growth from the east side of the city to well-resourced areas along transit corridors and low-density areas that are primarily located on the west and north sides of the city. Thus, the ASA also provides a generalized assessment of the relative archeological sensitivity of the areas projected to experience a greater share of anticipated growth as a result of the housing element update.

This document is an update of the William Self Associates, Inc. (WSA), 2010 Archeological Technical Memorandum,[6] which was prepared in support of the existing 2014 housing element.

[4] The city is divided into 18 planning districts, which are used in various aspects of the planning process.

[5] The city is divided into 41 neighborhoods, which are used to provide consistency in the analysis and reporting of socio-economic, demographic, and environmental data as well as data on city-funded programs and services.

[6] William Self Associates, Inc. 2010 Archeological Technical Memorandum, San Francisco General Plan, Housing Element EIR, San Francisco, California. Submitted to San Francisco Planning Department. On file at NWIC, Sonoma State University. April.



San Francisco Housing Element 2022 Update
Case No. 2019-016230ENV

Figure 1
Planning Districts and Neighborhoods

Table 1. Neighborhoods within Planning Districts

Planning Districts	Neighborhoods
Bernal Heights	Bernal Heights
Buena Vista	Haight Ashbury, Hayes Valley, Castro/Upper Market
Central	Castro/Upper Market, Twin Peaks, Noe Valley, Glen Park, Inner Sunset
Downtown	Financial District/South Beach, Tenderloin, South of Market (SoMa), Nob Hill
Golden Gate Park	Golden Gate Park
Ingleside	Lakeshore, Sunset/Parkside, West of Twin Peaks, Ocean View/Merced/Ingleside
Inner Sunset	Inner Sunset, Twin Peaks, West of Twin Peaks
Marina	Marina, Pacific Heights
Mission	Mission
Northeast	Russian Hill, North Beach, Nob Hill, Chinatown, Financial District/South Beach
Outer Sunset	Sunset/Parkside
Presidio	Presidio
Richmond	Lincoln Park, Seacliff, Inner Richmond, Outer Richmond, Pacific Heights, Lone Mountain/USF
South Bayshore	Bayview Hunters Point
South Central	Excelsior, Outer Mission, Ocean View, Portola, McLaren Park Visitacion Valley
South of Market	SoMa, Mission Bay, Potrero Hill, Financial District/South Beach
Treasure Island	Treasure Island/Yerba Buena Island
Western Addition	Lone Mountain/USF, Pacific Heights, Japantown, Western Addition, Hayes Valley

B. Analytical Methods

The ASA uses existing data to summarize the landscape, history, ethnography, and known archeology of the city, then characterizes the potential sensitivity of each planning district for archeological resources.

To understand the archeological character of the city, the document reviews the existing literature, archival city maps, historical maps, geological reports, an updated archeological records search, archeological reports, and site records. For an understanding of more modern development, it reviews aerial imagery, the San Francisco Property Information Map, and records of ground disturbance and foundation types from recent building projects. These data are then used to characterize the potential archeological resources and relative archeological sensitivity of each of the city's planning districts.

The ASA provides a summary of the current understanding of surface and buried site sensitivity relative to geographic regions, a description of the landscape in each region, the historical and environmental history of the region as it pertains to archeological resources, known and potential resource types in each planning district, information gaps, and key research questions.

C. Regulatory Context

Federal Regulations

IDENTIFICATION OF SIGNIFICANT CULTURAL RESOURCES

Projects that include federal land, use federal funding, or are subject to federal permitting or oversight are subject to the implementing regulations of the National Historic Preservation Act -(NHPA) of 1966, as amended. In San Francisco, these commonly include projects within state highway rights-of-way, which typically include funding or are regulated by the Federal Highway Administration, through the California Department of Transportation; affordable housing projects, which may include funding from the federal department of Housing and Urban Development; and projects that include components that would extend onto lands managed by a federal agency, such as the Golden Gate National Recreation Area, managed by the National Park Service. Such projects frequently include regulation by both the City and a federal agency.

Under the NHPA, a cultural resource is considered significant if it meets one or more of the criteria for listing in the National Register of Historic Places (NRHP) at 36 Code of Federal Regulations (CFR) 60.4, as stated below. Unless exceptionally significant, a property also must be at least 50 years old to be eligible for listing.

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess *integrity of location*, design, setting, materials, workmanship, feeling, and association and that:

a. Are associated with events that have made a significant contribution to the broad patterns of our history, or

b. Are associated with the lives of persons significant in our past, or

c. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or

d. Have yielded, or may be likely to yield, information important in prehistory or history.

If a resource meets one or more of the criteria above and retains sufficient historical integrity, it is considered eligible for listing in the NRHP and is termed a *historic property,* irrespective of whether it dates to the pre-European contact or historic period.

NHPA Section 106 requires federal agencies to consider the effects of the undertaking on historic properties (i.e., properties listed in or eligible for NRHP-listing) and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on any undertaking that would adversely affect historic properties. The Section 106 review normally involves a four-step procedure, which is described in detail in the implementing regulations (36 CFR Part 800). The process includes identifying historic properties in consultation with the State Historic Preservation Officer (SHPO) and interested parties, assessing project effects on identified historic properties, consulting with SHPO and others to develop and execute an agreement regarding the treatment of historic properties that will be adversely affected, if any and proceeding with the project according to the agreement.

State Regulations

Under California State law, effects to significant cultural resources—which may include archeological remains, historic buildings and structures, and Tribal Cultural Resources (TCRs)—must be considered as part of the environmental analysis of a proposed action. A project that would result in a substantial adverse change in the significance of a cultural resource would be considered to have a significant impact on the environment. If a resource is not a unique archeological or historical resource, or TCR, as defined below, the effects of the proposed action on that resource will not be considered a significant effect on the environment, and it need not be considered further in the California Environmental Quality Act (CEQA) process (California Code of Regulations [CCR] § 15064.5[c][4]).

DEFINITION OF HISTORICAL RESOURCES UNDER CEQA

CEQA Guidelines section 15064.5(a), in CCR Title 14, defines a *historical resource* as:

1. A resource listed in or determined to be eligible by the State Historical Resources Commission for listing in the California Register of Historical Resources (CRHR).

2. A resource included in a local register of historical resources, as defined in Public Resources Code (PRC) section 5020.1(k) or identified as significant in a historical resource survey meeting the requirements of PRC section 5024.1(g), will be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.

3. Any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered a historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource will be considered by the lead agency to be *historically significant* if the resource meets the criteria for CRHR-listing (see below).
4. The fact that a resource is not listed in, or determined to be eligible for listing in, the CRHR, not included in a local register of historical resources (pursuant to PRC § 5020.1(k)), or identified in a historical resources survey (meeting the criteria in PRC § 5024.1(g)) does not preclude a lead agency from determining that the resource may be a historical resource as defined in PRC sections 5020.1(j) or 5024.1.

CALIFORNIA REGISTER OF HISTORICAL RESOURCES

Criteria for defining significant cultural resources are stipulated in CEQA (codified at PRC § 21000 *et seq.*). CEQA recognizes two types of significant archeological resources: *unique* archeological resources (PRC § 21083.2) and archeological resources that qualify as *historical resources* (PRC § 21084.1; CCR § 15064.5); the latter may include CRHR-eligible archeological resources, as well as other archeological resources. The CRHR identifies resources considered to be important for state and local planning purposes and affords certain protection under CEQA. To be considered eligible for the CRHR-listing, a resource must possess *physical integrity* as well as *integrity of setting* and meet at least one of the following criteria (CCR Section 15064.5):

1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage
2. Is associated with the lives of persons important in California's past
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values
4. Has yielded, or may be likely to yield, information important in prehistory or history

UNIQUE ARCHEOLOGICAL RESOURCES

Under PRC Section 21083.2, a *unique archeological resource* is an object, artifact, or site that:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;
2. Has a special and particular quality, such as being the oldest of its type or the best available example of its type; or
3. Is directly associated with a scientifically recognized important Native American or historic event or person.

TRIBAL CULTURAL RESOURCES

In September 2014, the California Legislature passed Assembly Bill (AB) 52, which sets forth requirements for public agency consultation with California Native American tribes; and requires that CEQA analyses consider impacts on TCRs (PRC §§ 21080.3.1, 21080.3.2, 21082.3). Lead agencies are required to analyze project impacts on TCRs separately from archeological resources (PRC §§ 21074, 21083.09). A TCR is defined in PRC section 21074 as a site, feature, place, or cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is also:

1. Included or determined to be eligible for inclusion in the CRHR or in a local register of historical resources as defined in PRC section 5020.1(k), or
2. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in PRC section 5024.1(c). In applying the criteria set forth in PRC section 5024.1(c), the lead agency will consider the significance of the resource to a California Native American tribe.

During AB 52 tribal consultation with the City's Environmental Planning Division in 2015, local tribes advised that all Native American archeological resources in San Francisco should be assumed to constitute TCRs. Through consultation, it was agreed that the preferred treatment of archeological resources that are TCRs is preservation in place, if feasible, or, if not feasible, archeological data recovery and development and implementation of public interpretation in consultation with Native American representatives. Projects that have the potential to result in impacts on Native American archeological resources in San Francisco are assumed to have the potential for impacts on TCRs.

California law also protects Native American burials, skeletal remains, and associated grave goods, regardless of their antiquity, and requires input from an affiliated Native American descendant in the treatment and respectful disposition of those remains (California Health and Safety Code [CHSC] § 7050.5; PRC § 5097.94 *et seq.*).

Local Regulations

SAN FRANCISCO PLANNING CODE SECTION 101.1: MASTER PLAN PRIORITY POLICIES

Planning Code section 101.1 requires that the City find a proposed action is consistent and on balance with eight master plan priority policies. Priority Policy 7 is relevant to historical resources and establishes a priority policy "that landmarks and historic buildings be preserved."

SAN FRANCISCO GENERAL PLAN

The Urban Design Element of the general plan includes the following policy related to historic preservation:

- Policy 2.4: Preserve notable landmarks and areas of historic, architectural, or aesthetic value, and promote the preservation of other buildings and features that provide continuity with past development.

SAN FRANCISCO PLANNING DEPARTMENT, CEQA REVIEW PROCEDURES FOR HISTORICAL RESOURCES

The department prepared the CEQA Review Procedures for Historic Resources to provide guidance in determining whether a resource is considered a historical resource as defined by CEQA. Three categories of properties are defined:

- Category A: Category A has two subcategories:
  - Category A.1: Resources listed in or formally determined to be eligible for the CRHR
  - Category A.2: Resources listed in adopted local registers, or properties that appear eligible, or may become eligible, for CRHR-listing
- Category B. Properties requiring further consultation and review
- Category C. Properties determined not to be historical resources or properties for which the City has no information indicating that the property is a historical resource.

To determine if a property is eligible as a historical resource for the purposes of CEQA, the department (as the lead agency) requires an evaluation of a property's individual significance for listing in the CRHR, as well as an examination of a property's relationship to any eligible historic district. To assess impacts within historic districts, the department examines several factors including, but not limited to, size and significance of a historic district, number, and location of contributing and noncontributing features, district integrity, district boundaries, and the proposed action. Because archeological resources and sites can contribute to historic districts, this review may be applicable to future ground-disturbing activities in San Francisco, which could affect archeological resources. Proposed projects within historic districts are assessed on a case-by-case basis, due to the wide variety and unique nature of historical resources.

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2. PROJECT DESCRIPTION

The planning commission is proposing to update the existing 2014 housing element of the general plan. The EIR prepared for the housing element update evaluates the reasonably foreseeable environmental effects associated with adoption and implementation of the San Francisco Housing Element 2022 Update (housing element update or proposed action), which is an update to the existing 2014 housing element. The housing element update is mandated by state law, Government Code section 65583.

The housing element update establishes goals, policies, and actions to address the existing and projected housing needs of San Francisco. The goals, policies, and actions are required to plan for the regional housing targets allocated to San Francisco by regional agencies for the 2023–2031 cycle and meet future housing demand in San Francisco. The housing element update includes policies designed to improve housing affordability and advance racial and social equity in accordance with the directives from the planning commission and historic preservation commission in summer 2020.[7] The housing element update includes overarching goals for the future of housing in San Francisco that respond both to state law requirements as well as local community values. The underlying policies and actions would guide development patterns and the allocation of resources to San Francisco neighborhoods. In general, the housing element update would shift an increased share of the San Francisco's projected future housing growth to transit corridors and low-density residential districts within well-resourced areas.[8]

The housing element update would modify the policies of the general plan's housing element. It would not include specific changes to existing land use controls (e.g., zoning) or approve any physical development (e.g., construction of housing or infrastructure).[9] As such, the proposed action would not result in any direct physical changes to the environment, but would result in reasonably foreseeable indirect changes. Specifically, the department assumes that adoption of the housing element update would lead to future actions, such as planning code amendments to increase height limits along transit corridors and to modify density controls in low-density areas that are primarily located on the west and north sides of the city, designation of housing sustainability districts, and approval of development projects consistent with the goals, policies, and actions of the housing element update.

Under the proposed action, the department projects approximately 150,000 housing units would be constructed in the city by 2050 compared to 2020 conditions. The department projects approximately

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7 San Francisco Planning Commission Resolution No. 20738, *https://sfplanning.org/sites/default/files/documents/admin/R-20738_Centering_Planning_on_Racial_and_Social_Equity.pdf*, June 11, 2020 and Historic Preservation Commission Resolution No. 1127, *https://sfplanning.org/sites/default/files/documents/admin/R-1127_HPC_Equity_Resolution.pdf*, July 15, 2020.

8 *Well-resourced areas* are high- and highest-resource areas, which are neighborhoods identified by the State of California that provide strong economic, health, and educational outcomes for its residents. More information is available at: *https://www.sfhousingelement.org/high-opportunity-areas*.

9 Any changes to existing land use controls would require related legislative processes including review and public hearings before the planning commission and/or the board of supervisors. Approval of housing development or infrastructure would require development applications and approval. The EIR analyzes the secondary physical environmental impacts that could occur as a result of the housing element update.

102,000 housing units would be constructed by 2050 under the existing 2014 housing element (2050 environmental baseline).[10] In other words, the department predicts that approximately 50,000 more housing units would be constructed by 2050 if the housing element update is adopted compared with the development anticipated under the existing 2014 housing element. Future development consistent with the housing element update would predominately consist of residential projects, some with ground floor neighborhood services (e.g., retail or small medical offices) in well-resourced areas and along transit corridors. Figure 2 shows the projected difference in housing growth (approximately 102,000 housing units) and distribution in the city between 2020 conditions and the 2050 environmental baseline. Figure 3 shows the projected difference in housing unit growth (i.e., approximately 50,000 housing units) and distribution between the 2050 environmental baseline and the proposed action. While the impact analysis in the EIR prepared for the housing element update and this ASA is based on these representative future conditions, the depictions are not intended to be precise maps of where future development would occur. Rather, the depictions are used to identify the types and magnitude of impacts anticipated from the increased density and redistribution of housing growth under the proposed action compared to the 2050 environmental baseline.

The proposed action would occur entirely within the city. San Francisco is a consolidated city and county and approximately 49 square miles in size. As shown in Figure 1, the city is on the tip of the San Francisco Peninsula, with the Golden Gate Strait to the north, San Francisco Bay to the east, San Mateo County to the south, and the Pacific Ocean to the west.

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[10] As described in Chapter 4, Environmental Setting and Impacts, the 2050 projected growth under the existing 2014 housing element is considered the 2050 environmental baseline.

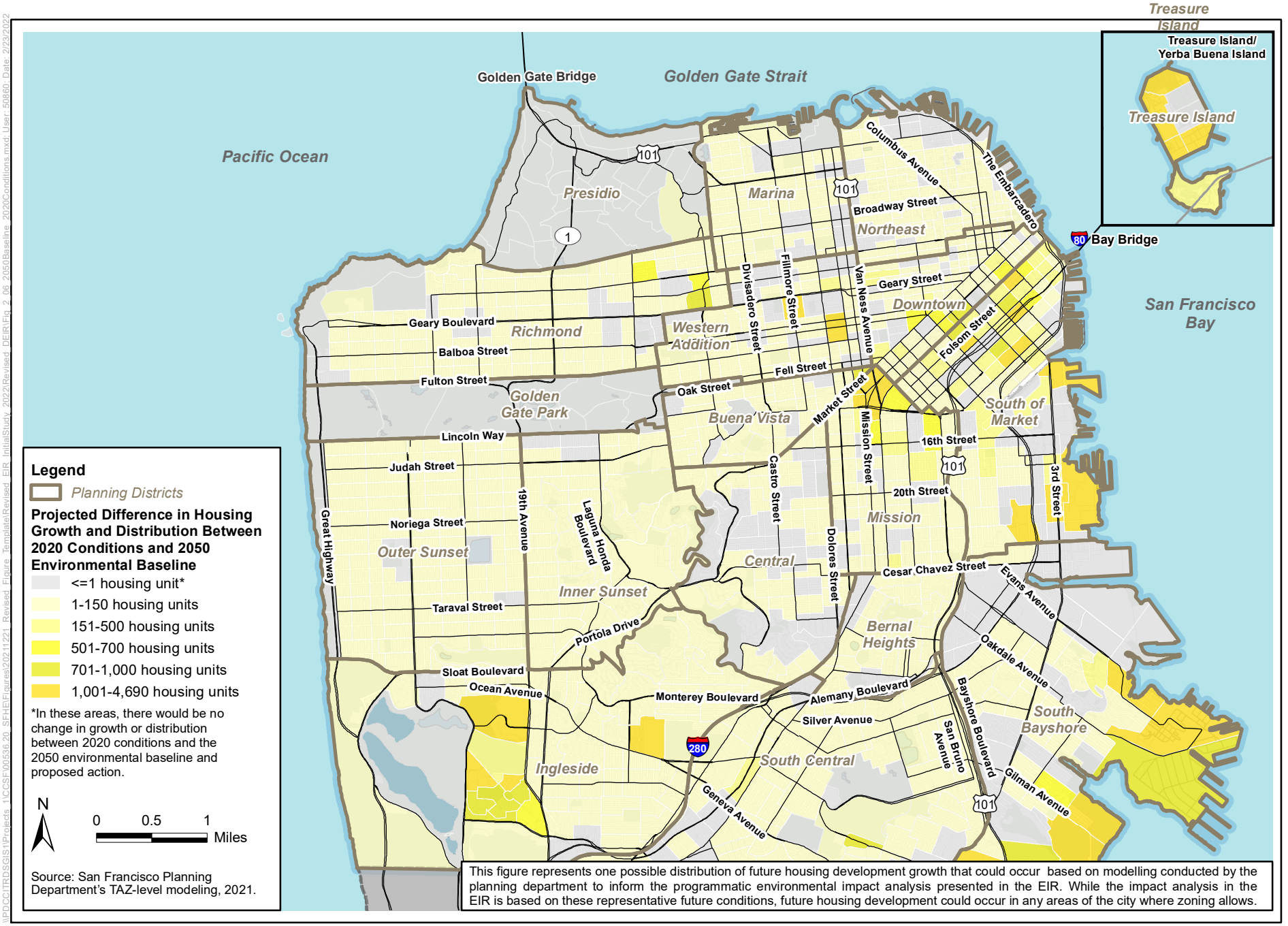

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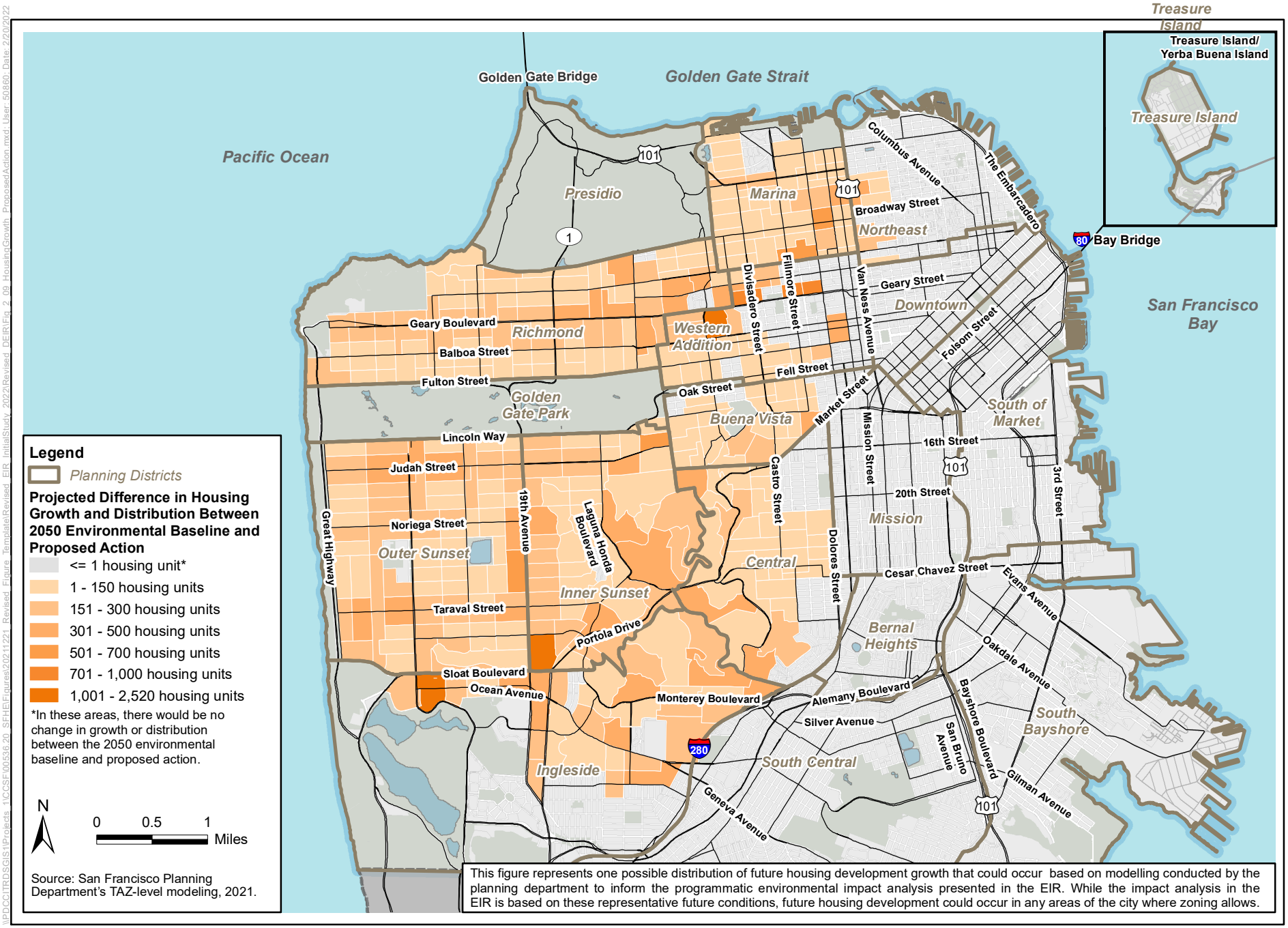
Figure 2
Projected Difference in Housing Growth and Distribution Between 2020 Conditions and 2050 Environmental Baseline



San Francisco Housing Element 2022 Update
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Figure 3
Projected Difference in Housing Growth and Distribution Between 2050 Environmental Baseline and Proposed Action

3. ENVIRONMENTAL AND CULTURAL SETTING OF SAN FRANCISCO

This section describes the generalized environmental conditions in San Francisco, both past and present. The archeological context and brief ethnographic summary provide a framework for later discussions of Native American resources (in this document, the term “Native American” or "pre-European contact" is used rather than “prehistoric”). The historical context sheds light on the processes of major land changes and settlement patterns.

A. Overview of Paleoenvironment and Historic Environmental Setting

This section describes the geomorphology and paleoenvironment of the study area vicinity. The purpose of this section is to characterize the environmental factors that could affect how humans used the landscape in the past and determine whether these factors could influence the visibility and preservation of archeological resources. The section is organized chronologically and briefly describes the environmental and geologic events that predate the period for which there is scientific consensus on human occupation of North America (hereafter referred to as the period of North American occupation) before discussing more recent events in greater detail. The period of North American occupation is thought to have started at the end of the Pleistocene epoch, as early as around 13,500 years ago (Meltzer 2004; Erlandson 2007; Braje et al. 2017). The reason for including information about some events that predate the period of human occupation is that some of these events have left a physical legacy that have has contributed to the landscape humans have interacted with during the period of North American occupation. Greater detail is provided for those environmental and geologic events that have affected the landscape during the period of human occupation of North America, and therefore have greater potential to affect the preservation and visibility of archeological resources.

The proposed action would occur entirely within the city on the tip of the San Francisco Peninsula, one of several northwest–southwest-trending ridges that the Coast Range geomorphic province comprises. The San Francisco Peninsula is bounded by the Pacific Ocean to the west, the San Francisco Bay and central valley to the east, and the northern extent of the Santa Cruz Mountains to the south. The peninsula formed as a result tectonic pressure, faulting, and deformation along the boundary between the Pacific plate and North American plate. This tectonic pressure has also resulted in the formation of a series of generally northwest–southeast oriented transform faults (i.e., faults that primarily move horizontally, rather than vertically) that parallel the coastline, including the San Andreas fault systems (Atwater et al. 1977; Clark 1981; Peterson et al. 2015).

Between the Jurassic (201 to 145 million years ago) and Cretaceous (145 to 66 million years ago) periods, the accretion of sediments along a now-extinct convergent plate boundary between the Pacific and North American plates off the present-day coast of California formed the bedrock that underlies the San Francisco Peninsula. Over time, the accreted sediments metamorphosed, uplifted, and formed the Coast Range, which is referred to

as the Franciscan Complex (Atwater et al. 1977; Sloan 1989, 2006; Trask and Rolson 1951). The coast range continues to uplift and warp because of tectonic pressures generated by the San Andreas fault zone—an active transform plate boundary (Atwater et al. 1977; Clifton and Hunter 1987, 1999).

At elevations of less than 500 feet above sea level, the Franciscan Complex is overlain by the poorly consolidated Colma Formation. Formed during the Pleistocene epoch (from around 2.6 million to 12,000 years ago), Colma Formation was deposited during a series of worldwide cyclical glacial advances and recessions, which in turn made sea levels rise and fall. During this period, alternating beds of marine sediments and aeolian (i.e., wind-deposited) sands and silts were deposited on and around the San Francisco Peninsula. These beds are collectively referred to as the Colma Formation. There are two widely recognized components of the Colma Formation. The older lower component formed between 120,000 and 80,000 years ago in shallow bay and estuarine environments at a time of higher sea level and comprises mostly yellowish-orange to gray sandy clay and silty sand. The younger, upper component was formed between 65,000 and 8,000 years ago as sand dunes along the marine shoreline and on the uplands (Schlocker 1974; Atwater et al. 1979; Peterson et al. 2015). In some instances, the upper Colma Formation, or material derived from it, has been found to interbed with younger estuarine and bay muds along late Pleistocene and early Holocene shorelines (Atwater et al. 1977, 1979; Sloan 1992, 1989; Peterson et al. 2015). Based on the age at which this formation was deposited, the uppermost part of the Colma formation is considered to be the “cultural basement”-- point below which the presence of archeological resources is highly unlikely.

At the end of the last major glaciation during the late Pleistocene epoch (between around 17,000 and 11,000 years ago), sea levels were between 100 and 130 meters (328 to 426.5 feet) lower than at present. During that time, much of the basin that is presently occupied by San Francisco Bay was a river valley. Fossil and paleobotanical data indicate that the valley hosted stands of deciduous trees and grassy meadows, as well as a variety of now-extinct mammals, including Pleistocene horse, bison, camel, and mammoth (Helley et al. 1972; Masters and Aiello 2007). Humans were present in California by the end of this period (and possibly much earlier), but no evidence of this has yet been found in the Bay Region. The range of flora during this time indicates an environment that was slightly cooler and wetter than at present, comparable to the current environmental conditions of the lowlands of the Pacific Northwest (Masters and Aiello 2007). Because of lowered sea levels during this period, the marine coastline was located approximately 35 kilometers (21.7 miles) west of its current location, at the edge of a broad coastal plain (Atwater et al. 1979; Sloan 1989). The area that is now San Francisco Bay was a broad river valley, and the mouth of the river was in the vicinity of what are now the Farallon Islands. During the late Pleistocene period, during which the coastal plain was exposed, alluvial sediments deposited along this plain were transported inland (east) by winds and formed a large sand dune sheet that extended from the western shore of the San Francisco Peninsula to the Oakland Hills (Schlocker 1974; Peterson et al. 2015). Because these dune sheets formed during the period for which there is evidence of human occupation of North America, they retain the potential to contain buried archeological resources.

During the early to middle Holocene epoch (around 12,000 years ago to around 5,000 years ago), sea levels rose rapidly, approaching near-present day levels approximately 5,000 years ago (Atwater et al. 1977) (Figure 4). As sea levels rose, the marine coastline rapidly moved inland (eastward), and by approximately 9,000 years ago ocean waters flowed in through the Golden Gate and, rapidly filled the San Francisco Valley, forming San Francisco Bay (Atwater et al. 1977; Helley et al. 1979; Peterson et al. 2015). During this same period, as the coastal plain along the west side of the San Francisco Peninsula became inundated, dune formation slowed on the San Francisco Peninsula (Peterson et al. 2015). It is during this period of rapid sea level rise that humans are believed to have first settled in the San Franciscan Valley.

However, archeological evidence of pre-European contact use or occupation in the valley or on the shores of the growing bay would have been inundated, then buried under bay-bottom sediments. Only a single human interment and one shell midden deposit that date to this period (c. 7,500 BP and 7,900 BP, respectively) have been found in San Francisco, and both only in the last decade.

As sea levels approached their near present-day elevation during the middle to late Holocene, around 4,000 years ago, the rate of sea level rise slowed markedly, and tidal marshes began to form along the margins of the San Francisco Bay as alluvial sediments, carried into the bay by creeks on the peninsula, accumulated along the shoreline (Figure 5). Sea levels continued to rise slowly, and the shoreline continued to fluctuate over the next 2000 years as the extent of marshes varied with changes in rainfall, tectonic events, subsidence, and other factors. At around the same time, archeological evidence indicates that human settlement began a marked increase around the bay. On the east side of the San Francisco Peninsula, over the subsequent 2000 years, large marshes formed in Yerba Buena Cove, Mission Bay, in the Islais Creek estuary, along Mission Creek and Hayes Creek, and at the present-day location of Crissy Field on the northern end of the peninsula (Atwater et al. 1979). Many Native American settlements were established around the marsh margins, particularly within the past 2000 years. During this same period, sands that began to accumulate on ocean beaches along the western shoreline of the San Francisco Peninsula served as source for a renewed period of dune formation and migration eastward across the peninsula (Peterson et al. 2015). During this time, the locations of drainages and upland ponds were most likely influenced by late Holocene dune formation and migration. The locations of these water bodies in the early to middle nineteenth century are depicted in Figure 5. Paleobotanical data from cores deep in the dunes indicate that perched freshwater ponds and vernal pools were present among the dunes. Paleobotanical data from this period also suggest that the San Francisco Bay area, over the past several thousand years, was marked by climatic shifts of alternating cool/wet and warm/dry periods that have generally continued to become warmer and drier with time (Malamud-Roam et al. 2007).

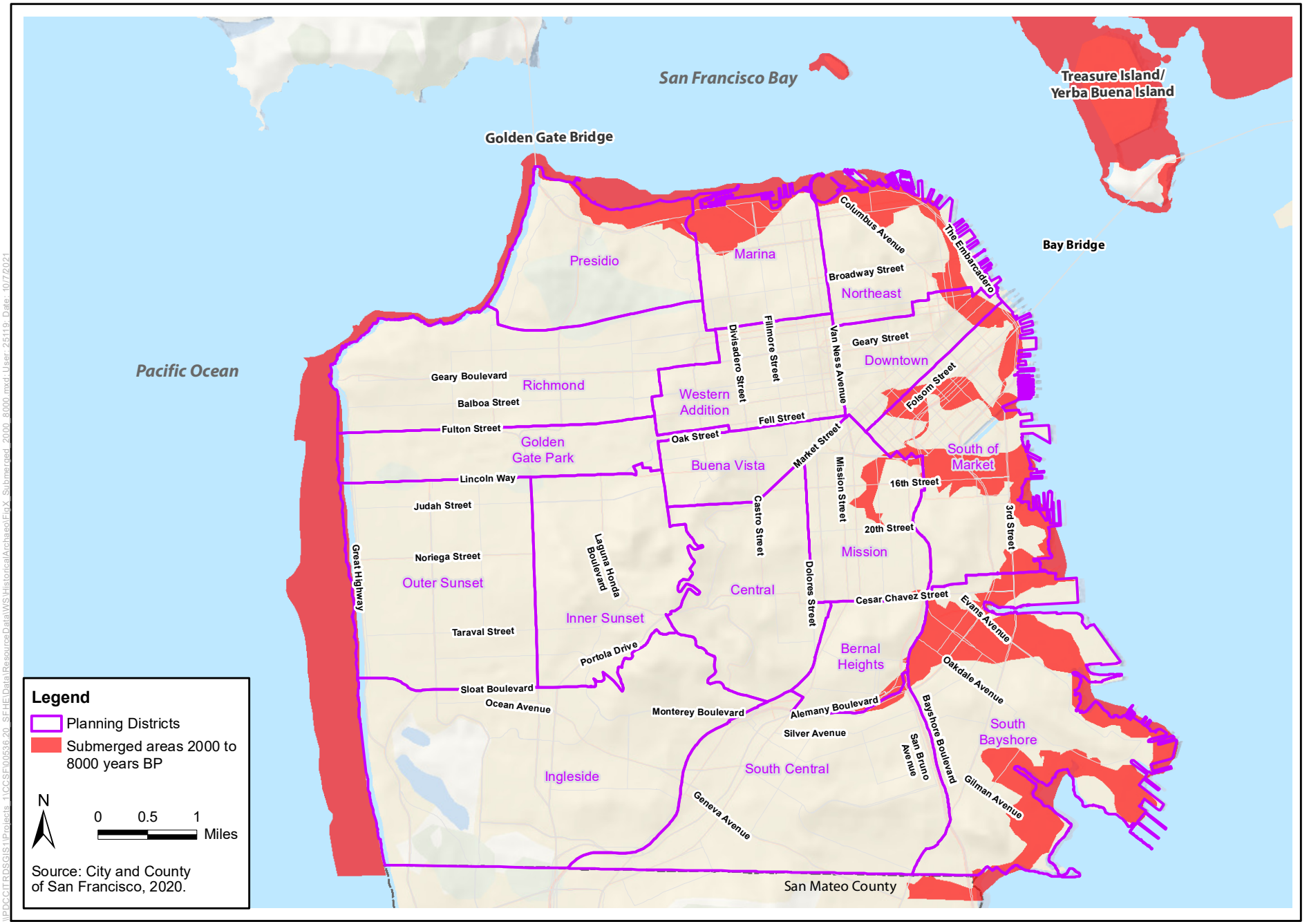

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Figure 4
Land Submerged Between 2000 and 8000 Years Before Present



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Figure 5
Watercourses and Marshes with Shorelines from 10,000 BP to AD 1850

The Native Americans who arrived in San Francisco during the period of sea level rise harvested plant and animal resources and managed natural vegetation in ways that altered San Francisco's biome, but they generally did not substantially alter the topography or hydrology of the city. The Spanish colonists who arrived in 1776, and the Mexican colonists who succeeded them, did engage in activities that resulted in minor topographic and hydrologic changes (such as road building and stream diversion), but still did not substantially change the city natural setting in a major way. However, following the discovery of gold near Sutter's Mill in 1848, a large influx of people migrated to the San Francisco Peninsula. Over the next year, the population of San Francisco grew from around 1,000 inhabitants to over 25,000. San Francisco's rapid population growth continued into the end of the nineteenth century as local industries were established (Hittell 1878:429; Scott 1985:50–51). With this rapid population growth came the need for developable land. Because the inland area of the San Francisco Peninsula was hilly and difficult to traverse and the ocean coast was separated from the harbors of the bay by massive sand dune fields, development efforts were focused on the bay shoreline: both individuals and the city government undertook widespread grading of the dunes, particularly in the South of Market and Downtown districts, and extensive landfill in Yerba Buena Cove and Mission Bay (U.S. Coast Survey 1853, 1857; NETR Online 2014). Land development in the nineteenth and twentieth centuries also led to the stabilization of sand dunes across the peninsula as the dunes were graded and built over and thus protected from the wind. In addition to the intentional land reclamation activities occurring along the San Francisco shoreline, the marshes and tide flats of San Francisco Bay accumulated sediment rapidly in the middle of the nineteenth century because of substantially increased sediment load from extensive hydraulic mining activities upriver of the bay on tributaries of the Sacramento and San Joaquin rivers (Atwater et al. 1979). Combined, these activities led to drastic changes in the shoreline, topography, and locations of freshwater bodies on the San Francisco Peninsula. Development of the San Francisco Peninsula continues into the present.

B. Native American and Historic Period Overview of San Francisco

Native American Cultural Chronology

Prior to the arrival of European settlers and the development of Spanish missions, Native American groups occupied the San Francisco Peninsula for at least 7,800 years, and probably longer. Our knowledge of the early pre-European contact period of the Bay Area is minimal, because early sites along the Bayshore were presumably inundated by the rising bay.

More than 100 years of archeological research has generated a wealth of information concerning the chronology and characteristics of Native American human adaptations in the San Francisco Bay Area. To better understand the nature of the archeological resources within the archeological study area, this section provides a summary of current data, outlining what is known about the pre-European contact and contact-period inhabitants and the material culture of the project region and vicinity (based on summaries presented in Jones & Stokes 2007; Byrd et al. 2010). Because of the nature of development across San Francisco historically, with much earlier and more intensive development—and more archeological investigations-- on the east side, archeology on the east side of the city is much better understood than archeology on the west side, which is relatively unknown.

Most known Native American sites in San Francisco are midden deposits of shellfish and occupation debris that accumulated at locations where Native American groups resided or gathered and processed shellfish near the shores of San Francisco Bay or the ocean coast. The first generation of San Francisco Bay archeologists (Nels Nelson, Max Uhle, W. E. Schenk, and L. Loud) recorded more than 425 shellmounds around the San Francisco Bay Area and were among the first to map, excavate and characterize these shellmounds, in the early twentieth century. Their reporting focused on spatial distribution, internal site constituents, and site formation (see Lightfoot in Erlandson and Jones 2002; Jones & Stokes 2007; Byrd et al. 2010).

Euro-Americans often mined these mounds for shell and to use as organically rich fertilizer. Subsequent development often resulted in these mounds being graded away or buried as the marshy bayshore was raised and the land leveled for buildings and roads. This has resulted in partial or complete destruction or obscuring of many Native American Bay Area sites and a loss of knowledge regarding the location and condition of many sites that once existed (Jones & Stokes 2007; Byrd et al. 2010).

The following summarizes the pre-European contact period of the Bay Area by the geologic time segments Terminal Pleistocene (13,500–11,600 calibrated years before present [cal BP]), Early Holocene (11,600-7700 cal BP), Middle Holocene (7700-3800 cal BP), and Late Holocene (3800 cal BP onward), with further cultural and chronological divisions of the Late Holocene based on recent data. It should be noted that these periods are academic constructs and are not necessarily reflective of the views of the descendants of Native American peoples. See WSA (2010) for a discussion of the development of the archeological research and the taxonomic system in central California.

Terminal Pleistocene (13,500-11,600 cal BP)

The Terminal Pleistocene is largely contemporaneous with the Clovis and Folsom periods of the great plains and the southwest, and is generally considered to be represented by mobile, wide-ranging hunters and gatherers who periodically exploited large game (Haynes 2002). Throughout California, Terminal Pleistocene occupation is infrequently encountered and poorly understood and most often represented by isolated fluted points (Erlandson et al. 2007; Rondeau et al. 2007; Byrd et al. 2010); however, no fluted points or archeological deposits dated to the Terminal Pleistocene have been documented in the Bay Area (Byrd et al. 2010). Several factors have very likely contributed to the lack of evidence of this period in the Bay Region, including what is assumed to be the small, mobile, and quickly moving nature of initial human populations, which would have been less likely to leave archeological features on the landscape than larger, more sedentary or permanent populations. Factors such as sea level rise, coastal erosion, and localized subsidence in coastal areas, resulting in the destruction or submersal and burial of such sites (Byrd et al. 2010), also contribute to the lack of the knowledge of archeological deposits dating to this period in the Bay Region.

Early Holocene (11,600-7700 cal BP)

The Early Holocene cultural landscape of Central California was characterized by semimobile hunter-gatherers exploiting a wide range of food resources from marine, lacustrine, and terrestrial contexts (Erlandson et al. 2007; Jones et al. 2002; Moratto 2002). However, little cultural evidence of the Early Holocene has been documented in the Bay Area, and, thus, there is still much that is unknown about this period.

There are four known and dated Early Holocene sites in or near the Bay Area. All these sites were found in buried terrestrial contexts (Rosenthal and Meyer 2004:30–32); no such sites have been found to date in San Francisco and none has been documented in other bay or coastal settings (Byrd et al. 2010). This almost certainly is due to the fact that sites along the bay or coast would have been inundated as sea levels rose rapidly during this period. The recent discovery of a submerged shell midden (SFR-220) in the Mission Bay area, dated just subsequent to the end of this period, supports this hypothesis and underscores the importance of continuing geoarcheological investigations in San Francisco in areas that were submerged pre-European contact and subsequently buried in nineteenth- and twentieth-century land fill.

Middle Holocene (7700-3800 cal BP)

The Middle Holocene was characterized by a diverse range of habitation sites and artifact assemblages, which suggests higher population levels, more complex adaptive strategies, and longer seasonal occupation than during the Early Holocene (Byrd et al. 2010). More than 30 Bay Area archeological sites have produced radiocarbon dates indicating occupation during this time segment). Several isolated human burials, including three on the San Francisco Peninsula (SFR-28, SFR-205, SMA-273), and one submerged shell midden in San Francisco's Mission Bay, SFR-220, have also been dated to the Middle Holocene (Byrd et al. 2010; Lentz et al. 2018).

Faunal assemblages at these sites suggest a shift toward a lacustrine and maritime focus, associated with the expansion of San Francisco Bay's estuary, mud flats, and freshwater tidal marshes during this time (Byrd et al. 2010).

Late Holocene (3800-170 cal BP)

The Late Holocene is generally divided, archeologically, into the following five main time periods: Early (4500/3800–2450 cal BP), Early-Middle Transition (2450–2050 cal BP), Middle (2050–900 cal BP), Middle-Late Transition (900–700 cal BP), and Late (700–170 cal BP).

There are more than 200 documented Late Holocene sites in the Bay Area. The Early Period of the Late Holocene marks the establishment of several large shellmounds. Bay margin sites, not surprisingly, revealed a strong emphasis on marine shellfish (particularly bay mussel and oyster), marine fishes, and marine mammals, whereas interior sites revealed a strong emphasis on freshwater fish and shellfish along with terrestrial mammals (Byrd et al. 2010).

Artifacts and exotic material types suggest that an extensive trade network had been established by this time (Byrd et al. 2010). The Middle Period of the Late Holocene is characterized by greater settlement permanence (either sedentary or multi-season occupation), mound building, and increasing social complexity and ritual elaboration (Lightfoot 1997; Lightfoot and Luby 2002). Both marine and terrestrial food resources were exploited, and the consumption of acorns increased (Bartelink 2006; Bickel 1978; Greengo 1951; Wohlgemuth 2004; Byrd et al. 2010).The Late Period of the Late Holocene is the best-documented Late Holocene division. Small seed exploitation increased, as evidenced by archeobotanical remains, and sea otters, rabbits, deer, clams, and horn snails were frequently exploited as foodstuffs. The bow and arrow first appeared during the

Late Period, and extensive trade relations with neighboring groups continued. Funerary rituals were strongly patterned and included flexed interment positions and "killed" grave offerings, along with occasional cremations (Byrd et al. 2010).

C. Ethnohistory and Cultural Affiliation

An ethnohistory of San Francisco is included in Section 4.3, Tribal Cultural Resources, of the EIR prepared for the housing element update.

D. Historic Context

History

SPANISH PERIOD

In 1769, an overland expedition led by Governor Gaspar de Portolá sighted San Francisco Bay, and in 1775, Juan Manuel de Ayala and José Cañizares navigated the first ship, the *San Carlos*, through the Golden Gate and into San Francisco Bay (Kyle 2002:349–350; Milliken 1995:36-40; Sandos 2004:42-43).

As in other regions of California, Spanish colonization of San Francisco (then known as Yerba Buena) involved the creation of two types of frontier institutions: a religious complex for converting native peoples to Catholicism and European modes of economic production (the mission) and a military garrison for defending the territory (the presidio). In 1776, Juan de Bautista de Anza led a party that traveled from Monterey into San Francisco to select settlement locations. Anza chose a site near today's Fort Point for the presidio, and a creek location approximately 3 miles to the southeast, which he named Arroyo de los Dolores, for the mission site. In the summer of 1776, Anza's lieutenant, José Joaquín Moraga, and Father Francisco Palóu led the settlers who had accompanied Anza to California on the last leg of their overland journey, from Monterey to San Francisco. On June 29, Palóu held the first mass at the site where the San Francisco mission would be developed. The Presidio of San Francisco was dedicated in September, and Mission San Francisco de Asís (which would become known as Mission Dolores) was dedicated in October (Kyle 2002:350–352; Woodbridge 2006:18–21).

The first mission chapel, built in 1776, was a temporary arbor-like structure. It was replaced in that same year by a chapel of *palizada* (similar to wattle and daub) and again in 1783 and 1787 by chapels of the same material. The current Mission Dolores chapel, made of adobe with clay roof tiles, was built between 1788 and 1791 (WSA 2010). The mission complex comprised a broad group of structures, including tanneries, mills, a school, water conveyance system of channels and reservoirs, prison, forge, bathhouse, corrals, weaving and carpentry shops, a music room, library, and a neophyte village (WSA 2010).

Spanish colonization, and subsequent rule by Mexico after 1821, translated into dramatic social upheaval and demographic decline for the region's native Ohlone inhabitants. Native American neophytes (mission converts), under Mexican rule, as under Spanish rule, were subject to disrupted traditional subsistence patterns, physical punishment, new forms of European labor discipline, clerics' efforts to eradicate native religion, and European

disease. Epidemics at the mission killed more than half of the neophytes. Over time, neophytes were gathered from an increasingly broad area and included Ohlone, Coast Miwok, Southern Pomo, and Wappo people (WSA 2010).

MEXICAN PERIOD

The Spanish period ended in 1821–22, when the new government of Mexico seized control of California. Fueled by anti-clerical sentiment, the Mexican government began secularizing the California missions during the 1830s, and within a decade only a handful of Native America neophytes still lived at the mission. Territorial governors granted vast tracts of land to civilians—many of them former Spanish soldiers—for private cultivation, including lands originally reserved for Mission Indians under Spanish law. A new class of Hispanic rancho landowners found a readily exploitable supply of labor in the Indians cut loose from the patriarchal Franciscan missions, many of whom occupied the lower social stratum in pueblos like the one that had taken shape around Mission Dolores. Rancho activities often included crop cultivation and cattle raising, and the production of hide and tallow provided California's main international trade commodities during the Mexican period (Bean and Rawls 2002:56, 58–70, 72; Sandos 2004:11–12, 108–09; JRP 2010:33). To support the residents and activities, rancho compounds included residences, kitchens, smaller houses for ranch hands, and structures and outbuildings such as corrals or stables (WSA 2010).

The bayside village of Yerba Buena, a multicultural settlement and small-scale harbor along the shores of Yerba Buena Cove, in what is now the city's Downtown District, grew slowly during the 1830s and early 1840s (Figure 6). The Yerba Buena settlement was described by a French visitor in 1841 as 20 houses belonging to foreigners and naturalized Mexican citizens grouped around a cove, connected to the mission by a dirt road. The arrangement was efficient for trade with American, Russian, and British ships that anchored in the cove. In 1847, Alcalde Washington A. Bartlett changed the name of Yerba Buena to San Francisco. With news of war between Mexico and the United States, and in anticipation of victory by the latter, Alcalde Bartlett commissioned Jasper O'Farrell, Surveyor General of Alta California, to conduct a new survey of San Francisco and modify an earlier plat prepared by Jean-Jacques



Legend

Planning Districts

1850 shoreline

N

0 150 300 Feet

Source: City and County of San Francisco, 2020; UC Berkeley, Bancroft Library

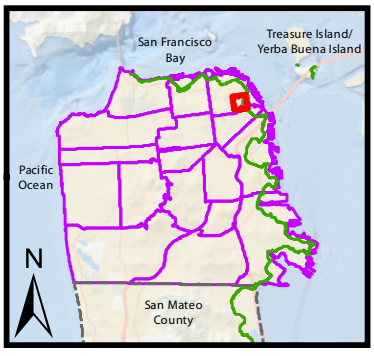

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Figure 6
1839 Vioget Plan of Yerba Buena with 1850 Shoreline

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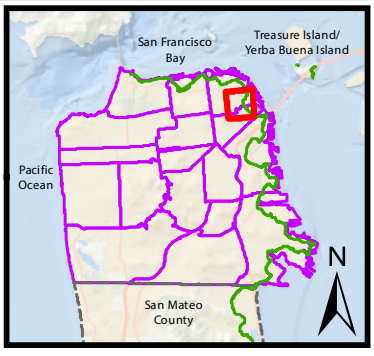
Vioget. In 1847, O'Farrell mapped the town and laid out Market Street as San Francisco's future main 110-foot-wide artery paralleling the old route between Mission Dolores and Yerba Buena Cove. The old route was "paved" as a plank road across the dunes, constructed in 1850, that later became Mission Street (Figure 7). North of Market Street, O'Farrell expanded Vioget's original 12-block 50-vara grid (*vara* representing the 33⅓-inch Spanish equivalent to the yard) to the south and west, with streets running in cardinal directions. South of Market Street, O'Farrell created a grid of larger 100-vara blocks intended for agricultural use, with streets aligned northeast, northwest, southeast, and southwest, rather than cardinally. Subsequent survey work would extend the smaller block sizes north of Market Street to the west into Hayes Valley (ICF 2015:43–44; Page & Turnbull, Inc. 2007:25–26, 2009:16–17).

EARLY GOLD RUSH AND EARLY URBAN DEVELOPMENT, 1847–1860

Gold was found in the American River in 1848. San Francisco, the closest seaport to the gold fields, as well as the largest nearby port where mining supplies could be obtained, became a frontier boomtown during the Gold Rush. The population grew from about 800 before the Gold Rush to 25,000 by the end of 1849. Soon, ships abandoned after bringing gold seekers to California began to clog the harbor. By 1851, Yerba Buena Cove resembled a "forest of masts". Some ships were connected to the shore with long piers and converted to storage, while others were salvaged for construction materials. This created a dangerous situation, and six major fires broke out between 1849 and 1851, burning ships and piers down to the water line, and rendering Yerba Buena Cove unnavigable.

Following the mild winter of 1848–1849, heavy rains, growing population, and increased traffic in the following winter combined to ravage San Francisco's unimproved streets. The state legislature approved the charter incorporating the City of San Francisco in 1851. In 1850, the City contracted the Mission Dolores Plank Road Company to construct a wood "highway" from the commercial district to Mission Dolores and maintain the road through toll charges on horse teams and carts. This plank road, which replace the earlier dirt road, was an important improvement in facilitating travel across the sand dune fields. In 1852, the City Council contracted another company to construct a plank road along Folsom Street (Folsom Street was chosen over Market and Howard streets because the latter two would have been more difficult to grade due to large sand dunes). Grading and plank road construction during this period was undertaken by private interests, often owners of adjacent property who secured City Council approval and hired contractors to perform the construction work under supervision of the city's public streets commissioner (later the public streets superintendent). Beginning in the later 1850s, infrastructure improvements began to include installation of redwood and brick sewers, which drained to the bay, and water storage cisterns (JRP 2010:39; Hittell 1878:152; Lotchin 1974:166).





Legend

Planning Districts

1850 shoreline

N

0 300 600 Feet

Source: City and County of San Francisco, 2020.

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Figure 7
Bartlett O'Farrell 1847 Map of San Francisco with 1850 Shoreline

San Francisco's *ayuntamiento* (pre-1851 City Council) established the first official public burial ground at a triangular-shaped piece of land bounded by Market Street at the southeast, Larkin Street at the west, and McAllister Street at the north, adjacent to what is now Civic Center Plaza. The site had previously served as an unofficial burial ground for deceased sailors and native-born Californians of European descent, with headstones dating to as early as 1849. By January 1, 1854, approximately 4,500 bodies had been interred at the graveyard, which was known as Yerba Buena Cemetery (Soulé 1855:594–596; Woodbridge 2006:52–53). Soulé described Yerba Buena Cemetery in 1854:

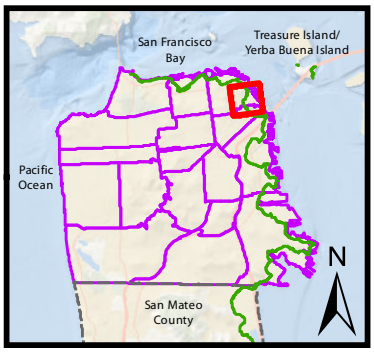
> It lies in a hollow among miserable looking sand-hills, which are scantily covered with stunted trees, worthless shrubs, and tufted weeds. It extends over a large space of ground and is still among the most dreary and melancholy spots that surround the city. In 1850, there was nothing visible, below and around, but the loose barren sand-hills, with their scattered patches of wild bushes…the place was sad and desolate in the extreme.
>
> Since that period it has been enclosed by a wooden fence, and a portion of the ground is now thickly covered with simple tablets and some highly decorated monuments to the departed. Many of the tombs are formed in the modern Parisian style, and in their trim flower-beds, neat rails, crosses and tablets, imitate the sepulchers of Père Lachaise…American and European, Asiatic and African are now the same filthy substance…in Yerba Buena Cemetery there is none better, none worse in all human respects (Soulé 1855: 594–595).

The boundaries of San Francisco expanded dramatically with the Consolidation Acts of 1850, 1851, and 1856 (Figures 8–11). The 1850 Act configured the city limits at the southern boundary of today's 17th Street, the western boundary at Buchanan Street north of Market Street, and Dolores Street south of Market Street. The 1851 Act pushed the southern boundary to 22nd Street and the western boundary to Castro Street. The 1856 Act consolidated the city and county governments and made the city and county boundaries identical. A year earlier, the Van Ness Ordinance of 1855 settled claims by squatters who had occupied outlying areas by January 1, 1855. The Van Ness Map of 1856 imposed a new grid of streets and blocks on formerly peripheral areas and set the stage for new surveys of Horner's Addition, Mission Dolores, the Mission Addition, and the Western Addition (Page & Turnbull, Inc. 2007:28–31).

In addition to the sand redistributed by the steam paddy, the refuse generated by fires, building construction and alteration, and boomtown Gold Rush capitalism generally also contributed to the fill materials used to transform the built environment of San Francisco's waterfront. Trash, scrap wood, stone and brick rubble, and abandoned vessels helped fortify the sand fill. According to Soulé, in 1850, "There were as many as five hundred and twenty-six vessels lying in the port, the great number of which were ships and barques, the remainder being brigs and schooners" (JRP 2010:43; Soulé 1855:281). Although most of these left the port eventually, many were converted to stationary storeships or abandoned in the cove. Some eventually became fill material. Soulé wrote in 1854 that "in many places of what is now the very centre of the business portion of the city lie large vessels, which…got stranded, or were used as storeships or lodging houses on the beach. When the extension of the city towards the waters of the cove took place, these ships remained where they were, fast imbedded in in the mud" (Soulé 1854:160) It appears that about 40 ships may lie buried beneath today's San Francisco streets in the Gold Rush–era fill zone, which extends from Montgomery Street south to Rincon Point.

The filling of portions of Yerba Buena Cove during this period dovetailed with grading efforts and rebuilding of the city, which, during the 1850s, would eliminate the large sand dunes south of Market Street. To address





Legend

Planning Districts

1850 shoreline

N 0 350 700 Feet

Source: City and County of San Francisco, 2020.

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Figure 8
Harrison 1848 Map of San Francisco with 1850 Shoreline

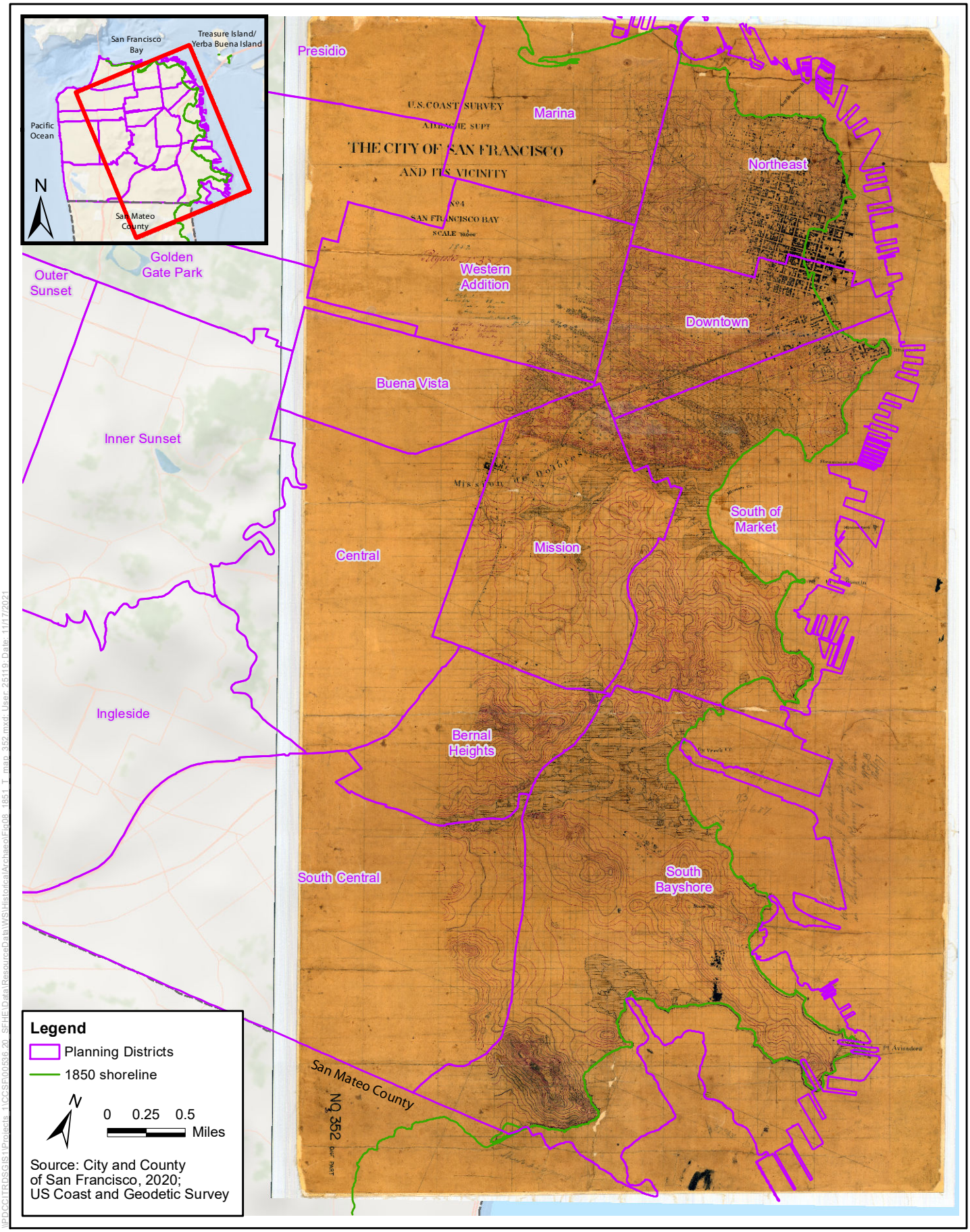

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Figure 9
1851 Map of San Francisco with 1850 Shoreline

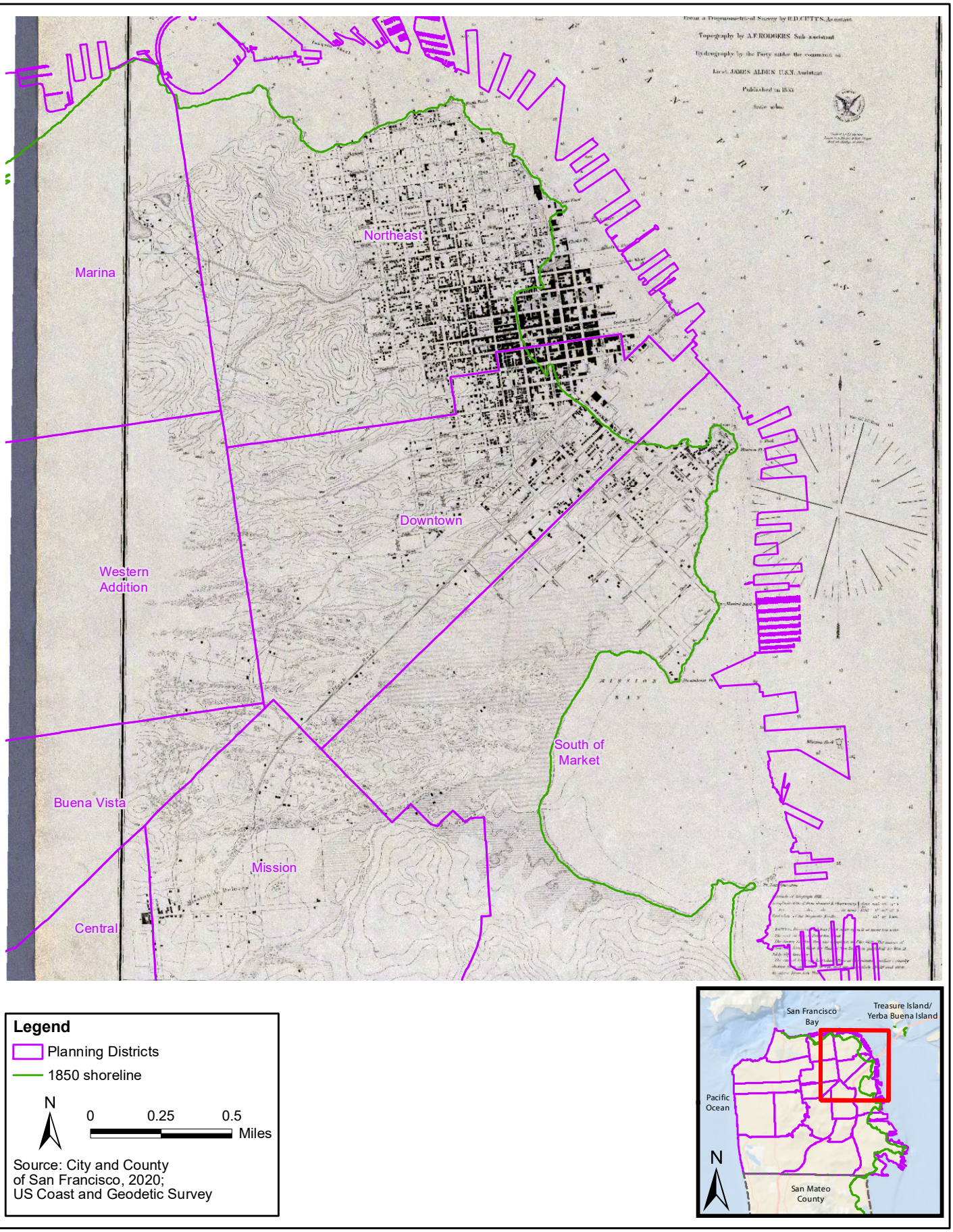

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Figure 10
U.S. Coastal Service 1853 Map of San Francisco with 1850 Shoreline

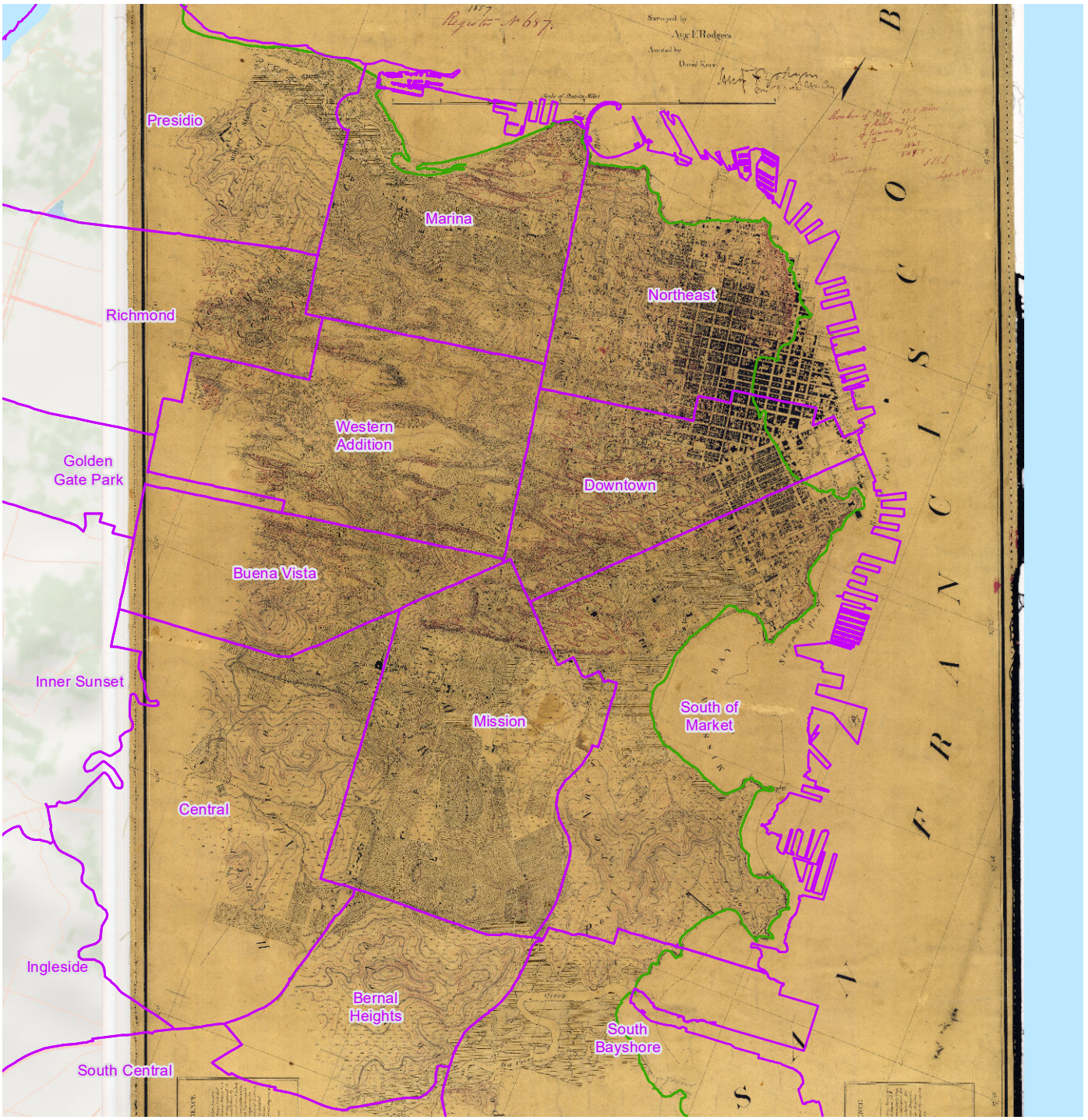

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Figure 11
U.S. Coastal Service 1857 Map of San Francisco with 1850 Shoreline

drainage problems in the east side of the city that resulted from grade changes along the shore through bay and marsh filling, the City of San Francisco adopted a new grading system in 1853. Inland streets had to be raised or lowered to provide for effective drainage flows toward Yerba Buena Cove and Mission Bay to the east. Named for the city engineer who conducted the new grading survey, the Hoadley Grade set a baseline elevation of 6.7 feet above the high-water mark at a wood piling located at Pacific and Davis streets, a baseline elevation that the city continues to use today. Hundreds of buildings, including brick masonry buildings, had to be raised, moved, or otherwise modified to accommodate the new street grades. In 1852, the invention of steam-powered mechanical equipment that could rapidly excavate and relocate large quantities of sand helped facilitate the movement of sand to fill Yerba Buena Cove through systematic large-scale grading. Prior to this invention, manual laborers— many of Irish descent—shoveled sand into wheelbarrows and wagons to fill the cove. Sand removal and filling would continue into the 1870s and later (Hittell 1878:436, 438; JRP 2010:43; Page & Turnbull, Inc. 2007:31).

INTENSIVE URBANIZATION, 1860–1906

Between 1860 and 1870, as industry and infrastructure expanded dramatically, the population of San Francisco almost tripled. The city's population was 56,835 in 1860. A decade later, San Francisco had nearly 150,000 residents (Hittell 1878:366, 429; Scott 1985:50–51). San Francisco developed from a frontier port city in 1860, when the first railroad began service on Market Street, to a truly modern Victorian city by the time of the calamitous earthquake and fire of 1906 (Figures 12–18). Private wealth invested in industry, commerce, and improved transportation helped fuel this growth. Although few individual gold miners became truly wealthy from the Gold Rush, a number of men who invested in successful hard rock gold mines in the California Mother Lode and in silver mines in the Comstock Lode in Nevada, or who made their fortunes by supplying miners with essential equipment and materials, put their fortunes to work after 1860 in railroad development, as well as banking, and made San Francisco their homes. These included William C. Ralston and Darius O. Mills of the Bank of California, and Leland Stanford, a member of the "Big Four" gold merchants who organized the Central Pacific (later the Southern Pacific) Railroad and completed the first transcontinental railroad in 1869. In an era when the influence of private interests dwarfed the influence of government, growing wealth and private enterprise fueled the expansion and development of San Francisco.

While San Francisco was spreading from Yerba Buena Cove to the west and south, increasingly high density in its older districts made the city California's most heavily urbanized built environment. Market Street became the grand avenue that O'Farrell had envisioned prior to the Gold Rush. Although the financial district remained concentrated north of Market Street, by the last decades of the nineteenth century, Market Street had come to function as the main circulation artery for both the city's transit system and its commercial culture. It also came to demarcate growing class and ethnic segregation as wealthy residents moved north and the South of Market area became an increasingly working-class and industrial district. Mission Street was also heavily developed, with its lower (northeastern) segments retaining an industrial character and its middle and upper (southwestern) segments exhibiting a mix of civic, commercial, and residential uses (ICF 2019: 3-19–3-29). The construction of Long Bridge in 1865, which spanned Mission Bay and the Islais Creek estuary, greatly improved access to the Bayview Hunters Point District. This enabled the development of slaughterhouses in Butchertown to the south of Islais Creek and early shipyard facilities around Hunters Point.

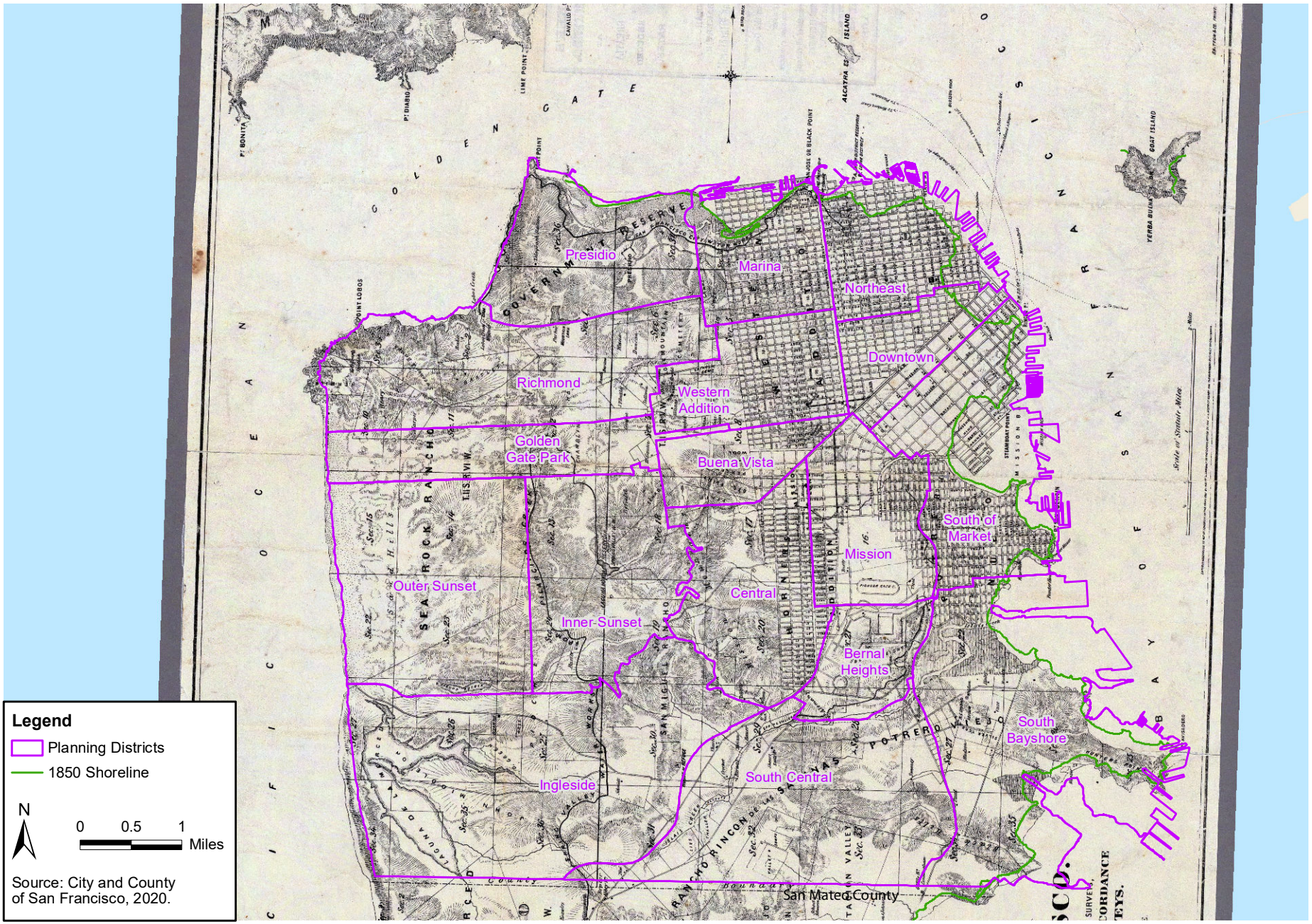

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Figure 12
Wackenreuder 1861 Map of San Francisco with 1850 Shoreline

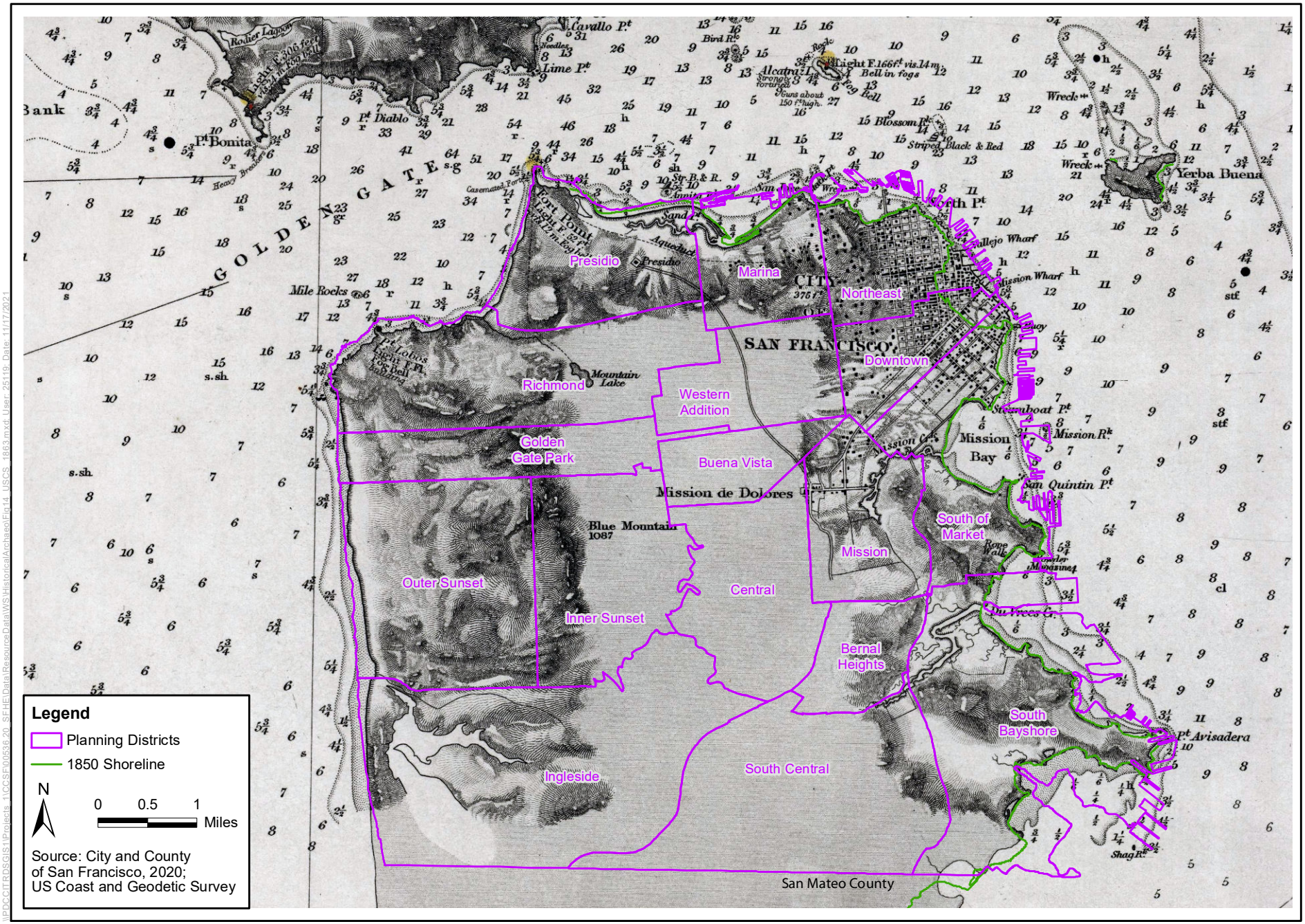

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Figure 13
U.S. Coastal Service 1863 Map of San Francisco with 1850 Shoreline

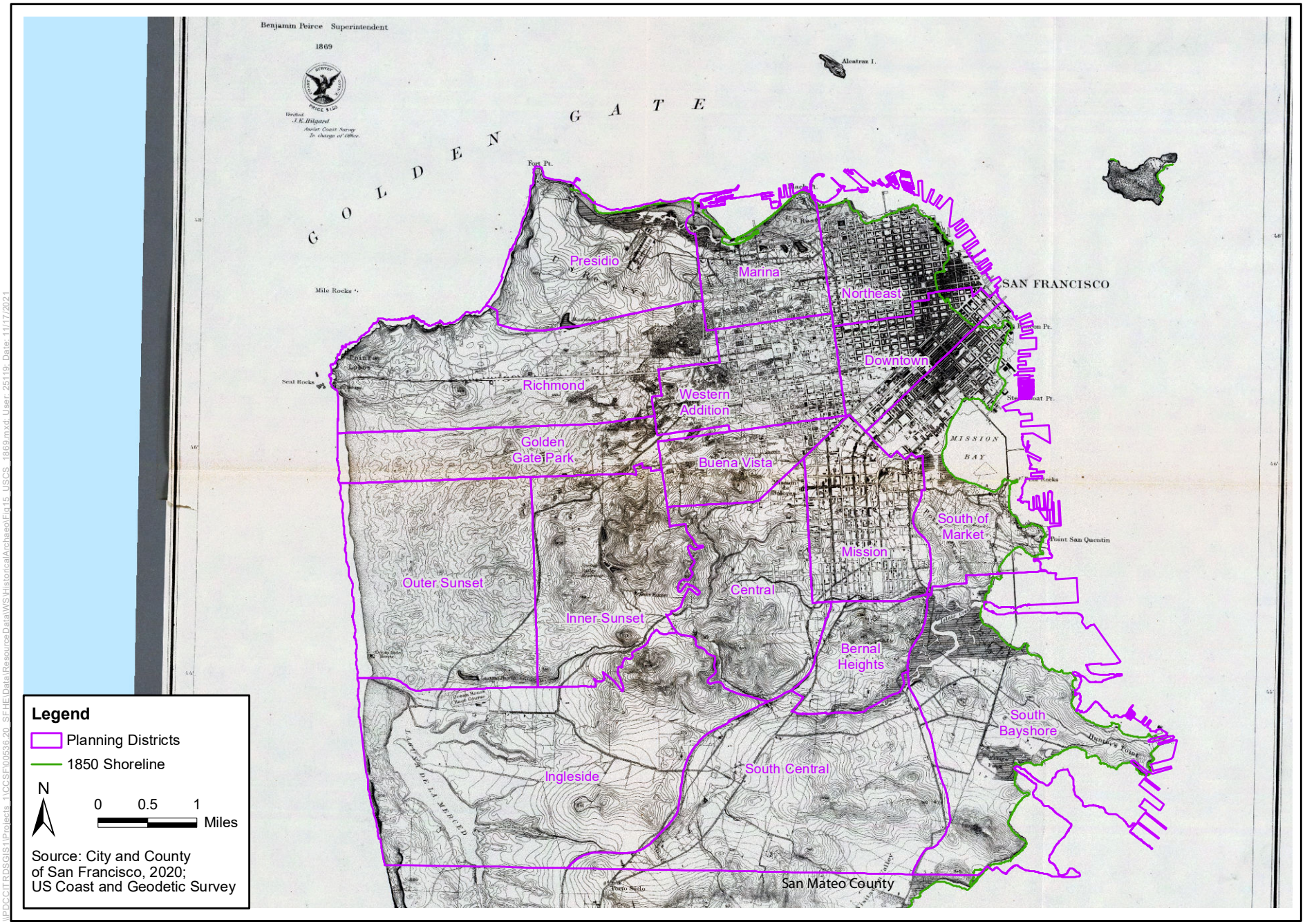

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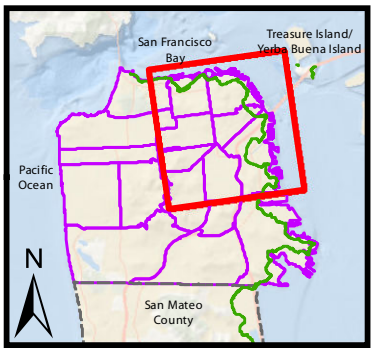
Figure 14
U.S. Coastal Service 1869 Map of San Francisco with 1850 Shoreline





Legend

Planning Districts

1850 shoreline

N

0 0.25 0.5 Miles

Source: City and County of San Francisco, 2020.

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Figure 15
Turnbull 1874 Map of San Francisco with 1850 Shoreline

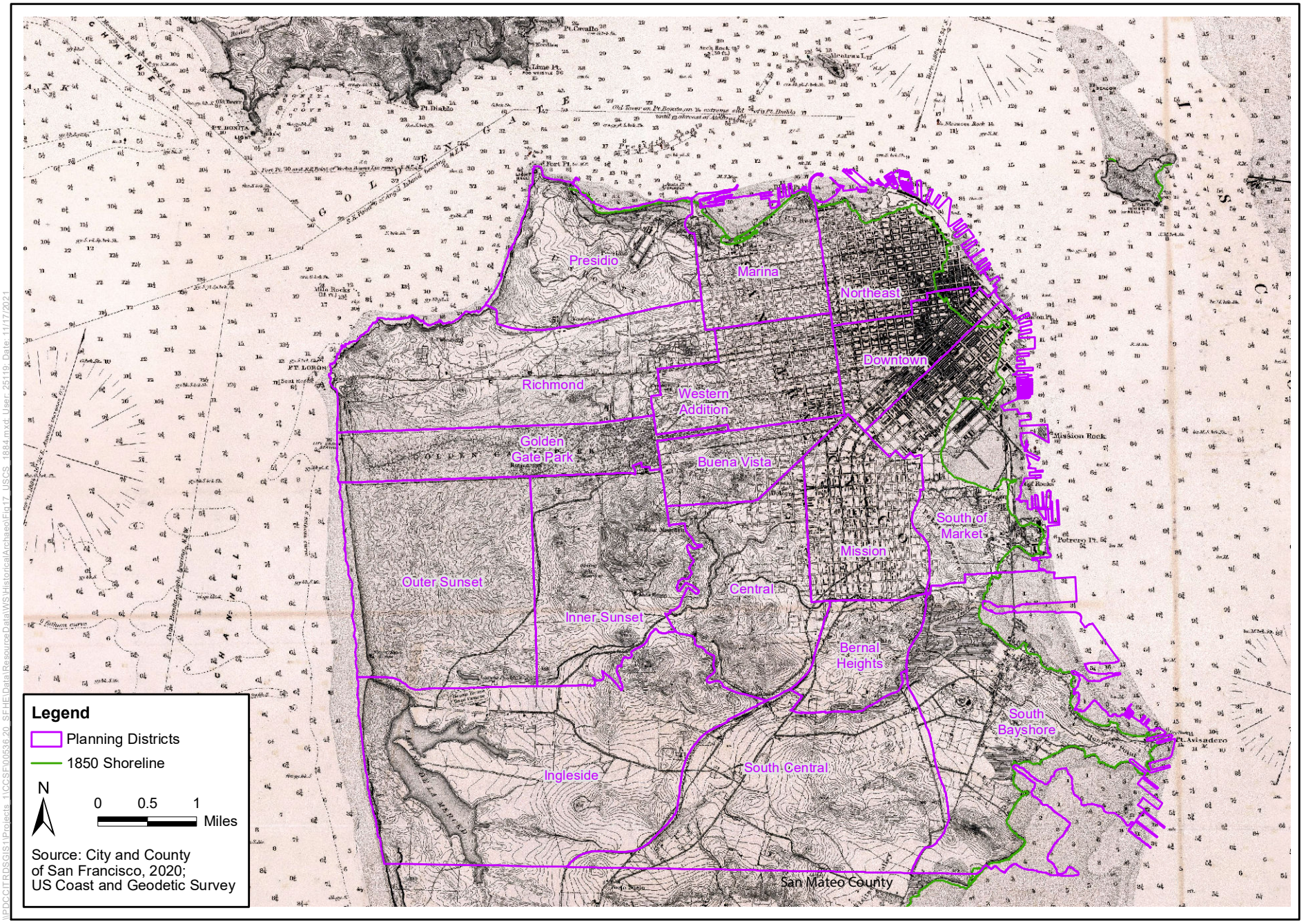

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Figure 16
U.S. Coastal Service 1884 Map of San Francisco with 1850 Shoreline

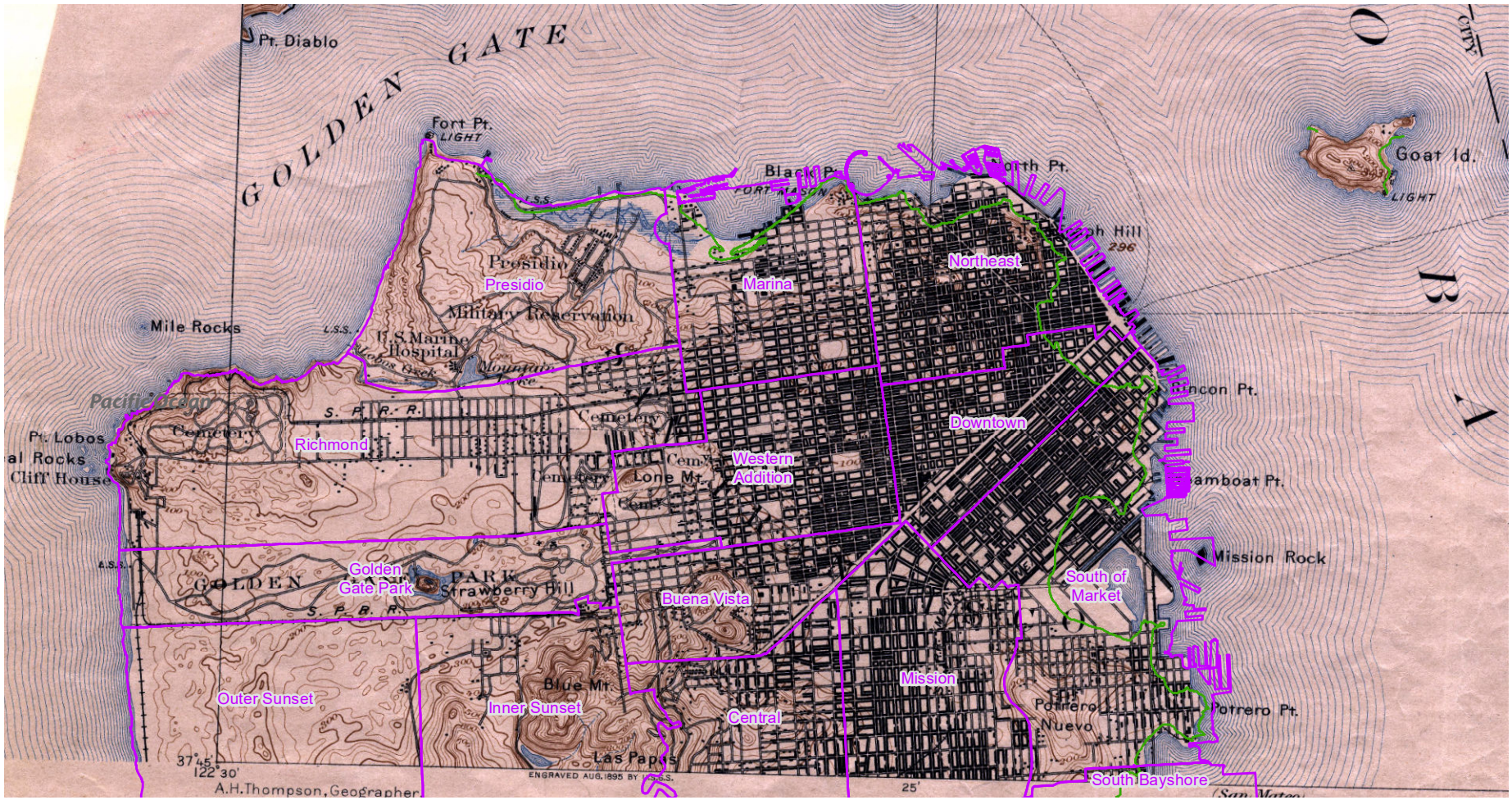

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Figure 17
U.S. Coastal Service 1895 Map of San Francisco with 1850 Shoreline

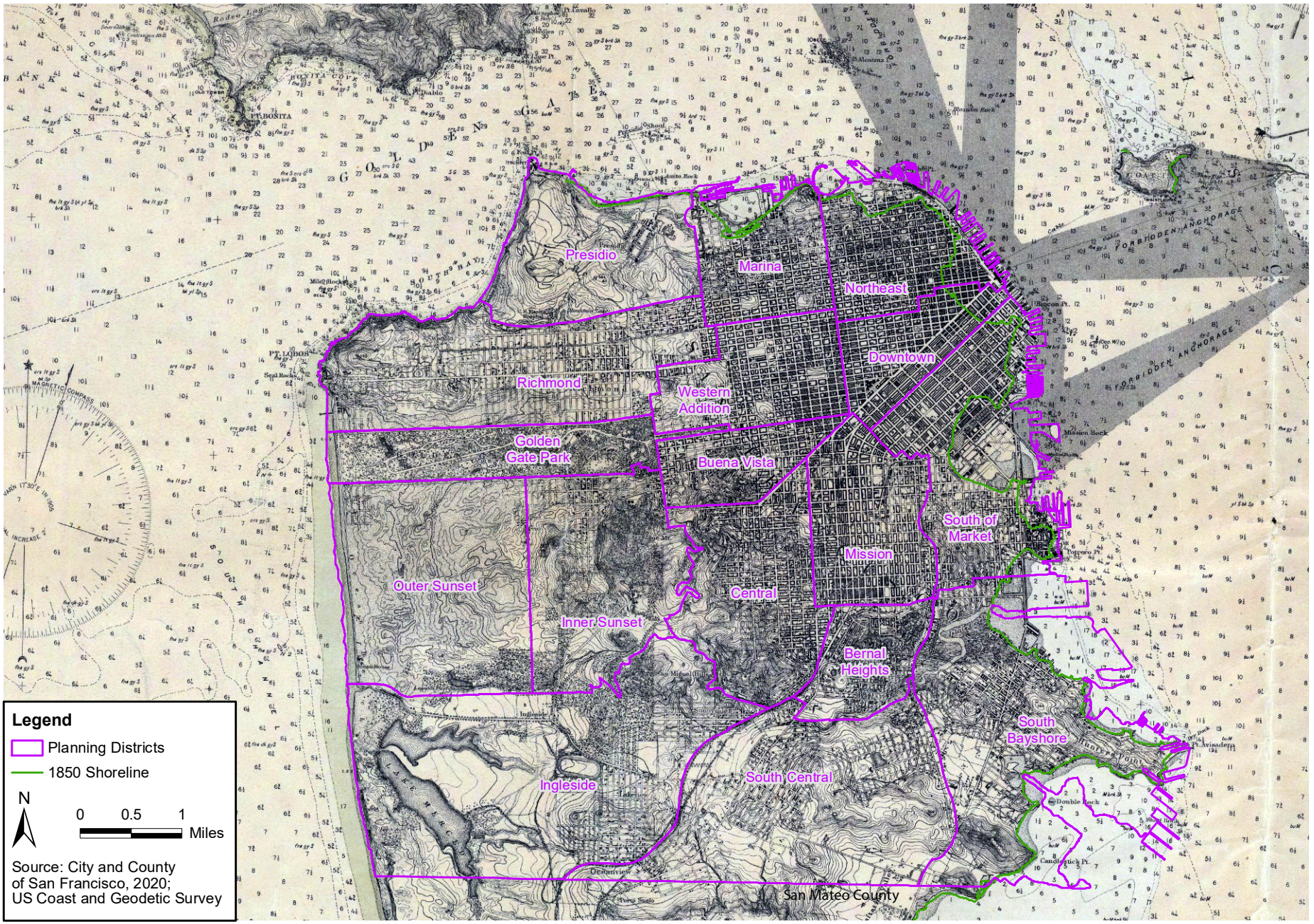

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Figure 18
U.S. Coastal Service 1905 Map of San Francisco with 1850 Shoreline

THE 1906 DISASTER AND AFTERMATH

On April 18, 1906, a major earthquake struck the San Francisco Bay Area. The earthquake's impact was worsened by liquefaction in areas that had been reclaimed through filling, including the Downtown, South of Market, and Marina planning districts. Numerous masonry buildings were destroyed or damaged, along with older, generally smaller frame buildings. With water mains broken across the city, fires—and eventually firestorms—in the part of the city east of Van Ness were fed by unseasonably warm weather and winds for three days immediately following the earthquake. Fire swept through the northeastern quadrant of the city and left total destruction in its wake, destroying an estimated 28,000 buildings and leaving up to 300,000 people homeless and living in refugee camps (Figure 19). Many buildings that might have survived the earthquake alone were destroyed by fires or had to be demolished, during the fires to halt the advance, or in their aftermath. The disaster produced an enormous quantity of debris; workers laid railroad lines down Market Street and other streets to facilitate rubble removal, which took many months (ICF 2015:57–58). A layer of burnt soil, and construction debris with late nineteenth-century artifacts, is nearly ubiquitous in areas of the city that burned after the quake.

Rebuilding took place quickly along Market Street and in residential areas (Figure 20). According to one account, after the first phase of reconstruction, "Market Street emerged more uniform in its architecture and in its business and social character than before the disaster" (Tim Kelley Consulting 2011:15). In contrast to the built environment of pre-1906 Market Street, the initially reconstructed streetscape reflected the economic concerns and popular Beaux Arts architectural style of the relatively short period between the 1906 disaster and World War I, which began in 1914. Dominated by masonry construction, post-1906 Market Street also lost the working-class character that it once had in some areas and instead became more uniformly middle class. Sixty percent of Market Street's current building stock dates to the initial period of reconstruction ending in 1913, whereas 81 percent of buildings were present by the beginning of the 1930s (Figure 21). Residences were also reconstructed at a rapid pace as a result of prioritization and the cheaper construction costs of wood-framed building compared to masonry structures; reconstruction of industrial structures took longer (Page & Turnbull, Inc. 2007:52; Tim Kelley Consulting 2011:14-16).

In addition to buildings, a wide array of infrastructure had to be reconstructed across Market and Mission streets and the city as a whole: streets, sidewalks, and sewers had to be replaced or repaired. The City's Bureau of Streets reported, for example, that by 1908 it had repaired 3,287 sewers, cleaned 66 blocks of sewers, and emptied 1,000 cesspools. By 1908, utility providers had also dug almost 16,000 "openings" in city streets to install new water, gas, and electricity lines (JRP 2010:64, 66). An Auxiliary Water Supply System, supported by reservoirs on the peninsula and including underground cisterns, substantial piping and fire hydrants throughout the eastern half of the city, was also constructed to support future firefighting efforts.

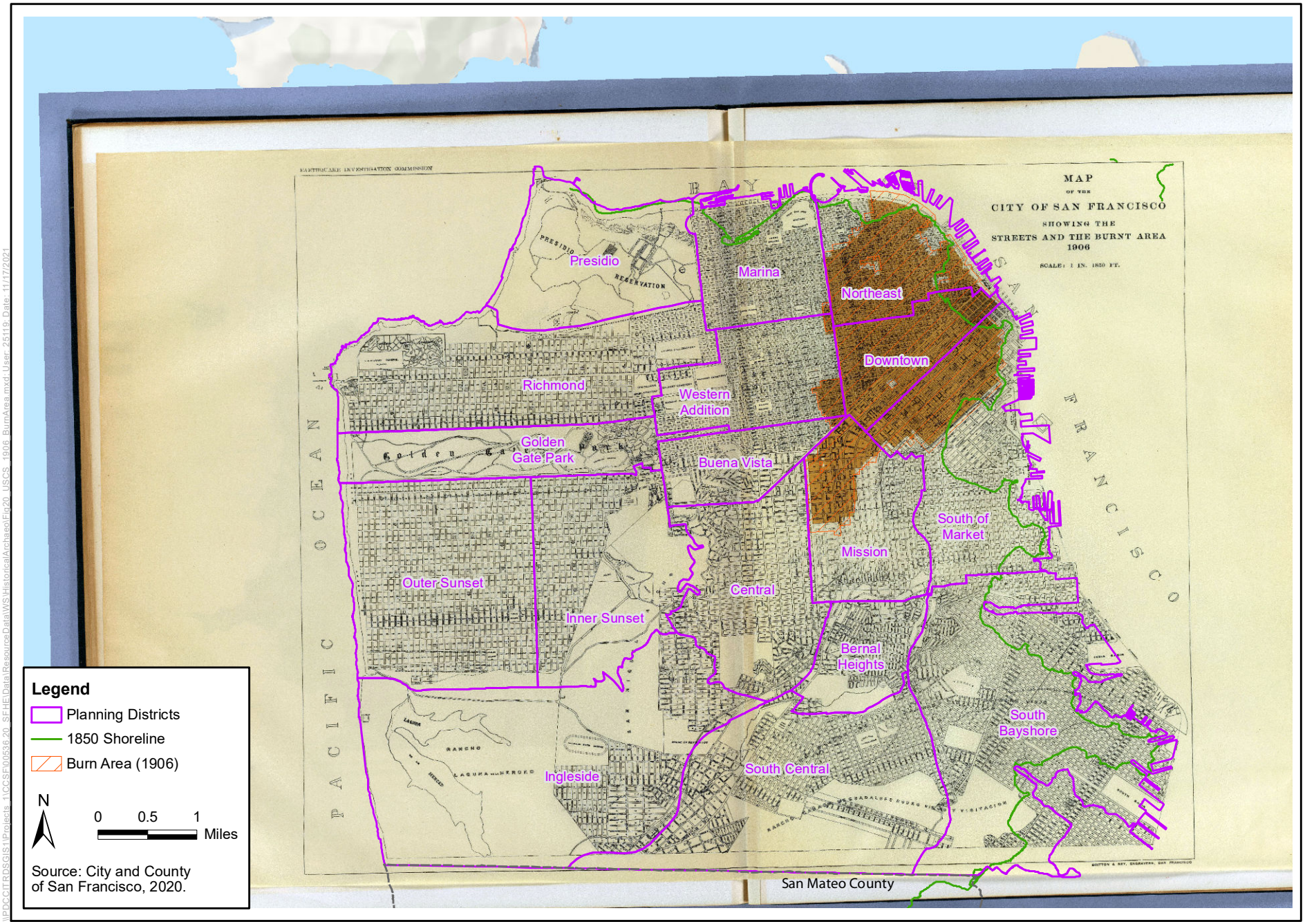

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Figure 19
1906 Burn Map of San Francisco with 1850 Shoreline

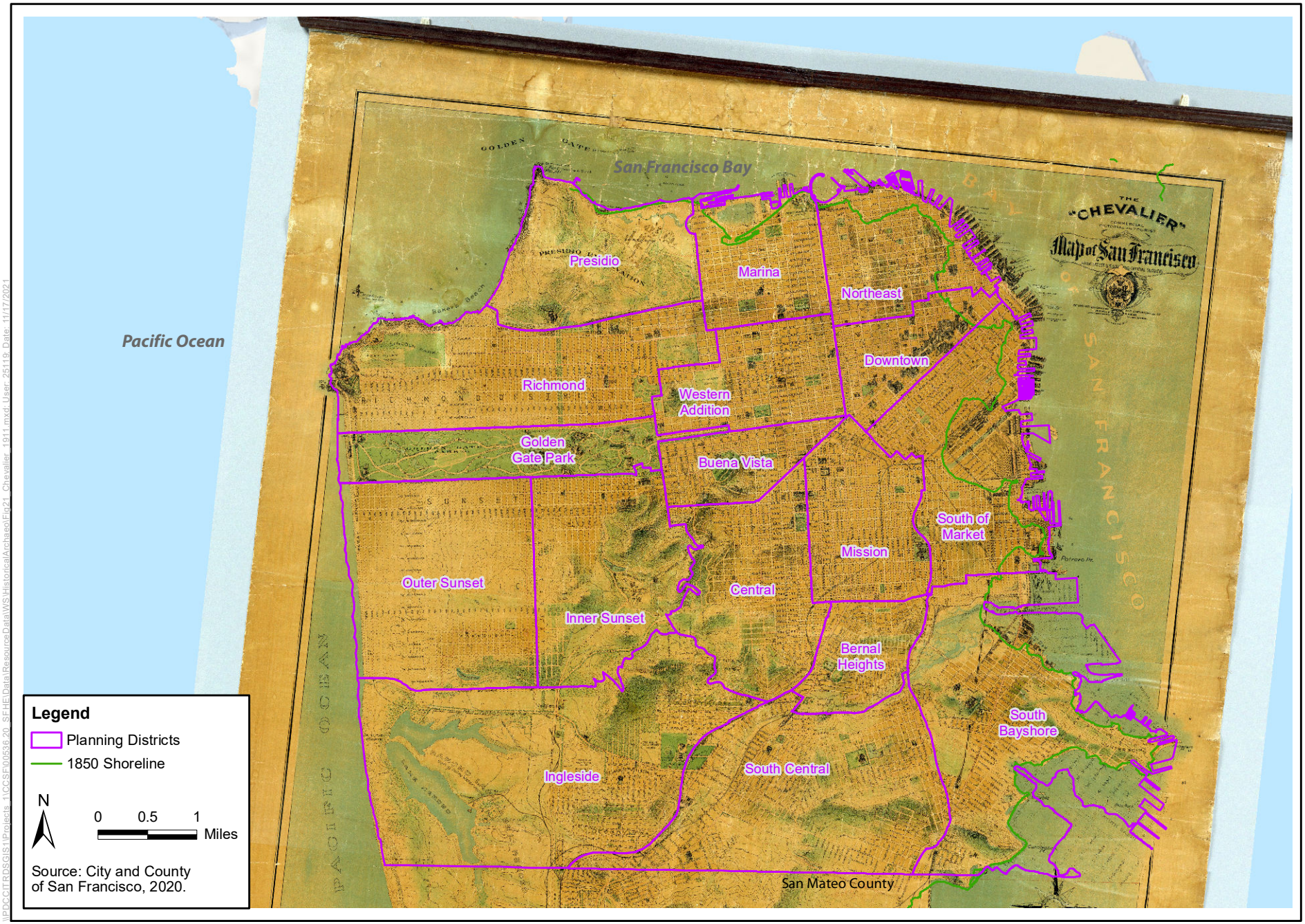

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Figure 20
Chevalier 1911 Map of San Francisco with 1850 Shoreline

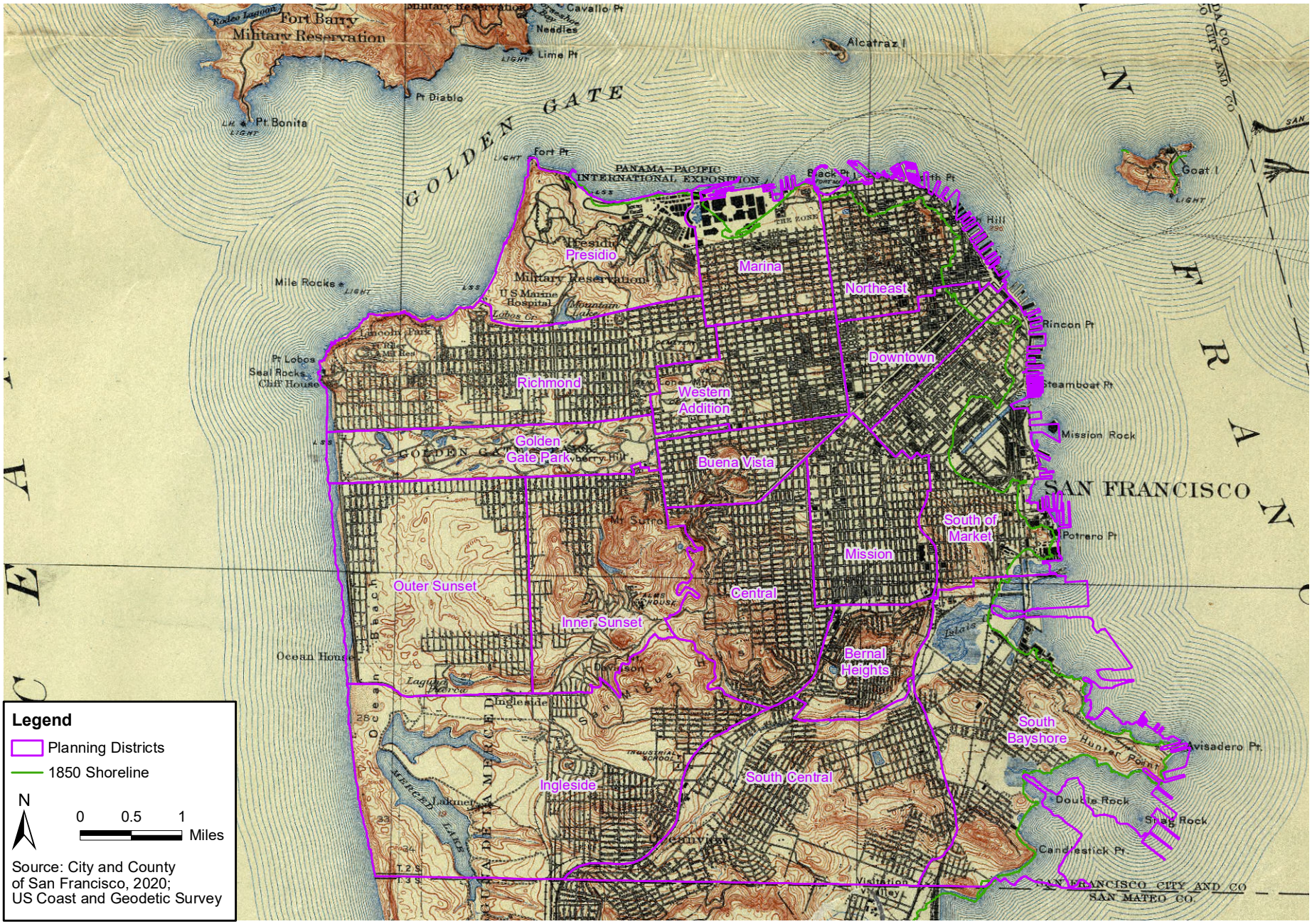

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Figure 21
U.S. Geological Survey 1915 Map of San Francisco with 1850 Shoreline

Many areas within San Francisco changed somewhat during rebuilding; however, the South of Market (SoMa) area changed substantially as it recovered from the earthquake and fires. Many longstanding industries were reestablished, and community institutions such as churches were rebuilt or constructed anew at different locations. However, whereas 62,000 people resided south of Market Street in 1900, only 24,500 lived there in 1910. Many people moved west, particularly to the Pacific Heights neighborhood, and south to build new houses. The trend away from residential use and toward greater industrial and commercial use in the planning district would continue for decades. Additionally, fewer families resided there after the disaster, and unmarried male workers came to dominate the planning district's population. Indeed, reconstruction efforts dramatically increased the number of construction workers in San Francisco, and World War I production brought another wave of industrial workers to San Francisco and the South of Market area. Numerous residential hotels and apartment buildings were developed in the SoMa area to house unmarried working-class men (Averbach 1973:203–206; Page & Turnbull, Inc. 2009:51–53).

The 1915 Panama Pacific International Exposition was an important boost for the city economically and psychologically. Three years were spent transforming the Marina planning district from mud flats to 635 acres of grounds on which the exposition was built. Several buildings from the exposition remain standing.

Additional development after the earthquake included growth of Hunters Point, in the Bayview neighborhood. In the decade following the earthquake, the Bethlehem Steel Company opened facilities in the area, catering to the U.S. Navy, which needed shipbuilding and ship repair on the Pacific Coast (Hamusek-McGann et. Al 1998). The Union Iron Works (which later joined the Bethlehem Steel Company and became the Bethlehem Shipbuilding Company) was built on nearby Potrero Point. Other shipbuilding companies were also established in the Hunters Point area, which brough prosperity and an increase in population to the area, resulting in additional housing development (WSA 2010).

MAJOR TWENTIETH-CENTURY DEVELOPMENT

During the Great Depression of the 1930s, changes in transportation usage and development reshaped development in San Francisco and began to alter its existing character in many places. Construction of the Golden Gate Bridge (1933) and the San Francisco–Oakland Bay Bridge (Bay Bridge) (1936) reflected the shift toward automobile travel. A long-term transportation plan created with New Deal funding through the auspices of the Works Progress Administration (Zeising 2000) envisioned a new system of highways through San Francisco. Other transportation planning focused on subway development, though this was not built for another 30 years (WSA 2010). As streetcar ridership declined, owners began to defer maintenance on the existing private rail system. During World War II, the City acquired the private streetcar system and proceeded to replace it with buses. Mirroring the declining streetcar system, housing stock and commercial buildings suffered from deferred structural maintenance in the 1930s, followed by wartime exigencies creating materials shortages and unprecedented geographic mobility (Olmstead 2002:88–89; Woo 2017:22).

Planning geared toward automobile travel resulted in large-scale transportation development in San Francisco from immediately prior to WWII into the 1960s. In 1938, South Van Ness Avenue was constructed through multiple existing blocks south of Market Street to Howard Street, creating several new triangular or otherwise nonrectilinear blocks along Market Street. During the 1950s, transportation planners' vision of a San Francisco

crossed by multiple elevated freeways began to take shape. The Embarcadero Freeway was constructed from the Bay Bridge approach north to Broadway by 1959. The Central Freeway was completed from the Bayshore Freeway west to Mission Street by 1955, and then across Market Street and north into Hayes Valley along Octavia Street by 1959.

The creation of jobs associated with wartime industry led to immigration to the San Francisco Bay Area during and directly after WWII and the large-scale development of residential western neighborhoods, particularly the Sunset. With this increase in population in the region and the new focus on the automobile, Bay Area roadways became increasingly congested. To address this growing problem, the Bay Area Rapid Transit (BART) Commission was created in 1951 and tasked with developing a regional transportation master plan. The master plan identified the need for a public transit system and preliminary drawings were prepared over 5 years, between 1957 and 1962. Although the original plan included five counties, San Mateo and Marin Counties both opted out; thus, BART, primarily in the form of subways, was constructed across the city and along Market Street and in a tunnel under the bay to the East Bay. Construction began in June 1964, and the system was operational by 1972 (WSA 2010).

The Embarcadero Freeway and the Central Freeway as far south as Market Street were both damaged by the 1989 Loma Prieta earthquake, and both were subsequently dismantled. This work was accompanied by revamping of The Embarcadero waterfront, which formerly had been beneath an elevated freeway, through construction of a spacious waterfront promenade. The west approach to the Bay Bridge also was damaged in the earthquake. A 1-mile segment and six off ramps were dismantled and reconstructed in the same footprint in 2004.

In the 1980s, the Financial District and Downtown San Francisco experienced a boom in development, including the construction of high-rise buildings. As the tech boom brought prosperity to the city, the construction of skyscrapers has been recently revitalized. Both of these periods of development have resulted in deep foundations excavated within the former Yerba Buena Cove and in some areas of the earliest historical settlements in San Francisco.

4. SUMMARY OF ARCHEOLOGICAL FINDS AND CURRENT STATUS OF ARCHEOLOGY IN SAN FRANCISCO

This section provides an overview of archeological discoveries within the city. First, it presents a high-level summary of known pre-European contact resources as well types of pre-European contact resources that are expected to be present within San Francisco. The section then summarizes historic era archeological resources that have been documented by archeologists as well as discussing common types of historical resources that are anticipated to be present throughout the city. After the discussion of archeological resources and property types, Section 4 addresses the limitations to archeological data recovery within San Francisco. It then connects the previously discussed expected archeological resources or property types with research themes. This section concludes with a presentation of the archeological sensitivity of each planning district.

A. Summary of Known Resources

The inhabitants of San Francisco have been uncovering material left by prior occupants of the peninsula for hundreds of years (San Francisco Call 1865, 1893). Archeology, the study of the ancient and recent human past through material remains, was established as a discipline in the late nineteenth century in the United States. The earliest formal archeology conducted in the Bay Area took place in the early twentieth century. Archeologists including Nels C. Nelson, Max Uhle, William Egbert Schenk, and Llewellyn L. Loud focused on documenting places that were once occupied by the Native American population of the region. After World War II there was an increased number of excavations in San Francisco, particularly by San Francisco State University students. These efforts are not well documented, and as such, little is known about archeological excavations that took place prior to the 1970s.

Environmental protection laws adopted by the state and federal governments in the 1970s, required lead agencies to consider the impacts of proposed construction on the environment. These laws asserted that non-renewable archeological resources are valuable because they are everyone's collective heritage, and that new development cannot destroy them without mitigation. While preservation in place is ideal, mitigation usually means that the information provided by the archeological resources is recovered, reported on, and the artifacts are curated. After enactment of environmental laws, a number of archeological companies were established in the Bay Area to carry out mitigation prior to development. Over the last approximately 50 years, these mitigation efforts have recovered hundreds of archeological resources that provide information about San Francisco rich and diverse history.



Amateur excavation in San Francisco (SF Call 1893



Professional excavation in 2013 (courtesy of WSA)

Recorded Native American Archeological Resources

Except for two isolated deeply buried human burials, discussed below, all the known Native American sites in San Francisco are shell midden deposits (Table 2). A few of the thicker deposits (SFR-6, -7, -114, -171) have been characterized by various researchers as "shell mounds," based on relative thickness of the deposit and inferred function of the site, but all such sites are made up of shell midden; typically, animal bone, charcoal, and fire-affected rock, characterized by a substantial component of marine shell in a sandy organically stained matrix. Nelson, in his book *Shellmounds of the San Francisco Bay Region* (1909), which recorded 425 sites of Native American origin around San Francisco Bay, distinguishes "shell heaps"—most sites along the shore; "earth mounds," generally found along inland reaches of creeks; and "a few minor localities" that he calls "temporary camps." Nelson (1909) reported deposits ranging in thickness from a few inches deep to as much as 30 feet tall (SFR-7 was more than 16 feet tall at the time of his investigation)—and some appear as landmarks on historic maps. An 1858 map[11] that laid out the "San Bruno Turnpike" (the route of a future road up the bay side of the peninsula), illustrates and labels seven shell mounds along the route, including some of the same mounds Nelson (1909) later mapped.

Most known pre-European contact archeological sites in San Francisco have been found buried under 4 to 15 feet of artificially deposited overburden. Geotechnical investigation reports often describe this overburden as "fill," which may imply imported soils, but more often it typically consists of native sand that has been disturbed by development and then redeposited on or near its original location. Archeological sites are also found within native sand deposits, below the fill. Disturbed soils in most of the eastern part of the city include a stratum of rubble and burnt material, which represents demolition and leveling after the Great Earthquake and Fire of 1906.

[11] "Map of the San Bruno Turnpike Road as located by A.J. Laston, Pres't and S. Mezes, Sec't. Surveyed July 1858, Alex Garby. Filed at the request of O. Cipriani, September 25th 1858 at One o'clock P.M., G.W. Beckh County Recorded in and for the City and County of San Francisco, Scale 1200 ft to one inch." On file, SF Planning Department.

Table 2. Native American Archeological Sites in San Francisco (adapted from Byrd et al. 2018)

Trinomial (CA-SFR-)	Location	Context	Site Attributes	Hand Excavated (M^2)	Intact Midden Hand Excavated (M^3)	Features	14c Dates	Time Span (1 Sigma, Cal BP)	Corresponding Periods	Reference	Name	Size (M^2)
4	Yerba Buena Island	On and buried within sand dunes	Shell midden, 120 cm maximum thickness	29	16.8 (plus 6.45 midden stained, midden stained, 1.6 submidden)	31 burials, hearths, 1 pit	Y (27)	3500–500	Early, Middle-Early to Middle-Late, MLT, and Late Phase 1	Morgan and Dexter (2008)	-	3,777
6//26	Presidio	North side of lagoon	Shell mound, +75 cm deep	1.2	0.5 1	burial (SFR-26), isolated human remains	Y (3)	1310–560	Middle-Late to Late Phase 1	Helger and Moratto (1973); Jones & Stokes (2002); Loud (1912)	Presidio Mound	2,076
7	Candlestick Cove	Adjacent to and partially inundated (1.5 m) by bay	Shell mound, 5.0 m thick	208	488	28+ burials, 5 rock concentrations, 1 hearth, 3 ash concentrations	N	n/a	Middle and Late (?)	Banks (1981); McCrossin); (1981); Nelson (1910a Rudo (1982)	Crocker/ Bay Shore Mound	11,400
17	Islais Creek	Along marsh adjacent to creek	Shell midden	2	0.5	1 burial	Y (3)	2350–790	Middle and MLT	Fitzgerald and Gmoser (1987); Van Bueren and Love (2008)		?
21	Near Point Lobos	Surface site in sand dunes	Shell midden, 150 cm maximum thickness	3.9	5.15	hearth	N	n/a	?	Holman et al. (1977)		106
28	North side of Hayes Creek east of Mission Bay	In bay mud, overlain by sand dunes, 7.9 m below msl	Isolated burial, female	n/a	n/a	1 burial	Y (1)	6270–4880	Middle Holocene	Henn et al. (1972)	BART woman	n/a

Trinomial (CA-SFR-)	Location	Context	Site Attributes	Hand Excavated (M^2)	Intact Midden Hand Excavated (M^3)	Features	14c Dates	Time Span (1 Sigma, Cal BP)	Corresponding Periods	Reference	Name	Size (M^2)
29	Near Black Point	Within sand dunes, truncated by historic-era building	Shell midden, +70 cm thick	2	1.2	Hearths	Y (1)	1555–1180	Middle-Intermediate to Middle-Late	Baker (1978)		~2,000
30	Near Black Point	Buried 20 cm in sand dunes	Shell midden, 20–40 cm thick	6	1.5	Hearths	Y (1)	1170–930	Middle Terminal	Baker (1978)		2,432
31	Near Black Point	Buried 30 cm in sand dunes	Shell midden, 50–70 cm thick	4	1.6	Hearth	N	n/a	?	Baker (1978)		1,510
112	Southwest of Yerba Buena Cove	Buried by 2.3 m of dune sand	Shell midden/ mound; northeast edge, 20–70 cm thick	15.8	8.02	Hearth remnants	Y (5)	1870–970	Middle-Early to Middle-Terminal	Pastron and Walsh (1988b)	Stevenson site	148 a
113 (east)	North of Mission Bay	Buried by 1.3 m of dune sand. Locus L-4: 24, L-5: 88	Shell midden with 5 loci (thickness: L-1: 30–80 cm; L-2: 80 cm; L-3: 20 cm; L-4: 2 cm; L-5: 20 cm)	25	14.05 (est. L-1: 8.62, L-2: 4.8, L-3: 0.4, L-4: 0.03, L-5: 0.2	L-1: surface, hearth, pit; L-2 FAR concentration; L-3: hearth	Y (7)	2310–1625 (entire site)	EMT to Middle-Early	Pastron and Walsh (1988a)	Market Street site	19000 (total site)
113 (west)	North of Mission Bay	Buried by up to 1.5 m dune sand. Locus sizes (m^2): L-A: 11, L-B: 9, L-C: 193, L-E: 6, L-F: 7.	Shell midden with 6 loci varying in and depth (L-A: 10 cm; L-B thin; L-C: 20–30 cm; L-D: 7 cm; L-3: 25 cm)	6	~2.3 (L-A: 0.1; L-C: ~1.0, L-D 0.14; L-E: 0.055	L-C: house floor? (F2 lower lens), 4 pits/hearths (F 3–6)	Y (9)	2310–1625 (entire site)	EMT to Middle-Early	Pastron and Ambro (2005) Market	Street site	19000 (total site)

Trinomial (CA-SFR-)	Location	Context	Site Attributes	Hand Excavated (M^2)	Intact Midden Hand Excavated (M^3)	Features	14c Dates	Time Span (1 Sigma, Cal BP)	Corresponding Periods	Reference	Name	Size (M^2)
114	North of Mission Bay	Portions buried by up to 70 cm of dune sand; portions truncated by development	Shell midden, 1.1 m thick (upper 20–25 cm, main 80 cm, basal 5 cm)	94	76	11 burials, 17 hearths, surface	Y (10)	2002–796	Middle-Early to MLT	Archeo-Tec (1990); Hattori and Pastron (1990)	Yerba Buena site	1,577 a
129	Near north shore of peninsula	Buried 30–150 cm in sand dunes	Shell midden, up to 40 cm thick	54	25.7	None	Y (7)	628–304	Late Phase 1 to Late Phase 2	Clark (2001)	Crissy Field site	5,592
135	Southwest of Yerba Buena Cove	Truncated by historic-era material and above sand dunes	Shell midden, 40–15 cm thick, truncated by historic-era occupation	9	1.58	None (isolated human remains)	N	n/a	?	Estes et al. (2001)		303
147	North of Mission Bay	Truncated by historic-era material	Shell midden, maximum 40 cm thick	1.0	0.6	Surface (Feature 1)	Y (2)	2000–1920	Middle-Early	Pastron et al. (2004)		70
148	West of Mission Bay	Overlain directly by historic-era material	Shell midden, 30 cm thick	18.0	~4.0	None	Y (5)	2300–1990	EMT	Crawford (2005)		303
151/H	West of Yerba Buena Cove	Buried by 1.5 m historic-era material and 2.0 m of dune sand	Shell midden, 6 cm thick	None	None (found in geoprobe)	None	Y (1)	1950–2015	Middle-Early	Byrd et al. (2010:80)		?
154/H	Northeast edge of Mission Bay	Surface site in sand dunes prior to historic-era occupation	Shell midden, 20–30 cm thick	7.9	~3.5	None	Y (2)	660–0	Late Phase 1 to Late Phase 2	Martin (2006)		18 a
155	North of Mission Bay	Truncated by historic-era material	Shell midden, 10–50 cm thick	2.0	0.41	None	Y (3)	1720–1550	Middle-Early	Pastron et al. (2004)		JSG-2 140 a

Trinomial (CA-SFR-)	Location	Context	Site Attributes	Hand Excavated (M^2)	Intact Midden Hand Excavated (M^3)	Features	14c Dates	Time Span (1 Sigma, Cal BP)	Corresponding Periods	Reference	Name	Size (M^2)
171	Islais Creek/marsh margin	Buried by 2.8 m historic-era fill and in places by bay mud	Terrestrial shell mound, up to 170 cm thick; submerged midden 70 cm thick	4.0	1.91	None	Y (21)	3860–435	Early to Late Phase 1	Byrd and Kaijankoski (2011); Kaijankoski and Byrd (2017); Kaijankoski et al. (2016)	Islais Mound	43228
175	North of Mission Bay	Buried by up to 3.4 m historic-era fill	Shell midden, 40–100 cm thick	?	42.49	?	Y (4)	1080–1410	Middle-Intermediate to Terminal	Praetzellis (2011)	Fourth Street Site	1100
176	South of Islais Creek	Buried under 8 m soil	Shell midden	None	None (found in geoprobe)	None	N	n/a	?	Holman Assoc. 2010		300
181	Ocean Beach	Elevated bluff; buried under 0.1-0.6 m soil	Midden, 0.5 m thick	None	None	Dietary shell and bone, charcoal, lithic debitage	N	n/a	?	Spillane 2014	Ocean Beach Midden	1500
183	Between Pacific and Lake Merced	Coastal bluff	Midden, 8 cm thick	None	None		N	n/a	?	Spillane 2014	Oceanside Midden Terraces	1000
184	West of Lake Merced	Fill, likely redeposited	Shell midden, 20 cm thick	None	None	None	N	n/a	?	Spillane 2014	East Lake Merced Midden	540
191/H	South of Bayview Hill	Buried by 2 m sediments	Shellmound, 2.2 m thick	7	?	3 burials, hearths, shell concentration	Y (2)	270-0	Middle-Terminal Late	Alonso 2015	Ralston Shell-mound	250
193/H	Yerba Buena Cove	Buried by 3 m fill	Shell midden, 50 cm thick	12	5	None	Y (2)	280-50 (2 sigma)	Terminal Late	Arrigoni 2015		700
205	West of Yerba Buena Cove	55 feet below ground surface	Isolated burial, male	n/a	n/a	1 burial	Y (4)	7600-7470	Middle Holocene	WSA 2018	Transbay Man	n/a

Notes: “a” represents only portion exposed.
n/a – Not available; FAR – fire-affected rock; EMT – Early/Middle Transition; MLT – Middle/Late Transition.

Although the full areal extent of each site has rarely been fully defined, owing to discovery on project sites in urban settings and undergoing urban redevelopment where the extent of the deposit cannot be traced because of the presence of overlying development, most sites appear to constitute a continuous midden stratum. A notable exception is SFR-113, which was identified as 11 small midden concentrations or loci. A second similar site was recently identified at another location in the South of Market district (personal communication S. Morgan 2021). As summarized by Byrd et al., with respect to the 21 Native American sites investigated in San Francisco as of 2018 (Byrd 2018), site size, where it can be determined, is highly variable:

> Most are either small (less than 300 square meters; n=7), or medium-sized (between 1,500 and 5,500 square meters; n=7), along with two large sites (at 11,400 and 19,000 square meters). The latter include the Crocker/Bayshore mound (SFR-7) and SFR-113, where none of the 11 loci, however, is larger than 150 square meters. Midden thickness also varies greatly between sites, ranging from thin lenses (one to two centimeters) at two loci of SFR-113 to thick (five meters) at SFR-7. Most midden deposits fall into one of two ranges of thickness: either 40 centimeters or less in thickness or between 70 and 150 centimeters in thickness [few of the latter].

Although human remains are common in shell middens around the bay, only a few site investigations in San Francisco have encountered human remains (28 at SFR-7 [Nelson 1910]—the largest and deepest site investigated; 11 at SFR-114 in the Downtown–SoMa area, and 31 at SFR-4, on Yerba Buena Island, along with single remains or human bone fragments at three or four other shell midden sites), but hearths and other features have been uncovered at a number of sites and, at one site, a house floor. As Byrd et al. note (2018), the relative rarity of human remains and of features such as house floors in sites excavated in San Francisco in the past 50 years possibly is attributable to the fact that most site investigations in the context of development have been limited to relatively small, discrete exposures within development sites, such as mechanical trenches or manual test units. However, there are a substantial number of historic newspaper accounts of discoveries of burials and Native American artifacts, particularly from the South Bayshore and Downtown–SoMa districts, which suggests that more of the midden sites very likely did or do include human remains.

Highly notable with respect to human remains are two separate Downtown–SoMa discoveries of isolate Early Period burials in marsh or bay mud settings, each buried at depths of more than 50 feet. Both substantially predate any of the sites reported as of 2021: SFR-28 (Bart Woman), discovered during BART excavations below Market Street, and dated to 5360 BP; and SFR-205 (Transbay Man), found in tunneling in SoMa and dated to 7600 BP. The only other dated archeological find of comparable age (7400 to 7500 cal BP) is SFR-220, a deeply buried submerged shell midden, discovered recently during geoarcheological coring at a project site on Mission Bay, at the northern end of the South Bayshore district. Investigation of that site is underway.

With the possible exception of two submerged shell middens on creek or bay margins (which historically may also have been dune settings) and the two submerged burials, all the known sites in San Francisco are situated within the sand dunes that historically covered much of the city. Except for a few known, but uninvestigated, shell midden deposits still visible on the surface in the Bayview–Hunters Point area and in the dunes west and south of Lake Merced, virtually all the known sites have been found beneath an overburden of historic-era fill, which is often several meters (10 or more feet) deep. Many of the sites in the SoMa area have been found also to have been buried by natural processes prior to the historic period; such sites often are very well preserved, having been spared the effects of historic development by a deep cover of sand. That most of the middens in the SoMa dunes had been buried pre-European contact by natural processes—along with the extent of

development in this area prior to the time of Nelson's survey–explains why Nelson mapped none in this area (Nelson 1909). It can be assumed that the sites in San Francisco that he reported in 1909 and recorded on his manuscript map of the survey were all on the surface at that time. It is of note that SFR-7, a large surface mound at Candlestick Point, was rediscovered in the 1970s under 30 feet of artificial landfill, placed subsequent to Nelson's recordation.

As noted above, in addition to shell middens, two isolate Native American burials have been discovered in San Francisco, one in 1969 and a second in 2014. Although the locations of rare isolate finds such as these cannot be predicted—in both cases, the finds were deeply buried and submerged—they do, when found, provide a glimpse of the earliest human occupation of San Francisco. In addition, isolate artifacts or clusters of artifacts have been found at several locations. Some may represent items lost while hunting; others very likely are remnants of destroyed pre-European contact deposits. Others may represent curio collection in the nineteenth or twentieth century. Such finds are rare.

Various researchers have suggested that additional undocumented Native American resource types, such as lithic quarries, travel routes, and fishing weirs, may be present in San Francisco. There may be the potential for chert quarry sites on some of the city's hilltops, but this does not seem particularly likely given that chert cobbles are readily available on the beach and in stream channels. Aboriginal travel routes undoubtedly existed in San Francisco, but because the northern part of the peninsula was covered in dunes historically, evidence of cross-peninsula routes would not be expected to have been preserved. In most areas, travel across the peninsula would have entailed passing through massive dune fields and thus may have been avoided in favor of travel along the bay shore, stream corridors, and the bay. In most part of the city, any evidence of travel routes in any case very likely has been obscured by urban development. Although weirs and other fishing features may well have been used in the shallow Mission Bay and Yerba Buena Cove, any evidence would lie deeply buried under artificial fill and be inundated. Identifying such features in bay-bottom sediments would be challenging.

Native American Archeological Site Distribution

Nelson, in the earliest comprehensive documentation of Bay Region site locations (1909 and unpublished manuscript map,[12] identified approximately 20 "shellmounds" in San Francisco, including sites in the Hunters Point area in the South Bayshore district, in Visitacion Valley and on upper Islais Creek in the South Central district, at Lands End at the coastal end of the Richmond District, and in the Presidio. After 1910, although a few additional sites were recorded incidentally, very little Native American archeological investigation took place in San Francisco over the subsequent six decades.

The passage of environmental laws in the 1970s, which required that both federal and California public agencies consider archeological resources in assessing development, marked the beginning of a new era of archeological work. Primarily because of these legal requirements, San Francisco's inventory of recorded Native American archeological resources has expanded substantially since the 1970s, with the recordation of more than 30 additional Native American sites around the city. Most notably, urban development between 1985 and the

[12] Map of San Francisco Bay Region showing distribution of shellheaps and numbered to correspond with transcribed field notes. On file, University of California Archeological Research Facility, Ms. 13-1065.

present have uncovered a complex of previously undocumented Middle and Late Period Native American archeological sites buried in the native sand dunes and under artificial fill between the former shores of Yerba Buena Cove and Mission Bay in the southern Downtown–northern SoMa planning districts. At least a dozen sites in this area have been investigated and reported since 1985 (as detailed in the Downtown and SoMa planning districts descriptions, to follow). These Downtown–SoMa planning district sites comprise the densest concentration of investigated Native American sites in San Francisco. Praetzellis et al. (2010) proposed that at least seven Native American sites along the shore of Mission Bay comprise a NRHP Native American district (ASC 2010). Other highly significant discoveries in this area during the last decade include the older submerged and buried burials and shell middens discussed above.

Elsewhere in San Francisco, sites discovered or rediscovered after 1970 included shell middens in Fort Mason on the northern bay shore of San Francisco; in the vicinity of Lake Merced/the San Francisco Zoo, and northern Fort Funston, in the southwestern part of the city; in the Mission district; and at several additional sites in the South Bayshore district. However, only in the South Bayshore district have Native American archeological sites been recorded in similar concentration to those found in Downtown–SoMa.

With the marked exceptions of SFR-7 (Nelson 1910) and, more recently, SFR-198 (Price et al. 2016 and ongoing), almost none of the Native American middens Nelson (1909) recorded in the South Bayshore district has been investigated archeologically. In fact, many of the 20-plus South Bayshore sites Nelson mapped or noted in his 1909 survey of San Francisco Bay shellmounds (Nelson 1909) have not been reliably relocated. Discoveries of shell midden traces on the surface or in utility trenches in South Bayshore hint at the locations of some of these sites. However, it appears that many of Nelson's sites have either been destroyed or, as in the south Downtown–northern SoMa districts and in the South Bayshore District, have been deeply buried and obscured by modern land fill and development.

The most striking pattern in the distribution of known sites is the near absence of archeological evidence of pre-European contact use of most inland portions of San Francisco. There are a few known shell midden deposits inland of the bay along Islais and Mission creeks, in the Mission and northern margin of the South Central/southern margin of the Bernal Heights district. However, no pre-European contact sites have been documented in the Inner or Outer Sunset, Richmond (apart from its coastal margin), the Central or Western Addition districts, or in the Northeast or Marina planning districts, except near their bay shore fringes (with the single exception of a recently discovered redeposited shell midden and fragmentary human remains near Cow Hollow, in an area modeled as highly sensitive for Native American resources, based on proximity to the freshwater Washerwoman's Lagoon) (personal communication, Sally Morgan, June 2021); there is also one an undocumented record of a shell midden in the Buena Vista district. There are two shell midden deposits on fingers of Lake Merced, and five in the coastal dunes to the west, in the western part of the Ingleside planning district, but none in the planning district's interior.

Intuitively, the dearth of evidence of Native American use of inland areas of San Francisco in preference for areas along the peninsula's shores and major creeks makes sense, given the vast extent of the dune fields that covered these areas. The marine food resources of the coast and bay were heavily used by native populations. Inland areas provided some plant foods and materials and, based on recent archeological discoveries and on archival

mapping, were sprinkled with small freshwater ponds, but simply may not have been as attractive for settlement as the resource-rich shore of the bay. These interior areas may have been used in more transitory ways, such as for hunting or special resource foraging, or merely transected in crossing the peninsula between the bay and the ocean coast. If this is a accurate depiction of settlement patterns, archeological remains would be expected to be rare inland, and may consist primarily of less detectable or more ephemeral remains, such as isolate projectile points, thin deposits representing short term uses, or small and sparse features, like lithic scatters. Resources of these kinds could be difficult to detect archeologically in the context of urban development—or even in the context of modern development mass excavations.

However, historic maps illustrate the presence of scattered ponds in the relatively level areas along the northern edge of the city (e.g., Washerwoman's Lagoon, on Lombard Street), in Golden Gate Park and the Western Addition, in Ingleside (notably, Pine Lake), and in the Mission District, where a large lagoon was present at the upper end of Mission Creek. Further, geoarcheological investigations at project sites along Van Ness both below and above Market Street have revealed deeply buried freshwater marsh deposits and evidence of burnt redwood tree stands that attest to substantial pre-European contact environmental resource variability among the dunes, which might have made them more attractive to Native American settlement. Potential resources of the interior also include rocky outcrops of chert, a common lithic tool material found on many hill tops—although chert is also available as stream and beach cobbles throughout San Francisco. The interior also would have been the likely source of firewood and of oak trees for acorns, a significant vegetable stable in Central California during the Late period.

If the interior of San Francisco was more than a vast expanse of barren sand dunes, other factors may contribute to the apparent dearth of Native American sites in inland areas of San Francisco. Archeological investigations in San Francisco during the past 50 years have tended to be associated either with large programs of development, or with projects that have entailed massive or deep excavations. Although such programs and projects have taken place throughout at least the urban part of the city (setting aside the relatively suburban planning districts), the majority have been sited in the Downtown–SoMa districts rather than the interior or western parts of the city. This geographic distribution of major development may have contributed to the patterns of Native American archeological site distribution seen in San Francisco. It is possible that, like the SoMa sites, sites in inland San Francisco (if present)—and the many weakly documented sites in the South Bayshore district—lie buried, perhaps deeply buried, beneath wind-moved sands and artificial fill and have not been discovered or rediscovered because there has been limited deep development and associated archeological work in those areas. Further investigations, including geoarcheological investigations, in potentially sensitive part of interior San Francisco (near inland streams and other potential waters sources and around buried marshes) would both improve our understanding of the environmental history of inland San Francisco, and may provide a more complete picture of the pattern of Native American site distribution in San Francisco.

Native American Archeological Site Sensitivity Model

As in most urban settings, surficial survey is rarely an effective means of identifying archeological resources in San Francisco because most surface soils are covered by buildings, landscaping, or paving. As discussed under *Environmental Setting*, above, much of the area of the future city was a massive sand dune field for at least

several thousand years before present. Archeological investigations in the SoMa district have revealed that, long before modern development stabilized these dunes, many pre-European contact sites in the dunes were buried by migrating sands. Subsequently, many areas of San Francisco have been subject to mass grading, which buried Native American sites that were on the surface in historic times and more deeply buried deposits already encased in the dunes. Further, since at least the 1970s (Bickel 1978), archeologists have postulated, as an explanation for the paucity of known sites that predate about 3,500 years ago, that rising sea levels during climatic warming beginning around 12,000 years ago almost certainly resulted in the inundation, over the subsequent 10,000 years, of any archeological deposits then present along the coastal and bay shores. Inundated sites that survived wave erosion would have been buried by bay-bottom sediments deposited by the rising waters. Although it is likely that few sites would have survived wave action along the ocean coast, the recent discoveries of SFR-220 (the submerged 57midden noted above) and SFR-171 (the early component to of which was submerged by the Islais Creek estuary) indicate that at least some sites survived inundation by the bay, increasing the likelihood that others lie buried under the Young Bay Mud sediments of San Francisco Bay and by the nineteenth and twentieth century landfill of Yerba Buena Cove, Mission Bay, and the estuaries of Islais and Mission creeks. Although undetectable from the surface, such sites are vulnerable to impacts from new development on the artificial fill, which must be supported on piles or deep ground improvements.

In 2018, Far Western Anthropological Research Group (Far Western), under contract with the department, developed a model to map Native American archeological sensitivity for the city as a framework for predicting the likelihood of the presence of near surface, buried, and submerged Native American sites at any given location in the city (Figures 22, 23, and 24). Figures 22 and 24 provide fine-grained analyses of surface, buried, and submerged sites, while Figure 23 highlights areas considered highly sensitive for surface and buried sites (and can be used in conjunction with Figure 26, which highlights areas highly sensitive for historic sites, for an overall picture of areas that are highly sensitive for archeological resources). Far Western (Meyer and Brandy 2019) provided sensitivity model mapping for near surface, buried, and submerged Native American archeological resources and changing bay shoreline locations at 2,000-year intervals, in a Geographic Information System (GIS) file format, to aid in assessment, design, and planning for future projects.

This model is based on both the factors that are presumed to have influenced where Native American people chose to settle and the influence of major post-deposition landscape changes on the archeological record. Based on known locations of Native American sites on the northern San Francisco Peninsula, Far Western's analysis concluded that distance to water, slope, and distance to stream confluences are the most influential factors in settlement location. The distance to water factor was weighted highest, for modeling purposes, because it proved to have the greatest positive and negative correlation with known site locations. Analyses included reconstruction of locations of perennial water sources over time, using U.S. Geological Survey (USGS) and other historical map data. Analysis concluded that areas within about a 120-meter (about 400-foot) radius of a seasonal stream, 240-meter (800-foot) radius of a larger perennial channel or other water source (e.g., bay margin, ponds, marshes), or 150-meter (500-foot) radius of a perennial stream confluence were modeled as having the greatest archeological sensitivity, with sensitivity decreasing incrementally as the distance from water increases. For modeling of submerged Native American site potential, the model also includes diachronic mapping of the shoreline of the bay at 2000-year intervals, based on elevations and estimated rates of sea level rise.

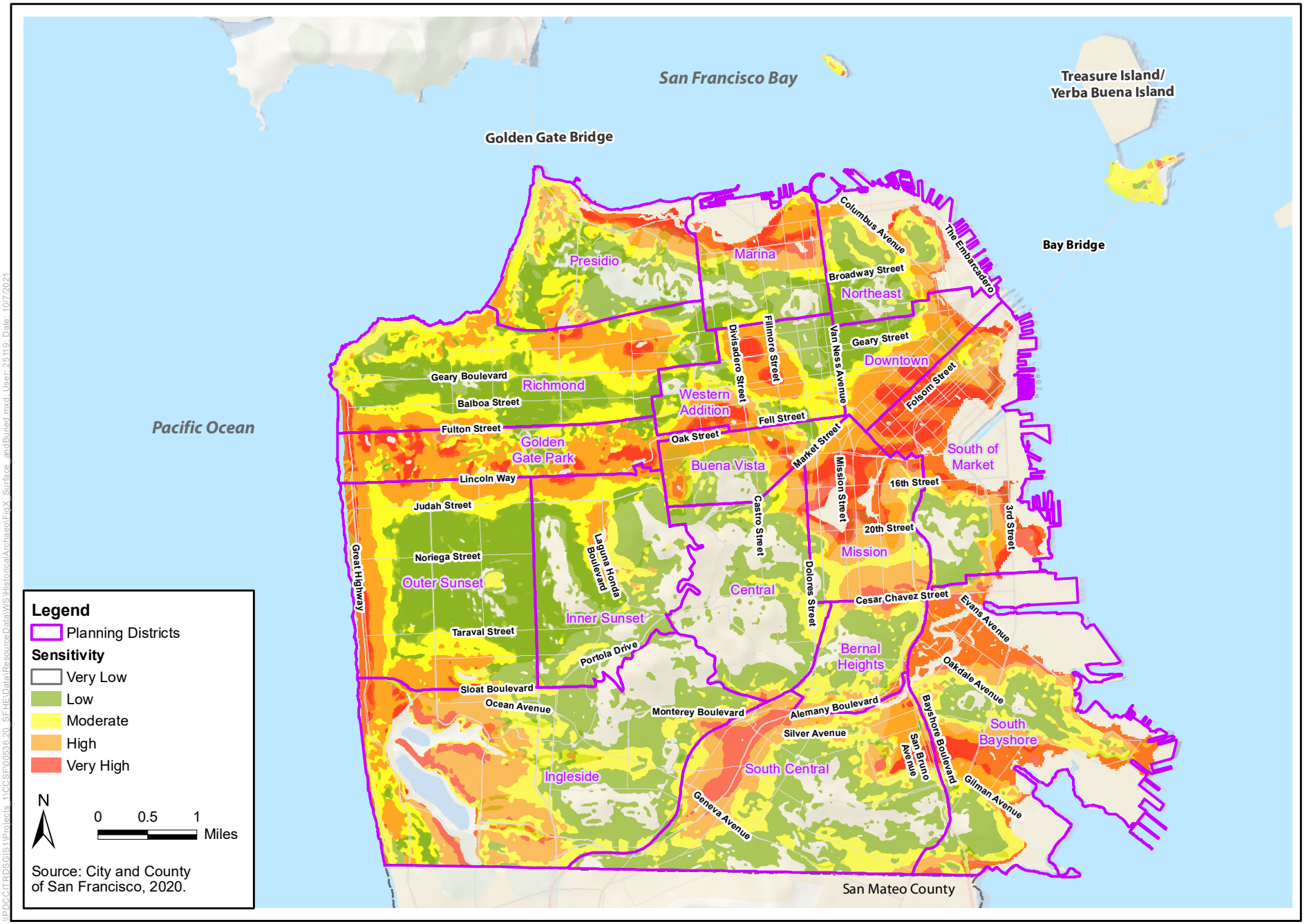

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Figure 22
Surface and Buried Native American Site Sensitivity

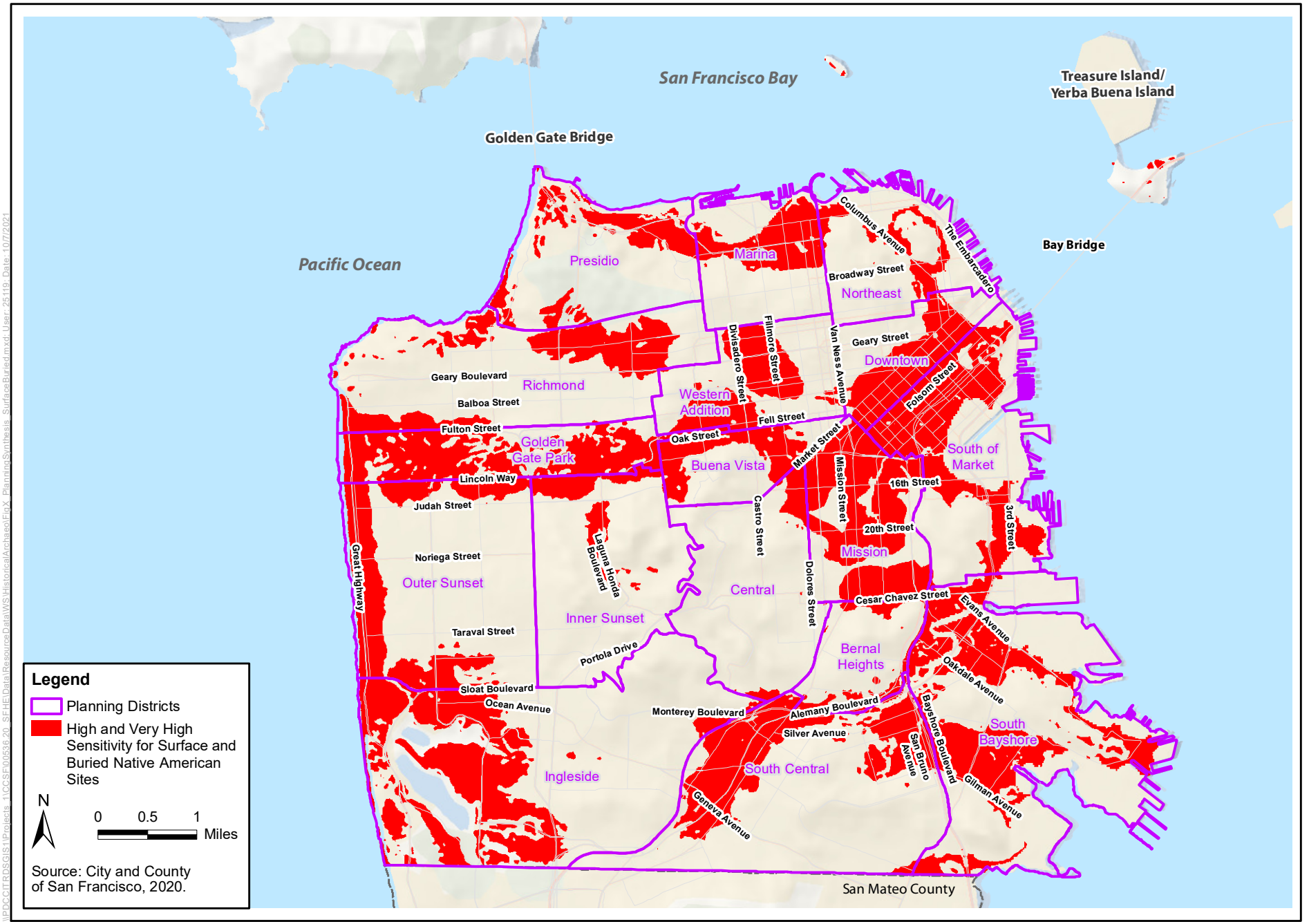

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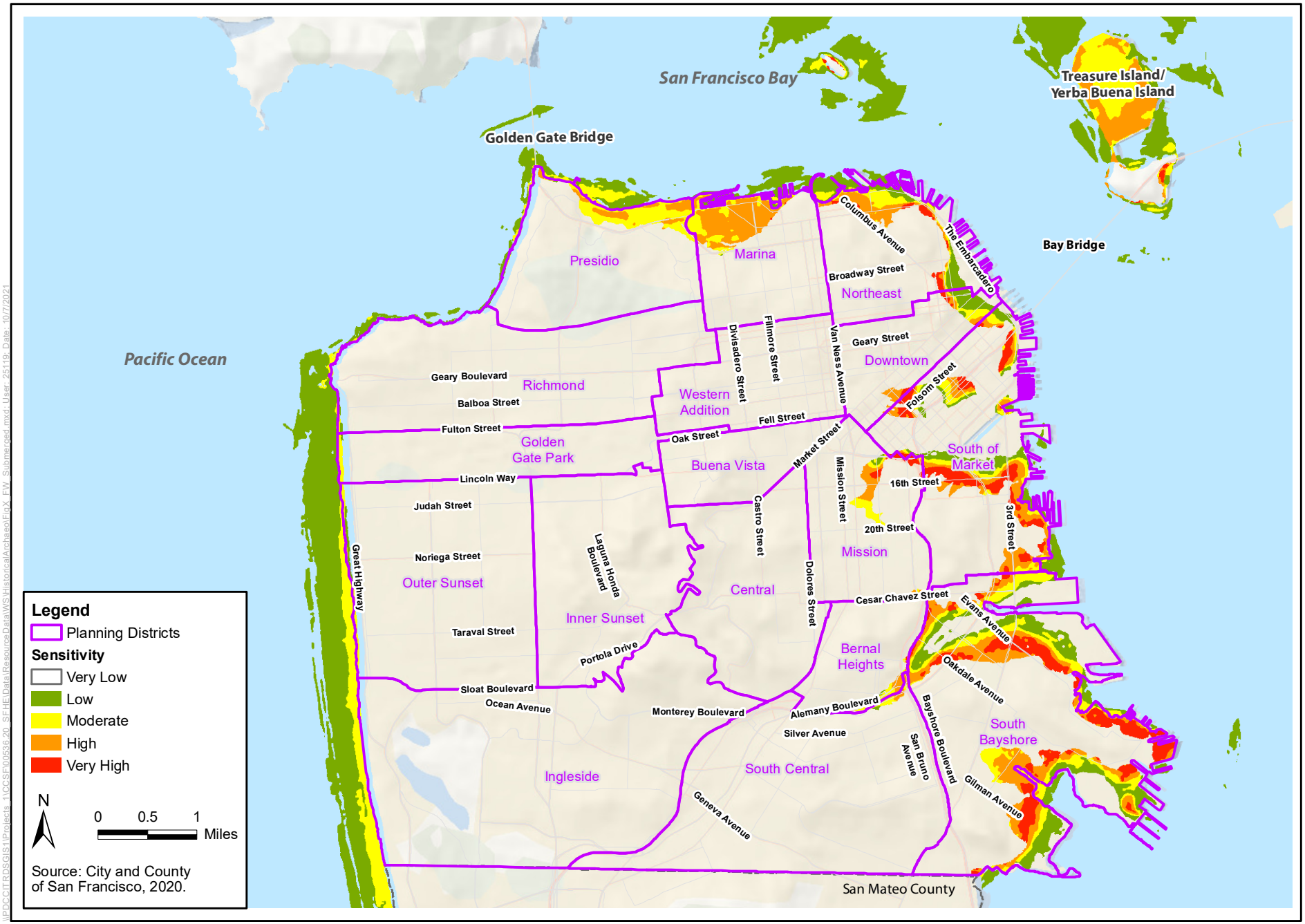
Figure 23
High and Very High Sensitivity for Surface and Buried Native American Sites



San Francisco Housing Element 2022 Update
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Figure 24
Submerged Native American Site Sensitivity

Far Western mapped sensitivity for undiscovered surface sites based on the criteria above. *Surface sites* refers to pre-European contact archeological deposits that might be present at or near the historic-era surface as it existed before about 1850 AD. While this sometimes coincides with the modern land surface, it should be noted that many or most surface sites in San Francisco are capped by built structures or covered by artificial fill deposits. The depth of potential artificial cover at particular locations is not taken into account in the model but must be assessed during site-specific project review based on geotechnical coring data, historic maps and records, or archeological testing.

With respect to sensitivity for buried archeological resources, in addition to considering distance from water, the analysis combined data from soil and Quaternary geology maps regarding the age and extent of surface deposits and landform types with specific information, such as radiocarbon dates, to reconstruct topographic change over time. These data were used to assess the potential presence of buried pre-European contact archeological sites associated with land surfaces that were covered by terrestrial sediments, such as alluvium, colluvium, or wind-blown dune sand, after the formation of the deposit and before the historic period. Degree of slope was particularly important in modeling the potential for sites to be buried, as such sites typically are associated with depositional landforms with low-angle surface slopes (i.e., 10 percent or less), and not with steeper land surfaces, which tend to be erosional. However, the buried model does not generally take into account grading or fill at specific locations, unless substantial topographic changes can be detected in comparisons among historic and modern maps.

Finally, to assess submerged site sensitivity beneath filled lands and under the bay around San Francisco's modern margins, Meyer and Brandy reconstructed the topography of the "pre-Bay" landscape and the network of historical stream channels that might have drained this landscape. An established chronology of sea-level elevation changes over time, in conjunction with topography of the valley floor beneath the Young Bay Mud stratum (reconstructed based on bay bottom bathymetry less thickness of the Young Bay Mud stratum as derived from geostratigraphic core data) was then used to estimate the elevation and configuration of the changing bay and ocean shorelines at approximately 2000-year increments. The model assumes that areas that were inundated later in time have high potential for submerged sites because they were available as dry land for human use for longer periods of time than areas inundated earlier. The model assesses low and lowest potential for area submerged more than about 4,000 years ago, which generally corresponds with settings located 20 meters or more below modern sea level. Areas with greater than 7 percent surface slopes that were also more than 440 meters from reconstructed water sources (creeks) at the time of inundation also are modeled as having low sensitivity for submerged Native American resources. As with all archeological sites, the actual potential for submerged sites is likely less in areas where deep cutting occurred (either during modern development or as the result of localized erosion before or as the sensitive stratum was submerged). However, this assessment generally must be made on a parcel-specific basis, and cannot be captured in the modeling in most cases.

Discussion of Recorded Native American Archeological Resources

The Native American model discussed above tends to confirm that it is likely that undiscovered near-surface and buried resources are distributed around most areas of the site, despite the dearth of Native American site discoveries to date in most of interior San Francisco. The model has been used effectively as an archeological

impact assessment tool since 2019. However, it must be understood that the model cannot accurately predict the locations of all sites because sites are known to occur in locations that are anomalous to the assumptions of the model, because localized environmental settings that affected the attractiveness of particular locations for settlement have fluctuated over time (e.g., undocumented freshwater pools have been discovered that were present among the dunes at some time in the past), and because it is not fine grained with respect to historic landscape alterations at specific sites. The assumption of reduced sensitivity for submerged sites as date of inundation increases also may be problematic because sites older than about 4,000 years, although rare, are likely to be of increased significance, based on age alone. It is important to note that Meyer and Brandy's model assumes that because Bay Region populations were small and widely distributed prior to about 4,000 years ago and, on that basis, areas inundated more than 4,000 years ago have low sensitivity for submerged Native American sites. However, based on recent discoveries in San Francisco of a submerged midden and a submerged burial more than 7,000 years old, the department extends potential high sensitivity for submerged sites generally to include bay shore locations inundated up to 8,000 years ago. Although such sites undoubtedly are rare, their rarity greatly increases their information potential about the prehistory of a period that is virtually unknown. For this reason, the department conservatively assumes higher sensitivity levels for submerged resources than are reflected in the model. Sensitivity predictions using this model should be made only by a qualified archeologist with local expertise, and always in conjunction with other sources, such as site-specific stratigraphic data from geotechnical cores, geoarcheological coring data, historical data on past grading and fill, and information about nearby sites.

Notable Recorded Native American Resources

The following summary of significant archeological findings is extracted primarily from Byrd et al. (2018), as updated by discoveries, testing, or data recovery at several additional Native American sites since the Byrd et al. summary of past findings in the final report of investigation at SFR-114.

At least 29 ancestral Native American sites have been subjected to formal archeological testing or data recovery excavations as of 2021. Most of the excavated sites, two isolate burials, and two sites for which documentation is in progress are clustered in the Downtown–SoMa districts in the eastern part of the city, between Yerba Buena Cove and Mission Bay. Other clusters include two farther south, two in the South Bayshore district and in Visitacion Valley, seven sites on the bay shore near the northwestern corner of the peninsula, and one on Yerba Buena Island.

The amount of intact midden that has been excavated differs greatly between sites, ranging from as little as 0.4 cubic meters at SFR-155 to 488 cubic meters (about 17, 234 cubic feet) at SFR-7. In addition, a variety of excavation and analytical techniques have been used: as a result, insights into site structure are highly varied. Nearly 100 radiocarbon samples have been obtained from 15 of the excavated sites. With the exception of Middle Holocene dates from SFR-28 and SFR-201 (both of which are deeply buried isolated skeletons), all the sites date to the Late Holocene. Most shell midden sites date to the Middle and Late periods, although a few include Early–Middle Transition components. Early Period occupation is currently only documented at SFR-04/H, on Yerba Buena Island (where it is represented only by burials), although the submerged component of SFR-171, yet to be investigated in detail, includes an Early Period component, and SFR-220, a submerged midden in Mission Bay, dates to the Middle Holocene (circa 7500 years BP). Investigations at this site are underway. Large numbers of burials have been

recovered from three sites: SFR-4 (mostly Early Period), SFR-7 (probably Middle Period), and SFR-114 (Middle Period). Despite the impact of historic-era and modern development, these sites generally contain well-preserved features, intramidden stratigraphy, and diverse cultural assemblages. However, a number of other shell middens in San Francisco appear to represent relatively short-term and discrete occupation events. As such, these sites have considerable potential to unravel diachronic and spatial trends in ancestral Native American hunter-gatherer settlement patterns within the region.

EXPECTED NATIVE AMERICAN SITE TYPES

- Resource collection and Processing: Archeological resources associated with resource collection and processing are formed through the deposition of artifacts and the creation of features over the course of collecting and processing food and raw materials. Such resources may be small and diffuse or consist of isolated artifacts in instances where a given location was used for a single activity that deposited artifacts (i.e., a brief pause in transit to sharpen a tool) or accessible only intermittently (i.e., a wetland). Such resources can also be large and clearly visible where a given location was repeatedly used for a large-scale resource collection and processing activity (i.e., a traditionally used fish camp). This resource type is likely to contain a limited diversity of artifacts and features, limited taxonomic diversity of floral and faunal resources (if present), and relatively higher frequency of a limited range of artifact and feature types relative to habitation and multiple-function archeological resources. Exotic and personal items tend to be rare or absent from this resource type. Resource collection and processing may be located outside of areas preferred for human habitation or in areas that may have been accessible only seasonally or periodically, such as wetlands or intertidal marshes.
- Habitation: Archeological resources that are associated with habitations are formed through the deposition of artifacts and the creation of features through domestic activities, such as the construction and maintenance of habitation structures, food consumption, waste disposal, and ceremonial activities, including human interments. Such resources may have been used on a seasonal basis or a more permanent basis. Habitation resources tend to contain a high diversity of artifacts of features and a high taxonomic diversity of floral and faunal resources. They are also likely to contain exotic and personal items. The ability to differentiate between habitations and resource collection and processing may require a large sample size. Otherwise, visible patterns in the relative frequency and diversity of artifacts and features may be more a function of sample, rather than the nature of the pre-European contact human activities that took place at the site. Habitation sites are likely to be located on stable and permanently accessible landforms near a perennial waters source.
- Multiple Function: Multiple-function archeological resources may consist of any combination of the activity types associated with resource collection and processing as well as habitation archeological resources. Such resources usually reflect changes in human activities over time (e.g., a temporary resource collection and processing resource that transitions into a temporary camp that transitions into a permanent village). In order to differentiate multiple-function archeological resources from the resource types identified above, the vertical stratigraphy and archeological sample size must be large enough to perceive variations in artifact diversity and frequency.

- Redeposited: Redeposited or reworked materials may consist of accumulations of Native American, historical, and/or modern items that have been displaced from the location of their primary deposition. These items could have been displaced by human-induced (i.e., anthropogenic) modifications or natural modifications (e.g., tidal action or erosion). Such items would not be in primary depositional context and would not represent intact archeological deposits. However, department policy is that redeposited Native American resources shall be considered significant until analyzed; a redeposited Native American midden may retain substantial information potential if it represents a single cultural period.

Recorded Historical Archeological Resources

Historical archeology focuses on societies that left behind historical records. This type of study examines both archeological materials and documents. Archeological resources can include small objects like buttons and sewing pins as well as large structures like buried ships and remnants of buildings. Documentary sources can include census records, city directories, diaries, deeds, historical maps, newspaper articles, oral histories, photographs, and voter records. By combining the use of documentation and archeological evidence, archeologists gain a better understanding of the past and human behavior.

Historical archeology can help shed light on the lives of people who have traditionally been underrepresented in historical records and who have been underrepresented as subjects of study as well. There is frequently a difference between what is written and what people actually do. The written record is biased by the beliefs of the people who authored the documents. Authors tend to replicate the beliefs of the hegemonic power at that time. Much of history in the United States has been written by people who have typically been rich, white, and male. The objects left behind by people are unintentional time capsules that reflect the behaviors and choices made by past peoples.

Archeology frequently provides a more objective account of our past than the historical record alone because it can provide information about people who were usually left out or on the margins of history, like the poor, women, immigrants, and people of color. Prominent Bay Area archeologists Mary and Adrian Praetzellis (Praetzellis and Praetzellis 2009:11) aptly describe how historical archeology adds to our understanding of the past, particularly when it focuses on marginalized groups: “Some of the most effective work is done at the small scale, emphasizing the commonplace, giving a voice to those whose history is not reported in written records, and bringing the lives of the disfranchised into focus.” Historical archeology can shed light on those less visible in the historical record by examining the mundane and personal to provide alternative histories that underscores that “there is no final and definitive account of the past as it was” (Shanks and Hodder 1995:5). Historical archeology has provided insights into San Francisco’s past, particularly the lives of immigrants, women and children, and working people.

A chronological summary of historical archeology in San Francisco is presented here as an orientation to the decades of work that has been conducted in the city. This section does not attempt to convey the full breath of the historical archeological body of literature in San Francisco. Instead, it focuses on important projects and significant historical archeological resources, then presents them chronologically.

Although residents of the city have uncovered the remnants of previous inhabitants on the peninsula since the earliest days of the town (*San Francisco Call* 1883), the first documented scholarly excavation of historic-era archeological resources took place in the mid-twentieth century. National Park Service regional historian Aubrey Neasham and architect Herbert Maier conducted excavations during construction of a sewage disposal plant at the foot of Bay Street in July 1949. These early efforts were not well documented; therefore, little is known about archeological excavations that took place during the mid-twentieth century.

The next era of archeology in San Francisco was stewarded by Adam E. Treganza, founder of the Department of Anthropology at San Francisco State University. He started the university's Archeological Survey and Anthropology Museum in 1953. The museum became a principal repository in central California for both Native American and historic archeological materials (Fentress 2017). The survey division conducted archeological field projects throughout California. One such project was Ronald N. Melander's excavation of a historical dump site near Folsom and Fremont streets in 1968. After Treganza passed away in 1968, the museum was renamed the Tregenza Anthropology Museum. In subsequent years, James Dotta, Robert Schenk, Robin Wells, and Miko Yamamoto have managed the museum. Michael J. Moratto was hired to replace Treganza as a professor. He and Thomas F. King conducted major cultural resource management projects in California (Fentress 2017). In 1974, Dotta recovered historical artifacts from the footprint of the proposed Embarcadero Center.

In need of more curation space, San Francisco State University built an archeology facility at the Romberg Tiburon Campus that housed the Tiburon Archeological Research Group. A landslide destroyed a number of the collections at the Tiburon facility in 1992. Although many collections were lost, some were salvaged and moved to three different locations (Fentress 2017). Historical archeology conducted in the city between the 1940s and the 1960s is little understood because of the destruction of early artifact collections as well as the lack of documentation and reporting on these early academic or salvage excavations.

Federal and state environmental laws passed in the late 1960s and early 1970s transformed the way archeology was conducted in San Francisco. CEQA, a California statute signed into law in 1970, created new procedures for protecting environmental resources, including archeological resources (a subset of the cultural resources CEQA topic). It took time for lead agencies, such as the department, to put the processes in place to determine if proposed projects would have environmental impacts and, if so, require mitigation measures. During the 1970s, construction projects with identified impacts on archeological resources tended to be very large government projects. The first of these was the Clean Water Program, or Wastewater Management Program, in the mid-1970s, which was a five-year project that called for replacing wastewater lines along the waterfront from the Marina planning district all the way to Islais Creek (Dames and Moore 1976; Pastron et al. 1981a–c). The Clean Water Program resulted in the excavation of 5,000 historic-era artifacts, including 500 artifacts of Chinese manufacture, during construction at the North Point (N-5) Pump Station near Bay and Kearney streets. The artifacts had been dumped by the cartload in the 1880s as part of the bay filling process. The refuse came from residents and establishments of nearby North Beach and Chinatown (Pastron et al 1981b:258). Archeological study of the artifacts and stratigraphy at the pump station provided a foundation for understanding land-filling practices during the late nineteenth century.

Another early historical archeological effort in San Francisco was the Pacific Gas and Electric Company's (PG&E's) Potrero Power Plant Unit No.7 Project, which upgraded various company facilities. The archeological investigations conducted as part of the project found remnants of an 1850s shipyard on King Street, the foundations of the 1854 Gibbons and Lammot powder magazine at the Potrero Power Plant, a large nineteenth-century urban refuse disposal area on Sixth Street, and late nineteenth-century artifacts and foundations at the Embarcadero Substation (Wirth Associates 1979a, 1979b). This large public project helped pave the way for archeological work in the city.

Court cases in the 1970s determined that CEQA applied to both public and private projects, and the city started to enforce environmental regulations for privately funded developments (Pastron 2007). Expansion of the scope of CEQA resulted in more projects being reviewed for their potential to affect archeological resources. The outcome of the inclusion of private projects within the purview of CEQA was the discovery of buried gold rush–era ships that brought national attention to San Francisco.

On April 28, 1978, construction workers struck the hull of a ship that was buried about 20 feet below city streets. It was identified as a gold-rush storeship, the *Niantic*. The ship's hull was all that remained after a fire in 1851 burnt the *Niantic* to its waterline. Well preserved by the mud on the bay floor and later covered by artificial fill, the hull still contained the cargo that had been carried on the *Niantic,* including tools, guns, writing utensils, foodstuffs, and even cases of champagne (Smith 1981).

Several months after the *Niantic* was unearthed, another gold rush–era ship was discovered during construction of Levi's Plaza on the city's northeast waterfront. The *William Grey* (NRHP #82002248), found beneath Battery and Greenwich streets, garnered much public curiosity and proved that the *Niantic* was not an isolated incident (Pastron et al. 1978; Pastron and Prichett 1979 and 1981). Another ship, the *Lydia*, was discovered in June 1978 by archeological monitors for the Clean Water Program. The 1840s American-made whaler was sunk in the early twentieth century between present-day King Street and The Embarcadero (Pastron et al. 1981a, 1981b). These charismatic ships, tangible elements of the city's prominent gold rush era, not only captured the public's attention but also the attention of regulators, developers, and contractors, underscoring the importance of archeological resources and the environmental laws that protect them.

Archeological work for the Clean Water Program, PG&E's Potrero Power Plant Unit No.7 Project, and private projects that uncovered gold rush–era ships in the late 1970s helped establish the foundation for historical archeology in San Francisco. These discoveries ushered in what James Delgado (2009) describes as "the modern age of historical archeology" in San Francisco. They established procedures for how archeology is practiced in an urban context, such as developing a sensitivity study and research design prior to fieldwork, conducting archeological testing to identify resources prior to construction rather than relying on accidental discovery, and producing reports of archeological treatment results.

Important archeological resources were discovered and recorded in San Francisco as a result of private and public development in the 1980s. Much of what was uncovered during the decade was associated with the gold rush, early Chinese populations in San Francisco, and the maritime industry. Gold rush–era sites include CA-SFR-118H (Pastron and Hattori 1990), CA-SFR-119H (Archeo-Tec 1986), CA-SFR-122H (Archeo-Tec 1989), and P-38-000122 (Pastron 1985). Respectively, these sites consisted of the remains of a chandlery known as the Hoff Store

at 275 Battery Street; structures and refuse associated with Happy Valley and a planked road at 100 Frist Street; a compacted, artifact-laden living area that appeared to date from the beginning of the gold rush at 235 Pine Street; and an unmortared brick floor, wells, privies, and a trash pit associated with the James King of William Banking House on the corner of Montgomery and Commercial streets (505 Montgomery Street).

Archeo-Tec excavated two sites that were associated with Chinese communities in the 1850s and 1860s. A Chinese fishing village (CA-SFR-116H) was discovered on the south side of Rincon Point as part of excavation for the Rincon Point/South Beach Project. One of the earliest of the many Chinese fishing villages along the California coast, this site represented an early fishing cooperative in which Chinese fishermen, who were largely excluded from trade with non-Chinese, sold and traded goods with Chinese merchants (Pastron 1990). Another significant Chinese site, CA-SFR-123H, was discovered during the 600 California Street Project. It consisted of the remains of a gold rush–era Chinese store. This was the oldest, most extensive, and best-preserved cultural deposit ever encountered in the heart of San Francisco's gold rush–era Chinatown (Mason Tillman Associates 1986; Pastron and Walsh 1988; Archeo-Tec 1992). The maritime resources recorded during this decade included CA-SFR-111H, the hull of a sailing vessel in Candlestick Cove's ship graveyard near Visitation Valley (Delgado and Foster 1986; Delgado 2013:133), and CA-SFR115H, a shipbreaking yard associated with Charles Hare on the shores of Yerba Buena Cove (ASR 1987; Delgado and Foster 1986).

Historical archeology during the 1990s continued to uncover important parts of San Francisco history. During this decade, more archeological consultants conducted work in the city, including the Anthropological Studies Center, Basin Research, Holman & Associates, and William Self Associates. This decade is also when report content became more systematic and organized. Although much of the historical archeological work in the previous decade was concentrated on the east side of the city, particularly to the northeast, projects that affected significant historical resources in the 1990s extended farther across the city.

As new areas of the city were investigated in the 1990s, more types of historic-era archeological resources were discovered, including cemeteries, residential and commercial sites, and military installations. Two cemeteries, City Cemetery and Yerba Buena Cemetery, were partially excavated by an archeologist. More than 700 burials from the "indigent" section of City Cemetery were recovered as part of seismic retrofit and expansion of the California Palace of the Legion of Honor (Ambro 1990 and 1993; Chattan et al. 1997). At least 59 individuals who were once buried in Yerba Buena Cemetery (1850–1854) were recovered during excavation for the San Francisco Main Library Project (Basin Research Associates 1994a, 1994b). This project also encountered the colossal foundation of the Beaux Arts–style city hall that stood from 1871 to 1906; the city hall was destroyed by the 1906 earthquake and subsequent fires. CA-SFR-125H, a residential hollow fill feature and early twentieth-century structural remains, was discovered at 450 10th Street during construction of Costco (WSA 1996c). CA-SFR-128H, structural remains of a nineteenth-century commercial building that once fronted Market Street, was uncovered during archeological testing for the Four Seasons Hotel at 757 Market Street (WSA 1999a). PAR Environmental Services conducted an archeological resources inventory at Yerba Buena Island and Treasure Island that documented the remains of buildings constructed by the U.S. Army and Navy (P-38-138 through 155) (PAR 1997).

Although new types of resources were found during the 1990s, maritime resources continued to be discovered, given the city's rich history as a port and continuous development in areas along the historical shoreline. CA-SFR-130H, a marine railway operated by Henry B. Tichenor from 1851 to 1868, was excavated during development at 725 Second Street (WSA 1999b). One of the most significant discoveries of the decade (SFR-127H) occurred during archeological work for the San Francisco Municipal Railway (Muni) Metro Turnback, Mid-Embarcadero Surface Roadway, and F-Line Extension Project. The hull of the three-masted *Rome* was encountered when crews were boring a tunnel to extend the Muni Metro aboveground to The Embarcadero. A section of the ship was excavated by an archeologist before it was removed for the tunnel. However, most of the ship remains buried at the foot of Market Street. The inbound K/T Line actually passes through the hull of the ship. Along with the *Rome,* the remains of pre-1870s wharfs, planking along East Street (Embarcadero), a rail line, and nineteenth-century structural remains make up SFR-127H (WSA 1996a, 1996b, 2000).

After the 1989 Loma Prieta earthquake, the California Department of Transportation (Caltrans) undertook two large projects to improve the seismic safety of the Bay Bridge as well as the Bayshore Viaduct, a vital transportation link between the bridge and points south along U.S. 101. These large-scale projects, the San Francisco-Oakland Bay Bridge West Approach Project and the Bayshore Viaduct Seismic Retrofit Project, led to the development of new approaches to historical archeology in the city. The advances were largely spearheaded by Adrian and Mary Praetzellis of the Anthropological Studies Center at Sonoma State University. They included assessment of archeological sensitivity on a programmatic scale, development of research topics, sampling strategies for testing, and programmatic analysis and interpretation of resources (e.g., telling the story of whole blocks or neighborhoods instead of an isolated handful of parcels). These large-scale projects required the use of rigorously consistent methods for recovery, lab analysis, and reporting. The methodology revealed patterns at the household, neighborhood, and city levels as well as consistencies and contrasts between San Francisco and West Oakland.

The Bayshore Viaduct Seismic Retrofit Project resulted in the documentation of 10 historic-era archeological sites (CA-SFR-137H, CA-SFR-138H, CA-SFR-139H, CA-SFR-140H, CA-SFR-141H, CA-SFR-142H, CA-SFR-143H, CA-SFR-144, CA-SFR-145H, CA-SFR-146H). Most of these sites included historic-era ground surfaces, structural remains (e.g., the brick foundations of the Eighth Street Primary School), and seven significant hollow fill features dating from the 1860s to 1906 (Praetzellis 2004). The San Francisco-Oakland Bay Bridge West Approach Project resulted in the documentation of six historical sites (CA-SFR-137H [overlaps Bayshore Viaduct Block 1), CA-SFR-150H, CA-SFR-151/H, CA-SFR-152H, CA-SFR-153H, and CA-SFR-154/H). These sites yielded 38 historical features that informed research regarding life in three nineteenth-century neighborhoods: the Tar Flats, the edges of Rincon Hill, and the shore of Mission Bay (Praetzellis 2007a, 2007b, 2007c). The interpretive volumes presented an unprecedented amount of data on the inhabitants of nineteenth-century South of Market. The analysis of thousands of artifacts led to unparalleled insights into ethnicity and socioeconomic status; immigrant women, including sewing and tobacco use; and maritime workers (Praetzellis 2009).

During the 2000s, the range of historical archeological site types expanded as the number of construction projects across the city increased. Resources associated with the period of Spanish and Mexican colonization, as well as the gold rush, were discovered around Mission Dolores. Archeological testing at the former Notre Dame School (now Children's Day School) represents the first archeological field excavations conducted within the

Mission Dolores complex. Five properties were determined eligible for the NRHP in the Notre Dame project area: the remains of the foundation for the Mission Orchard wall (c. 1783), the stone foundation of the José and Eustaquio Valencia brothers' house (c. 1845), the trash deposit associated with the Valencia brothers (c. 1845–c. 1858), the trash deposit associated with gold rush–period public house and bull ring (1850s), and a Native American shell midden from the Contact Period adjoining the neophyte rancheria (c. 1776–1820). In a block to the north, archeologists found nine archeological features, including a serpentine foundation associated with an adobe building, a pit filled with *tejas* (a type of Spanish tile), and nineteenth-century trash pits (38-000167), during construction at 299 Dolores Street (Pastron 2005). Testing up the street at 261 Dolores Street led to the discovery of CA-SFR-169H (P-38-004629), which contained architectural remains dating from between 1776 and 1848 (Pastron and Ambro 2008; WSA 2008b).

Resources associated with Chinese individuals were found in the Inner Mission District as well as Mission Bay. The remains of a late nineteenth-century Chinese vegetable garden and associated dwelling (P-38-004468) were recorded during construction of the Valencia Gardens Housing Complex at 309 Valencia (Archeo-Tec 2007a). Two Chinese-associated sites were found in Mission Bay. These included the remains of a Chinese-owned business known as the Wing Lee Laundry on the tip of Steamboat Point, between Third, Fourth, King, and Berry streets (Pastron and Beevers 2003). Archeo-Tec also recorded the remains of Dumpville, San Francisco's earliest established refuse dump, on what was the north shore of Mission Bay Cove, now located south of Berry Street between Fifth and Sixth streets. The dump was inhabited by transients in the 1870s and has a Chinese component (Archeo-Tec 2000).

Significant residential sites associated with Euro-American inhabitants of nineteenth-century San Francisco were found during the 2000s. These include three features that were found during expansion of Kaiser's Geary location. The features were associated with the Sheering family, Irish stoneworkers who carved monuments for nearby cemeteries (Clark et al. 2005). Refuse associated with the Italian Grassini family was uncovered during construction at 601 King Street (Archeo-Tec 2007b). CA-SFR-158H and CA-SFR-159H consisted of hollow fill features and artifact scatters associated with two German households (one of which may have been Jewish) and one Irish household. These were also identified as part of the Octavia Boulevard Improvement Project (Archeo-Tec 2005).

Commercial sites discovered during the 2000s include a refuse site associated with the first International Hotel (1854–1906) at 848 Kearny (Pastron et al. 2003) and the nineteenth-century saloons and boarding houses at 200 and 250 Brannan Street (Archeo-Tec 2008). In the Mission District, Archeo-Tec recorded the remnants of the kitchen and pantry of the working-class, late nineteenth-century Crystal Hotel (P-38-005151), and WSA recorded the structural remains of the Agricultural Implement Warehouse (CA-SFR-162H) (Archeo-Tec 2002; William Self Associates 2004). Industrial sites in the Mission District that were excavated during this decade include the remains of the San Francisco Glass Works (P-38-004294), a glass-manufacturing company that operated from 1865–1868 on King Street, near Fourth Street (Beevers 2003; Pastron and Vanderslice 2003), and the remains of a coal gasification facility (CA-SFR-161H) at 170 King Street (William Self Associates 2004). Industrial archeological resources outside the Mission District include CA-SFR-166H (P-38-004512), with structural remains from various nineteenth-century companies that operated at 400 Howard Street. These include the San Francisco Gas Company, Dow Iron & Brass Foundries, Dow Pumps & Compressors, and the Eureka Boiler Works. Construction

at 133 Shipley Street yielded architectural remains and artifact concentrations related to pre-1906 structures, most likely stables associated with the North Beach and Mission Railroad (P-38-004357) (Robichaud 2004; Archeo-Tec 2004). Archeological monitoring of a Van Ness Avenue improvement project encountered two features, concrete cable car troughs associated with the Ferries and Cliff House Railway and Sutter Street Railway, identified as late nineteenth century (Pastron and Robichaud 2004).

Maritime resources continued to be discovered during the 2000s. The remains of the 1,600-foot Meiggs Wharf, which was built in 1853 at Francisco Street in North Beach, were found during excavations for construction at 329 Bay Street (Praetzellis and Mc Ilroy 2005). The remains of two ships that were scuttled in Yerba Buena Cove during the gold rush were also found during the decade. Construction of a hotel at 425 Battery led to the discovery of the *General Harrison*, which dropped anchor in San Francisco Bay in February 1850 and was converted to a storeship by E. Mickle and Company in May. The storeship was consumed by fire on May 3 and 4, 1851, but later partially salvaged by Chinese workers employed by Charles Hare. The *General Harrison* assemblage included artifacts that were sold by E. Mickle and Company, such as architectural items, kitchenware, comestibles, storage containers, arms, apparel, and personal goods (Delgado et al. 2007). A major project at 300 Spear Street yielded CA-SFR-165H, which included 40 features that dated from the gold rush–period to the early to mid-twentieth century. These remains included the *Candace*, a dismantled whaling ship; 42 individual ship timbers, most likely associated with Charles Hare's ship-breaking operations; and footings from brick commercial buildings that served the maritime-orientated neighborhood (Strother et al. 2007).

Historic-era cemeteries continued to be affected by new construction in the 2000s. Forty-two people who were once buried in Yerba Buena Cemetery were recovered during excavation for the Asian Art Museum (Busby 2000a–g, 2001). Burials associated with Odd Fellows Cemetery were also discovered. One burial was found during construction at the San Francisco Columbarium at One Loraine Court (Pastron 2000). Construction of senior housing at 3575 Geary Boulevard led to archeological excavation of three individuals (P-38-4637) (Pastron 2000; Pastron and Ambro 2009). Rounding out the discussion of historical sites recorded between 2000 and 2010 are two unique sites that were associated with important groups or events in San Francisco history. The remains of three structures associated with the 1856 Committee of Vigilance were found during archeological testing at 275 Sacramento Street (P-38-004262). These included structural remains from Fort Vigilance, also known as Fort Gunnybags, which served as headquarters for San Francisco's second "Committee of Vigilance," a powerful but short-lived and quasi-legal organization of local citizens who were dedicated to the restoration of law and order in a burgeoning, dynamic, and often chaotic young metropolis that was known for its lawlessness (Pastron and Robichaud 2000). Rebuilding of the California Academy of Sciences resulted in the discovery of CA-SFR-167H, which was associated with San Francisco's 1894 Midwinter International Exposition. The Music Concourse in Golden Gate Park was once the bustling center of the exposition. The Academy of Sciences building stands over the area known as the Oriental Village, which featured the "people and pleasures" of Turkey, Persia, and Egypt. The recovered collection included souvenirs that had been recycled from the Chicago Columbian Exposition as well as adornments and trimmings that were very likely parts of participants' costumes or the décor of the Oriental Village (WSA 2008).

Historical archeology between 2010 and 2020 continued in the vein of the previous decade, meaning that the decade can be characterized by increased development that resulted in a mixture of large-scale projects and smaller projects as well as more archeological consultant work on projects than in any previous decade,

including work by AECOM, Albion, Archeo-Tec, ASC, Basin Research Associates, ESA, Far Western, GANDA/Klienfelder, Holman, ICF, Pacific Legacy, PaleoWest/WSA, and SWCA. Unique to this decade is the advent of archeological research design and treatment plans drafted for area plan EIRs, primarily in the South of Market area. These produced sweeping archeological sensitivity studies, historic contexts, research designs, and standardized investigation practices. The sensitivity studies are superb references regarding the archeology of the east side of San Francisco.

Three massive projects took place during the decade between 2010 and 2020. They include the Transbay Transit Center Program, Central Freeway Replacement, and Central Subway Program, each of which resulted in the discovery of significant historic-era archeological resources. The Transbay Transit Center Program, which covered 14 city blocks in the South of Market area, involved demolition of the Transbay Transit Terminal and construction of a new transit center in San Francisco as well as construction of a temporary terminal, bus ramps, and bus storage. Remains of the Risdon Ironworks were found during construction of the temporary terminal on Block 2 (WSA 2011). Sixteen significant features were found during construction of the new Transbay Transit Terminal on Block 10. The project yielded a unique concentration of gold rush–era features (c. 1850–1862) that once belonged to the early inhabitants of 39/43 Minna Street. The features included wood-lined storage bins, a privy, wood barrels, and a yard surface. This group of features is associated with some of San Francisco's earliest occupants, including produce merchant David Robison and his family, politician Asa Walker, and James Hagan, one of San Francisco's first harbor masters (WSA 2018a). There were also a handful of artifact-filled privies dating from the period between 1863 and 1882. Their contents reflect the everyday lives of a variety of San Francisco families, including those headed by a Yankee boat builder, a German grocer, an English ironworker, and Irish immigrants who were making their living as laborers, a stevedores, and newspaper agents (WSA 2018a). Archeological work at Block 6, Block 8 (bus storage), Block 9, and Block 11a resulted in the discovery of eight significant residential features dating from the 1860s to the 1880s (WSA 2019a), four significant residential features dating from the 1870s to the 1880s (WSA 2019b), one privy associated with the Heyfron family that resided at 28 Perry Street from 1859 through the 1890s (WSA 2018b), and one privy associated with the Madden family (WSA 2014), respectively.

The *Central Freeway Replacement Project Archaeological Research Design and Treatment Plan* (Ziesing 1998) was created in the 1990s for the Central Freeway Replacement Project. The project, which covered 10 blocks and involved retrofitting and widening the elevated structure between South Van Ness Avenue and Fell Street, extended into the 2010s. Construction of the Market and Octavia Central Freeway "Parcel P" Project yielded CA-SF-187H, a significant privy associated with the French Barnard family (Fernandez and Siskin 2015). CA-SFR-206H (P-38-005506) was a significant privy discovered on Parcel O that was associated with the Morehead household, which occupied 455 Fell Street from 1870 to at least 1874 (Walker et al. 2018).

The Central Subway Project, led by the San Francisco Municipal Transit Agency (SFMTA), extended the Muni T Line through South of Market, Union Square, and Chinatown. Like with the other large projects (e.g., the Bayshore Viaduct Seismic Retrofit Project and Bay Bridge West Approach Project), the Anthropological Studies Center managed the archeological aspects of this massive project. Two historic-period sites were discovered during archeological testing and monitoring. CA-SFR-219H was found during construction of a subway station's north egress (ASC 2015). The site was made up of a series of basements associated with Chinese clothing factories and later a commercial establishment that sold sewing machines and other merchandise associated

with the garment industry. These manufacturers and retailers operated at this location from the late 1870s until the 1906 earthquake and fire (ASC 2019). Another historical site, CA-SFR-216H, was discovered during excavations for the Yerba Buena/Moscone station at 266 Fourth Street. The site features one artifact-filled privy dating to the mid-nineteenth century (ASC 2020b).

Similar to the previous decade, significant historical archeological resources were encountered across the city during the 2010s but primarily on the city's east side. Excavation at 717 Battery Street yielded an unprecedented material record of the rapid transition of the village of Yerba Buena into a premier center of commerce and trade on the California coast during and after the gold rush. CA-SFR-186H was a stratified multi-component site with 25 discrete cultural features dating from the 1830s to the 1840s, including resources associated with the hide and tallow trade, as well as features from construction of the Musto Building, which currently occupies the parcel, in 1907. The site also had a score of gold rush–era resources, including a rock wharf, pier-supported wharf, secondary fill deposits, and tidal deposits, as well as a handful of resources from the 1860s to the 1870s (Pastron and Bruner 2013; Pastron and Ambro 2010). A dump from the gold rush era was discovered during work at 350 Mission Street. The artifacts were deposited in the shallows of Yerba Buena Cove between c. 1849 and 1854 when the lot was filled in (Baxter 2014).

Maritime resources found during the 2010s include remnants of the *Arkansas,* a three-masted schooner that ran aground on rocks near Alcatraz. The ship was towed to the Pacific Street Wharf, which was located in an area that would later become the northeast corner of Pacific Avenue and Battery Street. The *Arkansas* was found during construction at 240 Pacific Avenue. Being no longer seaworthy, the ships' masts were cut off and the *Arkansas* was converted to a storeship (PaleoWest 2018). A small, intact lighter, which had been used to ferry cargo between anchored ships and the shore, and a shipbreaking yard were excavated at 201 Folsom Street. The gold rush–era lighter was removed in one piece. It is currently being curated at the San Leandro storage facility of the San Francisco Maritime National Historical Park. The 201 Folsom site, CA-SFR-193/H, also contained numerous significant features associated with inhabitants near Rincon Point from the 1860s until the 1906 earthquake (PaleoWest 2021).

Residential archeological sites abounded in the 2010s. Construction at 975 Bryant Street found more than 100 historical features, the bulk of which was associated with immigrant households and the laborers who worked in nearby industries (PaleoWest [report still in progress]). CA-SFR-180H, discovered during construction at 333 Fremont Street, is a domestic collection of items associated with the household of Simon and Sarah Blum, Eastern European Jewish immigrants who lived at this address from 1864 to 1871 (Massey and Praetzellis 2013). Excavation at 355–399 Fremont Street yielded CA-SFR-189H (P 38-005033), a privy associated with the Dingley family, the male members of which were in the maritime industry. This project was one of the few in which living descendants of the Dingley family were found and wanted to participate in the project (Praetzellis 2015). Construction at 110 Embarcadero/115 Steuart Street resulted in the discovery of CA-SFR-195H (P-38-002324). The site comprised a layer of refuse that was deposited between the mid-1850s and about 1870. The artifacts and faunal remains appear to have been deposited by workers—primarily teamsters—who lived and worked at Dutton & Son's hay and grain business or the neighboring lumber warehouses, particularly that of Amos Phinney and Company, located next door at Pier 9. Other artifacts were from residents who lived on the corner lot facing Mission Street (Praetzellis 2017). Domestic features at 923 Folsom Street were associated with a highly mobile and ever-changing group of residents, ranging from traditional individual families to groups of

boarders (Russell et al. 2017). Two privies associated with a working-class tradesman and his family, which resided at 673 Clementina Street during the nineteenth century, were found at 1174–1178 Folsom Street (Russel et al. 2020).

A handful of commercial and industrial sites in San Francisco were documented by archeologists between 2010 and 2020. These included the remains of agricultural operations at 1500 Mission Street from the 1850s to the 1860s (PaleoWest 2020), a French laundry at 915 Cayuga Avenue (ASC 2020; Archeo-Tec 2000), and CA-SFR-199H (P-38-005463). Structural remains of the San Francisco and Pacific Sugar Refinery (1856–1872/1873) were found at 350 Eighth Street (Estes et al. 2018). The tracks of the San Francisco Belt Railroad were discovered during road work in the marina (Archeo-Tec 2012). Streetscape improvements at 1150 Third Street yielded CA-SFR-204H (P-38-5501), a late nineteenth-century streetscape composed of basalt paving blocks, concrete paving, and concrete and granite curbs. Also found were wooden railroad ties beneath Fourth Street and along the street's pre-1906 earthquake alignment (Russell et al. 2018).

Cemetery archeology also continued during the 2010s. Human remains from Yerba Buena Cemetery continued to be found during ground-disturbing construction in the Civic Center (ICF 2010; Russell et al. 2018), a member of the Odd Fellows who was buried at the Masonic Cemetery was uncovered at 530–532 Parker Avenue (Archeo-Tec 2011), 59 burials from the Masonic Cemetery were excavated as part of construction for the University of San Francisco Center (Archeo-Tec 2012), and an underground crypt that was once part of the Odd Fellows Cemetery was unearthed (Pastron and Cain 2012). Street work at the former location of Calvary Cemetery, which was relocated in the 1940s, encountered mortuary remains as well as several fragments of human bone during monitoring for a sewer replacement project at Vega Street and Anza Vista Avenue. The mortuary remains included 55 partial or nearly complete headstones, uncharacterized gravestone fragments, and three isolated mortuary-related artifacts (ESA 2019). Archeological monitoring during construction associated with remediation work at a sinkhole at 2675 Geary Boulevard resulted in the recovery of 30 headstone fragments, and 14 engraved mortuary curbs, and one non-engraved curb with graffiti (Wildt et al. 2018). The Mission Dolores Park Rehabilitation Project was conducted on land that was once part of two Jewish cemeteries, *Giboth Olam*, or Hills of Eternity, *and Navai Shalome*, or Peaceful Abode, that were established in 1860. Archeologists identified the foundations of mortuary structures (Praetzellis and Meyer 2016; Praetzellis 2014a, 2014b, 2015). Deceased inhabitants of City Cemetery were unearthed during the California Street Tile Steps Project in Lincoln Park (Pastron et al. 2010) and the Baker Beach Green Streets Project (ESA 2020).

For more than 50 years, development within San Francisco has prompted a great deal of archeological excavation, study, and interpretation. These studies have shown that the archeological record of the past 250 years has the potential to fill in gaps and correct the misrepresentations that characterized the written record, despite having been subject to differential preservation over time, subsequent disturbances, and the biases of archeologists in choosing what gets retrieved, recorded, and investigated. Such studies have shown that archeological deposits may have significant research value, independent of the existence of a good historical record. Decades of historical archeology in San Francisco have added to the rich tapestry of local history.

EXPECTED HISTORIC-PERIOD SITE TYPES

An archeological site—the features and deposits that constitute a resource—is the physical link between the contextual history outline above and the theoretical orientation and research themes presented in the research design below. These features and deposits are often linked through associated property types that allow researchers to build inferences and to understand a site's history

The Secretary of the Interior's Guidelines for Historic Preservation Planning (NPS 1983: 48 FR 44716) define a property type as "a grouping of individual properties based on shared physical or associative characteristics." The property type links the events and processes described in the context with categories of archeological features and sites that these historic processes created. In most cases, the importance of these property types will depend on the ability of the data they contain to address important research issues as required by Criterion 4 of the CRHR.

Historic-period archeological resources include individual objects; features consisting of spatially and historically associated objects; and sites – historically and spatially meaningful associations of objects, features, structural remains, and elements of landscape. These categories, originally developed in the context of the large transportation projects resulting from the Loma Prieta Earthquake (e.g., Praetzellis 1994; Praetzellis and Praetzellis 1992; Ziesing 2000), provide a basis for comparison and consistency between archeological research efforts. Fourteen general categories of resources were identified and summarized in eight categories presented below, which are coordinated with the archeological research issues presented below. Two additional categories are defined by a particular time period, the Gold Rush and the Spanish and Mexican periods. The first eight categories are broad enough to encompass evidence from different phases of San Francisco's history allowing for the study of change through time. Resources from either the Gold Rush era or the Spanish and Mexican period could have relevance to some of the eight general resource categories, however, archeological resources from these periods are rare, supporting documentary evidence is sparse, and therefore their potential significance to San Francisco history is great and merits individual treatment.

- Historic Maritime Resources: This resource type may include intact or in-ruin structural elements that were commonly associated with wharves, including decking/planking, pilings, and boards. Wharves would have been located above the tidal flat or have extended out into deeper waters. Therefore, if portions of this resource type remain intact, they are very likely to be found in fill deposits, with the piles and potentially associated deposits in the underlying bay mud. If in ruins, remnants of this resource type may be found in the fill or at the interface between the fill and the bay mud.
- Ships and Storeships: This includes the hulls of burned ships as well as intentionally grounded storeships and their contents. During the gold rush, as Yerba Buena Cove filled with ships, some ships were converted into storeships; others burned down to the waterline during several devastating fires. Storeship remains can contribute important research themes regarding San Francisco's early maritime culture and its beginnings as a port city.
- Cemeteries: This resource type includes existing and previous locations of burial grounds.

- Domestic Resources: This resource type may include refuse deposits as well and structural remains, including buildings, basements, wells, cisterns, privies, and garbage pits.
- Commercial Resources: This resource types includes the locations of businesses such as stores, restaurants, laundries, hotels, and saloons. This type will have features similar to those discussed above, but the associated artifacts will represent commercial industries.
- Industrial Resources: This resource type includes the refuse and structural remains of industry, such as tanneries, butcher shops, shipbuilding operations, glassworks, and ironworks. This type will have features similar to those discussed above but possibly at a larger scale. Artifacts expected in association with this resource type will represent industry.
- Institutional Resources: This site type includes organizations such as schools, hospitals, and churches and might be represented in the archeological record as refuse deposits and structural remains. This type will have features similar to those discussed above but possibly at a larger scale. Artifacts expected in association with this resource type will represent institutions.
- Landfills and Landfilling: This resource type includes the intentional filling of low-lying areas with refuse to expand development. Landfills consist of refuse that can be pulled from anywhere and may indicate the collection of refuse over a period of time. This type can also include structures constructed to support or hold filled-in areas.
- Spanish-, Mexican-, and Early American–Period Resources: This resource type includes various site types (e.g., domestic, commercial, military, institutional) that date between 1776 and 1848. This types includes refuse deposits, privies, hearths, and structural remains.
- Gold Rush–Period Resources: This resource type includes various site types (e.g., domestic, commercial, military, institutional) that date between 1849 and 1859. This types includes refuse deposits, privies, temporary structures, and structural remains.

Distribution and Assessment of the Locations of Historical Archeological Resources

Figure 25 shows San Francisco development from 1853 to 1905. The map uses chronological and thematic data to show the earliest likely extant of archeological remains in each area. It includes data about the gold rush and late nineteenth-century development, including data regarding historical cemeteries. It also includes themes such as infrastructure as well as the later development of residential and recreational areas in the western and southern parts of the city. Figure 26 shows areas of high historic-period site sensitivity, based on the data in Figure 25.

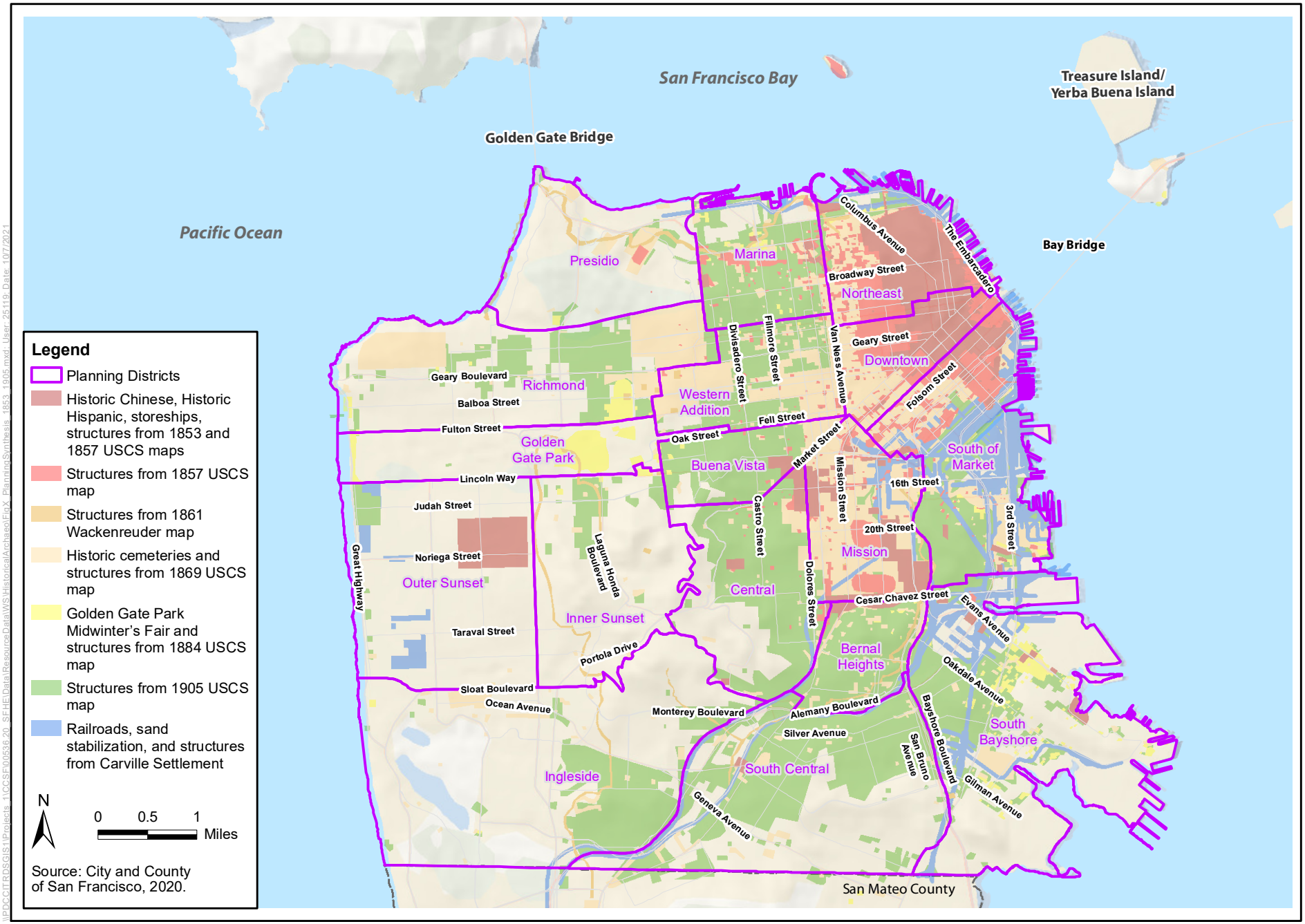

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Figure 25
San Francisco Development from 1853 to 1905

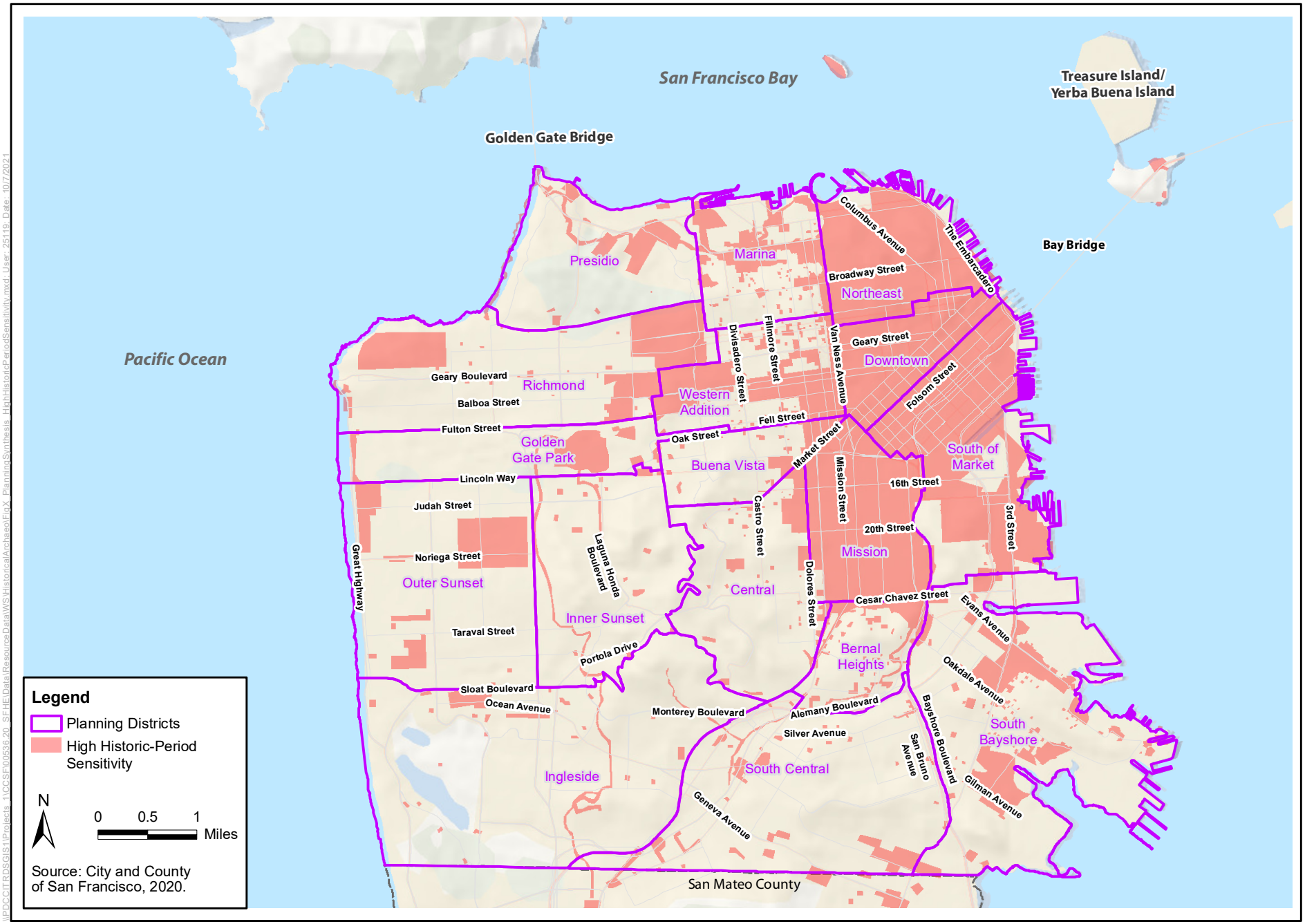

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Figure 26
Areas with High Historic Site Sensitivity

B. Limitations and Constraints of San Francisco Archeology

Archeological investigations in San Francisco have been numerous; however, the majority, if not all, have been driven by development rather than at locations selected to address particular research questions. This limits our understanding of the types of sites that are present and how archeological resources are distributed across the city. Preliminary archeological reviews routinely conducted by city archeologists provide for an educated supposition about the potential to encounter known and unknown archeological resources on a project-by-project basis based on pre-European contact modeling, historic-period sensitivity mapping, the locations of known sites, the archival history of a project site, and geotechnical data on soil stratigraphy; however, in some areas of the city, historical data are limited and sometimes completely lacking. Additionally, construction development provides its own constraints on the scope and extent of archeological investigations in the form of project size, schedule, and cost, and because the footprint and depth of archeological investigations must be based on the footprint and depth of project soil disturbance.

Archeology in San Francisco faces particular problems, including:

1. The identification and mitigation of submerged Native American resources and deeply buried maritime resources under highly developed areas of the city that were once marsh areas or baylands;
2. The unusual and complex environmental setting;
3. The natural migration of dunes across the city such that features such as ponds, which may have been exposed during Native American occupation, are very deeply buried, making it difficult to read the pre-European contact hydrology (unusual and complex environmental setting);
4. The logistical problems of testing due to shallow depth of groundwater in most of the eastern side of the city;
5. Sandy soils that limit the depth of trenching;
6. The need for geoarcheological expertise to understand the deposition of many sites;
7. The challenges of mitigating large buried structural features such as wharves or seawalls, even when they are fully exposed;
8. Changing analytical methods in the assessment of shell middens, which makes comparisons between sites difficult;
9. Determining the appropriate strategies for discovering and addressing historic human remains left behind when cemeteries were moved out of the city;
10. The rapid and repeated redevelopment of the Downtown and SoMa districts prior to any archeological investigations; and
11. The ongoing and the mass grading of SoMa to establish a street grade in the 1860s with resultant mixing of deposits and deep “fill” on many development sites.

During project planning in the city, the department archeologists conduct a preliminary review of existing historical mapping and archeological documentation to assess the archeological sensitivity of the project site. However, even though a great deal of historic documentation may be available, it is by no means a complete historical record. Further, much is unknown about patterns of Native American settlement throughout the city, particularly in areas where there has been less development and therefore limited archeological investigation.

As most archeological investigations in the city are driven by development, they are subject to the constraints of those projects. As noted above, the depth and footprint of archeological investigations generally is directly tied to the depth and extent of anticipated construction soil disturbances; archeological investigation is designed to address only the areas that would be disturbed by project excavations or other soil disturbances. The scope of investigations of archeological features or deposits discovered during construction must take into account the construction schedule, and constructability considerations for the anticipated development. These constraints provide very particular challenges to archeologists and Cultural Resource Management practitioners, who must strategize to balance archeological investigations with the significance of the resource and the limits of the construction schedule. Additionally, archeological investigations generally must be confined to the project site on which the resource is found, although in fact sites are rarely confined to a single parcel. To fully understand a resource, sampling throughout its extent is important, but where the development is confined to a single parcel, such exploration rarely is possible. Further, the scope of archeology generally is limited by the scope of construction soil disturbances, such as the location or maximum depth of construction excavations, which may not expose resources that subsequently will be covered by new development. Observations also may be constrained in narrow construction trenches, deep excavations, and by shoring. The pace of excavation and large volumes of soil excavated rapidly where a large excavator is employed also may not be compatible with effective archeological monitoring.

With the piecemeal picture development-related data can provide, our understanding of the type and distribution of archeological resources within the city may be skewed: the east side of the city has been subject to major recent development, whereas development of the west side generally has been on a smaller scale and, in most locations, has not included major large-scale excavation. The eastern side of the city presents its own constraints, as many projects require pile installation, which may result in impacts to deeply buried resources without providing an opportunity for the archeologist to observe the affected soils.

C. Archeological Research Issues

While every archeological resource has the potential to address some research themes; information potential varies widely among resources; and not all research themes are equally important. It is the goal of the research design to determine what research themes are important and what archeological data are necessary to address those themes. The research design allows archeologists to evaluate the significance of archeological resources based on their ability to address the research themes presented below. The following research themes identify important questions that may be addressed by the types of resources and kinds of data that can be encountered in the city of the San Francisco. Research themes are used to outline both the questions that can

be asked of the archeological record, and the types of data required to answer them. The purpose of identifying relevant research themes here is to help predict areas of special concern within city that might reasonably be present, and to serve as a guide to methods and strategies of archeological testing.

During the past several decades of research in the San Francisco Bay Area, archeologists have developed research themes for Native American and historical sites (ASC 2011, 2016, 2017, 2018; Byrd et al. 2014; Byrd et al. 2017; ESA 2016, 2017; ICF 2019; Praetzellis and Praetzellis 1992; Praetzellis 1994; McIlroy and Praetzellis 1997; Praetzellis and Ziesing 1998; Stewart and Praetzellis 2003; WSA 2017). As more cultural resources have been subject to archeological investigations, these themes have been developed to reflect the current state of archeological knowledge. The research themes are intended to be broad enough to encompass all the archeology in the city and are meant as guidance for developing more specific research themes for individual projects.

The research design provided below is an update to the research design provided in WSA's 2010 Archeological Technical Memorandum for the EIR prepared for the existing 2014 housing element, which was developed from archeological research designs from other major projects in the preceding decades (WSA 2010). The Native American section was originally written by Greg White and Jack Meyer for the *San Francisco–Oakland Bay Bridge (SFOBB) West Approach Replacement: Archaeological Research Design and Treatment Plan* (Ziesing 2000) and has been updated using information from the *Far Western Prehistoric Sensitivity Analysis* (Meyer and Brandy 2019), which provides a model for determining where Native American sites are likely to be located, incorporating subsequent landscape changes. The historical research questions were originally posited by Adrian and Mary Praetzellis in 1992.

Native American Research Questions

Native American research themes focus on understanding settlement patterns, resource exploitation, and change over time (Table 3 through Table 10). As no systematic studies of Native American sites have been carried out on the San Francisco Peninsula overall, most existing archeological data are derived from geographic areas where more recent development has occurred, often with deeper or more extensive excavation or grading. In San Francisco, most known archeological sites are in the eastern part of the city, and the majority of substantial archeological investigation has occurred in the South of Market and Downtown districts and, more recently, in the South Bayshore planning district. Research questions therefore have tended to focus on the settlement and resource exploitation patterns that have been observed in those areas and, more recently, characterizing pre-European contact environment and environmental change.

The following research questions are based on those included in WSA's 2010 Technical Memorandum, which were refined from earlier studies, and are grouped into themes that include a discussion and data requirements. These have been augmented based on more recent research. These research issues can be modified to address specific projects as necessary. As the results of future archeological research allow, these research issues can also be elaborated upon or added to with new and innovative lines of research.

Table 3. Human Occupation and Landscape Evolution

Research Questions	Discussion
Question 1. When did humans begin to use the San Francisco area and what environmental factors affected how the first sites of occupation were distributed? Did the distribution of settlements change over time?	Native American deposits have typically been found in association with previously stable landforms that were later buried during periods of landform instability. Correlations may be sought between the locations of dated archeological sites and paleoenvironmental features to determine if there is a link. Due to changes in landform morphology and rising sea levels, buried Native American deposits may exist within the dune sands that previously covered large parts of the San Francisco Peninsula, and older deposits, predating the development of San Francisco Bay, may also exist below sea level.
Question 2. How do landform-sediment assemblages in the project area compared to other local or regional depositional sequences?	
Question 3. How does the study area contribute to an understanding of the timing and extent of local or regional landscape evolution and the effects of these processes on the location, duration, and mode of pre-European contact human land use? How do the landform-sediment assemblages fit within the regional settlement pattern? *Question 4.* What resources were locally available for exploitation? Was the area suitable for long-term habitation or short-term resource exploitation use?	

Data Requirements

- Geological: Buried land surfaces (paleosols) that were available for pre-European contact human occupation of sufficient vertical and horizontal extent that they can be used as stratigraphic markers and searched for archeological remains. Paleosol should be sampled, dated and subjected to paleobotanical analysis (irrespective of whether archeological material is present) to provide data of value in diachronic environmental reconstruction, which will also assist in refining modeling of locations of buried and submerged archeological sites.
- Archeological: feature or layer interfaces, broad exposure, Radiometrically datable organics (in the form of charcoal, ash, bone, antler, or soil humates, etc.), or other chronometrically datable materials suitable for determining the age and depositional history of natural geological deposits.
- Faunal and paleobotanical remains: assemblages of sufficient size to yield meaningful quantitative data; faunal and floral assemblages from multicomponent sites, for assessment of patterns, changes over time.

Table 4. Culture Chronology and History

Research Questions	Discussion
Question 1. What is the temporal range of deposits at the site? Is there a single chronological period component, or are there discrete periods of site use? What changes in site use can be seen in different occupations? *Question 2.* Does the deposit contain, or have the potential to yield, evidence of one or more specific component assemblages, and are the assemblages associated with physical contexts that are vertically or horizontally discrete?	Culture history seeks to interpret historical relationships through the classification of stylistic and technological culture traits, which provide a relative chronological framework for the investigation of other research themes. Datable materials within a relatively intact stratigraphic sequence, or from single components at different sites, will assist in the development of reliable interpretations of site components. Multiple lines of evidence will contribute to the reliability of the interpretations.
Question 3. How does the deposit fit within the expected cultural chronology for the area? Does it support the established cultural chronology? If not, how does it expand our understanding of cultural patterns? *Question 4.* How does the assemblage(s) contribute to regional studies of the material correlates of specific cultural institutions, such as social identity and ritual belief systems? How are materials (that are dateable or assignable to a particular cultural phase artifacts) related to social identity or belief systems with regional correlations?	

Data Requirements

- Archeological: feature or layer interfaces, broad exposure; material remains representing a discrete time span of residence or other use at a specific location; radiometrically datable organics (in the form of charcoal, ash, bone, antler, or soil humates, etc.), obsidian artifacts suitable for hydration analysis, or other chronometrically datable materials. Diagnostic artifact types and features that have established temporal association (e.g., Olivella shell beads, Haliotis ornaments,projectile points, charmstones, burial position and orientation); materials that are dateable or assignable to a particular cultural-phase; artifacts related to social identity or belief systems with regional correlations

Table 5. Subsistence Patterns

Research Questions	Discussion
Question 1. What are the subsistence patterns represented by the archeological deposits (e.g. terrestrial vs marine/aquatic resources)?	Variability in both the temporal and spatial distribution of archeofaunal assemblages has been noted within the San Francisco Bay area. Assemblages typically include both terrestrial and marine species, with availability possibly influencing variation in spatial distribution. Explanations for temporal variations range from climate/environmental changes to resource intensification, but additional research is necessary to better understand the drivers of change. One of the differences between San Francisco Bay area archeofaunal assemblages and those of surrounding regions is the high frequency of small carnivores in some Bay area shellmounds. Temporal variations in the shellfish species exploited by Native American peoples have generally been explained as either the result of over-exploitation or a function of climate change. Recent archeological investigations in the San Francisco Bay area have tended to favor the climate change model. In the Bay Area, plant resources were a major component of indigenous subsistence, but few archeological studies have been conducted on the importance of plant resources.
Question 2. How can the archeological faunal assemblage contribute to the examination of local or regional differences in hunting strategies?	
Question 3. What changes in diet be inferred based on variations in the floral, faunal, and/or isotope chemistry and paleopathology of human remains in the assemblage ? What do these changes reflect in terms of resource intensification and depression, environmental change, resource access, or residential mobility?	
Question 4. What can the assemblage contribute to the examination of local, regional, or seasonal differences in shellfish collection strategies? *Question 5.* How do variations in faunal assemblages relate to different catchment opportunities available at different sites? How do faunal assemblages indicate seasonal exploitation and hunting strategies? How do faunal assemblages indicate targeted exploitation of game versus opportunistic encounter-based acquisition?	

Data Requirements

- Archeological: features such as burials, hearths, or house pits that contain artifacts, floral and faunal remains
- Faunal remains: variations in faunal assemblages showing temporal differences in faunal assemblages; large faunal assemblages indicating seasonal exploitation, faunal assemblages indicating hunting strategies
- Botanical remains: Floral remains in a datable context and in sufficient quantity to permit statistical analysis (recovery generally requires flotation of column samples and identification of macrobotanical remains) that could lead to identification of season of site occupation, as well as food emphases.

Table 6. Methodological Issues in Archeofaunal Research

Research Questions	Discussion
Question 1. What data recovery methods were used in the collection of fish and shellfish remains?	A recent review of archeological fish and shellfish studies in the San Francisco Bay area has shown that standardized data recovery methods and reporting are lacking. Standardization is needed for to enable comparisons between sites and time periods. Different field efforts have used different mesh sizes (ranging from 1/4 inch to 1/16 inch), wet screening vs. dry screening, and field sorting vs. lab analysis of heavy fractions. Finer screen mesh and wet screening collects bones from smaller fish species and lab-based analysis of heavy fraction samples is more thorough than field screening. Using larger mesh screens and relying on dry screening and field analysis have resulted in overemphasizing the reliance on large fish species and clams (compared to mussels) at Native American sites. Additionally, some studies fail to report the screen size or other data recovery methods and fail to use standardized volume measurements for collections, making it difficult to compare studies. New data recovery efforts on Native American middens and sites need to use 1/16-inch wet screening for contexts that may contain fish bones and need to analyze the heavy fraction in the laboratory. One-eighth-inch dry screening should be employed for shellfish collection to ensure the collection of fragile mussel shells. MNI should be used for shellfish counts to ensure greater accuracy. Reports must include a comprehensive discussion of field methods and include standard volumetric measurements to enable intersite comparisons.
Question 2: How are shellfish quantified in studies? Is MNI used?	

Data Requirements

- Faunal remains: Fish bones recovered using 1/16-inch wet screening and lab-based analysis of heavy fractions; shellfish recovered using 1/8-inch dry screening

Table 7. Coastal Colonization Patterns

Research Question	Discussion
Question 1. During what seasons was the site occupied? Are sites seasonal or permanent camps and what are the lines of evidence for this?	Given the small size of San Francisco (it is possibly to cross the peninsula in a few hours), Native American scholars (e.g. Cordero, personal communication) have suggested that it is unlikely that people relocated wholesale from one village to another seasonally and that, more typically, they moved up and down stream along major watersheds or to and from the shore for other reasons.
Question 2. How do newly discovered sites compare with recorded sites in similar locales in the region, with respect to season of use and resource choice? Is there evidence of interaction between site populations?	
Question 3. What does the evidence for seasonal or permanent or semi-permanent residential features (e.g., substantial structures, storage, midden deposits, etc.) suggest about differential use of different sites?	

Data Requirements

- Archeological: feature deposits with sufficient integrity and yield to produce well-dated archeological components containing toolkits and archeofaunal assemblages; midden deposits
- Faunal remains: shellfish assemblages indicative from the early Holocene, faunal assemblages indicating targeted exploitation of game versus opportunistic encounter-based acquisition

Table 8. Resource Intensification and Adaptive Change

Research Question	Discussion
Question 1. What can the assemblage reveal about diet and hunting and gathering practices? What types of social organization would be required to carry out resource intensification?	Archeological investigations seek to identify the presence, and determine the causes and consequences of resource intensification in Native American cultures, including the connection between resource intensification and population growth, increased sedentism and increased social stratification. Within the central coast, intensification of acorn exploitation is noted. In the Bay area changes in reliance on sea otter and deer reflect local resource depression, shifts in subsistence strategies, and the exploitation of more distant sources.
Question 2. What changes over time can be observed in the species, size, numbers and represented body parts present that indicate resource intensification? How does the archeological deposit fit into a time series providing insight into the development of regional resource intensifications? *Question 3.* Is there evidence of resource intensification and greater reliance on foods that require more effort to acquire for less caloric output/reward such as increased travel distances between resource patches?	

Data Requirements

- Archeological: artifact assemblages related to processing certain foods; produce well-dated archeofaunal, archeofloral, and technological assemblages indicative of diet and organization; sufficient depositional integrity and yield to produce well-dated archeofaunal, archeofloral, and technological assemblages
- Faunal remains: well-dated stratified deposits that include faunal bone that is adequately preserved to determined species, prey age, etc.
- Botanical remains: well-dated stratified deposits or dated components or features that include botanical remains
- Human remains: Human remains available for analysis and sufficiently well preserved to extract dietary isotopes, paleopathological and paleodemographic data

Table 9. Intergroup Interaction and Social Change

Research Question	Discussion
Question 1. Where were non-local resources obtained, and what might this imply about inter-tribal interactions and relations? Is there any evidence of two-way trade or exchange, indicated by materials local to the San Francisco Bay Area occurring in archeological contexts at the geographical source of non-local resources found in the Project? Is there evidence of a more complex exchange system with more than two source areas?	Archeological models have sought to explain the link between the development of exchange systems and social complexity. Inside culture represents a group's internal lifeways, and boundary culture represents the processes by which groups interact with other groups. The development of boundary culture seen through material culture may have resulted in increased social stratification.
Question 2. What, if any, non-local resources are present on-site? What are the sources of non-local resources (e.g., obsidian can be sourced using X-ray diffraction)? Are non-local food resources present?	
Question 3. How do proportions of local versus non-local materials change through time? Do non-local resources serve to replace or augment the use of local materials? How prevalent is the use of local versus non-local resources for comparable tasks?	
Question 4. Does the archeological deposit have the potential to yield evidence for the existence of production for exchange, features related to storage of surplus, or other signatures of emergent tribelet formations?	
Question 5. What evidence is there of site specialization? How did sites used for specialized resource production relate socially and functionally with contemporaneous sites within the larger network of sites in the area?	

Data Requirements

- Archeological: changes in the incidence of exchange items; specialized craft items, elite goods; identifiable as trade or exchange markers (e.g., obsidian, other foreign stone, or shell beads)
- Faunal remains: local and non-local faunal remains; changes in patterns of these remains
- Botanical remains: local and non-local botanical remains; changes in these patterns

Table 10. Research Potential of Redeposited Sites

Research Question	Discussion
Question 1. Does the redeposit contain sufficient evidence in the form of typeable artifacts or datable materials to establish it as the remains of a single-component archeological site?	Historic cutting and filling within San Francisco has affected many Native American sites. Redeposited materials lack integrity and are typically ineligible for the NRHP. However, a single-component redeposited site may possess sufficient material to allow investigators to address important research questions.
Question 2. Does the redeposit have the potential to yield sufficient frequencies and kinds of artifacts and archeofaunal and floral remains to address one or more questions presented above? Does material present in the deposit have interpretive potential?	

Data Requirements

- Archeological: Deposits establishing single-component vs. multi-component sites, Radiocarbon samples for dating, diagnostic datable artifacts; sufficient evidence in the form of typeable artifacts or datable materials to establish it as the remains of a single-component archeological site

Historical Research Questions

The research themes laid out below pertain to archeological resources that were deposited after the arrival of Europeans to the Bay Area. The research themes for historic era resources differ from Native American resources because written records are available for this period, which allows historical archeologists to use both artifacts and written records to give us a glimpse into past cultures. However, the research themes and questions discussed below cannot be addressed solely using data from documentary sources, such as archival records, but can only be addressed using the archeological record in conjunction with the documentary record. These research questions are applicable to resources that were deposited from the time of the arrival of the Spanish in the Bay Area, through the Gold Rush and the industrialization of the city. They reflect changes in consumer behaviors brought on by the Industrial Revolution and posit questions related to identity and self-expression.

Due to the broad range of activities that could have occurred in the boundaries of the 2022 Housing Element Update, historical archeological resources may reflect a variety of social groups, ranging from the individual residential unit (e.g., individual, family) or the collective, immediate community (e.g., neighborhood, etc.). The research themes below will be further refined, as needed, based on the resources encountered and the results of excavations.

The following research questions are grouped into themes and include a discussion and data requirements (Table 11 through Table 26).

Table 11. Spanish, Mexican, Californios (1776-1848)

Question	Discussion
Question 1. How were early Spanish buildings constructed at the Mission Dolores? Does this differ from building techniques used at the Presidio? Does this differ from buildings constructed in Yerba Buena? How do building techniques and materials change over time and what is this attributed to? What types of infrastructure did Spanish and Mexicans build?	The Spanish created a religious complex for converting native peoples to Catholicism and European modes of economic production (the mission) and a military garrison for defending the territory (the presidio). The mission complex comprised a broad group of structures and housed Spanish and Native American neophytes. Spanish colonization, and subsequent rule by Mexico after 1821, translated into dramatic social upheaval and demographic decline for the region's native Ohlone inhabitants. Mexican government began secularizing the California missions during the 1830s and granted vast tracts of land to civilians who developed rancho compounds. By the time that California was made part of the United States in 1848, San Francisco was a multicultural settlement, with small-scale harbor along the shores of Yerba Buena Cove.
Question 2. What was the material culture of the neophytes at Mission Dolores? What items were derived from traditional technology? Which were derived from Spanish technology? Were the uses native or Spanish (acculturated) in character?	
Question 3. How did neophytes adapt to religion at the Mission? What evidence exists for syncretism in architecture or artifacts? What evidence is there that neophytes hid non-Christian religious observances? What material evidence is there of attempts by neophytes to retain their cultural practices while attempting to survive within the Mission system?	
Question 4. How is the secularization of the Missions by Mexico in 1835 reflected in material culture? How is this reflected in the material culture of Native Americans during the post-Mission periods? How did secularization affect the development of Yerba Buena?	
Question 5. How did different national rule of San Francisco affect residents' access to material goods? How did access to goods changes over time?	
Question 6. How did the natural and cultural conditions present on the San Francisco Peninsula affect the choice of where to settle? How did early visitors to the area affect the natural environment in the San Francisco Bay area?	
Question 7. What evidence is there of the different ethnic groups in late Mexican California? Are there differences in land use that can be attributed to a particular ethnicity or national origin? How is the multi-ethnic character of late-Mexican Yerba Buena expressed in material culture?	
Question 8. What evidence is there of cattle raising, commerce, farming, and other economic practices in Spanish and Mexican California? How did these practices change the landscape?	

Data Requirements

- Archeological: features dating Spanish, Mexican, pre-Gold Rush eras; features associated with different ethnic/religious/national groups in Spanish and Mexican California; hidden Native American religious artifacts, artifacts demonstrating properties of Christianity and Native American religions
- Historical: Mission records, archival maps and drawings, narrative histories

Table 12. Gold Rush Era (1848-1855)

Question	Discussion
Question 1. How did the Gold Rush alter the historical landscape? What effect did such a sudden influx of people have on the infrastructure of San Francisco?	The population boom in 1849 brought dramatic growth to San Francisco. The city was expanded several times and the geography was drastically altered to create more habitable land. Immigrants came from all over the world, bringing different traditions, skillsets, and goods. This influx of people overwhelmed the local settlers and changed how the city was governed, with various public and private interests seeking to influence development.
Question 2. How did the Gold Rush affect the rules of interaction between local settlers? What effects did the influx of immigrants have on the lives of Native Americans and Spanish and Mexican Californios?	
Question 3. What evidence is there of squatters' encampments? What role did the transition from temporary to permanent structures play in the development of different parts of the city?	
Question 4. What factors determined the location and type of residence that immigrants chose upon arrival in San Francisco? Did ethnicity, national origin, wealth, or profession play important roles?	
Question 5. What effect did the massive influx of immigrants during the Gold Rush have on the town layout? What types of settlement housed different professions? How were public and private space and ownership negotiated in early Gold Rush San Francisco?	
Question 6. How did public and private interests negotiate expanding the city? How were decisions made to alter the geography of the city?	
Question 7. What were the goals of these early settlers, and how is this reflected in land-use patterns and the archeological record? *Question 8*. What evidence is there of foodways and the use of wild game/foods?	

Data Requirements

- Archeological: Dateable features that can be associated with a particular Gold Rush-era time frame or event; direct association with a family or group is less important, as settlement patterns from the period in general are not well understood and relatively few residential features have been found.
- Historical: Historical maps, archival references and narrative histories, records on town occupancy and local events, historical newspapers, and comparison with other Gold Rush-era sites in early California history.

Table 13. Waterfront: Buried Ships (wrecks, storeships, etc.) and Wharves

Question	Discussion
Question 1. What can this property reveal of ship building in the early nineteenth century? Is the vessel representative of her class and method of construction, or an unusual example? What can we learn about the repair, refitting, or adaptation of such vessels in the early nineteenth century? How were vessels adapted, reused, and broken up once they reached San Francisco?	Beginning in the early 1850s, lowlands adjacent to and within the cove waters were filled with sand removed from the dunes, rock blasted from nearby Telegraph Hill, and with rubble and debris from various fires, such as the devastating wharf fire of 1851, and deteriorated buildings, as well as with abandoned ships and boats left behind in the aftermath of the Gold Rush. Other vessels were docked and reused as hotels, shops, or storehouses. Storeships are particularly valuable because the potential artifacts associated with them can be tightly dated to the immediate post Gold Rush period. As the condition and associations of historical San Francisco wharves are not well understood, they are a rare and relatively unstudied resource. Archeological deposits associated with the maritime industry and waterfront development have been found along the historical cove shoreline representing the maritime cultural landscape of San Francisco's waterfront.
Question 2. Is there any indication of the specific historic use of the ship? How does that relate to San Francisco maritime history? If the property was adapted as a storeship, what architectural evidence is there of the nature of this conversion? If artifacts survive from the use of the vessel as a storeship, what do they reveal about the availability and sources of consumer goods in Gold Rush San Francisco?	
Question 3. How was the wharf or seawall constructed (cobb, crib, or pile)? Are the techniques used in construction typical of this type, or are they unusual, considering the property's location and date? Is there evidence of local innovation in the construction of this wharf? Do buried wharves provide information regarding repair/adaptation of the wharf or shoreline improvements? How did these techniques change over time as wharfs and the seawall were constructed multiple times?	
Question 4. What can deposits reveal about the businesses and residents along the wharf? What activities took place along the wharves?	

Data Requirements

- Archeological: physical integrity of ship's hull, and below and between deck areas; whole diagnostic artifacts or artifacts broken *in situ*, duplication of individual artifact types to ascertain storeship status; physical integrity of wharf remains; dense artifact deposits (especially unused goods) in large enough amounts to make associations with nearby businesses and residents
- Historical: ship building technology; history of vessel's construction and operation; for storeship, period of operation and area of specialization; for wharves, local wharf building practices; photographs and/or lithographs; maps; city directories
- Archival: ship records; storeship account books; historic photographs or lithographs of wharf construction; historical maps

Table 14. Consumer Behavior and Strategies (1848-1940)

nd Strategies Question	Discussion
Question 1. What information does this resource provide regarding the consumer practices and disposal behavior of a household or business. How can specific social, occupational, economic, or ethnic characteristics be identified? Did lower-class residents attempt to mirror middle- and upper-class elites within the community in terms of material culture and social status?	Cost and availability of goods plays an important role in the choices that consumers make. Mercantile sites within San Francisco, such as the Hoff Store site, provide information on the types of goods that were available for purchase. Residents within San Francisco may have supplemented purchased foodstuffs with items grown in their backyards, or fished or hunted from surrounding areas. Archeological deposits and pollen analyses may indicate whether spaces surrounding residences were used as gardens, and how the use of outside areas changed through time. Household refuse, including the remains of domestic activities such as food preparation and consumption, and activities related to personal hygiene and appearance, reflects the values that underlie peoples' consumer choices. Such topics are typically not recorded in written documents and archeological findings can provide insights into daily life and behavior that would not otherwise be possible. Changes in the use patterns of pit features, such as privies, drains and cisterns, may reflect changes in areas such as family composition and economic status. The pit feature itself, as well as the artifacts found in it, may have interpretive value.
Question 2. What does this resource add to our knowledge of the availability of various classes of consumer goods at a specific place and point in time (i.e., material remains associated with a particular mercantile establishment)? Did the quality of goods and supplies flowing into San Francisco from the U.S. and abroad improve over time as the area became more established or did it decline as more local industries were developed to serve these needs?	
Question 3. How did cost, tradition, quality, fashion, and efficiency affect the consumer choices of communities during the nineteenth century and twentieth centuries? How was the community influenced by the corporate marketing strategy of the early twentieth century? Was there a shift in purchasing/consuming nationally mass-produced items and how is this reflected archeologically? How did increasing access to mass produced goods and processed foods change consumer behavior of residents in the Project area in the late-nineteenth and early-twentieth centuries?	
Question 4. Does this resource add to our knowledge of adaptive behavior in urban settings associated with the acquisition and consumption of foodstuffs or the organization and use of space? Do consumption patterns vary between deposits associated with private spaces (residences) versus commercial spaces (shops and businesses) within the project neighborhood? Are varying patterns of public and private consumption evident in deposits associated with public and private spaces within the block; between families for which other elements in the assemblage seem to reflect variable social status or wealth?	
Question 5. What information can this resource, in combination with other classes of data, provide to aid in the understanding of landscape alteration, water and waste management, outbuilding construction, and dwelling renovation as these relate to changes in household composition?	

Data Requirements

- Archeological: Artifacts reflective of changes in consumer patterns in the early twentieth century
- Historical: associated with specific household/business; identify the occupants of specific lots through time; census records; census records; city directories
- Oral history: interviews with representatives of various ethnic groups to establish relevance of foodways and yard use in traditional behavior
- Faunal remains: economic scaling and ranking of butchering cuts (Lyman 1987; Schulz and Gust 1983a, 1983b); frequencies of types–domestic/wild; presence/absence of types
- Botanical remains: frequencies of types–domestic/wild; presence/absence of types
- Ceramic and glass function: MNI frequency/proportion
- Documentary: Mail-order catalogs, advertisements, commercial inventories, merchant and householder accounts, census records, business directories

Table 15. Mercantile – Trade Markets and Networks (1848-1940)

Question	Discussion
Question 1. How reliant were consumers on local or regional versus national or international produced goods? How did these patterns change over time?	As northern California became increasingly connected to the global economy as it urbanized in the second half of the nineteenth century, the emerging conflict between rival global cores played out in the material culture of the area. British core status was challenged and eventually eclipsed by the United States, as seen in advertisements of goods that were marketed and sold in San Francisco in the late nineteenth century. Connecting emerging markets in San Francisco to central places provides information about how communities of varying scale influenced one another and interacted with national and international markets. Documenting the archeological expression of the growing role of the region as a central place on the household and neighborhood level may prove valuable for comparisons with similar deposits from other west coast urban areas. In the late nineteenth century and early twentieth century local economies and goods were largely replaced by mass-produced materials often transported hundreds and even thousands of miles from an emerging manufacturing core in the eastern United States. Mail order catalogs, such as Sears & Roebuck and Montgomery Ward, allowed people to order manufactured goods that would then be delivered via the transportation networks. Analysis of specific stratigraphic events in relation to diagnostic artifacts and archival research may be able to document how the cultural landscape was influenced by the emerging global economy and increasing access to new consumer trends, products, and technologies.
Question 2. Are there patterns in what goods were purchased from the local or regional market versus the national or international market? Which goods originated locally and which from further afield? How integrated were businesses into national and international trade networks? What are the archeological expressions of the trade carried out at this location? Are these patterns reflective of a distinction between perishable and non-perishable items?	
Question 3. Does the presence of foreign (e.g. British and Chinese) ceramics indicate reliance on international markets? Does the presence of British ceramics suggest that they were purchased in an earlier time period when British ceramics were popular?	
Question 4. What does the presence of food containers representing imported goods relative to those representing location good reveal about consumer choices, food availability, ethnicity, and household wealth? How does emerging food preservation technology change subsistence patterns? Do the types of fruits and vegetables planted change over time? What does the presence and proportion of wild game in the faunal assemblage reveal about dietary choices, economy and availability?	

Data Requirements

- Archeological: features containing diagnostic local and exotic goods; remains of retail store buildings (e.g., general merchandise, chandlers, butchers, junk dealers, etc.) and warehouses, as well as the commercial artifacts they contain
- Documentary: understanding of import practices, food preservation technologies; advertisements
- Archival: Import records
- Oral history: interviews with representatives of various ethnic groups to explore the relevance of traditional material culture, foodways, and community life
- Botanical remains: pits, seeds indicating different local or imported fruits

Table 16. Ethnicity, Class, and Urban Subcultures (1848-1940)

Question	Discussion
Question 1. Does this resource reflect the rise or relative influence of Victorianism as a class-based ideology? Does this resource reflect resistance to Victorian or post-Victorian tastes and mores? How is this reflected archeologically?	Ethnicity, class, and religion are ways in which we identify groups of individuals. When groups interact, they identify themselves and others through perceived differences. When interacting groups express their identity, they do so as both active and responsive participants. Ethnicity as identity seems to be most apparent in situations wherein there is conflict. Comparisons of cultural deposits associated with residents of distinct ethnicities and socio-economic status can reveal both similarities and differences in the behaviors of different classes of people. Symbols can be used to maintain group boundaries. These can exist within the private sphere, such as the use of particular ceramic forms by Chinese, as well as in the public sphere, through avenues such as public dress, and landscaping. The middle-class typically embraced the Victorian ideology. Archeological deposits can show evidence of the acceptance of this ideology, as well as resistance. Domestic refuse such as ceramics, toys, and decorative items can provide information regarding the tastes and values of individuals and families.
Question 2. How can this resource help us to understand the dynamics of cultural pluralism and social stratification during the nineteenth and early twentieth centuries? What material remains are present that could elucidate economic distinctions between the material culture of members of distinct ethnic and subcultural groups, and what do they tell us on these issues? What patterns in the assemblage remain static and which change? Are those patterns that remain static evidence of resistance to adaptation? Do they reflect aspects of traditional culture that are deemed more essential to the household's ethnic identity?	
Question 3. Does this resource possess artifacts or faunal remains that could be used to elucidate the role of symbols in defining and maintaining class or other social or ethnic boundaries between groups?	
Question 4. For human remains found within known cemeteries, is there archeological evidence of distinct ethnic areas within the cemetery itself? Do historical records support archeological observations? What are the prominent areas people emigrated from? Are they primarily North America, or are African, Asian, and European individuals also present? Based on known places of origin in cemetery records, can we observe any creolization or adaptation of burial practices or other displays of identity? *Question 5.* Psychological studies on bicultural individuals and immigrants have focused on "code-switching" (how people can fluctuate between certain identities depending on the situation). Are there examples of code-switching evident in either the material cultural as contrasted with the historical record? What materials are present that might be interpreted as use of traditional practices by the residents while also conforming or converting to popular mores and tastes of the dominant culture?	
Question 6. What was the socioeconomic status of various residents? What was the role of material culture in the maintenance of power relations and the negotiation of	

Question	Discussion
identity? How did working-class consumption patterns change over time?	
Question 7. What was the relationship between homeownership and material well-being as measured by the possession of consumer products? If portions of the assemblage display diachronic shifts in artifact diversity, quantity, or quality of particular artifact types (e.g., ceramics), do these shifts correlate with shifts in resident occupations or household constituents? What differences are there in the archeological record associated with owner-occupancy of residences versus tenants or boarders?	

Data Requirements

- Archeological: features, artifacts or foodstuff associated with particular ethnicities, classes or urban subcultures; features that allow comparison between multiple households
- Documentary: understanding of ethnic foodways, style-bearing artifacts, etiquette books, fashion magazines
- Archival: ethnic identification, historical background
- Oral history: interviews with representatives of various ethnic groups to explore the relevance of traditional material culture, foodways, and community life
- Faunal remains: frequencies of types/domesticates/wild; presence/absence of types; butchering cuts

Table 17. Institutions (1848-1940)

Question	Discussion
Question 1. What information can this resource provide to help us to understand the dynamics within the institution? What was life like for inmates and staff in this institution and how did it compare with living conditions presented in official policies? How did the institution's managers impose its ideology and how successful were they? Is there evidence of unsanctioned (or undocumented) activities on the part of inmates or staff that indicates resistance to this ideology? Are there undocumented architectural remains that provide important information that is not available in, or that contradicts, the historical record?	Although the purpose of an institution is generally identifiable through historic research, the methods used to implement the goals of an institution, and what other functions they may have served, are not readily available. Archeological materials can provide insights into the way the institution functioned, as well as the ideologies etc. of those who controlled the institution and those who were the patrons. Material remains may provide evidence of changing uses of an institution. For example, segregation of patrons of different gender, race or ethnicity may have increased or decreased through time, possibly in response to changes within the surrounding community, and this may be reflected in the archeological record.
Question 2. Does this resource demonstrate a change in the relationship between the institution and its patrons through time? Does this resource demonstrate a change in the relationship between the institution and the surrounding community?	
Question 3. How can the archeological resource help us to understand the daily operation of the institution within the project area?	
Question 4. If a hospital or medical facility, is there archeological evidence of medical activities? How do those activities or behaviors change over time and what can those changes be attributed to? Can we understand the dynamics within the institution? How structured was the hospital? Is it possible to distinguish examples of medical reform movements and the effectiveness of those movements? Is it possible to discern accommodations for the sick or disabled? Are broader community-wide differences, such as economic, ethnic, religious, or political, manifest in the hospital layout?	
Question 5. Is there archeological evidence of classroom activities? How do those activities or behavior change over time and what can those changes be attributed to? How structured was the classroom? What were the dynamics within the institution? Is it possible to distinguish examples of educational reform movements and the effectiveness of those movements?	
Question 6. Is it possible to distinguish specific play areas in school grounds? Are broader community-wide differences, such as economic, ethnic, religious, or political, manifest in the school grounds? Is it possible to distinguish male and female play areas?	

Data Requirements

- Archeological: material remains indicative of the relative influences of those controlling the institution on those controlled by it, in terms of gender, economic, racial, ideological, political, or religious differences; period interface composed of feature and layer interfaces; many households and institutions
- Documentary: understanding of foodways, style-bearing artifacts, etiquette books, social-reform, and religious publications
- Archival: ethnic identification, historical background of institution, operators, and patrons
- Oral history: interviews with representatives of various ethnic, religious, and social-reform groups to explore the relevance of traditional material culture, foodways, and community life
- Ceramic, glass, metal containers: Standardized artifacts related to institution-level procurement

Table 18. Nineteenth Century Industrialization and Technology

Question	Discussion
Question 1. Does this resource contain evidence of undocumented or poorly documented industrial processes that could add significantly to our knowledge of the development of a specific industry? Does the resource contain evidence of local innovation or "appropriate technology" as opposed to the adoption of standardized tools and materials? Is there evidence for extensive reuse of equipment, sites, buildings, or artifacts? Can the archeological record contribute information on the internal organization and modifications to industrial complexes?	Analysis of industrial bi-products and waste can provide information on industrial processes, techniques and innovations that would not otherwise be available. These by-products can have greater interpretive value than the pieces of machinery themselves. Industrial waste was commonly used to infill land during the historic period. Archeological investigations can locate these potentially toxic materials for clean-up activities, as well as provide data on industry's approach to waste disposal.
Question 2. What does this resource demonstrate about the impact of industrialization on landscape, environment, or public health? How did the development of Butchertown transform the environment of South Bayshore?	
Question 3. What equipment was used in each of the various industrial endeavors are represented? How was it used? How was equipment adapted to new environments? And, most importantly, how did the system or process work?	
Question 3. How mechanized were the processes represented at the project site and did the technologies change during the course of the nineteenth century?	
Question 4. What were labor conditions in the various industries? How did these change as the city grew and mechanization increased?	
Question 4. Was the labor in industries distinct in terms of skill, race, ethnicity, and gender? Is there evidence of difference in skill level of laborers? Do artifact assemblages demonstrate a similarity or difference between choices made by skilled and non-skilled laborers? Can evidence of laborers' skill level be seen in waste material?	

Data Requirements

- Archeological: Dateable and identifiable structures or features designed for industrial or other commercial use.; Artifact waste from industry; Structural adaptation to buildings for conversion or technological modernization; Diagnostic artifacts (identifiable function, date of manufacture, source).
- Historical: Documentary research on the particular business, e.g., blacksmith shop, carriage and wagon manufactories, cooper shops, etc.
  - Archival: company records and accounts of various industrial processes, patents

Table 19. Urban Geography (1848-1940)

Question	Discussion
Question 1. Does this resource help us to understand the characteristics of the natural environment and the landscape modifications made during the historic period? To what degree did the natural environment's preexisting conditions influence town layout? Does this resource aid in our understanding of the beginnings of urban planning and infrastructure-water supply and storage, trash and sewage disposal, fire protection, draining-in San Francisco?	Both cutting and filling of the natural topography took place in San Francisco – to improve property value and create usable land from marshland or waterlots. Similarly, street raising improved transportation in impassable areas. These activities are well-documented when they took place on a large scale. Archeological investigation allows researchers to determine if this type of activity took place on a smaller scale, and to determine if individual households found solutions for drainage, sewage, and refuse disposal issues outside of the framework provided by city planners. Research of fill sequences in New York City reveals that residents were more likely to deposit clean fill (i.e., fill that contained no waste or debris) for land reclamation and leveling during times of public health crisis, like a yellow fever outbreak, although as the memory of the outbreak receded, they became less concerned, and once again deposited household and industrial waste these areas. Although research at the household level can be revealing, future research should also include comparisons between historically defined planning districts.
Question 2. What does this resource demonstrate about the relationship between public perceptions of the environment and public policy? How did society's perceptions of the cultural landscape and modifications to the environment change over time?	
Question 3. Is there physical evidence of initial city or neighborhood layout? What is its relationship to documentary evidence? Can stages in the development of California towns be discerned through the archeological evidence of town site creation? How does this archeological resource or site contribute to our knowledge of planning district formation (i.e., residential differentiation and the emergence of homogeneous planning districts along social and economic lines)?	
Question 4. How was land used around dwellings? Are there indications of gender-distinctive uses of space? How did the domestic landscape compare with that of workplaces? How did the domestication of the landscape and the introduction of non-native species affect the local environment?	
Question 5. How do the archeological infrastructure remains relate to the municipal ordinances regarding improvements to the infrastructure? Was the design of the infrastructure current with industry standards? Was the area up to date with new sanitation standards developed as a result of contemporary germ theory and public health information? How did residents respond to city public health and safety ordinances? Did residents connect to the city's sewer and water system or devise their own solutions to sewer and refuse disposal? Did residents build or use facilities that did not "meet code," keep prohibited livestock, or engage in unlawful activities?	

Question	Discussion
Question 7. What effect did the 1906 earthquake and fire have on the town layout and how did it affect early twentieth century expansion?	
Question 8. What can we learn about life in the 20th century from communities that lacked utility connections, such as the 20th century artists' colony on Rincon Hill, Carville, and areas of later development? How is the material evidence from these sites different from sites with utility connections?	

Data Requirements

- Archeological: Architectural remains of early buildings, streets and utilities; Remains of infrastructure, including sewer, water, and power lines in relation to structural remains, or datable features that indicate private utilities
- Historical: land-use study, patterning identified from archival sources
- Archival: photographs and accounts of industrialization; information on legal statutes; historical maps (e.g., town plats, Kroll Map Company maps, Sanborn Fire Insurance maps, engineering maps) and newspaper articles); public works documents, and code enforcement records

Table 20. Gender and Family (1848-1940)

Question	Discussion
Question 1. How did the status of women change over time as women became increasingly involved in women's movements?	Gender identities, roles, and ideologies vary across cultural groups over time and it also intersects in powerful ways with race, ethnicity, and class. Specialized activity areas such as outdoor cooking areas, kitchen gardens, or gaming areas with artifacts can be associated with gender and/or age. Artifacts attributable to a specific gender or age guide researchers in the interpretation of the spatial organization of sites.
Question 2. What percentage of the women associated with the archeological resource participated in the work force? How did this change over time? Is there evidence of female head of households or female-owned or managed businesses?	
Question 3. What were the perceptions of femininity/women's roles versus masculinity and men's roles? What about nineteenth-century construction of masculinity can be learned from these resources?	
Question 4. How did residents manifest age or gender roles (traditional or not)?	
Question 5. How is the teaching of values (family, social, political, moral, religious) reflected in children's artifacts? Is there evidence that people were educating their children?	

Data Requirements

- Archeological: clear associations between features and the occupants; a broad quantity and variety of household artifacts; Specialized activity areas such as outdoor cooking areas, kitchen gardens, or gaming areas with artifacts that can be readily associated with gender and/or age. Artifacts attributable to a specific gender or age will guide researchers in the interpretation of the spatial organization of the site
- Historical: census records, tax assessor's records, and city directories
- Archival: photographs, personal accounts

Table 21. Waste Disposal, Dumps, and Land Reclamation (1848-1940)

Question	Discussion
Question 1. Can this refuse dump aid in our understanding of planning district or citywide consumption and disposal patterns? Can neighborhood deposits in primary context be distinguished from larger municipal fills in secondary context? If so, how are neighborhoods characterized? Are there ethnic, industrial, commercial, residential patterns visible in the assemblage? How do materials found in the fill compare to materials found in contemporaneous privies in the neighborhood?	Refuse provides evidence of human behavior and becomes useful for research purposes when associations between the refuse and the people who deposited it can be made – this can be done on an individual, household, planning district, or citywide level. The argument has also been made that the necessity to link refuse to its source becomes increasingly less important as the spatial scale of the analysis increases. Dumps provide insight into the process of urban development and shed light on not only consumption, but the availability of specific consumer goods. San Francisco's main dump was in the Mission Bay HOA in the final decades of the nineteenth century, although additional planning district and household dumps are located throughout the city. The 1906 earthquake also created an enormous amount of both dumping and filling. The study of nineteenth and early twentieth century dumps allows researchers to study decomposition processes and potential health hazards. Public health data, like the incidence of disease in proximity to dump sites, may be correlated with archeological evidence.
Question 2. To what degree did a business' or residence's waste disposal practices conform to contemporary standards and understandings of disease? How did these practices affect public health?	
Question 3. Are the fill's attributes traceable to specific events, such as a neighborhood fires or earthquakes?	
Question 4. How does the archeological evidence of land creation fit within the known historical context of land use and modification? How was the creation of land accomplished? Were specific types of structures used to advance land reclamation? Were construction techniques related to other vernacular construction techniques?	
Question 5. What can the study of historic-period dumps contribute to the design of modern garbage landfill sites?	
Question 6. What evidence is there of waste disposal related to the 1906 earthquake and fire?	

Data Requirements

- Archeological: large, community refuse deposit, containing a range of domestic artifacts, identifiable community refuse deposit lacking certain types of artifacts; intact land reclamation features in primary contexts that can be correlated with specific episodes of land reclamation identified in the historical record.
- Archival: Statutes regarding waste disposal, creation of citywide facilities. Photographs and narrative accounts of community disposal practices

Table 22. Historical Burial Practice (1848-1940)

Question	Discussion
Question 1. What is the relationship between age, sex, and ethnicity, and burial mode? To what degree do grave furniture, coffin hardware, and funerary objects reflect these categories? What evidence is there of different cultural traditions in burial mode?	Burial methods and goods are often tied to religion and ethnicity. These may also be tied to socioeconomic status, but not always. The ability to ascribe burials to known individuals enables archeologists to determine what factors influenced how people were buried.
Question 2. Can historically documented individuals be identified within the recovered burial population? If so, do observations assist with interpretation of burials that remain unidentified?	
Question 3. For human remains that cannot be positively identified to a certain individual, based on the burial goods and hardware, is there evidence of varying socioeconomic status? Can burials associated with more affluent residents be differentiated from burials associated with less affluent residents? Do identified burials confirm or refute archeological interpretations?	

Data Requirements

- Archeological: Historic-period burials in primary contexts correlated with specific socio-economic or ethnic groups; burial goods; grave furniture and coffin hardware (such as inscribed name plates, elaborate handles, etc.); temporally diagnostic artifacts that show diachronic trends in burial goods and practices, and social status/identity; artifacts included with the burials that can be used to identify social status (e.g., high quality goods, diversity of items of similar quality) and that can be associated with specific time periods; artifact types that can be associated with particular socioeconomic status or specific ethnic groups.
- Historical: Cemetery records

Table 23. Nineteenth-Century Health and Disease

Question	Discussion
Question 1. Do morbidity and mortality trends observed in this population closely resemble those observed in European nineteenth century assemblages? Specifically, are there high rates of metabolic disease such as anemia, rickets and scurvy, with a morbidity curve-defined extreme early life mortality?	Nineteenth century residents of San Francisco suffered from a variety of ailments. Some of these are visible in the physical remains of individuals, while health-related artifacts show what remedies people relied on. Parasites have such specific lifecycles that the presence of specific parasites enables very detailed understanding of the foodways and living conditions the individual was exposed to. These data can provide information relevant to understanding subsistence strategies, and if the individual lived in an urban or agrarian environment. Parasite studies also provide information about specific agricultural practices and evidence significant disease vectors, such as drinking water sources and dietary composition. In the early 19th century, as advertising became more widespread, the pharmaceutical industry began producing a wider variety of medicinal treatments. Prescription medicines could have been obtained with a prescription from a physician, from a dispensary, or prepared at an apothecary
Question 2. Are parasitic infections present in the individuals?	
Question 3. Can distinct social practices be identified using the record of health and disease, and can the social practices be ascribed to particular socioeconomic or ethnic groups? Do historically identified burials confirm or refute interpretations?	
Question 4. Can diachronic shifts in health and disease status be detected and do the shifts correlate with shifts in socioeconomic status or ethnicity?	
Question 5. Are health and disease patterns distinctly different within individuals who are born in California versus those who emigrated from other areas?	
Question 6. How did various demographic groups treat illnesses? Did people visit physicians for medicines, or rely on patent medicines? Do patterns in medicine bottles indicate particular health conditions that households suffered from?	

Data Requirements

- Archeological:
  - Physical Anthropology: Complete macro scale recording of human remains. Specifically, calculations for age at death, sex, height, dental pathology, and paleopathological examination (Scheuer and Black 2000; Phenice 1967; Todd 1921; Brooks and Suchey 1990; Trotter 1970; Hilson 2000; Roberts 2009); Ability to conduct destructive analysis of tooth enamel and bone samples (typical sample size less than five grams); soil samples from adjacent to the burial, from within the abdominal cavity, and from directly adjacent to the sacrum; dental calculus samples from teeth.
  - Artifacts: Medicine bottles, implements for administering medicines
- Historical: Advertisements for medications; census records to tie to features containing medications

Table 24. Services (1848-1940)

Question	Discussion
Question 1. Are saloons/restaurants clientele's relative social level, gender, or ethnicity reflected in the food and drinks served? Are there different patterns of artifact disposal at restaurants, hotels, and brothels? What ranges of activities do the artifacts indicate took place in these establishments?	Service industry archeological resources include the remains of brothels, saloons, restaurants, theatres, laundries, and tailors/seamstress' shops. Saloons, restaurants, hotels, and brothels are often architecturally similar, and distinctions are seen only in artifact deposits. Commercial refuse deposits have been used to reconstruct foodways, trade patterns, gambling, and drug-taking. Chinese-run laundries provided one of the few entrepreneurial opportunities for urban Chinese immigrants in the nineteenth and early twentieth centuries. Sewing accessories and tools functioned in the historical construction of gender, class, and identity.
Question 2. How can archeologists document poorly understood ways of life, particularly groups who were socially marginalized due to their occupation or ethnicity? How can archeologists reconstruct the undocumented architectural features of specialized buildings and structures?	
Question 3. How did sewing accessories and tools function in the historical construction of gender, class, and identity? Do different ethnic groups use different sewing practices?	

Data Requirements

- Archeological: Dense features associated with specific addresses containing patterns of artifacts for comparison; sewing-related, laundry, and personal artifacts used in services.
- Historical: City directories, census records

Table 25. Residential (1848-1940)

Question	Discussion
Question 1. What gives people their sense of community? How is social structure, kinship, or ethnicity expressed in a specific locale?	The archeology of residential artifact assemblages is undertaken in the context of specific types of domestic units including single family (nuclear or extended family), multi-family (related and/or unrelated families and individuals), multi-household space (up/down, duplex, apartments), hotel and boardinghouse, and live/work arrangement (shared work-domestic space). It tends to focus on themes to which the remains contribute in their particular historic contexts, such as gender, class, race, ethnicity, consumerism and consumer choice, and health, as well as the intersections between them.
Question 2. How do artifacts reinforce the regimentation of everyday life that was essential for the development of industrial time discipline and how consumerism contributed to the maintenance of social class boundaries?	
Question 3. How did America's nineteenth-century economic transformation lead to the reorganization of the work process and the separation of residences from places of work? How did this affect residential artifact patterns?	
Question 4. How did working class immigrant groups cope with the process of immigration, the construction of cultural identities, and neighborhood change over time?	
Question 5. How did taking in boarders or lodgers affect households? How did this differ between small-scale family establishments and larger-scale commercial boardinghouses? *Question 6*. How does the way of life and associated material culture of specific boarding houses change over time? Is there evidence of the changing ethnic heritage of inhabitants? Are there long-term residents who can be associated with multiple archeological contexts of different dates that can be used to examine longitudinal studies of change in individual or group social status or ethnicity?	
Question 7. How did the 1906 earthquake and fire affect residential patterns?	

Data Requirements

- Archeological: Dense features associated with specific addresses containing patterns of artifacts for comparison
- Archival: City directories, census records for boarding houses

Table 26. Interpretive Potential

Question	Discussion
Question 1. Does the resource have public interpretive potential? For example, could the site provide information about the lifeways of a poorly documented ethnic or occupational group that can be used to better explain the group's position in the city's history to visitors and residents? What topics can the resource address that are of demonstrable public interest or value?	Archeological excavation provides tangible evidence of the past, and puts a human face on individuals and groups that may have otherwise been lost to history. Artifacts are an important part of public displays and allow researchers to convey information.
Question 2. Does the resource contain artifacts that could be used to interpret the past in a museum or public display or as a tangible, hands-on component of a teaching unit developed for use in schools?	Artifacts recovered through archeological investigation may form the basis for public outreach – specifically for use by teachers, who could incorporate artifacts into California History curriculum. Artifacts associated with significant events can help provide a tangible connects with that event, such as artifacts association with the 1906 Earthquake and Fire.

Data Requirements

- Archeological: artifacts and historical associations of interest to the public
- Oral history: interviews to document the lifeways of poorly documented ethnic or occupational groups

D. Archeological Characteristics by Planning District

Planning districts in the city were defined as a planning tool based on certain shared characteristics. However, each planning district includes one or more commonly recognized neighborhoods, and each neighborhood tends to have its own development history, and these histories vary within the planning district. Further, some neighborhoods are divided among multiple planning districts (Table 1). For this reason, the archeological characterization of each planning district, presented below and summarized in Table 27, must be understood to be a broad-brush generalization, which does not apply universally to the characterized district. A generalized sensitivity assessment of each planning district is provided for the purposes of comparison of the relative sensitivity among districts and overall areas of the city but should not be assumed to apply universally to all locations within the planning district.

This ASA discusses the archeological characteristics of each planning district, and Table 27 includes a generalized sensitivity assessment of each district.[13] For each planning district, it offers a brief description of the paleoenvironment and current environmental conditions, local geography, and major topographical changes in the historical period. The distribution and types of Native American and historical archeological sites found in each planning district are discussed and are used to suggest the types of undiscovered sites that may be present in each planning district. Historical maps and aerial photos are used to trace the development of each planning district through the present day to identify the types and locations of potential resources, and the potential effects of historical and modern development upon the archeological record.

[13] This ASA discusses the archeological characteristics of each planning district in the city except the Golden Gate Park, Presidio, and Treasure Island planning districts.

Table 27. Summary of Archeological Sensitivity and Expected Archeological Resource Types by Planning District

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Bernal Heights	Moderate at southern and northern borders of district for surface and buried sites; moderate to high potential for submerged sites in southeast corner; low sensitivity elsewhere	High sensitivity along northern border; low sensitivity elsewhere	• Near freshwater sources	• Jose Cornelia Bernal Adobe (Hispanic Area 8) • Post-1906 domestic sites, structural remains, and privies	• Very low

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Buena Vista	Moderate to high sensitivity for surface and buried sites in eastern and western parts of district; very low sensitivity elsewhere	High sensitivity in eastern corner; low sensitivity elsewhere	• Near historical springs and other water sources	• Northern Mission Complex (Hispanic Area 3), including acequias, possible water diversion, ranching, farming, and mining/quarrying operations • Unlocated archivally documented cemetery on 16th Street between Castro and Noe • Hispanic Area 3 (North Mission Complex), including acequias, possible water diversion, ranching, farming, and mining/quarrying operations • Residential hollow fill features from the mid- to late nineteenth century and early twentieth century • Deposits associated with amusement park, like Paul Boynton Chutes Company	• Low

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Central	Moderate to high sensitivity for surface and buried sites northeast corner and southern tip; low sensitivity elsewhere	High to moderate sensitivity along the northeast edge of district; low sensitivity elsewhere	• Near historical springs and other water sources	• Western part of Northern Mission Complex (Hispanic Area 3), Neophyte Rancheria (Hispanic Area 4), Southern Mission Complex • (Hispanic Area 5), and Noé Adobe (Hispanic Area 10) • Mission Dolores • Mission Dolores Cemetery • Spanish-/Mexican-era tannery • Late nineteenth- and early twentieth-century farms • Residential hollow fill features from the mid- to late nineteenth century and early twentieth century • Deposits associated with Chinese laborers of the Giant Powder Co. in the 1860s • Remains of the Southern Pacific Railroad • Brickyard	• Moderate

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Downtown	High sensitivity for surface and buried sites in southern two-thirds; submerged sensitivity in bay fill areas closest to the historical bay shoreline	High sensitivity throughout	• Isolated early burials • Deeply submerged midden off shore of the historic shoreline • Buried or near the historic surface within about 500 feet of the historic bay shore, marsh margins	• Yerba Buena era hollow fill, structural features, and deposits • Chinese hollow fill features and deposits • Gold Rush structural features and deposits • Submerged and buried ships • Cemeteries: Yerba Buena Cemetery • Archivally located burial places: Bush Street, Frist Street, Mission, and 3rd • Nineteenth-century industrial features • Residential hollow fill features from the mid- to late nineteenth century and early twentieth century • 1906 earthquake deposits • Commercial features from the mid- to late nineteenth century • Road and transportation infrastructure including the California Belt Railroad • Maritime infrastructure: wharves, piers, and seawalls	• High

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Ingleside	High sensitivity for surface and buried sites around Lake Merced; low sensitivity elsewhere	Generally low sensitivity, but some potential for early transportation infrastructure and scattered recreational sites	• Habitation sites around Lake Merced and drainages leading to lake • Marine resource collection sites near coast	• Spring Valley Water infrastructure in the 1860s • Infrastructure associated with access routes to coast • 1860–1900 farming around Lake Merced • Racetracks and other recreational features and deposits, domestic sites (primarily twentieth century), and artifacts • Nineteenth century railroad spurs • Residential and commercial hollow fill features from the mid- to late nineteenth century and early twentieth century • Deposits associated with early twentieth-century military programs associated with Fort Funston	• Low

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Inner Sunset	Moderate sensitivity for surface and buried sites at north boundary and in the center around historical water sources; otherwise low sensitivity	Generally low sensitivity with some potential for early transportation infrastructure and late 19th-century agricultural, recreational and institutional sites	• Near historical sources of fresh water (seasonal ponds)	• Spring Valley Water infrastructure, 1860s • Residential and commercial hollow fill features from the mid- to late nineteenth century and early to mid-twentieth century • Archival evidenced 1860s Laguna Cemetery	• Low

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Marina	High to very high sensitivity for surface and buried sites in central and northern part of the district; high sensitivity for submerged sites in northwestern portion of district along the historical bay shoreline; low sensitivity in southern half of district	High sensitivity focused in the center, with other high sensitivity areas in northwest, northeast, eastern borders of district; otherwise generally low	• Shell middens buried in dune sands • Submerged resources seaward of the historic shoreline	• Hispanic zone 12, Miranda and Briones Adobe • Spring Valley Water infrastructure, 1860s • Wharves and piers • Chinese gardens located west of Octavia Street • 1906 disaster refugee camp in Cow Hollow • 1915 Panama Pacific International Exposition • Residential and commercial hollow fill features from the mid- to late nineteenth century, especially around Washer Woman's laguna • Industrial sites associated with Cow Hollow and the shoreline • Hart Cemetery and archivally evidenced catholic cemetery south of Hart Cemetery	• High

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Mission	High sensitivity for surface and buried sites in central and northern parts of the district and along historic creek courses; moderate to high sensitivity for submerged sites in the center of district on historical marshlands; otherwise low to moderate	High sensitivity throughout	• Contact-period Native American habitation • In proximity to creeks, springs, Laguna Dolores	• Hispanic zones 1, 2, 5, 6, 7, 8 • Residential and commercial hollow fill features from the mid- to late nineteenth century and early twentieth century • Features associated with Chinese laborers, such as the Golden Gate Woolen Manufactory and Miller Lux, Deposits and structural remains associated with Chinese laborers that worked at manufactures and businesses such as the SF Cordage Factory Tubbs Co., Metropolitan Match & Commercial Co., California Fuse Company, Wool Pulling Works or Chinese agriculture • 1906 earthquake deposits • Industrial sites, especially those along historical railroad routes • Southern Pacific, Western Pacific, Ocean Shore in street railroads	• Moderate

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Northeast	High sensitivity for surface, buried, and submerged sites in north and east of district along historical bay shoreline; low sensitivity elsewhere	High sensitivity throughout	• Shell middens • Submerged sites offshore of historic shoreline	• Juana Briones adobe (Hispanic zone 13) • Residential and commercial deposits associated with the Yerba Buena and Gold Rush eras • Archivally sourced Gold Rush era cemeteries: Telegraph Hill, Russian Hill, and North Beach Cemetery Chinatown • Industrial sites, especially those along historical railroad routes and the waterfront • Maritime infrastructure: ships, wharves, and piers • In street railroads: Belt, Santa Fem Southern Pacific	• Moderate

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Outer Sunset	Low sensitivity for surface and buried sites throughout, with an increase to moderate in the vicinity of freshwater sources at north and south ends (Pine Lake and near Golden Gate Park ponds); moderate to high sensitivity for submerged sites along ocean shoreline	High sensitivity in northwest corner and northeast quadrant; generally low sensitivity elsewhere	• Habitation near fresh water, marine resource collection near coast • Submerged sites offshore of historic shoreline	• Remains of the 1870s Giant Powder Works and deposits associated with the Chinese laborers who worked at the factory • Deposits and structural remains associated with non-traditional residences (e.g., Carville) • Residential and commercial deposits associated with early twentieth century city expansion • Early twentieth century sand control infrastructure features • Historic shipwrecks offshore of historic shoreline, in near-shore coves (e.g., mouth of Lake Merced outlet creek)	• Low

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Richmond	Low sensitivity for surface and buried sites throughout, with an increase to moderate and high in the vicinity of freshwater ponds in the northeast and southwest portions of the district; moderate to high along ocean shoreline	High sensitivity in eastern and northwestern ends of the district; otherwise generally low	• Habitation near fresh water, marine resource collection near coast	• 1860s Spring Valley Water Co. Infrastructure • Residential and commercial hollow fill features from the mid- to late nineteenth century and early to mid-twentieth century • Agriculture and dairy deposits, terraforming associated • Cemeteries: City Cemetery, Odd Fellows, Lone Mountain/Laurel Hill, Greek Cemetery, including human remains, mortuary furniture, and cemeteries • Deposits and structural remains associated with recreational facilities like racetracks and amusement parks • Commination infrastructure including semaphores and telegraph line • Transportation infrastructure, especially cable carlines • Structural remains and deposits associated with Sutro baths and Sutro's property • Ocean View Railroad	• Moderate
South Bayshore	High sensitivity for surface and buried sites in northwest and	High sensitivity in central-north portion of the	• Marsh resource exploitation and collection sites	• Industrial and commercial refuse, and structural remains, especially early shoreline business along Hunters Point	• High

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
	Hunters Point; high sensitivity near Yosemite Slough, along Islais Creek, and historical bay shoreline ; moderate to low elsewhere	district along historical bay shoreline, Islais Creek, Yosemite Slough; otherwise generally low	• Within 500 feet of historic shoreline/ marshes, along historic creek alignments • Near surface and buried shell middens common	• Maritime infrastructure including ships, wharves, seawalls, bridge foundations • 19th and 20th century shipwreck and shipyards like Candlestick Cove • Deposits and structural remains associated with Chinese fishing and shrimp camps • Deposits and structural remains associated with Chinese laborers that worked at manufactures including Adnerton's Tannery and Wool Pulling, San Francisco Packing and Provision Co. • Deposits associated with the 19th century leper and smallpox ward • New Butchertown features, including, wharves, piers, industrial deposits, and faunal remains • Residential hollow fill features from the mid- to late nineteenth century and early to mid- twentieth century • Deposits associated with WWII housing • Resources associated with Southern Pacific and Santa Fe railroads, • Deposits and terraforming associated with agricultural (e.g., farm, dairy, flowers/nurseries)	

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
South Central	Moderate to high sensitivity for surface and buried sites along historical Islais Creek alignment; otherwise generally low	Generally low sensitivity; isolated areas of high sensitivity in southeast and northwest portions of the district	• Along upper reaches of Islais Creek, bayshore end of Visitacion Valley	• Resources associated with Hispanic Zone 9, Carmen de Bernal Adobe compound • Residential and commercial hollow fill features from the mid- to late nineteenth century and early to mid-twentieth century • Structural remains and deposits associated with industry, especially along railroad routes • Deposits and terraforming associated with agriculture (e.g., farm, dairy, flowers/nurseries) • Deposits associated with WWII era military structures • Structural remains and deposits resources associated with Ocean Shore Railroad and Southern Pacific Railroad	• Low
South of Market	High sensitivity for surface and buried sites along historical shoreline, high sensitivity for submerged sites along Mission Creek and east	Generally high sensitivity; low sensitivity along southwest corner	• Deep, isolated early burials • Submerged early Native American shell midden • Shell middens common, generally buried by fill and/or dune sand	• Deposits and structural remains associated with Hispanic zone 11, Potrero Hill Adobe • Maritime infrastructure including, wharves, seawalls, bridge foundations • Submerged ships and shipbreaking yards • Resources associated with railroad development • Nineteenth-century shipyards,	• Very High

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
	of historical bay shoreline			• Refuse associated with the 1906 earthquake • Industrial, commercial, and domestic features and refuse • Deposits and structural remains associated with Chinese fishing and shrimp camps • Industrial and commercial refuse and structural remains, especially early around Yerba Buena Cove and Mission Bay • Residential hollow fill features from the mid- to late nineteenth century and early to mid- twentieth century • Resources associated with Southern Pacific, Santa Fe, California Belt, and Western Pacific Railroad • Structural remains, deposits and faunal remains associated with Old Butchertown • Deposits and structural remains associated with Chinese laborers that worked at manufacturers and businesses such as the SF Cordage Factory Tubbs Co. • New Butchertown features, including, wharves, piers, industrial deposit, and faunal remains	

Planning District	Native American Site Sensitivity	Historical Sensitivity	Expected Native American Resource Locations (habitation sites, shell middens, special use/resource collection sites isolated artifacts, human remains, isolated burials expected in all areas)	Expected Historical Resource Locations and Types	Level of Archeological Investigations Undertaken
Western Addition	High sensitivity for surface and buried sites in southwest and north-central portion of the district	High sensitivity at west end around historical cemeteries, in center and southeast of district, with some isolated high sensitivities in the northeast of district	• Association with historic springs and ponds	• Industrial and commercial refuse and structural remains (e.g., foundation alignment, footings, floor slabs, ovens, stoves, walls, furnaces) • Residential hollow fill features from the mid- to late nineteenth century and early to mid- twentieth century • Earthquake camp deposits in Jefferson Square • Urban infrastructure (e.g., road base and road remnants such as brick, wood plank, etc.) from the late nineteenth and early twentieth centuries • Mortuary materials and human remains associated with historic cemeteries including Calvary Cemetery, Masonic Cemetery, and Greek Cemetery	• Low

Note: This ASA discusses the archeological characteristics of each planning district in the city except the Golden Gate Park, Presidio, and Treasure Island planning districts.

Bernal Heights Planning District

The Bernal Heights planning district is bounded by Cesar Chavez Street to the north, San José Avenue to the west, U.S. 101 to the east, and I-280 to the south. The Bernal Heights planning district contains the entirety of the Bernal Heights neighborhood.

The Bernal Heights planning district is in the southeast quadrant of San Francisco, on the lower slopes of Bernal Hill and Holly Hill, both of which are composed of sedimentary and metamorphic rock that formed during the Mesozoic Era. Bernal Hill is 475 feet tall. Holly Hill, to the south, is 275 feet tall and topped by Holly Park (Alexander n.d.). Precita Creek once ran across the northern border of Bernal Heights, roughly along the modern alignment of Cesar Chavez Street. Prior to its channelization in the late nineteenth century, Islais Creek flowed across the southern border of the planning district, along approximately the modern alignment of I-280 (USGS 1896). In the southeast corner of Bernal Heights, Islais Creek opened into a marshy estuary (Sowers and Richard 2011).

The planning district is primarily residential, with light commercial properties around Mission Street, Courtland Avenue, and Precita Avenue. Several large commercial properties are on the block between Mission and Valencia streets in the planning district's northwestern corner. Residential buildings are a mix of row houses and free-standing homes with rear yards, primarily low rise, mostly built in the first couple of decades of the twentieth century. Widespread residential development of this district generally did not occur until after the 1906 earthquake, although scattered development occurred as early as the Hispanic period. Data were not available regarding the depth of disturbance associated with existing development at specific locations but based on the extent of twentieth-century development in the planning district, it can be assumed that a substantial part of most parcels has been disturbed to at least 2 feet depth. Both Precita Creek and Islais Creek have been filled/undergrounded. College Hill Reservoir was built on the northwest edge of Holly Park in 1870 by the Spring Valley Water Company (Lappin 2011). Bernal Hill was quarried for materials for local twentieth-century construction projects, including fill for U.S. 101 and Candlestick Park.

Early documents reveal that the Bernal Heights area was part of the 1839 Mexican land grant referred to as Rancho Rincon de las Salinas y Potrero Viejo, which was awarded to José Cornelio Bernal (Mullins 2017). By 1860, the land had been transferred to François Louis Alfred Pioche, a financier of French birth who quickly parceled it out. During the Civil War, Army engineers from the Presidio laid out the planning district's street plan on paper. An 1864 map shows the main streets of the planning district, which had been roughly drawn (Butler 1864), although the streets were not built out until at least the 1880s. Many of the earliest non-native residents were Irish immigrants who established farms and dairies (Mullins 2017). An 1896 USGS map shows the Bernal Heights planning district with relatively dense residential development between Bernal Hill and Holly Hill. The development was bounded to the east by Islais Creek, which, at that time, broadened into a marsh before emptying into San Francisco Bay (USGS 1896).

Bernal Heights experienced a period of growth after the 1906 San Francisco earthquake, as displaced people from downtown San Francisco moved to the planning district for temporary or permanent residence (FoundSF 2006). These newcomers were drawn, at least in part, by the fact that the planning district had been built atop bedrock, which dampened the seismic effects and helped much of the planning district's buildings survive the

quake. The commercial corridor along Eugenia Avenue filled in with shops as the pastureland on the hilltop was developed for workers' homes during the rapid rebuilding of the city. During World War II, the area saw another population surge. The new arrivals included many African American families whose breadwinners worked at the nearby San Francisco Naval Shipyard at Hunters Point.

Only one Native American archeological site has been identified in the Bernal Heights planning district, a reported but unrecorded shell midden. Shell mounds mapped by N. Nelson between 1906 and 1909 were just south of the planning district, along the channel of Islais Creek (Nelson 1909). The Far Western pre-European contact archeological sensitivity model rates the southeast corner of Bernal Heights, which was formerly marshland associated with Islais Creek, as having high potential for resources (Meyer and Brandy 2019). The rest of the planning district has little potential for Native American archeological sites, particularly because the near-surface bedrock and shallow soils of the area leave little potential for resources to have survived development.

No historic-period archeological sites have been recorded in this planning district. Early residential development began in the northern part of the planning district, around Bernal Heights Park, which may be more sensitive for historical features such as privies and wells than areas developed later. Historic-period sites and structures, if present, would most likely stem from late nineteenth- to early twentieth-century residential and agricultural development, particularly dating after the influx of San Franciscans displaced by the 1906 earthquake. However, the potential for privies associated with development after 1906 is probably low because sewers were rapidly being extended throughout the city by that time. No archeological investigations have been completed in the Bernal Heights area.

Given the near absence of identified archeological studies in Bernal Heights, archeological characterization is based almost entirely on pre-European contact modeling and historical mapping. Except for the locations identified above, Bernal Heights appears to have limited Native American and historical archeological potential based on existing data. However, given the lack of archeological studies conducted in this planning district, there are insufficient data to definitively characterize the archeological potential.

Buena Vista Planning District

The Buena Vista planning district is bounded on the north by Oak Street, on the southeast by Market Street, on the south by 17th Street, and on the west by Stanyan Street. The Buena Vista planning district includes the entirety of the Haight Ashbury neighborhood, and portions of the Hayes Valley and Castro/Upper Market neighborhoods.

The Buena Vista planning district is centered around the rocky hills of Buena Vista Heights and Corona Heights, areas that are home to two city parks, Buena Vista Park and Corona Heights Park. Buena Vista Park, with an elevation of 575 feet, is located on sand dunes with San Francisco chert outcroppings. Corona Heights Park, with an elevation of 540 feet at its highest point, is part of the Castro and Corona Heights neighborhoods within the planning district. The entire park is underlain by Franciscan chert. Both hills are essentially undeveloped today.

The Buena Vista planning district is within the Mission Creek watershed, an area where pre-development water resources were limited to the headwaters of a few creeks and a small pond (Sowers and Richard 2011). At the eastern border of the planning district, there was a spring known historically as Arroyo Dolores. To the southwest, a creek, Laguna Seca, flowed between Mount Sutro and Buena Vista Heights. In addition, a small

pond existed near the future alignment of Fillmore Street, between Waller and Haight streets (Sowers and Richard 2011). This pond was used as part of the Paul Boynton Chutes Company amusement park at the end of the nineteenth century.

A review of aerial photos, along with a sampling of parcels on the San Francisco Property Information Map, indicates that, today, the planning district is generally residential, with free-standing single-family homes with open rear yards as well as multi-unit residences that range from two to four stories tall. Many buildings in this district, developed around the turn of the twentieth century, include subgrade basements or partial basements with slab foundations. Soils are sandy.

There was little development prior to development of the residential areas that exist today. Many of the existing residences date from the first half of the twentieth century. Maps from the mid-nineteenth century indicate that several blocks in the southern portion of the Buena Vista planning district were within the northern boundary of Rancho San Miguel (Wackenreuder and Langley 1861), a land grant given to Don José de Jesús Noé in 1846. Noé was the last Mexican alcalde of Yerba Buena, the settlement that became San Francisco. With its 4,443 acres, the rancho amounted to approximately one-sixth of modern-day San Francisco. The Wackenreuder and Langley map shows that the Buena Vista planning district included plots of land labeled "PFAFF," "GEO. FLINT," "PERLEY," and "WOOL", likely referring to the names of individuals who had been granted or otherwise owned the parcels at that time.

The 1861 map indicate that the street grid had already been laid out directly to the east of the Buena Vista district, at least on paper, and the modern borders between Market Street and Oak Street established. Residential development began in the late 1800s, starting at the eastern end of the planning district (SFGate n.d.). In addition to the grading necessary for residential development, disturbances between the 1890s and 1920s most likely included heavy quarrying in Corona Heights. The Gray brothers operated a quarry and brick factory on the southern slopes of Corona Heights, which was known as Rock Hill at the time. The slopes of the hill are now developed with residences, with a museum and park on the hilltop. Along with residential development, a water amusement park, Paul Boynton Chutes Company, had been established near Cole Street between Waller and Haight streets by the end of the century (Sanborn 1899).

The Buena Vista planning district is northwest of the Mission planning and its southern boundary is only three blocks from Mission Dolores. The Yelamu villages of Chutchui, reportedly a summer and fall camp, and Sitlintac, a winter camp, are believed to have been in the Mission Dolores vicinity (Milliken 1991), and it is possible that outlying sites associated with these settlements were present in the Buena Vista District. According to Far Western's pre-European contact sensitivity model (Meyer and Brandy 2019), the Buena Vista planning district is highly sensitive for Native American archeological sites near pre-development water sources, including the spring that was once flowed at the modern location of Noe Street, between Duboce Avenue and 14th Street, and at the pond on Fillmore Street between Waller and Haight streets.

The Mission Dolores complex included numerous associated structures and sub-complexes, associated with mission industries such as ranching, small scale farming, hide and tallow work, etc. At the height of the mission era, between 1810 and 1820, there were an estimated 1,100 Native Americans, including Miwok and Yokuts, living at the mission (Cleary 2003). Late nineteenth-century structural remains and a domestic privy have also been documented in the northeast of the Buena Vista planning district (P-38-004362, P-38-004363, P-38-004364).

Potential archeological sites in the planning district may contain historic-period remnants of mission outbuildings; the remains of ranching, farming, and mining/quarrying operations; and archeological features associated with suburban occupation from the mid- to late nineteenth century. The potential exists for the presence of infrastructure associated with Mission period water diversions and the channelization of spring-fed streams north and south of 14th Street, including acequias (i.e., water ditches, associated with the northern mission complex), which may also be found in the eastern part of this planning district. In addition, the department's Environmental Planning Division archival sources indicate that the potential exists for an undocumented historic-period cemetery to be located on 16th Street between Castro and Noe streets.

Few archeological studies have been completed for the Buena Vista planning district. Dean's 2004 archival study of archeological resources within the overlapping Market and Octavia area provides information about the eastern portion of the Buena Vista planning district. Further, various studies of Mission Dolores may be applicable for areas on the southeastern edge of the Buena Vista planning district (e.g., Pastron and Ambrose 2008).

The Buena Vista planning district has moderate potential for both Native American and historic archeological sites. The presence of historical water sources, as well as data from Mission records, suggest that more undiscovered Native American resources may be present, particularly in the eastern portion of the planning district. Historical sites dating to the Mission Period may be found in the southeast part of the planning district. Furthermore, features associated with late nineteenth- and early twentieth-century residential sites may be present throughout. The potential for significant historical residential features depends on the date of initial development of particular parcels or streets because city water and sewer services were available in this area by 1905, which suggests that the likelihood of the occurrence of hollow-fill domestic features after this date is low.

Central Planning District

The Central planning district is bounded on the east by Dolores Street; on the south by San José Avenue; on the west by Bosworth Street, O'Shaughnessy Boulevard, and Twin Peaks Boulevard; and on the north by Clarendon Avenue and Stanyan Street. The Central planning district includes the entirety of the Noe Valley and Glen Park neighborhoods and portions of the Twin Peaks, Inner Sunset, and Castro/Upper Market neighborhoods

The topography of the Central planning district is characterized by the low, wide hills of Dolores Heights and Castro Hill, both at elevations of 400 feet, in the center of Noe Valley. Duncan Hill, at 100 feet tall, is south of the planning district; the foothills of Twin Peaks intrude on the planning district from the west. The Central planning district is split between the Mission Creek watershed to the north and the Islais Creek watershed to the south. Before the city was built over, Arroyo Dolores crossed the northern part of the planning district; the marshy Laguna Dolores was to the northeast. Precita Creek also crosses the Central planning district, flowing eastward from the foothills of Twin Peaks. Along the southern border, a small creek flows along Glenn Canyon before joining Islais Creek.

The currently residential Central planning district comprises row houses as well as free-standing houses that are generally between two and four stories tall. Subgrade disturbance has been infrequent (Sanborn 1913). Like much of the rest of the city's residential areas, this planning district is a patchwork of old and new houses, with a

few late nineteenth-century houses; others were constructed in the early twentieth century, after the San Francisco earthquake and fires of 1906. During its development, grading occurred in various areas across the planning district; mass grading of the topography is more extensive in the foothills at the west side of the planning district.

Mission Dolores, also referred to as Misión San Francisco de Asís, was founded partly within the Central planning district. The original Mission building was located in the Mission District and dates to 1776. Later, the surviving mission building, which dates to 1791, was built. Other mission structures were built within the planning district in the early nineteenth century.

Early land grant maps show that most of the Central planning district was once Rancho San Miguel, a 4,443-acre land grant that was awarded to Don José de Jesús Noé in 1846. Noé was the last Mexican alcalde of Yerba Buena. The rancho amounted to approximately one-sixth of the area that would eventually become the city and county of San Francisco. However, there is no archival evidence of the development of any structures in this area at that time. In 1853, John Meir Horner purchased the eastern part of Rancho San Miguel from Noé and platted the area for residential development (San Francisco Planning Department 2010). Bounded roughly by 18th Street, 30th Street, Castro Street, and San José Road, the area came to be known as Horner's Addition. However, the addition remained largely undeveloped during Horner's ownership; financial circumstances forced him to sell it in the late 1850s. In the 1860s, the construction of horsecar lines on Mission and Valencia streets, east of the Central planning district, facilitated urban growth, but construction of the Giant Powder Works in Glenn Canyon Park attests to the fact that this area was still seen as remote from the city: powder works were notoriously prone to mass explosions and so generally were sited in remote area where they did not pose a risk to surrounding development. However, San Francisco continued to grow. By the 1870s, the Horner Addition had become an accessible residential area, but development of the area continued at a slow pace.

The 1883 construction of a cable car line on Valencia Street and 1891 construction of electric streetcar lines on Mission and Guerrero streets facilitated further development within the planning district. Farther west, other streetcar lines, such as those on Castro Street, eventually led to development of the Noe Valley portions of Horner's Addition.

The area experienced a boom after the 1906 earthquake when people who were displaced from elsewhere in the city resettled in the Central planning district, spurring much more concentrated development of residences and associated infrastructure (San Francisco Planning Department 2010).

Although no Native American resources have been found in the Central planning district, the Yelamu villages of Chutchui, possibly a summer and fall camp, and Sitlintac, possibly a winter camp, are believed to have been located in the general vicinity of Mission Dolores, within the planning district (Milliken 1991). A shell midden that is believed to represent a neophyte settlement was found in the vicinity in the 1980s. According to Far Western's pre-European contact sensitivity model, the likelihood of finding Native American resources in much of this area is low; however, near freshwater sources such as Laguna Dolores, particularly in the northeast part of the Central planning district, modeled Native American sensitivity is high. If present, Native American sites would most likely be located along waterways in the Mission Creek and Islais Creek watersheds, including Arroyo Dolores, Precita Creek, and a small creek along Glenn Canyon.

The Central planning district is the location of Mission Dolores (P-38-000022), the oldest surviving structure in San Francisco (Mead 1970). The original mission was built in 1776, supposedly several blocks east in the Mission planning district; however, that structure no longer exists. The surviving Mission Dolores along with outbuildings and water diversion features built to serve the mission, have the potential to be uncovered during future excavations. The mission, along with several related buildings, is located on what is now the southwestern corner of Dolores Street and 16th Street. A small but dense cemetery dating from the early days of the mission flanks the building's south side; a large Spanish Baroque basilica, referred to as the Mission Dolores Basilica, was completed in 1918 just north of the mission.

The Central planning district includes Mission Dolores and Mission Dolores Park, which are sensitive for historic-period resources, including nineteenth century Jewish cemeteries, and potentially Native American resources. Mission records indicate, the mission was in proximity to Ohlone encampments (AECOM 2017). It was also a center of Hispanic economic activity. At Mission Dolores Park (P-38-005221), archeologists documented a scatter of historic-period artifacts in the former channel for Dolores Creek, along what is today 18th Street between Church and Dolores streets that was associated with two Jewish graveyards that were also within Dolores Park. Burials from both cemeteries were apparently moved to Colma prior to 1900; however, some features of the cemetery could be present. Possible features in the park could include foundations of a *beis taharah*, or memorial chapel, along with an earlier Spanish-/Mexican-era tannery, American-era farms, homes, and a brickyard (Praetzellis and Meyer 2016).

Several archeological research designs and contexts have been written that provide information about archeology within the Central planning district. The reports, which focus on Mission Dolores and its associated occupations, include *A Focused Archeological Research Design/Testing/Data Recovery Plan for the 261 Dolores Street Project, 263–265 Dolores Street, San Francisco, California* (Pastron and Ambrose 2008) and the *Historic Context Statement for San Francisco's Mission District* (San Francisco Planning Department 2010), and others (Ambro 2003; Praetzellis and Meyer 2016).

The Central planning district contains known archeological sites from the early Mission Period as well as Native American ethnohistoric and possible Native American archeological sites. Areas where fresh water was available may contain ethnohistorically recorded or Native American settlements. However, pre-European contact archeological sensitivity is modeled as low across most of the planning district. Historical archeological sites may include mission sites as well as the later residential, community services (e.g., hospitals, cemeteries) and industrial sites.

Downtown Planning District

The Downtown planning district is bounded on the south by Howard Street from Van Ness Avenue to The Embarcadero/the bay shore and on the north by Bush Street and Sacramento Street The western boundary is Van Ness Avenue and the eastern boundary is the bay. The Downtown planning district follows the general alignment of Market Street from The Embarcadero west to Van Ness Avenue, although its southeastern boundary is almost a quarter mile southeast of Market Street, in what has traditionally been considered the SoMa neighborhood. The Downtown planning district includes the entirety of the Tenderloin neighborhood and portions of the Nob Hill, Financial District/South Beach, and SoMa neighborhoods.

Historically, the Downtown planning district contained a portion of Yerba Buena Cove, a shallow cove of San Francisco Bay, with tidal flats. The inland portion of the planning district was made up of large sand dune fields that rose to 80 feet above sea level at the highest point (on Market Street and between Second and Third streets) (Byrd et al. 2014). The dunes migrated eastward over time as wind blew in from the Pacific Ocean. There is evidence that two major discreet layers of dune sands exist; these were separated by Young Bay Mud and clay (Meyer and Brandy 2019). During historical development of the Downtown planning district, many of the sand dunes were leveled and used to fill in low-lying areas. As development continued, dune sand and other imported fill (such as building debris and rock blasted from Telegraph Hill) was used to fill in Yerba Buena Cove and extend the shore eastward to make space for additional development. Artificial fill within the Downtown planning district was identified in one study as extending to depths of 12 feet below the surface at the eastern edge of the planning district and 8 feet below the surface at the western edge (ICF 2019), but this is highly variable. Fill depth in the former Yerba Buena Cove may be considerably deeper, and deep erosion channels are known to be present at some locations.

The San Francisco Property Information Map indicates that current development varies throughout the greater downtown area. Along Market Street there are office, retail, and commercial mid- to high-rise buildings. The Embarcadero, also included in this planning district, comprises community businesses and some public spaces. On the north side of the Downtown Planning District, development consists primarily of combined residential and commercial spaces, with the commercial focus on the local residential community. Foundation depths vary within the Downtown planning district from up to 200 feet for high-rise commercial and residential buildings to 30 feet for mid-rise residential buildings that include subgrade stories. Foundations on fill or fill over Yerba Buena Mud deposits that represent marshes or the bay bottom have to extend through fill and Yerba Buena Mud to the Colma Formation, Upper Layered Sediments, Old Bay Clay or other competent strata, and therefore have the potential to result in impacts on both historic maritime features or ships in the fill and Yerba Buena Mud in Yerba Buena Cove and submerged pre-European contact deposits under the Yerba Buena Mud.

Development in the Downtown planning district was slow during the Spanish and Mexican periods. Before the Gold Rush, Yerba Buena was a small settlement that was primarily a trading outpost. It consisted of a mix of residential buildings and commercial and establishments along the shore of the cove and a short distance inland, with a population of about 1000.

In 1836, the Spanish *alcalde* (mayor) commissioned Jean-Jacques Vioget to survey the settlement, which was originally named Yerba Buena. California Street was the northern boundary of his survey (ICF 2019; Russell et al. 2018).

The Gold Rush was a critical historic period for this district, bringing a population explosion, the abandonment of ships in the harbor, the extension of piers and wharves, landfill, and population movement inland and to the south. The 1853 USCS map shows that the majority of Yerba Buena development was focused on the north side of Market Street, along the northwest shore of Yerba Buena Cove. There was some development on the south side of Market Street and along Mission Street; however, it was much sparser. At the time, Yerba Buena Cove extended to about First Street. By 1867, the USCS map shows that development intensified in the eastern part of the Downtown planning district, up to Fourth Street, and grew denser south of Market Street. By 1869, development extended

west to the modern-day alignment of Van Ness Boulevard, and Yerba Buena Cove had been filled in. The 1884 USCS map shows the street grids, as well as the extensive development that had occurred, at similar density to what we see today. At that point, the entire Downtown planning district was developed.

There are at least eight known Native American sites in the Downtown planning district, including several midden deposits where shell, faunal, and bone fragments have been identified at varying depths, generally between 10 and 24 feet below the modern ground surface. In addition, two isolated burials, approximately 55 to 75 feet below the ground surface, have been encountered. The Transbay Burial, from approximately 7600 cal BP, was encountered at a depth of 55 feet below the ground surface, and a 5,000-year old burial was encountered at a depth of 75 feet below ground surface (bgs) during excavation for BART. SFR-220, near the Mission Creek channel recently yielded a C-14 date of 7900 cal BP, the earliest recorded archeological site in the City (Sally Morgan, personal communication).

Seventeen historic-era archeological sites have been documented within the Downtown planning district, all of which include components that date to the Gold Rush period. These include the structural remains of a general store, Gold Rush ships, a Chinese store, miscellaneous commercial buildings, wharves, Fort Vigilance, and the San Francisco Gas Company. Several features associated with less-permanent structures, such as tent dwellings, and miscellaneous refuse deposits, have also been recorded. Yerba Buena Cemetery, designated in 1850, was in what is now Civic Center, within the Downtown planning district and the city's first official burial ground. During the late 1860s and early 1870s, the City of San Francisco decided to move the interred individuals and develop a public park in place of the cemetery. Various contractors were hired to move gravestones and individuals to other locations; however, the job was notoriously mismanaged. Coffins and gravestones continue to be encountered during excavations in the area, the latest in 2018.

As a result of heightened intensity of development within the Downtown planning district, including a number of large infrastructure projects, many archeological investigations have been conducted in recent decades. However, given the developed nature of the planning district, as well as the history of development, archeological investigation is challenging. Most—but not all—archeological sites or features have been disturbed by historic and modern development.

Given the number of known historic-era and Native American archeological resources present within the Downtown planning district, the planning district appears to have high sensitivity for both historic-era and Native American archeological resources.

Ingleside Planning District

The Ingleside planning district is bounded by Ocean Beach to the west, Sloat Boulevard to the north, Glen Canyon Park/I-280/San José Avenue to the east, and Daly City to the south. The Ingleside planning district includes the entirety of the Lakeshore and Oceanview/Merced/Ingleside neighborhoods and portions of the West of Twin Peaks and Sunset/Parkside neighborhoods.

The Ingleside planning district spans approximately 3 miles from east to west, with Mount Davidson in its northeastern corner and the Pacific Ocean along its western edge. Mount Davidson, a prominent Franciscan chert outcropping, is the highest natural point in San Francisco. Much of the planning district gradually slopes

toward the Pacific Ocean. An east–west ridge known as Merced Heights is near the center of the planning district. A band of dune sand that runs north–south along the Pacific Ocean connects to the expansive Holocene-aged dune field that covers planning districts to the north. The Ingleside planning district is underlain primarily by Holocene-aged alluvial deposits. In addition, the planning district contains Lake Merced, a large spring-fed water body with two distinct halves, which was originally an estuary. Historically a channel once connected the north end of Lake Merced to the Pacific Ocean. This has been repeatedly disrupted by the alternating formation and breaching of the natural sand barrier along the lake's western edge through tidal action and, at least once, as a result of an earthquake. As a result of this ocean connection, Lake Merced was at least tidally brackish historically. The connection was permanently disrupted through artificial filling after 1905, but an embayment at the location of the former creek mouth continued to be present at least intermittently until the 1920s.

A review of Google Earth aerial images indicates that the Ingleside planning district is predominantly residential in character. Many of the one- or two-story residences are either adjoining row houses near the street, with open rear yards within the interior of each block, or fully detached houses with open yards. Select areas with more intensive construction are home to multifamily developments, such as Parkmerced where the residential towers exceed 10 stories. The San Francisco State University and City College of San Francisco campuses are also within the Ingleside planning district. Their large-footprint institutional buildings stand between five and 10 stories tall. Although residential foundations are typically shallow (i.e., 3 to 5 feet deep), foundations and/or basements for larger institutional buildings may extend to 40 feet below the ground surface. Areas on Mount Davidson as well as areas surrounding Lake Merced contain recreational uses such as public parks and golf courses and relatively few buildings compared to the surrounding planning district. A topographic map (USGS 1905, 1926, 1940, and 2018) review suggests that the planning district has been developed primarily by grading and stabilizing the dunes rather than employing mass cut-and-fill methods.

An 1868 bird's-eye view of San Francisco and an 1869 USGS map indicate that the Ingleside Planning District was largely rural in character prior to the 1870s. A major east–west road along the same alignment as present-day Ocean Avenue ran from the Excelsior (in the South Central planning district) toward the northern end of Lake Merced and a cluster of buildings east of Lake Merced near the Ocean House Race Course. Several secondary roads extended from the east to the eastern edge of Lake Merced. The bird's-eye view also shows a small street grid that was part of a homestead association adjacent to the San Francisco and San José Railroad corridor, which is the approximate location of today's I-280. Surrounding areas in the planning district hosted small produce farms. The Industrial School, a municipal juvenile rehabilitation center stood near the current location of the City College of San Francisco. An 1892 USGS map shows further residential development near the railroad, in the eastern portion of the planning district, as well as a spur railroad between the two halves of Lake Merced that ran to Ocean Beach. The 1915 USGS map shows that city streets had been laid as far west as Junipero Serra Boulevard. Some of the intricately planned street patterns were in "residence parks" such as Ingleside Terraces, where the street grid followed the pattern of the former racecourse. During World War I, Fort Funston, a military installation, was built. The 1938 aerial photographic series by Harrison Ryker shows houses lining streets north of Garfield Avenue; however, many of the blocks south of Garfield Avenue and west of Orizaba Avenue were under development or vacant. Golf courses as well as Fleishhacker Zoo and Fleishhacker Pool had been built in

the vicinity of Lake Merced by this time. In the post–World War II period, residential development continued in the western half of the planning district. The Parkmerced complex and San Francisco State University campus opened immediately east of Lake Merced.

Relatively few archeological studies have been conducted in the Ingleside planning district. However, several precontact archeological shell midden sites have been identified within its boundaries, in the vicinity of Lake Merced and Ocean Beach. A recent archeological survey report, the *San Francisco Public Utilities Commission San Francisco Westside Recycled Water Project Historic Context and Archaeological Survey Report,* recognized the raised pre-European contact archeological sensitivity in southwestern San Francisco. Far Western's pre-European contact sensitivity model assigns most of the western half of the planning district, in the area surrounding Lake Merced, to the "high sensitivity" and "highest sensitivity" categories for near surface and buried sites, indicating that the lake and its drainages were very likely the sites of resource collection for Native American inhabitants of the Bay Area. East of 19th Avenue, however, the planning district generally has low pre-European contact resource sensitivity. The expected Native American site types are shell middens, potentially with special uses, such as shellfish collection camps. Isolates, such as projectile points, are also expected.

Previously recorded historic-era archeological sites in the Ingleside planning district include the following: an above-grade well, constructed of stone and filled with glass, that appears to date from the late-nineteenth century to World War II (P-38-000092; CA-SFR-101H); 1940s-era coal bin foundations (P-38-000094; CA-SFR-103H); and beached shipwreck remains associated with the schooner *Neptune* (P-38-000098; CA-SFR-107H). Identification of the sites did not involve sub-surface investigation, and none was evaluated as CRHR eligible. No historic-era sites have been identified in the eastern half of the planning district, an area where residential development occurred from the late-nineteenth century to the post–World War II period.

Potential historic-era research themes relevant to the Ingleside planning district include nineteenth-century recreational uses of San Francisco's southwestern outskirts (i.e., the Ocean House Race Course and associated buildings), the city's early peripheral settlement patterns and agriculture, and early twentieth-century military programs associated with Fort Funston (an NPS property where no housing development would be anticipated). Archeological materials that could be uncovered in the future related to these themes include buried residential building foundations, refuse deposits, and possibly residential privy deposits, in the eastern part of the planning district, which may have been developed before sewers were installed.

Few archeological studies have been completed for the Ingleside planning district. The San Francisco Public Utilities Commission San Francisco Westside Recycled Water Project Historic Context and Archaeological Survey Report from 2014 (ESA 2014) presents an overview of the geological, Native American, ethnographic, and historic-era context as well as potential Native American and historic-era archeological sensitivity associated with a project site that includes the northwestern corner of the Ingleside planning district. Furthermore, the 2010 historic context statement entitled San Francisco's Ocean View, Merced Heights, and Ingleside Planning Districts, 1862–1959 (Brandi and LaBounty 2010) provides details regarding historic-era development of the planning district's eastern half, although it was not prepared to inform archeological investigations and did not include a detailed pre-European contact or ethnographic context.

Previous archeological studies in the Ingleside planning district have identified precontact and historic-era archeological sites—specifically, in the western half of the planning district surrounding Lake Merced and Ocean Beach. Pre-European contact modeling assumes that this area has a generally high degree of precontact archeological sensitivity. However, the potential for encountering precontact sites in the eastern half of the planning district appears to be low. This is the area where the majority of existing residential development lies. Apart from select locations where early residential, agricultural, recreational, and institutional development occurred, as described above, the Ingleside planning district has limited potential with respect to encountering historic-era archeological sites.

Inner Sunset Planning District

The Inner Sunset planning district is bounded by 19th Street to the west, Lincoln Way/Golden Gate Park to the north, Stanyan Street/Twin Peaks/Mount Davidson to the east, and Sloat Boulevard to the south. The Inner Sunset planning district includes the entirety of the Inner Sunset neighborhood and portions of the Twin Peaks and West of Twin Peaks neighborhoods.

The Inner Sunset planning district has a varied topographic character. It contains two prominent bedrock landforms, Mount Sutro and a north–south ridge known as both Golden Gate Heights and Sunset Heights, an area surrounded by densely developed low-lying areas that were dominated by extensive sand dune fields prior to the planning district's historic-era development. Mount Sutro and Golden Gate Heights are primarily chert outcroppings of the Franciscan Formation; these areas are overlain by layers of aeolian dune sand. Much of Mount Sutro is densely forested, primarily with eucalyptus stands planted in the nineteenth century for aesthetic reasons. Laguna Honda, a natural lake, is situated in the stream-carved valley between Mount Sutro and Golden Gate Heights. In the 1860s, the Spring Valley Water Company lined the lake to create Laguna Honda Reservoir. During the earliest decades of the twentieth century, the sand dunes in the planning district's lower areas were graded to accommodate residential development.

Aerial images and desktop reconnaissance, using Google Maps, indicate that the majority of the Inner Sunset planning district's densely built urban fabric consists of one- to three-story residences, typically positioned near the street, with open yards to the rear. Residential foundations are shallow (i.e., 3 to 5 feet). The planning district's commercial and transit corridors, such as Judah Street, contain apartment buildings that are no more than six stories tall. At the north-facing base of Mount Sutro, near the Inner Sunset planning district's northeast corner, the Parnassus Campus of the University of California, San Francisco, features buildings that are as tall as 15 stories. Laguna Honda Hospital, south of Mount Sutro, is a complex with institutional buildings that rise above the surrounding residential planning districts. The steeper slopes of Mount Sutro and Golden Gate Heights remain largely undeveloped. A topographic map review (USGS 1905, 1926, 1940, and 2018) and historical aerial photographs show that the planning district has been developed primarily by grading and stabilizing the dunes rather than employing mass cut-and-fill methods.

The 1869 USGS map is the earliest map of the city that includes the Inner Sunset planning district. At the time of its publication, the planning district contained sparse rural development along an unpaved road that ran north of Mount Sutro and west of Golden Gate Heights; the road turned south as it approached Lake Merced. A secondary road extended southward through the valley between Golden Gate Heights and Mount Sutro and

passed a cluster of buildings immediately north of Laguna Honda Reservoir. This secondary road reached the Almshouse, a small facility that provided housing and medical care to indigent San Franciscans; the facility expanded in later decades and became known as the Relief Home, the precursor to Laguna Honda Hospital.

A review of USGS maps indicates that additional residences and roadways were present by 1895, particularly in the planning district's northeast corner, immediately south of Golden Gate Park. By 1915, the city's formal street grid had expanded to cover much of the planning district around Mount Sutro and Golden Gate Heights; numerous residences lined the streets in the northern half of the planning district. Harrison Ryker's 1938 aerial photographic series shows that most of the low-lying residential blocks were fully built out, although several scattered blocks were just then being graded and prepared for development. The opening of the Twin Peaks Tunnel and Duboce Tunnel in the 1910s and 1920s facilitated direct transit connections between the planning district and downtown San Francisco, enabling residential growth in the Inner Sunset planning district (Brown 2013:24–25). However, Golden Gate Heights remained largely undeveloped until terraced residences arose in later decades as streets were built on its slopes.

There are no known Native American archeological sites in the Inner Sunset planning district. Because the area was mostly developed prior to the enactment of environmental laws and has not been extensively redeveloped since that time, project-level archeological review has been limited. The pre-European contact sensitivity model prepared by Far Western (Meyer and Brandy 2019) identifies moderate to high sensitivity for buried pre-European contact archeological sites in the valley between Golden Gate Heights and Mount Sutro, an area that contained the naturally occurring Laguna Honda and therefore would have been an attractive environment for pre-European contact Native American residents. The area of raised pre-European contact archeological sensitivity extends northward to Golden Gate Park, which historically contained numerous sources of fresh water. The surrounding areas of the Inner Sunset planning district are modeled as having low pre-European contact archeological sensitivity.

The Inner Sunset planning district developed rapidly as a residential planning district in the late-nineteenth and early twentieth centuries through a process that involved speculative construction of housing developments. Developments of that kind would be assumed to have included water and sewer service and therefore would be less likely than earlier development to include depositional features like privy pits and wells that would have information potential. However, earlier historic-era uses—scattered homesteads, ranches and farms, a few institutional developments like the Alms House, and recreational routes and development—would most likely have included depositional features that may be archeologically significant for their potential to provide information about early rural uses of San Francisco as well as activities at institutions that were deliberately placed on what would have been the outskirts of the city in the late 1800s and around the turn of the nineteenth century. Roads were constructed through the planning district's current boundaries to serve and provide access to isolated rural dwellings and occasional recreational developments by the late 1860s. Archeological evidence associated with these residences, including household materials and building foundations, may provide information regarding historic-era settlement patterns and lifeways during the post-Gold Rush period, a time from which few residential buildings areextant. Investigations on the grounds of Laguna Honda Hospital could uncover materials associated with physical development of the Almshouse and Relief Home, including materials associated with past populations. The 1866 City Directory lists a cemetery near Laguna Honda, however very few

historical references refer to this cemetery, so it's possible that plans were carried out for the cemetery. An additional research area involves operations and technology associated with Laguna Honda Reservoir as well as associated settlement that supported the Spring Valley Water Company's delivery of drinking water to early San Francisco residents.

Few archeological studies have been completed for the Inner Sunset planning district; however, the 1994 *Archeological Resources Evaluations for the Laguna Honda Hospital's Institutional Master Plan* provides general Native American and historic-era background on the southeastern section of the planning district as well as context for potential research questions associated with historic-era development of the Laguna Honda Hospital site.

Because few archeological studies have been completed in the Inner Sunset planning district, determination of the potential to encounter archeological sites is based on Pre-European contact modeling and review of available historical maps. Given the planning district's natural hydrology as well as its limited rural and institutional development during the second half of the nineteenth century, there is some potential for Native American and historic-era archeological sites to be identified in the course of future development in the locations identified above and at individual sites that were settled prior to the initiation of widescale housing development in the planning district, ca. 1890. Otherwise, the Inner Sunset planning district appears to have limited archeological potential.

Marina Planning District

The Marina planning district is bounded by the northern shore of the San Francisco Peninsula, with bay waters to the north, Van Ness Avenue to the east, California Street to the south, and Lyon Street to the west. The Marina planning district includes the entirety of the Marina neighborhood and portions of the Pacific Heights neighborhood.

Historically, the northern portion of today's Marina planning district was part of San Francisco Bay. Prior to being filled in, the shoreline extended to approximately Bay and Laguna streets. Near the shoreline, the natural environment of the Marina was characterized by coastal marsh areas and sand dunes over the rocky bluffs of the Franciscan geological formation, which included sedimentary, volcanic, and metamorphic rock. One such rocky bluff near Fort Mason reached a height of 117 feet. The rest of the planning district was mostly sand dunes of up to 150 feet tall and grasslands. Several lagoons dotted the area near the bay shore as well, including a swampy freshwater lagoon south of Fort Mason and a lagoon at the Presidio. It is likely that the area also had freshwater springs, as is suggested by the presence of several nineteenth-century farms.

A review of aerial overviews (e.g., GoogleEarth), as well as a sampling of parcels on the San Francisco Property Information Map, indicates that, overall, the Marina is characterized by dense residential development, including multifamily apartment buildings, duplexes, and single-family dwellings, most of which have rear yards. There are also several planning district commercial corridors, along with schools, churches, and parks and other open spaces, including some along the waterfront. Examples of building foundation depths in the area indicate excavation and pile depths of 4 to 75 feet. Subgrade or partial subgrade levels are present but do not dominate the area. A topographic map review (USGS 1905, 1926, 1940, and 2018) indicates that the area north of Bay

Street was filled in. Prior to this fill, there was a massive sandbar parallel with the shore with a road and development in 1869. Major filling of the area was associated with the Panama Pacific Exposition of 1915.

The northern shore of the San Francisco Peninsula was highly suitable to Native American settlement. Early historical accounts reference a Native American rancheria or settlement near the shore of the Presidio. In 1797, the Spanish established a small military battery, Batería San José, an outpost of the Presidio de San Francisco. In 1850, the area became a U.S. Army reservation. In 1860, Fort Mason was established to fortify the coast. Neither area would be subject to development under the 2022 housing element.

The northern shoreline of the Marina planning district was filled in with sand over the course of several decades, beginning in the late 1860s. The western portion of the Marina planning district, adjacent to the Presidio, was graded in the 1880s for construction of a parade grounds, and the planning district's street grid was laid by 1895 (USGS 1895). Filling of the area was completed in 1912, in preparation for the 1915 Panama-Pacific International Exposition. A USGS map from 1915 shows that most of the exposition that took place in the Marina planning district, north of Lombard Street. South of the exposition area, the same map shows a mostly developed planning district, characterized by a dense configuration of multifamily apartments with full-lot coverage and larger single-family homes with rear yards. The Marina also included buildings and spaces that served the planning district overall, such as small-scale commercial buildings, schools and other institutional buildings, and waterfront parks and open spaces.

Fort Mason, on the northeast corner of the planning district, became a temporary refugee camp for some of the city's newly homeless population following the 1906 earthquake and fires. It also served as a key army supply depot and point of embarkation during World War I, World War II, and the Korean War.

Numerous archeological sites have been identified in the Marina planning district, most at Fort Mason, an area outside of the City's jurisdiction, as part of the Golden Gate National Recreation Area. There also are several known shell midden sides on Presidio lands immediately west of the Marina planning district. Findings at these Native American shell midden sites, most of which have been found buried in dune sands, have included human remains, faunal remains (e.g., shell, bird, fish, mammal bone), and artifacts, such as obsidian and other lithic tools, bone tools, ornaments, shell beads, grinding stones, quartz crystals, ochre, hearths, and fire-affected rock. A shell midden with human remains also was found recently on the west side of Van Ness a few blocks south of Van Ness (S. Morgan personal communication 7/15/2021). Given the existence of these pre-European contact-era archeological resources, as well as the Marina's proximity to the shoreline, fresh water sources, and food sources, there is high likelihood for additional Native American resources to be present in the planning district (Meyer and Brandy 2019), particular in the vicinity of this historic shoreline, south of Bay Street, and along the Lombard corridor

Several historic-era archeological sites have also been identified in the Marina. Historic trash pits were found in test excavations in Ft. Mason (Baker 1978). Furthermore, the potential exists for early historic-era archeological resources related to the Ojo de Agua de Figueroa land grant to be encountered, along with the home of historical figure Juana Briones. Resources related to a nineteenth-century woolen mill, and to agricultural and domestic uses of the Washerwoman's lagoon area also could be present. Other findings could contribute to our knowledge of the military history of the nearby area (e.g., batteries, Fort Mason, Presidio of San Francisco), wharves and piers, Chinese gardens located west of Octavia Street, a 1906 disaster refugee camp, the 1915

Panama Pacific International Exposition, cemetery resources (e.g., Hart Cemetery and an archivally documented Catholic cemetery), and Victorian-era resources.

Additional research should refer to the report on the Fort Mason archeological test excavations (Baker 1978).

Given the number of historic-era and Native American archeological resources present within the Marina planning district, as well as proximity to the coast and numerous freshwater sources, the Marina appears to have moderate to high sensitivity for pre-European contact and historic-era archeological resources. In addition, Far Western's sensitivity model indicates that the Marina contains areas of moderate, high, and highest near-surface, buried, and submerged resource sensitivity, especially along the shoreline.

Mission Planning District

The Mission planning district is bounded by Market Street to the north, 11th Street and Central Freeway/James Lick Freeway to the east, I-280 to the south, and Dolores Street to the west**.** The Mission planning district contains the entirety of the Mission neighborhood.

Historically, the natural setting of the central portion of the Mission planning district was a valley, with hills to the south and west and tidal marshes to the east that extended to Mission Bay. The topography was irregular and hilly, but with small green glens and fertile soils. The area was crossed by multiple creeks, including Mission Creek, as well as a lagoon, and a spring. The central and largest part of the area, the valley, comprises Pleistocene-aged marine sands, sandstone, and alluvium, as well as Holocene-aged marine sands, alluvium, and dune deposits. Along the hilly eastern and western edges of the planning district, Mesozoic-aged bedrock (Franciscan Formation) is present at the ground surface. Within this formation, several lithologic types, which were useful in Native American tool making, are present, including spheroidal basalt, sandstone, and an upper formation of radiolarian chert. Beginning in the Mission Period, people began filling in the marshland along the eastern margin of the area. In the mid- to late nineteenth century, the marshes and lagoon that extended inland from Mission Bay along the Mission Creek channel were gradually filled. By the late twentieth century, as much as 10 to 30 feet of sandy fill had been placed over the pre-development tidal marsh deposits in some areas.

A review of aerial overviews (e.g., from GoogleEarth), as well as a sampling of parcels on the San Francisco Property Information Map, indicates that existing development in the planning district overall is characterized by primarily residential properties in the southern and western portions of the planning district. Open rear yards are prevalent at the townhouses in the southeastern part of the planning district; the western areas are a denser mix of townhouses and apartment buildings. The northeast quarter contains commercial and some industrial development, ranging from one to three stories tall, as well as vehicle storage yards for municipal agencies. Some commercial buildings in this planning district have deep foundations. Basements are not common but are sometimes present.

The Mission planning district is one of the earliest settled parts of San Francisco, with Mission Dolores founded in 1776, possibly on or near the Native American village of Chutchui, near a lake or lagoon at the headwaters of Mission Creek (Dean 2004). Over time, the mission and associated settlement grew to include at least 43 buildings. In 1835, the mission was secularized, and, in 1839, the earliest land grants were given to Spanish settlers, who constructed adobe and wood-frame houses and other structures at scattered rancho sites.

The 1853 USCS map of San Francisco shows the Mission Dolores development laid out to the west of Mission Creek. An east–west thoroughfare leads from the creek to the mission, with marked plots (probably fenced fields or corrals) and a few small roads branching off to the north and south. A plank road through the sand dunes along the future route of Mission Street connects the mission area to the settlement at Yerba Buena Cove, which had grown exponentially starting in 1849 under the stimulus of the Gold Rush. The 1857 USGS map shows that more of the street grid had been established and that there were fields under cultivation; the land was used to grow crops for the increasing population.

San Francisco continued to grow at a rapid pace from that point onward. An 1869 map (USCS 1869) shows that additional streets had been laid out around Mission Dolores, and much of the western, central, and eastern parts of the planning district had been developed. Woodward Gardens, an amusement park and zoo, covered two blocks in the northern part of the Mission District. Horner's Addition, an 1860s housing development, was on the west side of the Mission planning district, and Potrero Nuevo, a settlement that had grown up around a rancho with access to the bay near the mouth of Mission Creek, included buildings east of the planning district. The Union and Pioneer racecourses were situated at the less-developed center of the planning district. By 1895, a USGS map shows that the Mission planning district was fully developed, with gridded streets lined with buildings. The 1906 earthquake and fire that destroyed part the Mission planning district stopped at Dolores Street on the west and 20th Street on the south, sparing Mission Dolores itself. Mission Dolores Park, in the planning district, was used as a refugee camp. Over the next decade, the planning district was rebuilt (Dean 2004).

N.C. Nelson's annotated map of San Francisco shell mounds includes one in the northern part of the Mission District, which has been estimated to have been located in the vicinity of Valencia and 14th streets (subsequently recorded and mapped solely on the basis of Nelson's notes as P-38-000019). Redeposited shell midden has been found at two construction project sites in the vicinity (Pastron and Robichaud 2007; Archeotec 2021)—but no substantial deposit been relocated. In addition, the ethnographic Yelamu villages of Chutchui, a summer and fall camp, and Sitlintac, a winter camp, were believed to have been in the Mission Dolores area (Milliken 1991), although their specific locations are unknown. A shell midden believed to represent a neophyte (Native American converts) village was uncovered during construction around the mission (Ambro 2003), and a shell midden on Valencia just north of Market and the former course of Mission Creek (SFR-148/H) yielded glass trade beads, indicative of an ethnohistoric occupation period. and also produced obsidian bifaces, chert cores, and faunal remains. Far Western's pre-European contact sensitivity model shows that the Mission planning district includes areas that range from the lowest to the highest probability with respect to finding near-surface pre-European contact deposits, depending mainly on proximity to historical water sources. Expected Native American site types include shell middens, including sites of the ethnohistoric period. Cultural deposits from sites occupied by Native American neophytes may provide insights into diet, material culture, cultural change, and even social and religious life.

The area within and around the historic Mission Dolores complex is highly sensitive for historical archeological resources. Several Mission-related structures have been identified, and others should be considered potentially present when planning future projects in the area. Features associated with Mission Period occupation may include foundations, domestic and agriculture-related refuse deposits, water conveyance features, privy pits,

and potentially human remains. Potential architectural features could include walls, foundations, wooden platforms, posts, and ovens. Such sites have the potential to provide information about the earliest non-native occupation of San Francisco. Later uses of the planning district included industrial activities, which may be reflected in sites shown on historic mapping in the eastern part of the planning district, including a match factory, Chinese laundry(s), and at least one lumberyard. Residences were present throughout the planning district by the end of the nineteenth century. Associated historical property types could include refuse features such as pits, privies, and wells.

Additional information about the archeology of the Mission planning district can be found in A Focused Archeological Research Design/Testing/Data Recovery Plan for the 261 Dolores Street Project, 263–265 Dolores Street, San Francisco, California (Pastron and Ambro 2008) and the City within a City Historic Context Statement for San Francisco's Mission District (San Francisco Planning Department 2010).

Given the local geography, which historically included flat areas around the headwaters of Mission Creek and the inland edge of a salt marsh of Mission Bay, as well as the history of landscape filling, which both buries and protects resources, the Mission planning district has a high degree of sensitivity for near surface and buried resources. This is supported by the presence of several historic-era and Native American archeological resources within the planning district, with Mission-era resources and those related to Native American neophytes of particular interest.

Northeast Planning District

The Northeast planning district is bounded on the west by Van Ness Avenue; on the south by Bush Street, California Street, and Sacramento Street; and on the north and east by San Francisco Bay. The Northeast planning district contains the entirety of the Russian Hill, North Beach, and Chinatown neighborhoods and portions of the Nob Hill and Financial District/South Beach neighborhoods.

The Northeast planning district is situated around three low hills, Nob Hill (341 feet), Russia Hill (318 feet), and Telegraph Hill (295 feet). The hills, along with Black Point, which extends into the bay at the northern edge of the planning district, are composed of sandstone. The lowlands are generally characterized by marine sands, sandstone, and alluvium deposited between the late Pleistocene and Holocene (Lawson 1908). The coastal margins have been largely reclaimed using fill, the placement of which began in the 1850s and was facilitated by construction of a series of sea walls along the bay margin of the planning district, which now support wharves and piers. Most of the planning district is within the North Beach watershed. Prior to extensive development and landfill activity surface water from Telegraph Hill drained into San Francisco Bay to the north and east, as well as Yerba Buena Cove to the southeast (OMCA 2021). The bayside slopes of Russian Hill and Pacific Heights drained into Cow Hollow, to the northwest, and contributed to a series of freshwater ponds near the dunes at Fort Mason and along the future alignment of Lombard Street. The west and south slopes of Nob Hill drained to Hayes Creek, which (south and east of the planning district) flowed into the marshlands around Mission Bay (OMCA 2021).

A review of aerial overviews (e.g., from GoogleEarth), as well as a sampling of parcels on the San Francisco Property Information Map, indicates that the Northeast planning district has highly varied development,

including the skyscrapers of the Financial District, the luxury condominiums of Nob Hill, the large commercial buildings and piers at North Beach, and the narrow streets with shops and apartments in Chinatown. Although the entire planning district has experienced some degree of development, large sections have been heavily developed. Modern large scale and tall development around the margins of the planning district in areas filled historically generally has required deep foundations or soil improvements due to the presence of unconsolidated fill and groundwater. Development on the steep hill slopes often includes piles or retaining walls to prevent slides. Elsewhere, deep foundations typically have not been needed, but much of the area's existing development includes at least partial subgrade stories to accommodate street slopes.

During the Spanish and Mexican periods, the planning district was largely vacant (Pastron and Bruner 2013), although, in the early nineteenth century, foreign ships, including Russian and English vessels, docked at Yerba Buena Cove for supplies, and a few trading posts and stores were established in the mid-1830s. These were quickly joined by other stores as merchants engaged in trade with area ranches, the mission, and the foreign ships. Through the early and mid-1840s, the town remained small, with fewer than 50 people working and living in its adobe structures. By the time the United States took the city in 1846, American-style wooden houses became the dominant shelter type at the settlement, although adobe construction was commonly used as well. In 1848, the discovery of gold on the American River caused the population of Yerba Buena to explode as gold seekers from around the world arrived in Yerba Buena Cove en route to the gold fields. The population of Yerba Buena expanded from a few hundred prior to the Gold Rush to between 20,000 and 25,000 By the end of 1849. Many, having failed in the search for gold, returned to the city to provide services and goods needed by gold seekers and the burgeoning population.

In 1848, Yerba Buena Cove extended southeastward along the bay from what is now the eastern end of Broadway to approximately the location of the intersection of Spear and Folsom streets; north of Market as far inland as Montgomery Street; and to First Street, south of Market. A few piers extended into the cove to facilitate offloading of ships at high tide. Starting in 1849, many vessels were abandoned in Yerba Buena Cove as crews jumped ship to join the rush for gold. Some of these, particularly in the area north of Market Street, were converted to stores, warehouses, and hotels that were connected to the shore by long piers. Over the next few years, these piers were extended farther and farther into the bay as sediment and debris from a series of wildfires built up between the piers, creating a need to reach deeper water. By 1853, much of Yerba Buena Cove north of Market Street, had been filled in this manner (USCS 1853). The fill consisted of rubbish, including ship ballast and building rubble, rock blasted from nearby hills, and the hulls of ships (Pastron and Bruner 2013). USCS 1853 shows that a street grid had been established—at least on paper—as far west as Taylor Street, and dense urban development had occurred on some blocks as far west as Stockton Street. By the early 1850s,immigrants from southern China had settled along Grant Avenue. By 1861, the western edge of the Northeast planning district had been fully platted as the Western Addition (Wackenreuder and Langley 1861).

Except in the northwest quadrant of the planning district, much of the development in the Northeast planning district was destroyed during the 1906 earthquake and fire, leading many residents to move farther out and into the developing outskirts of the city.

One suspected Native American site, P-38-000023, has been apocryphally documented in the planning district, based on an 1861 newspaper account of an ashy shell deposit with fish bones and evidence of burning noted on a point above the bay at the northern end of Hyde Street. N.C. Nelson's landmark shell mound survey, conducted between 1906 and 1909, the major reference source for Native American sites on San Francisco's peninsula, did not record any shell mounds in this planning district. However, as Nelson's and other historic maps show, much of the planning district's shoreline had been largely developed nearly 60 years earlier. As a result, it is possible that Native American sites were present in this area may but have been obscured by development, grading, and fill by the time of Nelson's survey.

The Far Western pre-European contact sensitivity analysis assessed the Northeast planning district's sensitivity for near surface and buried sites along the original shoreline as ranging from low sensitivity to the highest level of sensitivity (Meyer and Brandy 2019). Some areas along the historic shoreline are also sensitive for potential submerged pre-European contact resources. The historical shoreline at the base of Telegraph Hill and the original Yerba Buena Cove shoreline are considered areas with the highest levels of sensitivity; the hilltops are assessed as having the lowest pre-European contact sensitivity. Expected Native American site types for the Northeast planning district include shell middens. Isolates, such as projectile points and burials, could also be encountered.

The Northeast planning district has a large number of recorded historic era archeological sites. This paragraph discusses a few major projects. Several archeological investigations have taken place in this planning district, particularly in the developed lowland area. Less archeological work has been done in the interior hills of the planning district, in part because they were cut down to use as bay fill and thus have reduced archeological potential.

Excavations during the 717 Battery Street project, on the edge of the former Yerba Buena Cove, recorded 25 archeological features and 65,000 artifacts dating from the early- to late nineteenth century (Pastron and Bruner 2013). Work in Chinatown at Hoff's Store and at 600 California Street have shed light on commercial establishments serving the Chinese community during the Gold Rush (Archeo-Tec 1998; Delgado 2006; Pastron 1990). Potential historic archeological resources include features and deposits associated with the Juana Briones adobe, early unmarked cemeteries, buried ships, wharves, and piers, and nineteenth-century privies, wells, and trash features. Historical research themes might include Yerba Buena and immediate post-Yerba Buena development, maritime industries, and immigration, Chinese overseas culture, and the Gold Rush.

This planning district includes portions of the predevelopment bay shoreline, as well as pre-development freshwater sources, attributes that would have been desirable for both Native American and historical peoples. Despite the planning district being subject to early development, potentially burying as-yet undocumented Native American archeological sites, at least one shell midden (P-38-000023) has been noted to have been present in the planning district. On this basis, the predevelopment shoreline and the area around historic freshwater sources are anticipated to have high probability with respect to containing buried as-yet undocumented Native American archeological sites.

Given the nature and extent of historic development in the planning district, it also has high sensitivity with respect to historic-era archeological sites. The area with the highest likelihood for containing historical archeological sites is the area around Yerba Buena Cove, and under the fill in the cove itself, where the remnants

of merchant vessels and structures are known to be present. The southern part of the planning district may contain the remnants of structures associated with residences dating from the mid-nineteenth century, with Chinatown and the North Beach area likely to contain residential and commercial sites associated with Chinese and Italian immigrants, respectively.

Outer Sunset Planning District

The Outer Sunset planning district is located south of Golden Gate Park, west of 19th Avenue, and north of Vicente Street and bounded on the west by the ocean coast. The Outer Sunset planning district contains the entirety of the Sunset/Parkside neighborhood.

Historically, the natural setting of the Outer Sunset planning district was characterized by extensive rolling dunes, most of which were sparsely vegetated. Today, the highest elevations are in the central part of the area, with slopes descending to the south, north, and west. Dune sands to variable depths are underlain by the Colma or Merced Formation near the coast and, at some locations, by shallow bedrock.

There are no known historic freshwater sources in this area. A 1938 aerial photograph shows that sand dunes dominated the natural setting well into the twentieth century. Dunes in the central portion of the planning district were graded and stabilized between around 1910 and 1940 to facilitate widespread development.

A review of aerial overviews (e.g., from GoogleEarth), as well as a sampling of parcels on the San Francisco Property Information Map, indicates that development in the planning district overall is characterized by tightly packed single-family residences or duplexes with open rear yards. Scattered taller buildings are present along transit corridors. Existing foundations are generally shallow (i.e., 3 to 5 feet); subgrade or partial levels are rare, except as needed to accommodate sloping streets. A topographic map review (USGS 1905, 1926, 1940 and 2018) suggests that the planning district has been developed primarily by grading and stabilizing the dunes rather than employing mass cut-and-fill methods.

A review of the USCS 1869 map, the first historic map that provides detailed coverage of this area, indicates that the Outer Sunset planning district was a wasteland historically, probably because the extensive dune fields hindered travel across the area, and because the absence of freshwater sources for farming and grazing hindered both rural uses and residential development. Residential development of the area was very limited prior to the 1906 earthquake, except for a small settlement that began as “Carville,” located in the extreme northwestern corner of the Outer Sunset planning district where Golden Gate Park meets the coast (USGS 1905). This settlement made use of trolley cars junked at the site by the Municipal Railroad and converted to provide housing for a somewhat bohemian residential neighborhood near the beach and far from the settled part of the city. Eventually, as the demand for more conventional housing in the Outer Sunset grew, in the first decades of the twentieth century, Carville was demolished (AECOM 2020).

By 1915, streets had been laid out along the outer margins of most of the planning district, and development continued to densify and encroach on the interior of the planning district. Ryker’s 1938 aerial photographs indicate widespread systematic work was under way to stabilize sand dunes and lay out streets at that time. The area was essentially fully developed in its current pattern by the 1940s and 1950s.

There are no known archeological sites in the Outer Sunset planning district. Archeological investigations have been rare. Most development has been on the scale of single-family residences, and has been viewed as having limited archeological impact potential. Far Western's pre-European contact sensitivity model assesses most of this area as having low sensitivity. However, sensitivity is modeled as markedly higher in the three or four northernmost blocks of the Outer Sunset planning district, based on the presence of numerous small freshwater sources in the adjacent Golden Gate Park, and along a strip several blocks wide on the western margin of the planning district, based on the proximity to resources on the Pacific Ocean. Expected Native American site types include shell middens and potentially sites with special uses, such as shellfish collection camps. Isolates, such as projectile points, may also be expected.

Significant historical resources would be expected to be rare, based on the generally late development in the area. Just offshore, the S.S. King Philip, wrecked in 1878, is partially submerged along Ocean Beach. The schooner Reporter wrecked at the same site in 1902 and remains of this are broken up around the King Philip. Significant features could be present in association with early twentieth-century Carville development, which reused abandoned street cars as residences. Research themes of interest could include an investigation of the lifestyles of the populations that were drawn to this settlement with non-traditional housing in an isolated location. A second area of potential historic interest is the site of the 1870s Giant Powder Works, which was west of 19th Avenue between Kirkham and Moraga streets and employed Chinese laborers. This site was used for only a couple of years before the powder works exploded in 1872, after which the company relocated out of the area. Archeological materials associated with this industry, if any survive, could include residential as well as industrial features because it is likely that workers resided near the plant because, in 1870, the location was too remote for daily commuting. Such features would provide a rare glimpse into the lives of the workforce of the gunpowder industry, which often included Chinese workers. The Potrero 7 cultural resources overview (Wirth Associates) and California Department of Transportation historic context on rural work camps (California Department of Transportation 2013) may provide relevant research themes, should evidence of a powder works camp be identified. Finally, it appears that there has been almost no historic treatment of the systematic program of sand control that immediately preceded widespread development of much of the interior of the Outer Sunset planning district, which is evident in the 1938 aerial. The history of this endeavor and any remaining archeological evidence, which most likely would be aligned along the streets or near lot lines, would be of interest.

Few archeological studies have been completed for this area. However, the archeological research design and treatment plan for the Westside Recycled Water Project (ESA 2014) provides background on the history of development along the western margin of the Outer Sunset planning district.

Given the near absence of archeological studies in the Outer Sunset planning district, archeological characterization is based almost entirely on pre-European contact modeling and the locations of resources identified archivally. Apart from the locations identified above, the Outer Sunset planning district appears to have limited historic and Native American archeological potential, except in a few small areas, as noted.

Richmond Planning District

The Richmond planning district is bounded on the south by Golden Gate Park, on the west by the Pacific Ocean, and on the north by the San Francisco Presidio. Its eastern boundary is an irregular line between the southeast corner of the Presidio and the northeast corner of Golden Gate Park, west of the Marina and the Western Addition planning districts. The Richmond planning district includes the entirety of the Inner Richmond, Outer Richmond, Lincoln Park, Seacliff, and Presidio Heights neighborhoods and portions of the Lone Mountain/University of San Francisco (USF) neighborhood.

Prior to the period of historical development, the natural setting in the Richmond planning district consisted of rolling Holocene-aged sand dunes. Today, the highest elevations are in the eastern part of the planning district, with some areas reaching 420 feet above sea level; the slopes descend to the west and north. Lobos Creek and Mountain Lake are located in the San Francisco Presidio, immediately to the north of the planning district, and a number of freshwater ponds were present historically in Golden Gate Park, just south of the planning district, but surface fresh water was apparently all but absent historically in the planning district. One exception was Kelly Pond, a large freshwater pond in the dunes near the intersection of Parker Street and Geary Boulevard. The pond was filled in the 1890s. Topographic maps and aerial photography document that sand dunes were widespread in the area well into the twentieth century, particularly in the southern half of the planning district, although areas of substantial vegetation were present, based on historic photos. The northern half of the planning district was graded and stabilized gradually between 1895 and 1914. Starting around 1915, rapid development throughout the planning district occurred, and by the mid-1940s, a street grid had been established for the entirety of the planning district (USGS 1915, 1940).

A review of aerial overviews (e.g., from GoogleEarth), as well as a sampling of parcels on the San Francisco Property Information Map, indicates that development in the planning district overall is characterized by tightly packed single-family or duplex residences with open rear yards and often with a basement level. The planning district's commercial and transit corridors contain examples of taller apartment buildings, but none more than six stories. Topographic maps (USGS 1905, 1926, and 2018) suggest that the planning district has been developed primarily by grading and stabilizing the dunes, rather than employing mass cut-and-fill methods, except in the areas of steepest dunes where mass grading in some instances very likely occurred.

The earliest development of district was the Lone Mountain cemetery, an extensive area delineated in 1854 at the east end of the Richmond and western end of the Western Addition district, which was then the "Outside Lands" of the city, perceived as distant from the city center. Soon other cemeteries were established within the delineated area. The "big four" cemeteries, Odd Fellows, Masonic, Calvary, and Laurel Hill Cemeteries, were in use by the mid-1850s to mid-1860s. City Cemetery (also known as Golden Gate Cemetery) was established in 1868 in what is now Lincoln Park, adjacent to the northwestern corner of the planning district (in an area not subject to development).

The Richmond District outside lands were incorporated into the city in 1866 per the Outsideland Ordinance. Urban development of the outside lands was initially slow but use of the area increased with the establishment of Golden Gate Park in the 1870s as transportation lines. The cemetery complex was a popular park-like destination by the 1880s.

At Lands End, at the northwestern corner of the planning district, recreational enterprises developed on the cliffs near the shore, including the original Cliff House (constructed in 1863), joined by Sutro Heights Park in 1885, and, later, the Sutro Baths and Sutro Merrie Way Pleasure Grounds (1896). (Note that all of these are on Golden Gate National Recreation Area lands just west of the planning district.) The Midwinter Fair of 1894 drew international crowds to Golden Gate Park and probably brought increased attention to the Richmond District as a desirable area to settle.

Early historical maps with detailed coverage of this area after the beginning of development reveal that by 1895, development began along the San Francisco Railroad/Southern Pacific Railroad alignment, near the modern route of Geary Street, and expanded steadily from east to west (USGS 1895). In the Richmond district this rail corridor was probably occupied by the private Park and Cliff House Railway (Ferries and Cliff House Railway), which was the primary purpose of which was to bring people from downtown to the Sutro recreational developments at Lands End, at the northwest corner of the planning district (Cable Car Museum 2021). The railroad skirted the planning district along the northern and western boundaries, then terminated at Point Lobos. The Point Lobos and San Francisco Toll Road, today's Geary Boulevard, was the first road to traverse the entire planning district from east to west (USCS 1869). The road was developed by local dairy farmers. Early development was clustered along principal transportation routes, such as California Street, Geary Boulevard, and Fulton Street, as well as several north–south cross streets (Russell et al. 2014).

By 1900, most of the cemeteries had stopped accepting burials, as there was a push to move cemeteries out of the city to meet increasing demand for urban expansion (Shelton 2008). Development accelerated following the earthquake in 1906, after large parts of the east side of the city were destroyed. By 1915, the street grid in the planning district had been extended to the Pacific coast, and development continued to densify and encroach on the interior of the planning district.

San Francisco Property Information Map data show that the planning district was fully developed in the current pattern by the 1920s. Between the 1920s and the early 1940s, from the Big Four cemeteries interments were disinterred and relocated to Colma, but the thoroughness of the removal effort varied substantially from location to location: skeletal material, coffins and tombstones are found with some frequency during project excavations in these areas (ESA 2020, in progress; Ganda 2021, in progress; Paleowest 2021, in progress). The area vacated by the removal of the Laurel Hill Cemetery was not fully developed until the late 1940s.

There are three known Native American archeological sites in the Richmond Planning District, all in the Lands End vicinity, within the Golden Gate National Recreation Area (not subject to housing element policies). The sites consist of shell middens, located within a few hundred feet of the coast. Far Western's pre-European contact sensitivity model assesses most of the planning district as having low to moderate sensitivity (Meyer and Brandy 2019), primarily because surface freshwater sources apparently were very limited historically. However, sensitivity is modeled as markedly higher near the southwestern corner of the planning district and on the southern boundary, based on the presence of numerous freshwater sources in Golden Gate Park, and in proximity to resources at the coast, as well as along the northern border and northwest corner of the planning district (especially the Seacliff neighborhood), based on proximity to water sources and known sites in the Presidio. Although Far Western's model does not incorporate Kelly Lake (probably because it apparently was

overlooked in historic mapping), the area around this lake, near Parker and Geary, also very likely has high sensitivity for near-surface and buried Native American resources. On this basis, there is moderate likelihood for additional resources to be present in the planning district. Most Native American resources are expected to be located near freshwater sources or along the ocean coastline where they would provide access to marine food resources. Expected Native American site types include shell middens and, potentially, sites with special uses, such as the shellfish collection camps associated with sites that provide coastal access.

There are a few known historic sites within the Golden Gate National Recreation Area at Lands End (not subject to housing element policies). Two of the sites are near the coast and associated with properties owned by Adolph Sutro near Point Lobos. Architectural remains and a refuse deposit associated with Sutro's Ocean Terrace dating from 1890s to 1910s were identified as well as the location of Merrie Way Amusements, an amusement park that was active as of 1894. Several additional historic archeological sites consisting of human remains and mortuary materials have been recorded in recent years at development sites in the former Odd Fellows Cemetery, City Cemetery, Lincoln Park, Masonic Cemetery, and Cavalry Cemetery (ESA 2020, in progress; Ganda 2021, in progress; Paleowest 2021, in progress).

Christopher Ver Planck's Social and Architectural History of the Richmond District gives a concise history of early development and key developers in the planning district (Ver Planck 2002). ESA's San Francisco Public Utilities Commission San Francisco Westside Recycled Water Project Historical Context and Archeological Survey Report (Russell et al. 2014), with its larger scope, provides a more detailed look at the history and archeology of the west side of the San Francisco Peninsula.

Given the number of both historic-era and Native American archeological resources, the Richmond planning district appears to have moderate to high sensitivity for both Native American archeological resources around the margins, based on known sites and proximity to the shoreline and freshwater sources (with particular attention to Kelly Pond, a rare fresh water source), and relatively low sensitivity for Native American resources in the planning district's interior. The southeastern part of the planning district and Lincoln Park, on the northwest, have high sensitivity for historic-period human remains and mortuary materials within the boundaries of historic cemeteries. Elsewhere, there is some potential for historic archeological features representing the earliest development of the planning district, which included scattered dairy farms, recreational development, and residences during the 1860s through 1890s. The earliest Sanborn maps, from the 1880s, show wells at many developed sites, which suggest that municipal services were not available and that depositional features therefore are likely. Expected historic site types also include refuse features (e.g., pits, privies, wells), cemeteries, architectural features (e.g., foundations, footings, slabs, ovens, stoves, walls, furnaces), and potentially dairy infrastructure from the late nineteenth and early twentieth centuries. After about 1890, and certainly by 1905, as development density increased, most residences very likely were served by city water and sewer, so the potential for significant depositional features decreases. Site-specific information would be needed to assess the potential for domestic or farm-related depositional features at any particular site.

South of Market Planning District

The South of Market planning district is bounded on the north by Howard Street from 11th Street to The Embarcadero, on the west primarily by U.S.101, on the east by the bay shore, and on the south by 25th and 26th

streets. The SoMa district includes the entirety of the Mission Bay and Potrero Hill neighborhoods, and portions of the SoMa and Financial District/South Beach neighborhoods.

The natural setting of the South of Market planning district was immensely varied historically. The planning district contained the southern part of Yerba Buena Cove, a shallow cove with wide tidal flats that was the location of the settlement of Yerba Buena and San Francisco's first port, and all of Mission Bay, including the mouth of Mission Creek and all but the most inland extension of the associated marshes (ICF 2019 and 2020). Most of the bay shore within the South of Market planning district was historically composed of coastal marshlands, with the important exceptions of the rocky headlands of Rincon Point ("Point of Rocks") and Potrero Point (formerly "Point San Quentin"), which provided deep-water access to the bay for ship builders. The northern portion of the planning district was dominated by large dune fields with little vegetation, whereas the southern and eastern portions, south of the Mission Bay marshes, were coast prairie scrublands. Elevations in the dune fields extended up to 80 feet above to sea level at the highest sand dune (just north of the planning district, on Market Street, and between Second and Third Streets). Within the South of Market planning district, two separate deposits of dune sands have been identified between layers of tidal flats that represent changes in sea level (Byrd et al. 2014). Alluvial deposits with some bedrock outcroppings are present in the southern part of the planning district. Early development of San Francisco included mass movement of sand and rock blasted from rocky points to infill Yerba Buena Cove, Mission Bay, and other areas along the bay shore and level street grades (Byrd et al. 2014; ICF 2019; 2020). Artificial fill has been identified within the northern portion of the South of Market planning district to up to 8 feet deep, extending to as deep as 15 feet in the middle portion (Byrd et al. 2014; ICF 2019 and 2020). The depth of fill is highly variable, however, and material described as fill in geotechnical reports oftentimes is simply disturbed native dune sand rather than imported material.

Based on aerial overviews and a sampling of parcels on the San Francisco Property Information Map, existing development in the greater South of Market planning district is variable. In the northeast, Rincon Hill has mid- and high-rise businesses and residential towers, whereas South Beach and South Park contain low- and mid-rise businesses with some residential and light industrial development. There are docks along the Bay, but no associated industrial support areas. The part of the South of Market planning district between Howard Street and I-80, to the southwest of 4th Street, is characterized by a mix of low-rise business and residential development. The Mission Bay, Dogpatch, and Central Waterfront/Potrero Point areas within the planning district house industrial and institutional buildings, including the UCSF complex, warehouses, Oracle Park, and docks along the bay, whereas Potrero Hill, on the inland side of the planning district, is mainly residential. Existing foundations near the bay are typically deep (from 20 to 55 feet bgs) to provide seismic stability for construction on fill and bay muds. Two to four subgrade levels are common under the highest buildings. Elsewhere, foundations may be less than 5 feet deep.

Topographic map review (U.S. Coast Survey 1853; USGS 1905, 1926, 1947, 1995) shows dramatic landscape changes from the beginning of the Gold Rush to present day. Yerba Buena Cove was filled in, creating the northern tip of the South of Market planning district as well as much of the Financial District (in the Downtown planning district). Mission Bay and the marshlands to the north and west were also filled, and Mission Creek was channelized, creating land for the extensive development of Mission Bay. Rincon Hill was cut down the middle at Second Street, and Potrero Hill and other several other hills were reduced in size, both to provide bay fill and to facilitate travel through the planning district. The northeast bayshore of the city was extended several city blocks

to the east of its 1848 alignment. This necessitated adjustments of the city's street grade to provide for drainage, which were accomplished by massive and systematic grading of the natural dunes, particularly in the blocks between Market Street and the shores of Mission Bay north of Mission Creek.

During the Spanish and Mexican periods in California, the Yerba Buena Cove area was the principal shipping port, while the areas to the south, including Mission Bay, remained mostly undeveloped and were very likely used for cattle grazing. By the mid-1820s a trail extended along the southern edge of Yerba Buena Cove west to Mission Dolores. Trade and population increased during the 1830s (ICF 2019); however, it was not until the Gold Rush that development began to spike. Lots in the South of Market planning district, including those in Happy Valley and Pleasant Valley, which bordered Mission Street, were hastily developed as early as 1847—and intensively developed over the succeeding several years—to accommodate an influx of population.

As fill of Mission Bay and the bayshore marshes and the associated dune leveling progressed, more permanent development of the leveled land occurred, and soon the SoMa area had wood-framed houses. As development density increased, the SoMa area became predominantly working class. Local businesses capitalized on their proximity to the waterfront by opening foundries, gas works, rope works, mills, factories, and shipbuilding yards (Ziesing 2000).

The construction of the Long Bridge (along the modern alignment of Third Street) in 1864, which spanned Mission Bay and the Islais Creek estuary, greatly improved access to the South Bayshore planning district, immediately south of the South of Market planning district, which initially was an industrial outpost on the outskirts of the city. Construction of the San Francisco-San Jose Railroad from 1861 to 1863, along the future alignment of Interstate 280, in the South of Market planning district, also spurred development further south. The arrival of the railroad also coincided with the infilling of Mission Bay. During the 1880s, development swayed toward commercial and industrial use in the south, whereas the northern portion remained primarily residential.

Because most of the structures in the South of Market planning district were wood-framed, the fire that followed the earthquake in 1906 all but destroyed the area. Redevelopment of the South of Market planning district focused increasingly on industrial and commercial use, although with some residential areas. The population also became increasingly more diverse.

As described in the historic context section above, little permanent settlement occurred in the planning district during the Spanish and Mexican periods; therefore, it is unlikely that sites associated with that period exist within the planning district; no such sites have been documented during the many archeological investigations that have been conducted here. As development boomed during the Gold Rush period, more development occurred in this area, and structures became more permanent, and thus may have left an archeological record in the form of privies and other refuse deposits, foundations, and other structural features. Many areas in the eastern part of the planning district were used for farming or grazing. Both Yerba Buena Cove and Mission Bay were filled in to accommodate historic development; therefore, some maritime resources, such as piers, wharves, or skuttled ships, also may be present within the former waters of Mission Bay and Yerba Buena Cove in the South of Market planning district.

A substantial number of archeological investigations have been conducted in the northern portion of the South of Market planning district (between Howard Street and the Mission Creek channel), but far fewer have focused on the southern portion of the planning district (Mission Bay neighborhood south of the Mission Creek Channel and Potrero area). Within the northern portion of the South of Market planning district, numerous historic-era archeological resources have been documented. These resources include maritime resources, structural remains, resources associated with railroad development, and refuse associated with the 1906 earthquake, as well as industrial, commercial, and numerous domestic refuse features.

In addition, about a dozen Native American sites have been investigated in the greater South of Market planning district. Deep archeological investigations have been concentrated north of Mission Creek, where building foundations have extended far underground. Several later- Native American shell middens were found along coves and streams near the Mission Bay shoreline. The vast majority are 10 feet or more below the modern surface, although there is historic archival evidence of shell midden deposits on or near the surface in the early decades of the twentieth century. Dune fields with little vegetation have been subject to constant movement by the wind and can therefore preserve intact Native American archeological deposits. Far Western's pre-European contact sensitivity model (Byrd et al. 2014) assesses about 70 percent of the planning district as having low or non-existent sensitivity for buried and surface sites, with roughly equal likelihoods of moderate, high, and very high sensitivity across the rest of the area. There is high sensitivity for submerged sites east of the historical bayshore and along the former course of Mission Creek. The highest potential is assigned to the zone within 1,225 feet (375 meters) of the pre-Gold Rush shoreline, and high potential is assigned to the zone 1,225 feet (375 meters) to 2,500 feet (750 meters) from that historic shoreline. The Central SoMa Plan EIR indicates that expected Native American site types may include villages, special use sites, such as shellfish collection camps, as well as isolated artifacts, cemeteries, and deep, early burials (Byrd et al. 2014).

More than 25 historical archeological sites have been identified within the South of Market planning district. These include several blocks between Bryant and Harrison Streets found during highway construction. The partially dismantled store ship, Candace, and Charles Hare's shipbreaking yard have been found along the historical coastline. Several late nineteenth century residential and commercial sites with depths ranging from near the ground surface to several meters deep, have shed light on the household and business practices of the time.

Given the number of known historic-era and Native American archeological resources present within the South of Market planning district, as well as the lack of study that has been conducted in the southern portion, the South of Market planning district appears to have a high sensitivity for both historic-era and Native American archeological resources.

South Bayshore Planning District

The South Bayshore planning district is bounded by San Francisco Bay to the east, U.S. 101 to the west, 25th and 26th streets in the Central Waterfront planning district to the north, and the southern border of San Francisco County to the south. The South Bayshore planning district contains the entirety of the Bayview Hunters Point neighborhood.

The South Bayshore planning district is set on the east-facing shore of San Francisco Bay. Prior to 1850, it was characterized by the estuaries of Islais and Yosemite creeks, coastal marshlands, coastal prairies, and willow groves. A series of low hills and ridges divided the landscape and separated it from settlements in other areas of San Francisco to the north and east. Several hilly promontories, including Hunters Point and Candlestick Point, jut eastward into San Francisco Bay, while Bayview Hill in the south rises 425 feet above sea level. Before development, Yosemite Creek and Slough divided Hunters Point and Candlestick Point. The surface geology of the planning district is characterized by coastal outcrops of Jurassic-aged serpentine of the Great Valley complex, which are surrounded by Pleistocene and Holocene alluvium (Graymer et al. 2006). The planning district includes Islais Creek (near the north edge of the planning district), which was once the largest natural body of water in the city. The mouth of the creek was characterized by a wide, shallow marshy estuary that covered the northern portion of the South Bayshore planning district. Islais Creek has now been channelized and covered along much of its course. The marshlands at the mouth of the creek have been filled with rocks blasted from the hills adjacent to Potrero Point, as well as outside fill, including urban rubble from the San Francisco earthquake of 1906. Additional fill episodes in other areas, including Visitacion Cove, extended much of the eastern and southern shores of South Bayshore into the bay.

A review of aerial overviews, as well as a sampling of parcels on the San Francisco Property Information Map, indicates that development in the South Bayshore planning district is variable. The eastern shoreline is almost exclusively industrial, from the Central Waterfront, through Islais Creek and India Basin, to Hunters Point and Candlestick Point. The western areas of this planning district are primarily residential, but with some commercial zoning interspersed between the tracts of one- or two-story family dwellings and occasional multistory condominium and apartment buildings. There is also a line of commercial buildings between the western residential area and the eastern industrial zone, which was created by filling the coastal shallows and marshlands. The area was subject to redevelopment through the twentieth century, including the Butchertown Redevelopment Plan in the 1960s and 1970s.

The South Bayshore planning district was sparsely occupied during the Spanish and Mexican periods. European-American land uses during these periods were limited to small ranching operations that would have left little in the archeological record. Initial historic-era development of the land that would become the South Bayshore planning district occurred in a piecemeal fashion during the nineteenth century. Beginning in the 1820s, local land grants were used for grazing cattle, including ranching associated with Mission Dolores (Allan and Dean 2010). The planning district was taken up by the Potrero Viejo grant of the Rancho Rincon de Las Salinas y Potrero Viejo, which was given in 1839 by Governor *pro tem* Manuel Jimeno to José Cornelio Bernal. The grant stayed with the Bernal family as the territory passed to the United States from Mexico and was gradually sold off or lost in claim disputes, paving the way for development.

Multiple Chinese fishing settlements, composed of wooden houses built on stilts over the mudflats, existed on Hunters Point and the bayshore to the north from 1859 through 1930. By the 1860s, ship and boat builders had established themselves along the shoreline of Hunters Point, which included a racetrack, hotel, and pavilion from 1863 to 1883. In 1865, Long Bridge was built over Mission Bay and Islais Creek, which improved access to South Bayshore from the SoMa area (Dean 2006). Between 1868 and 1877, facilitated by the new access provided by the Long Bridge, the area south of Islais Creek developed into Butchertown accommodating noisy

and malodorous slaughterhouses and tanneries that were being banned in the developed areas of the city. Facilities were constructed on piers and wharves along the Islais Creek estuary, where tidal action could flush waste into the bay. By the end of that period, the area contained all the city's slaughterhouses and most of the associated industries, such as facilities for tanning and tallow production. Parts of this area continued as farms and cattle ranches, usually operated by Chinese, Italian, and Portuguese immigrants. After the 1906 earthquake, there was a large influx of new residents, leading to the building of residences and streetcar lines, construction of sea walls along Islais Creek and, by the 1920s, filling and channelizing of most of the estuary (Allan and Dean 2010). However, some of the tannery businesses continued in operation into the 1920s. During World War II, Hunter's Point, a major military installation, drew thousands of job seekers to the Bay area.

There are at least 10 known Native American sites in this planning district, all of which are shell middens. N. C. Nelson initially mapped nine of these middens between 1906 and 1909, undertaking his shellmound survey after initial reclamation work had taken place in the coastal areas, but before additional filling and alteration through the twentieth and twenty-first centuries. During investigations at the Crocker/Bayshore Mound (CA-SFR-7), Nelson uncovered 28 burials, a hearth, bone awls, pipe fragments, pestles, mortars, net sinkers, and a small crucifix. As part of the Potrero 7 project, investigations in the 1970s revealed that the remnant of that deposit, which had been on the surface in 1906, had been buried under some 30 feet of fill (Wirth and Associates 1979a, 1979b). Between 2016 and 2018, geoarcheological boring near Quint Street and Jerrold Avenue identified redeposited, intact terrestrial and submerged midden components of another shell midden, SFR-171, buried under deep artificial fill and (in the case of the submerged component) under Young Bay Mud at the edge of the former Islais Creek marsh. Far Western assesses much of the original shoreline and land adjacent to freshwater sources as having high to highest potential for the discovery of pre-European contact archeological sites, while higher elevations, such as Hilltop Park, are judged as having the lowest potential (Meyer and Brandy 2019). The South Bayshore planning district is believed to include a number of near-surface Native American shell midden deposits, particularly in the Hunter's Point vicinity, although most have not been relocated since the early part of the twentieth century.

As described above, historic-era development began in earnest in the mid- to late nineteenth century. By 1859, a Chinese fishing settlement of wood houses built on stilts was established at Hunters Point (Olmsted et al. 1982). At Bayview Park, there was an entertainment venue with a racetrack, hotel, and pavilion. Industrial development included livestock processing on wood wharves and piles at Butchertown in the Islais Creek and India Basin areas. Shipbuilding companies at Hunters Point constructed a stone dry dock and 200-foot wharf by the 1860s. In 1869, a road was present along the modern route of Highway 101 from Islais Creek to Visitacion Valley, and then extended along the bayshore well into San Mateo County. The Bayview neighborhood continued to grow after the 1906 earthquake, with steel and shipbuilding companies establishing facilities there to support the U.S. Navy. These companies attracted new workers, which spurred residential development in the area (WSA 2010).

Many historical archeological or historical studies have been completed for this planning district. While these have identified a wide range of historic activities in the planning district, only two historic period resources have been recorded. CA-SFR-111H P-38-000109 was a burned hull of a wooden sailing vessel that was partially exposed in Bay Mud; the vessel was documented during an archeological survey in 1986 (Foster and Delgado 1986) and is very likely one of at least five such wrecks, as shown in aerial imagery from 1938 of the area just

offshore from 250 Executive Park Boulevard (Ryker 1938). The survey suggested that the ship was most likely a nineteenth-century schooner. Another deeply buried boat hull, CASFR-178H (P-38-004915), interpreted as the remains of a ship salvage operation, was discovered during pipeline excavations in bay mud in the same vicinity in 2016 (WSA 2016).

Several extensive archival studies, archeological surveys and test investigations have been conducted within the South Bayshore planning district, particularly along the waterfront (AECOM 2020; ArcheoTec 2009; Far Western 2017). These have documented several Native American shell middens, as well as sites related to maritime industries and military activities. Fewer studies have focused on the west side of the planning district.

The South Bayshore planning district has one of the highest concentrations of historically-documented Native American archeological sites in San Francisco. Reclaimed areas of land along the Islais Creek drainage and Yosemite Slough are highly sensitive for submerged pre-European contact sites (Byrd et al. 2014). It was also the location of significant historic-era developments during the late-nineteenth and early twentieth centuries. Consequently, this planning district appears to have high sensitivity for both Native American and historical archeological resources.

South Central Planning District

The South Central planning district is bounded by Alemany Boulevard/I-280 to the north and west, Bayshore Boulevard to the east, and the San Francisco/San Mateo county line to the south. The South Central planning district includes the entirety of the Outer Mission, Excelsior, McLaren Park, Visitacion Valley, and Portola neighborhoods.

Located inland from San Francisco Bay, the natural environment of the South Central region historically bordered marshlands to the southeast, with high hills in the center of the planning district. Soils in the area include pre-quaternary bedrock, Pleistocene to Holocene alluvium with clay and sand, and Holocene fill.

The South Central area includes hills with elevations of up to 500 feet at its center, near today's McLaren Park, that slope southwest down into the Visitacion Valley basin. Historically, the area had several freshwater sources, including the upper reaches of Islais and Yosemite Creek, and several smaller creeks, and a small lake. A reservoir, part of the Spring Valley Water Company system, was present in the northeast portion of the South Central area as early as 1904 (Open SF History 2021). In 1936, the Works Progress Administration expanded the reservoir and named it University Mound Reservoir.

A review of aerial overviews (e.g., GoogleEarth), as well as a sampling of parcels on the San Francisco Property Information Map, indicates that the planning district is characterized principally by single-family homes with setbacks and rear yards; basements or partial subgrade stories, to accommodate the rolling topography of much of the planning district, are not uncommon. Taller apartment buildings are located along transit corridors. There are several planning district commercial districts, various community-serving institutions, and public open spaces, including McLaren Park and Crocker Amazon Playground. Building foundations in the area have excavation depths of up to 21 feet.

Before the Gold Rush, the area was part of two Mexican land grants, Rancho Rincon de las Salinas y Potrero Viejo and Rancho Cañada de Guadalupe la Visitación y Rodeo Viejo. Mission Street was the first major road to connect this remote area to the developed area of San Francisco. It was present along essentially its modern route by 1869, connecting to the settlement of Puerto Suelo just south of the modern San Francisco County border. The southern area of the planning district was only very sparsely developed prior to the twentieth century, however, with most development consisting of small farms and ranches, particularly in Visitacion Valley, as described below. The northern and western parts of South Central contained several smaller streets, all of which were sparsely lined with buildings.

In 1861, the Homestead Association developed a housing plan for the Excelsior neighborhood (Wackenreuder 1861), thereby establishing the street and block pattern that is visible today; however, it was not until 1896 (USGS) that street grids were built in that area. South Central also attracted industry, and railroad lines from the Southern Pacific Railroad are shown on the 1869 USCS map of San Francisco, extending along the route of present-day Interstate 280. The University Mound Ladies Home was built in 1884 to house single women. Residential building began in earnest in the west Excelsior neighborhood in the first decade of the twentieth century, then the east Excelsior and Outer Mission neighborhoods in the 1920s. Through the late nineteenth and early twentieth century, the southern part of the South Central region of San Francisco was used primarily for agricultural purposes, including dairy farms, produce farms, and greenhouses for flowers and produce. Agriculture relied on the immigrant farm and dairy workers who were drawn to the area. Many of the area's residents were Jewish, Italian, and Maltese. However, after the 1906 earthquake, many residents of the burnt out urban area moved south and a street grid of residential development appeared in Visitacion Valley, as shown on maps by 1911 (Chevalier).

The 1906 disaster brought more residents to the area. In response, new housing, planning district-serving businesses, and a streetcar line were built. By 1915, this suburban outpost of San Francisco had grown dramatically. In the southern portion of the planning district, which had been the least populated, significant development had occurred by this time. In addition, the area had a thriving flower district, including numerous nurseries. A historical map from 1938 shows a planning district pattern that looks very similar to the present pattern (Ryker 1938).

World War II brought additional changes to the area. Nearby Hunters Bay Point served as a major military installation during the war, which attracted thousands of newcomers to the Bay Area in search of employment. In 1941, a public housing project was constructed in Sunnydale (southern part of Visitacion Valley) to house many of the workers. Much of Visitacion Valley was developed around this time.

There is a complex of three known Native American archeological shell midden sites along Upper Islais Creek in South Central(CA-SFR-3/17/34). Two of these, recorded by N.C. Nelson (1908), included burials; one was recorded by Viola Happy in 1929. CA-SFR-17 contained obsidian flakes, fire-affected rock, charmstones, bone tools, projectile points, and haliotis pendants; a 1951 newspaper account mentions that seven skulls were found there. More recently, SFR-191/H was uncovered in Visitacion Valley. This includes a massive shell midden, historically known as the Ralston Mound. A second smaller shell midden (as yet not assigned a site number) was

recorded on the same project site. SFR-191/H also included deposits and features associated with the Union Pacific Silk Manufacturing Company, where Chinese workers produced silk ribbons in the 1870s and 1880s.

Although no other historical archeological sites have been documented within South Central, expected historical property types in South Central include industrial and domestic sites and associated artifacts. Historical research themes might include agriculture (farms, dairies, nurseries), residences (Mexican ranchos, late-nineteenth and early twentieth century), industry (e.g., Southern Pacific Railroad, Schlage Lock Factory), and World War II.

Additional research should refer to the archeological research design and treatment plan for the Visitation Valley redevelopment and associated archeological reports (WSA 2009, 2019).

The likelihood of Native American sites in the South Central planning district is high to very high along the upper reaches of Islais Creek and Yosemite Creek, in the northeastern quadrant and western parts of the planning district, and throughout Visitacion Valley. Elsewhere, pre-European contact sensitivity is modeled as no more than moderate, and low to nonexistent on the higher hills. Early twentieth-century domestic sites may be found in the north and west parts of the planning district; the southeast may contain industrial sites at the edge of the South Bayshore industrial development.

Western Addition Planning District

The Western Addition planning district is bounded by Oak Street and the north side of the Golden Gate Panhandle to the south, Van Ness Avenue to the east, California Street and Geary Boulevard to the north, and Parker Street and Golden Gate Park to the west. The Western Addition planning district includes the entirety of the Japantown and Western Addition neighborhoods and portions of the Pacific Heights, Hayes Valley, and Lone Mountain/USF neighborhoods.

Historically, the natural environment of the Western Addition was characterized by steep, partially wooded sandy slopes divided by 80- to 100-foot sand ridges. Located inland, far from any shoreline, the Western Addition had a few freshwater sources, including small ponds in the southwestern part of the planning district near the panhandle. The head of a single creek, Hayes Creek, was identified in the area, but it was most likely ephemeral, flowing only temporarily when it rained. It extended roughly from today's Golden Gate Avenue southeastward to Market Street. Natural sediments consist of Holocene-aged dune sand, marsh deposits, and alluvium, along with Pleistocene-aged marine sand, sandstone, and alluvium, as well as occasional Mesozoic-aged bedrock outcroppings. During the early late-nineteenth and early twentieth centuries, the area was extensively cut and filled. The process of cutting and filling most likely began in the mid- to late 1850s with a steam paddy clearing sand hills that were used as fill elsewhere in the city (ESA 2004). The area remained almost entirely undeveloped through the Gold Rush period (1849–1859), with the earliest development occurring in the 1860s during construction of the Point Lobos Toll Road (now Geary Boulevard) and Calvary Cemetery and Masonic Cemetery in the 1860s, which are discussed in the Richmond District section above. By 1869, the street grid from the eastern end of the planning district west to Divisadero had been laid out, at least on paper, and some streets constructed, with scattered development along the streets. West of Divisadero, the area was essentially undeveloped, with the exception of the cemeteries and the Pt. Lobos Road. Another road extended diagonally across the west end of the planning district enroute to Lake Merced and Sloat Boulevard.

A review of aerial overviews (e.g., GoogleEarth), as well as a sampling of parcels on the San Francisco Property Information Map, indicates that the planning district is characterized by densely developed residential properties, including an abundance of multifamily apartment buildings, along with some single-family homes and duplexes. Taller buildings are clustered along transit corridors. Most parcels in the area have rear yards or, in the case of multifamily apartment buildings, inner courtyards and large surface parking lots. Several planning district commercial corridors and large commercial developments are present along major thoroughfares. The Western Addition contains a significant number of government-sponsored, nonprofit affordable housing projects, as well as schools, churches, community centers, parks, playgrounds, plazas, and other community-serving spaces. The excavation depths of large building foundations and basements in the area extend down to 40 to 50 feet, though most residences are built on shallow mat slabs.

Based on reviews of the 1859 and 1869 USGS maps, the first historic maps that provided detailed coverage of this area, the Western Addition remained largely undeveloped until the 1860s, with the exception of farm complexes at east end of Panhandle and in Hayes Valley. This was very likely due to its isolated location, which was away from the shoreline and freshwater sources, as well as its inaccessible terrain. The area may have been occasionally traversed during the Spanish and Mexican eras, but most settlements during that period were at Yerba Buena, the Presidio, and Mission Dolores. The earliest developments in the area were the Big Four cemeteries, of which only Calvary Cemetery and Masonic Cemetery fall within the Western Addition District. Beginning in the 1850s, San Francisco recognized that the existing Yerba Buena Cemetery on Market Street (at the present location of the Civic Center), although originally in a remote part of town, was in the way of the city's westward expansion. The western part of the city, however, still seemed very remote and was considered a better location for the city's dead. Lone Mountain Cemetery was dedicated in 1854, just outside the planning district's boundaries. Other nearby cemeteries included Masonic Cemetery (1864), Odd Fellows Cemetery (1865), and Laurel Hill Cemetery (1867). The remains from the Big Four cemeteries were disinterred between 1920 and about 1940 and removed to cemeteries in Colma. However, a number of burials, as well as remnants of coffins, headstones, and other mortuary materials, were inadvertently left behind but have been discovered in subsequent construction (Archeo-Tec 2004b, ESA 2017) The Point Lobos Toll Road (now Geary Boulevard), constructed in the 1860s, was another early development. Residential development followed, consisting mostly of single-family dwellings with large yards; some also had barns and carriage houses. By 1869, the eastern half of the planning district was moderately developed, and most streets and parcels were completely or partially delineated. Sanborn maps from 1887 illustrate new pockets of densely built housing.

Maps and archival materials from the late-nineteenth century show a parcel that was owned by the Central Railroad (Hicks-Judd Block Books 1894), the Central Horse Car Depot and Stables (Sanborn Insurance Company Map 1887), and the Market Street Railway Old Car Barns (Sanborn Insurance Company Map 1887).

The earthquake and fire of 1906 represented a major turning point for the planning district. The Western Addition was spared from the fires and therefore became a destination for many of the city's newly homeless. Larger single-family homes were subdivided and converted into smaller homes or boarding houses. By 1913, the area contained tightly packed residences, apartment buildings, hotels, planning district commercial buildings, and community-serving uses. A "power house sub station" was also present by 1913 (Sanborn Insurance Company Map 1887).

Major redevelopment efforts during the 1970s brought another wave of changes to the urban landscape and infrastructure of the Western Addition, including new large-scale commercial and housing developments. A second phase of redevelopment brought a significant number of government-sponsored, nonprofit affordable housing projects (i.e., public housing, housing co-ops, church-sponsored affordable housing), as well as new public open spaces and a community center.

Overall, few archeological investigations have occurred in the Western Addition because most development has been small-scale and viewed as having limited impact potential. Far Western's pre-European contact sensitivity model assesses about half of this area as having high or very high sensitivity for buried sites, particularly in the southwest portion near the freshwater ponds and in the central-north portion. Expected Native American site types in the Western Addition include isolated burials and features, lithic scatters, and isolated artifacts. Potential research themes include Native American chronologies, cultural history, subsistence and settlement patterns, and trade, transport, and interregional contact.

Although few archeological investigations have been conducted in the Western Addition, several resulted in the discovery of cultural material dating to the historic era. Examples of discoveries include the remnants of a pre-1900 wood-framed house, a wooden wall and brick foundation from the late-nineteenth century, and a privy at 333 Fell Street. Expected historic site types include refuse features (e.g., pits, privies, wells), architectural features (e.g., foundations, footings, slabs, ovens, stoves, walls, furnaces), and urban infrastructure (e.g., roadbeds and road remnants, such as brick and wood planks) from the late-nineteenth and early twentieth centuries. Potential sites include Lone Mountain Cemetery and parts of the Calvary (P-38-5545) and Masonic cemeteries. Potential historic themes include Victorian culture and urban geography—specifically, the rise of the middle-class and consumer behaviors, the standardization of space within the house, the standardization of land use and urban geography in the late nineteenth century, and the experiences of the diverse ethnic groups that moved into the Western Addition following the 1906 disaster.

Few archeological studies have been completed for this area; however, the archeological research design and treatment plan for the Western Addition A-2 Redevelopment Project (Archeo-Tec 2004) provides background on the history of development. Archeological characterization is based on the small number of investigations conducted within the planning district and surrounding areas. The likelihood of Native American sites occurring in the Western Addition ranges from very low to very high, and given the area's past isolation, there is a possibility of locating deeply buried Native American sites and artifacts. There is also the potential for discovering cultural material from the historic period.

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5. SUMMARY

A. Summary of Proposed Action

The housing element update establishes goals, policies, and actions to address the existing and projected housing needs of San Francisco. The housing element update includes overarching goals for the future of housing in San Francisco that respond both to state law requirements as well as local community values. The underlying policies and actions would guide development patterns and the allocation of resources to San Francisco neighborhoods. In general, the housing element update would shift an increased share of the San Francisco's projected future housing growth to transit corridors and low-density residential districts within well-resourced areas.[14]

The housing element update would modify the policies of the general plan's housing element. It would not include specific changes to existing land use controls (e.g., zoning) or approve any physical development (e.g., construction of housing or infrastructure).[15] As such, the proposed action would not result in any direct physical changes to the environment, but would result in reasonably foreseeable indirect changes. Specifically, the department assumes that adoption of the housing element update would lead to future actions, such as planning code amendments to increase height limits along transit corridors and to modify density controls in low-density areas that are primarily located on the west and north sides of the city, designation of housing sustainability districts, and approval of development projects consistent with the goals, policies, and actions of the housing element update.

B. Summary of Sensitivity

The San Francisco Peninsula has been occupied for at least 7,900 years by Native Americans and, during the past 250 years, first by Spanish and Mexican settlers before becoming part of the United States. For more than a hundred years, archeological research in the City of San Francisco has helped to build a picture of the Native American and early historical of settlement in the region. As more archeological resources have been identified over time, researchers have refined their archeological sensitivity models and research designs, enabling planners to predict where significant archeological resources are most likely to be located.

This document assesses archeological sensitivity across the city to assist in determing potential effects to archeological resources as a result of anticipated changes in the distribution of future housing development growth consistent with the housing element update. It also is intended as an aid for planning research designs

[14] *Well-resourced areas* are high- and highest-resource areas, which are neighborhoods identified by the State of California that provide strong economic, health, and educational outcomes for its residents. More information is available at: *https://www.sfhousingelement.org/high-opportunity-areas*.

[15] Any changes to existing land use controls would require related legislative processes including review and public hearings before the planning commission and/or the board of supervisors. Approval of housing development or infrastructure would require development applications and approval. The EIR analyzes the secondary physical environmental impacts that could occur as a result of the housing element update.

and archeological treatment plans for future construction projects. This assessment is not comprehensive but provides background information and proposed research questions that may be posed to address sites that are uncovered by construction of new development.

The analysis in this document uses known archeological site types and locations, historical landforms and water sources, historical mapping and archival research, modeled Native American resources sensitivity, and trends in construction projects to assess the potential for archeological resources to be encountered as the result of future development consistent with the housing element update in the city during the next 30 years.

Based on this program-level archeological sensitivity assessment, there is the potential for significant archeological sites present in areas of the city where a greater share of anticipated growth under the housing element update would occur relative to the 2050 environmental baseline (i.e., development expected to result from the existing housing element), and for significant impacts on archeological resources to occur as a result of future development consistent with the housing element update. However, the potential for archeological resources to be present at a particular location, to have survived past development, and to be affected by future development consistent with the housing element update must necessarily be assessed at the time a specific project is proposed. This is the case because, although it is possible to make generalizations about the patterns of Native American and historic period land use and development in a particular planning district, the archeological potential of each individual project site can be determined only by consideration of a specific project site. This potential would then be assessed at the project level, based on the environmental setting of a specific project site; the history of past land use and development at that particular location; and the nature and depth of soil disturbance associated with a specific development project at the time it is proposed. Methods for this assessment are discussed in Section 4.2, Cultural Resources, of the EIR prepared for the housing element update.

The following Summary of Sensitivity first considers archeological sensitivity by planning district in well-resourced areas (i.e., high- and highest-resource areas, as defined by the state's opportunity area maps) and then sensitivity in moderate and low-resource areas (as defined by the state's opportunity area maps). As discussed above, the housing element update would increase housing production and shift a greater share of anticipated growth from the east side of the city to well-resourced areas along transit corridors and low-density areas that are primarily located on the west and north sides of the city. Most of the well-resourced areas are in the west and north sides of the city, and most of the moderate and low-resource areas are in the east and south sides of the city. Therefore, as discussed below, most of the anticipated increase in impacts to archeological resources as a result of future development consistent with the housing element update relative to the 2050 environmental baseline would occur in the planning districts located in the well-resourced areas in the west and north sides of the city (e.g., Inner Sunset, Outer Sunset, Richmond planning districts). Conversely, the potential for impacts as a result of future development consistent with the housing element update relative to the 2050 environmental baseline would be reduced in some planning districts in the moderate and low-resource areas in the east and south sides of the city (e.g., Downtown, Mission, and South of Market planning districts), to the extent that the housing element update would shift a greater share of anticipated growth from archeologically sensitive areas to areas of the city that are less archeologically sensitive.

Well-Resourced Areas

Most of the well-resourced areas (i.e., high- and highest-resource areas, as defined by state's opportunity area maps) are in the west and north sides of the city. The planning districts to the south of the Golden Gate Park planning district have little or no submerged Native American sensitivity and no potential for buried maritime features in areas that would be developed. With the exception of known Native American sites near the ocean coast in the Richmond, Golden Gate Park, Outer Sunset, and Ingleside planning districts, the Native American sensitivity of the western side of the city is not very well known due to a lack of archeological research. Areas with proximity to fresh water in the Richmond, Golden Gate Park, Lakeshore, and Ingleside planning districts are considered to be highly sensitive for Native American archeological resources.

The potential for significant historic-period sites is generally low in residential areas on the west side of the city south of the Golden Gate Park planning district, with the exception of relatively isolated earlier development. The majority of development in the Outer Sunset and Inner Sunset planning districts, particularly along the major avenues, occurred primarily in the 1920s through the 1950s and was supplied with city water and sewer from the time of initial development, precluding the need for trash pits or privies—elsewhere the most likely historical archeological residential features. As a result, the potential to find significant historic-period depositional features in west San Francisco south of the Golden Gate Park planning district is likely low, except where later development overlies the scattered sites of earlier rural, industrial, agricultural and recreational development.

No archeological sites have been found in the Inner Sunset planning district. Far Western's model assesses it to have low Native American archeological sensitivity, except along the northern edge of the planning district near the water sources in Golden Gate Park (Meyer and Brandy 2019).

The northern part of the Richmond planning district includes some areas around historical water sources modeled as high and highest sensitivity for Native American archeological resources (Meyer and Brandy 2019). With the exception of Native American sites around Lands End and in the Presidio planning district (where the proposed action is not anticipated to result in any housing units) and mortuary remains associated with historic-period cemeteries, no archeological sites are known in this area. However, this may be due to the relatively small number of major construction projects there in the period since archeological investigations have routinely been undertaken in the city.

The Marina planning district appears to have moderate to high sensitivity for Native American and historic-era archeological resources. In addition, Far Western's sensitivity model indicates that the Marina planning district contains areas of moderate, high, and highest near-surface, buried, and submerged resource sensitivity, especially along the shoreline.

A few historical archeological sites have been found in the northeast tip of the Central planning district. The lower elevations in the northeast portion of the Central planning district include some areas of the highest sensitivity for Native American sites, primarily based on proximity to historical water sources (Meyer and Brandy 2019). Ethnographic accounts mention Native American villages in the general area of the Central planning district.

The northeast corner of Buena Vista planning district contains a few recorded historical archeological sites. The eastern end of the Buena Vista planning district is also considered to have the highest sensitivity for Native American resources (Meyer and Brandy 2019). Ethnographic accounts mention Native American villages in the general area of the Buena Vista planning district.

The central portion of the Western Addition planning district contains areas of the highest precontact sensitivity around historical water sources (Meyer and Brandy 2019). Few historical sites have been identified in the Western Addition planning district, but that is likely due to a lack of major construction projects to drive archeological testing and monitoring for site identification.

Moderate and Low-Resource Areas

Most of the moderate and low-resource areas (as defined by state's opportunity area maps) are in the east and south sides of the city. The east side of the city (e.g., South of Market, Mission, Downtown, South Bayshore planning districts) appears to be more sensitive for archeological resources dating prior to European contact, than the west side. However, this may be in part the result of more extensive development and deeper project excavations on the east side that have revealed many Native American resources, in contrast to relatively more limited development on the west side since archeological investigations have routinely been undertaken in the city, which were uncommon before the 1980s. Sensitivity for historical sites is also high on the east side of the city, where much of the early settlement began. During this early historic period settlement, the absence of municipal utilities—with the resultant necessity for nearly ubiquitous privy pits and features, such as wells —has provided an archeological record of domestic occupation.

Construction in the Downtown and South of Market planning districts has included many buildings in areas of unconsolidated fill and sand that have either included deep basements or required pilings or soil improvements to 50 or 60 feet in depth or more. In this area, rated high and highest for near surface, buried and, in many areas, submerged Native American archeological sensitivity (Meyer and Brandy 2019), isolated Native American burials have been found 55 feet below the ground surface, and one submerged midden was found at a depth of 42 feet below surface. Shell middens buried in the dunes and buried and submerged ships have been exposed during excavations for such development.

Historical, ethnohistoric and disturbed Native American sites have been found in the Mission planning district. The northern portion of the Mission planning district is considered to have high Native American archeological sensitivity, in particular in the vicinity of historical waterways and water sources (Meyer and Brandy 2019). Ethnographic accounts mention Native American villages in the general area of the Mission planning district.

The predevelopment shoreline and the area around historical freshwater sources in the Northeast planning district are anticipated to have high probability with respect to containing buried as-yet undocumented Native American archeological sites. It also has high sensitivity with respect to historic-era archeological sites, particularly around Yerba Buena Cove, and under the fill in the cove itself, where the remnants of merchant vessels and structures are known to be present.

In the South Bayshore planning district, in the southeast part of the city, a large number of shell middens have been noted, and the area along the historical coastline and in the marshlands of the historical creeks are modeled as having the high and highest levels of pre-European contact sensitivity (Meyer and Brandy 2019). Historical industrial sites along the shoreline that extended into the San Francisco Bay, dating to the late nineteenth and early twentieth centuries, were part of the process of land reclamation in this area.

No Native American or historical archeological sites have been found in the Bernal Heights planning district. Far Western assesses the area to have the lowest sensitivity for Native American archeological sites, except along historical water channels at the northern and southern borders, which are highly sensitive. (Meyer and Brandy 2019). There was scattered historical development along the corridor by 1869, especially in the Bernal Heights area.

The northeastern portion of the South Central planning district has areas of highest Native American archeological sensitivity along Islais Creek, where a couple of shell middens have been noted, and there are known shell middens just south and east of the southeastern end of the planning district. The eastern part of the planning district includes some areas of highest sensitivity for Native American sites along the Yosemite Slough, but the rest of this planning district is modeled as sensitive (Meyer and Brandy 2019). Only one historical site has been identified in the South Central planning district, and the area is considered low sensitivity for historical sites.

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APPENDIX G

Transportation Supporting Information

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

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APPENDIX G.1. ROADWAY CLASSIFICATIONS

Roadway Classifications

The San Francisco Planning Department has developed a street hierarchy system for the City and County of San Francisco, in which the function and design of each street are consistent with the character and use of adjacent land. The major classifications in the Vehicle Circulation Plan of the San Francisco General Plan are:

- Freeways: Limited access, very high-capacity facilities; primary function is to carry intercity traffic; they may, as a result of route location, also serve the secondary function of providing for travel between distant sections in the city.
- Major Arterials: Cross-town thoroughfares whose primary function is to link districts within the city and to distribute traffic from and to the freeways; these are routes generally of citywide significance; of varying capacity depending on the travel demand for the specific direction and adjacent land uses.
- Transit Conflict Streets: Streets with a primary transit function which are not classified as major arterials but experience significant conflicts with automobile traffic.
- Secondary Arterials: Primarily intra-district routes of varying capacity serving as collectors for the major thoroughfares; in some cases supplemental to the major arterial system.
- Recreational Streets: A special category of street whose major function is to provide for slow pleasure drives and cyclist and pedestrian use; more highly valued for recreational use than for traffic movement. The order of priority for these streets should be to accommodate: 1) pedestrians, hiking trails or wilderness routes, as appropriate; 2) cyclists; 3) equestrians; 4) automobile scenic driving. This should be slow and consistent with the topography and nature of the area.
- Collector Streets: Relatively low-capacity streets serving local distribution functions primarily in large, low-density areas, connecting to major and secondary arterials.
- Local Streets: All other streets intended for access to abutting residential and other land uses, rather than for through traffic; generally of lowest capacity.

In addition to the San Francisco Planning Department's roadway classifications, the freeways, major arterials, and transit conflict streets are included in the Congestion Management Program (CMP) Network and Metropolitan Transportation System (MTS) Network (see below).

Transit Preferential Streets

The Transit Preferential Street network classification system takes into consideration all transportation functions, and identifies the major transit routes where general traffic should be routed away from. There are two classifications of transit preferential streets: Primary Transit Streets, which are either transit-oriented or transit-important; and Secondary Transit Streets.

- Primary Transit Street – Transit-Oriented: Not major arterials, with either high transit ridership, a high frequency of service, or surface rail. Along these streets, the emphasis should be on moving transit vehicles, and impacts on automobile traffic should be of secondary concern.
- Primary Transit Street – Transit-Important: Major arterials, with either high transit ridership, high frequency of service, or surface rail. Along these streets, the goal is to improve the

balance between modes of transportation, and the emphasis should be on moving people and goods, rather than on moving vehicles.

- Secondary Transit Street: Medium transit ridership and low-to-medium frequency of service, or medium frequency of service and low-to-medium transit ridership, or connects two or more major destinations.

In general, it is city policy that transit preferential treatments should be concentrated on the most important transit streets, and the treatments applied should respond to all transportation needs of the street. For example, on streets that are major arterials for transit and not for automobile traffic, treatments should emphasize transit priority; on streets that are major arterials for both transit and automobiles, treatments should emphasize a balance between the modes. It is also city policy that automobile facility features (such as driveways and loading docks) should be reduced, relocated or prohibited on transit preferential streets in order to avoid traffic conflicts and automobile congestion.

Citywide Pedestrian Network

The Citywide Pedestrian Network is a classification of streets throughout the city used to identify streets devoted to or primarily oriented to pedestrian use. The main classifications are:

- Citywide Pedestrian Network Street: An inter-neighborhood connection with "citywide significance" includes both exclusive pedestrian and pedestrian-oriented vehicular streets. These streets include the Bay, Ridge, and Coast trails, are used by commuters, tourists, and the general public, and connect major institutions with transit facilities.
- Neighborhood Network Street: A neighborhood commercial, residential or transit street that serves pedestrians from the general vicinity. Some streets may be part of the Citywide network, but are generally oriented towards neighborhood-serving uses. Types include exclusive pedestrian and pedestrian-oriented vehicular streets. As part of the Neighborhood Network Street network, streets are classified as Neighborhood Commercial Streets, which are streets that are predominately commercial use with parking and loading conflicts, or Neighborhood Network Connection Streets, which are intra-neighborhood connection streets that connect neighborhood destinations.

In general, it is city policy that sufficient pedestrian movement space should be provided to minimize pedestrian congestion, sidewalks should be widened where intensive commercial, recreational or institutional activity is present, and efforts should be made to ensure convenient and safe pedestrian crossings at intersections.

APPENDIX G.2. TRANSPORTATION DATA COLLECTION MEMORANDUM

FEHR PEERS

Memorandum

Date: February 24, 2021

To: Liz White and Wade Wietgrefe, San Francisco Planning Department

From: Kevin Zamzow-Pollock, Taylor McAdam, and Matt Goyne, Fehr & Peers
Luba Wyznyckyj, LCW Consulting

Subject: San Francisco Housing Element 2022 Update Transportation Data Collection Methodology

SF20-1097

The purpose of this memorandum is to outline the data selection approach and suggested sources of data for the San Francisco Housing Element 2022 Update EIR as required by Task 2 in the *Transportation Impact Analysis Scope of Work*, dated October 22, 2020 (Scope of Work) by Fehr & Peers and LCW Consulting (Transportation Team). This memorandum summarizes the quantitative and qualitative data needed to describe existing and projected future conditions to decision-makers and the public, and for use in the analyses for the CEQA and supplementary non-CEQA studies.

The memorandum presents the following data collection categories:

- Citywide Data
- Study Corridors
- Study Locations
- Site Observations

Citywide Data

Citywide data will inform the citywide impact analysis of VMT, although this data will also be summarized at a neighborhood and TAZ level. The following citywide input data will be collected:

- Work-based VMT and home-based VMT
- Summary of transportation-related comments and concerns heard during community engagement. This includes comments made by residents and community members, the Housing Equity Action Residents Dialogue (HEARD), and the Housing Policy Group.

Approach to Analysis

The Housing Element is an update to the City and County of San Francisco's housing policies and therefore, the Housing Element 2022 Update EIR is a programmatic analysis that encompasses the entire city. The Housing Element EIR analyzes three land use concepts[1]:

- Land Use Concept A – East Side
- Land Use Concept B – Transit Corridors
- Land Use Concept C – Residential Districts
- Land Use Concept D – Plan Bay Area 2050

It is anticipated that some combination of these concepts will constitute the final set of housing element plans and policies. For the purpose of environmental analysis, the Transportation Team, in coordination with the Planning Department and SFMTA, identified corridors that would be representative of the types of transportation-related impacts that could occur under the three land use concepts. The team selected specific study corridors and their extents to represent a bracketing, or range, of the anticipated impacts that could occur from the Housing Element 2022 Update under the three land use concepts proposed for review.

In the future, should legislative changes that implement housing element policies along other corridors, the impacts associated with these land use changes would be similar to those for study corridors with similar characteristics. As an example, the impacts associated with the proposed land use changes along the San Jose Avenue portion of the J Church would be similar to the impacts to the 14 Mission study corridor. Therefore, the analysis of transportation-related housing element impacts on the 14 Mission study corridor would represent the types of impacts that would occur under updated housing element plans to the San Jose Avenue portion of the J Church.

Study Corridors

As outlined in Task 2 of the Scope of Work, the primary data collection effort and CEQA transportation impact analysis will focus on seven study corridors that provide a representative depiction of transportation conditions throughout San Francisco under the land use concepts. Data collected for the study corridors will include existing travel times for the primary Muni routes within each of the seven study corridors, which will be used to inform the assessment of existing and future transit travel times. For the purposes of the CEQA travel time analysis, the primary Muni routes include the local and rapid routes (such as 38 Geary and 38R Geary Rapid) for each corridor, but not express routes (such as 38AX Geary A Express) or other routes that travel only a

[1] While no zoning changes are proposed as part of the Housing Element 2022 Update, subsequent legislative changes are reasonably foreseeable actions that may occur with implementation of housing element policies

portion of the corridor. Additional data collected for the study corridors will include average daily traffic volumes, as described in the study locations section below, and transit ridership information, which will be used for a supplementary non-CEQA transit capacity assessment to inform San Francisco Municipal Transportation Agency's (SFMTA's) future operational plans.[2]

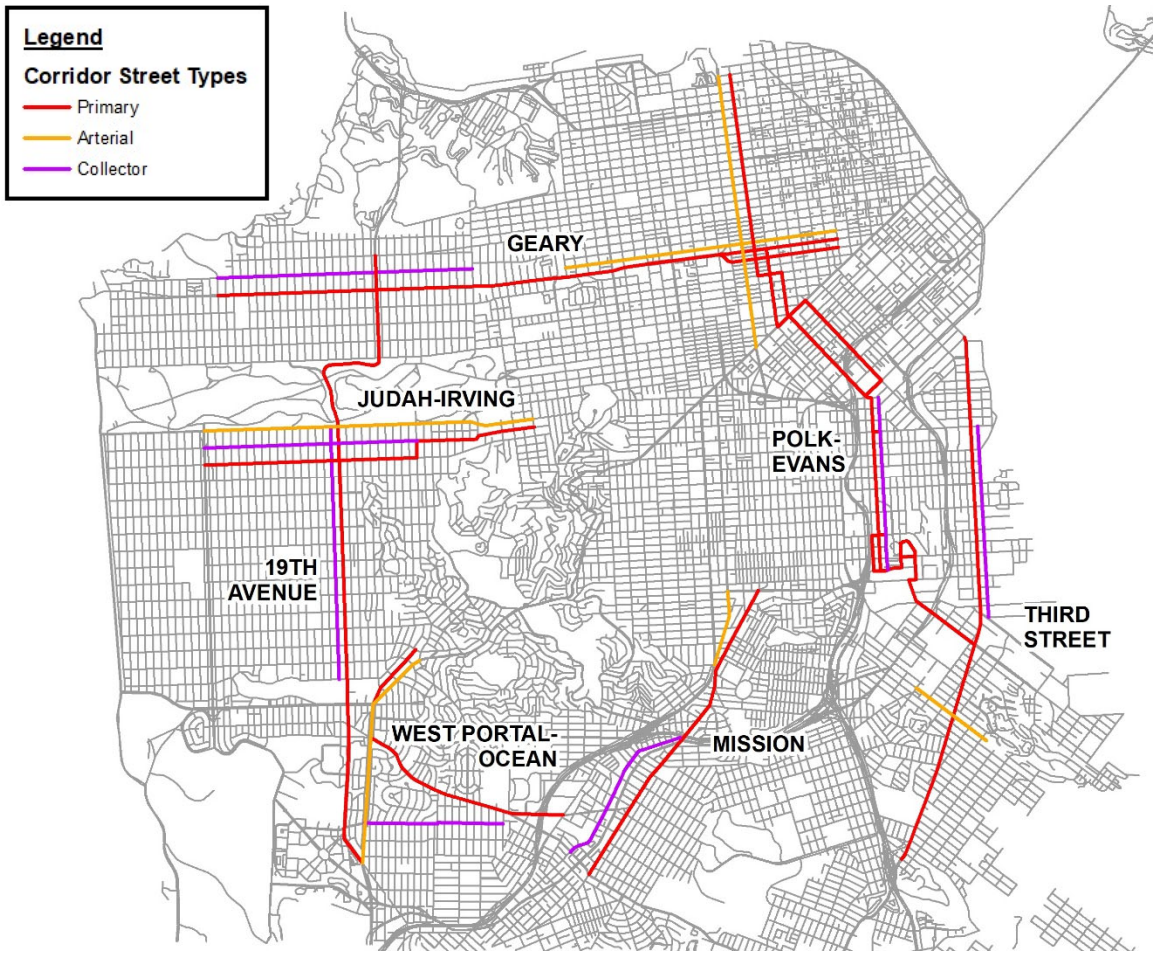
The Transportation Team, in coordination with the Planning Department and SFMTA, selected the following seven representative study corridors to represent a citywide cross-section of transportation facilities and land use types. The representative study corridors selected for the EIR analysis typically include a primary street centered on a transit route and several representative arterial and collector parallel and cross streets. The study corridors are listed below and shown with the selected representative streets within each corridor on **Figure 1**.

Table 1: Housing Element Study Corridors

Corridor Name	Muni Route	Begins At	Includes	Ends At
Geary	38 Geary	34th Avenue	Geary Boulevard, Geary Street, O'Farrell Street	Powell Street
Polk-Evans	19 Polk	North Point Street	Polk Street, Larkin Street, Hyde Street, Market Street, Seventh Street, Eighth Street, Rhode Island Street, De Haro Street, Kansas Street, 26th Street, Connecticut Street, Evans Street	Third Street
Third Street	T Third	Channel Street	Third Street	Le Conte Avenue
Mission	14 Mission	Cesar Chavez Street	Mission Street	Geneva Avenue
West Portal-Ocean	K Ingleside	Ulloa Street	West Portal Avenue, Junipero Serra Boulevard, Ocean Avenue	San Jose Avenue
19th Avenue	28 19th Avenue	California Street	Park-Presidio Boulevard, Crossover Drive, 19th Avenue	Junipero Serra Boulevard
Judah-Irving	N Judah	Sunset Boulevard	Judah Street, Irving Street, Carl Street	Cole Street

[2] The supplementary non-CEQA transit capacity assessment includes an additional eight study corridors, for a total of 15 corridors. These corridors are presented in **Attachment A**.

Figure 1: Study Corridors



Selection Methodology

Factors

The selection of the corridors and extents was based on the following factors:

- Muni routes with a diversity of operational types (e.g., bus versus light rail, operating within mixed-flow travel lanes versus dedicated lanes, and part of the citywide rapid network versus local community service)
- A large number of potential households projected in the land use concepts[3]

[3] Concentration of households was derived from maps within SF Planning's Housing Affordability Strategies Report: https://default.sfplanning.org/publications_reports/Housing_Affordability_Strategies_Report.pdf

- Connections to regional transit services (e.g, BART, Caltrain AC Transit, SamTrans, Golden Gate Transit)
- Muni routes that are listed in the Muni Equity Strategy as an Equity Strategy Route[4]
- Geographic distribution throughout city (covering many different neighborhoods)

A full list of considered study corridors and selection factors are presented in **Attachment A**.

Other considerations

The study corridors do not extend the full length of their transit routes and instead focus analysis on the sections that are slated for change in one of the three Housing Element land use concepts. The intent is to characterize the representative worst-case transportation-related l impacts of potential land use changes. For example, the 14 Mission operates in red, transit-only lanes north of Cesar Chavez Street and transit travel times are unlikely to be affected by general increases in traffic volumes due to land use changes outside of the neighborhood. The N Judah and K Ingleside corridors similarly extend only as far east as Sunset Tunnel and Twin Peaks Tunnel, respectively, due to the limited growth projected for the central neighborhoods and because traffic volume changes won't affect subway operations.

The Housing Element land use concepts would result in limited growth in some areas of the City compared to the baseline conditions, such as the Castro and Haight-Ashbury neighborhoods (growth being a factor identified above). Thus, study corridors exclude frequent transit routes such as the J Church, 24 Divisadero, and 22 Fillmore.

Several factors were considered when selecting between parallel routes in affected transit corridors.

For example, the team selected the 19 Polk between the 47 Van Ness, 49 Van Ness/Mission, and the 19 Polk. The 19 Polk was selected because it operates in mixed-flow lanes, which is more likely to experience additional delay than the transit-only lanes on Van Ness Avenue within which the 47 Van Ness and 49 Van Ness/Mission routes will travel in. Additionally, the 19 Polk is a local community-serving route, which adds operational diversity to the corridor sample.

As another example, the team selected the 38 Geary between the 1 California, 31 Balboa, and 38 Geary. The 38 Geary was selected because although routes parallel to the 38 Geary would likely experience added delay, the delay is expected to be similar to or less than the 38 Geary due the greater housing growth along this street compared to the other two streets. Additional details are included in **Attachment A.**

[4] https://www.sfmta.com/projects/muni-service-equity-strategy. GIS data sourced from https://data.sfgov.org/Transportation/Equity-Strategy-Neighborhoods/u7ag-wi48

Study Locations

The primary purpose of the study locations is to inform a description and assessment of existing and future roadway conditions at locations within the seven study corridors that also represent conditions found elsewhere in the study area and as inputs into the quantitative analyses. The Transportation Team will collect average daily traffic (ADT) data at study roadway segments and peak hour data at study intersections, including counts of vehicle traffic and people walking and bicycling. The Transportation Team will also conduct observations of existing pedestrian, bicycle, loading, and parking conditions. This data will inform the forecasting of future roadway volumes for the transit travel time, air quality, and noise analyses.

Selection Methodology

A total of 49 study intersections were selected along the seven corridors. For each corridor, in addition to the primary corridor street(s), two additional, roughly parallel or cross streets were selected: one arterial[5] and one collector[6].

Seven to nine study intersections were selected for each corridor, located along either the primary street(s), the designated arterial street, or the designated collector street. Four of these intersections were included as part of two different corridors. In addition, two locations along the primary street(s) were selected for ADT counts.

From among these 49 intersections, the Transportation Team selected 24 locations for bicycle and pedestrian counts. This aspect is discussed further at the conclusion of the study locations section.

The Transportation Team, in coordination with the Planning Department and SFMTA, selected the study intersections to represent a bracketing, or range, of the anticipated impacts that could occur from the 2022 Housing Element, based on the following factors:

- Presence of transit
- Location of Muni maximum load points[7]
- Inclusion in a Muni Equity Strategy neighborhood[8]
- Presence of bicycle facilities
- Location on the High Injury Network
- Primary surrounding land use[9]

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[5] Arterials are types of roads designed to carry high volumes of motorized traffic.
[6] Collectors are major and minor streets that connect local roads and streets with arterials.
[7] A maximum load point is the stop along a transit route where the average passenger load is highest
[8] More information on the Muni Equity Strategy can be found at: https://www.sfmta.com/projects/muni-service-equity-strategy and https://data.sfgov.org/Transportation/Equity-Strategy-Neighborhoods/u7ag-wi48
[9] The following primary land use categories were used to select study intersections: Residential, Commercial, Mixed Residential/Commercial, Industrial, and Institutional (e.g., school, hospital)

- Approximate level of density (Low, Medium, High)
- Geographic distribution along corridor (not bunched / covering different neighborhoods)
- Availability of AM and PM peak count data

The primary, arterial, and collector study streets and the primary factors for selecting the study locations are described for each of the seven study corridors on the following pages. A full list of selected study intersections and selection factors can be found in **Attachment B**.

Due to the ongoing COVID-19 pandemic and associated reductions in transit service and trips by all travel modes, collecting counts at this time would not represent typical conditions and would be misleading. As a result, the Transportation Team has assembled intersection counts and ADTs from within the past five years from secondary sources, where possible. These include counts obtained from the SFMTA, from IDAX's Historical Data Warehouse[10], and counts conducted for recent development and infrastructure projects in San Francisco (e.g., Balboa Reservoir, India Basin, 1200 Van Ness Avenue). The remaining intersection counts and ADTs will be sourced from StreetLight, a transportation data company that leverages big data to approximate counts and travel patterns.[11] For more information on StreetLight and its proposed use in this project, please see **Attachment D**.

[10] IDAX is a data collection provider that provides historic counts for $70 per intersection per time period time period for Turning Movement Counts (TMCs) and $70 per day for Average Daily Traffic (ADT) counts. The Transportation Team proposes purchasing an ADT at one location, a PM peak TMC at one location, and AM and PM peak TMCs at fourteen locations. This would total $2,100

[11] StreetLight provides data in batches of zones. The Transportation Team proposes purchasing a batch of 100 zones, which would total $13,760. Please see **Attachment D** for more details.

Geary Corridor

Primary Streets: Geary Boulevard, O'Farrell Street (Extents: 34th Avenue to Powell Street),

Arterial Street: Post Street

Collector Street: Clement Street

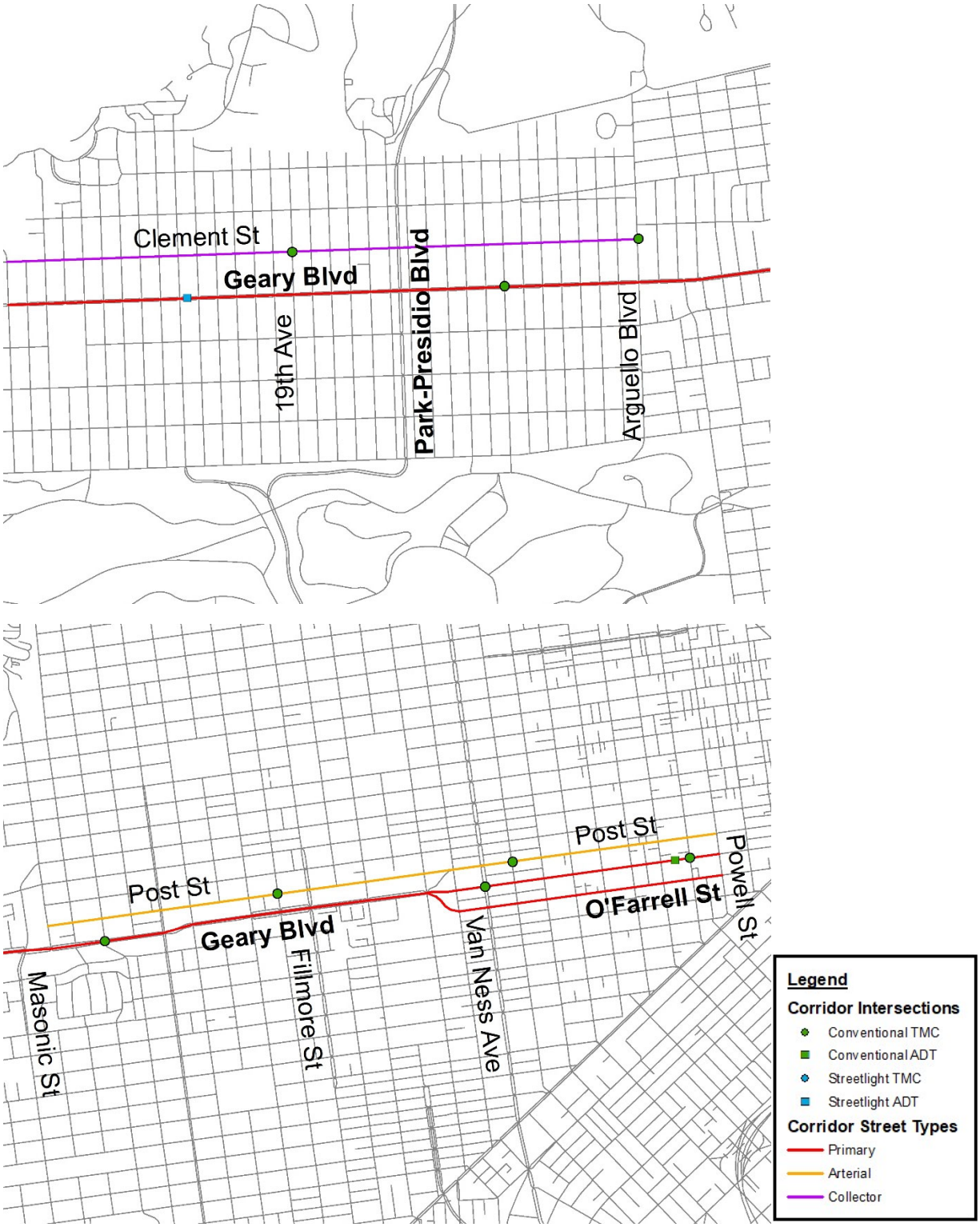
Transit Routes: 38 Geary, 38R Geary Rapid

Table 2: Geary Corridor Study Locations

Count Type	Main Street	Cross Street	Selection Factors	Count Source	Count Year
ADT	Geary Boulevard	Between Mason Street and Taylor Street	Transit, Muni Equity Strategy neighborhood, High Injury Network, Mixed residential/commercial, High density	IDAX	2017
ADT	Geary Boulevard	Between 24th Avenue and 25th Avenue	Transit, High Injury Network, Mixed residential/commercial, Medium density	StreetLight	2020
Intersection	Geary Boulevard	Baker Street	Transit, Muni Equity Strategy neighborhood, High Injury Network, Institutional, Medium density	IDAX	2018
Intersection	Geary Boulevard	Van Ness Avenue	Transit, Muni maximum load point, Muni Equity Strategy neighborhood, High Injury Network, Institutional, High density	IDAX	2017
Intersection	Geary Boulevard	Mason Street	Transit, Muni Equity Strategy neighborhood, High Injury Network, Commercial, High density	IDAX	2017
Intersection	Post Street	Fillmore Street	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Commercial, Medium density	SFMTA	2016
Intersection	Post Street	Polk Street	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Commercial, High density	SF Planning	2017
Intersection	Clement Street	19th Avenue	Mixed residential/commercial, Medium density	SFMTA	2018
Intersection	Clement Street	Arguello Boulevard	Transit, Bicycle facilities, High Injury Network, Mixed residential/commercial, Medium density	SFMTA	2015

Source: Fehr & Peers, SF Planning, SFMTA, IDAX, StreetLight, SF Planning

Figure 2: Geary Corridor



Polk-Evans Corridor

Primary Streets: Polk Street, Larkin Street, Hyde Street, Market Street, Seventh Street, Eighth Street, Rhode Island Street, De Haro Street, Kansas Street, 26th Street, Connecticut Street, Evans Avenue (Extents: North Point Street to Third Street)

Arterial Street: Van Ness Avenue

Collector Street: De Haro Street

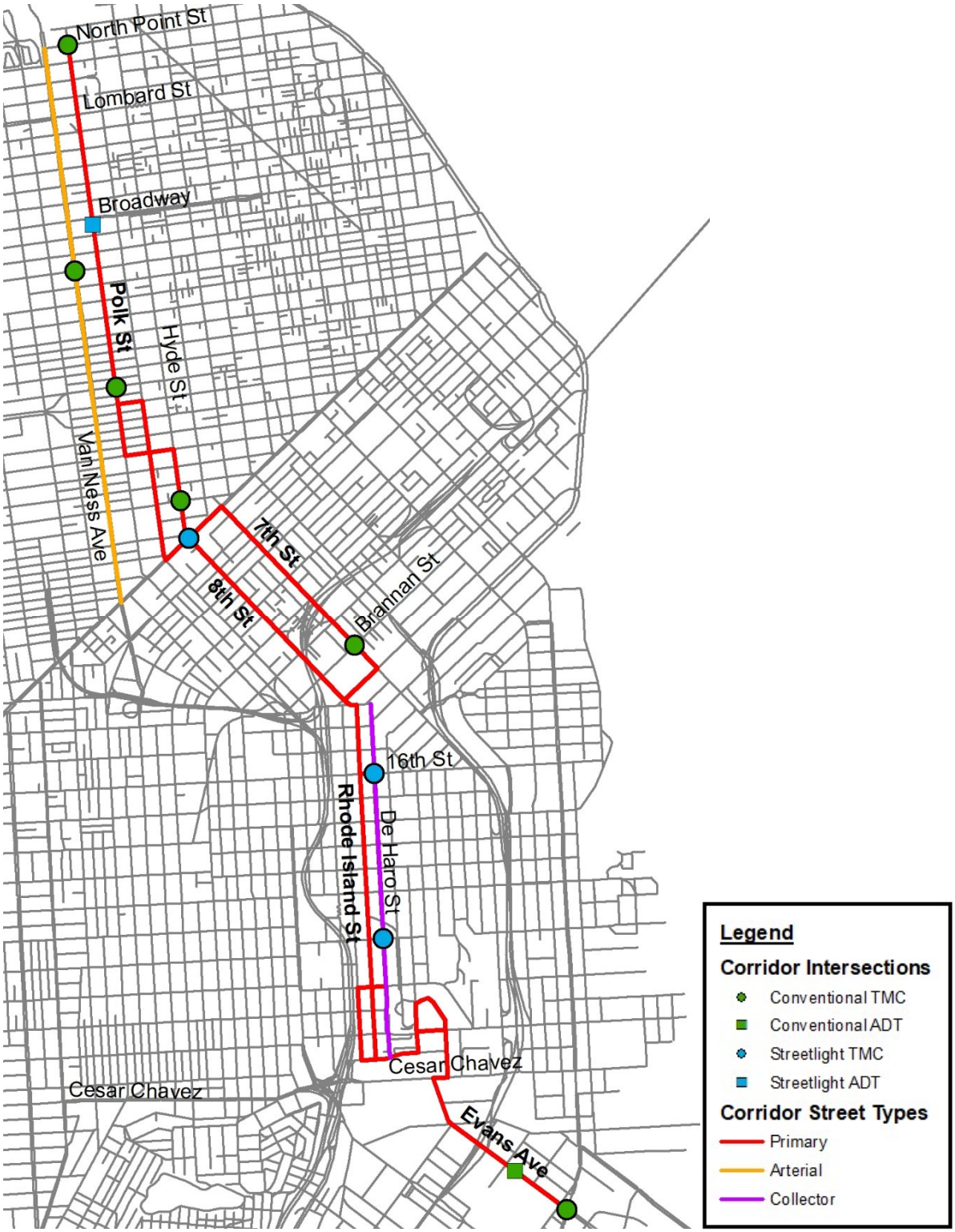
Transit Routes: 19 Polk, Southeast Muni Expansion routes (TBD)

Table 3: Polk-Evans Corridor Study Locations

Count Type	Main Street	Cross Street	Selection Factors	Count Source	Count Year
ADT	Polk Street	Between Broadway and Pacific Avenue	Transit, Bicycle facilities, High Injury Network, Commercial, Medium density	StreetLight	2020
ADT	Evans Avenue	Between Quint Street and Rankin Street	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Industrial, Low density	SFMTA	2015
Intersection	Polk Street	North Point Street	Transit, Bicycle facilities, Mixed residential/commercial, Medium density	SFMTA	2018
Intersection	Polk Street	Post Street	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Commercial, High density	SF Planning	2017
Intersection	Hyde Street	McAllister Street	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Institutional, High density	IDAX	2017
Intersection	Market Street	Eighth Street	Transit, Muni maximum load point, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Commercial, High density	StreetLight	2020
Intersection	Seventh Street	Brannan Street	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Mixed residential/commercial, Medium density	SFMTA	2017
Intersection	De Haro Street	16th Street	Transit, Commercial, Medium density	StreetLight	2020
Intersection	De Haro Street	22nd Street	Transit, Residential, Medium density	StreetLight	2020
Intersection	Evans Avenue	Third Street	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Industrial, Low density	SFMTA	2015
Intersection	Van Ness Avenue	Washington Street	Transit, High Injury Network, Mixed residential/commercial, High density	IDAX	2017

Source: Fehr & Peers, SF Planning, SFMTA, IDAX, StreetLight, SF Planning

Figure 3: Polk-Evans Corridor



Third Street Corridor

Primary Streets: Third Street (Extents: Channel Street to Le Conte Avenue)

Arterial Street: Oakdale Avenue

Collector Street: Illinois Street

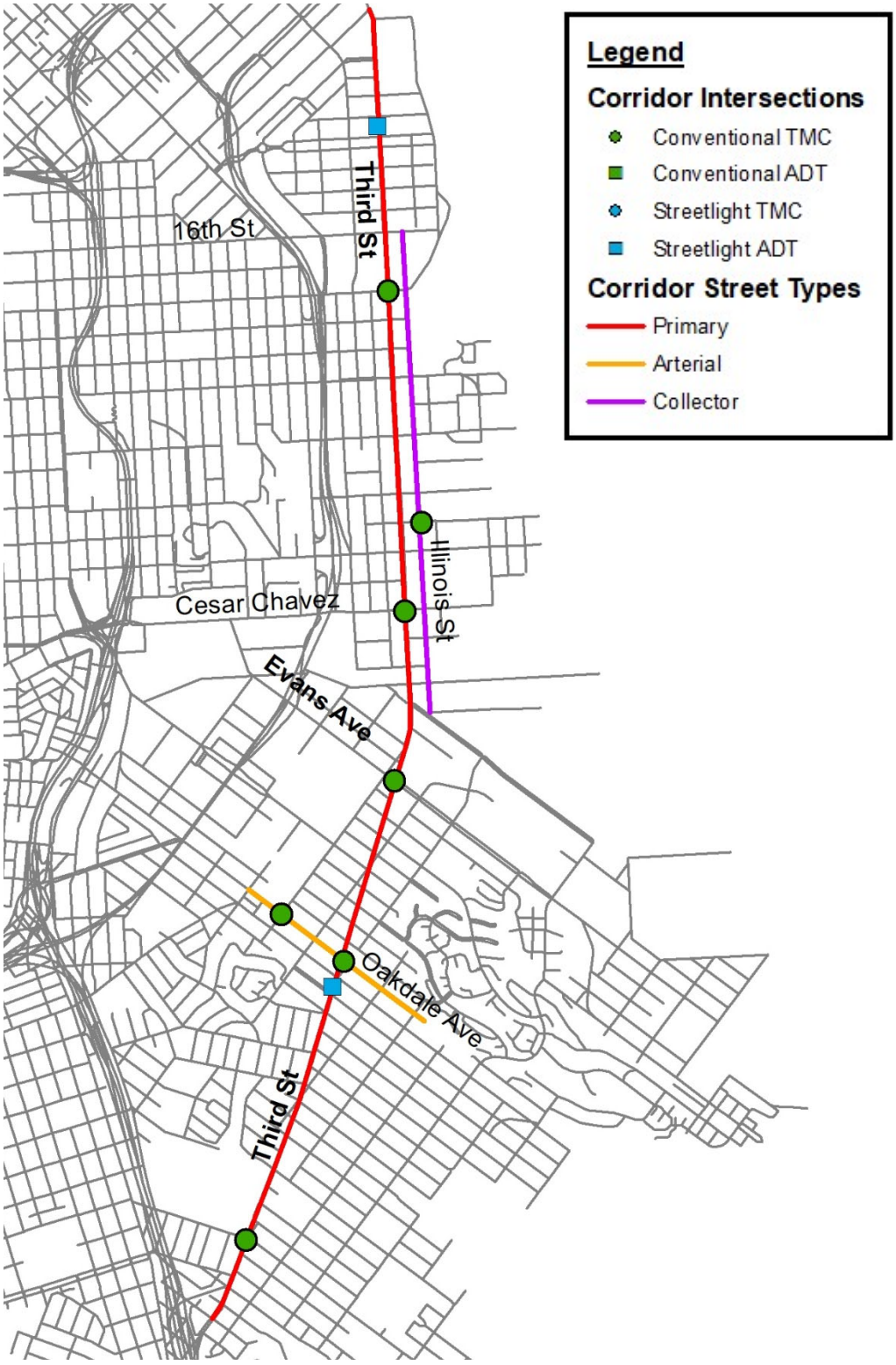
Transit Routes: T Third

Table 4: Third Street Corridor Study Locations

Count Type	Main Street	Cross Street	Selection Factors	Count Source	Count Year
ADT	Third Street	Between China Basin Street and Mission Bay Boulevard North	Transit, Mixed residential/commercial, High density	StreetLight	2020
ADT	Third Street	Between Palou Avenue and Quesada Avenue	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Commercial, Low density	StreetLight	2020
Intersection	Third Street	Mariposa Street	Transit, Bicycle facilities, Institutional, High density	IDAX	2019
Intersection	Third Street	Cesar Chavez Street	Transit, Muni Equity Strategy neighborhood, High Injury Network, Industrial, Low density	SF Planning	2018
Intersection	Third Street	Evans Avenue	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Industrial, Low density	SF Planning	2018
Intersection	Third Street	Oakdale Avenue	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Commercial, Low density	SF Planning	2015
Intersection	Third Street	Paul Avenue	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Industrial, Low density	SF Planning	2015
Intersection	Oakdale Avenue	Phelps Street	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, Institutional, Medium density	SFMTA	2015
Intersection	Illinois Street	25th Street	Bicycle facilities, Industrial, Medium density	IDAX	2017

Source: Fehr & Peers, SF Planning, SFMTA, IDAX, StreetLight, SF Planning

Figure 4: Third Street Corridor



Mission Corridor

Primary Streets: Mission Street (Extents: Cesar Chavez Street to Geneva Avenue)

Arterial Street: Guerrero Street/San Jose Avenue

Collector Street: Cayuga Avenue

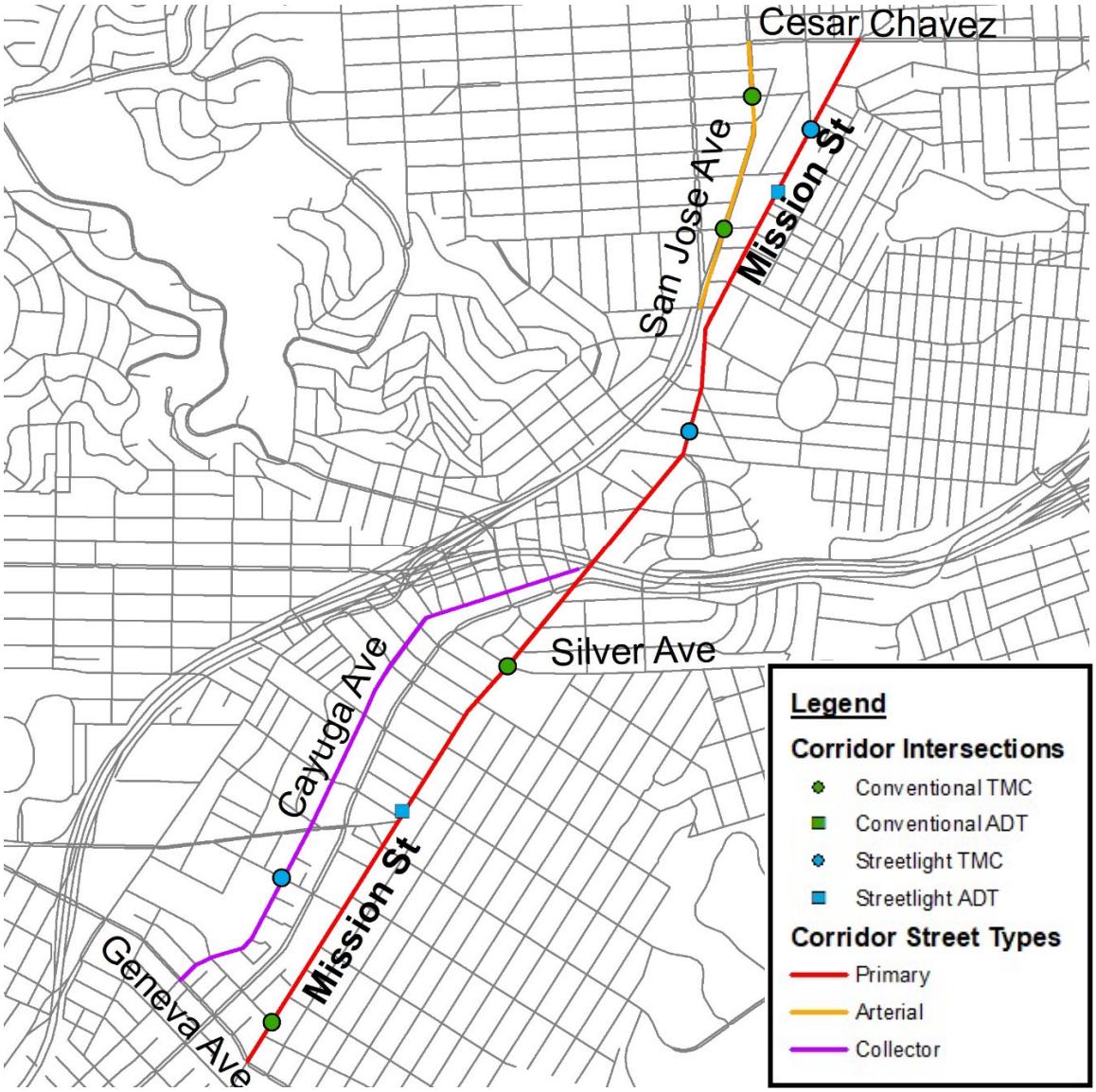
Transit Routes: 14 Mission, 14R Mission Rapid

Table 5. Mission Corridor Study Locations

Count Type	Main Street	Cross Street	Selection Factors	Count Source	Count Year
ADT	Mission Street	Between 29th Street and Virginia Avenue	Transit, High Injury Network, Commercial, Medium density	StreetLight	2020
ADT	Mission Street	Between Brazil Avenue and Ocean Avenue	Transit, Muni Equity Strategy neighborhood, High Injury Network, Commercial, Medium density	StreetLight	2020
Intersection	Mission Street	Valencia Street	Transit, High Injury Network, Mixed residential/commercial, Medium density	StreetLight	2020
Intersection	Mission Street	Richland Street	Transit, Muni maximum load point, Bicycle facilities, Commercial, Medium density	StreetLight	2020
Intersection	Mission Street	Silver Avenue	Transit, Muni maximum load point, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Commercial, Low density	SFMTA	2017
Intersection	Mission Street	Seneca Avenue	Transit, Muni Equity Strategy neighborhood, High Injury Network, Mixed residential/commercial, Medium density	SFMTA	2017
Intersection	Guerrero Street	Duncan Street	Bicycle facilities, Residential, Medium density	IDAX	2016
Intersection	San Jose Avenue	30th Street	Transit, Bicycle facilities, High Injury Network, Mixed residential/commercial, Low density	IDAX	2016
Intersection	Cayuga Avenue	Onondaga Avenue	Muni Equity Strategy neighborhood, Residential, Medium density	StreetLight	2020

Source: Fehr & Peers, SF Planning, SFMTA, IDAX, StreetLight

Figure 5: Mission Corridor



West Portal-Ocean Corridor

Primary Streets: West Portal Avenue, Junipero Serra Boulevard, Ocean Avenue (Extents: Ulloa Street to San Jose Avenue)

Arterial Street: Portola Drive/Junipero Serra Boulevard

Collector Street: Holloway Avenue

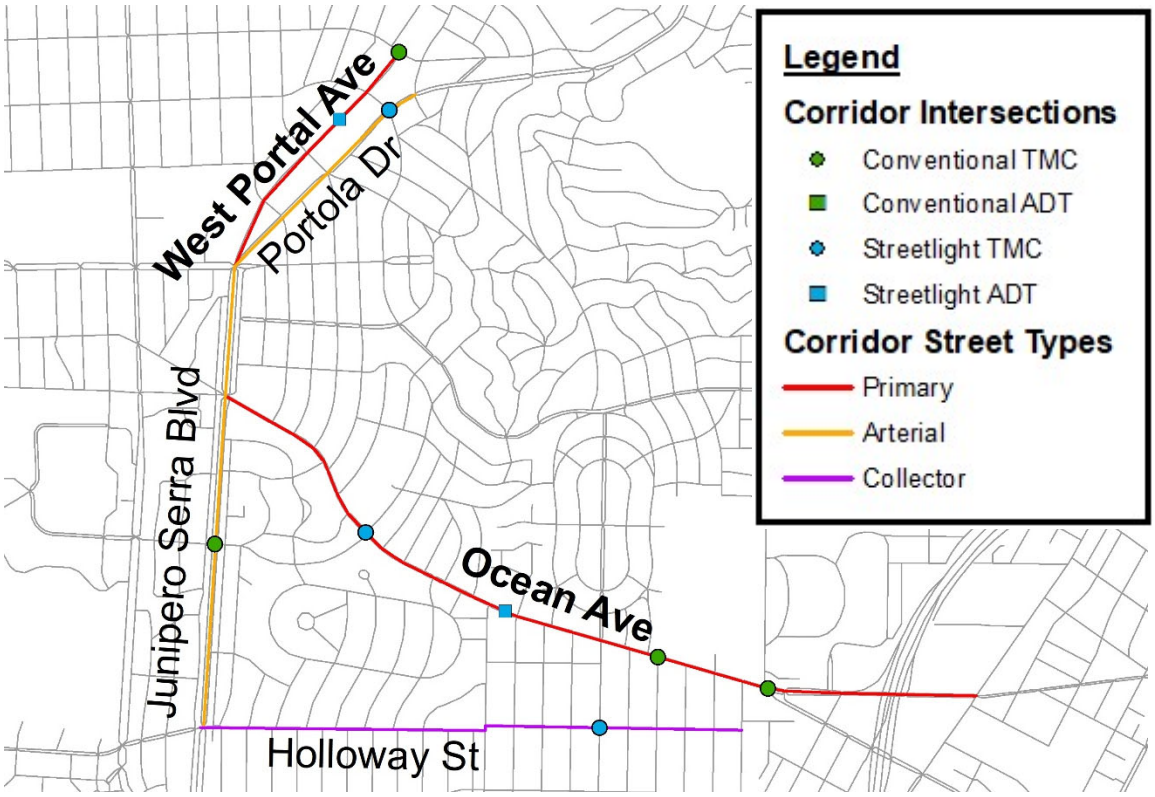
Transit Routes: K Ingleside

Table 6: West Portal-Ocean Corridor Study Locations

Count Type	Main Street	Cross Street	Selection Factors	Count Source	Count Year
ADT	West Portal Avenue	Between Ulloa Street and Vicente Street	Transit, Commercial, Low density	StreetLight	2020
ADT	Ocean Avenue	Between Ashton Avenue and Jules Avenue	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, Commercial, Medium density	StreetLight	2020
Intersection	West Portal Avenue	Ulloa Street	Transit, Commercial, Low density	SFMTA	2019
Intersection	Ocean Avenue	Westgate Drive/Cerritos Avenue	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, Residential, Low density	StreetLight	2020
Intersection	Ocean Avenue	Plymouth Avenue	Transit, Muni maximum load point, Muni Equity Strategy neighborhood, Bicycle facilities, Mixed residential/commercial, Medium density	SF Planning	2018
Intersection	Ocean Avenue	Frida Kahlo Way	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Institutional, Medium density	SF Planning	2018
Intersection	Portola Drive	Vicente Street	Transit, Bicycle facilities, Residential, Low density	StreetLight	2020
Intersection	Junipero Serra Boulevard	Winston Drive	Bicycle facilities, Residential, Low density	IDAX	2018
Intersection	Holloway Avenue	Miramar Avenue	Muni Equity Strategy neighborhood, Bicycle facilities, Residential, Medium density	StreetLight	2020

Source: Fehr & Peers, SF Planning, SFMTA, IDAX, StreetLight, SF Planning

Figure 6: West Portal-Ocean Corridor



19th Avenue Corridor

Primary Streets: Park Presidio Boulevard, 19th Avenue (Extents: California Street to Junipero Serra Boulevard)

Arterial Street: Junipero Serra Boulevard

Collector Street: 20th Avenue

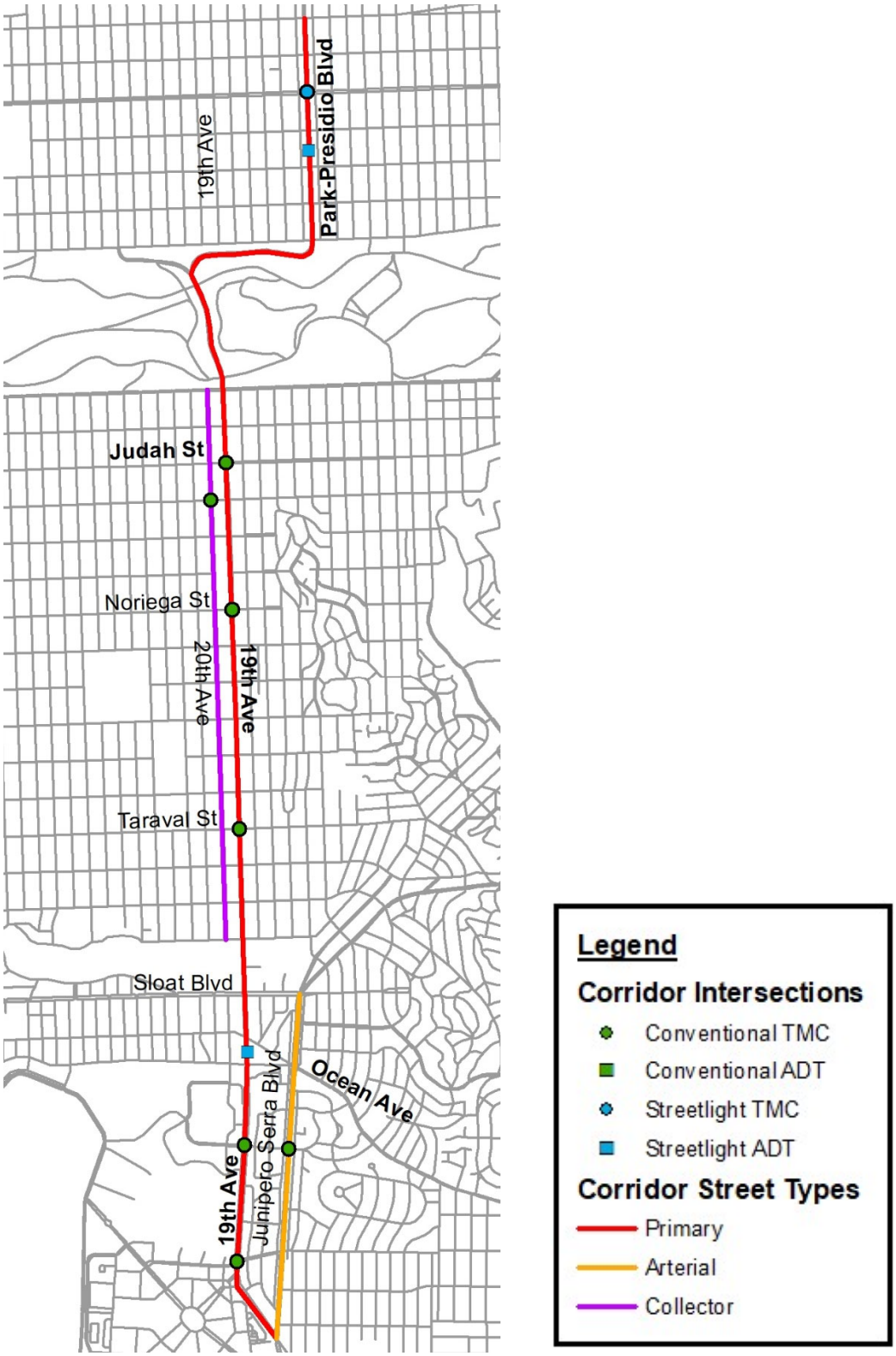
Transit Routes: 28 19th Avenue, 28R 19th Avenue Rapid

Table 7: 19th Avenue Corridor Study Locations

Count Type	Main Street	Cross Street	Selection Factors	Count Source	Count Year
ADT	Park Presidio Boulevard	Between Anza Street and Balboa Street	Transit, Residential, Medium density	StreetLight	2020
ADT	19th Avenue	Between Ocean Avenue and Eucalyptus Drive	Transit, High Injury Network, Residential, Low density	SFMTA	2015
Intersection	Park Presidio Boulevard	Geary Boulevard	Transit, High Injury Network, Mixed residential/commercial, Low density	StreetLight	2020
Intersection	19th Avenue	Judah Street	Transit, Muni maximum load point, Mixed residential/commercial, Medium density	SFMTA	2015
Intersection	19th Avenue	Noriega Street	Transit, Muni maximum load point, Mixed residential/commercial, Medium density	SFMTA	2015
Intersection	19th Avenue	Taraval Street	Transit, High Injury Network, Commercial, Medium density	SFMTA	2015
Intersection	19th Avenue	Winston Drive	Transit, Bicycle facilities, High Injury Network, Commercial, Low density	IDAX	2018
Intersection	19th Avenue	Holloway Avenue	Transit, Bicycle facilities, High Injury Network, Institutional, Low density	IDAX	2018
Intersection	Junipero Serra Boulevard	Winston Drive	Bicycle facilities, Residential, Low density	IDAX	2018
Intersection	20th Avenue	Kirkham Street	Bicycle facilities, Residential, Medium density	SFMTA	2018

Source: Fehr & Peers, SF Planning, SFMTA, IDAX, StreetLight

Figure 7: 28 19th Avenue Corridor



Judah-Irving Corridor

Primary Streets: Judah Street, Irving Street, Carl Street (Extents: Sunset Boulevard to Cole Street)

Arterial Street: Lincoln Way

Collector Street: Irving Street

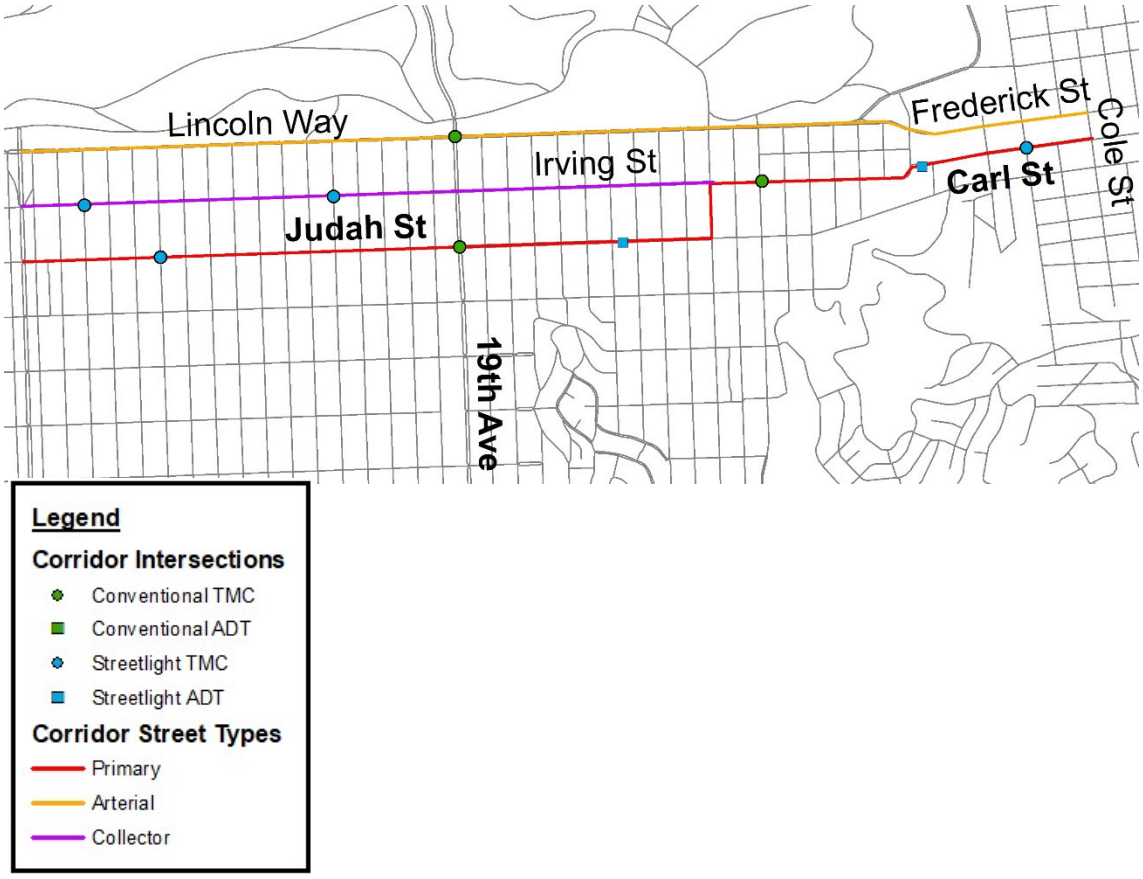
Transit Routes: N Judah

Table 8: Judah-Irving Corridor Study Locations

Count Type	Main Street	Cross Street	Selection Factors	Count Source	Count Year
ADT	Judah Street	Between Funston Avenue and 12th Avenue	Transit, Residential, Medium density	StreetLight	2020
ADT	Carl Street	Between Arguello Boulevard and Hillway Avenue	Transit, Institutional, Medium density	StreetLight	2020
Intersection	Judah Street	31st Avenue	Transit, Mixed residential/commercial, Medium density	StreetLight	2020
Intersection	Judah Street	19th Avenue	Transit, Muni maximum load point, Mixed residential/commercial, Medium density	SFMTA	2015
Intersection	Irving Street	Seventh Avenue	Transit, Bicycle facilities, Commercial, Medium density	SFMTA	2015
Intersection	Carl Street	Stanyan Street	Transit, Residential, Medium density	StreetLight	2020
Intersection	Lincoln Way	19th Avenue	Transit, High Injury Network, Commercial, Low density	SFMTA	2016
Intersection	Irving Street	34th Avenue	Bicycle facilities, Residential, Low density	StreetLight	2020
Intersection	Irving Street	24th Avenue	Commercial, Medium density	StreetLight	2020

Source: Fehr & Peers, SF Planning, SFMTA, StreetLight

Figure 8: Judah-Irving Corridor



Bicycle and Pedestrian Counts

The Transportation Team, in coordination with the Planning Department and SFMTA, selected the bicycle and pedestrian count locations to represent a bracketing, or range, of the anticipated impacts that could occur from the Housing Element 2022 Update, based on the following factors:

- Presence/type of bicycle facilities
- Geographic diversity
- Availability of AM and PM peak bicycle and pedestrian counts

Fewer bicycle and pedestrian count locations compared to vehicle counts locations were selected because bicycle data from secondary sources is very limited and detailed pedestrian and bicycle count data is not required for the quantitative transportation analyses. For this analysis, projections of growth in pedestrian and bicycle travel will not be made at the intersection level; bicycle and pedestrian counts will be supplemented by qualitative observations described on the following page.

Table 9: Bicycle and Pedestrian Study Locations

Study Corridor	Main Street	Cross Street	Bicycle Facilities	Count Source	Count Year
Geary	Geary Boulevard	Eighth Avenue	Class III	SFMTA	2017
Geary	Geary Boulevard	Baker Street	None	IDAX	2018
Geary	Geary Boulevard	Van Ness Avenue	None	IDAX	2017
Geary	Geary Boulevard	Mason Street	None	IDAX	2017
Geary	Post Street	Fillmore Street	Class III	SFMTA	2016
Geary	Clement Street	19th Avenue	None	SFMTA	2018
Geary	Clement Street	Arguello Boulevard	Class II	SFMTA	2015
Polk-Evans	Polk Street	North Point Street	Class II & Class II	SFMTA	2018
Polk-Evans	Hyde Street	McAllister Street	Class III	IDAX	2017
Polk-Evans	Seventh Street	Brannan Street	Class II	SFMTA	2017
Polk-Evans	Van Ness Avenue	Washington Street	None	IDAX	2017
Third Street	Third Street	Mariposa Street	Class III	IDAX	2019
Third Street	Illinois Street	25th Street	Class II	IDAX	2017
Mission	Mission Street	Silver Street	Class III	SFMTA	2017
Mission	Mission Street	Seneca Street	None	SFMTA	2017
Mission	Guerrero Street	Duncan Street	Class II	IDAX	2016
Mission	San Jose Avenue	30th Street	Class II	IDAX	2016
West Portal-Ocean	Ocean Avenue	Frida Kahlo Way	Class II & Class III	Quality Counts	2018

19th Avenue	19th Avenue	Taraval Street	None	SFMTA	2016
19th Avenue	19th Avenue	Winston Drive	Class III	IDAX	2018
19th Avenue	19th Avenue	Holloway Avenue	Class II	IDAX	2018
19th Avenue	20th Avenue	Kirkham Street	Class II & Class III	SFMTA	2018
Judah-Irving	Irving Street	Seventh Avenue	Class III	SFMTA	2015
Judah-Irving	Lincoln Way	19th Avenue	None	SFMTA	2016

Source: Fehr & Peers, SF Planning, SFMTA, IDAX, Quality Counts

Site Observations

Purpose

The primary purpose of site observations is to augment count data along the selected corridors with quantitative and qualitative assessment of activity levels, commercial and passenger loading activities, double parking, and corridor conditions. Site observations will include assessment of land use, topography, infrastructure condition, potential hazards, speed limits and speeds, queueing and congestion, and activity levels for all modes.

Site observations will be conducted in Spring 2021. Restrictions due to the COVID-19 pandemic may be in effect and therefore could impact data collection efforts. The data collection team will note instances where conditions may not be reflective of pre-COVID conditions. According to the SFCTA's COVID-Era Congestion Tracker, vehicle travel speeds and VMT have returned to pre-COVID conditions in some areas of the city.[12]

Where available, the data collection team will also draw on observations from pre-COVID planning studies, including Environmental Impact Reports and Mitigated Negative Declarations, located along the study corridors to augment site observations.

A sample site observation template can be found in **Attachment C**.

[12] https://covid-congestion.sfcta.org/

Methodology

A corridor section no more than half a mile in length has been determined for each of the seven study corridors, as follows:

Table 10: Site Observation Corridors

Study Corridor	Main Street	From	To	Selection Factors
Geary	Geary Boulevard	4th Avenue	Parker Avenue	Transit, High Injury Network, Mixed residential/commercial, Medium density
Polk-Evans	Polk Street	Clay Street	Post Street	Transit, Muni maximum load point, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Mixed residential/ commercial, High density
Third Street	Third Street	Revere Avenue	Carroll Avenue	Transit, Muni Equity Strategy neighborhood, Bicycle facilities, High Injury Network, Industrial/ residential, Low density
Mission	Mission Street	Santa Rosa Avenue	France Avenue	Transit, Muni Equity Strategy neighborhood, High Injury Network, Commercial, Medium density
West Portal	Ocean Avenue	Victoria Street	Plymouth Avenue	Transit, Muni maximum load point, Muni Equity Strategy neighborhood, Bicycle facilities, Mixed residential/ commercial, Medium density
19th Avenue	19th Avenue	Santiago Street	Vicente Street	Transit, Muni maximum load point, High Injury Network, Mixed residential/ commercial, Medium density
Judah-Irving	Judah Street / Irving Street	14th Avenue	Seventh Avenue	Transit, Mixed residential/ commercial, Medium density

ATTACHMENT A
STUDY CORRIDORS

SELECTED ROUTES

Route Information						Criteria for Evaluation							
Corridor Name	**Muni Route**	**Primary Street(s)**	**Corridor Extent**	**Distance**	**Operations Type**	**East Side Focus Scenario**	**Transit Corridors Scenario**	**Residential Development Scenario**	**Large number of projected households[1]**	**Rapid Network**	**Community serving[2]**	**Connects to Regional Transit**	**Equity Strategy Route**
Geary	38 / 38R	Geary Blvd/O'Farrell St	34th Avenue to Powell Street	4.7	Bus - Dedicated lanes		x	x		x		BART, AC Transit, GGT, SamTrans	Citywide
Polk-Evans	19 Polk	Various	North Point Street to Third Street	6	Bus - Mixed-flow (local)	x		x	x		x	BART, GGT, SamTrans	Bayview & SoMa-Tenderloin
Third Street	T Third	Third Street	Channel St to Le Conte Ave	4	LRT - Dedicated lanes	x			x	x		BART, Caltrain, AC Transit, GGT, SamTrans	Bayview & Visitacion Valley
Mission	14 / 14R	Mission Street	Cesar Chavez Street to Geneva Ave	3	Bus - Mixed-flow		x	x		x		BART, AC Transit, GGT	Citywide
West-Portal-Ocean	K Ingleside	West Portal/Junipero Serra/Ocean Ave	Ulloa Street to San Jose Ave	2.5	LRT - Mixed-flow		x	x		x		BART, AC Transit, GGT, SamTrans	Oceanview-Ingleside
19th Avenue	28 / 28R	Park Presidio Boulevard/ 19th Avenue	California St to Junipero Serra Blvd	5.2	Bus - Mixed-flow		x	x	x	x		BART, GGT	None
Judah-Irving	N Judah	Judah/Irving/Carl	Sunset Boulevard to Cole Street	2.7	LRT - Mixed-flow		x	x		x		BART, Caltrain, AC Transit, GGT, SamTrans	None

[1]Derived from maps contained within SF Planning's Housing Affordability Strategies Report: https://default.sfplanning.org/publications_reports/Housing_Affordability_Strategies_Report.pdf

[2]Routes that fulfill three conditions: a) have headways of at least ten minutes, b) are not on the Muni Rapid Network, and c) do not serve the downtown employment centers

UNSELECTED ROUTES

Route Information					Criteria for Evaluation							
Muni Route	**Street**	**Corridor Extent**	**Distance**	**Operations Type**	**East Side Focus Scenario**	**Transit Corridors Scenario**	**Residential Development Scenario**	**Large number of projected households[1]**	**Rapid Network**	**Community serving[2]**	**Connects to Regional Transit**	**Equity Strategy Route**
47. 49	Van Ness	Market to Lombard	1.8	Bus - Dedicated lanes	x				x		BART, GGT	Citywide
28 19th Ave	Lombard Street	Lyon to Van Ness	1.3	Bus - Mixed-flow		x	x				GGT	None
5/5R Fulton	Fulton/McAlister	6th Street to 34th Ave	4.5	Bus - Mixed-flow			x		x		BART, AC Transit, GGT, SamTrans	Western Addition
8/8X Bayshore	Geneva	San Jose to Bayshore	2.5	Bus - Mixed-flow			x	x		x	BART, GGT, SamTrans	Citywide
29 Sunset	Sunset	Mission to Sunset	6.4	Bus - Mixed-flow (local)						x	BART	Excelsior-Outer Mission & Visiacion Valley
7 Haight	Either Noriega from 22nd to Great Highway or Haight from Gough to Stanyan		2	Bus - Mixed-flow (local)			x		x	x	BART, AC Transit, GGT, SamTrans	Western Addition
M Ocean	19th Avenue/West Portal	West Portal to Sargent	2	LRT - Dedicated lanes		x	x	x	x		BART, AC Transit, GGT, SamTrans	Oceanview-Ingleside
L Taraval	Taraval	19th Ave to 46th Ave	2.3	LRT- Dedicated lanes		x	x		x		BART, AC Transit, GGT, SamTrans	None

[1]Derived from maps contained within SF Planning's Housing Affordability Strategies Report: https://default.sfplanning.org/publications_reports/Housing_Affordability_Strategies_Report.pdf

[2]Routes that fulfill three conditions: a) have headways of at least ten minutes, b) are not on the Muni Rapid Network, and c) do not serve the downtown employment centers

ATTACHMENT B
STUDY INTERSECTIONS

Count Type	Neighborhood	Cross Street 1	Cross Street 2	Selected for Bike/Ped	Transit	Max Load Point	Muni Equity Strategy	Bike Facilities	High Injury Network	Primary Land Use	Assessed Density	Source	Year	Additional Notes
Geary Corridor - 34th Avenue to Powell														
ADT	Downtown/North Beach	Geary Blvd	Mason St	n/a	Yes	No	Yes	No	Yes	Mixed Residential/Commercial	High	IDAX	2017	
ADT	Richmond	Geary Blvd	25th Ave	n/a	Yes	No	No	No	Yes	Mixed Residential/Commercial	Medium	Streetlight	2020	
Intersection	Richmond	Geary Blvd	Eighth Avenue	Yes	Yes	No	No	Yes	Yes	Mixed Residential/Commercial	Medium	SFMTA	2017	
Intersection	Marina/Western Market	Geary Blvd	Baker St	Yes	Yes	No	Yes	No	Yes	Institutional	Medium	IDAX	2018	
Intersection	Downtown/North Beach	Geary Blvd	Van Ness Ave	Yes	Yes	Yes	Yes	No	Yes	Institutional	High	IDAX	2017	
Intersection	Downtown/North Beach	Geary Blvd	Mason St	Yes	Yes	No	Yes	No	Yes	Commercial	High	IDAX	2017	
Intersection	Marina/Western Market	Post St	Fillmore St	Yes	Yes	No	Yes	Yes	Yes	Commercial	Medium	SFMTA	2016	
Intersection	Downtown/North Beach	Post St	Polk St	No	Yes	No	Yes	Yes	Yes	Commercial	High	SF Planning	2017	Also used for Polk-Evans corridor
Intersection	Richmond	Clement St	19th Ave	Yes	No	No	No	No	No	Mixed Residential/Commercial	Medium	SFMTA	2018	
Intersection	Richmond	Clement St	Arguello Blvd	Yes	Yes	No	No	Yes	Yes	Mixed Residential/Commercial	Medium	SFMTA	2015	
Polk-Evans Corridor - North Point to Third														
ADT	Downtown/North Beach	Polk St	Broadway	n/a	Yes	No	No	Yes	Yes	Commercial	Medium	Streetlight	2020	
ADT	Bayshore	Evans Ave	Quint St	n/a	Yes	No	Yes	Yes	Yes	Industrial	Low	SFMTA	2015	
Intersection	Downtown/North Beach	Polk St	North Point St	Yes	Yes	No	No	Yes	No	Mixed Residential/Commercial	Medium	SFMTA	2018	
Intersection	Downtown/North Beach	Polk St	Post St	No	Yes	No	Yes	Yes	Yes	Commercial	High	SF Planning	2017	Also used for Geary corridor
Intersection	Downtown/North Beach	Hyde St	McAllister St	Yes	Yes	No	Yes	Yes	Yes	Institutional	High	IDAX	2017	
Intersection	Downtown/North Beach	Market St	Eighth Street	No	Yes	Yes	Yes	Yes	Yes	Commercial	High	Streetlight	2020	
Intersection	SoMa	7th St	Brannan St	Yes	Yes	No	Yes	Yes	Yes	Mixed Residential/Commercial	Medium	SFMTA	2017	
Intersection	Mission	De Haro St	16th St	No	Yes	No	No	No	No	Commercial	Medium	Streetlight	2020	
Intersection	Mission	De Haro St	22nd St	No	Yes	No	No	No	No	Residential	Medium	Streetlight	2020	
Intersection	Bayshore	Evans Ave	Third St	No	Yes	No	Yes	Yes	Yes	Industrial	Low	SFMTA	2015	Also used for Third Street corridor
Intersection	Downtown/North Beach	Van Ness Ave	Washington St	Yes	Yes	No	No	No	Yes	Mixed Residential/Commercial	High	IDAX	2017	
Third Street Corridor - Channel to Le Conte														
ADT	Mission	Third St	China Basin St	n/a	Yes	No	No	No	No	Mixed Residential/Commercial	High	Streetlight	2020	
ADT	Bayshore	Third St	Quesada Ave	n/a	Yes	No	Yes	Yes	Yes	Commercial	Low	Streetlight	2020	
Intersection	Mission	Third St	Mariposa St	Yes	Yes	No	No	Yes	No	Institutional	High	IDAX	2019	
Intersection	Mission	Third St	Cesar Chavez	No	Yes	No	Yes	No	Yes	Industrial	Low	SF Planning	2018	
Intersection	Bayshore	Third St	Evans Ave	No	Yes	No	Yes	Yes	Yes	Industrial	Low	SF Planning	2018	Also used for Geary corridor
Intersection	Bayshore	Third St	Oakdale Ave	No	Yes	No	Yes	Yes	Yes	Commercial	Low	SF Planning	2015	
Intersection	Bayshore	Third St	Paul Ave	No	Yes	No	Yes	Yes	Yes	Industrial	Low	SF Planning	2015	
Intersection	Bayshore	Oakdale Ave	Phelps St	No	Yes	No	Yes	Yes	No	Institutional	Medium	SFMTA	2015	
Intersection	Mission	Illinois St	25th St	Yes	No	No	No	Yes	No	Industrial	Medium	IDAX	2017	
Mission Corridor - Cesar Chavez to Geneva														
ADT	Outer Mission/Hills	Mission St	29th St	n/a	Yes	No	No	No	Yes	Commercial	Medium	Streetlight	2020	
ADT	Outer Mission/Hills	Mission St	Ocean Ave	n/a	Yes	No	Yes	No	Yes	Commercial	Medium	Streetlight	2020	
Intersection	Outer Mission/Hills	Mission St	Valencia St	No	Yes	No	No	No	Yes	Mixed Residential/Commercial	Medium	Streetlight	2020	
Intersection	Outer Mission/Hills	Mission St	Richland Ave	No	Yes	Yes	No	Yes	No	Commercial	Medium	Streetlight	2020	
Intersection	Outer Mission/Hills	Mission St	Silver Ave	Yes	Yes	Yes	Yes	Yes	Yes	Commercial	Low	SFMTA	2017	
Intersection	Outer Mission/Hills	Mission St	Seneca Ave	Yes	Yes	No	Yes	No	Yes	Mixed Residential/Commercial	Medium	SFMTA	2017	
Intersection	Outer Mission/Hills	Guerrero St	Duncan St	Yes	No	No	No	Yes	No	Residential	Medium	IDAX	2016	
Intersection	Outer Mission/Hills	San Jose Ave	30th St	Yes	Yes	No	No	Yes	Yes	Mixed Residential/Commercial	Low	IDAX	2016	
Intersection	Outer Mission/Hills	Cayuga Ave	Onondaga Ave	No	No	No	Yes	No	No	Residential	Medium	Streetlight	2020	
West Portal-Ocean Corridor - Ulloa to San Jose														
ADT	Outer Mission/Hills	West Portal Ave	Ulloa St	n/a	Yes	No	No	No	No	Commercial	Low	Streetlight	2020	
ADT	Outer Mission/Hills	Ocean Avenue	Jules Ave	n/a	Yes	No	Yes	Yes	No	Commercial	Medium	Streetlight	2020	
Intersection	Outer Mission/Hills	West Portal Ave	Ulloa St	No	Yes	No	No	No	No	Commercial	Low	SFMTA	2019	
Intersection	Outer Mission/Hills	Ocean Avenue	Westgate Dr	No	Yes	No	Yes	Yes	No	Residential	Low	Streetlight	2020	
Intersection	Outer Mission/Hills	Ocean Avenue	Plymouth Ave	No	Yes	Yes	Yes	Yes	No	Mixed Residential/Commercial	Medium	SF Planning	2018	
Intersection	Outer Mission/Hills	Ocean Avenue	Frida Kahlo Way	Yes	Yes	No	Yes	Yes	Yes	Institutional	Medium	SF Planning	2018	
Intersection	Outer Mission/Hills	Portola Dr	Vicente St	No	Yes	No	No	Yes	No	Residential	Low	Streetlight	2020	
Intersection	Outer Mission/Hills	Junipero Serra Blvd	Winston Dr	No	No	No	No	Yes	No	Residential	Low	IDAX	2018	Also used for 19th Avenue corridor
Intersection	Outer Mission/Hills	Holloway Ave	Miramar Ave	No	No	No	Yes	Yes	No	Residential	Medium	Streetlight	2020	

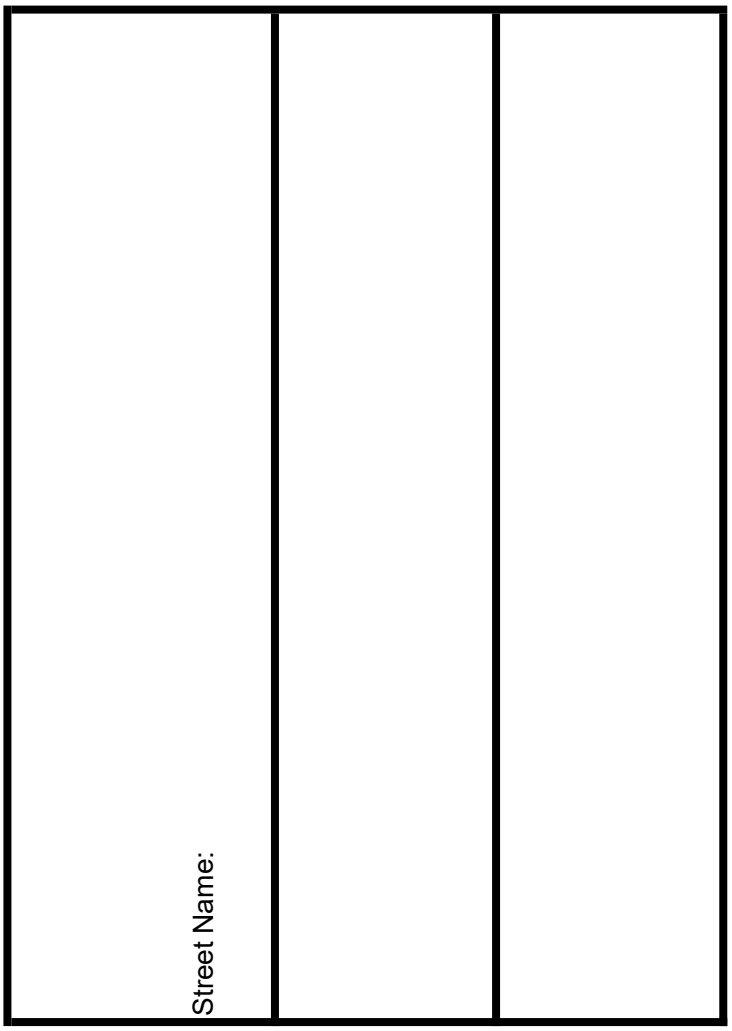
19th Avenue Corridor - California to Junipero Serra													
ADT	Richmond	Park Presidio	Anza St	n/a	Yes	No	No	No	No	Residential	Medium	Streetlight	2020
ADT	Sunset	19th Avenue	Ocean Ave	n/a	Yes	No	No	No	Yes	Residential	Low	SFMTA	2015
Intersection	Richmond	Park Presidio	Geary Blvd	No	Yes	No	No	No	Yes	Mixed Residential/Commercial	Low	Streetlight	2020
Intersection	Sunset	19th Avenue	Judah St	No	Yes	Yes	No	No	No	Mixed Residential/Commercial	Medium	SFMTA	2015 Also used for Judah-Irving corridor
Intersection	Sunset	19th Avenue	Noriega St	No	Yes	Yes	No	No	No	Mixed Residential/Commercial	Medium	SFMTA	2015
Intersection	Sunset	19th Avenue	Taraval St	Yes	Yes	No	No	No	Yes	Commercial	Medium	SFMTA	2015
Intersection	Sunset	19th Avenue	Winston Dr	Yes	Yes	No	No	Yes	Yes	Commercial	Low	IDAX	2018
Intersection	Sunset	19th Avenue	Holloway Ave	Yes	Yes	No	No	Yes	Yes	Institutional	Low	IDAX	2018
Intersection	Sunset	Junipero Serra Blvd	Winston Dr	No	No	No	No	Yes	No	Residential	Low	IDAX	2018 Also used for W Portal-Ocean corridor
Intersection	Sunset	20th Avenue	Kirkham St	Yes	No	No	No	Yes	No	Residential	Medium	SFMTA	2018
Judah-Irving Corridor - Sunset to Cole													
ADT	Sunset	Judah St	Funston Ave	n/a	Yes	No	No	No	No	Residential	Medium	Streetlight	2020
ADT	Sunset	Carl St	Arguello Blvd	n/a	Yes	No	No	No	No	Institutional	Medium	Streetlight	2020
Intersection	Sunset	Judah St	31st Ave	No	Yes	No	No	No	No	Mixed Residential/Commercial	Medium	Streetlight	2020
Intersection	Sunset	Judah St	19th Ave	No	Yes	Yes	No	No	No	Mixed Residential/Commercial	Medium	SFMTA	2015 Also used for 19th Avenue corridor
Intersection	Sunset	Irving St	Seventh Avenue	Yes	Yes	No	No	Yes	No	Commercial	Medium	SFMTA	2015
Intersection	Sunset	Carl St	Stanyan St	No	Yes	No	No	No	No	Residential	Medium	Streetlight	2020
Intersection	Sunset	Lincoln Way	19th Ave	Yes	Yes	No	No	No	Yes	Commercial	Low	SFMTA	2016
Intersection	Sunset	Irving St	34th Ave	No	No	No	No	Yes	No	Residential	Low	Streetlight	2020
Intersection	Sunset	Irving St	24th Ave	No	No	No	No	No	No	Commercial	Medium	Streetlight	2020

ATTACHMENT C
SITE OBSERVATION TEMPLATE

Project: _____

Date: _____ **Time:** _____

City: _____



Notes:

Vehicles:

Parking:

Loading:

Bicycle:

Ped:

Transit:

Important Items to note:		
Intersection Locations	Driveways and crosswalks	Loading activity
Speed Limits and Speeds	Activity (all modes)	Topography
Queueing/Congestion	Condition of Infrastructure	Potential hazards

Land Uses:

_____

_____

_____

General / Observations Notes: **Photo Name:**

_____ _____

_____ _____

_____ _____

_____ _____

ATTACHMENT D
STREETLIGHT DATA MEMO

FEHR PEERS

Memorandum

Date: August 23, 2021

To: Wade Wietgrefe and Liz White, SF Planning

From: Kevin Zamzow-Pollock, Matt Goyne, and Taylor McAdam, Fehr & Peers

Subject: San Francisco Housing Element 2022 Update – Data Collection Approach Adjustment

SF20-1097

Considering the real-time data collection constraints imposed by the COVID-19 pandemic, Fehr & Peers worked with the Planning department (department), SFMTA and SFCTA to prepare an approach using historic traffic count data for the Housing Element Update transportation analysis. The transportation team initially proposed a combination of single day counts collected for previous projects within the past six years (2015 through 2019) and StreetLight Data, a technology provider that aggregates location-based services data from cell phone apps (see *San Francisco Housing Element Transportation StreetLight Methodology Memo*, April 13, 2021 and *San Francisco Housing Element StreetLight Validation Methodology Memo*, July 13, 2021).

After exploring the feasibility of using StreetLight Data from 2019 to represent pre-COVID baseline conditions for the San Francisco Housing Element Update, the transportation team determined that the StreetLight Data did not adequately meet the validation criteria required to produce intersection-level turning movement traffic counts. The primary uses for StreetLight Data are to estimate traffic patterns at the roadway or neighborhood level. For more detailed traffic count estimates, such as for intersections or turning movements, the transportation team determine that validating and calibrating StreetLight Data requires historic data counts from a similar land use environment and street type as the study intersection (e.g., matching land use mix, matching building density, and matching street design characteristics such as presence of transit lanes and number of lanes). The San Francisco Housing Element Update covers the entire City of San Francisco, which includes a diversity of land use type.

The transportation team researched several sources for acquiring historic traffic counts to use in calibration efforts. However, the transportation team was ultimately unable to assemble an adequate sample of historic traffic counts within each land use type and street environment to use in calibration efforts. The San Francisco Housing Element Update traffic analysis will therefore rely on historic single day counts, collected within the City of San Francisco between the years

2015 and 2019. Although single day counts cannot capture the full range of traffic activity at an individual intersection, traffic counts are intentionally collected on a weekday that represents typical conditions with no holidays, unusual weather, or special events. This is an acceptable level of precision to inform a multi-decade forecasting exercise. This approach is also consistent with prior environmental studies within the City of San Francisco.

FEHR PEERS

Memorandum

Date: July 13, 2021

To: Wade Wietgrefe and Liz White, SF Planning

From: Matt Goyne, Taylor McAdam, and Kevin Zamzow-Pollock, Fehr & Peers

Subject: San Francisco Housing Element 2022 Update StreetLight Validation Methodology

SF20-1097

This memo details Fehr & Peers' approach to collecting and validating StreetLight Data vehicle volume estimates for the San Francisco Housing Element Update EIR. StreetLight Data was proposed because the COVID-19 pandemic precluded collecting new data and historic count data was insufficient to meet the needs of the study.

Definitions

StreetLight Data is a databased platform that provides estimated vehicle volumes through the use of anonymized location-based services (LBS) data from cell phone apps.

Historic count data is the best available traffic volume data, collected between 2015 and 2019, including both turning movement counts (TMC) and link-level average daily traffic counts (ADT). Data was drawn from previous city projects, SFMTA resources, and the IDAX Historical Data Warehouse, a data collection provider that sells historic traffic counts. Data was considered **"complete"** if it included both AM and PM peak periods. The majority of locations had complete historic count data available and therefore did not require StreetLight volume estimates.

Study location, for the purpose of this memo, refers only to intersections or road segments where the analysis relied on StreetLight traffic volume estimates, not locations with complete historic count data. Study locations may either be TMC locations or ADT/link-level volume locations.

Validation is the process of checking StreetLight traffic volume estimates against available count data to determine StreetLight's accuracy and, if necessary, making adjustments to the StreetLight estimates to improve their accuracy.

Validation location refers to an intersection or road segment with historic count data used to validate StreetLight traffic volume estimates at a study location. The validation location may be the same as the study location or it may be a nearby or comparable intersection where historic count data was available.

Methodology

This methodology memo identifies six steps in the process of acquiring and validating StreetLight vehicle volume estimates:

1. Validation location selection
2. StreetLight volume estimate acquisition
3. Data compilation
4. StreetLight validation
5. StreetLight adjustment
6. Final volume generation

To help elucidate this methodology, we have selected the intersection of Carl Street and Stanyan Street on the Judah corridor as a case study intersection and will explain how its volumes were validated using this process.

1. Validation location selection

At locations where complete historic count data was not available, we decided to use StreetLight traffic volume estimates.

Due to known biases, StreetLight volume estimates require validation against historic count data. We developed three validation methods for three different contexts, listed in order of preference:

Method 1

Context: There is historic count data at the study location, but it is incomplete (e.g., contains only one peak period) or is of the wrong format (e.g., ADT data at a TMC location).

Method: The validation location is the same as the study location. Available historic count data can be used to validate StreetLight estimates of the same time period and/or format.

Method 2

Context: There is no historic count data at the study location, but there is historic count data at a location along the same corridor near enough to assume no significant change in volume from the study location.

Method: The validation location is nearby and on the same corridor as the study location. Available historic count data can be compared to StreetLight estimates at the study location as if they were at the same location.

Method 3

Context: There are no nearby locations with historic count data. However, there is a location of a similar transportation context (e.g., transit routes and volumes, bicycle facilities and volumes, land use mixes and densities) with historic count data. Only a few locations fit this category.

Method: The validation location is of a similar transportation context to the study location but is not necessarily in the same neighborhood or along the same corridor. Historic count data at the validation location can be compared to StreetLight volume estimates at the same validation location, generating a correction factor which can be applied to StreetLight estimates at the study location.

In some cases, we chose to use different methods for different approaches, based on available data. For example, available historic data a block north of the study location meant we could use Method 2 for the north-south corridor, but a lack of such data in the east-west direction meant we had to use historic data from a mile away and apply Method 3.

Fehr & Peers staff with expertise in intersection operations and knowledge of both StreetLight Data and San Francisco's streets reviewed these validation methods and locations.

For more details on StreetLight biases and the selection of validation locations, please see the **StreetLight Methodology Memo** attached to the **Data Collection Memo**.

Case Study: Carl Street and Stanyan Street

The intersection of Carl Street and Stanyan Street did not have any historic count data. However, there was nearby TMC data at Irving Street and Fourth Avenue (AM and PM), Carl Street and Arguello Boulevard (PM only), and Stanyan Street and Parnassus Avenue (AM and PM). This made Carl Street and Stanyan Street a perfect candidate for Method 2.

2. StreetLight volume estimate procurement

A Fehr & Peers staff member well-versed in StreetLight's platform and outputs set up the analysis on StreetLight's online portal and downloaded the resulting data. They performed standard post-processing to produce daily and peak period traffic estimates at all study locations, as well as the additional StreetLight estimates for validation locations in Method 3.

We decided to use three months of StreetLight data (September-November 2019) in order to provide the best average volume estimates, as well as allow for the calculation of a standard deviation.

3. Data compilation

Data compilation involved taking historic count data and StreetLight volume estimates and making sure they were in comparable formats. Due to the nature of the three analysis methods, we could not always compare individual turning movements between the study location and the validation location. Exceptions to this include Method 1 locations where the study location and validation location were the same and Method 3 locations where the entire intersection was being compared and not just one direction of traffic.

We averaged the three months of StreetLight data to represent the average day of traffic across that time period. Where historic count data was missing from an intersection approach or time period, we also excluded the corresponding StreetLight data from analysis.

Case Study: Carl Street and Stanyan Street

We decided to validate the intersection of Carl Street and Stanyan Street using Method 2, which involves using separate data sources for each road. As Carl Street has two potential historic count locations, we decided to use the TMC at Carl Street and Arguello Boulevard as our PM data, the only period in which it was available, because it was closer to our study location. We used the TMC at Irving Street and Fourth Avenue as our AM data.

We aggregated the TMC data into approach-level volumes, producing eight numbers:

- Eastbound on Carl Street/Irving Street, AM and PM
- Westbound on Carl Street/Irving Street, AM and PM
- Northbound on Stanyan Street, AM and PM
- Southbound on Stanyan Street, AM and PM

We did the same for StreetLight volume estimates at Carl Street and Stanyan Street, averaging data from September, October, and November 2019.

4. StreetLight validation

Because there is natural variation in traffic volumes, a single day of historic count data cannot capture the full range of vehicular activity. Therefore, to determine the reasonableness of the StreetLight volume estimates, we applied three established statistical tests:

1. The standard deviation test checked whether the historic count data fell within two standard deviations of the StreetLight average.

2. The GEH statistic compared the historic count data and the StreetLight estimate against the established threshold of GEH<5. [1]
3. The maximum deviation test, based on an established validation method for traffic models, checked the percent difference between the historic count data and the StreetLight estimate against a table of maximum acceptable deviations.

Due to their different approaches and standards, these three tests provided a broader sense of the reasonableness of the StreetLight estimates than any of them would alone. These three tests provided a standard against which to check our adjustments to StreetLight data.

Case Study: Carl Street and Stanyan Street

When we compared the approach-level historic count data and StreetLight volume estimates, no approaches passed the GEH test and only a few approaches passed the standard deviation and maximum deviation tests. For the majority of approaches, the StreetLight volume estimates significantly overestimated the volume at the intersection.

5. StreetLight adjustment

In dense urban areas with high transit, bicycle, and pedestrian activity, StreetLight frequently overestimates traffic counts, likely due to a higher observed device penetration rate. To account for this, where volumes did not pass the validation tests described in Step 4, we instituted a number of adjustments that deducted absolute numbers of trips from StreetLight's estimate:

- 20-30% (depending on transit volume) of peak hour ridership on Muni Metro routes that pass through the study location, sourced from the most recent reliable Muni counts (2016) as received from SFMTA
- Historic pedestrian or bicycle counts at the study location or a nearby validation location
- 30% of total StreetLight estimated approach volume, based on previous Fehr & Peers analysis showing that historic count data was on average 30% lower than StreetLight estimates at urban, transit-rich locations in the Bay Area

We did not apply all adjustments at all locations, but applied them selectively based on available data, knowledge of San Francisco's streets, and engineering judgement. Where, even after adjustment, the StreetLight volume estimates did not pass all of the tests, we determined whether the adjusted StreetLight estimates nevertheless represented a reasonable volume.

At three locations, we determined the StreetLight traffic volume estimates could not be validated with the available historic count data. Even after applying the adjustments listed above, the

[1] The GEH (Geoffrey E. Havers) statistic is an empirical formula used by many transportation professionals, including Caltrans, to measure the similarity between two traffic volumes in order to validate one of them. A GEH value of less than 5 is broadly considered to indicate sufficient similarity.

StreetLight volume estimates were significantly and unreasonably higher than the historic count data. Therefore, we removed these three locations from subsequent analysis:

- Judah Street and 31st Avenue
- Judah Street between 12th Avenue and Fulton Street
- Third Street between Palou Avenue and Quesada Avenue

Case Study: Carl Street and Stanyan Street

As described above, StreetLight volume estimates at the intersection of Carl Street and Stanyan Street appeared to overestimate volumes at the intersection. This was a reasonable outcome for a dense, walkable, and bikeable area with a major transit route, the N Judah.

In order to adjust the intersection volumes, we deducted 20% of peak hour ridership on the N Judah from the Carl Street volume estimates to represent transit trips which had been accidentally included in StreetLight's volume estimate. As a result, test passing improved on Carl Street. However, some Carl Street estimates and all Stanyan Street estimates were still too high.

Next, we deducted 30% of the total StreetLight approach-level volume estimate from each volume estimate, with the exception of two estimates on Carl Street that were passing tests well. This adjustment is based on prior Fehr & Peers research on StreetLight's biases at urban locations in the Bay Area and accounts for the higher than average device penetration rate at these locations. As a result, test passing significantly improved for all approaches.

After applying these two adjustments, all approaches in both AM and PM passed the standard deviation and maximum deviation tests. Three of the approaches during the PM peak period did not pass the GEH test, being still too high. However, since the absolute overestimate was low and we could not justify further reduction, we determined this to be an acceptable outcome.

6. Final volume generation

Having adjusted the StreetLight vehicle volume estimates, we calculated the percent difference between the original and adjusted estimates and applied the following further modifications:

- Where validation relied on historic count data that was missing a peak period or an approach direction, we extrapolated the percent difference to cover all periods and approaches.
- For locations that used Method 3, we applied the percent differences at the validation location to the original study location.
- Where we saw significant volumes on prohibited left turn movements, we adjusted the percent difference down by a further 90%, attributing the error to StreetLight overinflating the occasional illegal left turn.

We applied these percent differences to the original StreetLight estimates at the study location to produce final volume estimates. We compiled these estimates with locations with historic count data (and did not require StreetLight analysis) to create a complete set of baseline data for SF Housing Element analyses.

Case Study: Carl Street and Stanyan Street

The intersection of Carl Street and Stanyan Street did not have any of the unique circumstances described above, so its volumes were finalized as they were.

FEHR PEERS

Memorandum

Date: April 13, 2021

To: Wade Wietgrefe and Liz White, SF Planning

From: Matt Goyne, Taylor McAdam, Allison Quach, and Kevin Zamzow-Pollock, Fehr & Peers

Subject: San Francisco Housing Element 2022 Update Transportation StreetLight Methodology

SF20-1097

Purpose

As presented in the *Housing Element 2022 Update EIR – Transportation Impact Analysis Scope of Work*[1], the transportation team will collect data at up to seven study corridors and up to 55 intersections to support our assessment of existing conditions[2]. Based on meetings with the Planning Department and SFMTA staff in November and December 2020, we identified 49 study intersections and 14 roadway segments across seven selected study corridors.

Due to changes in travel behavior and transportation resulting from the COVID-19 pandemic, the standard approach of collecting new traffic counts is not an option. To address this, the transportation team has identified manual counts collected between 2015 and 2019 representing pre-COVID activity levels, sourced from the City of San Francisco and the IDAX Historical Data Warehouse[3]. However, as reflected in **Table 1** and **Figure 1**, historic counts are incomplete or not available for 14 of the 49 proposed study intersections and 11 of the 14 proposed roadway segments.

This memo describes some considerations for using StreetLight Data and Fehr & Peers' proposal to use StreetLight Data's turning movement volume estimates as an alternative source of pre-COVID count data for the intersections for which prior manual count data are not available. Streelight Data is a databased platform that provides vehicle counts through the use of

[1] *Housing Element 2022 Update EIR – Transportation Impact Analysis Scope of Work (October, 2020)*

[2] For the purpose of the Housing Element 2022 Update EIR, the planning department will rely on pre-COVID-19 conditions as the existing setting.

[3] IDAX is a data collection provider that provides historic counts for $70 per intersection per time period time period for Turning Movement Counts (TMCs) and $70 per day for Average Daily Traffic (ADT) counts

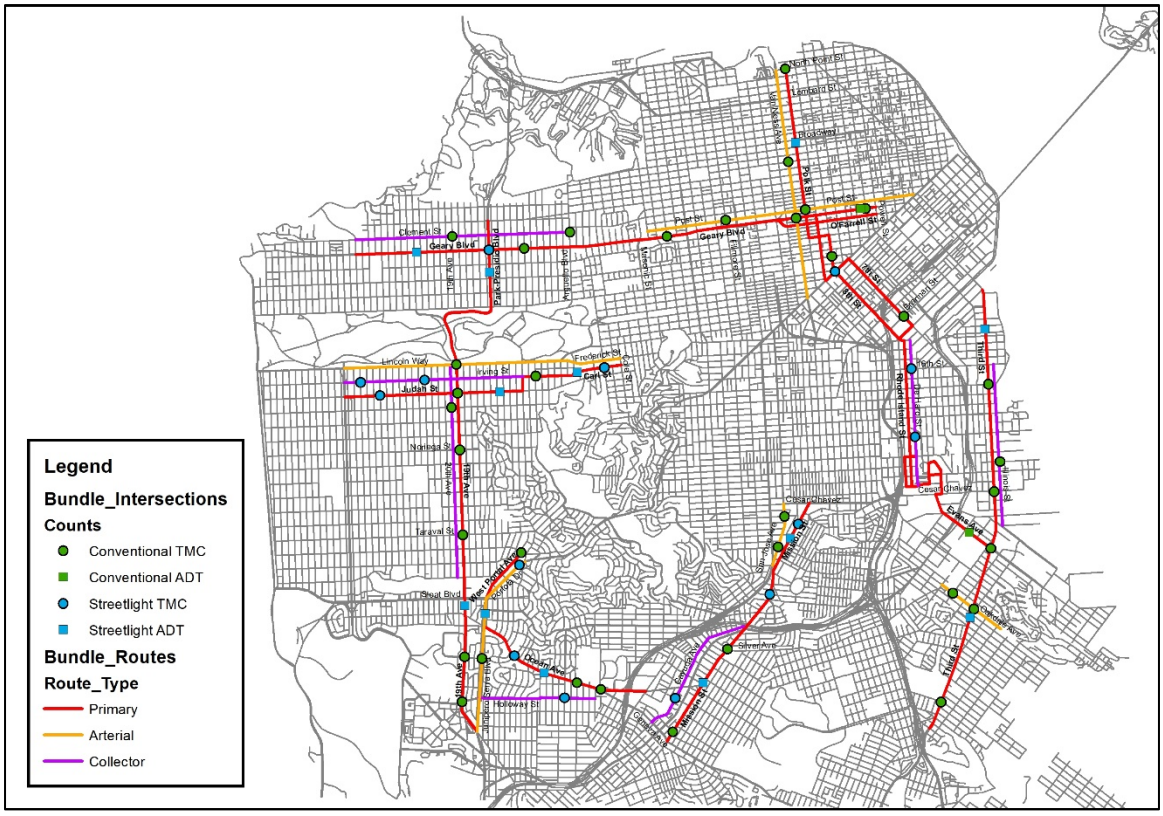
anonymized cellphone data. Further, this memorandum explores what steps are required to validate the StreetLight Data for use in San Francisco and counts that were collected prior to 2017 (the oldest reliable data).

Table 1. Data Collection Locations

Type	Count
Intersection Turning Movement Counts	
From Existing City Counts or Studies	23
From IDAX Historical Data Warehouse	12
From StreetLight Data	14
Total Intersection Counts	**49***
Intersection Bike/Ped Counts	30**
Roadway Average Daily Traffic Counts (ADTs)	
From Existing City Counts or Studies	2
From IDAX Historical Data Warehouse	1
From StreetLight Data	11
Total ADTs	**14**

Source: Compiled by Fehr & Peers (2021) based on an evaluation of counts collected by SFMTA, Fehr & Peers, and IDAX.
***** Four intersections are used for two different corridors.
** Bike/ped counts are a subset of total intersection counts

Figure 1. Study Corridors and Data Collection Status



Source: Compiled by Fehr & Peers (2021) based on an evaluation of counts collected by SFMTA, Fehr & Peers, and IDAX

StreetLight Data Considerations

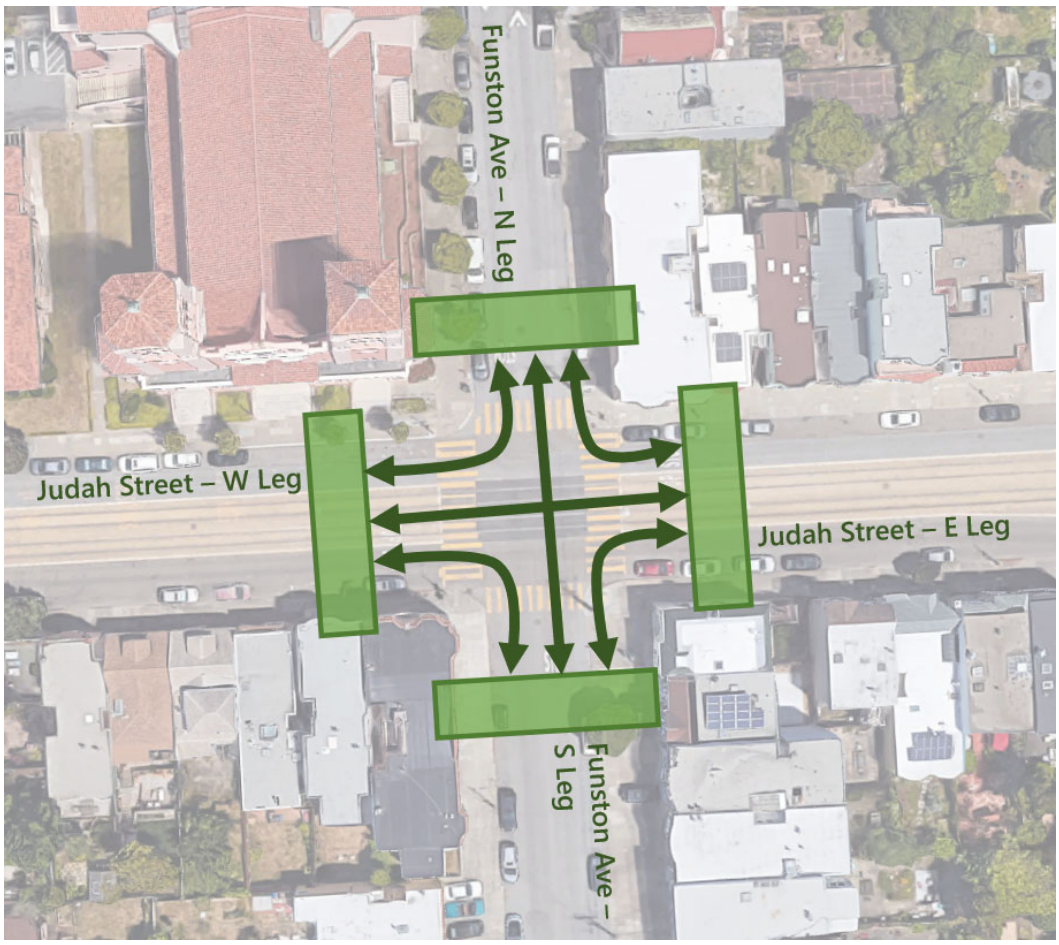
There are two primary concerns many jurisdictions have with using StreetLight or other big data providers – data privacy and data biases. StreetLight Data attempts to address both concerns at several points in the data processing workflow.

All mobile device location data provided to StreetLight has been de-identified (personally identifiable information removed) by data suppliers. StreetLight runs the data through several rounds of processing to take raw device traces and produce individual trips that follow roadways. Quality assurance tests ensure that traces with erratic or unlikely behavior are filtered out of the final data set, and that the data are appropriately normalized to the population.

When users such as Fehr & Peers query StreetLight's dataset, trips are aggregated and averaged over one or more months. StreetLight uses "zones", designated road segments or geographic areas, to aggregate its data. In the case of estimating intersection turning movement counts, StreetLight uses four zones, one for each intersection leg, to aggregate trips traveling from each intersection leg to every other leg. A sample diagram of a StreetLight intersection turning movement query is shown in **Figure 2.** StreetLight's turning movement estimates are presented

as volumes and do not include additional information about device origin or destination. Additionally, a query that returns too few trips (raising concerns of both statistical validity and privacy) is flagged for review before delivered to users.

Figure 1. Sample StreetLight Intersection Turning Movement Zones



Source: Fehr & Peers (2020)

Fehr & Peers' independent validation of StreetLight's intersection turning movement volume estimates[4] found that StreetLight estimates are a reasonable replacement for traditional traffic counts. In 88 percent of locations tested, manual counts fell within the unadjusted StreetLight estimates confidence intervals. This validation effort found two biases in StreetLight's raw vehicle estimates that can be corrected with adjustments: (1) estimates for through movements are typically higher than for left and right turns and (2) estimates are higher in areas with higher device concentration (typically more urban contexts with higher pedestrian, bicycle, or transit

[4] More information about the validation methodology for StreetLight data can be found in the white paper here: https://www.fehrandpeers.com/transformative-data-collection-solution/, May 2020.

activity). Fehr & Peers proposes to collect data at the missing study locations and supplemental data validation locations to address these biases as described in the following sections.

StreetLight Data Collection

StreetLight Data are based around zones, which are road segments or geographic areas by which StreetLight aggregates its data. Average Daily Traffic (ADT) data require one StreetLight zone. A Turning Movement Count (TMC) requires four StreetLight zones, one for each leg of the intersection, as seen in **Figure 2**.

StreetLight Data may be purchased in batches of zones: 10 zones, 50 zones, 100 zones, 250 zones, and so on. Fehr & Peers will acquire 100 StreetLight zones, which will be used for the following three purposes, which are also presented in **Table 2**:

- As study locations where pre-COVID manual count data are not available
- As data validation locations for the above counts (described below in StreetLight Data Validation Methodology)
- As data validation locations for older manual count data (described below in Older Count Data Validation Methodology)

Table 2. StreetLight Data Locations

Purpose	Type	# of Locations	Zones per Location	# of Zones
StreetLight Study Locations	ADT	11	1	11
	TMC	14	4	56
StreetLight Data Validation	ADT	1	1	1
	TMC	4	4	15
Older Count Data Validation	TMC	4	4	16
Total		34	--	100

Source: Compiled by Fehr & Peers (2021) based on an evaluation of counts collected by SFMTA, Fehr & Peers, and IDAX.

StreetLight Data Validation Methodology

Due to the aforementioned biases in StreetLight's raw vehicle estimates, it is necessary to validate StreetLight Data against available traditional traffic counts. In general, the biases are based on the context of the study location as the intersection configuration (through versus turning movements) and density of land uses or presence of transit or bicycle facilities are most likely to influence the biases noted above. In order to validate the StreetLight Data at all of the StreetLight study locations, Fehr & Peers developed three distinct methods; listed in order of preference, these methods are 1) using existing or historical counts at the same location, 2) at a nearby location, or 3) at a location with a similar land use and transportation context. The final method

also requires collecting the StreetLight Data Validation locations shown in **Table 2**. In some cases, multiple validation methods may be required for the same location as presented in **Table 3** (e.g. one method for primary street volumes and a different method for cross-street volumes).

1. **Method 1: Use counts at the study location:** In some cases, existing or historical data are available at the study location, but they don't represent the data we need on their own because a) they are incomplete (e.g., only include PM counts but not AM counts), or b) they are of the wrong format (ADT vs. TMC). However, the available data are sufficient to validate StreetLight counts at that location. There are two ADT and four TMC locations that can be validated using Method 1. Variations on Method 1 include:
    - **1.1. For study ADT locations,** we would use full or partial historic TMC data at an immediately adjacent intersection.
    - **1.2. For study TMC locations**, we would use partial (e.g. one peak period only) historic TMC data.
2. **Method 2: Use counts at nearby locations:** If Method 1 is infeasible due to a lack of data at the study location, there may be available data at a nearby "validation location" with similar levels of vehicle, pedestrian, bicycle, or transit activity. This available data could then be used to validate StreetLight data. There are eight ADT and five TMC locations that can be validated using Method 2, as well as four additional TMC locations that can be partially validated using Method 2. Variations on Method 2 include:
    - **2.1. For study ADT locations,** we would use existing or historic ADT or TMC data along the same corridor.
    - **2.2. For study TMC locations,** we would use existing or historic ADT or TMC data along both the primary corridor and the cross street.
    - **2.3. For study TMC locations**, we would use existing or historic ADT or TMC data along the primary corridor alone, if we can reasonably assume that vehicle volumes on the cross street are negligible.
3. **Method 3: Use counts in a similar land use and transportation context:** If Method 1 and Method 2 are infeasible for a study location, Fehr & Peers will compare StreetLight Data and historic traffic counts at a validation location in a similar land use and transportation context to develop a correction factor for the StreetLight Data at the study location. For this method to work, it is essential that a) the StreetLight Data at the validation and study locations are from the same year, and b) the validation location has similar vehicle, transit, bicycle, and pedestrian volumes, and land use mixes and densities. There are one ADT and one TMC location that can be validated using Method 3, as well as four additional TMC locations that can be partially validated using Method 3. Variations on Method 3 include:
    - **3.1.** The validation location could be another location along the same corridor that is too far away to assume no intervening change in volume.
    - **3.2.** The validation location could be a location elsewhere in the city that has similar vehicle, transit, bicycle, and pedestrian volumes, and land use mixes and densities to the study location.

Table 3 presents the 25 StreetLight study locations and their proposed validation methodology. The rightmost column identifies the validation location(s) with existing or historic count data that would be used to validate that StreetLight data. Validation locations in *italics* are those that are not currently Housing Element study intersections. Locations that are underlined are the five extra locations (four TMC locations and one ADT location) for which data would be acquired from StreetLight as part of validation Method 3, namely the following locations:

1. Geary & 8th
2. Clement & 19th
3. Judah & 19th
4. Judah & 41st (ADT)
5. Kirkham & 20th

Table 3. StreetLight Validation Locations and Methods

Corridor	Type	Study Location	Method	Validation Location (count source)
Geary	ADT	Geary & 25th	3.1	Geary & 8th (SFMTA)
Polk-Evans	ADT	Polk & Broadway	1.1	*Polk & Broadway (SFMTA)*
Polk-Evans	TMC	Market & Eighth	2.3	Hyde & McAllister (IDAX), *8th & Folsom (SFMTA)*
Polk-Evans	TMC	De Haro & 16th	1.2	*PM count at De Haro & 16th (F&P)*
Polk-Evans	TMC	De Haro & 22nd	2.3	*De Haro between 22nd and 23rd ADT (SFMTA)*
Third Street	ADT	Third & China Basin	2.1	Third & Mariposa (IDAX)
Third Street	ADT	Third & Quesada	2.1	Third & Oakdale (SF Planning)
Mission	TMC	Mission & Valencia	2.2	*Mission & Cesar Chavez (IDAX), Valencia & Cesar Chavez (IDAX), Mission & 30th (SFMTA)*
Mission	ADT	Mission & 29th	2.1	*Mission & 30th (SFMTA), Mission & Cesar Chavez (IDAX)*
Mission	TMC	Mission & Richland	1.2	*PM count at Mission & Richland (IDAX)*
Mission	ADT	Mission & Ocean	1.1	*Mission & Ocean (SFMTA)*
Mission	TMC	Cayuga & Onondaga	1.2	*PM count and ADT at Cayuga & Onondaga (SFMTA)*
West Portal-Ocean	TMC	Holloway & Miramar	3.2	20th & Kirkham (SFMTA)
West Portal-Ocean	ADT	Ocean & Ashton	2.1	Ocean & Plymouth (SF Planning)
West Portal - Ocean	TMC	Ocean & Westgate	2.2	Ocean & Plymouth (SF Planning), Junipero Serra & Winston (IDAX)
West Portal-Ocean	ADT	West Portal & Ulloa	2.1	West Portal & Ulloa (SFMTA)

West Portal-Ocean	TMC	Portola & Vicente	1.2	*AM count at Portola & Vicente (SFMTA)*
19th Avenue	ADT	Park Presidio & Anza	2.1	*AM count at Park Presidio & California (SFMTA)*
19th Avenue	TMC	Park Presidio & Geary	2.2 (PP) 3.1 (Geary)	Geary & 8th (SFMTA), *AM count at Park Presidio & California (SFMTA)*
Judah-Irving	TMC	Carl & Stanyan	2.2	Irving & 7th (SFMTA), *Irving & 4th (SFMTA), Stanyan & Parnassus (SFMTA and F&P)*
Judah-Irving	ADT	Irving & Arguello	2.1	Irving & 7th (SFMTA), *Irving & 4th (SFMTA)*
Judah-Irving	ADT	Judah & Funston	2.1	Judah & 19th (SFMTA), *WB ADT on Judah E of 12th (SFMTA)*
Judah-Irving	TMC	Judah & 31st	3.1 (Judah) 2.2 (31st)	Judah & 19th (SFMTA), *EB ADT on Judah W of 41st ADT (SFMTA), ADT on 33rd Ave N of Irving (SFMTA)*
Judah-Irving	TMC	Irving & 24th	3.2 (Irving) 2.2 (24th)	Clement & 19th (SFMTA), *ADT on 20th Ave N of Irving (SFMTA)*
Judah-Irving	TMC	Irving & 34th	3.2 (Irving) 2.2 (34th)	Clement & 19th (SFMTA), *ADT on 33rd Ave N of Irving (SFMTA)*

Source: Compiled by Fehr & Peers (2021)

Older Count Data Validation Methodology

Among the existing count data sourced from the City of San Francisco and the IDAX Historical Data Warehouse, there are older counts from 2015 and 2016. These locations are concentrated on the Third Street, Mission, and 19th Avenue corridors. With the remaining 16 (out of 100) StreetLight zones, Fehr & Peers will validate and improve the quality of this older count data by using StreetLight to determine the extent of traffic volume changes since those years and adjust the counts accordingly.

The proposed methodology is as follows:

1. For each of the three aforementioned corridors, one location would be selected that is considered representative of the corridor. Preference would be given to locations that are already being acquired as study locations.
2. The StreetLight Marketing Portal allows one to preview data before purchasing it. Fehr & Peers would look for a notable change in volume between 2017 (the oldest reliable data) and 2019 (the most recent reliable data) at the representative location.
3. If a notable change in volume is observed, additional "older count validation locations" along the corridor would be acquired from StreetLight as part of the 16 remaining zones.
4. If needed, these older count validation locations would be used to estimate a growth factor for the corridor and scale the older count data accordingly.

Table 4 presents the representative locations and potential older count validation locations for each of the corridors with older count data.

Table 4. Older Count Data Validation Locations

Corridor	Representative Location	Older Count Validation Locations (if needed)
Third Street	Third & Palou	Third & Paul, Third & Evans
Mission	Guerrero & Duncan	Guerrero & Duncan
19th Avenue	Judah & 19th	19th & Taraval

Source: Compiled by Fehr & Peers (2021)

Conclusion

In conclusion, this memo documents the considerations and validation efforts for using Streetlight Data to inform existing traffic conditions in light of the COVID-19 pandemic. This memo provides substantial evidence that that planning department has relied on the best available information to determine existing conditions.

APPENDIX G.3. TRANSPORTATION MODEL RESULTS REPORT

San Francisco Housing Element 2022 Update:
Transportation Model Results

Prepared for:
San Francisco Planning Department

February 2022

SF20-1097

FEHR PEERS

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Introduction

This report presents the transportation modeling results and the approach used by Fehr & Peers and LCW Consulting (transportation team) to interpret transportation model data for the San Francisco Housing Element 2022 Update EIR as required by Task 3 in the *Transportation Impact Analysis Scope of Work*, dated October 22, 2020 (Scope of Work). This report also documents the purpose and scale of the transportation models used for the Housing Element 2022 Update EIR ("EIR") impact analysis.

The transportation team prepared a series of memoranda in the early stages of this work to refine the data collection and analysis approach. The table below summarizes these memoranda.

Table 1: Analysis Approach Memoranda

Memo Title	Content	Delivery Date	Review Status	Outcomes
Data Collection Memo	Summarizes the quantitative and qualitative data needed to describe existing and projected future conditions for use in the analyses for the CEQA and supplementary non-CEQA studies. Presents the study corridors approach.	February 2021	Reviewed; approach confirmed February 24, 2021	Transportation Team moved forward with data collection
Streetlight Memos				
San Francisco Housing Element Transportation StreetLight Methodology Memo **(**memos 1 and 2 combined)	Memo 1+2: Describes StreetLight Data, its biases, and the proposed approach to selecting locations.	December 7, 2020 February 24, 2021	Memos 1 and 2 reviewed; approach confirmed April 13, 2021	Transportation Team acquired StreetLight Data.
3 StreetLight Validation Memo	Memo 3: Details the approach to collecting and validating StreetLight Data vehicle volume estimates.	July 9, 2021	Memo 3 reviewed in July	StreetLight analysis paused.
4 Data Collection Approach Adjustment	Memo 4: Explains the ultimate decision to forego the use of StreetLight data in the Housing Element impact analysis due to validation concerns.	November 15, 2021	Memo 4 reviewed in November	StreetLight count locations dropped from analysis.

Modeling Approach Memo	Presents the draft daily and PM peak hour travel demand, vehicle miles traveled (VMT), and public transit results for the purposes of demonstrating the validation of the 2020 models and the preliminary effects between the Housing Element land use concepts (land use concepts).	May 3, 2021	Reviewed; approach confirmed at May 14, 2021 meeting with written comments delivered May 20, 2021	Transportation Team proceeded with modeling approach and began preparing this report
Transit Delay Approach Memo	Summarizes transit delay methodology (moving and dwell time refinements) and presents results for Geary test corridor.	July 8, 2021	Reviewed by SFCTA, SFMTA, and Planning; comments sent to Transportation Team via email on July 28, 2021.	Transit delay methodology altered after discussions with SFCTA and SFMTA; new data was requested of SFMTA to accomplish new methodology.

This report presents the following model outputs for EIR impact analysis:

- Travel demand
- Vehicle miles traveled
- Traffic volumes (*Note to reviewer: Appendix D only includes draft volumes and does not yet include PBA or Proposed Action).*

This report presents the daily, AM peak hour, and PM peak hour travel demand, vehicle miles traveled (VMT), and traffic volumes, for the Housing Element land use concepts (land use concepts) A, B, C, Plan Bay Area 2050 (PBA), and Proposed Action.

This report will inform the detailed quantitative analysis of public transit delay and VMT, the assessments of potentially hazardous conditions, loading, and bike, pedestrian, and emergency access impacts, and non-CEQA assessments of transit fleet needs and accessibility. The remaining transportation impact topics, including parking and construction, will rely on other data sources not presented within this report.

Modeling Approach

Forecasting Approach

The scale of the analysis, study scenarios, model types, and model inputs used to develop the future year (2035 and 2050) forecasts for the EIR are described below.

Analysis Scale

The report presents the following data at different geographic scales:

- Citywide – Land use inputs and travel demand (trip generation and mode share) and VMT outputs.
- Planning District – Land use inputs and travel demand (trip generation and mode share) and VMT outputs.
- Study Corridors and Study Locations – Traffic volumes at study locations within representative study corridors. The approach to transit delay and capacity analysis for the representative study corridors are described seperately in the *Transit Delay Approach Memo (*February 2022).
- Transportation Analysis Zone (TAZ) – VMT maps by TAZ.

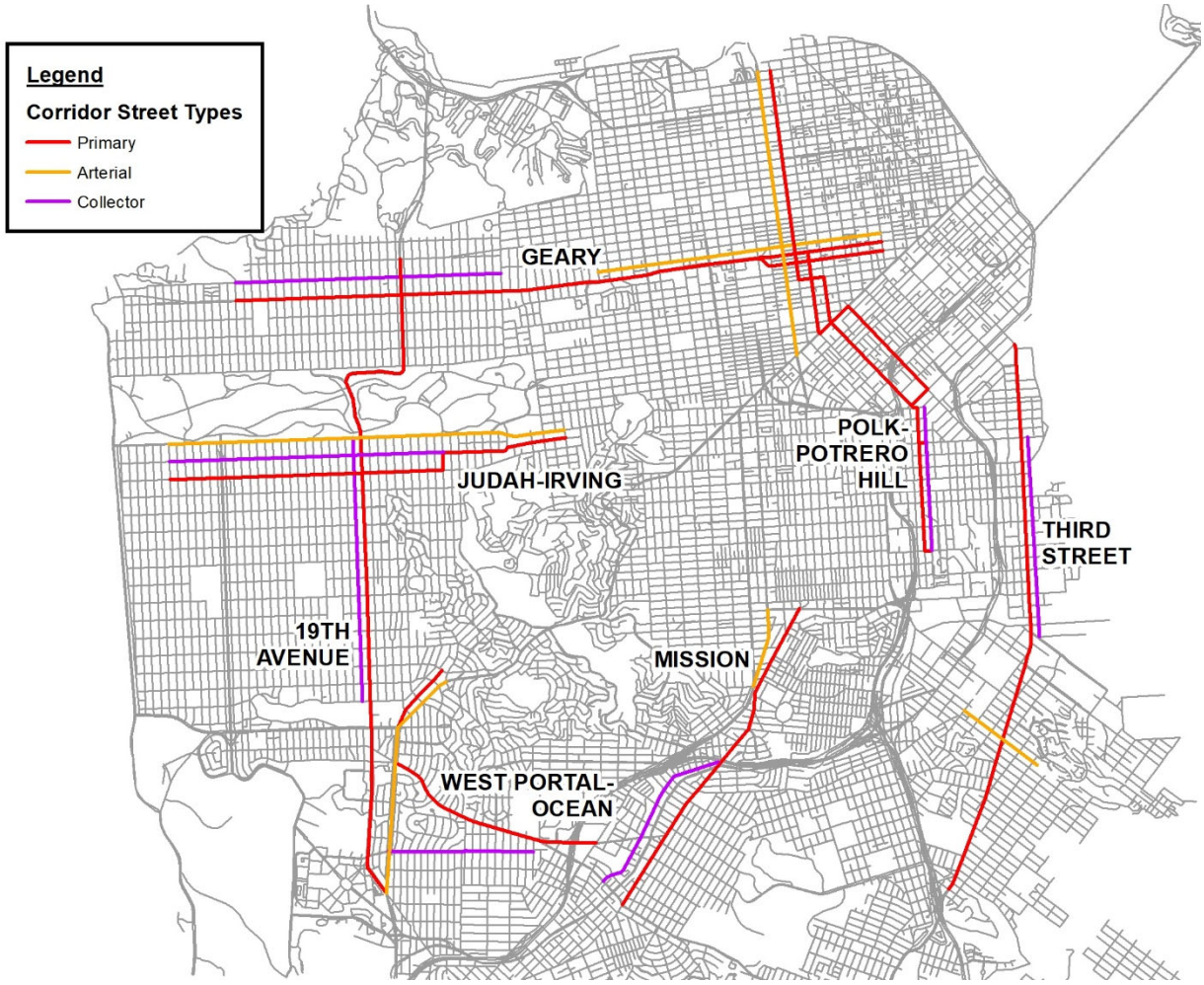
Study Corridors

As outlined in the memorandum *San Francisco Housing Element Transportation Data Collection Methodology* (Fehr & Peers, February 2021), the CEQA transportation impact analysis will focus on seven study corridors that provide a representative depiction of the land use concepts and transportation conditions throughout San Francisco. The transportation team, in coordination with the San Francisco Planning Department (department) and SFMTA, selected the seven representative study corridors shown in **Table 2** to represent a citywide cross-section of transportation facilities and land use types. The study corridors selected for the EIR analysis typically include a primary street on a transit route and several representative arterial and collector parallel and cross streets. The study corridors are shown on **Figure 1**.

Table 2: Housing Element Study Corridors

Corridor Name	Muni Route	Begins At	Includes	Ends At	Study Locations
Geary	38 Geary	34th Avenue	Geary Boulevard, Geary Street, O'Farrell Street	Powell Street	8th Avenue / Geary Boulevard Baker Street / Geary Boulevard Van Ness Avenue / Geary Boulevard
Polk-Potrero Hill	19 Polk	North Point Street	Polk Street, Larkin Street, Hyde Street, Market Street, Seventh Street, Eighth Street, Rhode Island Street, De Haro Street	23rd Street	Van Ness Avenue / Washington Street Hyde Street / McAllister Avenue Seventh Street / Brannan Street
Third Street	T Third	Channel Street	Third Street	Le Conte Avenue	Third Street / 16th Street Third Street / Paul Avenue Third Street / Evans Avenue
Mission	14 Mission	Cesar Chavez Street	Mission Street	Geneva Avenue	San Jose Avenue / 30th Street Mission Street / Silver Avenue Cayuga Street / Onondaga Avenue
West Portal-Ocean	K Ingleside	Ulloa Street	West Portal Avenue, Junipero Serra Boulevard, Ocean Avenue	San Jose Avenue	West Portal Avenue / Ulloa Street Junipero Serra Blvd / Winston Drive Ocean Avenue / Geneva Avenue
19th Avenue	28 19th Avenue	California Street	Park-Presidio Boulevard, Crossover Drive, 19th Avenue	Junipero Serra Boulevard	20th Avenue /Kirkham 19th Avenue /Taraval 19th Avenue /Holloway
Judah-Irving	N Judah	43rd Avenue	Judah Street, Irving Street, Carl Street	Cole Street	19th Avenue / Judah Street 19th Avenue / Lincoln Way 7th Avenue / Irving Street

Figure 1. Housing Element Study Corridors



Analysis Scenarios

To prepare for the EIR impact analysis, the transportation team analyzed SF-CHAMP model outputs for the following scenarios:

1. Existing conditions (2020)
2. Baseline conditions (2035 and 2050) (assumes a continuation of existing housing element plans and policies)
3. 2035 and 2050 *Land Use Concept A*
4. 2035 and 2050 *Land Use Concept B*
5. 2035 and 2050 *Land Use Concept C*
6. 2035 and 2050 *Plan Bay Area 2050 (PBA)*
7. 2035 and 2050 *Proposed Action*

The existing conditions (2020) model outputs will be used to describe the EIR existing conditions and compared to existing transit and traffic data, where available. The remaining analysis scenarios will allow

for the development of 2035 and 2050 baseline conditions, and for a comparison of the baseline conditions to conditions under each land use concept for the EIR impact analysis.

Existing Conditions (2020) and all "existing" data sources are based on pre-COVID-19 conditions. All analysis scenarios assume similar work from home rates (and other travel behavior factors) as were in place before COVID-19.

Model Descriptions

The transportation team used two transportation models to prepare outputs for the EIR impact analysis: the San Francisco County Transportation Authority's (SFCTA) SF-CHAMP model and a Visum post-processing model. The purpose and inputs of each model are presented below.

SF-CHAMP

The SF-CHAMP model is an activity-based travel demand model that has been validated to represent existing transportation conditions in San Francisco. The model predicts person travel for a full day (a typical weekday) based on a synthetic population, locations of housing units, and employment, which are then allocated to different periods throughout the day, using time-of-day sub-models. The SF-CHAMP model predicts person travel by mode: auto, transit, walking, bicycle, and TNC/taxi trips. These trips are assigned to paths along road and transit networks, producing forecasts of vehicular traffic on regional freeways, major arterials, and the local roadway network; and forecasts of transit riders on local and regional transit services. The model considers available roadway and transit route capacity, origin-destination demand, travel speeds, and other costs including but not limited to tolls, transit fares, and transit access, when assigning future travel demand to the roadway and transit network. The SF-CHAMP model also forecasts vehicle and transit travel speeds based on the roadway capacity in addition to the number of riders for transit services.

Visum

Visum, developed by PTV Group, is a traffic analysis, travel demand forecasting, and GIS-based data-management software. The transportation team created a Visum model that serves as a GIS-based repository for the SF-CHAMP model's inputs and outputs, including - land use tables, highway network, auto and transit assignment results, VMT results etc. The Visum model was used to review the reasonableness of the SF-CHAMP model outputs, and to prepare visual and tabular summaries of the SF-CHAMP outputs for the EIR. Additionally, the Visum model was used to conduct the transit delay analysis for the Housing Element 2022 Update, by incorporating intersection capacities and revised assumptions provided by SFMTA for signal timing, transit-only lanes, and transit signal priority.

Model Inputs

Land Use

The department provided land use inputs for the 981 transportation analysis zones in San Francisco for each land use concept modeled in SF-CHAMP. The department summarized the housing units and jobs



on a citywide basis (**Table 3**) and for 16 Planning Districts (**Table 4** and **Table 5**) for 2035 and 2050 conditions, respectively. To maintain uniform population growth across land use concepts the department assumed the household size for each new housing unit (2.36) to be equal to the existing citywide average household size.

MTC prepared the regional land use inputs for 2020 and 2035 for *Plan Bay Area 2040*. The department, with partner agencies in ConnectSF, developed the regional land use assumptions for 2050 by continuing the 2015-2040 growth trajectories from the MTC land use inputs for an additional 10 years beyond 2040. The regional land use is consistent across all scenarios sharing an analysis year.

Between 2020 existing and 2035 baseline conditions, the department projected a citywide increase of approximately 56,000 housing units and 78,000 jobs. Between 2020 and 2050 baseline conditions, the department projected a citywide increase of approximately 102,000 housing units and 111,000 jobs. As shown on **Table 3**, Land Use Concepts A, B, and C assume a similar net-increase above baseline conditions) in the number of housing units: 21,000 more units under 2035 conditions and 53,000 more units under 2050 conditions. *PBA* assumes a greater net increase above baseline conditions in housing units than Land Use Concepts A, B, and C: 22,000 more units under 2035 conditions and 88,000 more units under 2050 conditions. The *Proposed Action* assumes 21,000 more units under 2035 conditions and 50,000 more units under 2050 conditions. The SF-CHAMP land use concept model files include changes to employment, shown in **Table 3**, that represent a less than one percent change to total citywide employment.

Appendix A presents additional information about the land use assumptions in the *Housing Element Transportation Network and Land Use Assumptions* memorandum (SFCTA, August 2020). **Appendix B** presents maps of the land use inputs by Planning District for the 2035 and 2050 baseline and each analysis scenario, and the percent change between baseline and each analysis scenario.

Table 3: Citywide Housing Units and Employment by Land Use Concept

	2035 Conditions		2050 Conditions	
Land Use Scenario	**Total Units**	**Net Change from Baseline**	**Total Units**	**Net Change from Baseline**
Residential Housing Units[1]				
Baseline	462,000	0	509,000	0
LU Concept A	484,000	+21,000 (5%)	562,000	+53,000 (10%)
LU Concept B	484,000	+21,000 (5%)	562,000	+53,000 (10%)
LU Concept C	484,000	+21,000 (5%)	562,000	+53,000 (10%)
Plan Bay Area	485,000	+22,000 (5%)	596,000	+88,000 (17%)
Proposed Action	484,000	+21,000 (5%)	559,000	+50,000 (10%)
Employment (Jobs)[1]				
Baseline	849,000	0	882,000	0
LU Concept A	849,000	0	890,000	+8,000 (1%)
LU Concept B	847,000	-2,000 (<1%)	887,000	+8,000 (1%)
LU Concept C	847,000	-2,000 (<1%)	887,000	+6,000 (1%)
Plan Bay Area	799,000	-50,000 (6%)	888,000	+7,000 (1%)
Proposed Action	849,000	0	879,000	-2,000 (<1%)

Notes: Values are rounded to nearest 1,000 to simplify review. Numbers may not sum to match Table 4 and Table 5 totals due to rounding.
1. Detailed information regarding the land use assumptions are presented in the memorandum *Housing Element 2022 Update Modeling and Land Use Concept Assumptions* (January 2022). Source: SF-CHAMP, Fehr & Peers, 2021.

Table 4: Housing Units and Employment by Analysis Scenario and Planning District for 2020 Existing Conditions

Land Use	Residential Housing Units	Employment (Jobs)
Richmond	37,000	25,000
Marina	25,000	28,000
Northeast	38,000	79,000
Downtown	37,000	260,000
Western Addition	32,000	42,000
Buena Vista	17,000	11,000
Central	26,000	13,000
Mission	28,000	53,000
South of Market	37,000	117,000
South Bayshore	17,000	52,000
Bernal Heights	10,000	6,000
South Central	29,000	17,000
Ingleside	27,000	18,000
Inner Sunset	18,000	25,000
Outer Sunset	27,000	15,000
Presidio	1,000	7,000
Treasure Island	1,000	1,000
Golden Gate Park	0	1,000
Total	**407,000**	**768,000**

Values are rounded to nearest 1,000 to simplify review. Numbers may not sum to match Table 3 total due to rounding.
Source: Planning Department, Fehr & Peers, 2021.

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Table 4: Housing Units and Employment by Analysis Scenario and Planning District for 2035 Conditions

Land Use	Residential Housing Units						Employment (Jobs)					
	Baseline	LU Concept A	LU Concept B	LU Concept C	Plan Bay Area	Proposed Action	Baseline	LU Concept A	LU Concept B	LU Concept C	Plan Bay Area	Proposed Action
Richmond	37,000	38,000	41,000	39,000	39,000	45,000	24,000	24,000	24,000	24,000	25,000	24,000
Marina	25,000	26,000	26,000	26,000	27,000	27,000	28,000	28,000	28,000	28,000	22,000	28,000
Northeast	39,000	40,000	39,000	39,000	42,000	39,000	81,000	81,000	80,000	80,000	85,000	80,000
Downtown	42,000	46,000	44,000	44,000	43,000	41,000	285,000	285,000	284,000	284,000	265,000	284,000
Western Addition	34,000	36,000	40,000	36,000	33,000	36,000	38,000	38,000	38,000	38,000	44,000	38,000
Buena Vista	18,000	18,000	18,000	18,000	18,000	19,000	10,000	10,000	10,000	10,000	11,000	10,000
Central	26,000	26,000	26,000	27,000	27,000	27,000	13,000	13,000	13,000	13,000	9,000	13,000
Mission	35,000	37,000	35,000	36,000	32,000	35,000	49,000	49,000	48,000	48,000	51,000	48,000
South of Market	61,000	64,000	62,000	62,000	57,000	56,000	171,000	171,000	170,000	170,000	137,000	170,000
South Bayshore	27,000	29,000	27,000	27,000	35,000	27,000	58,000	58,000	58,000	58,000	58,000	58,000
Bernal Heights	10,000	10,000	10,000	10,000	10,000	10,000	6,000	6,000	6,000	6,000	4,000	6,000
South Central	30,000	30,000	32,000	31,000	33,000	30,000	17,000	17,000	16,000	16,000	15,000	16,000
Ingleside	31,000	33,000	32,000	34,000	33,000	33,000	20,000	20,000	20,000	20,000	27,000	20,000
Inner Sunset	19,000	19,000	20,000	20,000	19,000	23,000	26,000	26,000	26,000	26,000	28,000	29,000
Outer Sunset	27,000	27,000	29,000	29,000	28,000	34,000	14,000	14,000	14,000	14,000	9,000	14,000
Presidio	1,000	1,000	1,000	1,000	1,000	1,000	7,000	7,000	7,000	7,000	2,000	7,000
Treasure Island	2,000	4,000	3,000	3,000	7,000	2,000	2,000	2,000	2,000	2,000	1,000	2,000
Golden Gate Park	0	0	0	0	0	0	1,000	1,000	1,000	1,000	7,000	1,000
Total	**462,000**	**484,000**	**484,000**	**484,000**	**485,000**	**485,000**	**849,000**	**849,000**	**847,000**	**847,000**	**799,000**	**849,000**

Notes: Values are rounded to nearest 1,000 to simplify review. Numbers may not sum to match Table 3 total due to rounding.
Source: Planning Department, Fehr & Peers, 2021.



Table 5: Housing Units and Employment by Analysis Scenario and Planning District for 2050 Conditions

		Residential Housing Units						Employment (Jobs)				
Land Use	**Baseline**	**LU Concept A**	**LU Concept B**	**LU Concept C**	**Plan Bay Area**	**Proposed Action**	**Baseline**	**LU Concept A**	**LU Concept B**	**LU Concept C**	**Plan Bay Area**	**Proposed Action**
Richmond	39,000	41,000	53,000	46,000	51,000	52,000	24,000	25,000	26,000	26,000	24,000	25,000
Marina	25,000	31,000	27,000	26,000	29,000	30,000	28,000	28,000	28,000	28,000	23,000	28,000
Northeast	39,000	41,000	39,000	40,000	51,000	40,000	82,000	82,000	81,000	81,000	88,000	81,000
Downtown	44,000	56,000	46,000	48,000	52,000	43,000	289,000	289,000	288,000	288,000	288,000	288,000
Western Addition	37,000	44,000	49,000	40,000	41,000	43,000	38,000	38,000	38,000	38,000	44,000	38,000
Buena Vista	18,000	18,000	19,000	19,000	23,000	20,000	10,000	10,000	10,000	10,000	11,000	10,000
Central	26,000	26,000	27,000	30,000	31,000	29,000	14,000	14,000	14,000	14,000	12,000	14,000
Mission	38,000	45,000	37,000	40,000	47,000	36,000	51,000	51,000	50,000	50,000	58,000	50,000
South of Market	68,000	86,000	68,000	75,000	70,000	62,000	184,000	184,000	183,000	183,000	159,000	183,000
South Bayshore	32,000	36,000	31,000	32,000	46,000	32,000	68,000	68,000	68,000	68,000	69,000	68,000
Bernal Heights	10,000	10,000	11,000	11,000	11,000	10,000	6,000	6,000	6,000	6,000	5,000	6,000
South Central	31,000	30,000	38,000	37,000	36,000	31,000	17,000	17,000	16,000	16,000	18,000	16,000
Ingleside	40,000	39,000	44,000	46,000	42,000	47,000	20,000	20,000	21,000	21,000	35,000	21,000
Inner Sunset	19,000	19,000	25,000	23,000	22,000	30,000	26,000	26,000	26,000	26,000	33,000	26,000
Outer Sunset	28,000	27,000	36,000	39,000	32,000	42,000	14,000	14,000	15,000	15,000	11,000	15,000
Presidio[1]	1,000	1,000	1,000	1,000	1,000	1,000	7,000	14,000	14,000	14,000	2,000	7,000
Treasure Island	11,000	11,000	11,000	11,000	11,000	11,000	3,000	3,000	3,000	3,000	1,000	3,000
Golden Gate Park	0	0	0	0	0	0	1,000	1,000	1,000	1,000	7,000	1,000
Total	**509,000**	**562,000**	**562,000**	**562,000**	**596,000**	**559,000**	**882,000**	**890,000**	**887,000**	**887,000**	**888,000**	**879,000**

Notes: Values are rounded to nearest 1,000 to simplify review. Numbers may not sum to match Table 3 total due to rounding.
Source: Planning Department, Fehr & Peers, 2021. [1] There is an error in the Presidio jobs data that resulted in a larger share of employment growth.

Transportation Network

The SFCTA coded transportation network changes to create 2035 and 2050 SF-CHAMP models based on input from SFMTA and department staff. Local transportation network changes include infrastructure projects listed in San Francisco's Countywide Transportation Plan, Capital Plan, the SFMTA's Capital Improvement Program, and other transportation infrastructure projects that were reasonably foreseeable in January 2020 (pre-COVID-19). The regional transportation changes for 2035 and 2050 were prepared by MTC for *Plan Bay Area 2040*. The land use concepts do not propose changes to the transportation network, and thus the transportation network is consistent for all scenarios for each analysis year. Additional information about the transportation network changes for 2035 and 2050 are presented in **Appendix A** and **Appendix B**.

Model Outputs

The future year 2035 and 2050 citywide travel demand model outputs, including daily trip generation, mode split, trip distribution, and vehicle miles traveled, are presented in **Table 6** through **Table 15**. Changes to daily person trips are presented in the figures that follow to illustrate the effects of each land use concept.

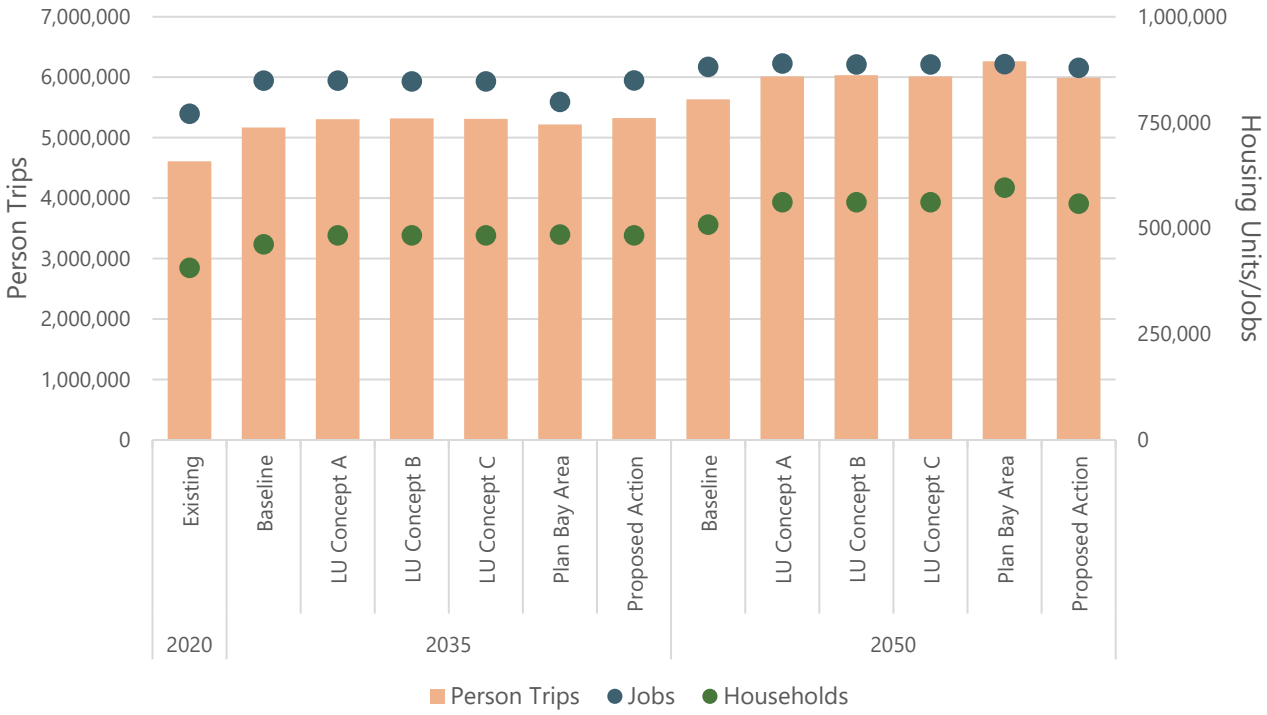
Travel Demand

Project travel demand refers to the new vehicle (driving alone, carpooling, and TNC/taxi), transit, pedestrian, and bicycle trips generated by the land use concepts for 2035 and 2050 conditions. The land use concept travel demand is based on outputs from SF-CHAMP and includes the number of person trips by Planning District, mode of travel, and time of day.

Trip Generation and Mode Split

The transportation team reviewed trip generation and mode split at the citywide and Planning District level (**Appendix C**). **Figure 2** presents the citywide total person trips for the 2035 and 2050 baseline scenarios and land use concepts. Overall, the total number of person trips citywide would increase in line with the increase in housing units and jobs for each land use concept compared to the baseline. This indicates that SF-CHAMP is responding well to the alterations in land use changes proposed by the Housing Element 2022 Update.

Figure 2. SF-CHAMP Land Use Inputs and Total Daily Person Trips



Person trip differences between scenarios depend on the Planning District where the housing unit growth occurs, as illustrated on a citywide basis in **Figure 3** and **Figure 4** and by mode in **Appendix C-1**. For example, Land Use Concept A would increase the total percentage of citywide TNC/taxi and walk trips with a corresponding decrease in the share of auto and transit trips by concentrating new units in northeastern Planning Districts (e.g., Marina, Financial District, etc.). The northeastern Planning Districts are close to Downtown job centers and other amenities; these Districts have high walk mode share and low vehicle ownership rates today and would retain these traits, based on the SF-CHAMP outputs.

Total transit ridership increases under all land use concepts. However, transit ridership as a share of total travel decreases under all land use concepts as well – meaning transit ridership is increasing at a slower rate compared to travel by other modes. This decline in total share of transit trips corresponds with an increase in walking trips – in each scenario, the share of total travel that occurs via walking trips increases. In a similar manner, citywide automobile and TNC mode share changes are inversely proportional based on the vehicle ownership rates of the new housing locations. When new housing occurs in locations with high vehicle ownership rates, automobile mode share increases while TNC mode share decreases, and the inverse is true when housing growth is in districts with lower vehicle ownership rates.

Table 6 and **Table 9** present the total number of daily person trips, trips by mode, and vehicle trips for all trips that start and/or end in the city for each land use concept compared to the 2035 and 2050 baseline conditions. **Table 7** and **Table 10**, and **Table 8** and **Table 11** present the same information for the AM

and PM peak hours, respectively. The Proposed Action generates more total person trips than the other land use concepts due to the concentration of new households in neighborhoods that generate more person trips per household, based on the SF-CHAMP baseline outputs. Plan Bay Area has the largest land use growth under 2050 conditions and thus generates the most total person trips under this scenario. Total person trips are categorized by mode: auto (includes driving alone and carpooling), TNC/taxi, public transit, walking, and bicycling. Auto person trips are converted to vehicle trips using the following vehicle occupancy assumptions:

- 1 person trip per single occupancy vehicle trip
- 2 person trips per carpool vehicle trip
- 3.5 person trips per high occupancy vehicle trip
- 1.48 person trips per TNC/taxi vehicle trip

Vehicle trips, rather than auto person trips, are the relevant output metric to understand how auto traffic will impact transit travel times, hazards, and emergency access.

Figure 3. Change in Daily Total Mode Share between Baseline and Land Use Concepts A, B, C, Plan Bay Area, and Proposed Action for 2050 Conditions

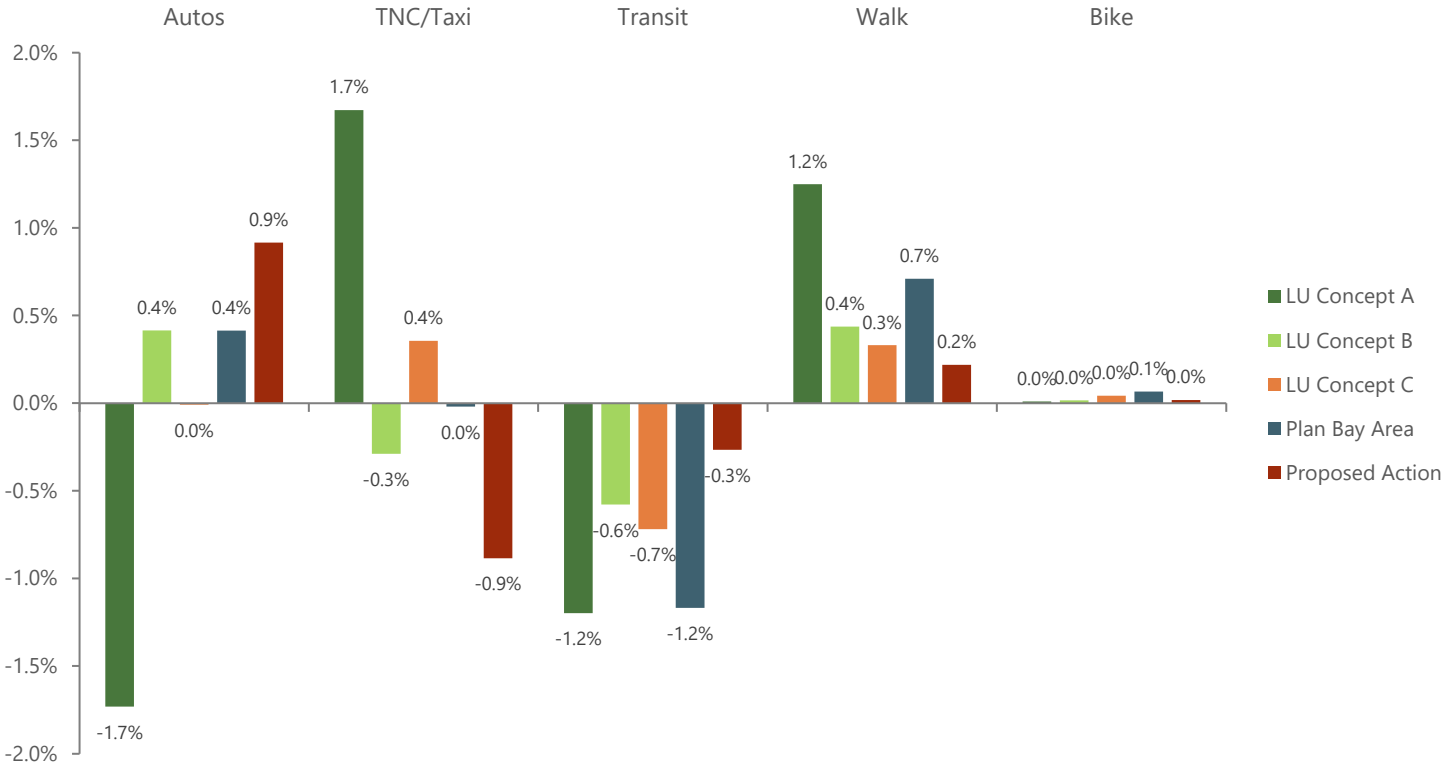


Figure 4. Change in PM Peak Total Mode Share between Baseline and Land Use Concepts A, B, C, Plan Bay Area, and Proposed Action for 2050 Conditions

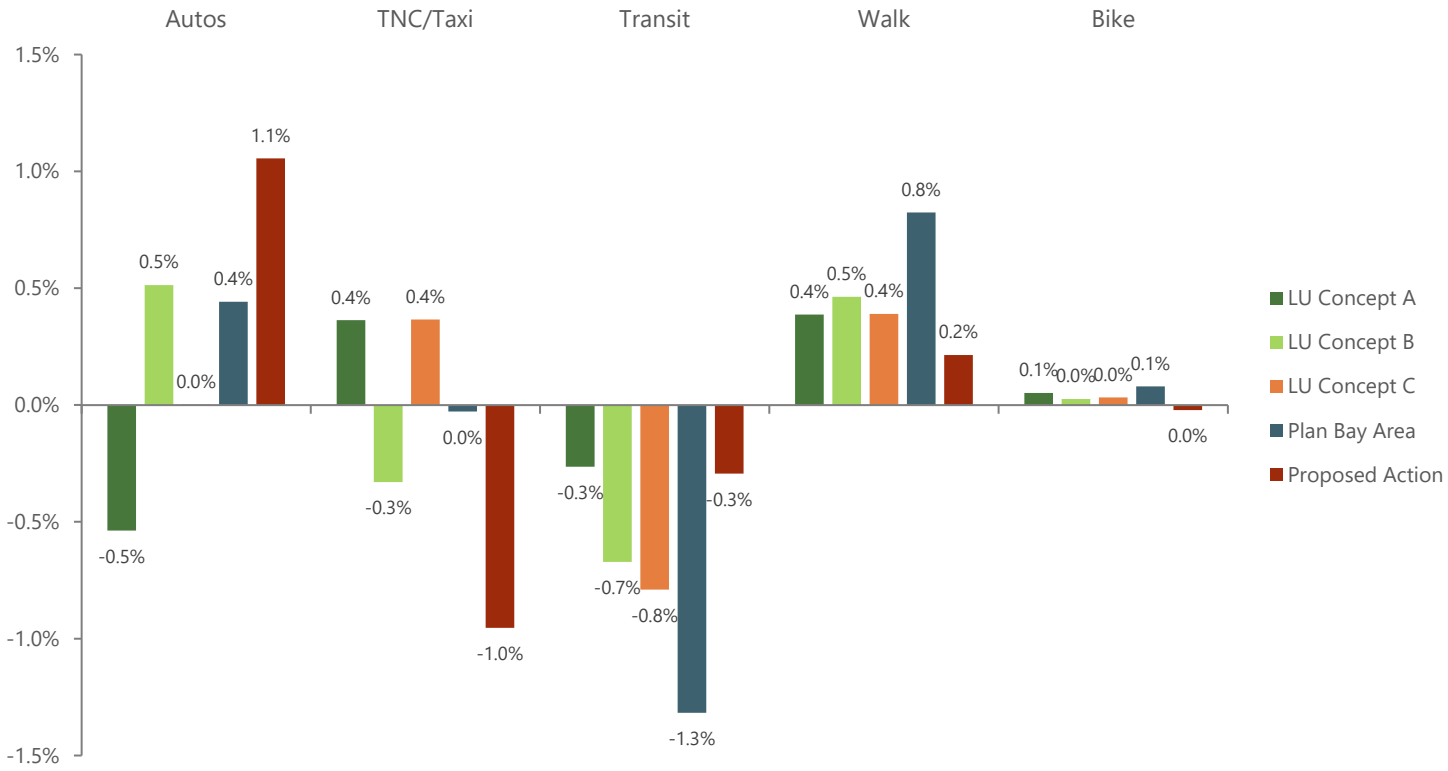


Table 6: Citywide Weekday Daily Travel Demand by Way of Travel by Housing Element Land Use Concept for 2035 Conditions

Land Use Concept/ Analysis Scenario	Person Trips by Way of Travel						Vehicle Trips
	Auto	TNC/Taxi	Transit	Walk	Bike	Total	
Existing (2020)	2,567,000	268,000	904,000	740,000	129,000	4,608,000	1,975,000
2035 Baseline	2,727,000	389,000	1,083,000	831,000	136,000	5,166,000	2,163,000
Land Use Concept A							
Housing Element	2,770,000	416,000	1,101,000	875,000	142,000	5,304,000	2,208,000
Net Change from 2035 Baseline	+43,000	+27,000	+18,000	+44,000	+6,000	+138,000	+45,000
Percent Change	+2%	+7%	+2%	+5%	+4%	+3%	+2%
Land Use Concept B							
Housing Element	2,801,000	403,000	1,105,000	869,000	141,000	5,318,000	2,221,000
Net Change from 2035 Baseline	+74,000	+14,000	+22,000	+38,000	+5,000	+152,000	+58,000
Percent Change	+3%	+4%	+2%	+5%	+4%	+3%	+3%
Land Use Concept C							
Housing Element	2,795,000	404,000	1,104,000	867,000	142,000	5,311,000	2,217,000
Net Change from 2035 Baseline	+68,000	+15,000	+21,000	+36,000	+6,000	+145,000	+54,000
Percent Change	+2%	+4%	+2%	+4%	+4%	+3%	+2%
Plan Bay Area							
Housing Element	2,857,000	341,000	1,036,000	845,000	138,000	5,217,000	2,219,000
Net Change from 2035 Baseline	+130,000	-48,000	-47,000	+14,000	+2,000	+51,000	+56,000
Percent Change	+5%	-12%	-4%	+2%	+1%	+1%	+3%
Proposed Action							
Housing Element	2,843,000	371,000	1,113,000	856,000	141,000	5,324,000	2,232,000
Net Change from 2035 Baseline	+116,000	-18,000	+30,000	+25,000	+5,000	+158,000	+69,000
Percent Change	+4%	-5%	+3%	+3%	+4%	+3%	+3%

Notes: Values are rounded to nearest 1,000 to simplify review of citywide and Planning District level data.
Source: SF-CHAMP, Fehr & Peers, 2021.

Table 7: Citywide Weekday AM Peak Hour Travel Demand by Way of Travel by Housing Element Land Use Concept for 2035 Conditions

Land Use Concept / Analysis Scenario	Person Trips by Way of Travel						Vehicle Trips
	Auto	TNC	Transit	Walk	Bike	Total	
Existing (2020)	158,900	13,500	75,500	35,800	9,000	292,700	123,300
2035 Baseline	168,300	20,000	89,500	39,600	9,200	326,600	134,100
Land Use Concept A							
Housing Element	170,800	21,300	90,700	41,800	9,700	334,300	136,600
Net Change from 2035 Baseline	+2,500	+1,300	+1,200	+2,200	+500	+7,700	+2,500
Percent Change	+1%	+7%	+1%	+6%	+5%	+2%	+2%
Land Use Concept B							
Housing Element	172,400	20,600	90,600	41,500	9,600	334,700	137,400
Net Change from 2035 Baseline	+4,100	+600	+1,100	+1,900	+400	+8,100	+3,300
Percent Change	+2%	+3%	+1%	+5%	+4%	+2%	+2%
Land Use Concept C							
Housing Element	172,100	20,800	90,500	41,500	9,800	334,700	137,100
Net Change from 2035 Baseline	+3,800	+800	+1,000	+1,900	+600	+8,100	+3,000
Percent Change	+2%	+4%	+1%	+5%	+7%	+2%	+2%
Plan Bay Area							
Housing Element	177,100	17,100	84,700	40,600	9,400	328,900	138,400
Net Change from 2035 Baseline	+8,800	-2,900	-4,800	+1,000	+200	+2,300	+4,300
Percent Change	+5%	-15%	-5%	+3%	+2%	+1%	+3%
Proposed Action							
Housing Element	174,400	18,900	91,400	40,900	9,600	335,200	137,700
Net Change from 2035 Baseline	+6,100	-1,100	+1,900	+1,300	+400	+8,600	+3,600
Percent Change	+4%	-6%	+2%	+3%	+4%	+3%	+3%

Notes: Values are rounded to nearest 100 to simplify review of citywide and Planning District level data.
Source: SF-CHAMP, Fehr & Peers, 2021.

Table 8: Citywide Weekday PM Peak Hour Travel Demand by Way of Travel by Housing Element Land Use Concept for 2035 Conditions

Land Use Concept / Analysis Scenario	Person Trips by Way of Travel						Vehicle Trips
	Auto	TNC	Transit	Walk	Bike	Total	
Existing (2020)	194,400	21,600	78,500	51,600	10,500	356,600	153,100
2035 Baseline	203,600	31,000	93,600	57,600	11,000	396,800	165,600
Land Use Concept A							
Housing Element	206,800	33,300	95,000	60,700	11,500	407,300	169,200
Net Change from 2035 Baseline	+3,200	+2,300	+1,400	+3,100	+500	+10,500	+3,600
Percent Change	+2%	+7%	+1%	+5%	+5%	+3%	+2%
Land Use Concept B							
Housing Element	208,800	32,300	94,900	60,400	11,300	407,700	170,000
Net Change from 2035 Baseline	+5,200	+1,300	+1,300	+2,800	+300	+10,900	+4,400
Percent Change	+3%	+4%	+1%	+5%	+3%	+3%	+3%
Land Use Concept C							
Housing Element	208,600	32,300	95,200	60,200	11,400	407,700	169,900
Net Change from 2035 Baseline	+5,000	+1,300	+1,600	+2,600	+400	+10,900	+4,300
Percent Change	+2%	+4%	+2%	+5%	+4%	+3%	+3%
Plan Bay Area							
Housing Element	212,800	27,300	88,700	58,500	11,200	398,500	169,300
Net Change from 2035 Baseline	+9,200	-3,700	-4,900	+900	+200	+1,700	+3,700
Percent Change	+5%	-12%	-5%	+2%	+2%	+0%	+2%
Proposed Action							
Housing Element	211,900	29,400	95,800	59,000	11,300	407,400	170,500
Net Change from 2035 Baseline	+8,300	-1,600	+2,200	+1,400	+300	+10,600	+4,900
Percent Change	+4%	-5%	+2%	+2%	+3%	+3%	+3%

Notes: Values are rounded to nearest 100 to simplify review of citywide and Planning District level data.
Source: SF-CHAMP, Fehr & Peers, 2021.

Table 9: Citywide Weekday Daily Travel Demand by Way of Travel by Housing Element Land Use Concept for 2050 Conditions

Land Use Concept / Analysis Scenario	Person Trips by Way of Travel						Vehicle Trips
	Auto	TNC	Transit	Walk	Bike	Total	
Existing (2020)	2,567,000	268,000	904,000	740,000	129,000	4,608,000	1,975,000
2050 Baseline	2,930,000	459,000	1,202,000	901,000	142,000	5,634,000	2,344,000
Land Use Concept A							
Housing Element	3,021,000	590,000	1,210,000	1,036,000	152,000	6,011,000	2,491,000
Net Change from 2050 Baseline	+91,000	+131,000	+8,000	+135,000	+10,000	+377,000	+147,000
Percent Change	+3%	+29%	+1%	+15%	+7%	+7%	+6%
Land Use Concept B							
Housing Element	3,162,000	474,000	1,252,000	991,000	153,000	6,032,000	2,514,000
Net Change from 2050 Baseline	+232,000	+15,000	+50,000	+90,000	+11,000	+398,000	+170,000
Percent Change	+8%	+3%	+4%	+10%	+8%	+7%	+7%
Land Use Concept C							
Housing Element	3,125,000	511,000	1,239,000	981,000	154,000	6,010,000	2,510,000
Net Change from 2050 Baseline	+195,000	+52,000	+37,000	+80,000	+12,000	+376,000	+166,000
Percent Change	+7%	+11%	+3%	+9%	+8%	+7%	+7%
Plan Bay Area							
Housing Element	3,283,000	509,000	1,263,000	1,046,000	162,000	6,263,000	2,614,000
Net Change from 2050 Baseline	+353,000	+50,000	+61,000	+145,000	+20,000	+629,000	+270,000
Percent Change	+12%	+11%	+5%	+16%	+14%	+11%	+12%
Proposed Action							
Housing Element	3,170,000	435,000	1,262,000	971,000	152,000	5,990,000	2,491,000
Net Change from 2050 Baseline	+240,000	-24,000	+60,000	+70,000	+10,000	+356,000	+147,000
Percent Change	+8%	-5%	+5%	+8%	+7%	+6%	+6%

Notes: Values are rounded to nearest 1,000 to simplify review of citywide and Planning District level data.
Source: SF-CHAMP, Fehr & Peers, 2021.



Table 10: Citywide Weekday AM Peak Hour Travel Demand by Way of Travel by Housing Element Land Use Concept for 2050 Conditions

Land Use Concept / Analysis Scenario	Person Trips by Way of Travel						Vehicle Trips
	Auto	TNC	Transit	Walk	Bike	Total	
Existing (2020)	158,900	13,500	75,500	35,800	9,000	292,700	123,300
2050 Baseline	180,000	23,700	98,700	42,900	9,600	354,900	144,300
Land Use Concept A							
Housing Element	186,500	31,200	99,000	49,300	10,400	376,400	153,600
Net Change from 2050 Baseline	+6,500	+7,500	+300	+6,400	+800	+21,500	+9,300
Percent Change	+4%	+32%	+0%	+15%	+8%	+6%	+6%
Land Use Concept B							
Housing Element	193,900	24,300	102,000	47,100	10,300	377,600	154,600
Net Change from 2050 Baseline	+13,900	+600	+3,300	+4,200	+700	+22,700	+10,300
Percent Change	+8%	+3%	+3%	+10%	+7%	+6%	+7%
Land Use Concept C							
Housing Element	192,600	26,700	101,200	46,800	10,500	377,800	154,900
Net Change from 2050 Baseline	+12,600	+3,000	+2,500	+3,900	+900	+22,900	+10,600
Percent Change	+7%	+13%	+3%	+9%	+9%	+6%	+7%
Plan Bay Area							
Housing Element	202,900	25,800	102,600	50,300	10,900	392,500	161,500
Net Change from 2050 Baseline	+22,900	+2,100	+3,900	+7,400	+1,300	+37,600	+17,200
Percent Change	+13%	+9%	+4%	+17%	+14%	+11%	+12%
Proposed Action							
Housing Element	194,300	22,200	102,700	46,000	10,300	375,500	153,400
Net Change from 2050 Baseline	+14,300	-1,500	+4,000	+3,100	+700	+20,600	+9,100
Percent Change	+8%	-6%	+4%	+7%	+7%	+6%	+6%

Notes: Values are rounded to nearest 100 to simplify review of citywide and Planning District level data.
Source: SF-CHAMP, Fehr & Peers, 2021.

Table 11: Citywide Weekday PM Peak Hour Travel Demand by Way of Travel by Housing Element Land Use Concept for 2050 Conditions

Land Use Concept / Analysis Scenario	Person Trips by Way of Travel						Vehicle Trips
	Auto	TNC	Transit	Walk	Bike	Total	
Existing (2020)	194,400	21,600	78,500	51,600	10,500	356,600	153,100
2050 Baseline	216,400	36,700	103,300	62,300	11,400	430,100	177,400
Land Use Concept A							
Housing Element	222,300	47,000	103,900	72,200	12,200	457,600	188,200
Net Change from 2050 Baseline	+5,900	+10,300	+600	+9,900	+800	+27,500	+10,800
Percent Change	+3%	+28%	+1%	+16%	+7%	+6%	+6%
Land Use Concept B							
Housing Element	233,600	37,700	107,300	68,700	12,300	459,600	190,400
Net Change from 2050 Baseline	+17,200	+1,000	+4,000	+6,400	+900	+29,500	+13,000
Percent Change	+8%	+3%	+4%	+10%	+8%	+7%	+7%
Land Use Concept C							
Housing Element	230,700	40,800	106,500	68,200	12,300	458,500	190,100
Net Change from 2050 Baseline	+14,300	+4,100	+3,200	+5,900	+900	+28,400	+12,700
Percent Change	+7%	+11%	+3%	+9%	+8%	+7%	+7%
Plan Bay Area							
Housing Element	241,700	40,500	108,100	72,900	13,000	476,200	197,100
Net Change from 2050 Baseline	+25,300	+3,800	+4,800	+10,600	+1,600	+46,100	+19,700
Percent Change	+12%	+10%	+5%	+17%	+14%	+11%	+11%
Proposed Action							
Housing Element	234,500	34,600	108,300	67,100	12,000	456,500	188,900
Net Change from 2050 Baseline	+18,100	-2,100	+5,000	+4,800	+600	+26,400	+11,500
Percent Change	+8%	-6%	+5%	+8%	+5%	+6%	+6%

Notes: Values are rounded to nearest 100 to simplify review of citywide and Planning District level data.
Source: SF-CHAMP, Fehr & Peers, 2021.

Trip Distribution

The land use concepts have the potential to affect total travel in and out of the city in different ways by locating units in different Planning Districts. As shown in **Table 12**, all land use concepts would reduce the proportion of total San Francisco person trips with an origin or destination outside of San Francisco by increasing the proportion of trips occurring within San Francisco. Plan Bay Area offers the greatest reduction of external trips as a percent of total person trips because it adds the most housing closest to jobs and amenities in San Francisco. Concept A results in both an absolute reduction and proportional reduction in intercity trips. The Proposed Action has the greatest growth in intercity travel and least growth in intracity travel.

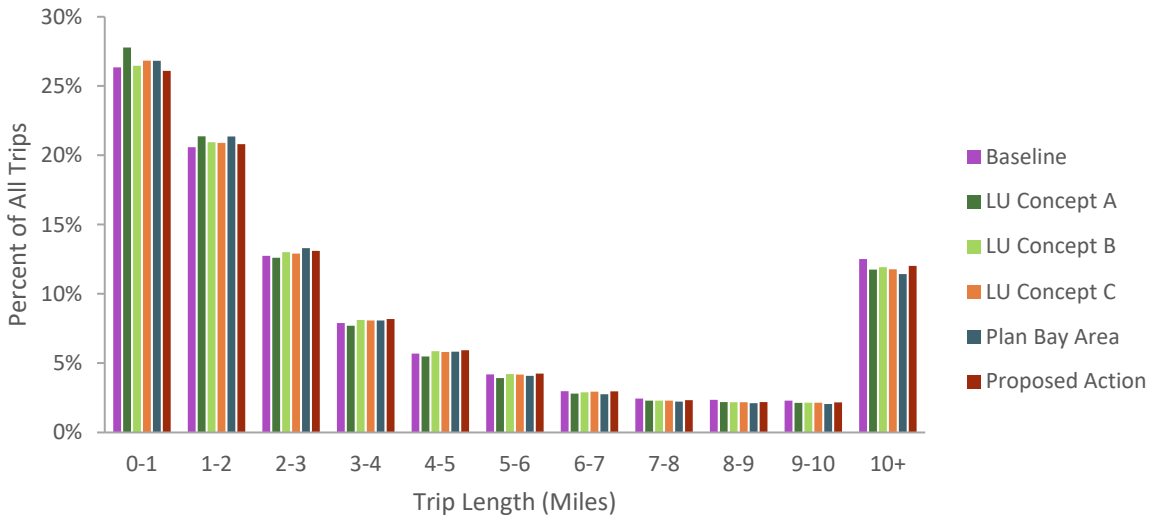
Table 12: Daily Person Trips In or Out of the City for 2050 Conditions

Land Use Scenario	Total Daily Person Trips		Percent Change from Baseline		Trips In/Out as a Percent of Total Trips
	Internal City Trips	Trips In or Out of the City	Internal City Trips	Trips In or Out of the City	
Baseline	4,077,000	1,557,000	-	-	28%
LU Concept A	4,456,000	1,554,000	+9%	+0%	26%
LU Concept B	4,447,000	1,585,000	+9%	+2%	26%
LU Concept C	4,437,000	1,573,000	+9%	+1%	26%
Plan Bay Area	4,675,000	1,589,000	+15%	+2%	25%
Proposed Action	4,400,000	1,589,000	+8%	+2%	27%

Source: SF-CHAMP, Fehr & Peers, 2021.

As shown in **Figure 5,** Land Use Concepts A, B, C, and Plan Bay Area would increase the percentage of total person trips with at least one trip end in San Francisco that are less than two miles by locating units closer to jobs and amenities compared to the 2050 baseline. The greatest increase for Land Use Concept A is for trips under two miles, which is the result of locating the majority of new units near jobs and amenities in Downtown. Land Use Concepts C and Plan Bay Area also increase the number of units in Downtown and SoMa, though not by as much, and as a result would increase the percent of trips under five miles and decrease the percent of longer trips. Land Use Concepts B and Proposed Action would reduce trip length compared to the Baseline and would slightly reduce the percent of trips over ten miles.

Figure 5. Trip Length Distribution for 2050 Conditions



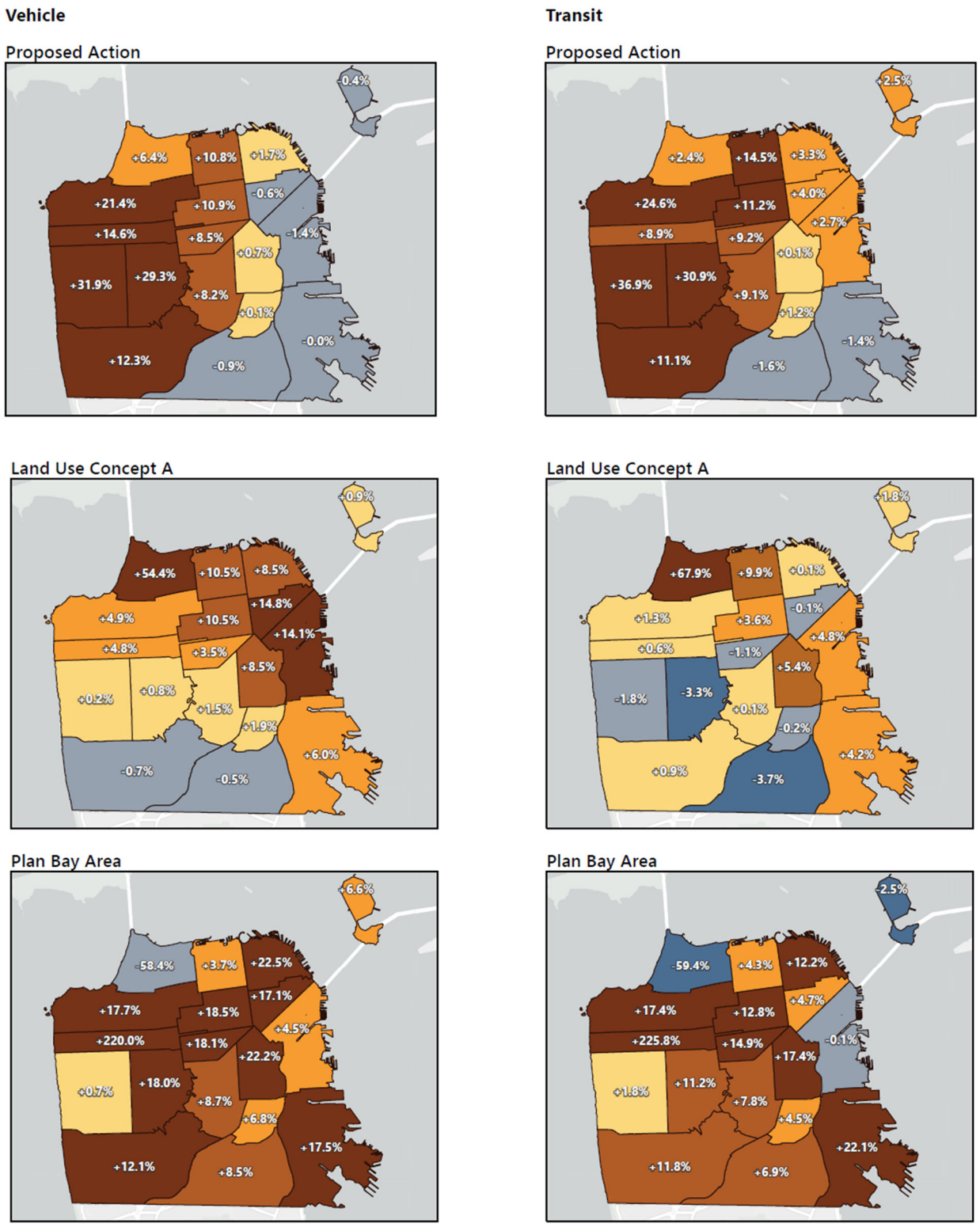
Vehicle and transit trips from the SF-CHAMP model scenarios are inputs to the quantitative public transit delay impact analysis. For each land use concept, the changes in vehicle and transit trips from the 2035 and 2050 baseline conditions provide an indication as to which transit lines are most likely to see transit delay impacts. **Appendix C-2** present maps showing the total number of vehicle trips (including private automobile and TNC/taxi), transit person trips, and percent change between baseline and each land use concept by Planning District for the 2035 and 2050 conditions.

Figure 6 indicates the greatest increases in vehicle trips and transit person trips are concentrated in the Planning Districts with the highest land use growth, such as Downtown, SoMa, and the Van Ness corridor in Land Use Concept A, the Sunset, Richmond, and Western Addition in Land Use Concept B, the Sunset and Richmond Districts in Land Use Concept C[1], the Mission and Bayview in Plan Bay Area, and the Sunset, Richmond, and Oceanview in the Proposed Action. Some Planning Districts on the western or southern side of San Francisco in Land Use Concept A and the Bayview in the Proposed Action and Land Use Concept B and C, show a slight decrease in transit or vehicle trips. These slight reductions are due to the reallocation of housing and job connections against the 2050 baseline and the resulting local mode share changes estimated by the SF-CHAMP model.

As shown in **Figure 6**, roadways through the Downtown, Western Addition, and South of Market Planning Districts would experience the largest increase in vehicle trips under Land Use Concept A and Plan Bay Area while the western Planning Districts would experience the largest increases under Land Use Concept B, C, and Proposed Action. Detailed roadway volumes for study corridor segments are provided in **Appendix D**, including adjustments to ensure reasonableness of the forecasted volumes at the roadway link level.

[1] The Presidio has a low baseline number of trips so the changes to land uses shown in Table 4 results in a large percentage increase, but relatively low number of total trips compared to other neighborhoods.

Figure 6. 2050 Daily Vehicle and Transit Person Trips, Percent Change between 2050 Baseline and 2050 Land Use Concept



Vehicle Miles Traveled

Table 13 presents the citywide total VMT for each land use concept under 2035 and 2050 conditions. This captures only VMT within the City's boundaries rather than the full length of trips into and out of San Francisco. In general, total citywide VMT increases slightly under all land use concepts, with Land Use Concept B, Plan Bay Area, and the Proposed Action increasing more than Land Use Concepts A and C, due to more vehicle trips and longer trip lengths as presented in **Trip Distribution**.

Table 14 presents regional total VMT for each land use concept under 2035 and 2050 conditions. This captures the full effect of the different land use concepts on VMT by including full trip lengths for all trips with at least one trip end in San Francisco. All land use concepts show an increase in total VMT due to the additional households in the region, but the increases are relatively small. Again, Land Use Concept B, Plan Bay Area, and the Proposed Action show the greatest increases.

Table 13: Citywide Total Daily VMT by Housing Element Land Use Concept

	2020 Conditions	2035 Conditions		2050 Conditions	
Land Use Scenario	Total VMT	Total VMT	Net Change from 2035 Baseline	Total VMT	Net Change from 2050 Baseline
Baseline	10,492,814	10,922,000	N/A	11,617,000	N/A
LU Concept A	N/A	11,031,000	+1%	11,932,000	+3%
LU Concept B	N/A	11,280,000	+3%	12,365,000	+6%
LU Concept C	N/A	11,079,000	+1%	12,138,000	+4%
Plan Bay Area	N/A	11,344,000	+4%	12,655,000	+9%
Proposed Action	N/A	11,282,000	+4%	12,361,000	+6%

Source: SF-CHAMP, Fehr & Peers, 2021.

Table 14: Regional Total Daily VMT by Housing Element Land Use Concept

	2020 Conditions	2035 Conditions		2050 Conditions	
Land Use Scenario	Total VMT	Total VMT	Net Change from 2035 Baseline	Total VMT	Net Change from 2050 Baseline
Baseline	162,583,589	171,630,000	N/A	184,372,000	N/A
LU Concept A	N/A	171,978,000	+0%	185,029,000	+0%
LU Concept B	N/A	173,974,000	+1%	187,562,000	+2%
LU Concept C	N/A	171,991,000	+0%	185,269,000	+0%
Plan Bay Area	N/A	174,417,000	+2%	188,200,000	+2%
Proposed Action	N/A	174,071,000	+1%	187,575,000	+2%

Source: SF-CHAMP, Fehr & Peers, 2021.

Table 15 presents the residential and office VMT per capita results for each land use concept under 2035 and 2050 conditions. Under Land Use Concepts A, B, C, and Proposed Action the residential VMT per capita would not change substantially because the new residents would rely on the same transportation network as the existing residents in each Planning District. Some small shifts in mode share are expected as shown in **Appendix C-1** as the Planning Districts become denser. The overall trend to add units to currently low-density, more auto-oriented neighborhoods results in a slight increase in VMT per capita. Each land use concept would result in a three to six percent reduction in VMT per capita for the office land use by providing additional housing closer to jobs in San Francisco. This finding is consistent with the above finding that all land use concepts reduce average trip lengths.

In addition, the VMT per capita values presented in **Table 15** are those most relevant to determining the potential VMT impacts of a given project, as per CEQA Guidelines Section 15064.3, the OPR Technical Advisory, and the San Francisco Planning Department's 2019 Transportation Impact Analysis Guidelines.

Table 15: Citywide Per Capita VMT Results by Housing Element Land Use Concept

	2035 Conditions		2050 Conditions	
Land Use	**Housing Element**	**Net Change**	**Housing Element**	**Net Change**
Residential VMT				
Regional Average (Baseline)	17.7	n/a	17.1	n/a
Baseline	8.3	0%	8.5	0%
LU Concept A	8.2	-1%	8.5	0%
LU Concept B	8.4	+1%	8.7	+2%
LU Concept C	8.3	0%	8.7	+2%
Plan Bay Area	8.8	+6%	8.8	+3%
Proposed Action	8.4	+2%	8.8	+3%
Office VMT				
Regional Average (Baseline)	24.7	n/a	23.8	n/a
Baseline	13.2	0%	12.6	0%
LU Concept A	12.8	-3%	12.1	-3%
LU Concept B	13.0	-2%	12.1	-3%
LU Concept C	12.8	-3%	11.9	-5%
Plan Bay Area	13.1	-1%	11.8	-6%
Proposed Action	13.0	-2%	12.1	-4%

Notes: The transportation team did not evaluate retail VMT per capita because the land use concepts do not propose changes to retail. Source: SF-CHAMP, Fehr & Peers, 2021.

Vehicle Volumes

Existing AM and PM peak hour turning movement volumes for the 20 study intersections are based on pre-pandemic traffic counts collected between 2015 and 2019 as described in the memorandum *San Francisco Housing Element Transportation Data Collection Methodology* (Fehr & Peers, February 24, 2021). Future year volumes for 2035 midpoint conditions were estimated using a two-step process: step 1 – using the SF-CHAMP model outputs, subtract the peak hour traffic volumes for 2020 conditions from the 2035 midpoint conditions; and step 2, adding the results of step 1 to the existing traffic counts. Therefore, the SF-CHAMP model outputs are used to develop the change in traffic volumes and this change is added to the existing counts. This approach was also used to develop the traffic conditions for the 2050 environmental baseline scenario by adding the change in model outputs between 2050 and 2020 conditions to the existing traffic counts. For the proposed action and other land use concepts, the change in model outputs between the study scenario and the 2035 midpoint or 2050 environmental baseline conditions was added to the baseline traffic volumes developed above. This approach was used to develop both AM and PM peak hour future year turning movement volumes for all scenarios. **Appendix D** presents the resulting AM and PM peak hour turning movement vehicle volumes for the 20 study intersections along the seven representative corridors.

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Appendix A
Housing Element Transportation Network and Land Use Assumptions Memo (SFCTA)

Housing Element and Waterfront Plan Transportation Network and Land Use Assumptions

Prepared by the San Francisco County Transportation Authority
January 12, 2022

1. INTRODUCTION

This memo describes year 2020, 2035, and 2050 transportation network and land use assumptions for Housing Element and Waterfront Plan analysis. The 2020 base year represents late January 2020, including recent projects like Better Market Street and several quick-build bicycle safety projects, but prior to the COVID-19 shelter-in-place restrictions and contraction of the economy. The future years 2035 and 2050 each feature a baseline and three Housing Element rezoning scenarios. Years 2020 and 2050 each feature a Waterfront Plan buildout scenario. The scenarios within each year share a common set of network assumptions.

2. CATEGORIES OF ASSUMPTIONS

Four categories of input assumptions are necessary to specify a model scenario. These include:

- **Regional land use assumptions** – Households and jobs by San Francisco Transportation Analysis Zone (TAZ) for the eight Bay Area counties outside of San Francisco. 2050 regional land use assumptions were developed through ConnectSF.
- **San Francisco land use assumptions** – Households and jobs by SF TAZ within San Francisco. The Housing Element team developed baseline land use assuming no change to the existing 2014 housing element, a proposed action, and three alternative rezoning scenarios for 2035 and 2050. The Housing Element team also conducted a Plan Bay Area 2050 model run. The Waterfront Plan team developed intensified land use assumptions for the Waterfront Plan Area, which are applied to create 2020 and 2050 scenarios.
- **Land use adjustment factors** – Values such as household size, household income distributions, age distributions, employed residents to household ratios, that are applied to household and job assumptions to develop complete land use assumptions. These assumptions are inherited from Plan Bay Area 2040 regional land use forecasts.
- **Transportation network assumptions** – These include roads, tolls, parking costs, transit services, transit fares and related attributes.

3. SCENARIOS

The Housing Element conducted 17 model runs: a baseline for 2020, 2035, and 2050, and for each forecast year (2035 and 2050), five San Francisco zoning scenarios (Eastside Focus "A", Transit Corridor Focus "B", Residential Growth Focus "C", Plan Bay Area 2050 "D", and the "Proposed Action"). The Housing Element team also conducted two scenarios to test the sensitivity of outcomes to the recently-adopted Plan Bay Area 2050 ("D + PBA2050" and "Proposed Action + PBA2050"). The Waterfront Plan will use the same 2020 and 2050 baseline scenarios, and requires two additional model runs: 2020 Waterfront Plan and 2050 Waterfront Plan. The land use assumptions were developed by Planning Department staff with consulting support. There will be one set of transportation networks for each model year shared by all the scenarios for that year. Regional land use assumptions and land use adjustment factors will also be shared by all scenarios for a model year. Scenarios within a common model year will differ solely in the allocation of households and jobs within San Francisco, representing either the baseline or one of three alternative zoning assumptions.

4. SAN FRANCISCO LAND USE ASSUMPTIONS

The San Francisco Planning Department produced 19 land use scenarios for the Housing Element and Waterfront Plan, summarized in Table 1.

Table 1: San Francisco Land Use Assumptions by Housing Element and Waterfront Scenario

Scenario	Households	Population	Jobs	Housing Element	Waterfront Plan
2020 Base	407,044	941,269	770,882	X	X
2020 Waterfront Plan	407,299	941,688	785,678		X
2035 Baseline	462,548	1,074,358	849,053	X	
2035 Scenario A	483,659	1,124,243	849,095	X	
2035 Scenario B	483,628	1,124,241	847,183	X	
2035 Scenario C	483,617	1,124,256	847,254	X	
2035 Scenario D	485,352	1,128,337	798,771	X	
2035 Scenario D + PBA2050 regional	485,352	1,128,337	798,771	X	
2035 Proposed Action	483,606	1,124,243	849,402	X	
2035 Proposed Action + PBA2050 regional	483,606	1,124,243	849,402	X	

2050 Baseline	508,744	1,185,477	881,546	X	X
2050 Scenario A	561,873	1,310,873	889,695	X	
2050 Scenario B	561,893	1,310,873	887,394	X	
2050 Scenario C	561,882	1,310,884	887,386	X	
2050 Scenario D	596,351	1,392,247	888,190	X	
2050 Scenario D + PBA2050 regional	596,351	1,392,247	888,190	X	
2050 Proposed Action	558,617	1,303,171	879,193	X	
2050 Proposed Action + PBA2050 regional	558,617	1,303,171	879,193	X	
2050 Waterfront Plan	508,999	1,185,908	896,343		X

5. REGIONAL LAND USE ASSUMPTIONS

The Metropolitan Transportation Commission (MTC) produces regional land use projections as part of Plan Bay Area. In October 2021, MTC adopted Plan Bay Area 2050, replacing the Plan Bay Area 2040. The development of land use inputs and subsequent modeling of the Housing Element and Waterfront Plan Project scenarios took place under Plan Bay Area 2040. The regional land use assumptions for 2020 and 2035 were prepared by MTC for Plan Bay Area 2040. The regional land use assumptions for 2050 were developed by the ConnectSF team based on continuing 2015-2040 growth trajectories for an additional 10 years beyond 2040. The regional land use is consistent across all scenarios sharing a model year. These land use assumptions are described in Table 2.

Table 2: PBA2040 and ConnectSF Regional Land Use Assumptions by Year

Model Year	Households	Population	Jobs
2020	2,473,369	6,940,868	3,361,936
2035	2,827,365	8,035,115	3,701,762
2050	3,177,664	9,220,906	4,135,229

Due to the adoption of PBA2050, four new scenarios were added, which use land use described in Table 3.

Table 3: PBA2050 Regional Land Use Assumptions by Year

Model Year	Households	Population	Jobs
2035	3,024,502	7,952,227	4,018,977
2050	3,464,942	9,052,596	4,490,258

6. 2050 NETWORK ASSUMPTIONS

Transportation networks for 2020, 2035, and 2050 were developed, based on networks prepared for ConnectSF and further updated with input from SFMTA and Planning Department staff. Transportation network assumptions vary only by year, but are consistent for all scenarios sharing a model year.

Network Development Process

SFTCA developed a draft project list for the Housing Element and Waterfront Plan based on the ConnectSF transportation network assumptions. This formed a draft 2040 transportation project list. Planning Department and SFMTA staff reviewed the draft project list and responded with comments. SFCTA staff incorporated these comments where possible and sought clarification where additional information was needed. Upon clarification from SFMTA and Planning Department staff, SFCTA incorporated remaining updates into final network model assumptions. The resulting 2040 transportation network assumptions are inputs into the 2040 Baseline SF-CHAMP scenario.

Project List

The 2020 base networks represent the end of January 2020, up to and including the implementation of Better Market Street. Table 2 lists San Francisco projects included in the 2035 and 2050 networks and designates in which model years they are included.

Table 1 lists San Francisco transportation projects included in the Housing Element and Waterfront Plan transportation networks, and designates which model years each project is included in. Table 2 shows significant regional transit projects that are represented in the network.

Plan	Project	Description
2035		
Bike Plan	5th Street Bike Lanes (Bike Plan - Long-Term)	Bike lanes on 5th Street between Market and Townsend
Bike Plan	2nd Street Bike Lanes (Bike Plan)	Bike lanes on 2nd Street between Market and Townsend
Bike Plan	San Bruno Project	New bike lane is added between Mansell and Paul.

	Upper Market Street	Implements a variety of street and circulation changes to the Upper Market Street area included lane changes, turn restrictions, and bicycle facilities
Central SoMa	3rd St (Central SoMa)	3rd from Market St to Townsend St, 3 NB auto lanes, 1 NB bus lane along the east curb, and right turn pockets in some locations, with boarding islands or bus bulbs at transit stops
Central SoMa	4th St (Central SoMa)	4th from Market St to Folsom St, 2 SB auto lanes, 1 bus lane, plus turn lanes. 4th from Harrison St to Townsend, 2 SB auto lanes with bi-directional T-Third right of way in the center
Central SoMa	Folsom Street (Central SoMa - Quick-Build)	Folsom from 2nd St to 11th St, Not technically a Central SoMa Plan project.
Central SoMa	Howard St (Central SoMa - Quick-Build)	Howard from 4th St to 11th St, Not technically a Central SoMa Plan project.
Central SoMa	Folsom Street (Central SoMa - Long-Term)	Folsom from 2nd St to 11th St, during peak: two EB auto lanes, one EB bus lane, and two-way cycle track along north curb; during off-peak: two EB auto lanes, and two-way cycle track along north curb. Cycle track would also extent further east to the Embarcadero. Replacement text from CSoMa Note to File: Folsom Street, between 2nd and 11th streets, would include two eastbound travel lanes from 4th to 10th streets, three eastbound travel lanes from 10th to 11th and 2nd to 4th streets, a two-way cycle track along the southern curb, a transit-only lane from Mabini to 10th streets, new bulb-outs on the north side of the street (east of 8th Street only), turn pockets at intersection approaches, and 10-foot sidewalks on both sides of the street.
Central SoMa	Howard Street (Central SoMa - Long-Term)	Howard from 3rd St to 11th St, during peak: three WB auto lanes, and two-way cycle track along south curb; during off-peak: two WB auto lanes, and two-way cycle track along south curb. Left turn-pockets and left-turn signals created where possible. Replacement Text from CSoMa Note to File: Howard Street, between 4th and 11th streets, would include two westbound travel lanes, a two-way cycle track along the southern curb, new bulb-outs on the north side at all intersections, parking and loading on both sides of Howard Street, turn pockets at intersection approaches, and 12-foot-wide sidewalks on both sides of the street.

Central SoMa	Harrison (Central SoMa)	Harrison from 2nd St to 3rd St, during peak: one WB bus lane, two WB auto lanes, two EB auto lanes; during off-peak: two WB auto lanes, one EB auto lane. Harrison from 3rd St to 6th St, during peak: four WB auto lanes, one WB bus lane; during off-peak: three WB auto lanes. Harrison from 6th St to 10 St, all times: four WB auto lanes, one WB bus lane. Harrison from 10th to 11th St, all times: two WB auto lanes, one WB bus lane, one EB auto lane.
Central SoMa	Bryant (Central SoMa)	Bryant from 2nd to 3rd St, during peak: five EB auto lanes; during off-peak, three EB auto lanes. Bryant from 3rd St to 6th St, during peak: four EB auto lanes, one EB bus lane; during off-peak, 3 EB auto lanes. Bryant from 6th St to 7th St, all times: four EB auto lanes, one EB bus lane.
Central SoMa	Brannan (Central SoMa - Long-Term)	Brannan from 2nd St and 6th St, one EB auto lane and one WB auto lane, one-way buffered cycle tracks in each direction, 100-foot-long right-turn poockets at intersection approaches
Hub Public Realm Plan	13th St (Hub PRP)	Extension of the 13th St protected bike lanes from Folsom to Valencia 13th from Valencia to Otis - 2 WB auto lanes, 2 EB auto lanes One NB US-101 lane to WB 13th, one NB US-101 lane to EB Mission 13th from Otis to S Van Ness - 1 WB auto lane, 2 EB auto lanes to US-101, 1 through EB auto lane 13th from S Van Ness to Folsom - 1 WB right turn lane, 1 WB through lane, 2 WB left turn lanes, 2 EB auto lanes
Hub Public Realm Plan	11th St (Hub PRP)	Protected bikes lanes between Market and Bryant Elimination of center turn lane between Minna and Bryant One NB auto lane, one SB auto lane Turn pockets at some intersections
Hub Public Realm Plan	S Van Ness (Hub PRP)	Lane reconfiguration to redesign street as boulevard between Mission and 13th St 2 NB auto lanes, 2 SB auto lanes 1 NB local traffic auto lane, 1 SB local traffic auto lane

Hub Public Realm Plan	Mission/Otis (Hub PRP)	EB U-turns from Mission to Otis prohibited One WB transit-only lane on Otis Two WB auto lanes on Otis between Gough and S Van Ness Two WB auto left-turn lanes on Otis between Gough and 13th
Civic Center Public Realm Plan	Polk Street (Civic Center PRP)	Protected cycletracks on Polk between McAllister and Grove Polk from McAllister to Grove - Two SB auto lanes, zero NB auto lanes
Civic Center Public Realm Plan	Grove Street (Civic Center PRP)	Protected cycletracks on Grove between Market and Gough Grove from Market to Larkin - one WB auto lane, zero EB auto lanes Grove from Larkin to Polk - closed to autos Grove from Polk to Van Ness - one EB auto lane, zero WB auto lanes Grove from Van Ness to Franklin - one EB auto lane, one EB right-turn only approaching Van Ness, one WB auto lane Grove from Franklin to Gough - one EB auto lane, one EB left-turn lane at Franklin, one WB left-turn only lane at Gough Gough SBRT to Grove prohibited
Muni Forward	14 Mission SoMa Muni Forward	Expand existing part-time transit lanes to 24/7 between Main and 11th streets by remove one lane of parking.
Muni Forward	22 Fillmore: 16th Street Improvement Project (Muni Forward)	Between Church and Bryant streets, create a side running transit-only lane in the westbound direction through lane conversion. Between Bryant and Mississippi streets, create center-lane transit lane in eastbound direction (replaces existing curbside transit lane between Potrero Avenue and Mississippi Street that was added circa 2017). Between Fourth and Third streets, create side running transit-only lane in both directions through lane conversion. Along the length of the corridor, add traffic signals, add left turn restrictions, and add some left turn pockets. Add transit bulbs and transit islands at various locations along the corridor.
6th Street	6th Street (Long-Term)	Between Market Street and Howard Street, convert four travel lanes to two travel lanes; add a new bicycle lane in each direction with sidewalks widened by 3 to 6 feet (3 to 4 feet at block corners and 6 feet along the block). Traffic signal cycle lengths would be increased from 60 to 90 seconds, and the offsets would be adjusted.

7th and 8th Street	7th and 8th Streets Complete Streets (Long-Term)	7th Street: three traffic lanes and class 4 bike lane from Market to Heron in 2020. Extend bike lane and road diet to Townsend in 2040.
Better Market Street	Better Market Street - Transportation Elements	Improve Market Street between Steuart Street and Octavia Boulevard. Includes resurfacing, sidewalk improvements, way-finding, lighting, landscaping, transit boarding islands, transit connections, traffic signals, transportation circulation changes, and utility relocation and upgrade./
19th Avenue	19th Avenue Corridor	Tier 4C projects from the 19th Avenue Corridor Study: · 19th Ave / Holloway Ave – add a fourth southbound lane · 19th Ave / Crespi Dr – fourth southbound lane will be extended and converted into a through-right into Crespi · 19th Ave / Junipero Serra Blvd – add a fourth lane for southbound right-turn onto Junipero Serra
	Annie Street	· The existing mini-plaza at the intersection of Annie St and Market St will be expanded to Stevenson Street · Between Mission Street and Ambrose Bierce Alley, Annie Street would be closed to vehicular traffic and transformed into a new pedestrian plaza · The remainder of Annie St between the two plazas would retain vehicular traffic but be redesigned as a single-surface shared street
Geary BRT	Geary Boulevard Improvement Project (Geary BRT Phase 2)	Implement Geary Bus Rapid Transit (BRT) to improve service between Stanyan St and Point Lobos Avenue. This proposal includes dedicated bus lanes, enhanced platforms, adjustments to local bus stops, turn lane restrictions, new signalization with Transit Signal Priority, real-time arrival information, low-floor buses, and safety improvements in support of Vision Zero. Expansion vehicles are included in RTPID 17-05-0013.
Geneva BRT	Geneva-Harney Bus Rapid Transit	Provides exclusive bus lanes, transit signal priority, and high-quality stations along Geneva Avenue (from Santos St to Executive Park Blvd), Harney Way, and Crisp Avenue, and terminating at the Hunters Point Shipyard Center. The project includes pedestrian and bicycle improvements in support of Vision Zero and connects with Muni Forward transit priority improvements west of Santos Street. This is the near-term alternative that does not rely on the full extension of Harney Way across US 101.
CPHPS	Candlestick Point Local Roads Phase 1	Build new local streets within the Hunters Point Shipyard and Candlestick Point area.
Mission Bay	Mariposa Ramp, Mission Bay	Increase Hwy 101 offramp to Mariposa from 1 to 2 lanes.

Parkmerced	Parkmerced Transportation Improvements	Implements transportation improvements for the Parkmerced development including enhanced transit service, pedestrian and bicycle facilities, intersection improvements, parking management, carshare and bikehare stations
CPHPS	Southeast Waterfront Transportation Improvements - Phase 1 (Candlestick express bus, 56 extension into Candlestick, dedicated bike lanes)	Create a 5 mile multi-modal corridor of streets, transit facilities, pedestrian paths, and dedicated bicycle lanes to link the Candlestick project area to BART, T-Third light rail, Caltrain, local bus lines and future ferry service. A BRT system (included in a RTPID 17-05-0032) would use exclusive transit right-of-way, station and shelter facilities, and transit signal priority infrastructure. This project also includes express bus and enhances transit service between the Southeast Waterfront and downtown San Francisco. Candlestick express bus and 56 extension into Candlestick, dedicated bike lanes, will be functional as of 2035. This includes portion within Candlestick only. Hunters Point Shipyard will not be done by 2035. Parts of BRT right of way will be constructed by 2035, but entire Geneva-Harney BRT will not be in place by 2035.
Treasure Island	Treasure Island Mobility Management Program: Intermodal Terminal, Congestion Toll, Transit Service, Transit Capital	New ferry service between San Francisco and Treasure Island; AC Transit service between Treasure Island and Oakland; shuttle service on-Island; bike share on-Island; priced-managed parking on-Island; Travel Demand Management program.
Central Subway	T-Third Phase II: Central Subway	Extends the Third Street Light Rail line north from King Street along Third Street, entering a new Central Subway near Bryant Street and running under Geary and Stockton Streets to Stockton & Clay Streets in Chinatown. New underground stations will be located at Moscone Center, Third & Market Streets, Union Square, and Clay Street in Chinatown. Includes procurement of four LRVs.
Van Ness BRT	Van Ness Avenue Bus Rapid Transit	Implement Van Ness Avenue Bus Rapid Transit (Van Ness BRT) to improve approximately two miles of a major north-south urban arterial in San Francisco. Project would include a dedicated lane for BRT buses in each direction between Mission and Lombard Streets. There will be nine BRT stations, with platforms on both sides for right-side passenger boarding and drop-off.
Treasure Island	Yerba Buena Island (YBI) I-80 Interchange Improvement	Includes two major components: 1) On the east side of the island, the I-80/YBI Ramps project will construct new westbound on- and off- ramps to the new Eastern Span of the Bay Bridge; 2) On the west side of the island, the YBI West-Side Bridges Retrofit project will seismically retrofit the existing bridge structures.

	California Street Safety Project (Quick-Build)	Reconfigure roadway from four lanes (two lanes in each direction) to three (one lane in each direction with center turn lane)
	Mission Rock - new street	Exposition Street between 3rd and Terry Francois Boulevard
TCDP	Transit Center District Plan	Road diets, transit facilities, and bike facilities consistent with the Transit Center District Plan
Muni Forward	Muni Forward, formerly TEP and TTRP	Muni TEP: Travel Time Reduction Program, Expanded level (project-level). Travel Time Reduction Program, Expanded level (project-level: 5/5R Fulton, 7 Haight, 8 Bayshore, 9 San Bruno, 14 Mission/14 R Mission Rapid/49 Mission-Van Ness, 22 Fillmore, 28 19th Ave, J Church, L Taraval, and N Judah.
Muni Forward	1 California Muni Forward (entire route)	Muni Forward improvements on the 1 California (entire line). Specific scope to be determined.
Muni Forward	5 Fulton Rapid Project: Inner Richmond segment	Add transit bulbs at various stops and optimize one stop on the 5R Fulton Rapid from Arguello to Park Presidio Boulevard.
Muni Forward	7 Haight Rapid Project: Haight Street	On Haight from Stanyan to Laguna, replace numerous stop signs with signals, transit stop improvements
Muni Forward	7 Haight Muni Forward: West of Stanyan	Muni Forward improvements on the 7 Haight-Noriega from Stanyan to the western terminal. Specific scope to be determined.
Muni Forward	8 Bayshore: Geneva & Visitacion Valley Muni Forward	Implement Muni Forward improvements on the 8 Bayshore in Visitacion Valley and on Geneva Avenue. Specific scope to be determined.
Muni Forward	14 Mission - Outer Mission Muni Forward	Implement transit priority improvements for the 14 Mission on Mission Street between Randall Street and Daly City. Specific scope to be determined.
Muni Forward	22 Fillmore: Fillmore Street Muni Forward	Implement Muni Forward improvements on the 22 Fillmore on Fillmore Street between Duboce Avenue and Bay Street. Specific scope to be determined.
Muni Forward	27 Bryant Muni Forward: Full project	Add bus bulbs at various stops on the 27 Bryant from Market to northern terminal
Muni Forward	28 19th Avenue Muni Forward	Added transit bulbs at most stops on 19th Avenue for the 28 19th Avenue; consolidate stops; optimize stops. No changes to travel lanes.
Muni Forward	29 Sunset Muni Forward	Muni Forward improeements on the 29 Sunset (entire line). Specific scope to be determined.
Muni Forward	30 Stockton: Stockton and Columbus Ave Muni Forward	Implement Muni Forward improvements on the 30 Stockton on Stockton Street in Chinatown and on Columbus Avenue in North Beach. Specific scope to be determined.
Muni Forward	J Church Muni Forward	Muni Forward improvements on the J Church (Duboce to Balboa Park Station). Scope to be determined.
Muni Forward	K Ingleside - Ocean Avenue	Install center-running transit lanes on Ocean Avenue along the K line. Extend boarding islands to accommodate 2-car trains. Consolidate some stops.

Muni Forward	L Taraval Improvements Project: Full project	Add boarding islands at all stops on Taraval Street; add five new traffic signals on Taraval street with transit signal priority; consolidate additional stops on Taraval.
Muni Forward	M Oceanview Muni Forward	Transit priority improvements on the surface alignment of the M Oceanview, focused on the Oceanview neighborhood segment. Specific scope to be determined.
Muni Forward	N Judah: Judah Street Muni Forward: Quick-build phase	On the N Judah on Judah Street, consolidate some stops, lengthen boarding platforms to accommodate 3-car trains (using temporary and reversable materials)
Muni Forward	N Judah: Judah Street Muni Forward: Full project	Replace various stop signs with signals with transit priority; upgrade transit stops with permanent boarding islands.
2050		
Balboa Park Station Area	Balboa Park Station Area - Closure of Northbound I-280 On-Ramp from Geneva Avenue	This project would study and implement closure of the northbound I-280 on-ramp from Geneva Avenue to improve safety. Closure of the ramp would initially be a pilot project, if possible, depending on the results of traffic studies. The linked on-ramp from Ocean Avenue would remain open.
Balboa Park Station Area	Balboa Park Station Area - Southbound I-280 Off-Ramp Realignment at Ocean Avenue	This project will realign the existing uncontrolled southbound I-280 off-ramp to Ocean Avenue into a T-intersection and construct a new traffic signal on Ocean Avenue to control the off-ramp.
	Expand SFMTA Transit Fleet	This project entails future expansion of the SFMTA transit fleet and needed facilities to house and maintain transit vehicles. The purpose is to meet projected future transit demand, as indicated in the SFMTA Transit Fleet Plan. It will facilitate the future provision of additional service through the procurement of transit vehicles as well as the development of needed modern transit facilities. This also includes the expansion vehicles for Geary BRT (RTPID 17-05-0021) and does not include expansion vehicles for Central Subway, which are in RTPITD 17-05-0041.
	Historic Streetcar Extension - Fort Mason to 4th & King	The project would extend historic streetcar service by extending either the E-line or the F-line service from Fishermanâ€™s Wharf to Fort Mason, using the historic railway tunnel between Van Ness Ave. and the Fort Mason Center. The project will seek non-transit specific funds and will seek to improve the historic streetcar operation as an attractive service for tourists and visitors.
	HOV/HOT Lanes on U.S. 101 and I-280 in San Francisco	Phase 1 (full implementation): Convert an existing mixed traffic lane and/or shoulder/excess ROW in each direction to HOV 3+ lanes on US 101 from SF/SM County line to I-280 interchange and on I-280 from US 101 interchange to 6th Street off ramp to enhance carpool and transit operations during peak periods.

	HOV/HOT Lanes on U.S. 101 and I-280 in San Francisco	Phase 2 (planning and environmental review only): Convert Phase 1 HOV lanes to HOT/Express Lanes. Express transit to be funded with HOT lane revenues.
	Hunters Point Shipyard Local Roads Phase 1	Build new local streets within the Hunters Point Shipyard and Candlestick Point area.
CPHPS	Southeast Waterfront Transportation Improvements - Phase 1 - Entire Corridor from Balboa Park to the Shipyard, entire BRT project	Create a 5 mile multi-modal corridor of streets, transit facilities, pedestrian paths, and dedicated bicycle lanes to link the Candlestick/Hunters Point Shipyard project area to BART, T-Third light rail, Caltrain, local bus lines and future ferry service. A BRT system (included in a RTPID 17-05-0032) would use exclusive transit right-of-way, station and shelter facilities, and transit signal priority infrastructure. This project also includes express bus and enhances transit service between the Southeast Waterfront and downtown San Francisco.

Figure 2. Regional 2040 Transportation Project List

Project	RTP ID	Description
AC Transit East Bay BRT		Upgrades the existing #1 bus route to BRT. Project includes center-median and curbside transit-only lanes and bus stations along International Boulevard from Uptown Oakland to San Leandro.
AC Transit San Pablo Ave BRT		Adds BRT service along San Pablo Ave from Oakland to Richmond.
Albany/Berkeley Ferry Terminal	17-10-0042	Construct a new Berkeley/Albany ferry terminal, purchase 2 new ferry vessels, operate new ferry service between Berkeley/Albany and San Francisco.
BART Berryessa Extension		Extend BART service from Warm Springs to Milpitas and Berryessa
BART Irvington Station		Add Irvington station between Fremont and Warm Springs
BART Metro Program + Bay Fair Connector	17-10-0005	Investments in support of the region's Sustainable Communities Strategy, including studies of a future Transbay Corridor rail crossing. Capital: Turnbacks/crossovers/tail track extensions (24th St, Lafayette, Glen Park, Millbrae, Dublin, Daly City, Richmond, South Hayward); Station capacity improvements (platform doors at 4 downtown SF stations, additional stairs/escalators/elevators Operating: 12-minute headways on all lines in the peak period (instead of current 15-minutes)

		Bay Fair Connector: Modify BART Bay Fair Station and approaches to add one or more additional tracks and one or more passenger platforms for efficient train service and operational flexibility. Includes station modernization, modifications to switches, tracks, crossovers, train control, signaling, traction power, etc.
BART: Silicon Valley Phase 2		BART extended from Berryessa to Alum Rock, Downtown San Jose, Diridon, and Santa Clara
Bus and Ferry Service Expansion	17-10-0010	This program includes planned bus and ferry expansion projects such as new express bus service between East Santa Rosa and San Francisco; between Richmond and San Rafael; and between Central Marin and West San Francisco. This program also includes off-site parking and an additional Larkspur Ferry crossing.
California HSR in the Bay Area	17-10-0007	This project implements the segment of California High Speed Rail that is in the Bay Area.
Caltrain Electrification Phase 1 + CBOSS	17-10-0008	The Peninsula Corridor Electrification Project (PCEP) includes the electrification of the Caltrain corridor between San Francisco and San Jose, the procurement of new, Electric Multiple Unit rolling stock, and an increase in the Caltrain service levels. This project also includes CBOSS, which is the Communications Based Overlay Signal System (CBOSS) Positive Train Control necessary to monitor and control train movements as well as increase safety.
Caltrain/HSR Downtown San Francisco Extension	17-10-0038	The Downtown Rail Extension (DTX) will extend Caltrain commuter rail from its current terminus at Fourth and King streets and deliver the California High-Speed Rail Authorityâ€™s future high-speed service to the new Transit Center. The 1.95-mile rail extension will be constructed principally below grade underneath Townsend and Second streets. The design includes an underground station at Fourth and Townsend streets, utility relocations, rail systems work, and structures for emergency exit, ventilation at six locations along the alignment, and an underground pedestrian bridge connecting the Transbay Terminal to the Embarcadero BART station. Cost includes operating expenses - capital cost is $3.999 billion
Central Bay Ferry Service Enhancement	17-10-0041	Purchase and operate 2 new ferry vessels for WETA Central Bay ferry services. Project increases frequency for the Oakland-Alameda-SF ferry line and the Harbor Bay-SF ferry line.
eBART		eBART line from Pittsburg to Antioch

Implement Transbay Transit Center/Caltrain Downtown Extension (Phase 1 - Transbay Transit Center)	17-10-0039	The project has 3 components: (1) new Transbay Transit Center built on the site of the former Transbay Terminal in downtown San Francisco serving 11 transportation systems; (2) extension of Caltrain commuter rail service from its current San Francisco terminus at 4th & King Streets to a new underground terminus; and (3) establishment of a Redevelopment Area Plan with related development projects.
North Bay Ferry Service Enhancement	17-10-0040	Purchase and operate 2 new ferry vessels for WETA North Bay ferry services. Project increases frequency for the Richmond-SF and Vallejo-SF ferry lines.
SMART: Larkspur to San Rafael		SMART - Extend SMART from San Rafael to Larkspur
SMART: Santa Rosa to Cloverdale		SMART - Extend SMART from Santa Rosa to Cloverdale

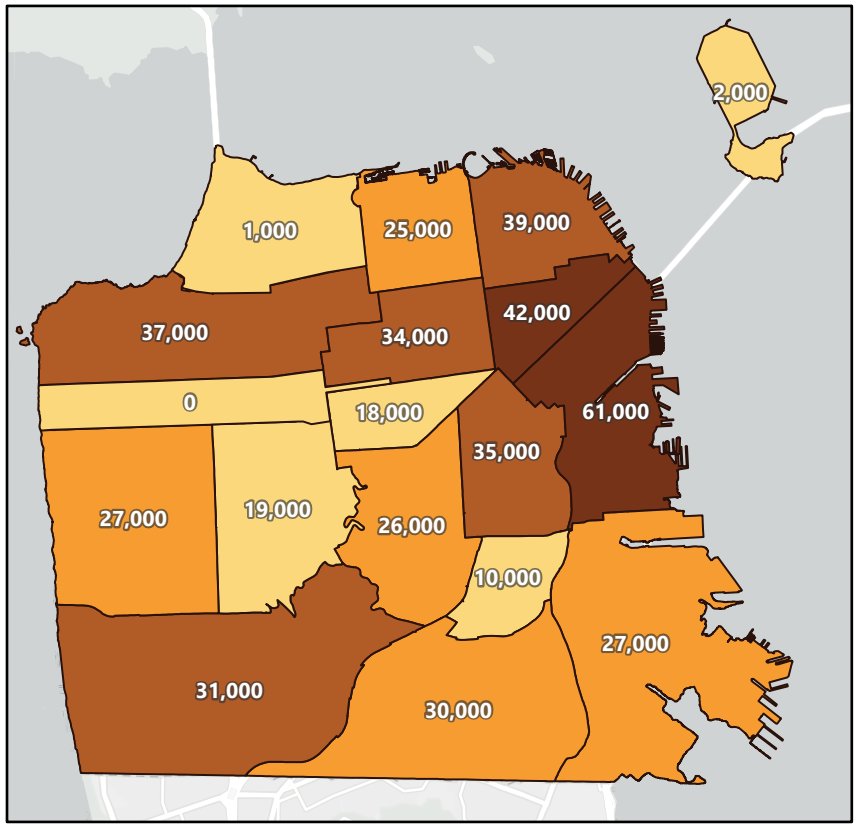
Appendix B
SF-CHAMP Inputs

Appendix B-1

SF-Champ Housing Inputs

Total Housing Units, No Project

2035 Conditions



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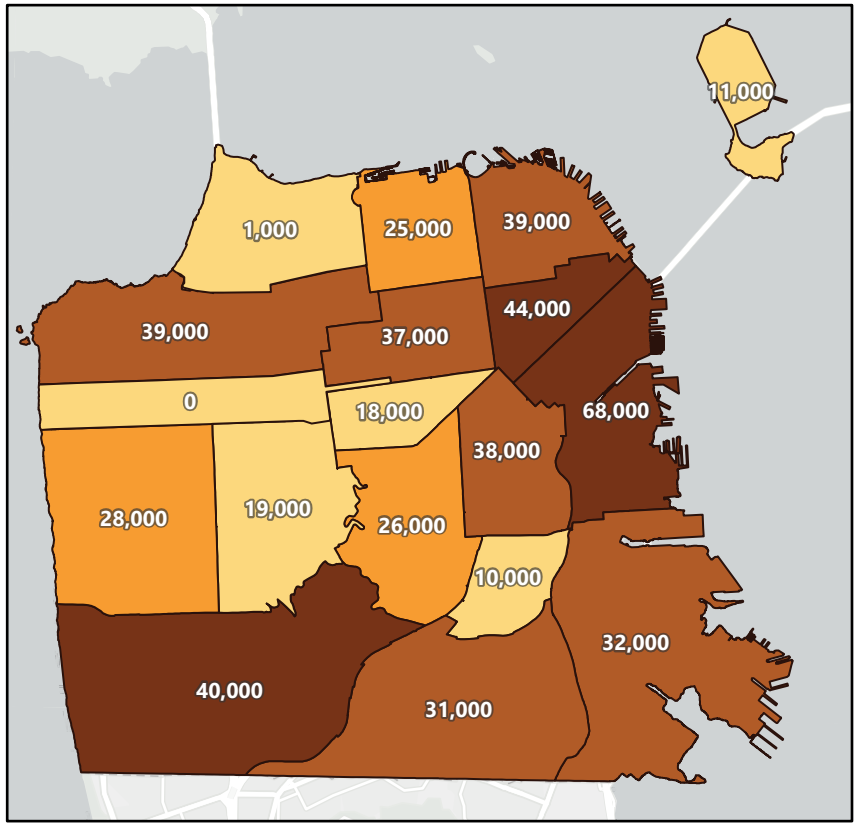
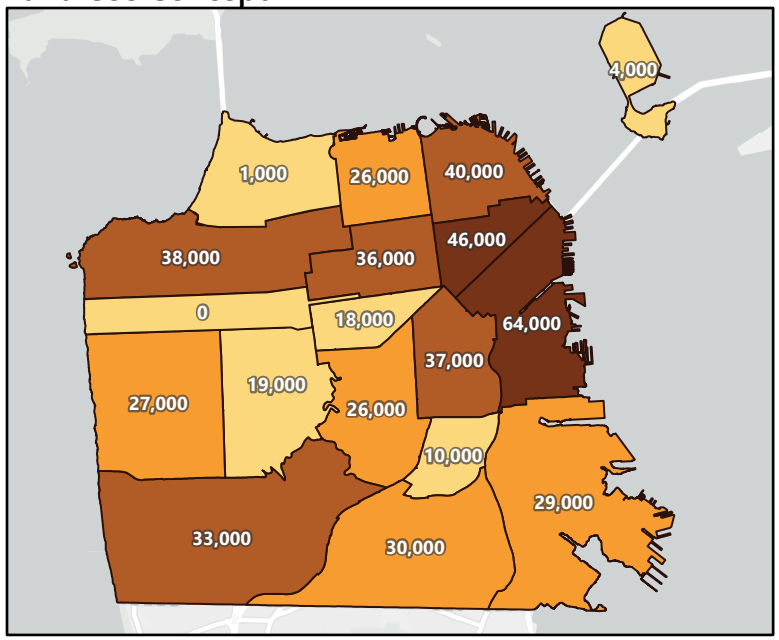


Total Housing Units by Land Use Concept for 2035 Conditions

Land Use Concept A



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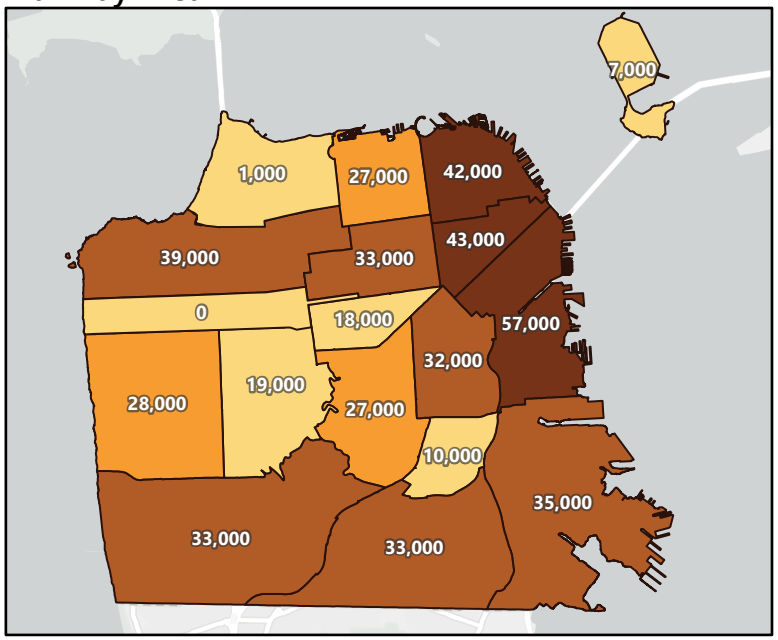

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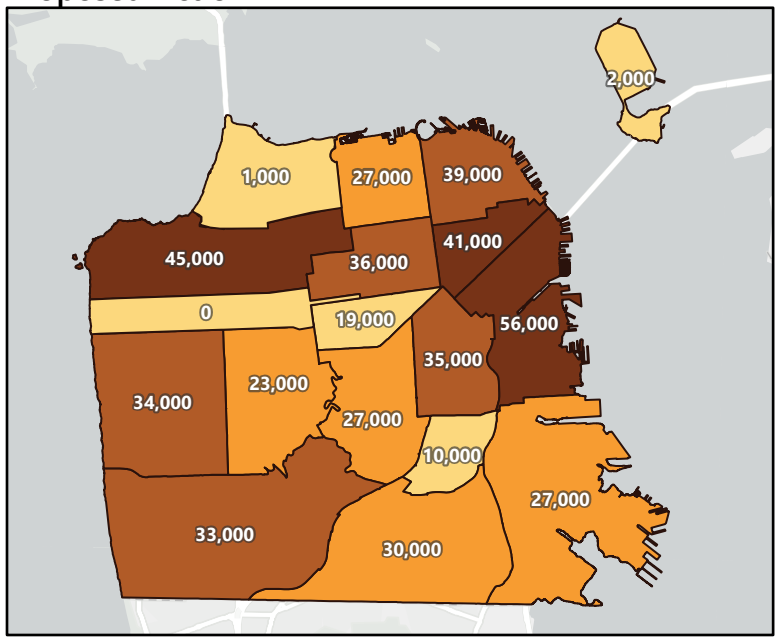

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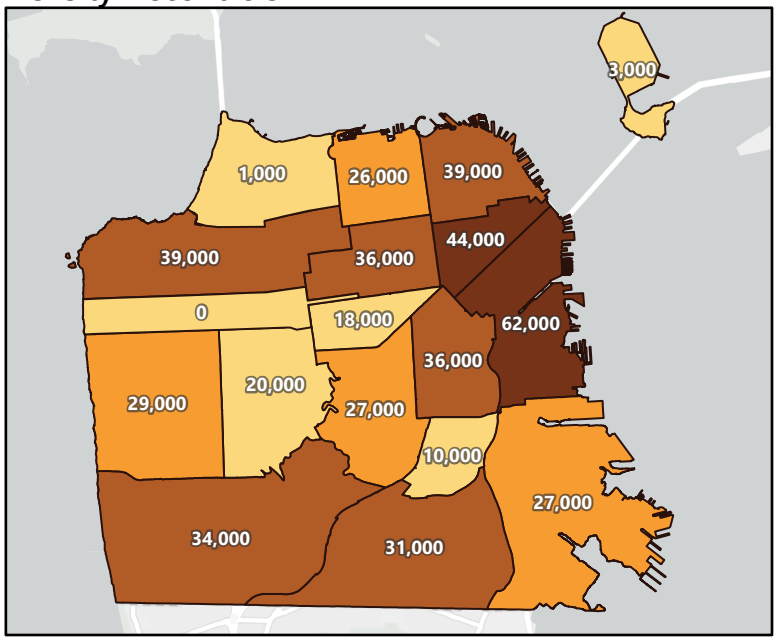
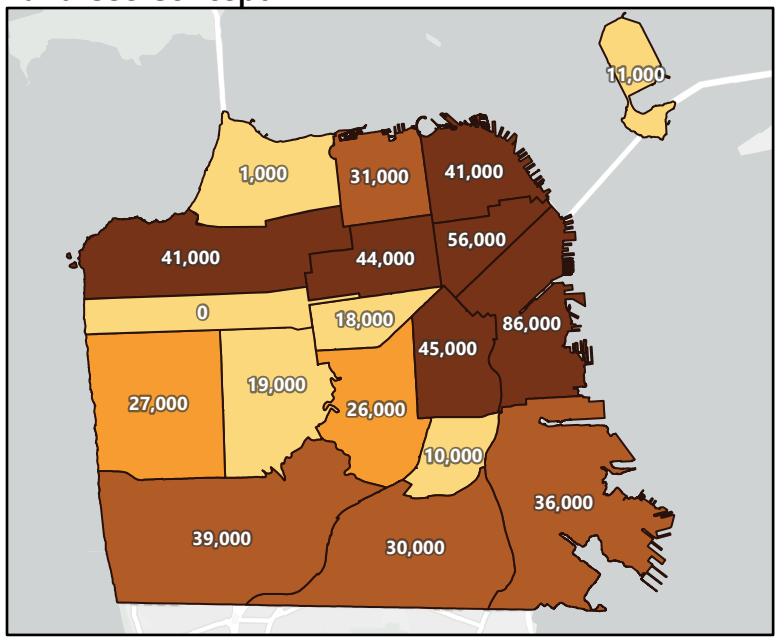


Total Housing Units by Land Use Concept for 2050 Conditions

Land Use Concept A



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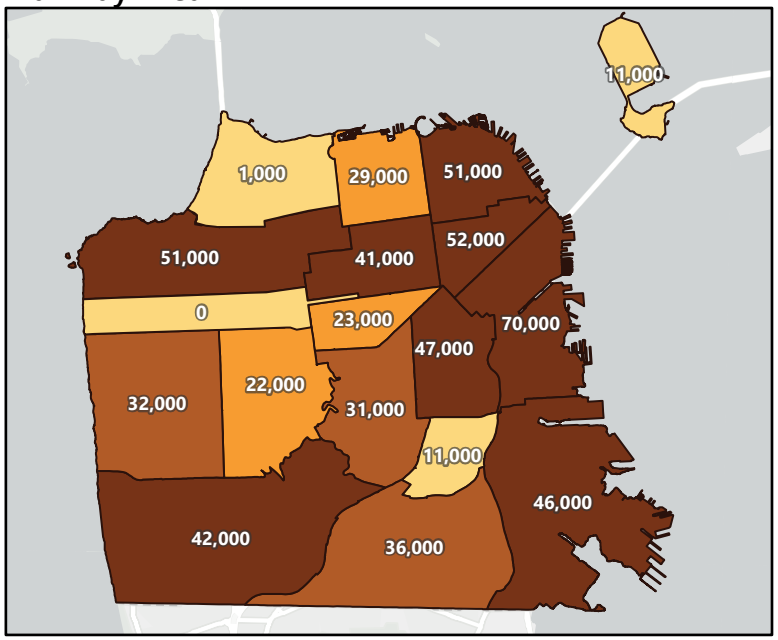

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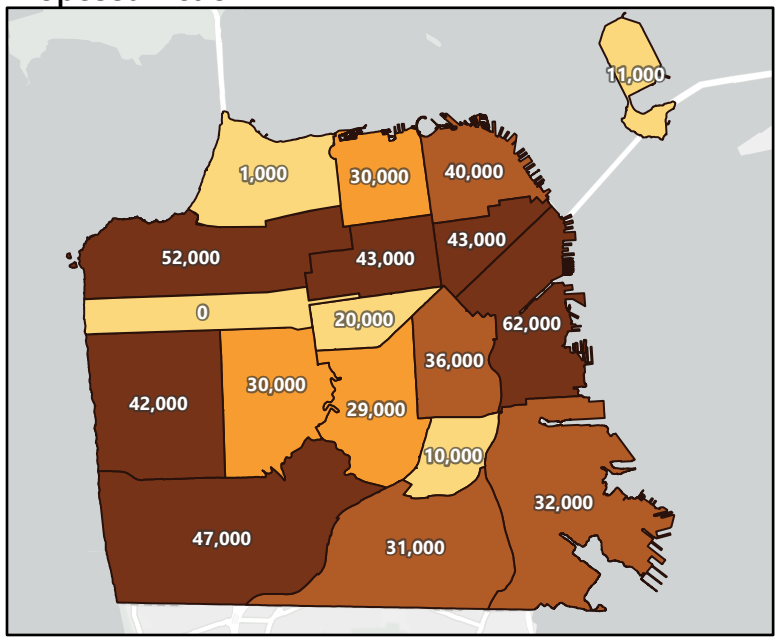

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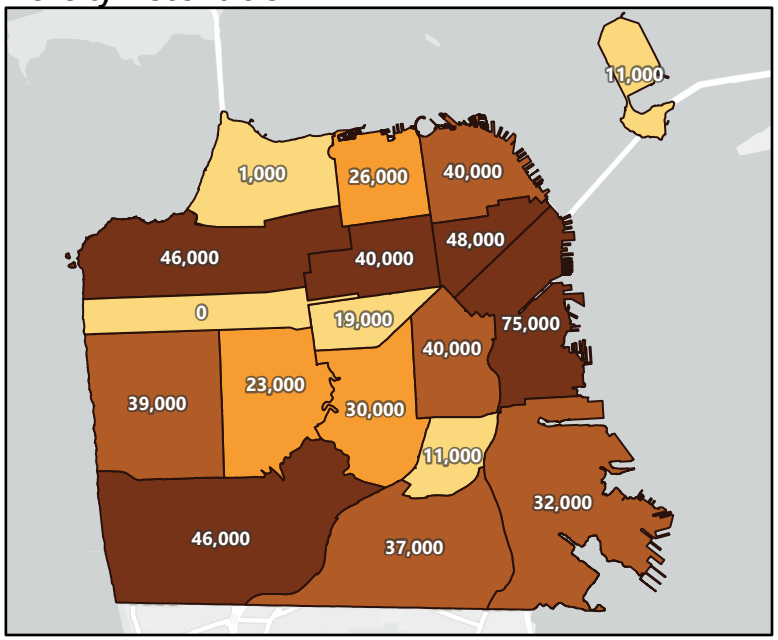
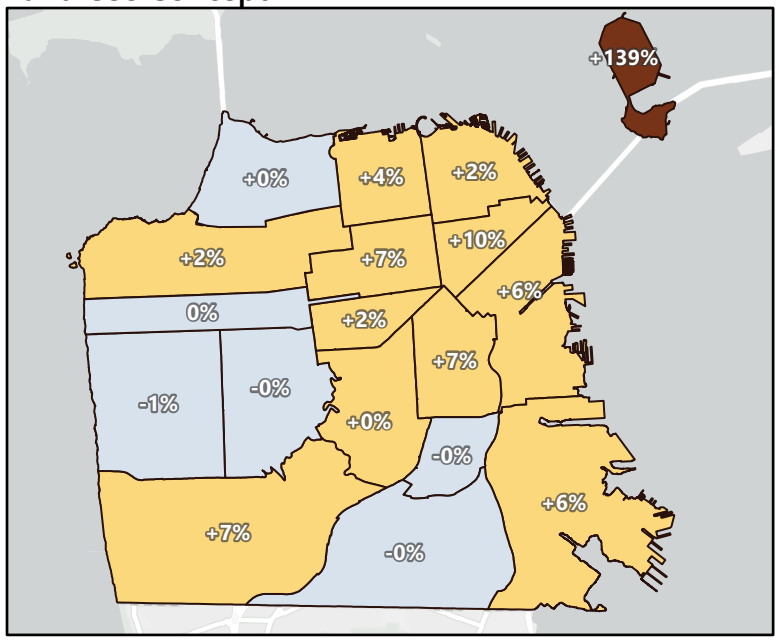


Total Housing Units, Percent Change Between Baseline and LU Concept for 2035 Conditions

Land Use Concept A



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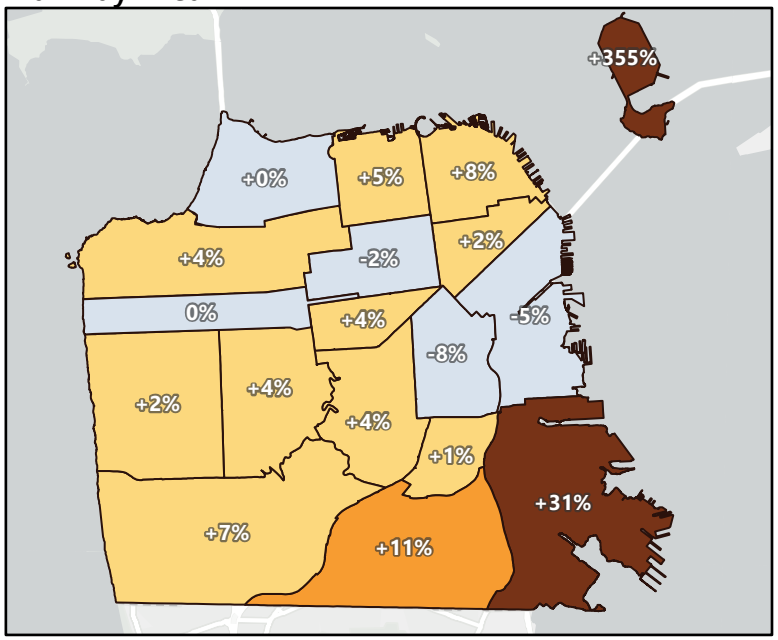

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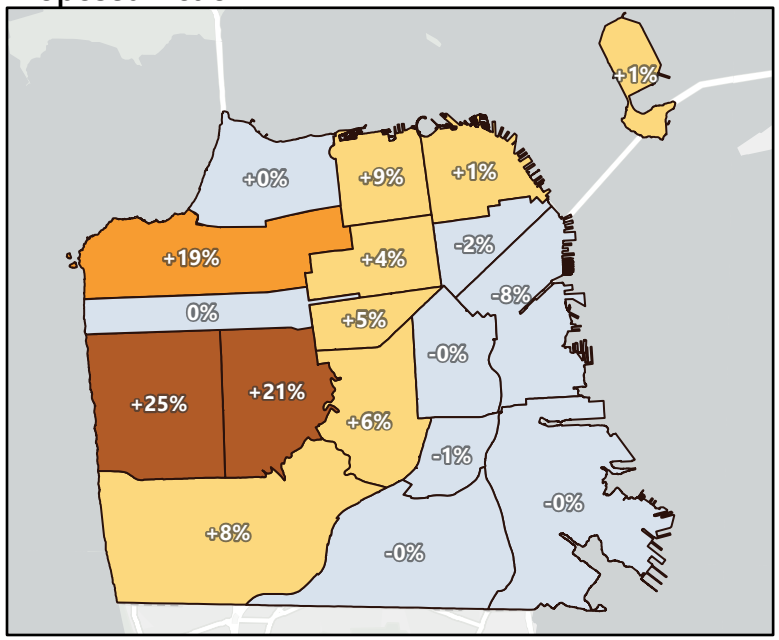

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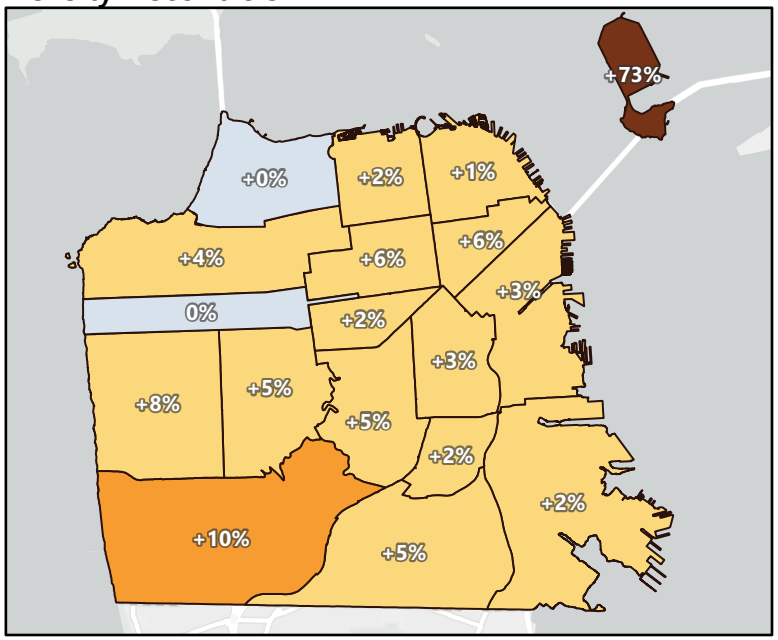
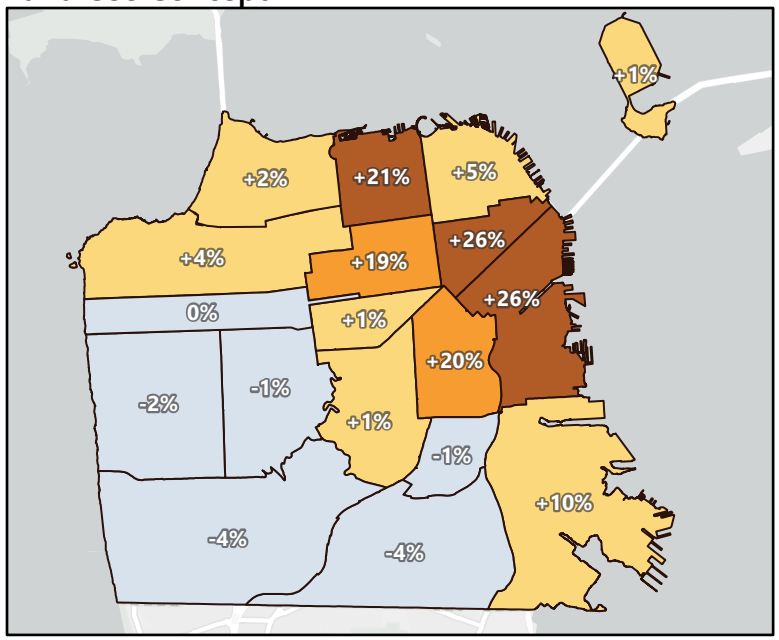


Total Housing Units, Percent Change Between Baseline and LU Concept for 2050 Conditions

Land Use Concept A



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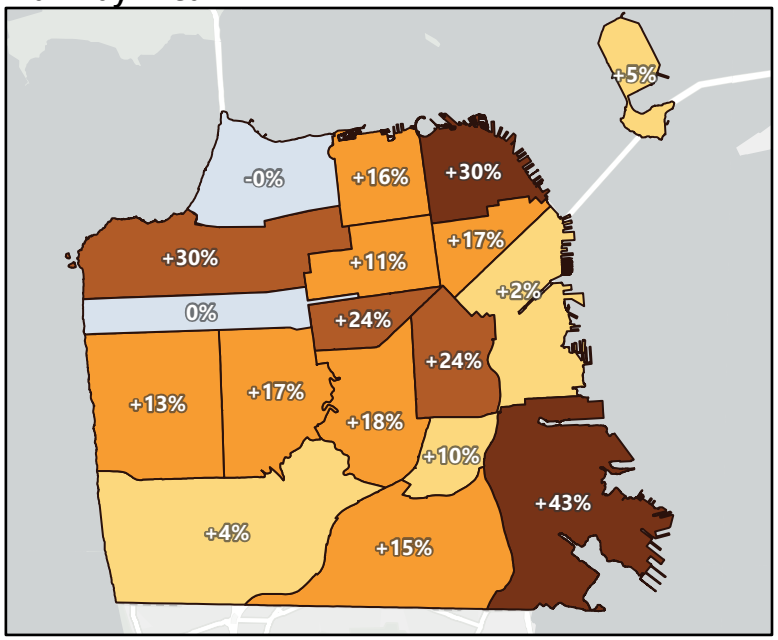

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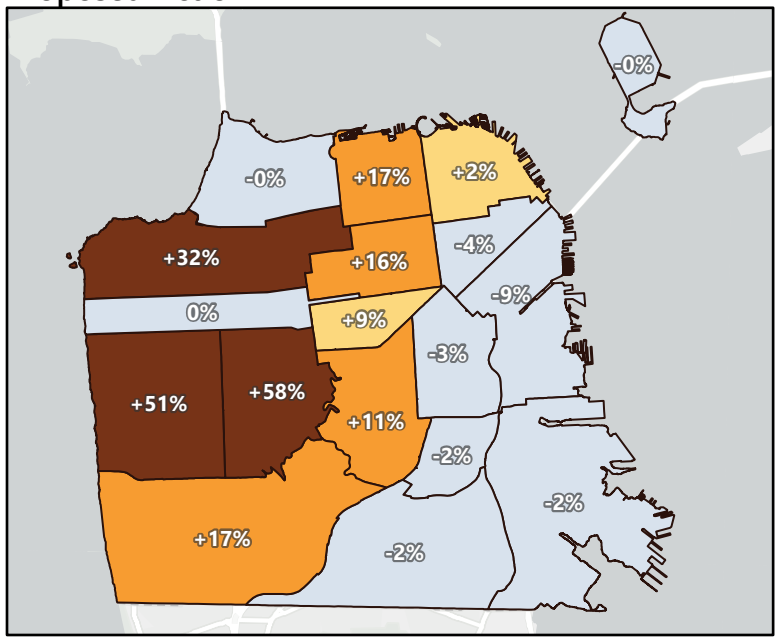

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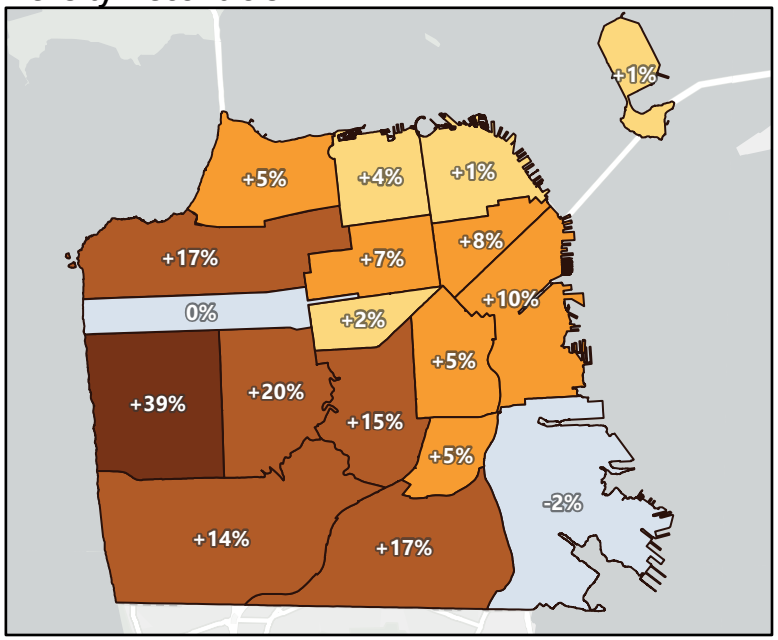

Appendix B-2

SF-Champ Employment Inputs

Total Employment by Land Use Concept for 2035 Conditions

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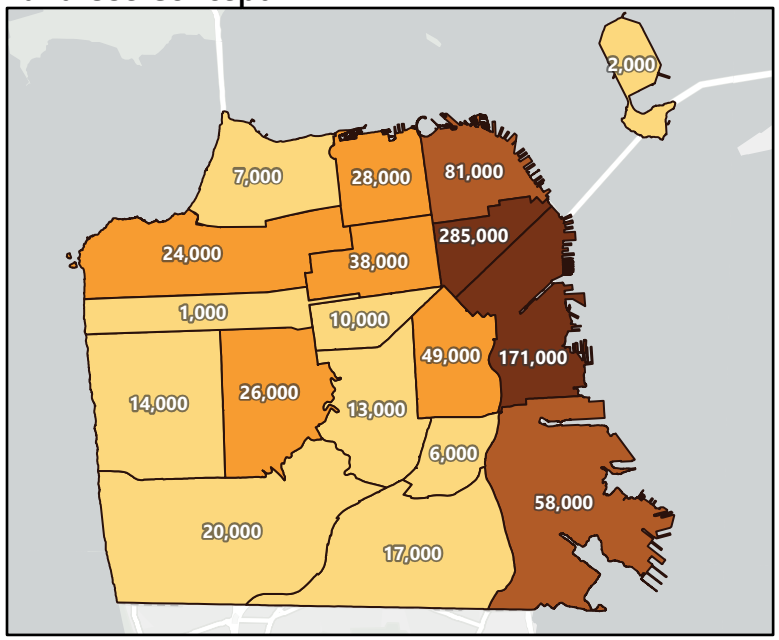

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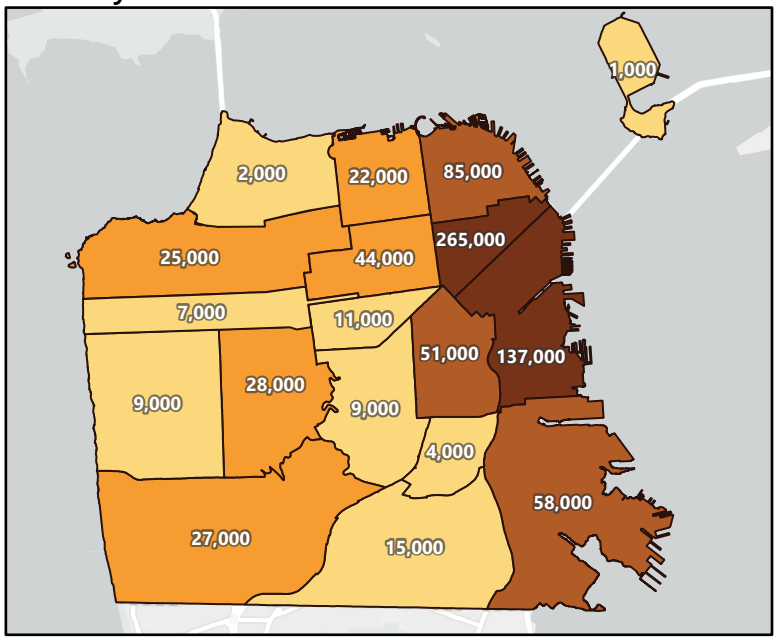

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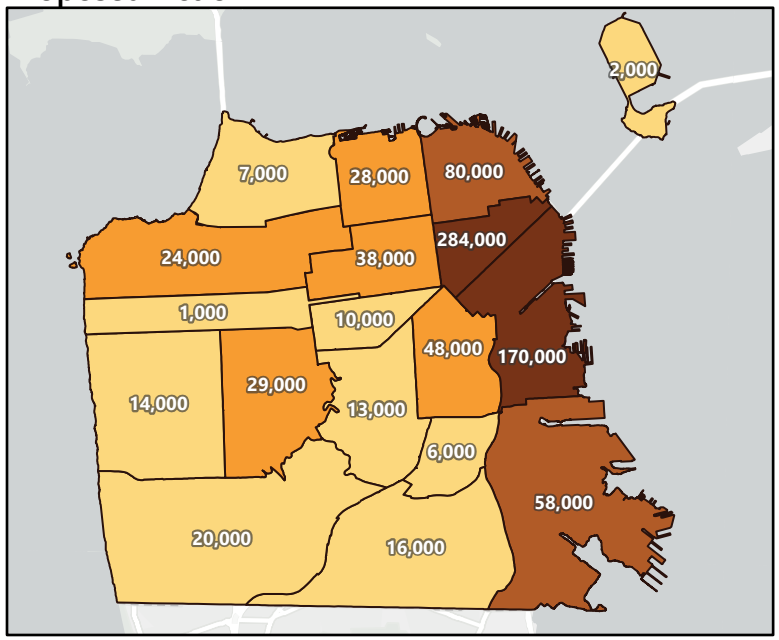

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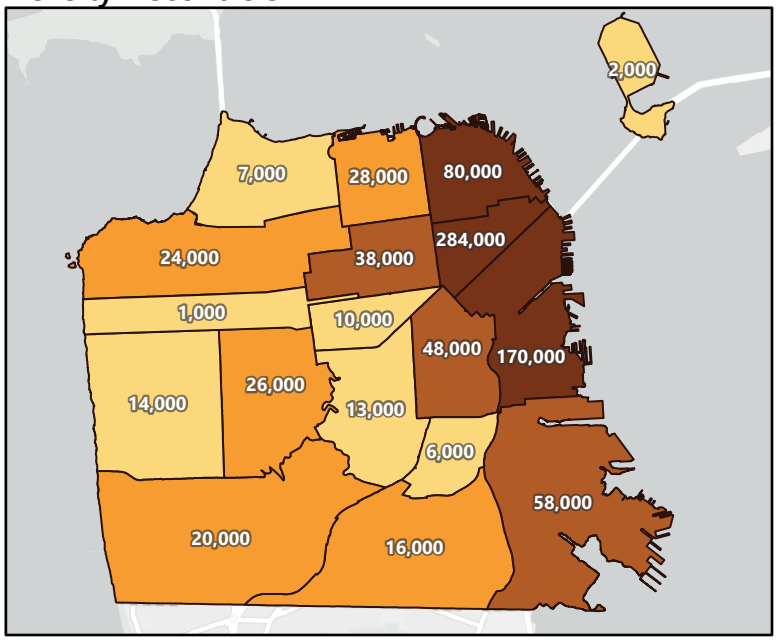
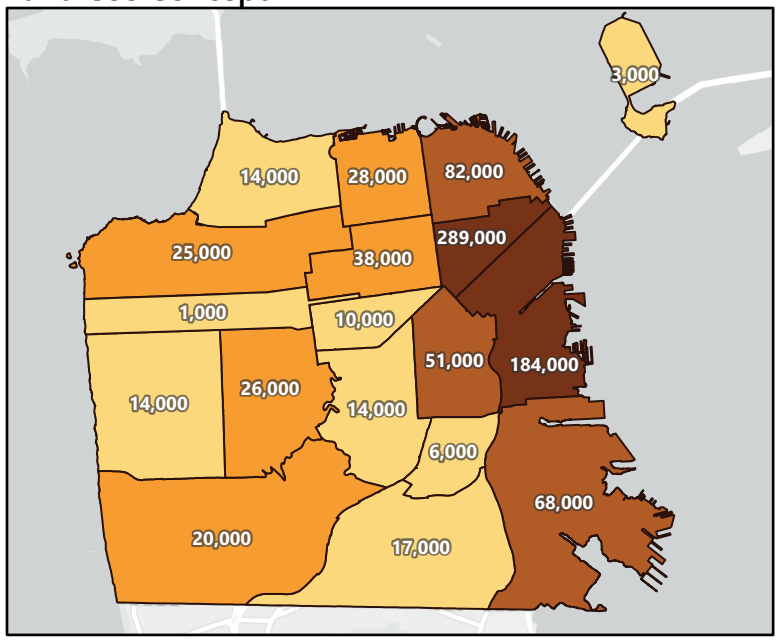


Total Employment by Land Use Concept for 2050 Conditions

Land Use Concept A



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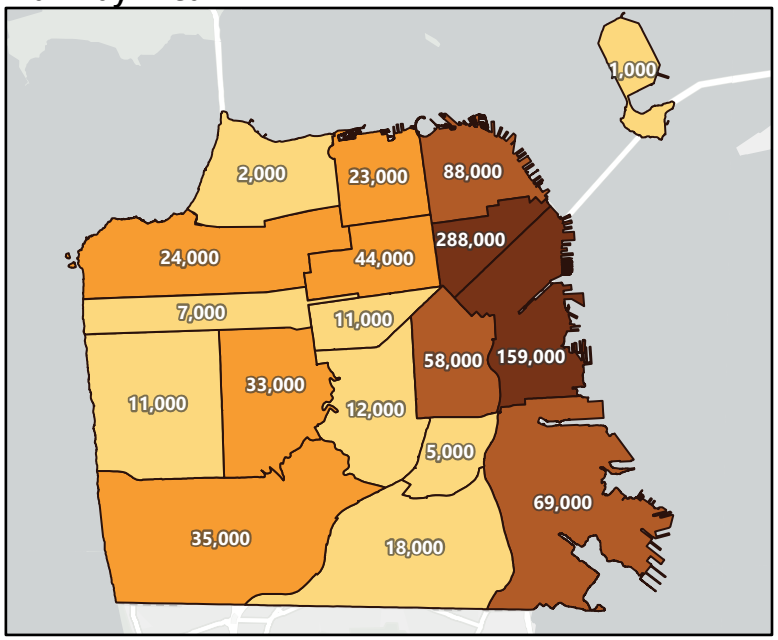

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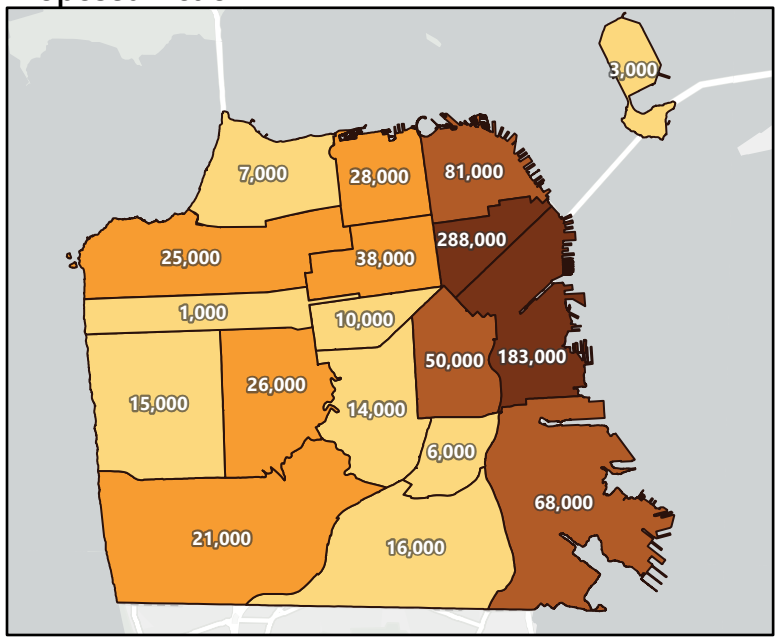

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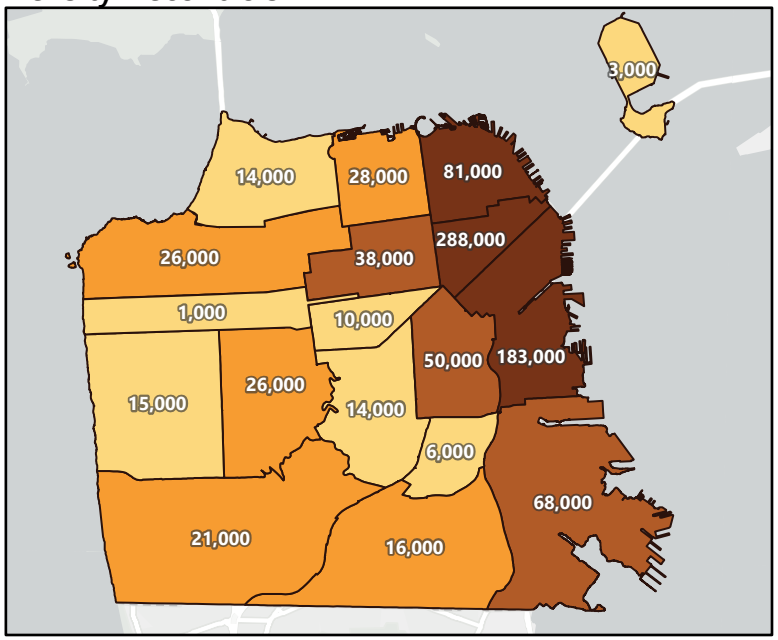
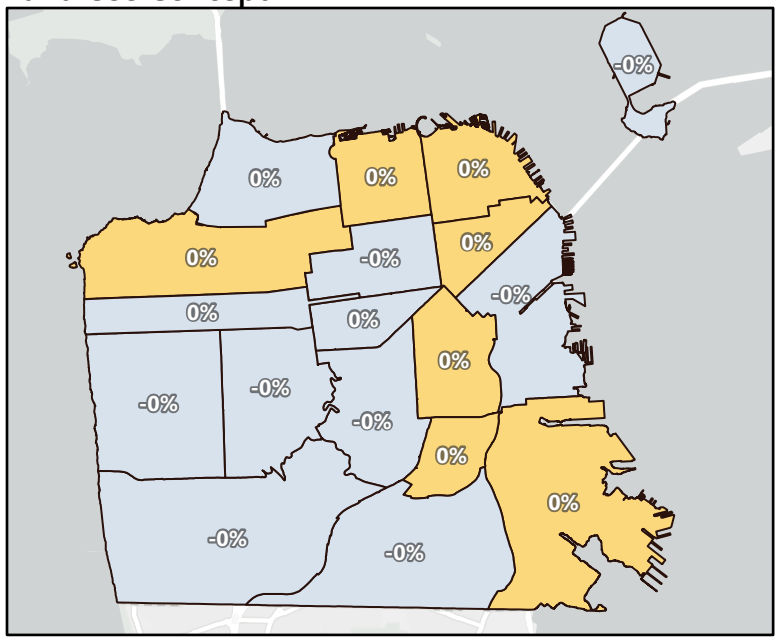


Total Employment, Percent Change Between Baseline and LU Concept for 2035 Conditions

Land Use Concept A



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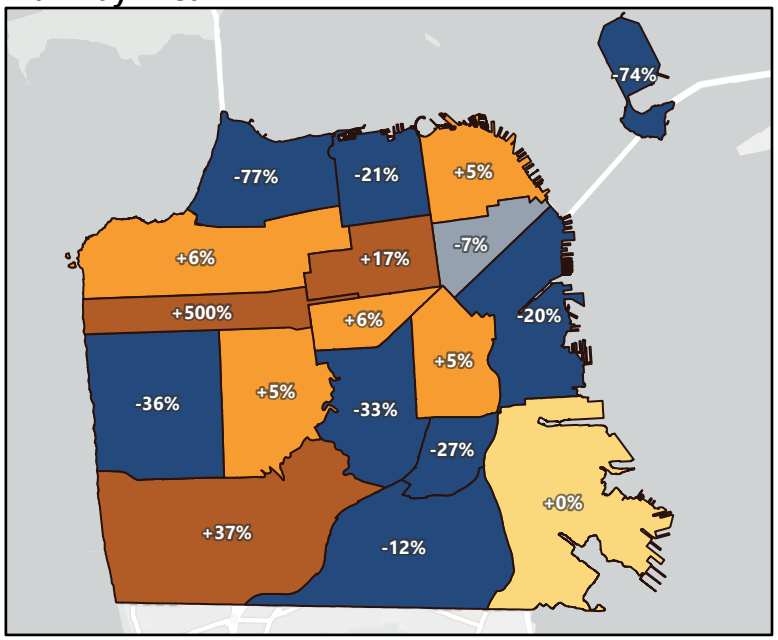

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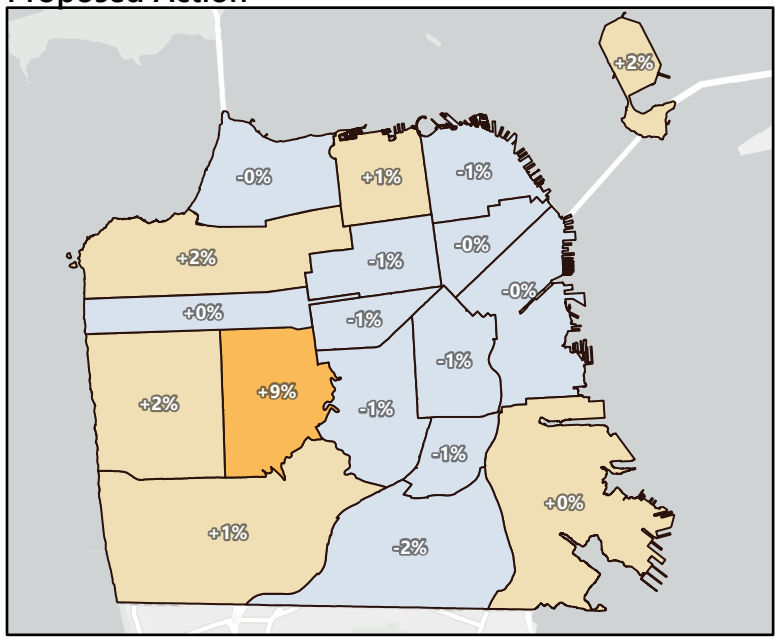

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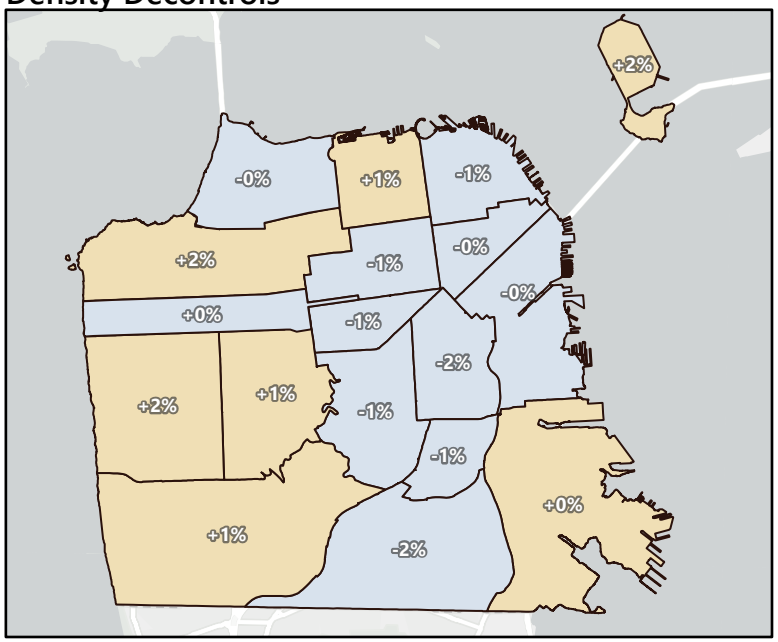
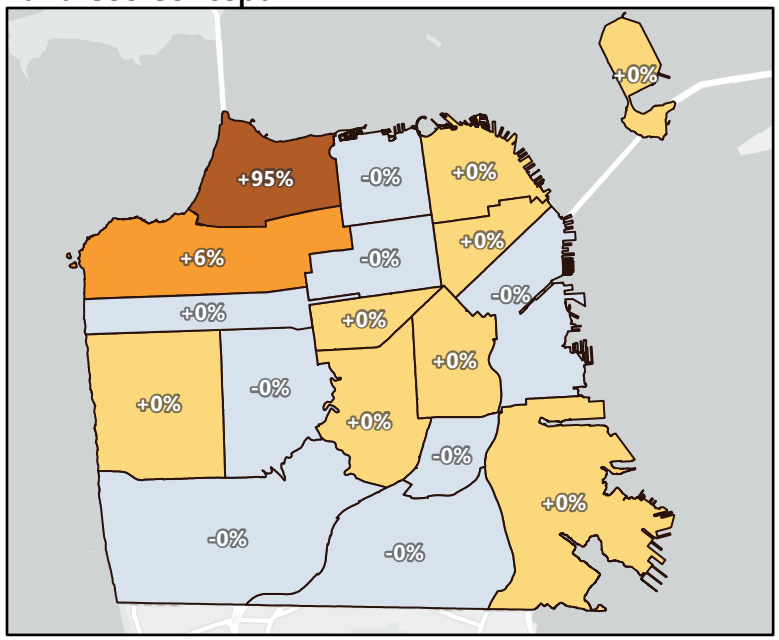
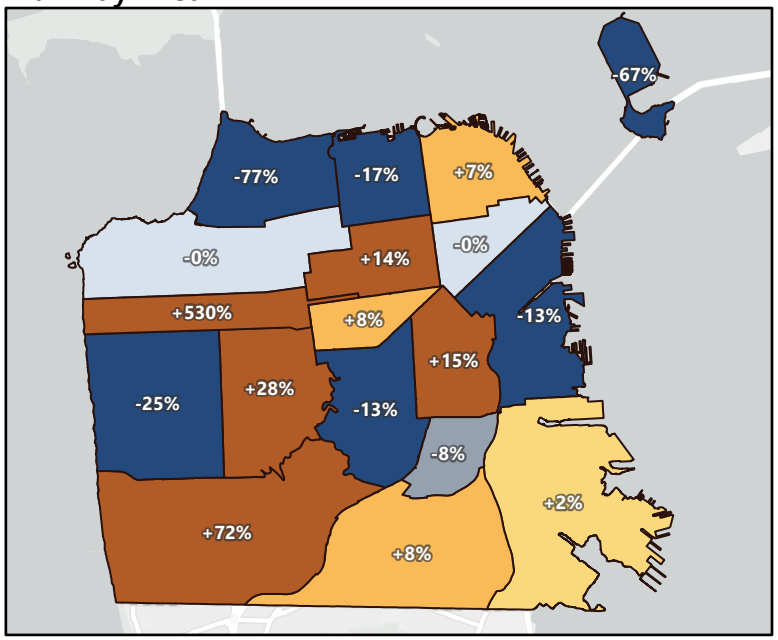


Total Employment, Percent Change Between Baseline and LU Concept for 2050 Conditions

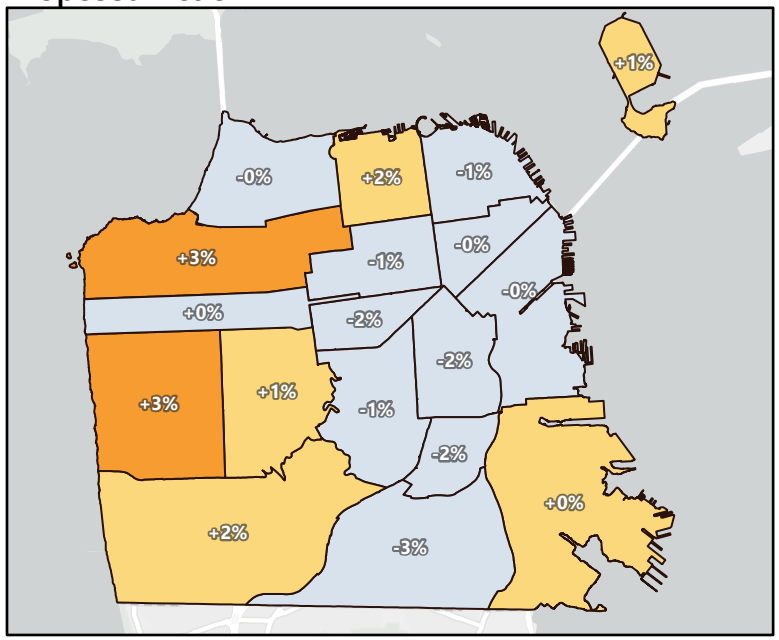
Land Use Concept A



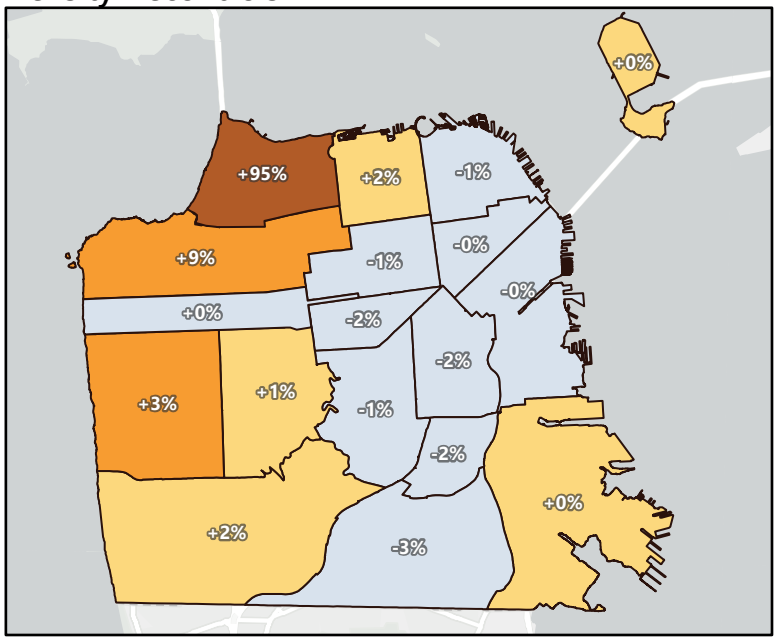
Plan Bay Area



Proposed Action

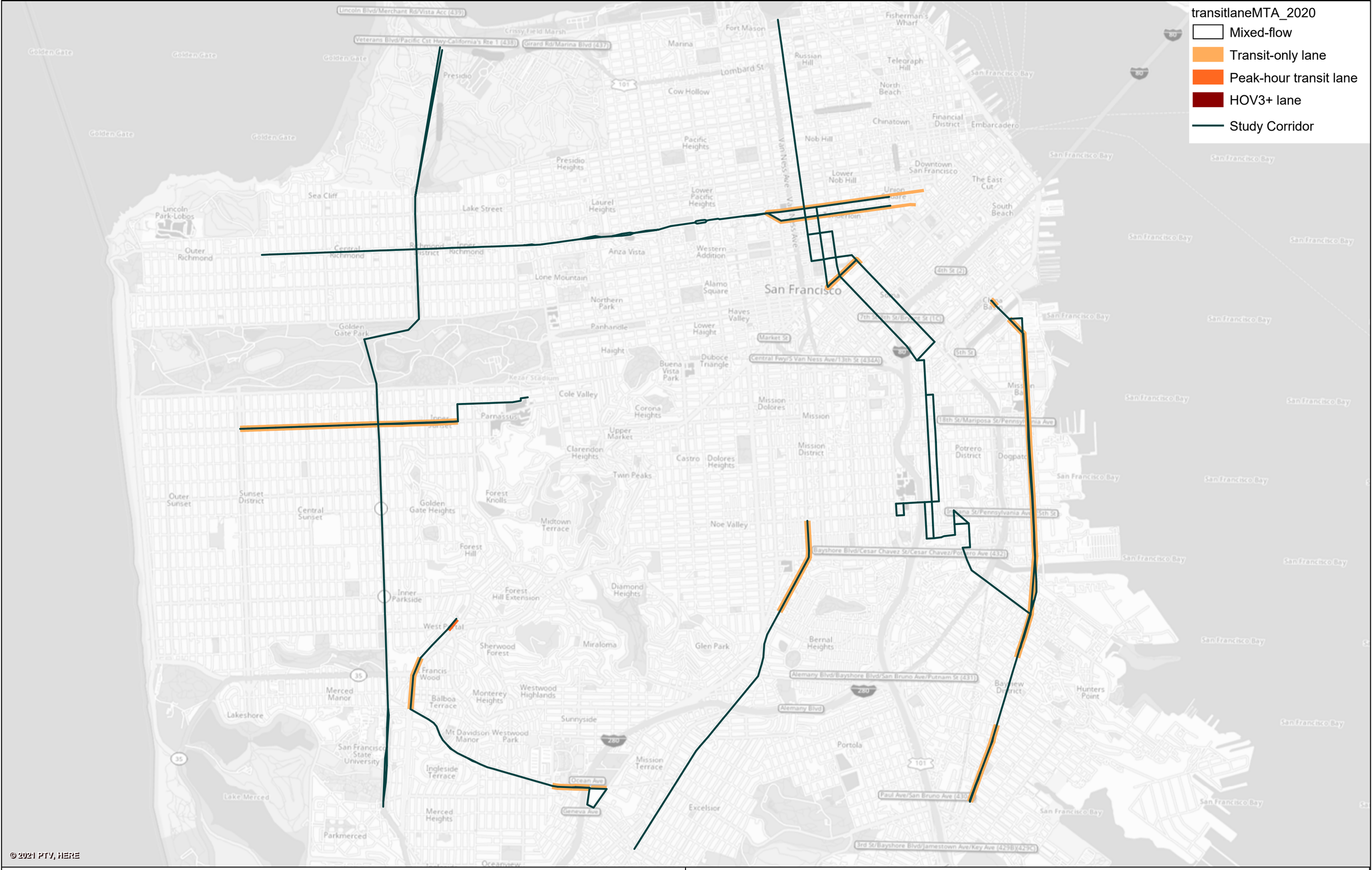


Density Decontrols

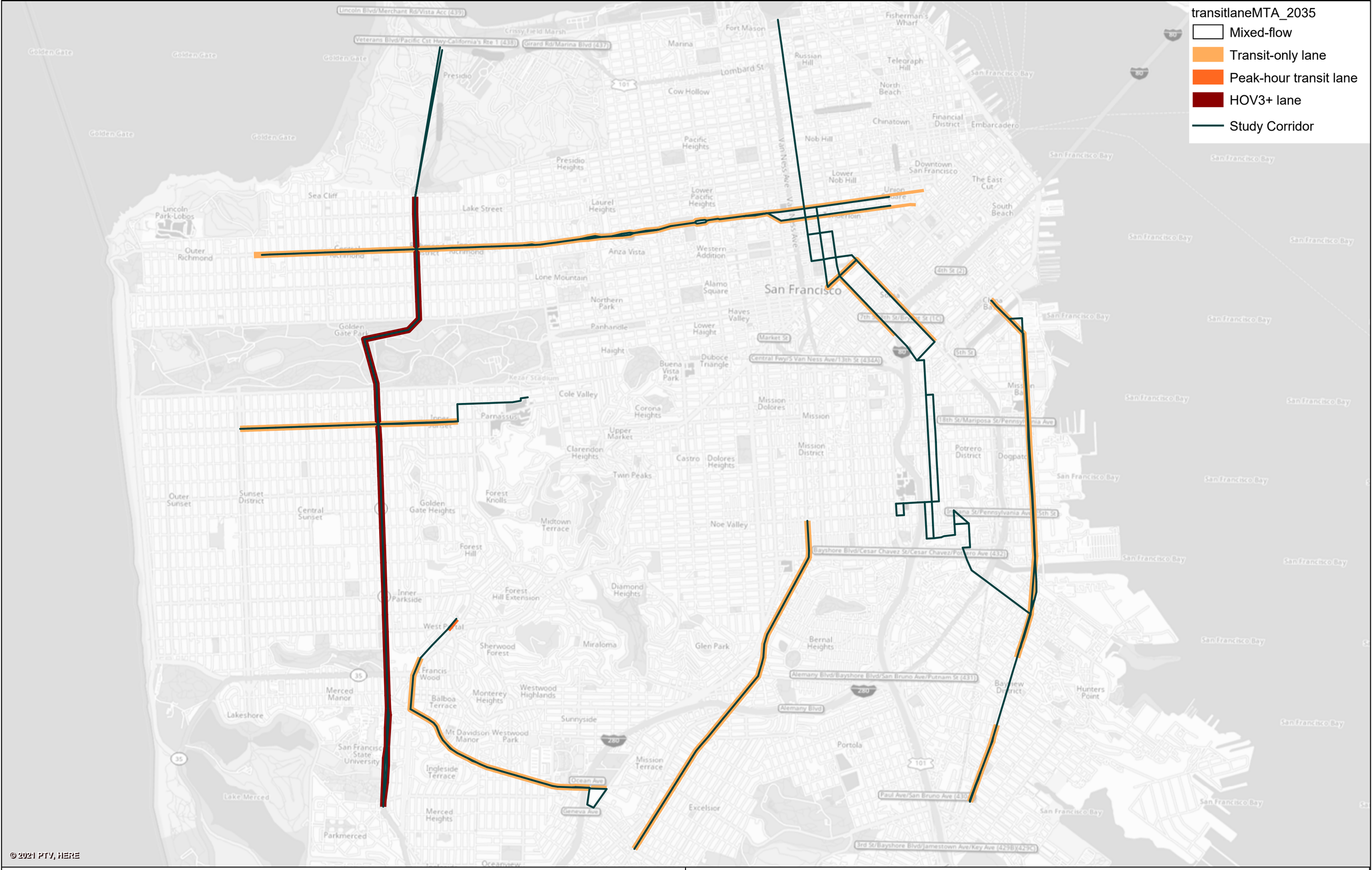


Appendix B-3

SF-Champ Network Inputs



Transit Lanes - 2020



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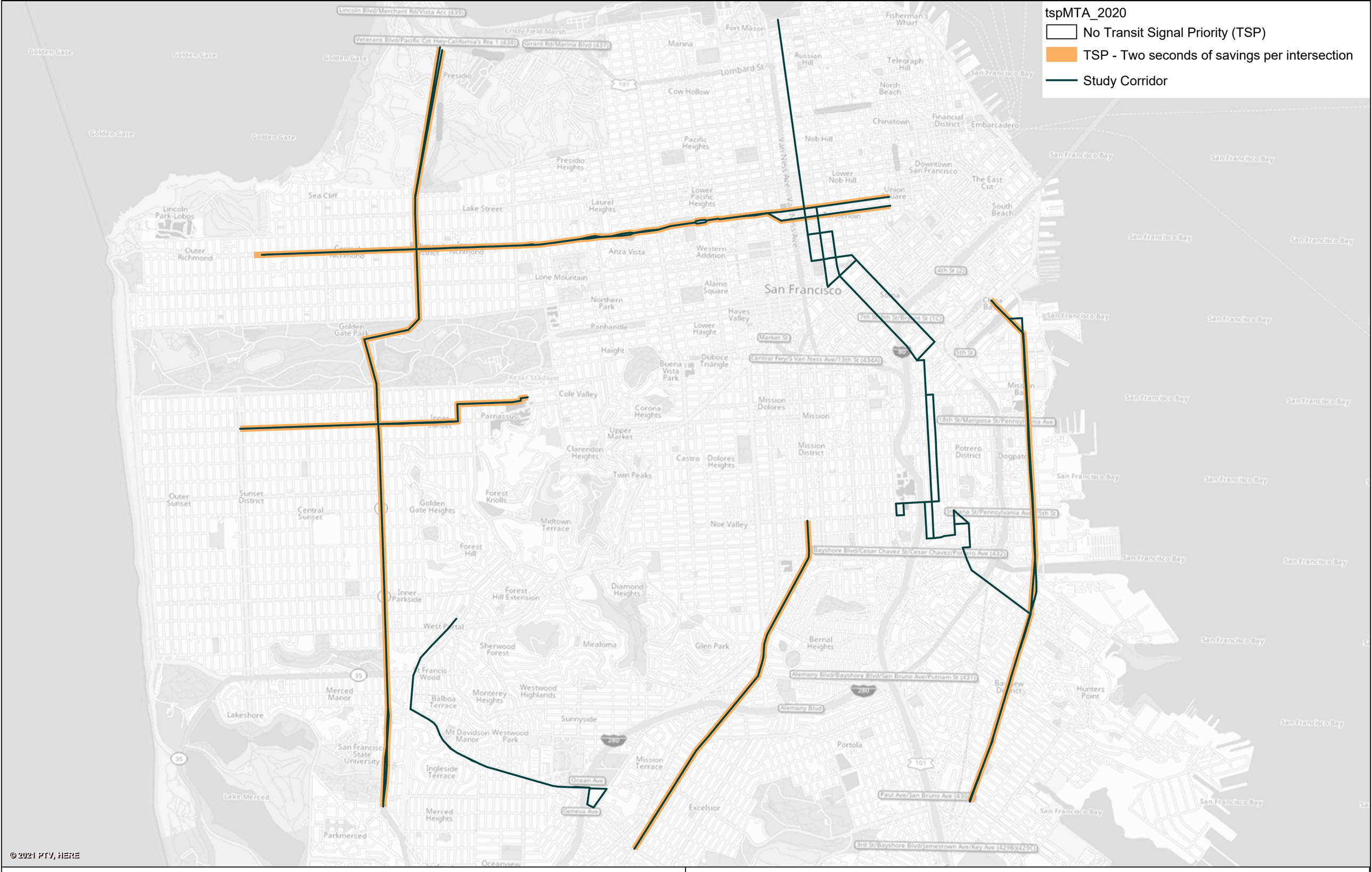
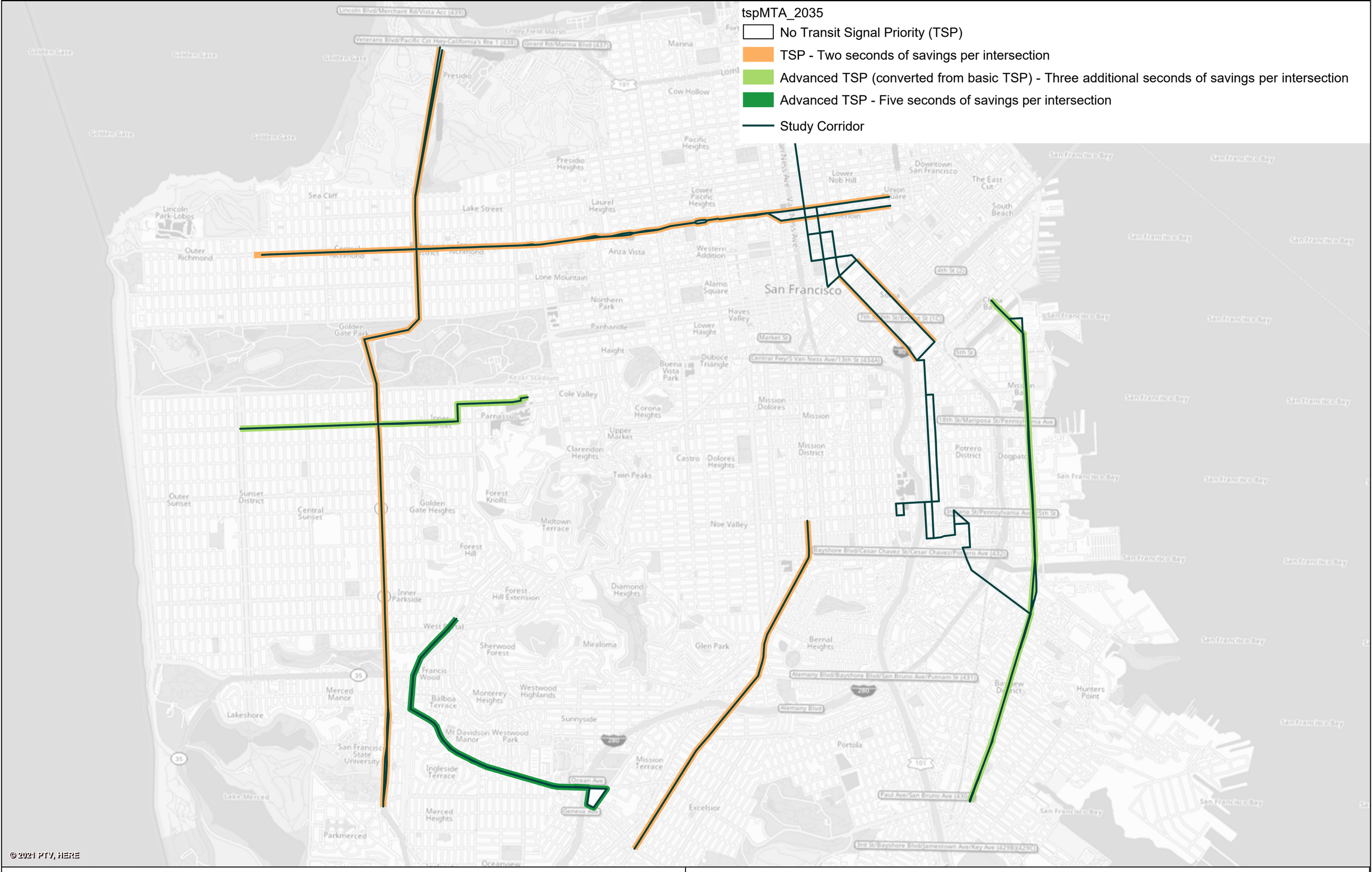
Transit Lanes - 2035



Transit Signal Priority - 2020



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Transit Signal Priority - 2035

Appendix C
SF-CHAMP Travel Demand Outputs

Appendix C-1

SF-Champ Mode Share Outputs

Table C-1: Mode Share by Planning District, Existing, 2020 Conditions

Planning District	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	66%	3%	13%	3%	15%
Marina	51%	7%	16%	4%	22%
Northeast	33%	15%	23%	3%	26%
Downtown	26%	11%	34%	3%	26%
Western Addition	47%	7%	17%	4%	25%
Buena Vista	55%	5%	17%	4%	20%
Central	64%	3%	14%	3%	15%
Mission	56%	5%	16%	4%	20%
South of Market	49%	11%	21%	3%	16%
South Bayshore	74%	2%	11%	3%	11%
Bernal Heights	66%	3%	13%	3%	15%
South Central	72%	1%	11%	2%	13%
Ingleside	69%	2%	14%	3%	12%
Inner Sunset	69%	2%	13%	3%	13%
Outer Sunset	74%	1%	10%	2%	12%
Presidio	77%	4%	8%	3%	8%
Treasure Island	75%	3%	20%	0%	2%
Golden Gate Park	75%	4%	7%	3%	12%



Table C-2: Mode Share by Planning District, Baseline, 2035 Conditions

Planning District	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	65%	3%	14%	3%	15%
Marina	50%	8%	17%	4%	22%
Northeast	31%	17%	24%	3%	25%
Downtown	24%	14%	34%	3%	25%
Western Addition	45%	8%	17%	4%	26%
Buena Vista	53%	6%	17%	4%	20%
Central	63%	3%	15%	3%	15%
Mission	52%	7%	17%	3%	21%
South of Market	43%	15%	22%	3%	17%
South Bayshore	71%	2%	12%	3%	11%
Bernal Heights	66%	3%	14%	3%	14%
South Central	72%	2%	11%	2%	12%
Ingleside	69%	2%	15%	2%	12%
Inner Sunset	68%	3%	13%	3%	12%
Outer Sunset	74%	1%	11%	2%	12%
Presidio	75%	5%	9%	3%	8%
Treasure Island	44%	2%	47%	2%	5%
Golden Gate Park	72%	5%	8%	3%	13%

Table C-3: Mode Share by Planning District, Land Use Concept A, 2035 Conditions

	2035 Mode Share, Land Use Concept A					2035 Mode Share Difference, Land Use Concept A from 2035 Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	64%	3%	14%	3%	15%	-0.5%	0.1%	0.0%	0.0%	0.3%
Marina	49%	8%	17%	4%	22%	-0.8%	0.4%	-0.1%	0.0%	0.5%
Northeast	31%	17%	23%	3%	26%	-0.2%	0.3%	-0.4%	0.0%	0.3%
Downtown	23%	15%	34%	3%	26%	-0.4%	0.8%	-0.8%	0.0%	0.4%
Western Addition	44%	9%	17%	4%	26%	-1.0%	0.7%	-0.5%	0.0%	0.7%
Buena Vista	52%	6%	17%	4%	20%	-0.6%	0.3%	-0.2%	0.0%	0.5%
Central	63%	4%	15%	3%	15%	-0.4%	0.1%	0.0%	0.1%	0.2%
Mission	51%	7%	16%	3%	22%	-1.0%	0.3%	-0.2%	0.0%	0.8%
South of Market	43%	15%	22%	3%	17%	-0.4%	0.0%	-0.1%	0.0%	0.5%
South Bayshore	71%	3%	12%	3%	11%	0.0%	0.1%	0.0%	0.0%	-0.1%
Bernal Heights	65%	3%	14%	3%	14%	-0.3%	0.1%	0.0%	0.2%	0.0%
South Central	72%	2%	11%	2%	12%	-0.2%	0.1%	0.0%	0.0%	0.1%
Ingleside	68%	2%	15%	2%	13%	-0.7%	0.0%	0.1%	0.0%	0.5%
Inner Sunset	68%	3%	14%	3%	13%	-0.5%	0.1%	0.3%	0.0%	0.1%
Outer Sunset	74%	1%	10%	2%	12%	-0.1%	0.0%	-0.2%	0.0%	0.2%
Presidio	75%	5%	9%	3%	8%	0.0%	0.1%	-0.3%	0.1%	0.1%
Treasure Island	42%	1%	49%	1%	7%	-2.8%	-0.9%	1.8%	-0.4%	2.3%
Golden Gate Park	72%	5%	8%	3%	13%	0.0%	0.2%	-0.3%	-0.1%	0.3%

Table C-4: Mode Share by Planning District, Land Use Concept B, 2035 Conditions

	2035 Mode Share, Land Use Concept B					2035 Mode Share Difference, Land Use Concept B from 2035 Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	64%	3%	15%	3%	16%	-0.9%	0.1%	0.2%	0.0%	0.7%
Marina	49%	8%	16%	4%	22%	-0.3%	0.2%	-0.3%	0.0%	0.4%
Northeast	31%	17%	24%	3%	25%	0.1%	0.0%	-0.1%	0.0%	0.0%
Downtown	24%	14%	34%	3%	25%	0.0%	0.3%	-0.4%	0.0%	0.1%
Western Addition	44%	9%	17%	4%	27%	-1.0%	0.2%	-0.5%	0.0%	1.3%
Buena Vista	52%	6%	17%	4%	20%	-0.5%	0.1%	0.1%	-0.1%	0.3%
Central	63%	4%	15%	3%	15%	-0.2%	0.1%	0.0%	0.0%	0.1%
Mission	52%	7%	17%	3%	21%	-0.2%	0.1%	0.0%	0.0%	0.1%
South of Market	43%	15%	22%	3%	17%	0.3%	-0.3%	-0.1%	0.0%	0.0%
South Bayshore	71%	3%	13%	3%	11%	-0.1%	0.0%	0.2%	0.0%	-0.2%
Bernal Heights	66%	3%	14%	3%	14%	-0.1%	0.1%	-0.1%	0.0%	0.1%
South Central	72%	2%	11%	2%	13%	-0.4%	0.0%	0.2%	0.0%	0.3%
Ingleside	69%	2%	15%	2%	12%	-0.3%	0.0%	0.1%	0.0%	0.2%
Inner Sunset	68%	3%	14%	3%	13%	-0.6%	0.1%	0.2%	0.0%	0.4%
Outer Sunset	73%	2%	10%	2%	13%	-0.5%	0.0%	-0.2%	0.1%	0.5%
Presidio	74%	5%	9%	3%	8%	-0.5%	0.2%	0.2%	0.0%	0.1%
Treasure Island	43%	2%	48%	1%	7%	-1.3%	-0.5%	0.7%	-0.5%	1.6%
Golden Gate Park	70%	6%	7%	3%	14%	-1.3%	0.7%	-0.8%	0.1%	1.2%

Table C-5: Mode Share by Planning District, Land Use Concept C, 2035 Conditions

	Mode Share					Difference from Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	64%	3%	14%	3%	15%	-0.4%	0.1%	0.0%	0.0%	0.3%
Marina	49%	8%	17%	4%	22%	-0.4%	0.1%	-0.2%	-0.1%	0.5%
Northeast	31%	17%	24%	3%	25%	0.0%	0.1%	-0.1%	-0.1%	0.0%
Downtown	23%	14%	34%	3%	25%	-0.3%	0.4%	-0.3%	0.0%	0.2%
Western Addition	45%	9%	17%	4%	26%	-0.4%	0.3%	-0.4%	0.0%	0.5%
Buena Vista	53%	6%	17%	4%	20%	-0.3%	0.0%	0.0%	0.0%	0.2%
Central	63%	4%	15%	3%	15%	-0.4%	0.0%	-0.1%	0.2%	0.3%
Mission	52%	7%	17%	3%	21%	-0.4%	0.1%	0.0%	0.0%	0.3%
South of Market	43%	15%	22%	3%	17%	0.0%	-0.2%	0.0%	0.0%	0.2%
South Bayshore	71%	2%	12%	3%	11%	-0.2%	0.0%	0.1%	0.1%	0.0%
Bernal Heights	66%	3%	14%	3%	14%	0.0%	0.0%	0.0%	0.1%	-0.1%
South Central	72%	2%	11%	2%	13%	-0.5%	0.1%	0.1%	0.0%	0.4%
Ingleside	69%	2%	15%	2%	12%	-0.4%	0.0%	-0.1%	0.1%	0.4%
Inner Sunset	68%	3%	14%	3%	13%	-0.6%	0.1%	0.1%	0.0%	0.3%
Outer Sunset	73%	1%	10%	2%	12%	-0.4%	0.0%	-0.1%	0.1%	0.4%
Presidio	75%	5%	9%	3%	8%	-0.2%	0.0%	0.1%	0.1%	-0.1%
Treasure Island	42%	2%	48%	1%	7%	-2.0%	-0.4%	1.0%	-0.2%	1.6%
Golden Gate Park	71%	5%	7%	3%	14%	-1.0%	0.3%	-0.6%	0.5%	0.7%

Table C-6: Mode Share by Planning District, Plan Bay Area, 2035 Conditions

	Mode Share					Difference from Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	65%	3%	14%	3%	15%	0.6%	-0.2%	-0.5%	0.0%	0.1%
Marina	50%	7%	17%	4%	22%	0.5%	-0.5%	-0.2%	-0.2%	0.4%
Northeast	33%	15%	23%	3%	25%	1.9%	-1.6%	-0.5%	-0.1%	0.2%
Downtown	26%	13%	32%	3%	26%	2.5%	-1.1%	-2.0%	0.0%	0.6%
Western Addition	46%	8%	17%	3%	25%	1.4%	-0.2%	-0.6%	-0.1%	-0.5%
Buena Vista	54%	6%	17%	4%	20%	0.8%	-0.3%	-0.5%	-0.1%	0.1%
Central	65%	3%	15%	3%	14%	1.4%	-0.4%	-0.6%	-0.1%	-0.3%
Mission	55%	6%	16%	3%	20%	2.4%	-0.9%	-0.7%	0.0%	-0.8%
South of Market	48%	11%	21%	3%	17%	4.5%	-4.0%	-0.7%	0.2%	-0.1%
South Bayshore	72%	2%	12%	3%	12%	0.5%	-0.3%	-0.7%	0.0%	0.6%
Bernal Heights	67%	3%	13%	3%	14%	1.4%	-0.2%	-0.8%	-0.1%	-0.3%
South Central	73%	2%	11%	2%	12%	0.5%	-0.1%	-0.4%	0.0%	0.0%
Ingleside	69%	2%	14%	2%	12%	0.3%	-0.1%	-0.5%	0.0%	0.3%
Inner Sunset	69%	2%	13%	3%	12%	1.1%	-0.2%	-0.8%	0.1%	-0.2%
Outer Sunset	74%	1%	10%	2%	12%	0.9%	-0.1%	-0.4%	-0.1%	-0.2%
Presidio	78%	3%	8%	3%	7%	3.0%	-1.8%	-0.5%	0.3%	-1.0%
Treasure Island	47%	0%	44%	1%	8%	2.9%	-1.7%	-3.3%	-0.7%	2.8%
Golden Gate Park	71%	3%	8%	3%	15%	-0.3%	-2.0%	0.4%	0.0%	1.9%



Table C-7: Mode Share by Planning District, Proposed Action, 2035 Conditions

	Mode Share					Difference from Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	64%	3%	14%	3%	16%	-0.8%	-0.2%	0.1%	-0.1%	1.0%
Marina	49%	7%	17%	4%	23%	-0.3%	-0.4%	-0.1%	0.0%	0.7%
Northeast	31%	16%	24%	3%	25%	0.4%	-0.6%	0.3%	0.0%	0.0%
Downtown	24%	13%	35%	3%	25%	0.4%	-0.7%	0.6%	0.0%	-0.3%
Western Addition	45%	8%	17%	4%	25%	0.5%	-0.3%	0.1%	0.0%	-0.2%
Buena Vista	53%	6%	17%	4%	20%	0.1%	-0.2%	0.1%	0.0%	0.0%
Central	63%	3%	15%	3%	15%	0.0%	-0.1%	0.2%	0.0%	-0.1%
Mission	53%	6%	17%	3%	21%	0.5%	-0.4%	0.1%	0.0%	-0.2%
South of Market	44%	14%	22%	3%	17%	1.2%	-1.4%	0.6%	0.0%	-0.3%
South Bayshore	72%	2%	12%	3%	11%	0.4%	-0.2%	0.1%	0.0%	-0.3%
Bernal Heights	66%	3%	14%	3%	14%	0.2%	-0.1%	0.0%	0.0%	-0.2%
South Central	73%	2%	11%	2%	12%	0.2%	-0.1%	0.0%	0.0%	-0.2%
Ingleside	69%	2%	15%	2%	12%	-0.2%	-0.1%	0.0%	0.0%	0.3%
Inner Sunset	67%	3%	14%	3%	13%	-1.3%	-0.1%	0.5%	0.0%	0.9%
Outer Sunset	72%	1%	11%	2%	13%	-1.3%	0.0%	0.0%	0.0%	1.3%
Presidio	75%	5%	9%	3%	8%	0.5%	-0.2%	-0.2%	0.0%	-0.1%
Treasure Island	44%	2%	47%	1%	5%	-0.1%	-0.1%	0.4%	-0.1%	-0.1%
Golden Gate Park	71%	5%	7%	3%	14%	-1.1%	-0.3%	-0.8%	0.5%	1.7%

Table C-8: Mode Share by Planning District, Baseline, 2050 Conditions

Planning District	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	65%	3%	14%	3%	15%
Marina	50%	8%	17%	4%	22%
Northeast	31%	17%	24%	3%	25%
Downtown	23%	15%	35%	3%	25%
Western Addition	44%	9%	17%	3%	26%
Buena Vista	52%	6%	17%	4%	20%
Central	63%	4%	15%	3%	15%
Mission	51%	7%	17%	3%	21%
South of Market	41%	17%	22%	3%	17%
South Bayshore	70%	3%	14%	2%	11%
Bernal Heights	66%	3%	14%	3%	14%
South Central	72%	2%	11%	2%	12%
Ingleside	68%	2%	14%	2%	13%
Inner Sunset	68%	3%	14%	3%	12%
Outer Sunset	74%	2%	10%	2%	12%
Presidio	75%	5%	9%	3%	8%
Treasure Island	45%	1%	42%	1%	11%
Golden Gate Park	71%	6%	8%	3%	12%



Table C-9: Mode Share by Planning District, Land Use Concept A, 2050 Conditions

	Mode Share					Difference from Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	64%	4%	14%	3%	15%	-0.6%	0.5%	-0.5%	0.1%	0.6%
Marina	46%	10%	16%	4%	25%	-4.0%	1.7%	-0.9%	-0.1%	3.3%
Northeast	30%	19%	22%	3%	26%	-1.3%	2.0%	-1.6%	-0.1%	1.0%
Downtown	22%	18%	31%	3%	26%	-0.9%	2.9%	-3.2%	-0.1%	1.3%
Western Addition	41%	11%	16%	3%	29%	-2.9%	1.6%	-1.6%	-0.1%	3.0%
Buena Vista	51%	7%	17%	4%	22%	-1.3%	1.1%	-0.8%	-0.1%	1.1%
Central	62%	4%	15%	3%	15%	-0.6%	0.6%	-0.3%	0.0%	0.2%
Mission	48%	9%	16%	3%	24%	-3.0%	1.4%	-1.0%	-0.1%	2.7%
South of Market	39%	20%	20%	3%	18%	-1.9%	2.4%	-1.7%	0.0%	1.2%
South Bayshore	69%	3%	13%	3%	12%	-0.7%	0.5%	-0.3%	0.1%	0.4%
Bernal Heights	65%	4%	14%	3%	14%	-0.8%	0.6%	-0.3%	0.1%	0.4%
South Central	72%	2%	11%	2%	12%	-0.1%	0.3%	-0.3%	0.0%	0.0%
Ingleside	67%	3%	14%	2%	13%	-0.2%	0.4%	0.2%	0.0%	-0.4%
Inner Sunset	68%	3%	13%	3%	12%	-0.2%	0.6%	-0.5%	0.0%	0.1%
Outer Sunset	74%	2%	10%	2%	12%	0.2%	0.2%	-0.1%	0.0%	-0.3%
Presidio	71%	7%	9%	3%	9%	-3.4%	1.8%	0.6%	-0.1%	1.0%
Treasure Island	45%	1%	42%	1%	11%	-0.2%	0.1%	0.0%	0.1%	0.0%
Golden Gate Park	69%	7%	8%	3%	14%	-2.0%	1.3%	-0.4%	-0.4%	1.5%

Table C-10: Mode Share by Planning District, Land Use Concept B, 2050 Conditions

	2050 Mode Share, Land Use Concept B					2050 Mode Share Difference, Land Use Concept B from 2050 Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	62%	3%	14%	3%	17%	-2.3%	-0.1%	-0.2%	0.0%	2.6%
Marina	49%	8%	16%	4%	23%	-0.6%	-0.1%	-0.3%	0.1%	1.0%
Northeast	31%	17%	24%	3%	25%	0.4%	0.0%	-0.1%	0.0%	-0.3%
Downtown	23%	15%	34%	3%	24%	0.4%	-0.1%	-0.2%	0.0%	-0.1%
Western Addition	43%	9%	16%	3%	29%	-1.3%	-0.4%	-0.8%	-0.1%	2.6%
Buena Vista	52%	6%	17%	4%	20%	0.4%	0.1%	-0.2%	-0.1%	-0.2%
Central	63%	4%	15%	3%	15%	0.0%	0.1%	0.0%	0.0%	0.0%
Mission	51%	7%	17%	3%	21%	0.4%	-0.1%	-0.1%	0.0%	-0.1%
South of Market	42%	16%	22%	3%	17%	1.0%	-0.8%	0.2%	0.0%	-0.4%
South Bayshore	70%	3%	13%	3%	11%	0.3%	0.0%	-0.2%	0.1%	-0.2%
Bernal Heights	65%	3%	15%	3%	14%	-0.6%	0.0%	0.1%	0.0%	0.6%
South Central	72%	2%	11%	2%	13%	-1.0%	0.1%	0.0%	0.0%	0.8%
Ingleside	68%	2%	14%	2%	14%	-0.1%	0.0%	-0.2%	0.1%	0.2%
Inner Sunset	67%	3%	14%	3%	13%	-0.6%	-0.1%	-0.1%	0.0%	0.9%
Outer Sunset	73%	2%	10%	2%	13%	-1.1%	-0.1%	0.2%	0.0%	0.9%
Presidio	73%	6%	9%	3%	9%	-2.2%	0.3%	0.6%	-0.1%	1.3%
Treasure Island	45%	1%	42%	1%	11%	0.0%	0.0%	-0.4%	0.1%	0.3%
Golden Gate Park	70%	5%	7%	3%	15%	-1.4%	-0.1%	-0.7%	-0.3%	2.5%



Table C-11: Mode Share by Planning District, Land Use Concept C, 2050 Conditions

	Mode Share					Difference from Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	64%	3%	14%	3%	16%	-0.4%	0.0%	-0.4%	0.0%	0.7%
Marina	49%	9%	17%	4%	22%	-0.3%	0.3%	-0.2%	-0.1%	0.2%
Northeast	31%	18%	24%	3%	25%	-0.3%	0.6%	-0.2%	0.0%	-0.1%
Downtown	23%	16%	34%	3%	25%	-0.3%	0.8%	-0.8%	0.0%	0.2%
Western Addition	43%	9%	17%	4%	27%	-0.6%	0.3%	-0.4%	0.1%	0.6%
Buena Vista	52%	7%	17%	4%	21%	-0.1%	0.3%	-0.3%	0.0%	0.0%
Central	63%	4%	15%	3%	15%	0.1%	0.0%	-0.3%	0.0%	0.2%
Mission	51%	8%	17%	3%	22%	-0.5%	0.3%	-0.2%	-0.1%	0.5%
South of Market	40%	19%	21%	3%	17%	-1.0%	1.3%	-0.7%	0.0%	0.3%
South Bayshore	70%	3%	13%	3%	11%	-0.3%	0.2%	-0.2%	0.1%	0.1%
Bernal Heights	65%	3%	14%	3%	14%	-0.6%	0.2%	-0.2%	0.1%	0.5%
South Central	72%	2%	11%	2%	13%	-0.6%	0.1%	0.1%	0.1%	0.4%
Ingleside	67%	2%	14%	2%	14%	-0.4%	0.1%	-0.3%	0.1%	0.5%
Inner Sunset	68%	3%	13%	3%	13%	-0.2%	0.1%	-0.5%	0.0%	0.6%
Outer Sunset	72%	2%	10%	2%	13%	-1.2%	0.0%	-0.1%	0.0%	1.2%
Presidio	73%	6%	9%	3%	9%	-2.1%	0.6%	0.6%	-0.1%	0.9%
Treasure Island	45%	1%	42%	1%	11%	-0.3%	0.1%	0.1%	0.0%	0.1%
Golden Gate Park	70%	6%	7%	3%	15%	-1.5%	0.2%	-0.9%	0.0%	2.1%

Table C-12: Mode Share by Planning District, Plan Bay Area, 2050 Conditions

	Mode Share					Difference from Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	64%	3%	14%	3%	16%	-1.0%	-0.1%	-0.4%	-0.1%	1.5%
Marina	49%	8%	16%	4%	23%	-0.9%	0.2%	-0.3%	-0.1%	1.1%
Northeast	31%	18%	22%	3%	25%	0.2%	1.0%	-1.6%	-0.1%	0.6%
Downtown	24%	16%	32%	3%	25%	1.1%	0.9%	-2.2%	0.0%	0.2%
Western Addition	44%	10%	17%	3%	26%	0.0%	0.6%	-0.7%	0.0%	0.1%
Buena Vista	51%	7%	17%	4%	22%	-1.0%	0.5%	-0.7%	-0.1%	1.3%
Central	62%	4%	15%	3%	16%	-0.9%	0.2%	-0.4%	-0.1%	1.2%
Mission	51%	7%	16%	3%	23%	-0.1%	-0.2%	-0.8%	-0.1%	1.3%
South of Market	45%	15%	21%	3%	17%	3.5%	-2.8%	-0.7%	0.2%	-0.2%
South Bayshore	69%	3%	14%	3%	12%	-1.2%	-0.1%	0.2%	0.1%	1.0%
Bernal Heights	65%	3%	14%	3%	15%	-0.5%	0.1%	-0.4%	0.0%	0.8%
South Central	72%	2%	11%	2%	13%	-0.4%	0.1%	-0.2%	0.1%	0.4%
Ingleside	68%	2%	14%	2%	13%	-0.1%	0.2%	0.0%	0.1%	-0.2%
Inner Sunset	68%	3%	13%	3%	13%	0.0%	0.1%	-0.7%	0.1%	0.5%
Outer Sunset	74%	2%	10%	2%	12%	0.2%	0.0%	0.1%	0.0%	-0.2%
Presidio	78%	4%	8%	3%	6%	2.9%	-1.2%	-0.3%	0.2%	-1.5%
Treasure Island	48%	1%	41%	1%	10%	2.5%	-0.1%	-1.0%	-0.1%	-1.2%
Golden Gate Park	70%	4%	9%	3%	15%	-0.9%	-2.0%	0.6%	-0.3%	2.6%



Table C-13: Mode Share by Planning District, Proposed Action, 2050 Conditions

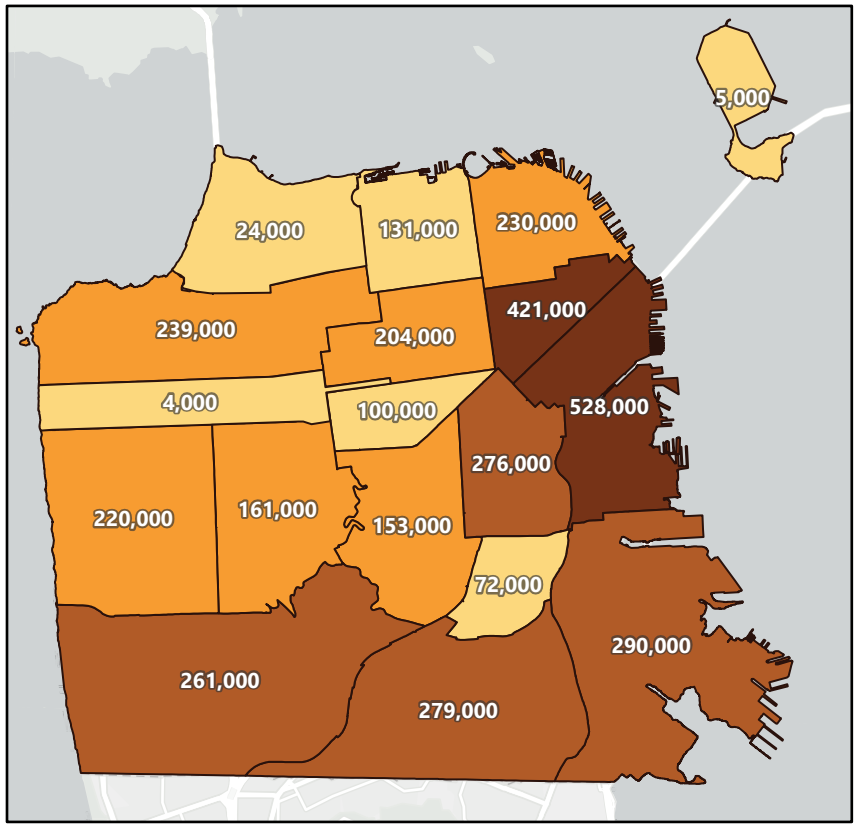
	Mode Share					Difference from Baseline				
Planning District	Auto	TNC/Taxi	Transit	Bike	Walk	Auto	TNC/Taxi	Transit	Bike	Walk
Richmond	63%	3%	14%	3%	17%	-1.6%	-0.3%	-0.1%	0.0%	2.1%
Marina	49%	8%	17%	4%	23%	-0.9%	-0.6%	0.0%	0.0%	1.5%
Northeast	31%	17%	24%	3%	25%	0.6%	-0.8%	0.3%	0.0%	0.0%
Downtown	24%	14%	36%	3%	24%	0.6%	-1.4%	0.9%	0.0%	-0.2%
Western Addition	44%	8%	17%	3%	27%	0.3%	-0.8%	-0.1%	-0.1%	0.7%
Buena Vista	52%	6%	18%	4%	20%	0.4%	-0.3%	0.1%	0.0%	-0.1%
Central	63%	3%	15%	3%	15%	0.2%	-0.3%	0.0%	0.0%	0.0%
Mission	52%	7%	17%	3%	21%	1.0%	-0.5%	0.0%	0.0%	-0.5%
South of Market	43%	15%	23%	3%	16%	1.7%	-1.9%	0.9%	0.0%	-0.7%
South Bayshore	70%	3%	13%	2%	11%	0.2%	-0.2%	-0.1%	0.0%	0.0%
Bernal Heights	66%	3%	15%	3%	14%	-0.1%	-0.2%	0.1%	-0.1%	0.2%
South Central	73%	2%	11%	2%	12%	0.2%	0.0%	-0.1%	0.1%	-0.2%
Ingleside	67%	2%	14%	2%	14%	-0.3%	0.0%	-0.2%	0.0%	0.5%
Inner Sunset	67%	3%	14%	3%	14%	-1.2%	-0.3%	-0.2%	0.0%	1.7%
Outer Sunset	72%	2%	10%	2%	14%	-2.0%	0.0%	0.2%	-0.1%	1.9%
Presidio	75%	5%	8%	3%	9%	0.0%	-0.1%	-0.4%	-0.2%	0.7%
Treasure Island	45%	1%	43%	1%	11%	-0.4%	-0.1%	0.8%	-0.1%	-0.2%
Golden Gate Park	69%	5%	7%	3%	15%	-1.8%	-0.3%	-0.6%	-0.3%	3.0%

Appendix C-2

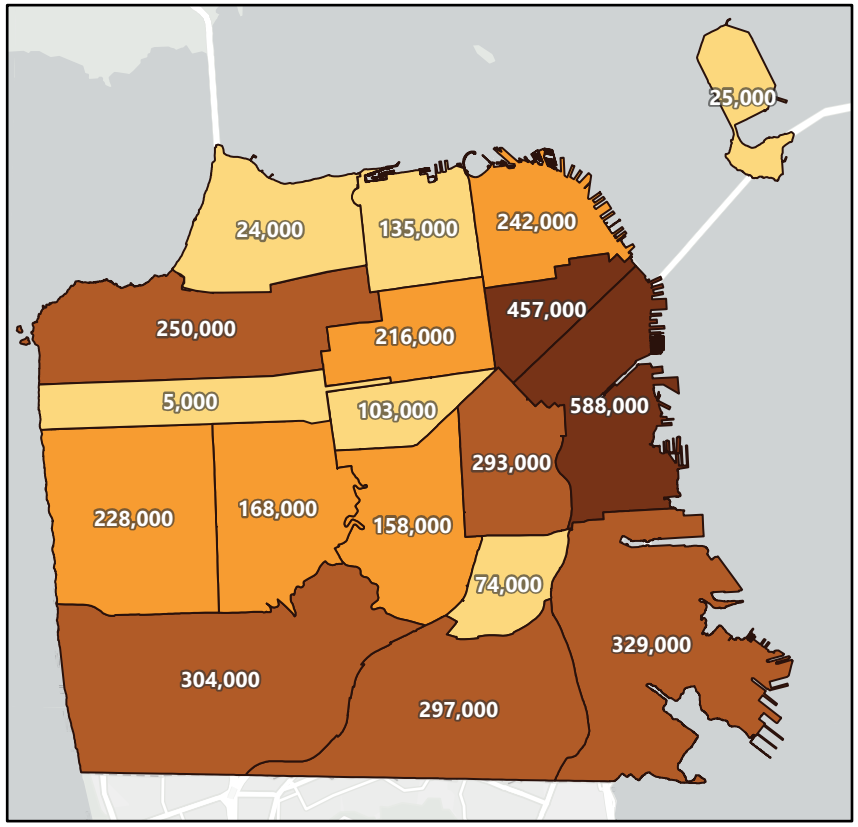
Vehicle & Transit Trip Maps by Planning District

Daily Vehicle Trips, No Project

2035 Conditions

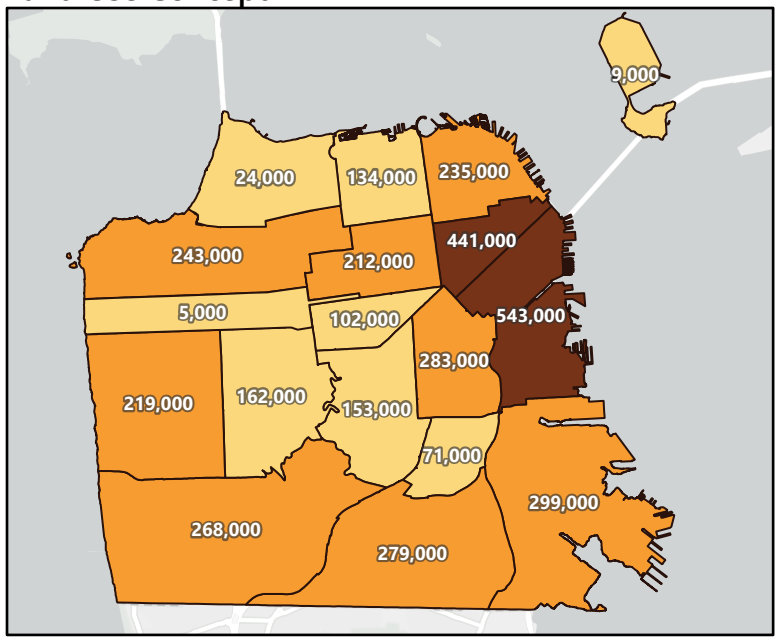


2050 Conditions

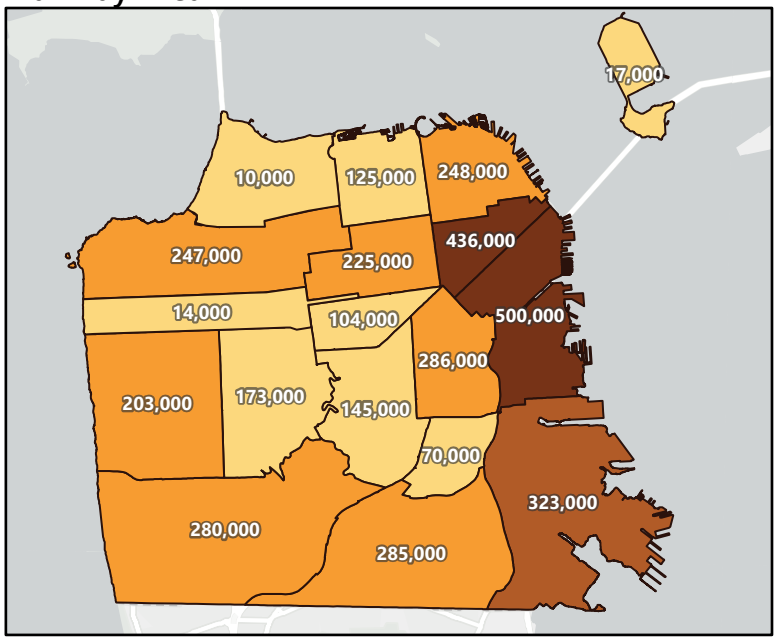


Daily Vehicle Trips by Land Use Concept for 2035 Conditions

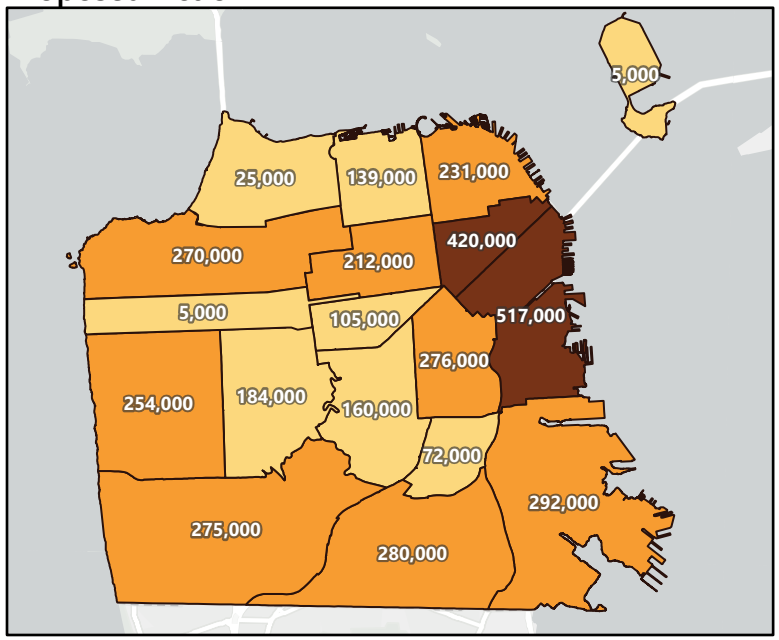
Land Use Concept A



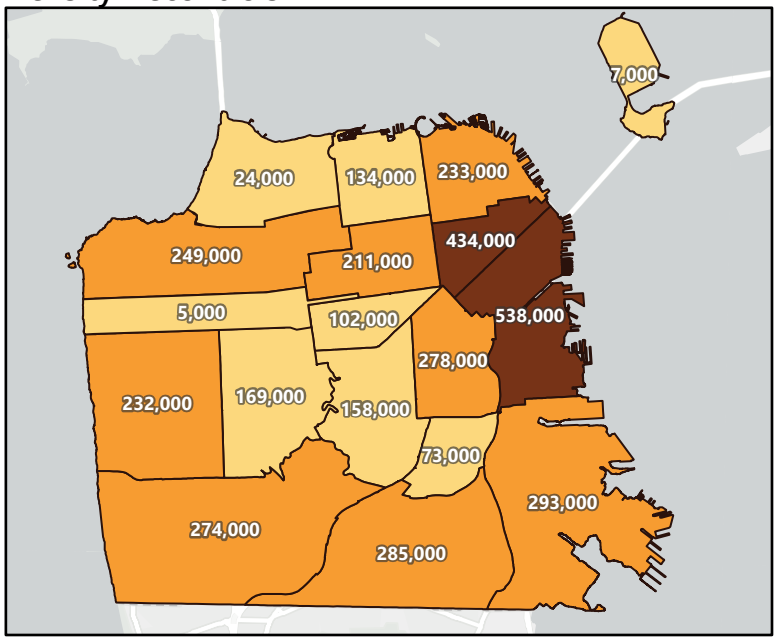
Plan Bay Area



Proposed Action

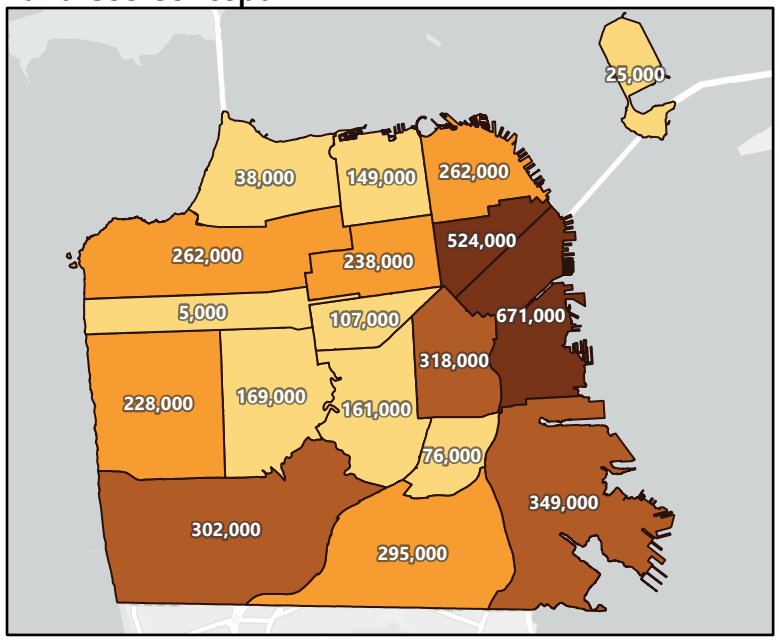


Density Decontrols

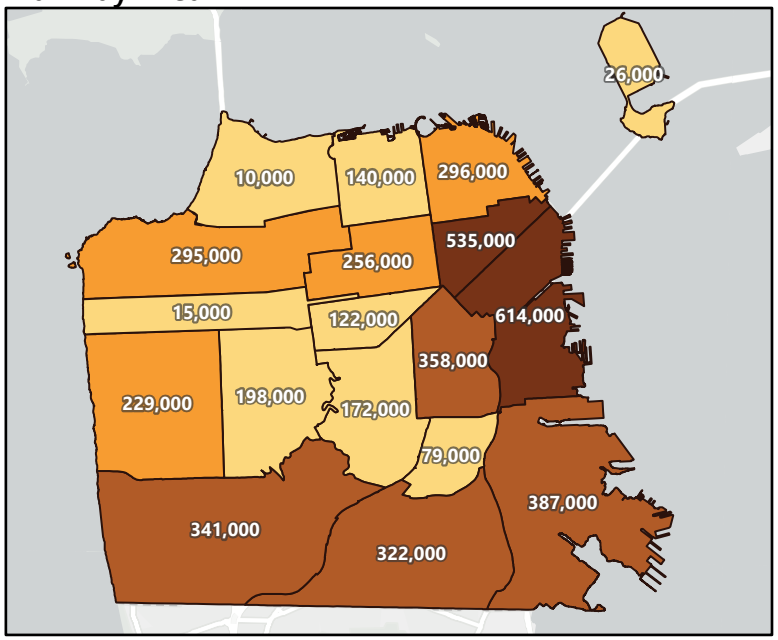


Daily Vehicle Trips by Land Use Concept for 2050 Conditions

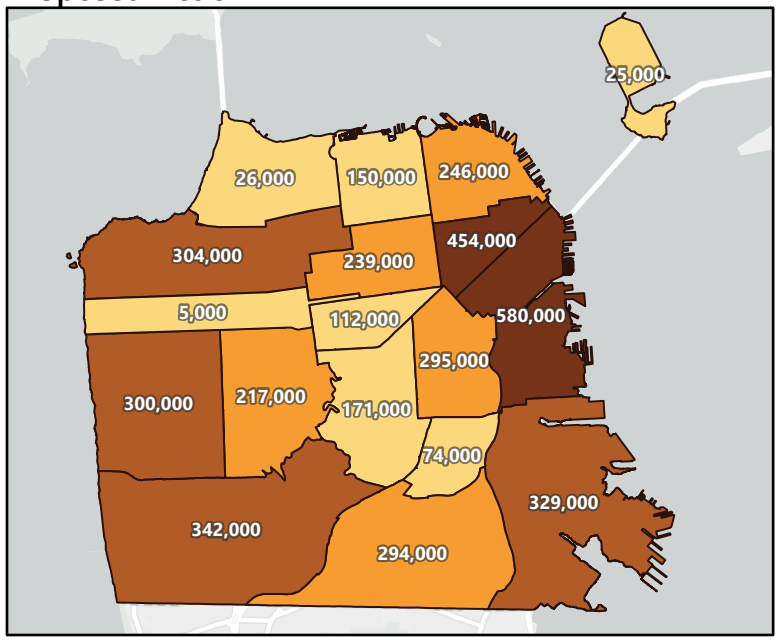
Land Use Concept A



Plan Bay Area



Proposed Action



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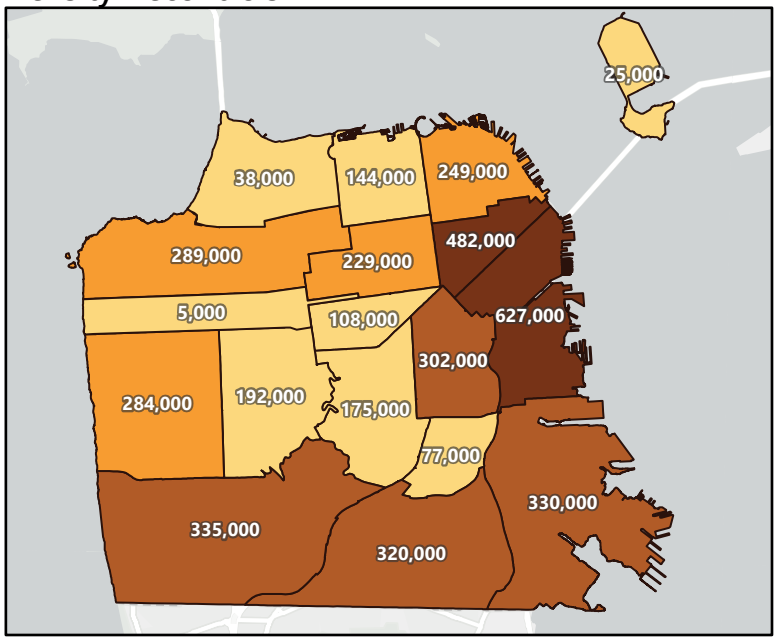
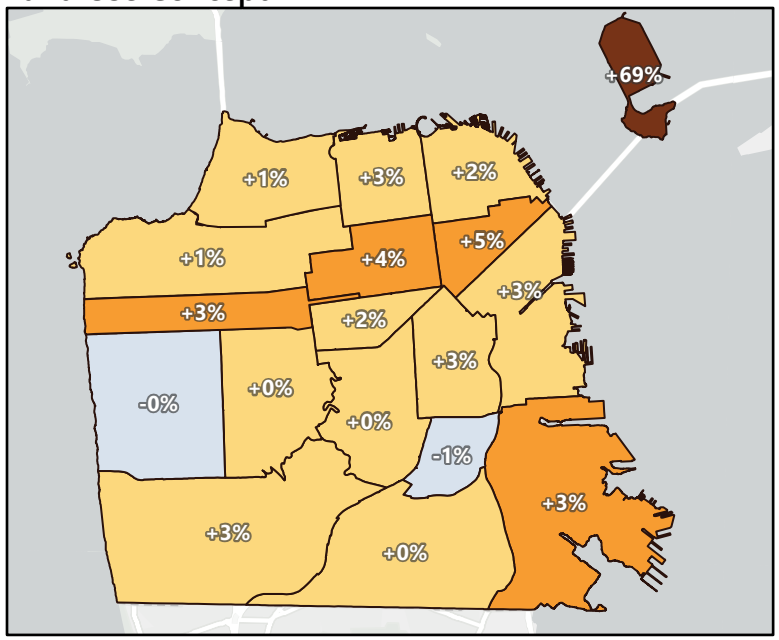
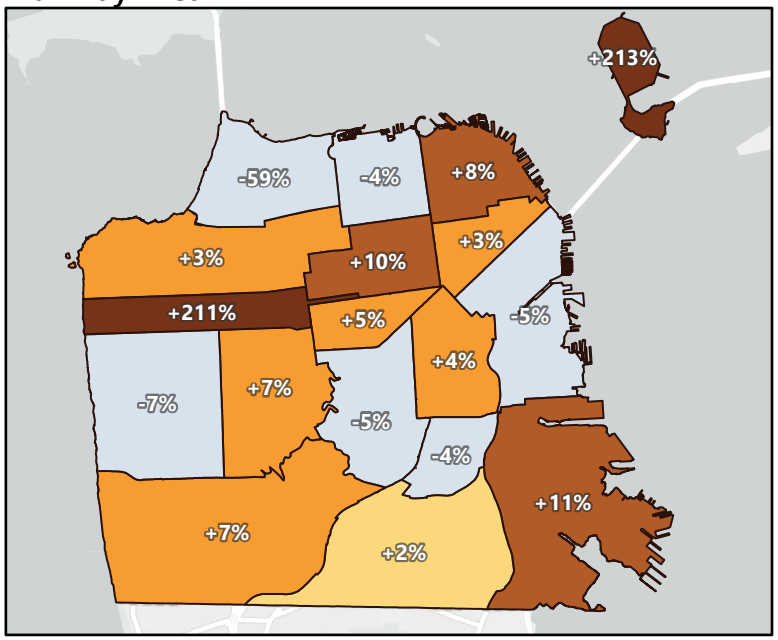


Daily Vehicle Trips, Percent Change Between Baseline and LU Concept for 2035 Conditions

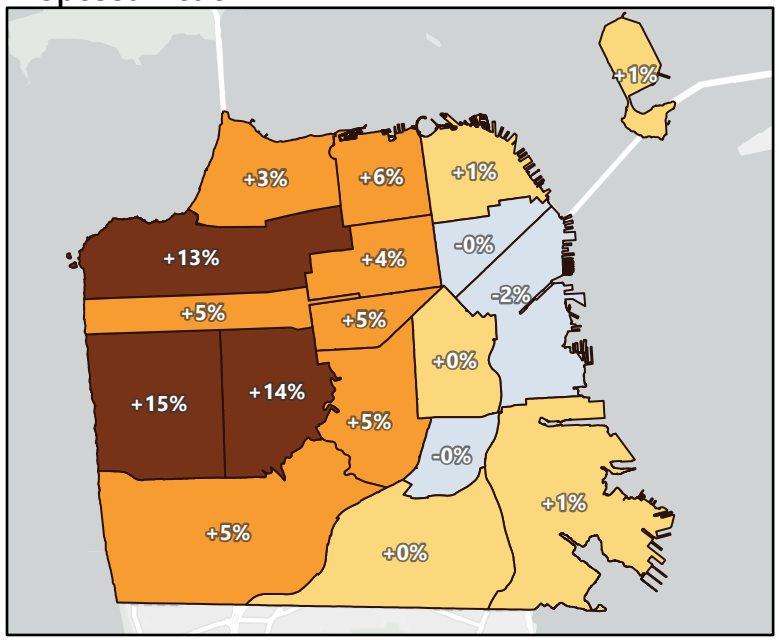
Land Use Concept A



Plan Bay Area



Proposed Action



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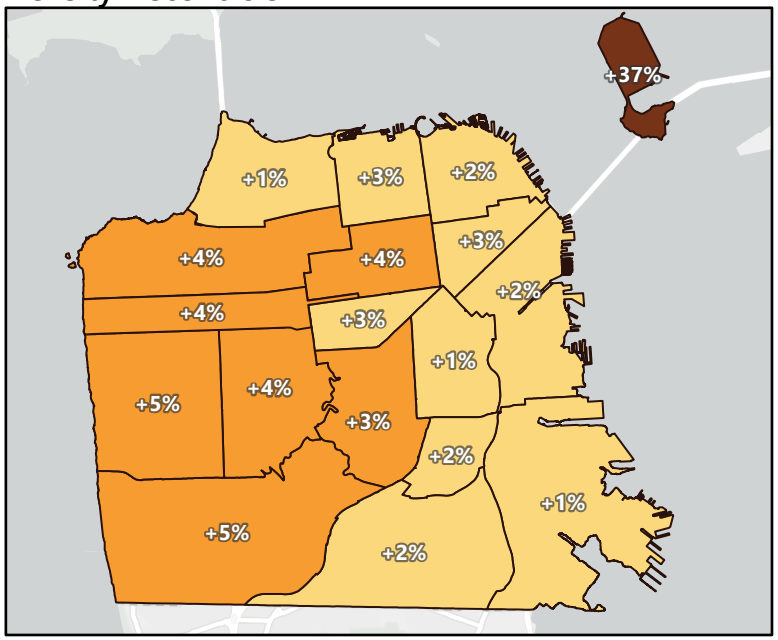
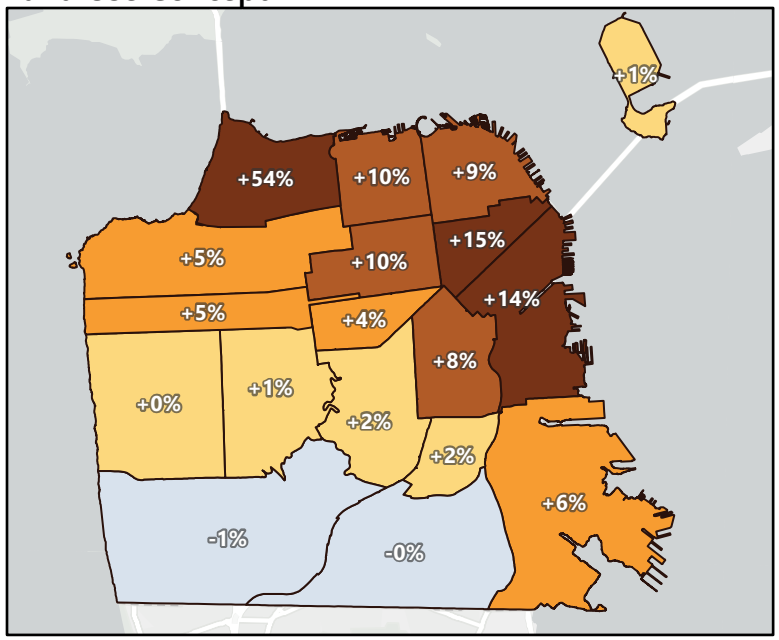
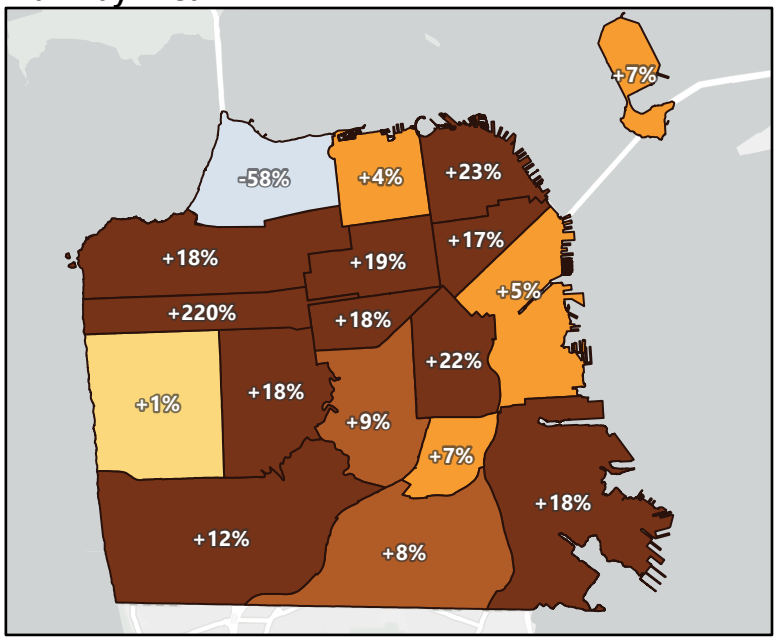


Daily Vehicle Trips, Percent Change Between Baseline and LU Concept for 2050 Conditions

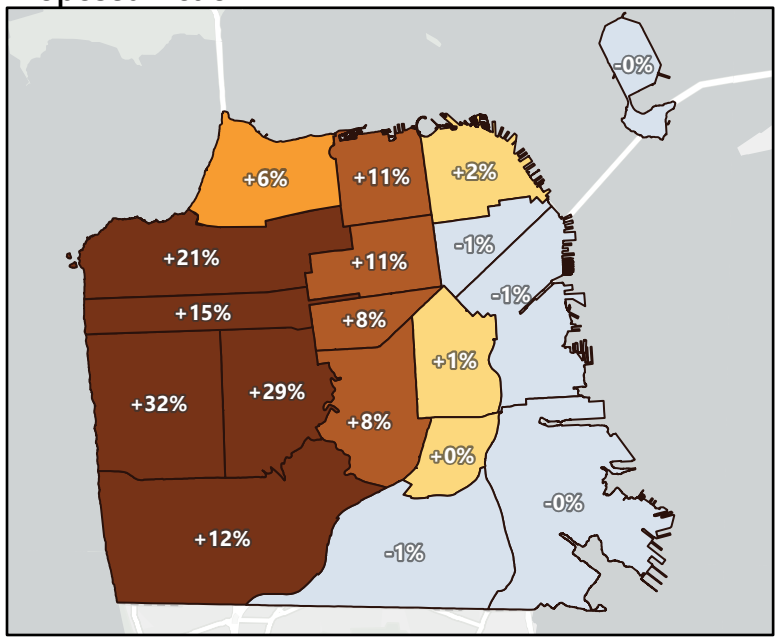
Land Use Concept A



Plan Bay Area



Proposed Action



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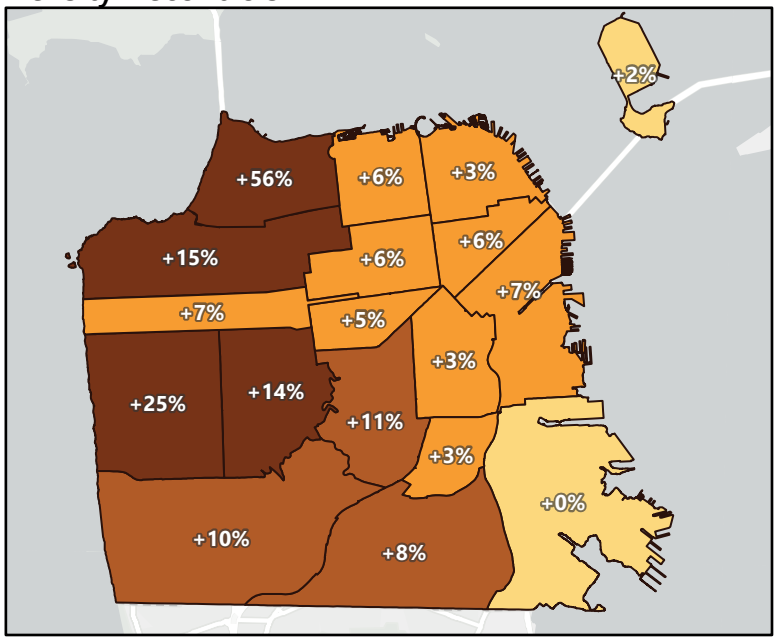
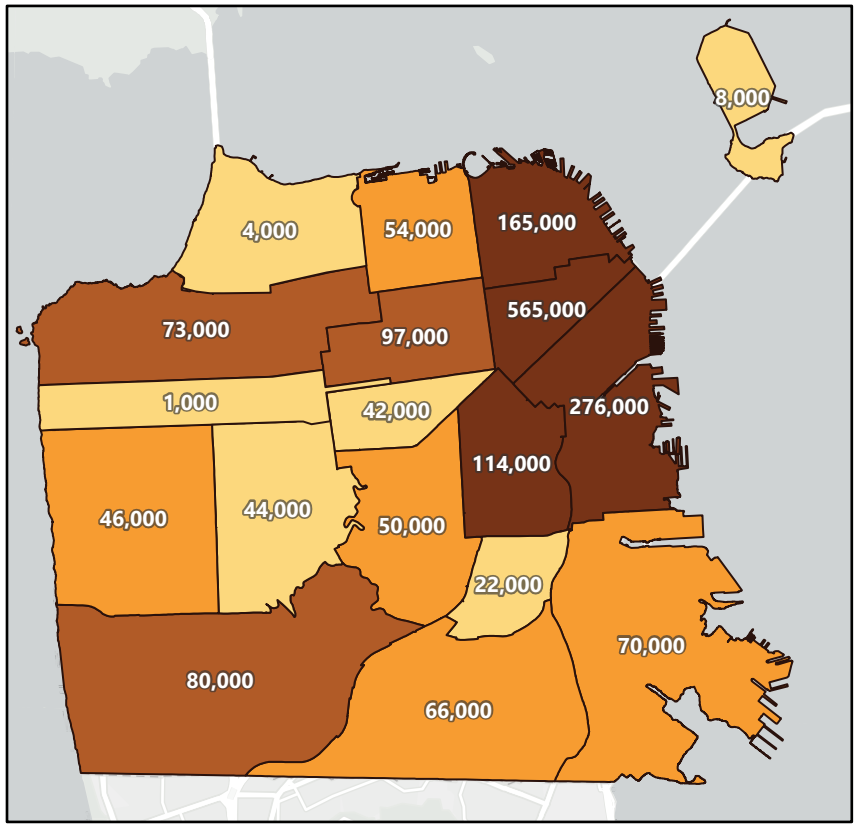
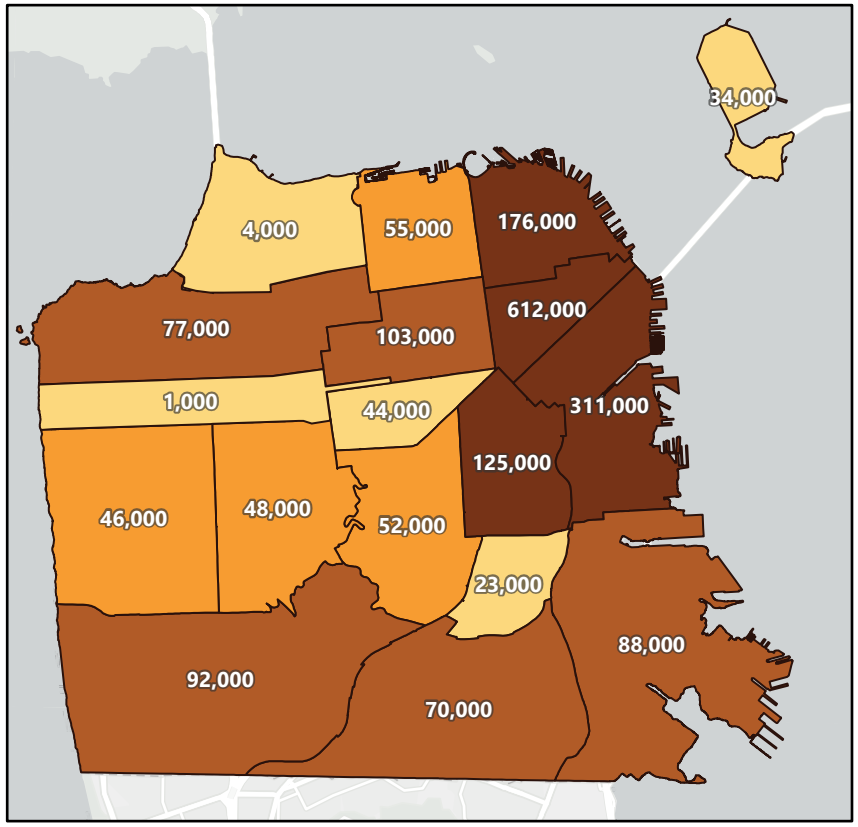


Daily Transit Person Trips, No Project

2035 Conditions

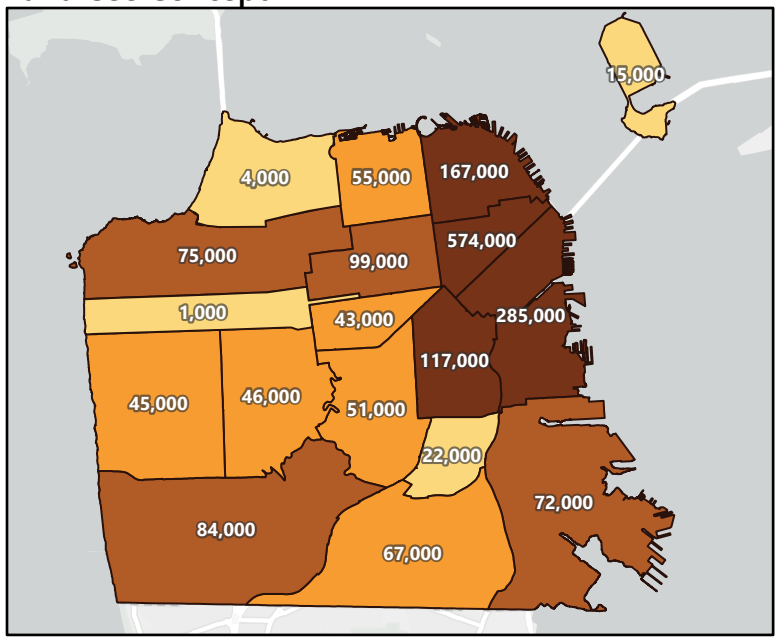


2050 Conditions

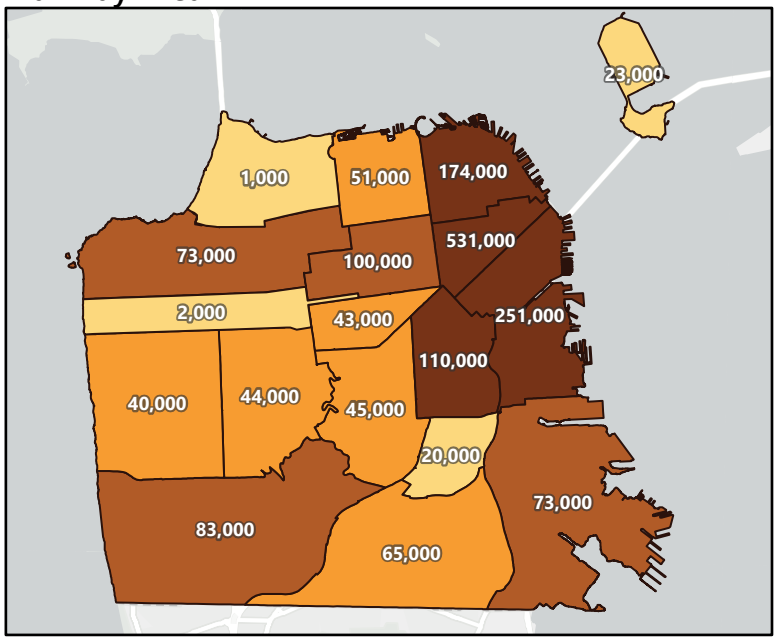


Daily Transit Person Trips by Land Use Concept for 2035 Conditions

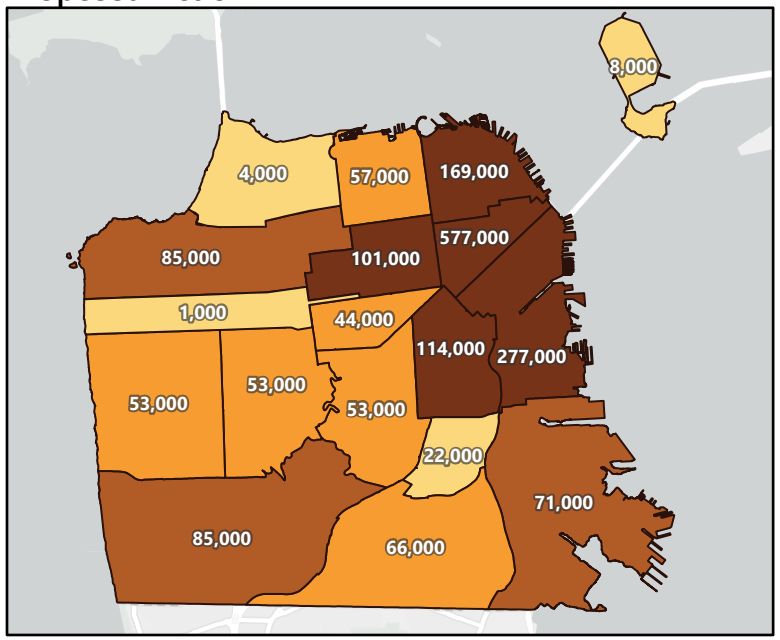
Land Use Concept A



Plan Bay Area



Proposed Action



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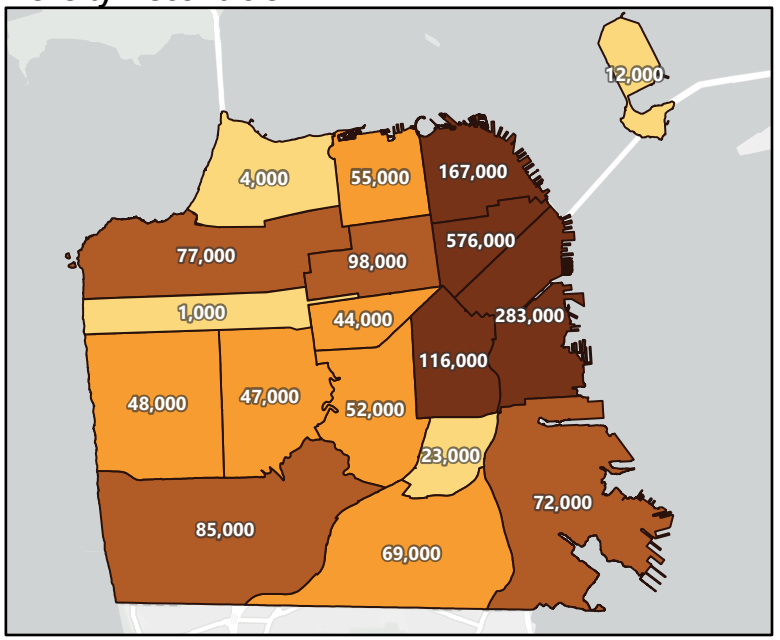
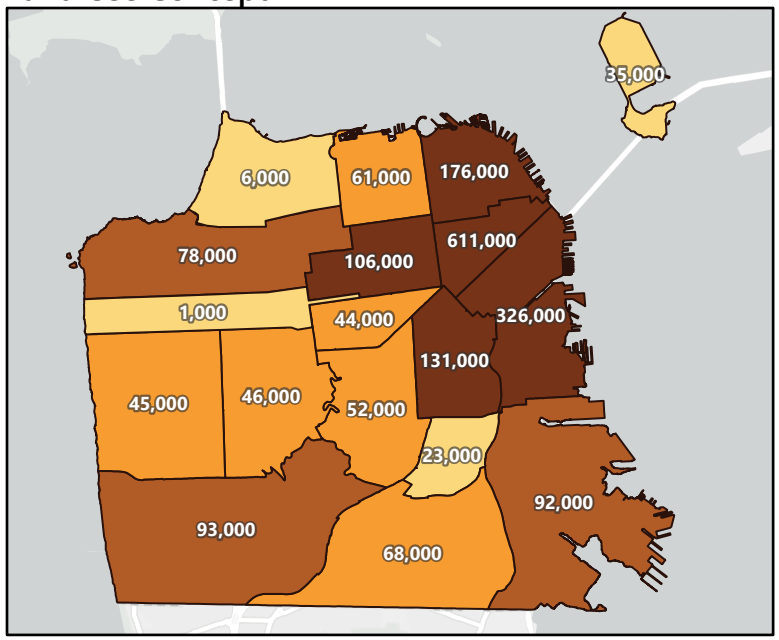
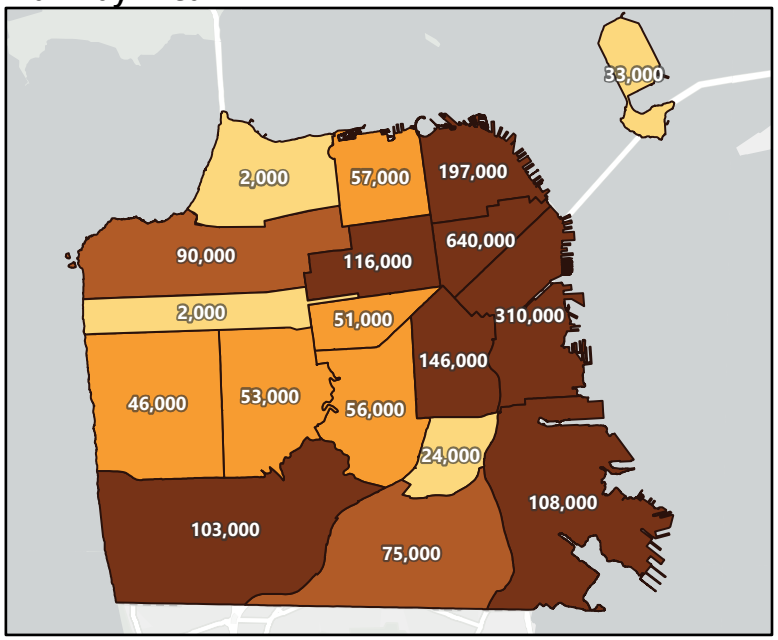


Daily Transit Person Trips by Land Use Concept for 2050 Conditions

Land Use Concept A



Plan Bay Area



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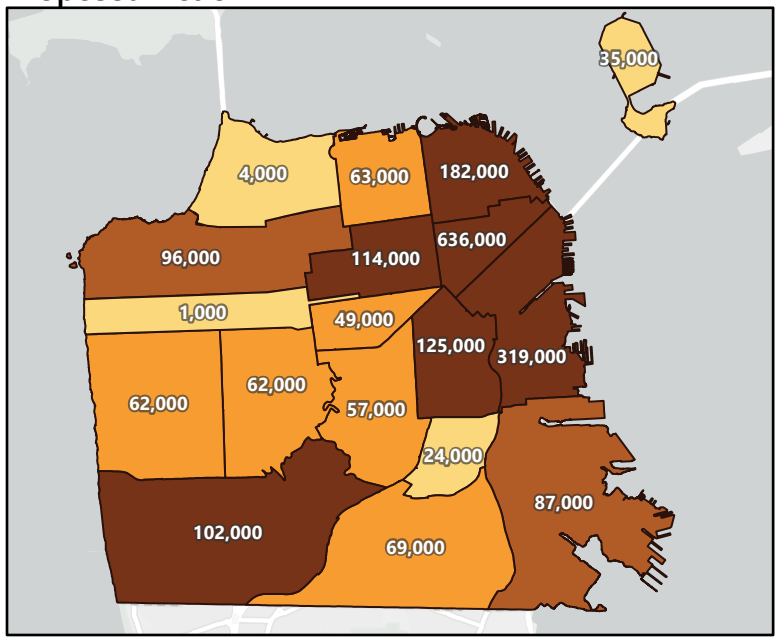

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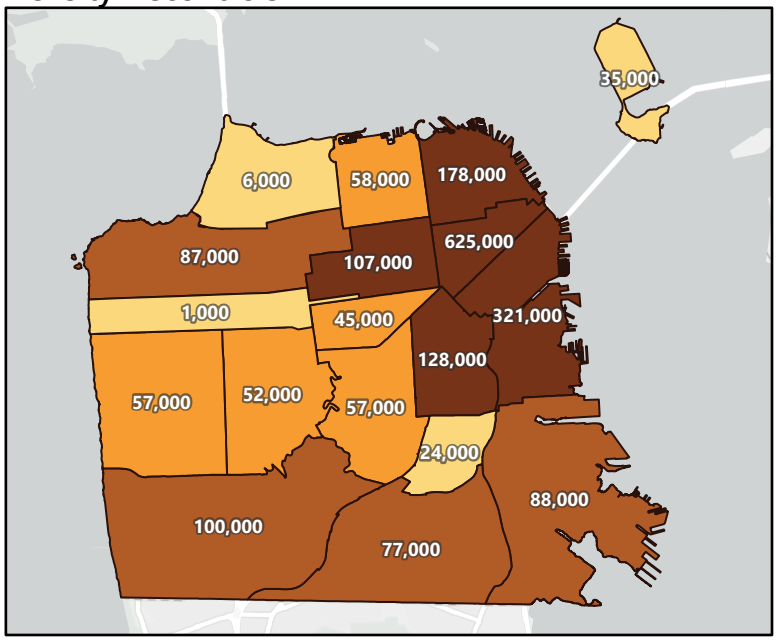
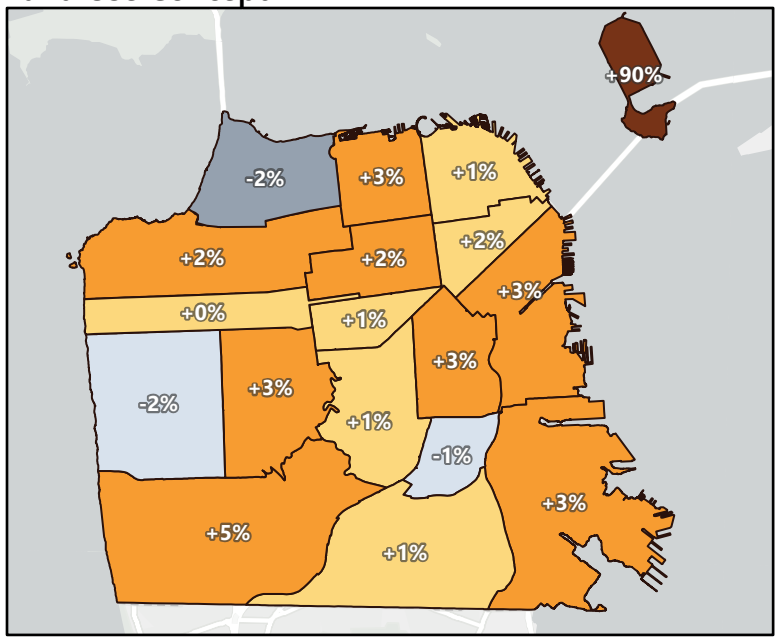
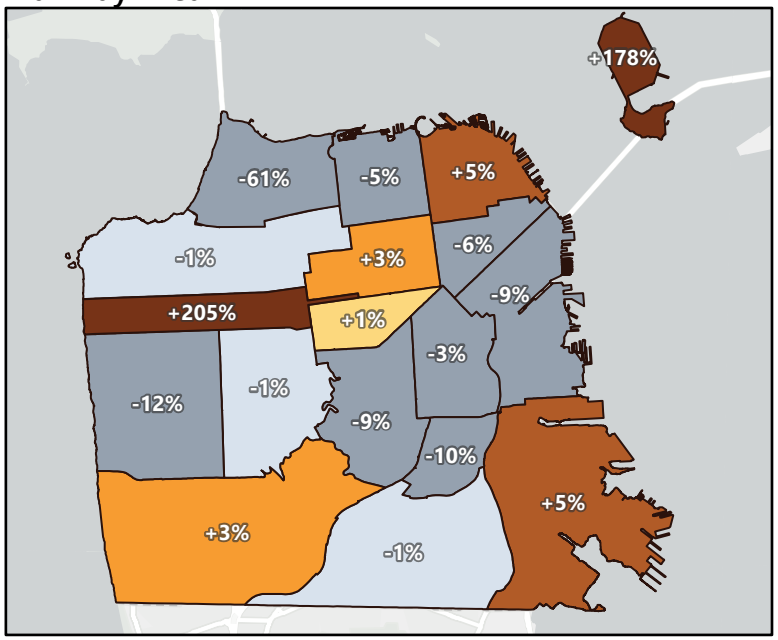


Daily Transit Person Trips, Percent Change Between Baseline and LU Concept for 2035 Conditions

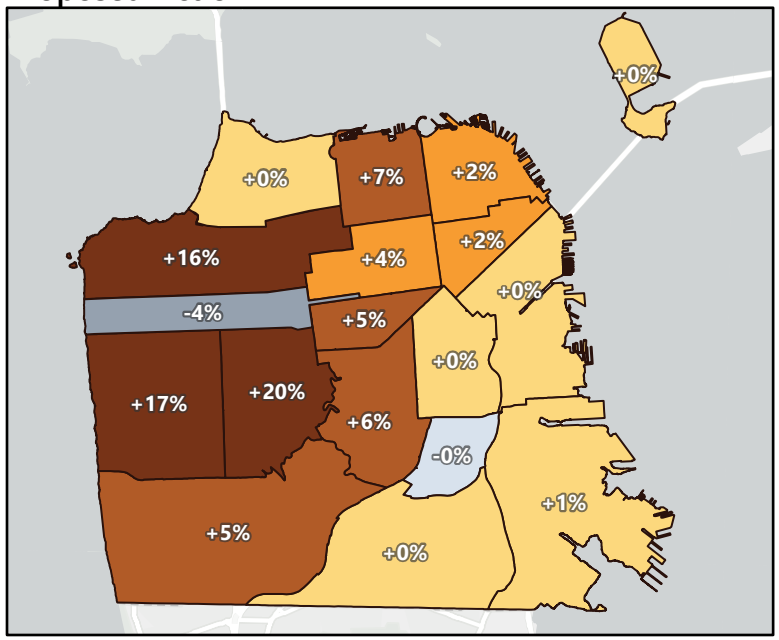
Land Use Concept A



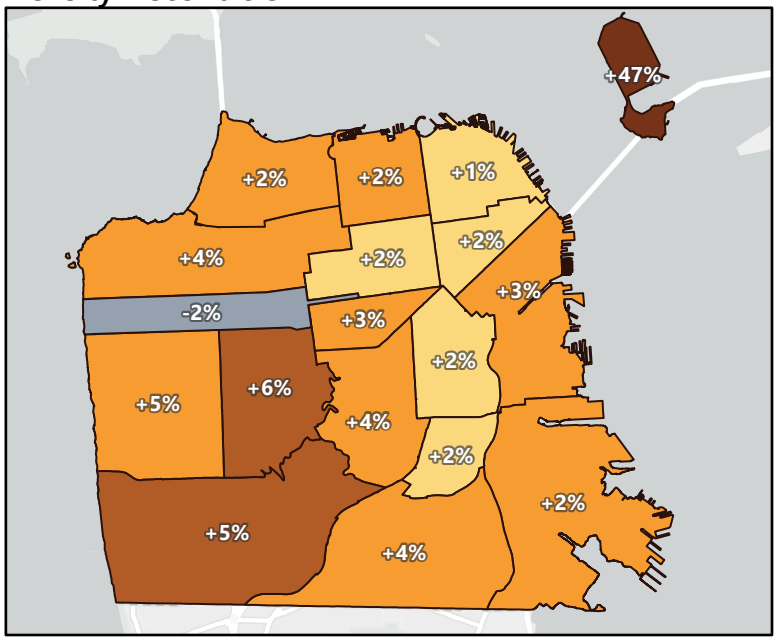
Plan Bay Area



Proposed Action

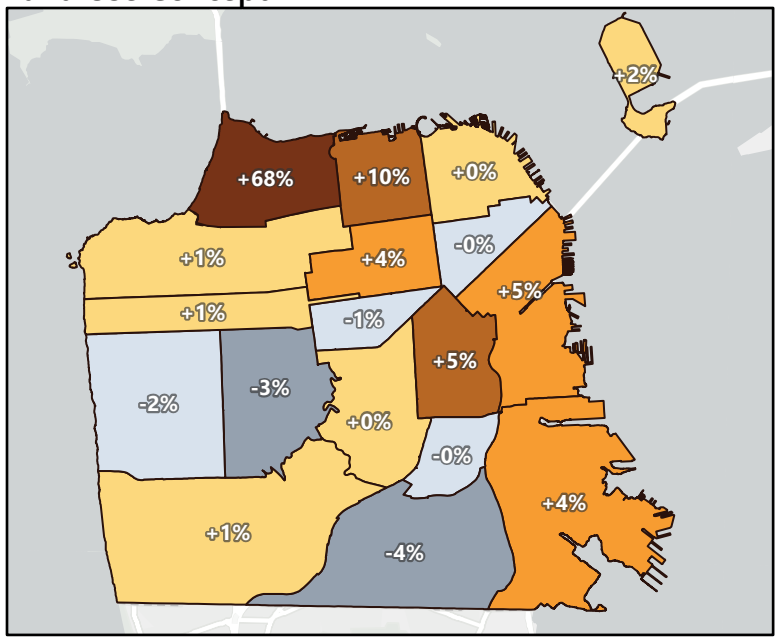


Density Decontrols

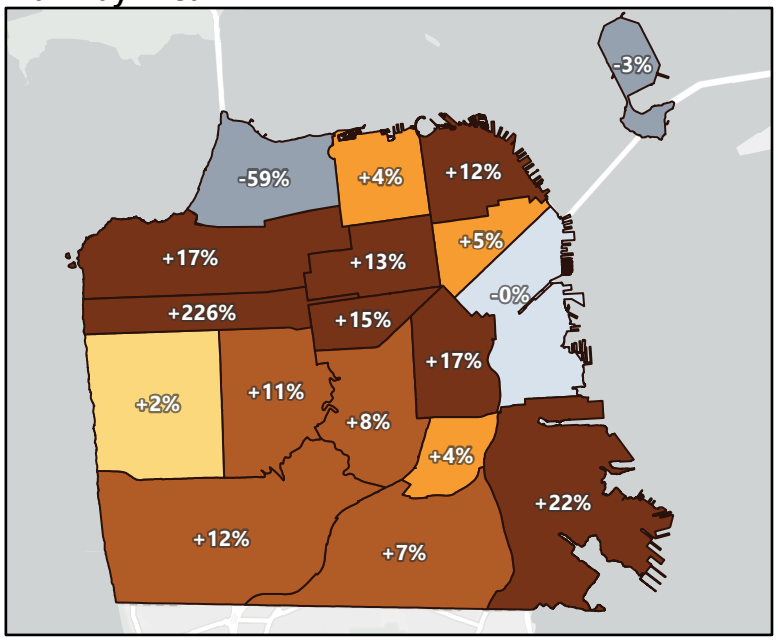


Daily Transit Person Trips, Percent Change Between Baseline and LU Concept for 2050 Conditions

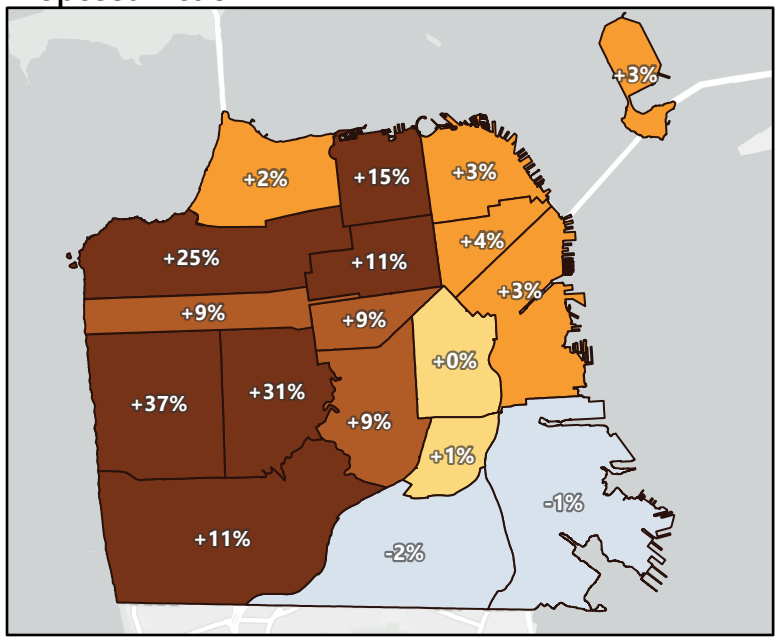
Land Use Concept A



Plan Bay Area



Proposed Action



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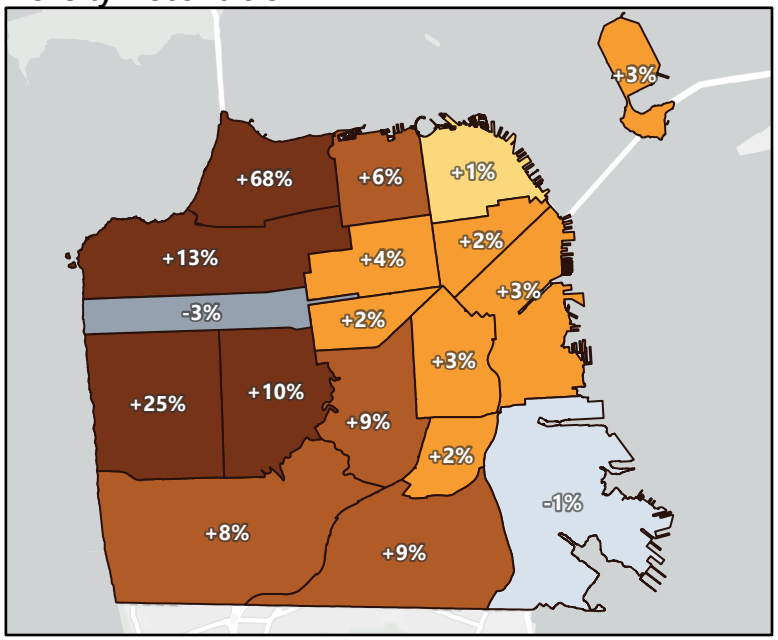
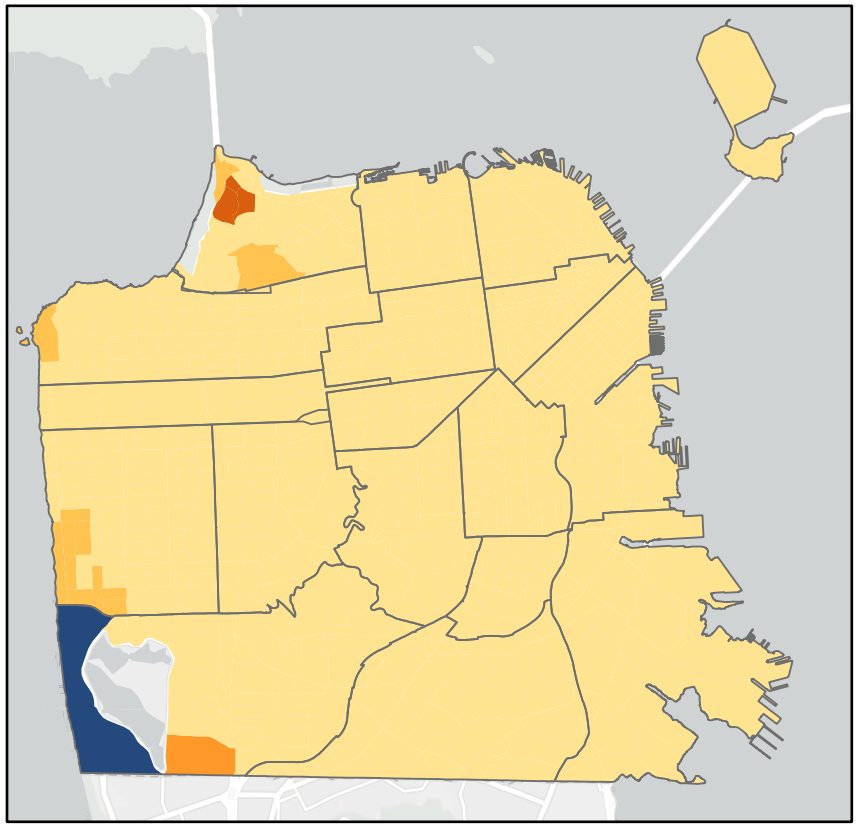


Appendix C-3

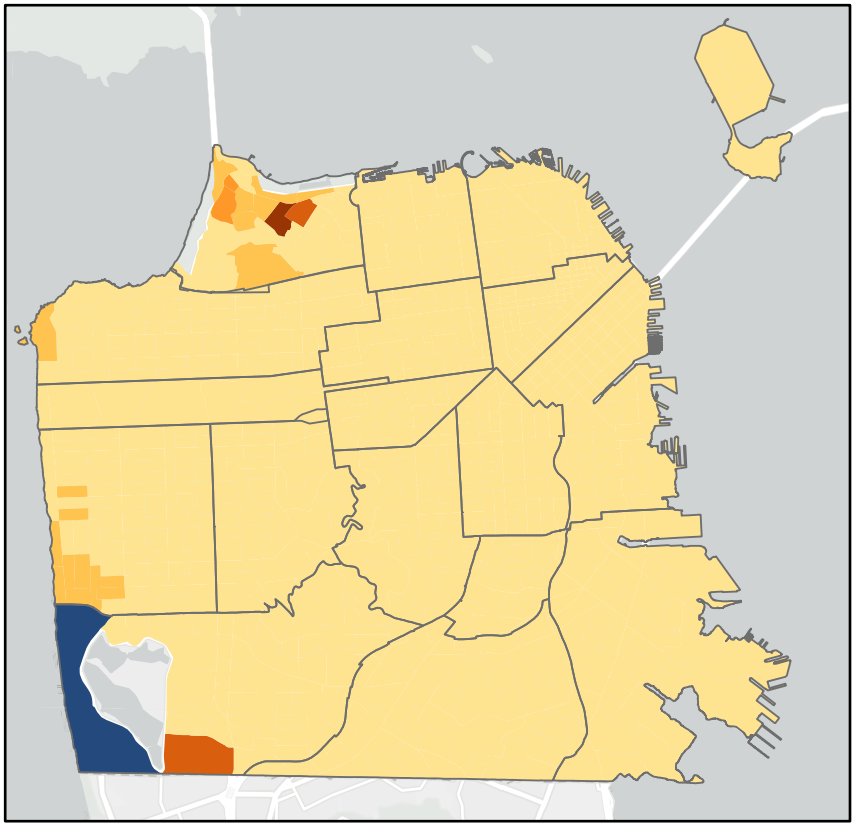
Residential & Office VMT by Planning District

Residential VMT per Capita, Baseline

2035 Conditions



2050 Conditions

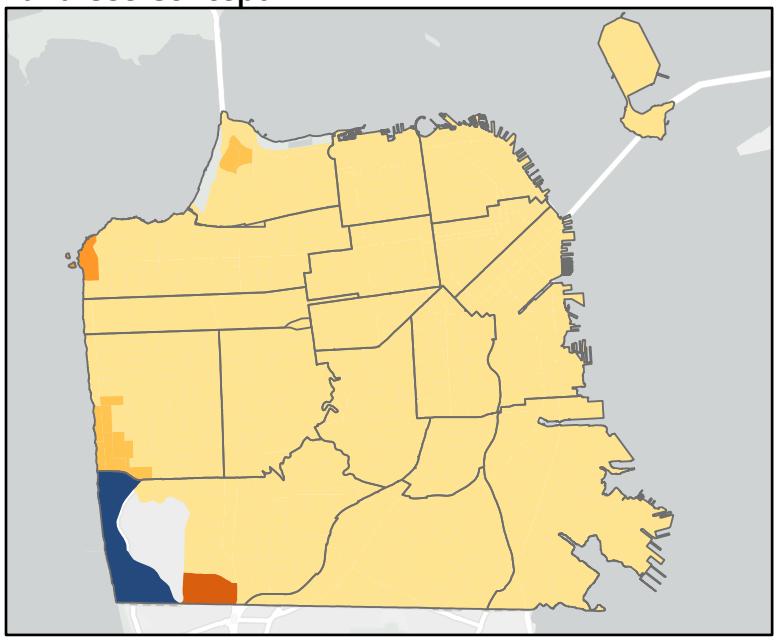


Residential VMT per Capita
(% Below 2020 Regional Average)

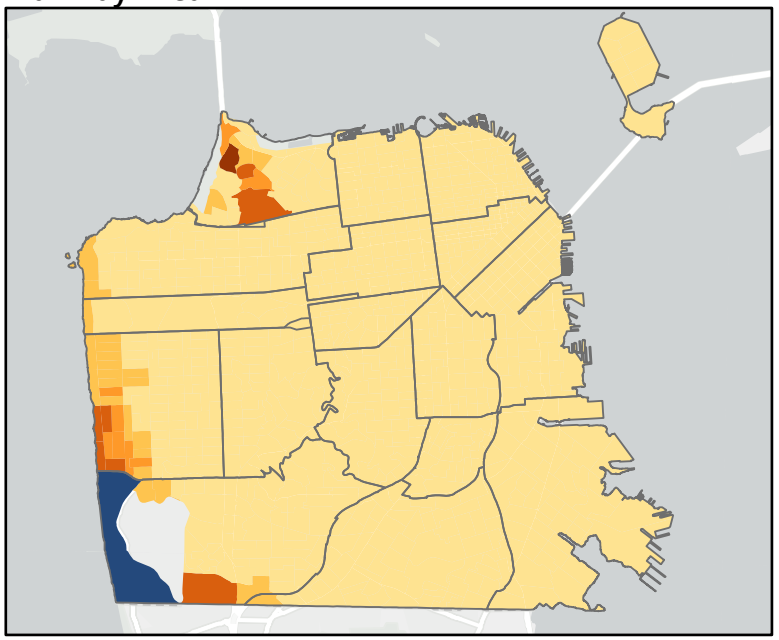
- ≤ 13.0 (30%)
- ≤ 14.0 (25%)
- ≤ 14.9 (20%)
- ≤ 15.8 (15%)
- ≤ 18.6 (2020 Regional Avg)
- > 18.6 (Above 2020 Regional Avg)

Residential VMT per Capita by Land Use Concept for 2035 Conditions

Land Use Concept A



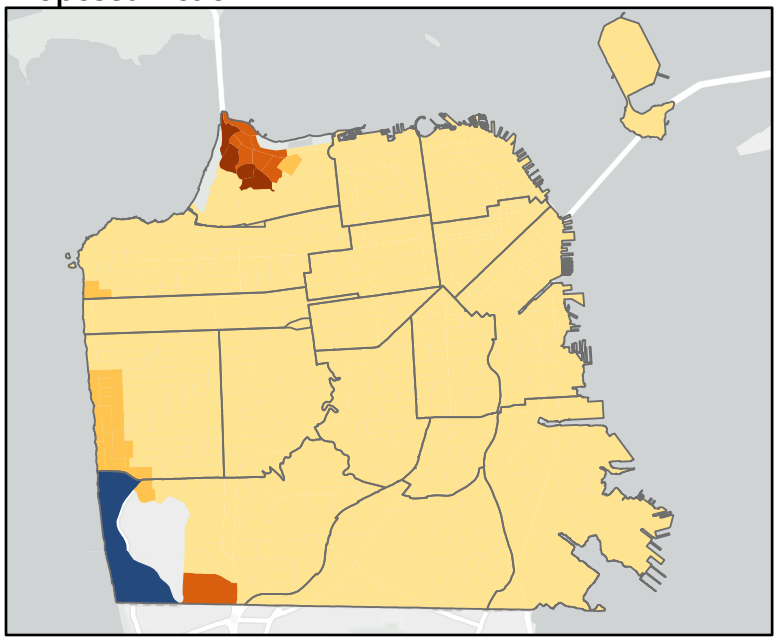
Plan Bay Area



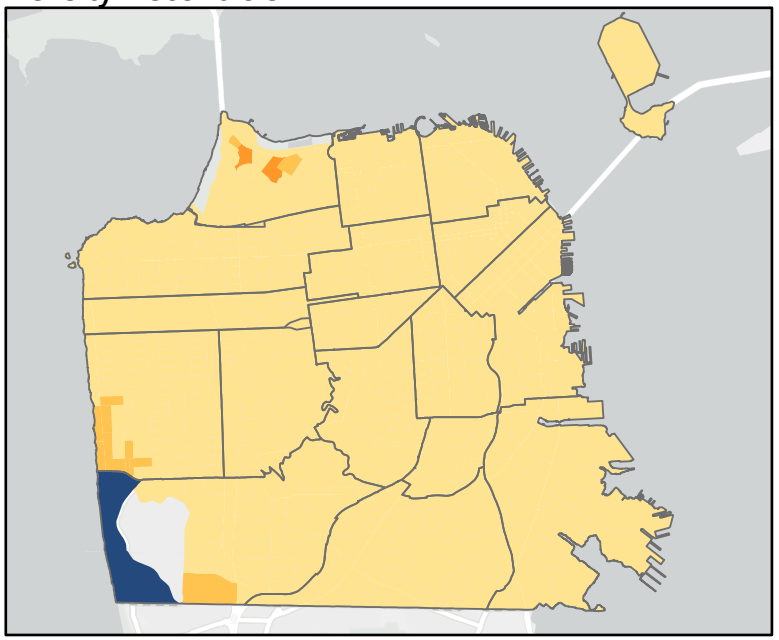
Residential VMT per Capita
(% Below 2020 Regional Average)

- ≤ 13.0 (30%)
- ≤ 14.0 (25%)
- ≤ 14.9 (20%)
- ≤ 15.8 (15%)
- ≤ 18.6 (2020 Regional Avg)
- > 18.6 (Above 2020 Regional Avg)

Proposed Action

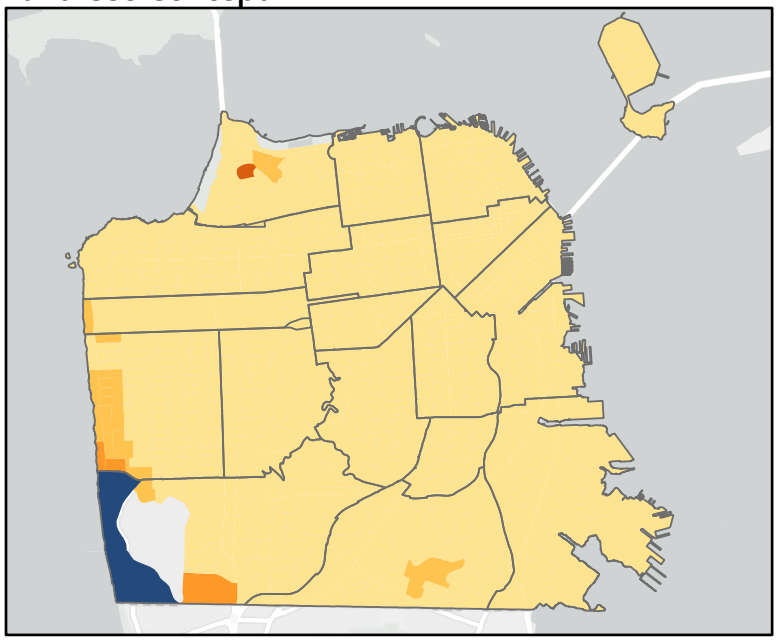


Density Decontrols

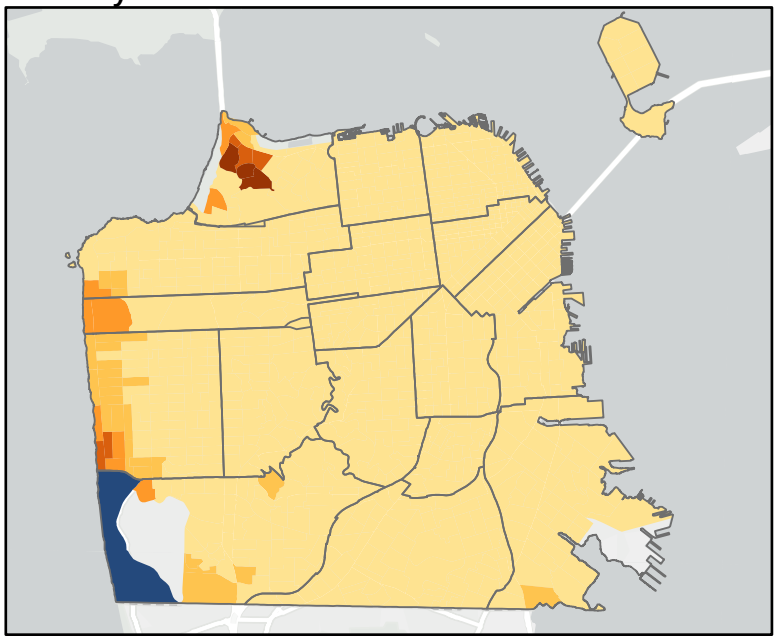


Residential VMT per Capita by Land Use Concept for 2050 Conditions

Land Use Concept A



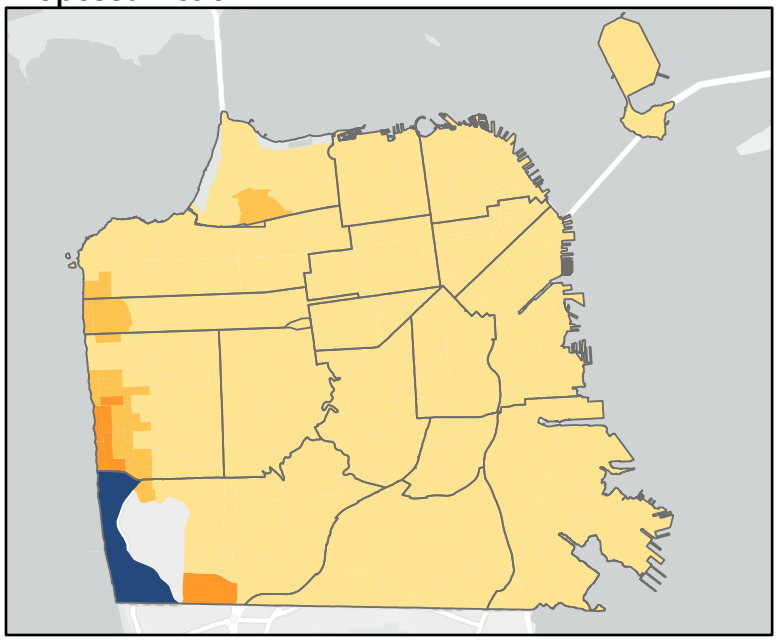
Plan Bay Area



Residential VMT per Capita
(% Below 2020 Regional Average)

- ≤ 13.0 (30%)
- ≤ 14.0 (25%)
- ≤ 14.9 (20%)
- ≤ 15.8 (15%)
- ≤ 18.6 (2020 Regional Avg)
- > 18.6 (Above 2020 Regional Avg)

Proposed Action



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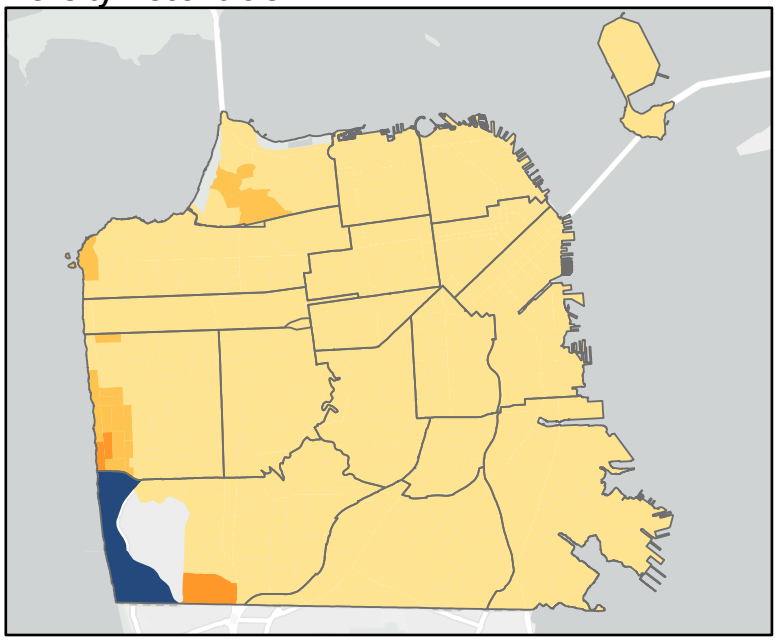
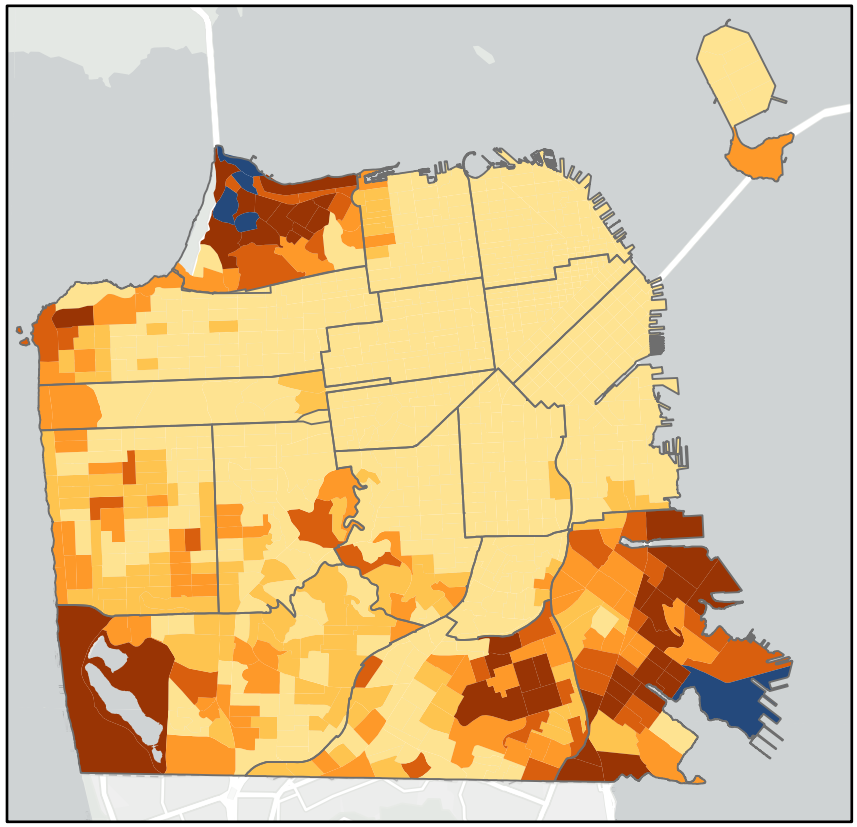
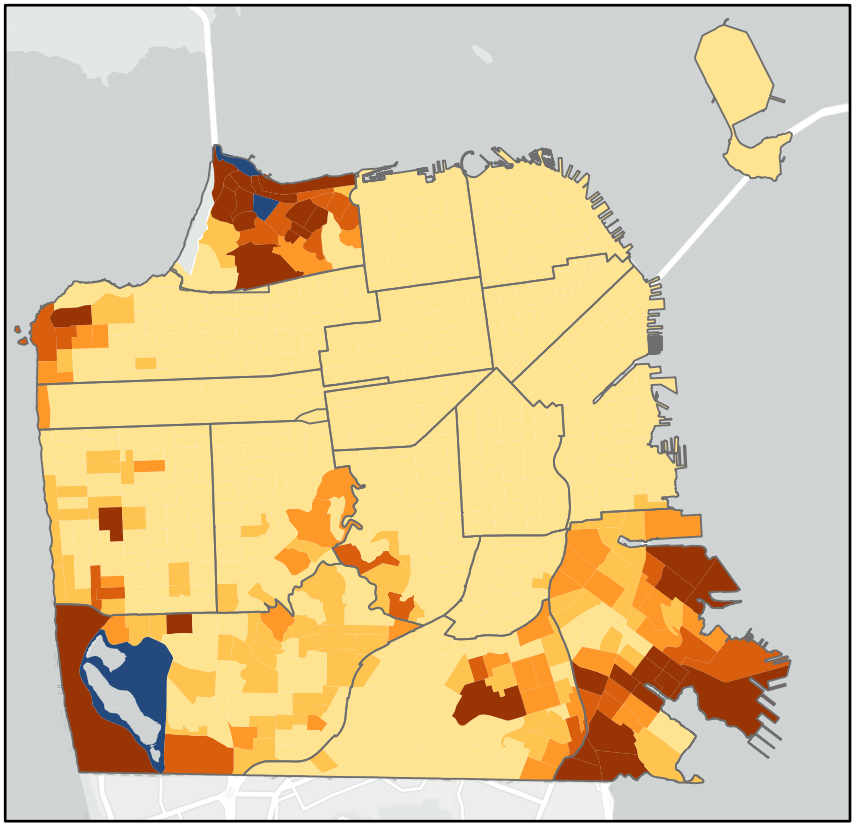


Office VMT per Employee, Baseline

2035 Conditions



2050 Conditions

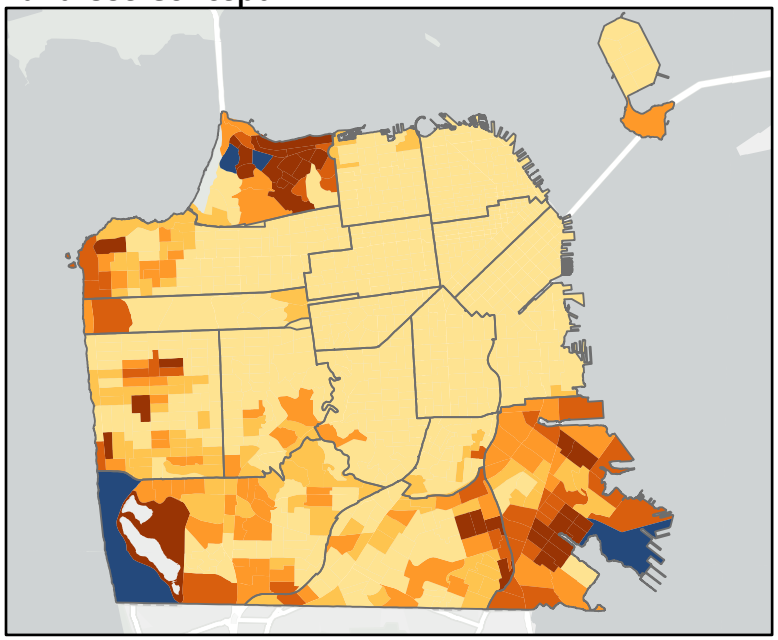


Office VMT per Employee
(% Below Regional Average)

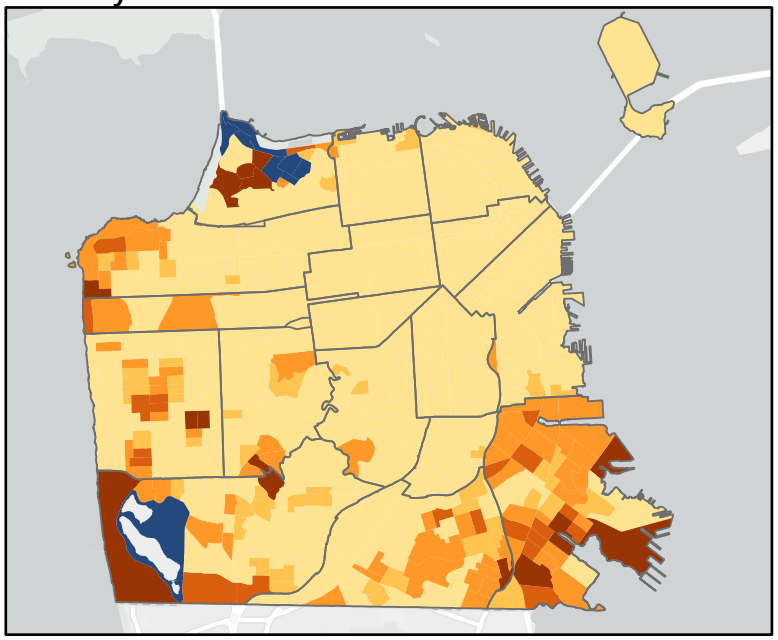
- ≤ 18.0 (30%)
- ≤ 19.3 (25%)
- ≤ 20.6 (20%)
- ≤ 21.8 (15%)
- ≤ 25.7 (Regional Avg)
- > 25.7 (Above Regional Avg)

Office VMT per Employee by Land Use Concept for 2035 Conditions

Land Use Concept A



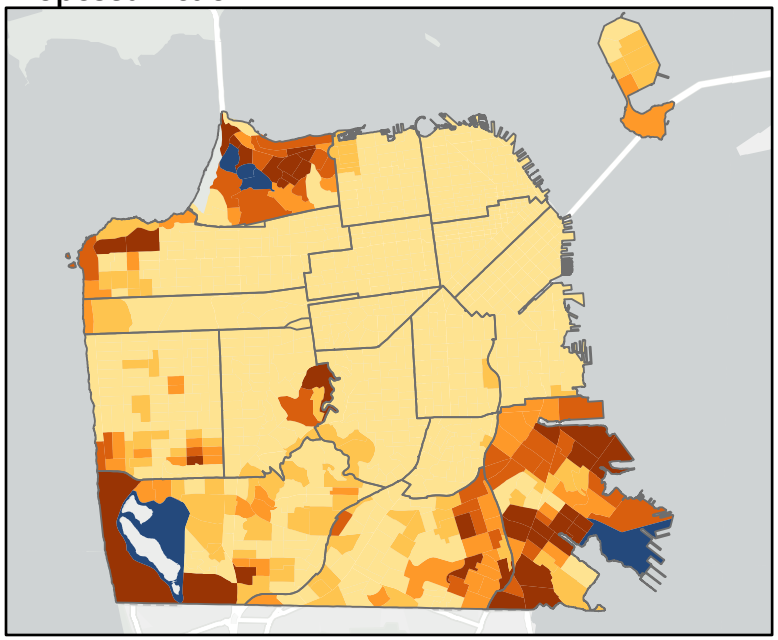
Plan Bay Area



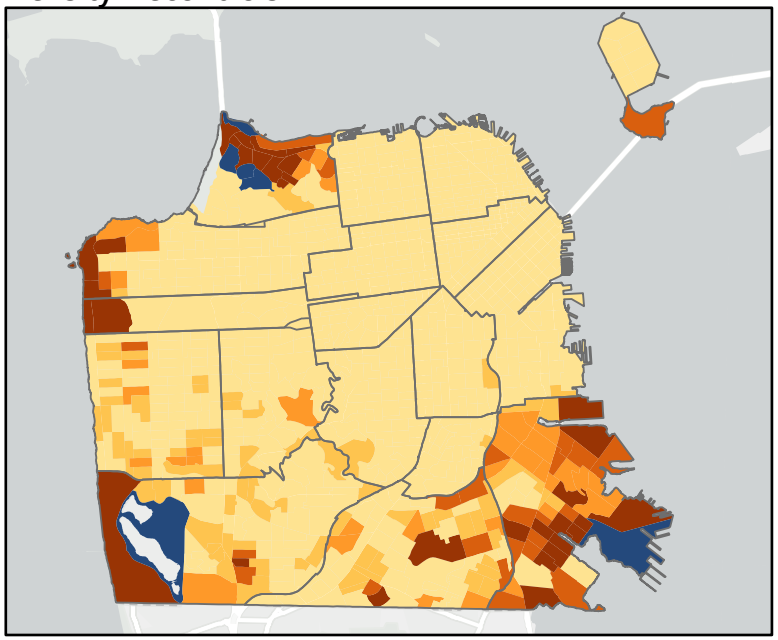
Office VMT per Employee
(% Below Regional Average)

- ≤ 18.0 (30%)
- ≤ 19.3 (25%)
- ≤ 20.6 (20%)
- ≤ 21.8 (15%)
- ≤ 25.7 (Regional Avg)
- > 25.7 (Above Regional Avg)

Proposed Action

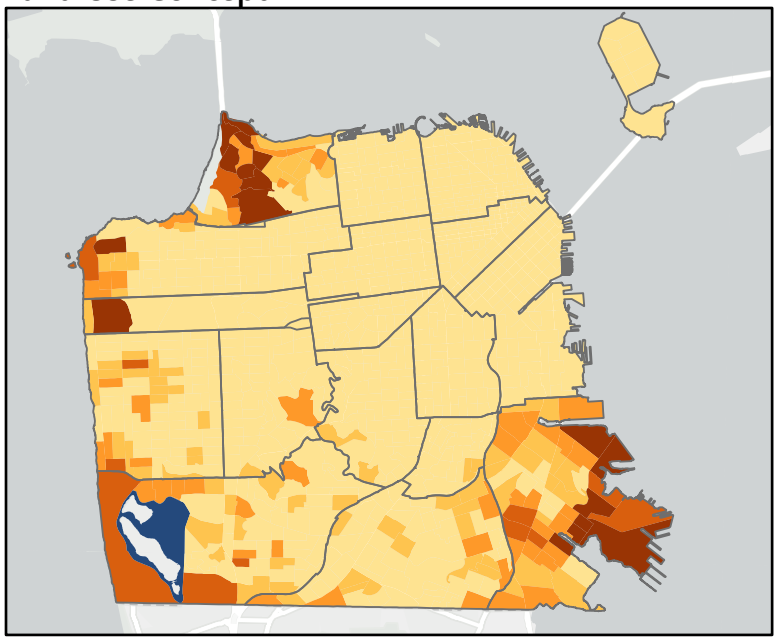


Density Decontrols

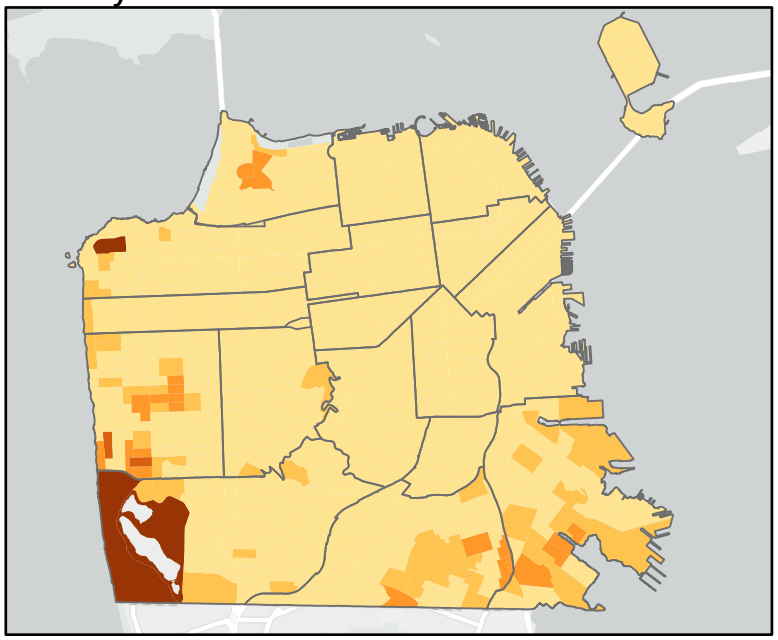


Office VMT per Employee by Land Use Concept for 2050 Conditions

Land Use Concept A



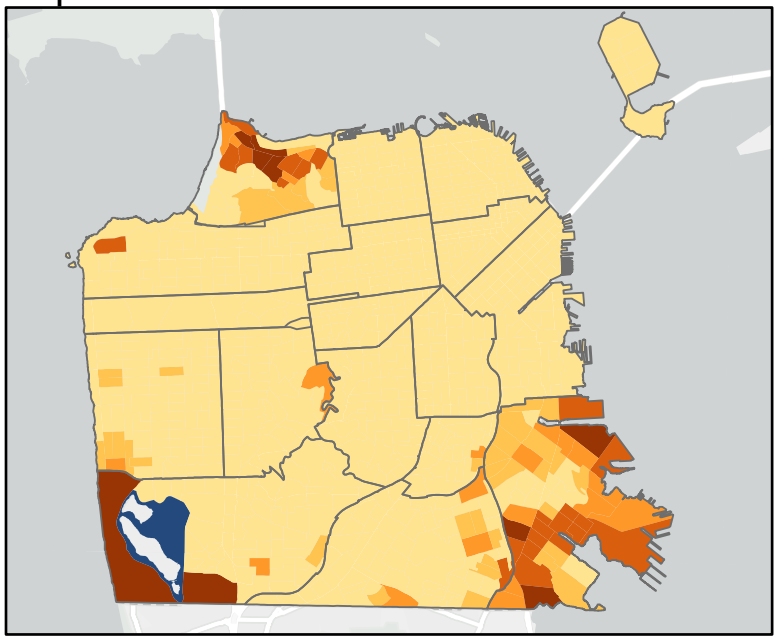
Plan Bay Area



Office VMT per Employee
(% Below Regional Average)

- ≤ 18.0 (30%)
- ≤ 19.3 (25%)
- ≤ 20.6 (20%)
- ≤ 21.8 (15%)
- ≤ 25.7 (Regional Avg)
- > 25.7 (Above Regional Avg)

Proposed Action



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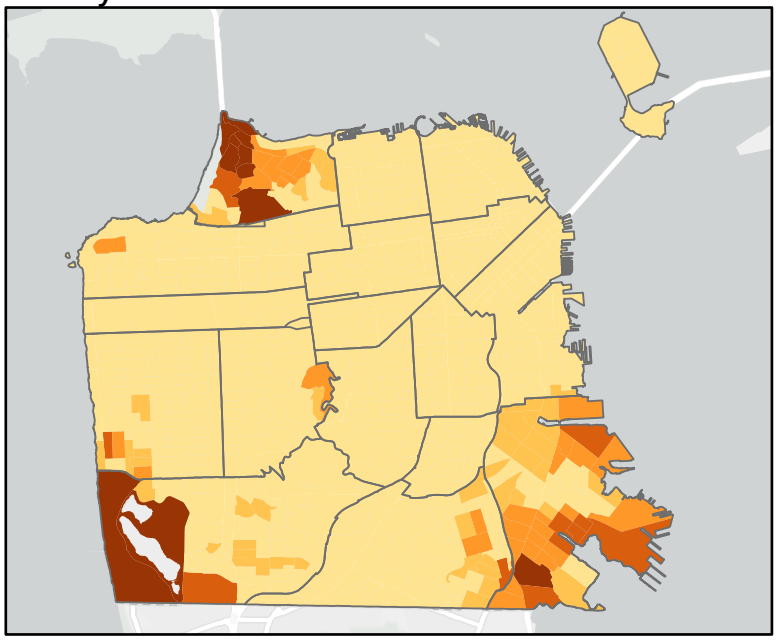

Appendix C-4

VMT per Capita Summary

Housing Element Update

VMT Per Capita Summary for 2035 and 2050 Conditions

	Year 2035 Midpoint Conditions																	
	Residential						Office						Retail					
	No Project Baseline	Concept A	Concept B	Concept C	PBA 2050	Proposed Action	No Project Baseline	Concept A	Concept B	Concept C	PBA 2050	Proposed Action	No Project Baseline	Concept A	Concept B	Concept C	PBA 2050	Proposed Action
1. Citywide Average	8.3	8.2	8.4	8.3	8.8	8.4	13.2	12.8	13.0	12.8	13.1	13.0	7.1	7.2	7.3	7.2	7.3	7.3
2. Regional Average	17.7	--	--	--	--	--	24.7	--	--	--	--	--	15.3	--	--	--	--	--
3. 15 % less than regional avg	15.0	--	--	--	--	--	21.0	--	--	--	--	--	13.0	--	--	--	--	--
4. By Planning District																		
Richmond	9.0	9.0	9.0	9.0	9.5	8.9	16.7	16.7	15.7	15.8	16.9	15.7	8.5	8.4	8.4	8.6	8.3	8.8
Marina	6.4	6.4	6.5	6.4	7.0	6.5	16.0	15.4	15.7	15.4	15.1	15.5	6.0	5.8	6.0	6.0	5.8	6.0
Northeast	6.1	6.1	6.2	6.2	6.2	6.1	12.2	11.8	11.8	11.8	11.8	11.8	4.4	4.3	4.3	4.4	5.0	4.4
Downtown	6.1	6.2	6.2	6.1	6.1	6.1	9.4	9.2	9.3	9.1	9.3	9.4	4.5	4.4	4.4	4.5	4.2	4.5
Western Addition	5.4	5.5	5.5	5.4	5.7	5.6	13.2	12.6	12.8	12.9	12.9	13.1	6.4	6.2	6.4	6.5	6.1	6.4
Buena Vista	7.1	6.9	7.0	7.0	7.4	7.1	12.8	12.7	12.7	12.8	13.0	12.4	7.0	6.7	6.8	6.9	6.8	7.1
Central	8.7	8.7	9.0	8.8	9.7	8.9	16.1	15.1	15.1	15.1	14.8	15.3	8.2	7.9	7.9	8.2	8.6	8.3
Mission	6.0	6.1	6.3	6.2	6.6	6.3	14.5	14.2	14.4	14.3	14.5	14.7	7.2	7.1	7.1	7.3	7.6	7.4
South of Market	7.7	7.5	7.7	7.7	7.4	7.7	13.5	13.0	13.3	13.0	13.5	13.4	7.8	7.7	7.8	7.9	7.9	7.7
South Bayshore	10.1	10.2	9.9	9.9	10.7	10.1	22.0	21.6	21.8	21.3	21.6	21.9	10.8	11.0	11.2	10.9	12.0	10.9
Bernal Heights	8.7	8.7	9.0	8.7	9.7	9.0	16.5	16.0	15.9	15.4	15.6	15.5	8.9	8.8	8.7	9.1	9.5	9.1
South Central	10.0	10.0	10.2	10.1	10.8	10.1	18.9	18.7	18.2	18.2	18.4	18.5	11.0	10.9	10.8	11.2	11.5	11.1
Ingleside	11.1	11.2	11.1	11.1	11.8	11.2	18.9	18.6	18.7	17.9	18.6	18.2	9.3	9.0	9.1	9.2	9.2	9.3
Inner Sunset	9.3	9.2	9.3	9.3	9.9	9.2	16.6	16.2	16.2	16.1	17.0	15.8	8.4	8.3	8.3	8.4	8.5	8.8
Outer Sunset	11.3	11.3	11.5	11.4	12.3	11.4	18.3	17.7	17.7	17.5	17.7	17.0	10.6	10.4	10.5	10.7	11.3	11.2
Presidio	11.4	10.8	11.1	10.8	11.8	11.7	21.6	22.0	21.0	20.9	22.5	21.6	10.1	9.9	9.9	10.0	8.8	10.3
Treasure Island	6.4	5.9	6.1	6.1	7.4	6.6	17.1	14.6	16.2	17.1	7.5	19.1	6.6	5.5	7.6	6.8	16.4	5.6
Golden Gate Park	--	--	--	--	--	--	18.3	17.1	17.2	16.6	19.7	16.9	3.8	3.5	3.8	3.7	3.8	3.8

Source: SF-CHAMP model runs for San Francisco Housing Element 2022 Update

Yellow highlight indicates where planning district average daily VMT per capita exceeds significance threshold

Housing Element Update

VMT Per Capita Summary for 2035 and 2050 Conditions

	Year 2050 Conditions																	
	Residential						Office						Retail					
	No Project Baseline	Concept A	Concept B	Concept C	PBA 2050	Proposed Action	No Project Baseline	Concept A	Concept B	Concept C	PBA 2050	Proposed Action	No Project Baseline	Concept A	Concept B	Concept C	PBA 2050	Proposed Action
1. Citywide Average	8.5	8.5	8.7	8.7	8.8	8.8	12.6	12.1	12.1	11.9	11.8	12.1	7.5	7.8	8.0	7.9	7.9	8.0
2. Regional Average	17.1	--	--	--	--	--	23.8	--	--	--	--	--	15.7	--	--	--	--	--
3. 15 % less than regional avg	14.5	--	--	--	--	--	20.2	--	--	--	--	--	13.3	--	--	--	--	--
4. By Planning District																		
Richmond	9.1	9.2	9.1	9.2	9.6	9.2	15.6	15.3	14.5	14.6	15.0	14.2	8.7	8.9	9.4	9.2	9.3	9.5
Marina	6.6	6.4	6.6	6.5	7.0	6.7	14.9	14.2	14.2	14.1	13.6	14.2	6.1	6.4	6.3	6.2	6.2	6.4
Northeast	6.4	6.7	6.6	6.4	6.5	6.6	11.6	11.0	11.0	10.9	10.6	11.0	4.5	4.8	4.8	4.7	5.6	4.8
Downtown	6.7	6.9	6.7	6.7	6.9	6.6	9.0	8.7	8.7	8.7	8.5	8.7	4.7	5.0	4.9	4.8	4.8	4.8
Western Addition	5.4	5.4	5.7	5.4	5.9	5.7	12.5	11.6	11.6	11.9	11.4	11.7	6.5	6.8	7.0	6.8	6.6	6.9
Buena Vista	7.1	7.2	7.2	7.1	7.4	7.2	12.6	12.1	12.2	11.7	11.1	11.7	6.9	7.2	7.4	7.3	7.5	7.5
Central	9.0	9.2	9.1	9.1	9.3	9.1	15.3	14.7	14.2	14.3	13.9	14.2	8.4	8.5	8.7	9.1	9.0	8.8
Mission	6.3	6.3	6.4	6.3	6.6	6.4	13.9	13.2	13.4	13.0	12.6	13.4	7.5	7.8	7.8	7.8	8.2	7.8
South of Market	7.9	8.1	8.1	8.0	7.8	8.0	12.7	12.0	12.3	11.9	12.1	12.4	8.2	8.8	8.6	8.5	8.3	8.4
South Bayshore	10.2	10.4	10.2	10.0	10.7	10.3	20.5	20.2	19.9	19.4	18.1	19.9	11.3	11.8	11.3	11.1	12.7	11.2
Bernal Heights	8.8	9.0	9.1	9.1	9.1	8.9	15.5	14.5	14.4	15.2	14.2	15.5	9.3	9.5	9.7	9.5	9.8	9.4
South Central	10.2	10.5	10.6	10.5	10.6	10.4	17.7	17.5	17.0	16.9	17.3	16.9	11.5	11.6	12.3	12.2	11.7	11.7
Ingleside	11.4	11.5	11.6	11.5	11.7	11.5	18.1	17.7	17.1	16.7	17.3	16.5	9.9	10.0	10.4	10.4	9.5	10.6
Inner Sunset	9.4	9.5	9.6	9.5	9.9	9.7	15.9	15.3	14.6	14.4	15.3	14.1	8.7	8.8	9.4	9.3	8.7	10.0
Outer Sunset	11.5	11.7	11.7	11.7	12.2	11.8	17.1	17.1	16.1	15.6	17.1	15.7	10.8	11.0	11.7	11.9	11.7	12.3
Presidio	11.5	10.5	11.2	10.8	12.3	11.2	21.6	19.1	19.5	19.4	19.9	19.5	10.1	8.9	9.2	9.1	9.1	11.1
Treasure Island	6.6	6.6	6.7	6.6	7.3	6.6	10.7	10.9	10.3	10.1	7.6	11.1	11.0	11.0	11.1	11.0	16.5	11.1
Golden Gate Park	--	--	--	--	--	--	16.0	15.7	13.9	15.1	16.7	14.8	3.5	3.9	4.0	3.9	3.9	4.0

Source: SF-CHAMP model runs for San Francisco Housing Element 2022 Update

Yellow highlight indicates where planning district average daily VMT per capita exceeds significance threshold

Appendix D
Vehicle Volume Forecasts

Appendix D-1

2035 AM Vehicle Volume Forecasts

SF Housing Element 2022 Update Roadway Volumes

2035 AM Link-Level Volumes			11/5/2021				2035 Baseline		2035 Proposed Action		2035 Concept A		2035 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2020 Count	Volume	Change from 2020	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline
GEARY	1	Clement Street	19th Avenue	North	NB	113	120	7	125	5	120	0	125	5
					SB	84	90	6	95	5	90	0	95	5
				South	NB	154	165	11	170	5	165	0	170	5
					SB	95	100	5	105	5	100	0	105	5
				East	EB	233	245	12	275	30	250	5	260	15
					WB	139	145	6	150	5	145	0	150	5
				West	EB	207	220	13	240	20	225	5	235	15
					WB	143	155	12	160	5	155	0	165	10
	2	Geary Boulevard	Eighth Avenue	North	NB	211	210	-1	215	5	215	5	220	10
					SB	196	210	14	210	0	215	5	210	0
				South	NB	198	200	2	205	5	200	0	205	5
					SB	164	165	1	170	5	165	0	165	0
				East	EB	1,738	1,405	-333	1,475	70	1,405	0	1,465	60
					WB	840	810	-30	875	65	820	10	850	40
				West	EB	1,726	1,335	-391	1,425	90	1,340	5	1,400	65
					WB	847	875	28	940	65	880	5	895	20
	3	Clement Street	Arguello Boulevard	North	NB	423	495	72	540	45	495	0	530	35
					SB	305	330	25	335	5	340	10	340	10
				South	NB	328	375	47	400	25	380	5	395	20
					SB	298	410	112	465	55	415	5	415	5
				West	EB	162	315	153	405	90	320	5	315	0
					WB	74	110	36	120	10	110	0	110	0
	4	Geary Boulevard	Baker Street	North	NB	135	180	45	185	5	190	10	140	-40
					SB	103	100	-3	105	5	100	0	105	5
				South	NB	219	365	146	255	-110	425	60	255	-110
					SB	189	255	66	250	-5	260	5	270	15
				East	EB	1,574	1,510	-64	1,680	170	1,525	15	1,625	115
					WB	694	610	-84	725	115	610	0	715	105
				West	EB	1,645	1,655	10	1,815	160	1,670	15	1,775	120
					WB	763	745	-18	810	65	775	30	820	75
	5	Post Street	Fillmore Street	North	NB	225	250	25	250	0	255	5	265	15
					SB	185	195	10	190	-5	200	5	285	90
				South	NB	312	325	13	320	-5	330	5	370	45
					SB	186	195	9	195	0	200	5	275	80
				East	EB	552	735	183	795	60	745	10	765	30
					WB	97	110	13	115	5	115	5	120	10
				West	EB	467	670	203	720	50	680	10	695	25
					WB	98	105	7	105	0	105	0	120	15
	6	Geary Street	Van Ness Avenue	North	NB	913	1,020	107	940	-80	1,100	80	955	-65
					SB	1,048	1,065	17	1,065	0	1,085	20	1,070	5
				South	NB	840	940	100	875	-65	1,010	70	840	-100
					SB	986	990	4	990	0	1,020	30	995	5
				East	WB	648	655	7	695	40	670	15	700	45
				West	WB	637	690	53	725	35	705	15	725	35
	7	Post Street	Polk Street	North	NB	146	150	4	145	-5	155	5	150	0
					SB	310	315	5	335	20	320	5	325	10
				South	NB	160	160	0	155	-5	165	5	160	0
					SB	336	390	54	395	5	405	15	405	15
				East	EB	783	845	62	895	50	880	35	850	5
				West	EB	795	890	95	915	25	925	35	890	0
	8	Geary Street	Mason Street	North	SB	661	670	9	735	65	675	5	790	120
					SB	671	675	4	725	50	680	5	805	130
				East	WB	603	620	17	625	5	620	0	675	55
					WB	731	790	59	640	-150	630	-160	635	-155
POLK - POTRERO HILL	9	Polk Street	North Point Street	North	NB	138	140	2	210	70	210	70	210	70
					SB	148	150	2	110	-40	110	-40	110	-40
				South	NB	115	115	0	160	45	170	55	165	50
					SB	148	150	2	80	-70	80	-70	85	-65
				East	EB	183	185	2	300	115	290	105	345	160
					WB	348	355	7	180	-175	180	-175	185	-170
				West	EB	206	225	19	370	145	340	115	385	160
					WB	348	350	2	220	-130	210	-140	220	-130
	10	Van Ness Avenue	Washington Street	North	NB	1,002	1,010	8	570	-440	580	-430	575	-435
					SB	868	875	7	960	85	970	95	985	110
				South	NB	1,051	1,075	24	640	-435	665	-410	610	-465
					SB	905	955	50	1,035	80	1,035	80	1,055	100
				East	EB	204	240	36	280	40	290	50	250	10
				West	EB	192	265	73	320	55	310	45	325	60
	11	Hyde Street	McAllister Street	North	SB	1,314	1,490	176	1,505	15	1,480	-10	1,550	60
				South	SB	1,450	1,600	150	1,740	140	1,695	95	1,675	75
				East	EB	23	25	2	30	5	30	5	30	5
					WB	454	495	41	530	35	525	30	505	10
				West	EB	172	185	13	210	25	205	20	95	-90
					WB	467	470	3	445	-25	460	-10	430	-40
	12	Seventh Street	Brannan Street	North	NB	1,510	1,675	165	905	-770	940	-735	1,030	-645
				South	NB	1,185	1,505	320	820	-685	850	-655	910	-595
					SB	189	270	81	635	365	650	380	575	305
				East	EB	870	935	65	600	-335	565	-370	530	-405
					WB	560	690	130	645	-45	655	-35	605	-85
				West	EB	1,114	1,125	11	1,045	-80	1,030	-95	950	-175
					WB	290	395	105	355	-40	370	-25	330	-65
	13	Evans Avenue	Quint Street	West	EB	357	615	258	530	-85	535	-80	800	185
					WB	478	640	162	580	-60	610	-30	1,010	370
THIRD STREET	14	Third Street	Evans Avenue	North	NB	835	1,095	260	1,120	25	1,100	5	1,230	135
					SB	396	410	14	400	-10	415	5	655	245
				South	NB	776	1,040	264	1,040	0	1,070	30	1,045	5
					SB	329	350	21	340	-10	375	25	485	135
				East	EB	455	575	120	600	25	575	0	920	345
					WB	520	780	260	785	5	740	-40	1,295	515
				West	EB	352	485	133	510	25	505	20	705	220
					WB	425	660	235	630	-30	655	-5	1,030	370
	15	Third Street	16th Street	North	NB	986	1,595	609	1,605	10	1,605	10	1,750	155
					SB	373	880	507	890	10	950	70	960	80
				South	NB	1,081	1,675	594	1,790	115	1,675	0	1,855	180
					SB	370	750	380	835	85	780	30	855	105
				East	EB	90	175	85	185	10	235	60	225	50
					WB	174	270	96	270	0	290	20	285	15
				West	EB	367	540	173	565	25	545	5	575	35
					WB	549	785	236	790	5	785	0	790	5

2035 AM Link-Level Volumes			11/5/2021				2035 Baseline		2035 Proposed Action		2035 Concept A		2035 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2020 Count	Volume	Change from 2020	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline
	16	Illinois Street	25th Street	North	NB	257	365	108	335	-30	385	20	430	65
					SB	58	80	22	80	0	85	5	95	15
				South	NB	251	460	209	470	10	465	5	480	20
					SB	84	115	31	115	0	120	5	160	45
				East	EB	28	35	7	35	0	35	0	35	0
					WB	19	25	6	25	0	25	0	25	0
				West	EB	87	95	8	55	-40	115	20	145	50
					WB	46	80	34	55	-25	90	10	85	5
	17	Third Street	Cesar Chavez Street	North	NB	1,136	1,400	264	1,505	105	1,410	10	1,570	170
					SB	271	560	289	515	-45	605	45	600	40
				South	NB	1,134	1,510	376	1,550	40	1,520	10	1,830	320
					SB	471	480	9	555	75	485	5	655	175
				East	EB	356	645	289	550	-95	680	35	830	185
					WB	139	210	71	225	15	225	15	315	105
				West	EB	781	800	19	915	115	815	15	975	175
					WB	362	580	218	600	20	620	40	705	125
	18	Oakdale Avenue	Phelps Street	North	NB	277	305	28	320	15	325	20	305	0
					SB	230	235	5	250	15	240	5	265	30
				South	NB	103	110	7	110	0	110	0	110	0
					SB	64	120	56	110	-10	125	5	120	0
				East	EB	223	290	67	300	10	295	5	405	115
					WB	235	305	70	305	0	305	0	360	55
				West	EB	404	500	96	515	15	510	10	655	155
					WB	408	435	27	445	10	435	0	535	100
	19	Third Street	Oakdale Avenue	North	NB	868	1,150	282	1,140	-10	1,150	0	1,140	-10
					SB	355	405	50	405	0	430	25	475	70
				South	NB	825	1,135	310	1,100	-35	1,155	20	1,155	20
					SB	408	435	27	455	20	450	15	540	105
				East	EB	144	200	56	195	-5	205	5	315	115
					WB	161	210	49	225	15	215	5	310	100
				West	EB	219	275	56	290	15	275	0	415	140
					WB	140	220	80	210	-10	220	0	315	95
	20	Third Street	Paul Avenue	North	NB	821	1,060	239	995	-65	1,075	15	1,145	85
					SB	595	610	15	620	10	645	35	790	180
				South	NB	662	885	223	820	-65	890	5	995	110
					SB	496	510	14	525	15	540	30	660	150
				East	EB	222	270	48	285	15	285	15	280	10
					WB	217	230	13	230	0	235	5	260	30
				West	EB	327	385	58	405	20	400	15	400	15
					WB	262	275	13	275	0	275	0	355	80
MISSION	21	Guerrero Street	Duncan Street	North	NB	1,418	1,425	7	1,405	-20	1,430	5	1,490	65
					SB	668	690	22	695	5	700	10	745	55
				South	NB	1,360	1,360	0	1,345	-15	1,365	5	1,430	70
					SB	656	700	44	700	0	710	10	745	45
				East	EB	73	75	2	80	5	80	5	80	5
					WB	97	95	-2	90	-5	95	0	100	5
				West	EB	95	100	5	100	0	100	0	100	0
					WB	73	75	2	75	0	80	5	80	5
	22	San Jose Avenue	30th Street	North	NB	1,327	1,335	8	1,295	-40	1,320	-15	1,385	50
					SB	642	705	63	700	-5	710	5	755	50
				South	NB	1,306	1,310	4	1,280	-30	1,300	-10	1,370	60
					SB	650	715	65	715	0	725	10	775	60
				East	EB	174	195	21	205	10	195	0	185	-10
					WB	186	190	4	185	-5	185	-5	185	-5
				West	EB	178	195	17	200	5	195	0	185	-10
					WB	161	165	4	160	-5	160	-5	155	-10
	23	Mission Street	Silver Avenue	North	NB	919	880	-39	825	-55	860	-20	855	-25
					SB	442	450	8	455	5	445	-5	435	-15
				South	NB	824	725	-99	680	-45	705	-20	750	25
					SB	380	405	25	405	0	405	0	425	20
				East	EB	331	325	-6	370	45	325	0	325	0
					WB	478	510	32	500	-10	505	-5	505	-5
				West	EB	260	260	0	280	20	260	0	250	-10
					WB	374	380	6	385	5	380	0	380	0
	24	Cayuga Avenue	Onondaga Avenue	North	NB	176	185	9	175	-10	190	5	180	-5
					SB	229	230	1	230	0	230	0	230	0
				South	NB	283	295	12	295	0	310	15	295	0
					SB	376	375	-1	375	0	375	0	370	-5
				East	EB	227	235	8	240	5	240	5	250	15
					WB	403	410	7	415	5	405	-5	420	10
				West	EB	298	300	2	305	5	300	0	310	10
					WB	321	325	4	335	10	330	5	345	20
	25	Mission Street	Seneca Avenue	North	NB	645	640	-5	645	5	640	0	680	40
					SB	517	520	3	515	-5	520	0	525	5
				South	NB	863	835	-28	845	10	840	5	835	0
					SB	544	510	-34	505	-5	505	-5	475	-35
				West	EB	191	170	-21	170	0	165	-5	175	5
					WB	385	370	-15	375	5	370	0	380	10
WEST PORTAL - OCEAN	26	West Portal Avenue	Ulloa Street	South	NB	209	220	11	225	5	220	0	230	10
					SB	294	300	6	300	0	300	0	305	5
				East	EB	264	275	11	290	15	275	0	285	10
					WB	177	210	33	210	0	210	0	210	0
				West	EB	256	260	4	275	15	260	0	265	5
					WB	176	185	9	190	5	185	0	185	0
	27	Junipero Serra Boulevard	Winston Drive	North	NB	1,269	1,280	11	1,290	10	1,305	25	1,320	40
					SB	771	830	59	960	130	830	0	950	120
				South	NB	1,337	1,340	3	1,355	15	1,360	20	1,365	25
					SB	832	855	23	985	130	865	10	1,010	155
				East	EB	87	125	38	135	10	140	15	115	-10
					WB	152	155	3	160	5	155	0	160	5
				West	EB	119	185	66	200	15	215	30	175	-10
					WB	191	200	9	205	5	200	0	190	-10
	28	Ocean Avenue	Plymouth Avenue	North	NB	149	155	6	160	5	160	5	160	5
					SB	39	45	6	50	5	45	0	45	0
				South	NB	195	295	100	295	0	300	5	320	25
					SB	91	100	9	105	5	100	0	100	0
				East	EB	851	720	-131	755	35	720	0	755	35
					WB	780	600	-180	630	30	600	0	625	25
				West	EB	827	710	-117	740	30	710	0	745	35
					WB	750	635	-115	670	35	635	0	690	55

2035 AM Link-Level Volumes			11/5/2021				2035 Baseline		2035 Proposed Action		2035 Concept A		2035 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2020 Count	Volume	Change from 2020	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline
	29	Ocean Avenue	Frida Kahlo Way	North	NB	707	700	-7	710	10	715	15	985	285
					SB	358	440	82	500	60	470	30	490	50
				South	NB	632	515	-117	530	15	525	10	635	120
					SB	515	620	105	685	65	655	35	655	35
				East	EB	611	520	-91	570	50	535	15	525	5
					WB	702	615	-87	645	30	615	0	660	45
				West	EB	1,030	860	-170	920	60	875	15	955	95
					WB	889	735	-154	775	40	735	0	755	20
19TH AVENUE	30	19th Avenue	Judah Street	North	NB	1,836	1,855	19	1,950	95	1,860	5	1,885	30
					SB	1,957	1,980	23	2,015	35	1,985	5	2,000	20
				South	NB	1,704	1,720	16	1,810	90	1,725	5	1,745	25
					SB	1,956	1,975	19	1,990	15	1,975	0	2,000	25
				East	EB	200	210	10	255	45	210	0	215	5
					WB	324	335	11	360	25	340	5	320	-15
				West	EB	233	240	7	285	45	245	5	255	15
					WB	226	235	9	260	25	240	5	220	-15
	31	20th Avenue	Kirkham Street	North	NB	235	245	10	245	0	250	5	225	-20
					SB	107	140	33	175	35	145	5	120	-20
				South	NB	235	245	10	245	0	250	5	215	-30
					SB	117	140	23	185	45	145	5	125	-15
				East	EB	422	435	13	480	45	440	5	445	10
					WB	238	245	7	250	5	255	10	240	-5
				West	EB	371	390	19	435	45	390	0	405	15
					WB	177	185	8	190	5	185	0	180	-5
	32	19th Avenue	Noriega Street	North	NB	2,053	2,070	17	2,135	65	2,075	5	2,120	50
					SB	2,127	2,145	18	2,195	50	2,145	0	2,190	45
				South	NB	2,079	2,100	21	2,155	55	2,125	25	2,130	30
					SB	2,145	2,155	10	2,185	30	2,155	0	2,190	35
				East	EB	208	230	22	275	45	250	20	240	10
					WB	123	130	7	145	15	135	5	130	0
				West	EB	245	255	10	275	20	255	0	265	10
					WB	168	175	7	185	10	175	0	175	0
	33	19th Avenue	Taraval Street	North	NB	2,135	2,155	20	2,175	20	2,185	30	2,145	-10
					SB	2,357	2,380	23	2,430	50	2,385	5	2,430	50
				South	NB	2,221	2,250	29	2,285	35	2,280	30	2,205	-45
					SB	2,394	2,415	21	2,460	45	2,420	5	2,445	30
				East	EB	357	370	13	405	35	375	5	380	10
					WB	310	320	10	345	25	320	0	340	20
				West	EB	297	310	13	330	20	310	0	330	20
					WB	299	315	16	335	20	315	0	330	15
	34	19th Avenue	Ocean Avenue	South	NB	1,146	1,205	59	1,225	20	1,235	30	1,145	-60
					SB	1,911	1,930	19	2,055	125	1,935	5	1,965	35
	35	19th Avenue	Winston Drive	North	NB	1,381	1,425	44	1,445	20	1,460	35	1,340	-85
					SB	2,317	2,325	8	2,460	135	2,335	10	2,370	45
				South	NB	1,592	1,605	13	1,615	10	1,620	15	1,515	-90
					SB	2,450	2,465	15	2,600	135	2,465	0	2,535	70
				East	EB	145	255	110	255	0	300	45	240	-15
					WB	216	225	9	230	5	225	0	215	-10
				West	EB	304	495	191	500	5	570	75	465	-30
					WB	453	490	37	510	20	510	20	455	-35
	36	19th Avenue	Holloway Avenue	North	NB	1,730	1,745	15	1,755	10	1,760	15	1,650	-95
					SB	2,530	2,670	140	2,800	130	2,710	40	2,750	80
				South	NB	1,758	1,770	12	1,765	-5	1,770	0	2,020	250
					SB	2,509	2,660	151	2,795	135	2,745	85	2,710	50
				East	EB	248	330	82	325	-5	370	40	385	55
					WB	296	360	64	365	5	380	20	515	155
				West	EB	227	360	133	330	-30	400	40	280	-80
					WB	324	340	16	340	0	340	0	285	-55
JUDAH-IRVING	37	Lincoln Way	19th Avenue	North	NB	2,703	2,720	17	2,915	195	2,725	5	2,775	55
					SB	2,468	2,510	42	2,595	85	2,515	5	2,445	-65
				South	NB	2,323	2,345	22	2,465	120	2,345	0	2,375	30
					SB	2,218	2,240	22	2,280	40	2,245	5	2,250	10
				East	EB	1,113	1,135	22	1,300	165	1,140	5	1,205	70
					WB	969	975	6	1,085	110	1,000	25	1,105	130
				West	EB	1,085	1,105	20	1,260	155	1,110	5	1,180	75
					WB	811	845	34	910	65	850	5	870	25
	38	Irving Street	Seventh Avenue	North	NB	390	390	0	435	45	395	5	470	80
					SB	402	420	18	420	0	420	0	535	115
				South	NB	671	680	9	715	35	680	0	715	35
					SB	432	455	23	455	0	455	0	595	140
				East	EB	435	450	15	540	90	455	5	290	-160
					WB	106	125	19	130	5	130	5	105	-20
				West	EB	310	315	5	375	60	315	0	315	0
					WB	232	265	33	270	5	270	5	320	55

Appendix D-2

2035 PM Vehicle Volume Forecasts

SF Housing Element 2022 Update Roadway Volumes

2035 PM Link-Level Volumes			11/5/2021				2035 Baseline		2035 Proposed Action		2035 Concept A		2035 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2020 Count	Volume	Change from 2020	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline
GEARY	1	Clement Street	19th Avenue	North	NB	102	110	8	110	0	110	0	110	0
					SB	84	90	6	90	0	90	0	95	5
				South	NB	131	135	4	135	0	135	0	135	0
					SB	103	110	7	110	0	110	0	115	5
				East	EB	179	185	6	190	5	190	5	200	15
					WB	211	225	14	255	30	235	10	235	10
				West	EB	172	180	8	185	5	185	5	195	15
					WB	214	230	16	250	20	235	5	245	15
	2	Geary Boulevard	Eighth Avenue	North	NB	164	200	36	210	10	210	10	180	-20
					SB	207	205	-2	205	0	205	0	180	-25
				South	NB	153	150	-3	155	5	150	0	155	5
					SB	242	245	3	255	10	245	0	250	5
				East	EB	1,008	880	-128	935	55	885	5	915	35
					WB	1,437	995	-442	1,070	75	995	0	1,060	65
				West	EB	1,006	965	-41	1,035	70	985	20	1,005	40
					WB	1,429	975	-454	1,050	75	980	5	1,030	55
	3	Clement Street	Arguello Boulevard	North	NB	309	315	6	335	20	335	20	340	25
					SB	590	660	70	695	35	660	0	690	30
				South	NB	288	365	77	395	30	370	5	380	15
					SB	554	560	6	580	20	565	5	580	20
				West	EB	189	210	21	240	30	225	15	210	0
					WB	204	375	171	440	65	375	0	375	0
	4	Geary Boulevard	Baker Street	North	NB	192	215	23	220	5	230	15	200	-15
					SB	158	170	12	175	5	195	25	160	-10
				South	NB	290	305	15	325	20	315	10	295	-10
					SB	252	350	98	335	-15	360	10	335	-15
				East	EB	962	920	-42	990	70	940	20	960	40
					WB	1,530	1,460	-70	1,565	105	1,465	5	1,525	65
				West	EB	1,063	1,100	37	1,165	65	1,110	10	1,135	35
					WB	1,635	1,580	-55	1,710	130	1,580	0	1,655	75
	5	Post Street	Fillmore Street	North	NB	201	205	4	225	20	210	5	250	45
					SB	229	260	31	265	5	280	20	275	15
				South	NB	288	290	2	300	10	295	5	330	40
					SB	224	250	26	260	10	265	15	285	35
				East	EB	368	475	107	420	-55	515	40	475	0
					WB	114	125	11	150	25	130	5	150	25
				West	EB	286	400	114	345	-55	440	40	400	0
					WB	124	135	11	140	5	140	5	155	20
	6	Geary Street	Van Ness Avenue	North	NB	1,056	1,060	4	1,045	-15	1,090	30	1,045	-15
					SB	903	910	7	915	5	940	30	920	10
				South	NB	968	970	2	955	-15	1,000	30	935	-35
					SB	856	860	4	885	25	885	25	870	10
				East	WB	749	730	-19	800	70	755	25	795	65
				West	WB	708	645	-63	695	50	670	25	670	25
	7	Post Street	Polk Street	North	NB	149	190	41	175	-15	210	20	195	5
					SB	418	420	2	440	20	430	10	430	10
				South	NB	161	180	19	170	-10	180	0	180	0
					SB	422	470	48	470	0	475	5	500	30
				East	EB	596	615	19	640	25	625	10	630	15
				West	EB	588	720	132	690	-30	750	30	720	0
	8	Geary Street	Mason Street	North	SB	615	640	25	680	40	660	20	700	60
					SB	638	645	7	680	35	680	35	705	60
				East	WB	828	885	57	925	40	915	30	945	60
					WB	731	790	59	850	60	815	25	805	15
POLK - POTRERO HILL	9	Polk Street	North Point Street	North	NB	138	140	2	140	0	140	0	140	0
					SB	148	150	2	150	0	150	0	150	0
				South	NB	115	115	0	145	30	120	5	150	35
					SB	148	150	2	150	0	150	0	155	5
				East	EB	183	185	2	205	20	200	15	185	0
					WB	348	355	7	370	15	360	5	400	45
				West	EB	206	225	19	225	0	235	10	225	0
					WB	348	350	2	365	15	355	5	385	35
	10	Van Ness Avenue	Washington Street	North	NB	1,002	1,010	8	1,020	10	1,035	25	1,015	5
					SB	868	875	7	910	35	915	40	875	0
				South	NB	1,051	1,075	24	1,095	20	1,090	15	1,085	10
					SB	905	955	50	985	30	990	35	955	0
				East	EB	204	240	36	215	-25	255	15	200	-40
				West	EB	192	265	73	220	-45	285	20	220	-45
	11	Hyde Street	McAllister Street	North	SB	1,314	1,490	176	1,530	40	1,520	30	1,615	125
				South	SB	1,450	1,600	150	1,605	5	1,655	55	1,670	70
				East	EB	23	25	2	25	0	25	0	25	0
					WB	454	495	41	490	-5	505	10	440	-55
				West	EB	172	185	13	155	-30	210	25	135	-50
					WB	467	470	3	465	-5	485	15	420	-50
	12	Seventh Street	Brannan Street	North	NB	1,510	1,675	165	1,675	0	1,680	5	1,710	35
				South	NB	1,185	1,505	320	1,510	5	1,540	35	1,520	15
					SB	189	270	81	255	-15	315	45	300	30
				East	EB	870	935	65	970	35	945	10	1,005	70
					WB	560	690	130	710	20	710	20	690	0
				West	EB	1,114	1,125	11	1,165	40	1,140	15	1,215	90
					WB	290	395	105	440	45	405	10	365	-30
	13	Evans Avenue	Quint Street	West	EB	357	615	258	575	-40	605	-10	950	335
					WB	478	640	162	650	10	660	20	1,090	450
THIRD STREET	14	Third Street	Evans Avenue	North	NB	717	775	58	755	-20	780	5	990	215
					SB	594	720	126	760	40	710	-10	815	95
				South	NB	642	715	73	655	-60	740	25	760	45
					SB	507	705	198	690	-15	715	10	705	0
				East	EB	436	640	204	645	5	605	-35	1,050	410
					WB	548	715	167	770	55	705	-10	1,160	445
				West	EB	301	490	189	450	-40	485	-5	745	255
					WB	425	590	165	610	20	605	15	870	280
	15	Third Street	16th Street	North	NB	1,029	1,330	301	1,410	80	1,330	0	1,435	105
					SB	771	1,275	504	1,255	-20	1,280	5	1,330	55
				South	NB	1,025	1,200	175	1,280	80	1,215	15	1,325	125
					SB	816	1,185	369	1,265	80	1,185	0	1,285	100
				East	EB	77	260	183	265	5	275	15	290	30
					WB	221	400	179	420	20	405	5	425	25
				West	EB	502	710	208	735	25	710	0	735	25
					WB	597	755	158	760	5	760	5	760	5

2035 PM Link-Level Volumes			11/5/2021				2035 Baseline		2035 Proposed Action		2035 Concept A		2035 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2020 Count	Volume	Change from 2020	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline
	16	Illinois Street	25th Street	North	NB	186	200	14	190	-10	210	10	210	10
					SB	189	360	171	360	0	360	0	385	25
				South	NB	200	220	20	215	-5	230	10	290	70
					SB	162	320	158	345	25	320	0	355	35
				East	EB	16	15	-1	15	0	15	0	15	0
					WB	30	30	0	30	0	30	0	30	0
				West	EB	42	45	3	55	10	50	5	45	0
					WB	94	170	76	175	5	175	5	170	0
	17	Third Street	Cesar Chavez Street	North	NB	721	995	274	1,040	45	1,000	5	1,180	185
					SB	950	1,585	635	1,600	15	1,610	25	1,660	75
				South	NB	718	820	102	785	-35	850	30	1,085	265
					SB	867	1,010	143	1,030	20	1,010	0	1,115	105
				East	EB	180	190	10	185	-5	195	5	390	200
					WB	223	225	2	225	0	230	5	315	90
				West	EB	605	770	165	920	150	785	15	925	155
					WB	728	1,165	437	1,235	70	1,235	70	1,265	100
	18	Oakdale Avenue	Phelps Street	North	NB	275	280	5	275	-5	285	5	280	0
					SB	393	480	87	470	-10	485	5	505	25
				South	NB	97	105	8	105	0	105	0	105	0
					SB	104	115	11	115	0	115	0	115	0
				East	EB	301	405	104	405	0	425	20	560	155
					WB	72	80	8	105	25	85	5	140	60
				West	EB	497	605	108	600	-5	610	5	745	140
					WB	379	465	86	480	15	475	10	550	85
	19	Third Street	Oakdale Avenue	North	NB	682	785	103	740	-45	800	15	815	30
					SB	700	910	210	910	0	910	0	960	50
				South	NB	620	705	85	680	-25	720	15	705	0
					SB	776	975	199	1,005	30	985	10	1,075	100
				East	EB	181	275	94	275	0	285	10	390	115
					WB	152	160	8	190	30	170	10	335	175
				West	EB	305	420	115	425	5	440	20	545	125
					WB	138	150	12	180	30	155	5	250	100
	20	Third Street	Paul Avenue	North	NB	620	720	100	630	-90	755	35	795	75
					SB	888	980	92	940	-40	1,010	30	1,105	125
				South	NB	542	640	98	590	-50	675	35	775	135
					SB	722	805	83	765	-40	830	25	925	120
				East	EB	262	320	58	330	10	320	0	315	-5
					WB	155	165	10	140	-25	185	20	165	0
				West	EB	260	320	60	320	0	320	0	320	0
					WB	241	250	9	255	5	275	25	275	25
MISSION	21	Guerrero Street	Duncan Street	North	NB	1,023	1,050	27	1,090	40	1,080	30	1,100	50
					SB	1,184	1,190	6	1,240	50	1,200	10	1,275	85
				South	NB	979	1,015	36	1,050	35	1,045	30	1,060	45
					SB	1,173	1,185	12	1,220	35	1,205	20	1,285	100
				East	EB	47	50	3	55	5	55	5	50	0
					WB	139	145	6	160	15	145	0	155	10
				West	EB	54	55	1	55	0	55	0	55	0
					WB	113	120	7	140	20	125	5	125	5
	22	San Jose Avenue	30th Street	North	NB	1,011	1,045	34	1,075	30	1,080	35	1,140	95
					SB	1,082	1,150	68	1,180	30	1,150	0	1,235	85
				South	NB	996	1,045	49	1,075	30	1,070	25	1,135	90
					SB	1,109	1,205	96	1,230	25	1,200	-5	1,280	75
				East	EB	182	190	8	205	15	205	15	180	-10
					WB	169	245	76	215	-30	260	15	200	-45
				West	EB	179	185	6	200	15	205	20	180	-5
					WB	124	170	46	145	-25	190	20	130	-40
	23	Mission Street	Silver Avenue	North	NB	615	600	-15	595	-5	600	0	550	-50
					SB	726	665	-61	635	-30	670	5	625	-40
				South	NB	544	515	-29	505	-10	525	10	500	-15
					SB	620	530	-90	505	-25	540	10	510	-20
				East	EB	383	425	42	410	-15	420	-5	400	-25
					WB	348	370	22	355	-15	365	-5	325	-45
				West	EB	298	315	17	315	0	315	0	300	-15
					WB	298	335	37	330	-5	335	0	310	-25
	24	Cayuga Avenue	Onondaga Avenue	North	NB	74	80	6	85	5	95	15	65	-15
					SB	132	150	18	145	-5	155	5	140	-10
				South	NB	126	135	9	155	20	155	20	120	-15
					SB	118	125	7	150	25	140	15	125	0
				East	EB	226	230	4	225	-5	225	-5	240	10
					WB	110	115	5	105	-10	110	-5	130	15
				West	EB	208	215	7	240	25	220	5	230	15
					WB	113	115	2	120	5	115	0	130	15
	25	Mission Street	Seneca Avenue	North	NB	473	465	-8	465	0	475	10	450	-15
					SB	674	495	-179	505	10	500	5	525	30
				South	NB	548	510	-38	505	-5	515	5	455	-55
					SB	803	625	-178	625	0	620	-5	610	-15
				West	EB	255	245	-10	255	10	245	0	255	10
					WB	201	185	-16	200	15	185	0	195	10
WEST PORTAL - OCEAN	26	West Portal Avenue	Ulloa Street	South	NB	204	210	6	210	0	220	10	265	55
					SB	187	210	23	210	0	215	5	265	55
				East	EB	154	160	6	185	25	160	0	175	15
					WB	150	185	35	225	40	190	5	190	5
				West	EB	138	160	22	160	0	165	5	210	50
					WB	95	100	5	120	20	100	0	110	10
	27	Junipero Serra Boulevard	Winston Drive	North	NB	1,289	1,305	16	1,450	145	1,310	5	1,450	145
					SB	1,064	1,075	11	1,110	35	1,090	15	1,125	50
				South	NB	1,355	1,440	85	1,595	155	1,445	5	1,595	155
					SB	1,071	1,075	4	1,115	40	1,100	25	1,125	50
				East	EB	177	190	13	195	5	195	5	190	0
					WB	128	145	17	170	25	170	25	145	0
				West	EB	293	310	17	320	10	325	15	305	-5
					WB	303	400	97	435	35	415	15	405	5
	28	Ocean Avenue	Plymouth Avenue	North	NB	79	95	16	115	20	95	0	95	0
					SB	98	105	7	105	0	110	5	100	-5
				South	NB	155	210	55	225	15	220	10	230	20
					SB	138	195	57	195	0	195	0	200	5
				East	EB	899	755	-144	790	35	760	5	790	35
					WB	764	610	-154	650	40	620	10	635	25
				West	EB	849	760	-89	795	35	760	0	790	30
					WB	750	625	-125	660	35	640	15	670	45

2035 PM Link-Level Volumes			11/5/2021				2035 Baseline		2035 Proposed Action		2035 Concept A		2035 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2020 Count	Volume	Change from 2020	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2035 Baseline
	29	Ocean Avenue	Frida Kahlo Way	North	NB	626	700	74	760	60	730	30	755	55
					SB	601	630	29	635	5	650	20	840	210
				South	NB	604	480	-124	515	35	485	5	500	20
					SB	669	740	71	745	5	750	10	930	190
				East	EB	689	570	-119	600	30	570	0	600	30
					WB	637	615	-22	670	55	625	10	635	20
				West	EB	1,055	905	-150	950	45	915	10	985	80
					WB	913	770	-143	820	50	775	5	825	55
19TH AVENUE	30	19th Avenue	Judah Street	North	NB	2,368	2,395	27	2,490	95	2,395	0	2,405	10
					SB	2,187	2,190	3	2,280	90	2,190	0	2,225	35
				South	NB	2,298	2,325	27	2,420	95	2,325	0	2,340	15
					SB	2,175	2,185	10	2,260	75	2,185	0	2,225	40
				East	EB	201	230	29	270	40	235	5	240	10
					WB	377	385	8	475	90	390	5	385	0
				West	EB	229	235	6	275	40	240	5	245	10
					WB	347	355	8	445	90	360	5	350	-5
	31	20th Avenue	Kirkham Street	North	NB	91	105	14	120	15	105	0	95	-10
					SB	108	130	22	155	25	130	0	120	-10
				South	NB	101	110	9	130	20	110	0	115	5
					SB	131	140	9	165	25	140	0	110	-30
				East	EB	277	285	8	310	25	285	0	290	5
					WB	331	335	4	365	30	335	0	330	-5
				West	EB	221	230	9	255	25	230	0	215	-15
					WB	262	275	13	305	30	275	0	285	10
	32	19th Avenue	Noriega Street	North	NB	2,272	2,275	3	2,330	55	2,275	0	2,330	55
					SB	2,505	2,510	5	2,575	65	2,510	0	2,580	70
				South	NB	2,261	2,270	9	2,330	60	2,270	0	2,310	40
					SB	2,503	2,510	7	2,575	65	2,510	0	2,560	50
				East	EB	133	135	2	150	15	135	0	165	30
					WB	243	250	7	265	15	250	0	265	15
				West	EB	229	230	1	255	25	230	0	240	10
					WB	330	340	10	370	30	340	0	345	5
	33	19th Avenue	Taraval Street	North	NB	2,355	2,375	20	2,495	120	2,380	5	2,400	25
					SB	2,490	2,510	20	2,540	30	2,520	10	2,540	30
				South	NB	2,401	2,410	9	2,535	125	2,415	5	2,415	5
					SB	2,479	2,495	16	2,540	45	2,505	10	2,490	-5
				East	EB	294	300	6	325	25	300	0	320	20
					WB	357	370	13	430	60	375	5	360	-10
				West	EB	275	280	5	315	35	285	5	310	30
					WB	395	405	10	470	65	405	0	420	15
	34	19th Avenue	Ocean Avenue	South	NB	1,403	1,445	42	1,535	90	1,445	0	1,445	0
					SB	1,800	1,810	10	1,870	60	1,850	40	1,805	-5
	35	19th Avenue	Winston Drive	North	NB	1,630	1,655	25	1,750	95	1,660	5	1,655	0
					SB	2,210	2,340	130	2,360	20	2,405	65	2,275	-65
				South	NB	1,848	1,890	42	1,995	105	1,910	20	1,895	5
					SB	2,459	2,470	11	2,515	45	2,495	25	2,450	-20
				East	EB	308	355	47	375	20	375	20	345	-10
					WB	279	370	91	425	55	395	25	410	40
				West	EB	732	820	88	825	5	840	20	795	-25
					WB	672	925	253	945	20	1,015	90	910	-15
	36	19th Avenue	Holloway Avenue	North	NB	1,956	2,000	44	2,105	105	2,020	20	2,005	5
					SB	2,560	2,570	10	2,655	85	2,590	20	2,595	25
				South	NB	1,979	1,995	16	2,110	115	2,000	5	2,120	125
					SB	2,589	2,610	21	2,705	95	2,675	65	2,865	255
				East	EB	263	360	97	350	-10	370	10	540	180
					WB	277	330	53	355	25	385	55	390	60
				West	EB	302	415	113	395	-20	440	25	305	-110
					WB	310	320	10	330	10	325	5	260	-60
JUDAH-IRVING	37	Lincoln Way	19th Avenue	North	NB	2,430	2,475	45	2,640	165	2,485	10	2,485	10
					SB	2,690	2,710	20	2,865	155	2,715	5	2,780	70
				South	NB	2,423	2,460	37	2,565	105	2,465	5	2,455	-5
					SB	2,351	2,365	14	2,455	90	2,365	0	2,420	55
				East	EB	1,025	1,055	30	1,125	70	1,060	5	1,150	95
					WB	1,139	1,160	21	1,290	130	1,160	0	1,210	50
				West	EB	840	865	25	935	70	875	10	975	110
					WB	1,286	1,310	24	1,435	125	1,315	5	1,360	50
	38	Irving Street	Seventh Avenue	North	NB	314	375	61	390	15	385	10	420	45
					SB	558	565	7	585	20	570	5	665	100
				South	NB	452	510	58	530	20	515	5	525	15
					SB	601	665	64	670	5	670	5	730	65
				East	EB	195	275	80	295	20	275	0	210	-65
					WB	246	265	19	315	50	265	0	215	-50
				West	EB	200	315	115	315	0	335	20	295	-20
					WB	346	365	19	415	50	370	5	375	10

Appendix D-3

2050 AM Vehicle Volume Forecasts

SF Housing Element 2022 Update Roadway Volumes

2050 AM Link-Level Volumes			11/5/2021				2050 Baseline		2050 Proposed Action		2050 Concept A		2050 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline
GEARY	1	Clement Street	19th Avenue	North	NB	120	130	10	135	5	140	10	135	5
					SB	90	100	10	105	5	110	10	105	5
				South	NB	165	175	10	180	5	185	10	180	5
					SB	100	105	5	105	0	115	10	110	5
				East	EB	245	250	5	310	60	255	5	295	45
					WB	145	150	5	165	15	155	5	170	20
				West	EB	220	230	10	275	45	230	0	260	30
					WB	155	160	5	170	10	160	0	180	20
	2	Geary Boulevard	Eighth Avenue	North	NB	210	230	20	235	5	255	25	190	-40
					SB	210	215	5	215	0	255	40	170	-45
				South	NB	200	210	10	210	0	215	5	215	5
					SB	165	170	5	175	5	175	5	170	0
				East	EB	1,405	1,410	5	1,510	100	1,410	0	1,480	70
					WB	810	830	20	925	95	850	20	925	95
				West	EB	1,335	1,345	10	1,505	160	1,350	5	1,445	100
					WB	875	890	15	995	105	935	45	1,000	110
	3	Clement Street	Arguello Boulevard	North	NB	495	505	10	605	100	515	10	560	55
					SB	330	350	20	375	25	390	40	365	15
				South	NB	375	385	10	420	35	405	20	385	0
					SB	410	420	10	515	95	455	35	500	80
				West	EB	315	325	10	515	190	350	25	450	125
					WB	110	115	5	160	45	150	35	120	5
	4	Geary Boulevard	Baker Street	North	NB	180	190	10	205	15	245	55	140	-50
					SB	100	105	5	125	20	105	0	115	10
				South	NB	365	445	80	395	-50	575	130	410	-35
					SB	255	265	10	250	-15	265	0	255	-10
				East	EB	1,510	1,545	35	1,820	275	1,555	10	1,775	230
					WB	610	620	10	740	120	645	25	690	70
				West	EB	1,655	1,695	40	1,950	255	1,710	15	1,895	200
					WB	745	790	45	880	90	855	65	885	95
	5	Post Street	Fillmore Street	North	NB	250	255	5	310	55	270	15	315	60
					SB	195	210	15	215	5	285	75	325	115
				South	NB	325	335	10	380	45	370	35	420	85
					SB	195	210	15	230	20	275	65	315	105
				East	EB	735	760	25	905	145	765	5	875	115
					WB	110	115	5	130	15	115	0	120	5
				West	EB	670	695	25	810	115	700	5	800	105
					WB	105	115	10	120	5	125	10	130	15
	6	Geary Street	Van Ness Avenue	North	NB	1,020	1,135	115	1,065	-70	1,295	160	1,150	15
					SB	1,065	1,085	20	1,140	55	1,265	180	1,240	155
				South	NB	940	1,040	100	985	-55	1,190	150	1,030	-10
					SB	990	1,015	25	1,075	60	1,205	190	1,155	140
				East	WB	655	690	35	735	45	745	55	770	80
				West	WB	690	725	35	765	40	785	60	825	100
	7	Post Street	Polk Street	North	NB	150	160	10	155	-5	205	45	180	20
					SB	315	325	10	345	20	335	10	345	20
				South	NB	160	165	5	160	-5	205	40	185	20
					SB	390	405	15	420	15	430	25	450	45
				East	EB	845	875	30	1,000	125	935	60	960	85
				West	EB	890	930	40	1,015	85	1,000	70	1,010	80
	8	Geary Street	Mason Street	North	SB	670	685	15	750	65	725	40	870	185
					SB	675	695	20	750	55	765	70	935	240
				East	WB	620	655	35	640	-15	705	50	760	105
					WB	731	790	59	650	-140	685	-105	690	-100
POLK - POTRERO HILL	9	Polk Street	North Point Street	North	NB	138	140	2	210	70	210	70	210	70
					SB	148	150	2	110	-40	110	-40	110	-40
				South	NB	115	115	0	175	60	175	60	180	65
					SB	148	150	2	85	-65	85	-65	95	-55
				East	EB	183	185	2	340	155	295	110	380	195
					WB	348	355	7	195	-160	215	-140	200	-155
				West	EB	206	225	19	385	160	340	115	395	170
					WB	348	350	2	230	-120	245	-105	245	-105
	10	Van Ness Avenue	Washington Street	North	NB	1,002	1,010	8	570	-440	745	-265	605	-405
					SB	868	875	7	1,015	140	965	90	1,120	245
				South	NB	1,051	1,075	24	665	-410	845	-230	690	-385
					SB	905	955	50	1,090	135	1,035	80	1,200	245
				East	EB	204	240	36	335	95	395	155	320	80
				West	EB	192	265	73	350	85	410	145	340	75
	11	Hyde Street	McAllister Street	North	SB	1,314	1,490	176	1,595	105	1,580	90	1,705	215
				South	SB	1,450	1,600	150	1,890	290	1,805	205	1,890	290
				East	EB	23	25	2	30	5	30	5	30	5
					WB	454	495	41	550	55	620	125	565	70
				West	EB	172	185	13	280	95	210	25	160	-25
					WB	467	470	3	465	-5	535	65	485	15
	12	Seventh Street	Brannan Street	North	NB	1,510	1,675	165	930	-745	995	-680	1,130	-545
				South	NB	1,185	1,505	320	845	-660	890	-615	1,020	-485
					SB	189	270	81	750	480	815	545	800	530
				East	EB	870	935	65	570	-365	455	-480	545	-390
					WB	560	690	130	680	-10	790	100	770	80
				West	EB	1,114	1,125	11	1,125	0	1,080	-45	1,090	-35
					WB	290	395	105	375	-20	460	65	410	15
	13	Evans Avenue	Quint Street	West	EB	357	615	258	570	-45	590	-25	755	140
					WB	478	640	162	695	55	720	80	1,210	570
THIRD STREET	14	Third Street	Evans Avenue	North	NB	1,095	1,230	135	1,260	30	1,195	-35	1,275	45
					SB	410	510	100	515	5	535	25	585	75
				South	NB	1,040	1,195	155	1,220	25	1,200	5	1,285	90
					SB	350	450	100	455	5	490	40	530	80
				East	EB	575	595	20	645	50	645	50	805	210
					WB	780	885	105	850	-35	830	-55	1,295	410
				West	EB	485	505	20	560	55	570	65	730	225
					WB	660	770	110	735	-35	770	0	1,240	470
	15	Third Street	16th Street	North	NB	1,595	1,605	10	1,680	75	1,645	40	1,840	235
					SB	880	1,040	160	1,120	80	1,125	85	1,200	160
				South	NB	1,675	1,695	20	1,855	160	1,700	5	1,890	195
					SB	750	830	80	895	65	880	50	975	145
				East	EB	175	270	95	300	30	285	15	330	60
					WB	270	285	15	285	0	375	90	395	110
				West	EB	540	550	10	590	40	555	5	570	20
					WB	785	800	15	815	15	860	60	840	40

2050 AM Link-Level Volumes			11/5/2021				2050 Baseline		2050 Proposed Action		2050 Concept A		2050 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline
	16	Illinois Street	25th Street	North	NB	365	440	75	440	0	445	5	500	60
					SB	80	90	10	85	-5	100	10	110	20
				South	NB	460	480	20	495	15	480	0	520	40
					SB	115	155	40	110	-45	190	35	180	25
				East	EB	35	40	5	40	0	40	0	40	0
					WB	25	30	5	30	0	30	0	30	0
				West	EB	95	200	105	155	-45	215	15	205	5
					WB	80	90	10	85	-5	135	45	120	30
	17	Third Street	Cesar Chavez Street	North	NB	1,400	1,485	85	1,565	80	1,485	0	1,820	335
					SB	560	650	90	665	15	770	120	775	125
				South	NB	1,510	1,680	170	1,710	30	1,680	0	2,085	405
					SB	480	525	45	560	35	560	35	670	145
				East	EB	645	715	70	720	5	715	0	860	145
					WB	210	260	50	255	-5	270	10	350	90
				West	EB	800	830	30	910	80	850	20	960	130
					WB	580	640	60	630	-10	720	80	765	125
	18	Oakdale Avenue	Phelps Street	North	NB	305	315	10	315	0	315	0	315	0
					SB	235	285	50	235	-50	305	20	365	80
				South	NB	110	120	10	120	0	120	0	135	15
					SB	120	125	5	135	10	130	5	130	5
				East	EB	290	360	70	395	35	375	15	500	140
					WB	305	320	15	355	35	320	0	370	50
				West	EB	500	580	80	620	40	600	20	735	155
					WB	435	510	75	495	-15	525	15	655	145
	19	Third Street	Oakdale Avenue	North	NB	1,150	1,330	180	1,365	35	1,330	0	1,425	95
					SB	405	530	125	525	-5	560	30	565	35
				South	NB	1,135	1,380	245	1,390	10	1,385	5	1,485	105
					SB	435	590	155	615	25	615	25	685	95
				East	EB	200	235	35	245	10	245	10	305	70
					WB	210	220	10	255	35	225	5	260	40
				West	EB	275	350	75	385	35	365	15	465	115
					WB	220	280	60	290	10	280	0	320	40
	20	Third Street	Paul Avenue	North	NB	1,060	1,185	125	1,125	-60	1,190	5	1,260	75
					SB	610	700	90	660	-40	735	35	1,175	475
				South	NB	885	1,005	120	945	-60	1,010	5	1,100	95
					SB	510	585	75	585	0	625	40	985	400
				East	EB	270	310	40	315	5	310	0	310	0
					WB	230	275	45	275	0	275	0	275	0
				West	EB	385	435	50	455	20	440	5	440	5
					WB	275	340	65	325	-15	340	0	390	50
MISSION	21	Guerrero Street	Duncan Street	North	NB	1,425	1,555	130	1,580	25	1,500	-55	1,650	95
					SB	690	775	85	805	30	915	140	1,090	315
				South	NB	1,360	1,495	135	1,510	15	1,430	-65	1,585	90
					SB	700	785	85	810	25	940	155	1,105	320
				East	EB	75	80	5	85	5	80	0	85	5
					WB	95	95	0	95	0	110	15	120	25
				West	EB	100	105	5	105	0	110	5	110	5
					WB	75	75	0	75	0	80	5	90	15
	22	San Jose Avenue	30th Street	North	NB	1,335	1,425	90	1,450	25	1,395	-30	1,510	85
					SB	705	800	95	835	35	945	145	1,125	325
				South	NB	1,310	1,390	80	1,415	25	1,350	-40	1,480	90
					SB	715	815	100	850	35	965	150	1,145	330
				East	EB	195	200	5	225	25	220	20	225	25
					WB	190	190	0	190	0	190	0	195	5
				West	EB	195	205	10	235	30	230	25	225	20
					WB	165	170	5	170	0	175	5	180	10
	23	Mission Street	Silver Avenue	North	NB	880	930	50	870	-60	930	0	945	15
					SB	450	455	5	465	10	465	10	485	30
				South	NB	725	820	95	750	-70	800	-20	875	55
					SB	405	425	20	445	20	435	10	490	65
				East	EB	325	355	30	390	35	345	-10	335	-20
					WB	510	535	25	525	-10	535	0	530	-5
				West	EB	260	265	5	295	30	265	0	260	-5
					WB	380	390	10	390	0	390	0	395	5
	24	Cayuga Avenue	Onondaga Avenue	North	NB	185	215	30	210	-5	210	-5	210	-5
					SB	230	230	0	230	0	230	0	230	0
				South	NB	295	310	15	310	0	300	-10	290	-20
					SB	375	375	0	385	10	380	5	380	5
				East	EB	235	240	5	250	10	250	10	260	20
					WB	410	415	5	420	5	415	0	430	15
				West	EB	300	305	5	325	20	315	10	325	20
					WB	325	325	0	335	10	320	-5	325	0
	25	Mission Street	Seneca Avenue	North	NB	640	650	10	660	10	650	0	680	30
					SB	520	520	0	525	5	525	5	550	30
				South	NB	835	845	10	845	0	835	-10	815	-30
					SB	510	515	5	520	5	520	5	510	-5
				West	EB	170	175	5	190	15	185	10	205	30
					WB	370	370	0	375	5	370	0	385	15
WEST PORTAL - OCEAN	26	West Portal Avenue	Ulloa Street	South	NB	220	225	5	230	5	225	0	230	5
					SB	300	305	5	380	75	310	5	310	5
				East	EB	275	285	10	315	30	290	5	300	15
					WB	210	225	15	235	10	240	15	230	5
				West	EB	260	265	5	480	215	265	0	310	45
					WB	185	200	15	215	15	205	5	205	5
	27	Junipero Serra Boulevard	Winston Drive	North	NB	1,280	1,410	130	1,410	0	1,380	-30	1,445	35
					SB	830	970	140	1,290	320	1,030	60	1,245	275
				South	NB	1,340	1,445	105	1,450	5	1,415	-30	1,495	50
					SB	855	1,015	160	1,350	335	1,105	90	1,310	295
				East	EB	125	160	35	170	10	165	5	165	5
					WB	155	160	5	175	15	170	10	180	20
				West	EB	185	265	80	310	45	305	40	290	25
					WB	200	210	10	225	15	215	5	230	20
	28	Ocean Avenue	Plymouth Avenue	North	NB	155	165	10	170	5	170	5	180	15
					SB	45	50	5	60	10	50	0	55	5
				South	NB	295	315	20	315	0	315	0	345	30
					SB	100	110	10	110	0	110	0	115	5
				East	EB	720	745	25	810	65	750	5	770	25
					WB	600	620	20	660	40	635	15	655	35
				West	EB	710	725	15	755	30	730	5	750	25
					WB	635	650	15	675	25	650	0	695	45

2050 AM Link-Level Volumes			11/5/2021				2050 Baseline		2050 Proposed Action		2050 Concept A		2050 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline
	29	Ocean Avenue	Frida Kahlo Way	North	NB	700	760	60	760	0	770	10	1,145	385
					SB	440	620	180	695	75	625	5	745	125
				South	NB	515	530	15	555	25	535	5	690	160
					SB	620	810	190	900	90	815	5	925	115
				East	EB	520	565	45	655	90	570	5	570	5
					WB	615	665	50	675	10	670	5	730	65
				West	EB	860	920	60	1,015	95	925	5	1,025	105
					WB	735	760	25	790	30	765	5	760	0
19TH AVENUE	30	19th Avenue	Judah Street	North	NB	1,855	1,925	70	2,145	220	1,965	40	1,965	40
					SB	1,980	2,035	55	2,045	10	2,040	5	2,175	140
				South	NB	1,720	1,790	70	2,000	210	1,830	40	1,835	45
					SB	1,975	2,010	35	2,020	10	2,015	5	2,155	145
				East	EB	210	225	15	295	70	225	0	255	30
					WB	335	345	10	380	35	350	5	345	0
				West	EB	240	250	10	340	90	250	0	290	40
					WB	235	245	10	275	30	250	5	250	5
	31	20th Avenue	Kirkham Street	North	NB	245	260	15	270	10	265	5	260	0
					SB	140	180	40	180	0	185	5	195	15
				South	NB	245	280	35	305	25	280	0	280	0
					SB	140	165	25	175	10	175	10	220	55
				East	EB	435	450	15	525	75	455	5	485	35
					WB	245	255	10	255	0	275	20	345	90
				West	EB	390	405	15	465	60	410	5	440	35
					WB	185	195	10	200	5	195	0	215	20
	32	19th Avenue	Noriega Street	North	NB	2,070	2,110	40	2,230	120	2,115	5	2,160	50
					SB	2,145	2,180	35	2,245	65	2,185	5	2,280	100
				South	NB	2,100	2,210	110	2,260	50	2,220	10	2,210	0
					SB	2,155	2,205	50	2,215	10	2,215	10	2,285	80
				East	EB	230	290	60	335	45	290	0	315	25
					WB	130	160	30	180	20	165	5	195	35
				West	EB	255	265	10	290	25	270	5	285	20
					WB	175	185	10	190	5	185	0	190	5
	33	19th Avenue	Taraval Street	North	NB	2,155	2,275	120	2,275	0	2,320	45	2,275	0
					SB	2,380	2,400	20	2,490	90	2,405	5	2,450	50
				South	NB	2,250	2,345	95	2,350	5	2,365	20	2,345	0
					SB	2,415	2,430	15	2,535	105	2,435	5	2,500	70
				East	EB	370	380	10	465	85	385	5	420	40
					WB	320	330	10	370	40	335	5	360	30
				West	EB	310	320	10	385	65	320	0	335	15
					WB	315	325	10	345	20	325	0	340	15
	34	19th Avenue	Ocean Avenue	South	NB	1,205	1,310	105	1,340	30	1,315	5	1,270	-40
					SB	1,930	1,965	35	2,230	265	1,965	0	2,145	180
	35	19th Avenue	Winston Drive	North	NB	1,425	1,535	110	1,555	20	1,535	0	1,470	-65
					SB	2,325	2,390	65	2,670	280	2,440	50	2,595	205
				South	NB	1,605	1,755	150	1,690	-65	1,740	-15	1,610	-145
					SB	2,465	2,500	35	2,755	255	2,500	0	2,695	195
				East	EB	255	390	135	410	20	455	65	415	25
					WB	225	235	10	260	25	235	0	260	25
				West	EB	495	625	130	710	85	720	95	715	90
					WB	490	525	35	585	60	575	50	585	60
	36	19th Avenue	Holloway Avenue	North	NB	1,745	1,890	145	1,830	-60	1,875	-15	1,740	-150
					SB	2,670	2,825	155	3,025	200	2,915	90	3,005	180
				South	NB	1,770	1,965	195	1,895	-70	1,895	-70	2,190	225
					SB	2,660	2,945	285	3,115	170	3,005	60	2,980	35
				East	EB	330	585	255	550	-35	485	-100	595	10
					WB	360	490	130	480	-10	480	-10	705	215
				West	EB	360	580	220	525	-55	490	-90	485	-95
					WB	340	365	25	380	15	360	-5	315	-50
JUDAH-IRVING	37	Lincoln Way	19th Avenue	North	NB	2,720	2,825	105	3,275	450	2,890	65	2,990	165
					SB	2,510	2,580	70	2,705	125	2,640	60	2,805	225
				South	NB	2,345	2,430	85	2,705	275	2,470	40	2,470	40
					SB	2,240	2,290	50	2,340	50	2,305	15	2,455	165
				East	EB	1,135	1,175	40	1,485	310	1,180	5	1,310	135
					WB	975	1,035	60	1,240	205	1,040	5	1,230	195
				West	EB	1,105	1,140	35	1,445	305	1,145	5	1,265	125
					WB	845	890	45	980	90	910	20	1,030	140
	38	Irving Street	Seventh Avenue	North	NB	390	415	25	520	105	420	5	455	40
					SB	420	435	15	465	30	450	15	605	170
				South	NB	680	690	10	715	25	690	0	720	30
					SB	455	470	15	480	10	475	5	655	185
				East	EB	450	470	20	565	95	475	5	375	-95
					WB	125	135	10	150	15	150	15	160	25
				West	EB	315	330	15	415	85	330	0	365	35
					WB	265	275	10	275	0	315	40	400	125

Appendix D-4

2050 PM Vehicle Volume Forecasts

SF Housing Element 2022 Update Roadway Volumes

2050 PM Link-Level Volumes			11/5/2021				2050 Baseline		2050 Proposed Action		2050 Concept A		2050 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline
GEARY	1	Clement Street	19th Avenue	North	NB	110	115	5	115	0	130	15	115	0
					SB	90	95	5	100	5	105	10	100	5
				South	NB	135	140	5	140	0	155	15	140	0
					SB	110	115	5	120	5	120	5	120	5
				East	EB	185	190	5	205	15	195	5	230	40
					WB	225	230	5	280	50	245	15	275	45
				West	EB	180	185	5	200	15	185	0	225	40
					WB	230	240	10	280	40	250	10	280	40
	2	Geary Boulevard	Eighth Avenue	North	NB	200	205	5	230	25	295	90	195	-10
					SB	205	235	30	235	0	300	65	210	-25
				South	NB	150	155	5	185	30	180	25	170	15
					SB	245	260	15	265	5	270	10	265	5
				East	EB	880	895	15	1,000	105	915	20	1,025	130
					WB	995	1,000	5	1,135	135	1,005	5	1,100	100
				West	EB	965	980	15	1,095	115	1,025	45	1,100	120
					WB	975	990	15	1,130	140	995	5	1,075	85
	3	Clement Street	Arguello Boulevard	North	NB	315	330	15	335	5	345	15	360	30
					SB	660	665	5	720	55	670	5	690	25
				South	NB	365	375	10	400	25	375	0	405	30
					SB	560	580	20	610	30	610	30	610	30
				West	EB	210	230	20	290	60	295	65	310	80
					WB	375	385	10	485	100	400	15	450	65
	4	Geary Boulevard	Baker Street	North	NB	215	245	30	245	0	265	20	215	-30
					SB	170	200	30	205	5	265	65	170	-30
				South	NB	305	320	15	350	30	330	10	345	25
					SB	350	380	30	385	5	430	50	405	25
				East	EB	920	940	20	1,055	115	1,015	75	985	45
					WB	1,460	1,480	20	1,625	145	1,485	5	1,615	135
				West	EB	1,100	1,115	15	1,255	140	1,180	65	1,220	105
					WB	1,580	1,595	15	1,815	220	1,590	-5	1,785	190
	5	Post Street	Fillmore Street	North	NB	205	220	15	250	30	220	0	265	45
					SB	260	285	25	315	30	325	40	335	50
				South	NB	290	305	15	330	25	320	15	355	50
					SB	250	275	25	305	30	310	35	330	55
				East	EB	475	525	50	490	-35	605	80	570	45
					WB	125	125	0	195	70	130	5	185	60
				West	EB	400	445	45	410	-35	535	90	500	55
					WB	135	135	0	155	20	150	15	200	65
	6	Geary Street	Van Ness Avenue	North	NB	1,060	1,115	55	1,130	15	1,205	90	1,200	85
					SB	910	940	30	935	-5	1,040	100	985	45
				South	NB	970	1,025	55	1,040	15	1,120	95	1,105	80
					SB	860	915	55	970	55	1,035	120	980	65
				East	WB	730	770	40	875	105	825	55	895	125
				West	WB	645	670	25	715	45	700	30	760	90
	7	Post Street	Polk Street	North	NB	190	215	25	180	-35	265	50	255	40
					SB	420	430	10	445	15	450	20	445	15
				South	NB	180	185	5	170	-15	195	10	210	25
					SB	470	480	10	500	20	500	20	525	45
				East	EB	615	645	30	675	30	705	60	710	65
				West	EB	720	780	60	770	-10	880	100	880	100
	8	Geary Street	Mason Street	North	SB	640	645	5	665	20	695	50	730	85
					SB	645	660	15	695	35	750	90	805	145
				East	WB	885	920	35	995	75	1,025	105	1,120	200
					WB	731	790	59	890	100	905	115	910	120
POLK - POTRERO HILL	9	Polk Street	North Point Street	North	NB	138	140	2	140	0	140	0	140	0
					SB	148	150	2	150	0	150	0	150	0
				South	NB	115	115	0	145	30	120	5	140	25
					SB	148	150	2	150	0	155	5	170	20
				East	EB	183	185	2	210	25	225	40	225	40
					WB	348	355	7	390	35	380	25	430	75
				West	EB	206	225	19	235	10	290	65	280	55
					WB	348	350	2	390	40	380	30	425	75
	10	Van Ness Avenue	Washington Street	North	NB	1,002	1,010	8	1,130	120	1,070	60	1,180	170
					SB	868	875	7	995	120	1,035	160	990	115
				South	NB	1,051	1,075	24	1,215	140	1,140	65	1,245	170
					SB	905	955	50	1,075	120	1,120	165	1,075	120
				East	EB	204	240	36	255	15	335	95	305	65
				West	EB	192	265	73	275	10	370	105	350	85
	11	Hyde Street	McAllister Street	North	SB	1,314	1,490	176	1,570	80	1,640	150	1,715	225
				South	SB	1,450	1,600	150	1,685	85	1,795	195	1,820	220
				East	EB	23	25	2	25	0	25	0	25	0
					WB	454	495	41	540	45	545	50	555	60
				West	EB	172	185	13	200	15	260	75	225	40
					WB	467	470	3	520	50	540	70	565	95
	12	Seventh Street	Brannan Street	North	NB	1,510	1,675	165	1,730	55	1,810	135	1,980	305
				South	NB	1,185	1,505	320	1,610	105	1,650	145	1,775	270
					SB	189	270	81	285	15	395	125	335	65
				East	EB	870	935	65	980	45	995	60	1,045	110
					WB	560	690	130	765	75	825	135	820	130
				West	EB	1,114	1,125	11	1,155	30	1,245	120	1,280	155
					WB	290	395	105	465	70	455	60	450	55
	13	Evans Avenue	Quint Street	West	EB	357	615	258	705	90	690	75	1,145	530
					WB	478	640	162	715	75	740	100	1,095	455
THIRD STREET	14	Third Street	Evans Avenue	North	NB	775	850	75	810	-40	905	55	1,050	200
					SB	720	785	65	810	25	775	-10	835	50
				South	NB	715	825	110	800	-25	895	70	975	150
					SB	705	845	140	885	40	840	-5	850	5
				East	EB	640	665	25	645	-20	635	-30	1,075	410
					WB	715	720	5	765	45	755	35	1,025	305
				West	EB	490	555	65	550	-5	540	-15	890	335
					WB	590	635	45	685	50	695	60	890	255
	15	Third Street	16th Street	North	NB	1,330	1,340	10	1,440	100	1,400	60	1,525	185
					SB	1,275	1,345	70	1,365	20	1,395	50	1,470	125
				South	NB	1,200	1,220	20	1,315	95	1,255	35	1,405	185
					SB	1,185	1,220	35	1,300	80	1,245	25	1,365	145
				East	EB	260	270	10	270	0	305	35	335	65
					WB	400	410	10	430	20	425	15	450	40
				West	EB	710	735	25	785	50	760	25	790	55
					WB	755	780	25	790	10	790	10	785	5

2050 PM Link-Level Volumes			11/5/2021				2050 Baseline		2050 Proposed Action		2050 Concept A		2050 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline
	16	Illinois Street	25th Street	North	NB	200	225	25	200	-25	295	70	275	50
					SB	360	390	30	405	15	395	5	440	50
				South	NB	220	260	40	230	-30	340	80	325	65
					SB	320	350	30	375	25	355	5	395	45
				East	EB	15	20	5	20	0	20	0	20	0
					WB	30	35	5	35	0	35	0	35	0
				West	EB	45	50	5	80	30	55	5	70	20
					WB	170	175	5	185	10	175	0	175	0
	17	Third Street	Cesar Chavez Street	North	NB	995	1,010	15	1,135	125	1,030	20	1,165	155
					SB	1,585	1,735	150	1,755	20	1,805	70	2,055	320
				South	NB	820	895	75	850	-45	985	90	1,120	225
					SB	1,010	1,070	60	1,090	20	1,075	5	1,245	175
				East	EB	190	235	45	205	-30	335	100	415	180
					WB	225	225	0	235	10	255	30	350	125
				West	EB	770	790	20	975	185	820	30	885	95
					WB	1,165	1,205	40	1,270	65	1,310	105	1,460	255
	18	Oakdale Avenue	Phelps Street	North	NB	280	295	15	295	0	305	10	295	0
					SB	480	520	40	525	5	520	0	555	35
				South	NB	105	105	0	105	0	110	5	120	15
					SB	115	135	20	130	-5	135	0	145	10
				East	EB	405	475	70	480	5	475	0	680	205
					WB	80	95	15	110	15	105	10	195	100
				West	EB	605	690	85	690	0	700	10	895	205
					WB	465	540	75	570	30	555	15	690	150
	19	Third Street	Oakdale Avenue	North	NB	785	885	100	860	-25	930	45	965	80
					SB	910	1,075	165	1,100	25	1,080	5	1,160	85
				South	NB	705	805	100	815	10	870	65	925	120
					SB	975	1,165	190	1,215	50	1,170	5	1,255	90
				East	EB	275	295	20	310	15	295	0	405	110
					WB	160	215	55	240	25	215	0	280	65
				West	EB	420	500	80	500	0	495	-5	605	105
					WB	150	195	45	210	15	200	5	290	95
	20	Third Street	Paul Avenue	North	NB	720	760	40	700	-60	835	75	1,145	385
					SB	980	1,065	85	1,060	-5	1,085	20	1,200	135
				South	NB	640	705	65	665	-40	765	60	1,125	420
					SB	805	885	80	875	-10	905	20	1,030	145
				East	EB	320	330	10	325	-5	330	0	335	5
					WB	165	170	5	155	-15	175	5	175	5
				West	EB	320	325	5	325	0	330	5	330	5
					WB	250	270	20	280	10	270	0	280	10
MISSION	21	Guerrero Street	Duncan Street	North	NB	1,050	1,125	75	1,190	65	1,235	110	1,425	300
					SB	1,190	1,265	75	1,335	70	1,270	5	1,405	140
				South	NB	1,015	1,095	80	1,150	55	1,200	105	1,380	285
					SB	1,185	1,280	95	1,335	55	1,280	0	1,415	135
				East	EB	50	50	0	55	5	55	5	55	5
					WB	145	145	0	165	20	145	0	150	5
				West	EB	55	65	10	65	0	70	5	85	20
					WB	120	125	5	145	20	130	5	135	10
	22	San Jose Avenue	30th Street	North	NB	1,045	1,145	100	1,210	65	1,295	150	1,485	340
					SB	1,150	1,235	85	1,290	55	1,220	-15	1,360	125
				South	NB	1,045	1,135	90	1,205	70	1,260	125	1,445	310
					SB	1,205	1,255	50	1,325	70	1,250	-5	1,355	100
				East	EB	190	200	10	225	25	205	5	215	15
					WB	245	335	90	370	35	340	5	345	10
				West	EB	185	200	15	220	20	230	30	250	50
					WB	170	290	120	310	20	285	-5	325	35
	23	Mission Street	Silver Avenue	North	NB	600	635	35	660	25	700	65	705	70
					SB	665	700	35	695	-5	680	-20	675	-25
				South	NB	515	580	65	600	20	645	65	670	90
					SB	530	595	65	575	-20	565	-30	590	-5
				East	EB	425	470	45	465	-5	460	-10	440	-30
					WB	370	430	60	435	5	415	-15	405	-25
				West	EB	315	325	10	325	0	325	0	320	-5
					WB	335	345	10	370	25	350	5	345	0
	24	Cayuga Avenue	Onondaga Avenue	North	NB	80	95	15	110	15	105	10	100	5
					SB	150	165	15	160	-5	160	-5	165	0
				South	NB	135	175	40	200	25	190	15	190	15
					SB	125	135	10	135	0	130	-5	140	5
				East	EB	230	230	0	230	0	220	-10	225	-5
					WB	115	115	0	125	10	110	-5	145	30
				West	EB	215	220	5	230	10	215	-5	220	0
					WB	115	120	5	140	20	125	5	155	35
	25	Mission Street	Seneca Avenue	North	NB	465	470	5	475	5	470	0	465	-5
					SB	495	550	55	555	5	550	0	575	25
				South	NB	510	515	5	515	0	515	0	480	-35
					SB	625	670	45	670	0	665	-5	655	-15
				West	EB	245	245	0	255	10	245	0	255	10
					WB	185	185	0	200	15	190	5	205	20
WEST PORTAL - OCEAN	26	West Portal Avenue	Ulloa Street	South	NB	210	220	10	220	0	220	0	255	35
					SB	210	265	55	265	0	265	0	340	75
				East	EB	160	165	5	195	30	165	0	180	15
					WB	185	195	10	275	80	195	0	200	5
				West	EB	160	210	50	245	35	215	5	275	65
					WB	100	100	0	130	30	100	0	110	10
	27	unipero Serra Boulevard	Winston Drive	North	NB	1,305	1,450	145	1,705	255	1,530	80	1,665	215
					SB	1,075	1,130	55	1,195	65	1,140	10	1,185	55
				South	NB	1,440	1,515	75	1,665	150	1,550	35	1,620	105
					SB	1,075	1,150	75	1,180	30	1,165	15	1,195	45
				East	EB	190	205	15	225	20	220	15	225	20
					WB	145	180	35	205	25	190	10	200	20
				West	EB	310	385	75	485	100	430	45	515	130
					WB	400	430	30	460	30	425	-5	455	25
	28	Ocean Avenue	Plymouth Avenue	North	NB	95	110	15	150	40	115	5	125	15
					SB	105	115	10	115	0	115	0	115	0
				South	NB	210	220	10	225	5	230	10	230	10
					SB	195	200	5	215	15	205	5	210	10
				East	EB	755	765	10	800	35	770	5	805	40
					WB	610	670	60	735	65	675	5	695	25
				West	EB	760	770	10	820	50	775	5	820	50
					WB	625	660	35	675	15	665	5	680	20

2050 PM Link-Level Volumes			11/5/2021				2050 Baseline		2050 Proposed Action		2050 Concept A		2050 Plan Bay Area	
Corridor	#	Primary Street	Intersecting Street	Leg	Direction	2035 Baseline	Volume	Change from 2035 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline	Volume	Change from 2050 Baseline
	29	Ocean Avenue	Frida Kahlo Way	North	NB	700	830	130	885	55	835	5	1,030	200
					SB	630	770	140	775	5	770	0	1,050	280
				South	NB	480	500	20	520	20	510	10	555	55
					SB	740	870	130	875	5	870	0	1,095	225
				East	EB	570	585	15	630	45	595	10	635	50
					WB	615	680	65	765	85	685	5	730	50
				West	EB	905	950	45	1,010	60	955	5	1,095	145
					WB	770	800	30	865	65	805	5	845	45
19TH AVENUE	30	19th Avenue	Judah Street	North	NB	2,395	2,460	65	2,580	120	2,545	85	2,610	150
					SB	2,190	2,220	30	2,405	185	2,230	10	2,305	85
				South	NB	2,325	2,395	70	2,510	115	2,485	90	2,550	155
					SB	2,185	2,215	30	2,355	140	2,220	5	2,305	90
				East	EB	230	245	15	345	100	250	5	325	80
					WB	385	400	15	565	165	400	0	495	95
				West	EB	235	250	15	345	95	250	0	330	80
					WB	355	365	10	555	190	370	5	455	90
	31	20th Avenue	Kirkham Street	North	NB	105	120	15	155	35	120	0	115	-5
					SB	130	150	20	195	45	155	5	155	5
				South	NB	110	125	15	160	35	125	0	135	10
					SB	140	155	15	200	45	155	0	160	5
				East	EB	285	300	15	345	45	310	10	335	35
					WB	335	340	5	395	55	340	0	365	25
				West	EB	230	250	20	300	50	255	5	265	15
					WB	275	285	10	335	50	290	5	285	0
	32	19th Avenue	Noriega Street	North	NB	2,275	2,295	20	2,380	85	2,320	25	2,390	95
					SB	2,510	2,515	5	2,625	110	2,515	0	2,585	70
				South	NB	2,270	2,300	30	2,360	60	2,310	10	2,365	65
					SB	2,510	2,520	10	2,615	95	2,520	0	2,555	35
				East	EB	135	140	5	140	0	140	0	160	20
					WB	250	260	10	290	30	265	5	280	20
				West	EB	230	230	0	280	50	230	0	245	15
					WB	340	340	0	405	65	345	5	360	20
	33	19th Avenue	Taraval Street	North	NB	2,375	2,415	40	2,685	270	2,445	30	2,545	130
					SB	2,510	2,560	50	2,615	55	2,565	5	2,560	0
				South	NB	2,410	2,450	40	2,745	295	2,485	35	2,590	140
					SB	2,495	2,540	45	2,580	40	2,545	5	2,565	25
				East	EB	300	315	15	390	75	315	0	330	15
					WB	370	395	25	525	130	400	5	455	60
				West	EB	280	290	10	330	40	290	0	335	45
					WB	405	420	15	550	130	430	10	495	75
	34	19th Avenue	Ocean Avenue	South	NB	1,445	1,460	15	1,675	215	1,465	5	1,595	135
					SB	1,810	1,965	155	2,015	50	1,965	0	1,935	-30
	35	19th Avenue	Winston Drive	North	NB	1,655	1,670	15	1,895	225	1,655	-15	1,775	105
					SB	2,340	2,575	235	2,630	55	2,595	20	2,545	-30
				South	NB	1,890	1,975	85	2,155	180	2,015	40	2,055	80
					SB	2,470	2,705	235	2,715	10	2,735	30	2,620	-85
				East	EB	355	390	35	430	40	445	55	455	65
					WB	370	425	55	470	45	445	20	470	45
				West	EB	820	915	95	955	40	990	75	950	35
					WB	925	1,125	200	1,170	45	1,215	90	1,165	40
	36	19th Avenue	Holloway Avenue	North	NB	2,000	2,090	90	2,265	175	2,130	40	2,170	80
					SB	2,570	2,730	160	2,770	40	2,710	-20	2,715	-15
				South	NB	1,995	2,080	85	2,255	175	2,115	35	2,260	180
					SB	2,610	2,830	220	2,915	85	2,805	-25	2,980	150
				East	EB	360	510	150	520	10	505	-5	765	255
					WB	330	565	235	550	-15	500	-65	570	5
				West	EB	415	620	205	620	0	605	-15	480	-140
					WB	320	545	225	480	-65	455	-90	595	50
JUDAH-IRVING	37	Lincoln Way	19th Avenue	North	NB	2,475	2,550	75	2,770	220	2,665	115	2,835	285
					SB	2,710	2,765	55	3,230	465	2,840	75	2,975	210
				South	NB	2,460	2,525	65	2,650	125	2,605	80	2,655	130
					SB	2,365	2,395	30	2,600	205	2,415	20	2,485	90
				East	EB	1,055	1,105	50	1,250	145	1,115	10	1,325	220
					WB	1,160	1,185	25	1,360	175	1,190	5	1,355	170
				West	EB	865	910	45	1,045	135	930	20	1,150	240
					WB	1,310	1,345	35	1,670	325	1,370	25	1,485	140
	38	Irving Street	Seventh Avenue	North	NB	375	435	60	455	20	440	5	500	65
					SB	565	640	75	675	35	645	5	725	85
				South	NB	510	690	180	700	10	690	0	705	15
					SB	665	870	205	885	15	870	0	930	60
				East	EB	275	455	180	500	45	465	10	490	35
					WB	265	285	20	365	80	290	5	300	15
				West	EB	315	550	235	575	25	565	15	640	90
					WB	365	440	75	515	75	445	5	485	45

APPENDIX G.4. REPRESENTATIVE BUILDING TYPE TRIP GENERATION

LCW Consulting

Memo

To: File

From: Luba C. Wyznyckyj

Date: February 21, 2022

Re: Housing Element Update 2022 Update – Representative Building Types Trip Generation

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Weekday p.m. peak hour trip generation, and commercial vehicle and passenger loading demand for the representative building types was estimated using the methodology and data contained within the department's SF Guidelines. The department's Trip Generation Workbook (SF Workbook), a spreadsheet travel demand model, was used to calculate the travel. The travel demand calculation assumptions and summaries from the SF Workbook for the representative building types are attached.

In calculating travel demand for the representative building types, the transportation team used the SF Guidelines urban high density location (i.e., place type 1) for representative building type 1, and urban medium density location (i.e., place type 2) for representative building types 2 to 6. Travel demand was not calculated for representative building type 7, accessory dwelling unit, as it would generate few daily and peak hour trips.

The selection of SF Guidelines place types affects the mode split assumptions for each representative building type. The transportation team selected these place types for these representative building types because under the proposed action larger buildings associated with representative building type 1 are anticipated for the denser east side of the city, and other size buildings are anticipated for the less dense west side of the city. The transportation team did not use the SF Guidelines urban low density (i.e., place type 3) in the analysis, although the SF Guidelines mode split. assumptions are the same for place types 2 and 3 for residential uses.

Table 1 summarizes the seven representative building types and the number of housing units and retail square footage assumed in the trip generation calculations.

Table 1: Representative Building Type Characteristics

Representative Building Type	Building Height	Number of Housing Units	Retail Square Feet
Type 1	590-foot-tall building	1,000	30,000
Type 2	240-foot-tall building	500	4,000
Type 3	120-foot-tall building	200	3,000
Type 4	85-foot-tall building	50	2,000
Type 5	65/66-foot-tall building	30	0
Type 6	40-foot-tall building	30	0
Type 7	Accessory Dwelling Unit	1	0

Table 2 summarizes the weekday p.m. peak hour trip person trip by way of travel and vehicle trip generation for the representative building types.

Table 2: Representative Building Type P.M. Peak Hour Person and Vehicle Trip Generation by Way of Travel

Representative Building Type [a]	Person Trips by Way of Travel						Vehicle Trips
	Auto	Taxi/TNC	Transit	Bicycle	Walk	Total	
Type 1: 590-foot-tall building	161	46	233	28	396	**864**	166
Type 2: 240-foot-tall building	124	11	60	13	128	**336**	99
Type 3: 120-foot-tall building	98	8	48	10	101	**265**	79
Type 4: 85-foot-tall building	18	1	9	2	25	**55**	14
Type 5: 65/66-foot-tall building	6	1	3	1	6	**17**	5
Type 6: 40-foot-tall building	6	1	3	1	6	**17**	5

Notes:

Row totals may not sum because of rounding.

a. Representative building type 7, accessory dwelling unit would generate about one person trips during the weekday p.m. peak hour and is therefore not included in this table.

Table 3 summarizes the freight/service vehicle and passenger loading space demand for the representative building types.

Table 3: Representative Building Type Peak Loading Demand

Representative Building Type	Peak Hour Freight Loading Space Demand	Peak 15-minute Passenger Loading Space Demand
Type 1: 590-foot-tall building	1.66	**2.10**
Type 2: 240-foot-tall building	0.88	**0.77**
Type 3: 120-foot-tall building	0.58	**0.61**
Type 4: 85-foot-tall building	0.10	**0.11**
Type 5: 65/66-foot-tall building	0.04	**0.04**
Type 6: 40-foot-tall building	0.04	**0.04**

Building Type 1 - Place Type 1 Trip Generation

Person Trips by Mode

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Auto Split	116	-	45	-	-	-	-	161
Taxi TNC Split	28	-	18	-	-	-	-	46
Public Transit	131	-	101	-	-	-	-	233
Walk	177	-	219	-	-	-	-	396
Bike	14	-	15	-	-	-	-	28
	466		398					864

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.68816	0	0.3650625	0	0	0	0	1.0532225
Peak 15-minutes Spaces of Demand	1.37632	0	0.730125	0	0	0	0	2.106445
Freight Loading Demand								
Peak Hour Spaces of Demand	1.28819444	0	0.3755787	0	0	0	0	1.66377315

Place Type 1 travel demand assumptions used for building type 1. Place Type 1 includes Downtown/North Beach and SoMa districts where building type 1 projects would most likely be developed.

Building Type 1 - Place Type 1 Trip Generation

OD PERSON TRIPS BY TRIP PURPOSE AND DIRECTION - DISTRICT

							Outbound				
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
		Downtown/ NorthBeach	SoMa	Marina/Wes ternMarket	Mission/Pot rero	OuterMissio n/Hills	Bayshore	Richmond	Sunset	Islands	South Bay
Auto Person Trips	**PM Work Trips**	2	0	8	1	-	0	0	0	-	2
	PM Non-Work Trips	14	2	4	2	2	6	3	0	-	4
Taxi / TNC Person Trips	**PM Work Trips**	1	0	2	0	-	0	0	0	-	1
	PM Non-Work Trips	4	1	1	1	1	2	1	0	-	2
Transit Person Trips	**PM Work Trips**	3	-	2	1	1	-	-	-	-	2
	PM Non-Work Trips	19	1	17	5	2	0	8	2	-	4
Auto VehicleTrips*	**PM Work Trips**	1	0	6	0	-	0	0	0	-	1
	PM Non-Work Trips	9	2	3	1	1	4	2	0	-	3
Taxi / TNC Vehicle Trips*	**PM Work Trips**	0	0	2	0	-	0	0	0	-	1
	PM Non-Work Trips	3	0	1	1	0	1	1	0	-	1

*Auto vehicle trips based on rolling up of shared ride 2, shared ride 3, and drive alone person trips divided by an AVO of 2,3.5, and 1, respectively

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.68816	0	0.3650625	0	0	0	0	1.0532225
Peak 15-minutes Spaces of Demand	1.37632	0	0.730125	0	0	0	0	2.106445
Freight Loading Demand								
Peak Hour Spaces of Demand	1.28819444	0	0.3755787	0	0	0	0	1.66377315

Place Type 1 travel demand assumptions used for building type 1. Place Type 1 includes Downtown/North Beach and SoMa districts where building type 1 projects would most likely be developed.

Inbound

11 East Bay	12 North Bay	Total	1 Downtown/ NorthBeach	2 SoMa	3 Marina/WesternMarket	4 Mission/Potrero	5 OuterMission/Hills	6 Bayshore	7 Richmond	8 Sunset	9 Islands	10 South Bay	11 East Bay	12 North Bay	Total
1	0	15	13	5	3	1	17	0	0	0	-	6	3	1	50
2	1	40	26	3	9	1	1	3	2	8	-	1	4	0	57
0	0	5	3	1	1	0	4	0	0	0	-	1	1	0	13
1	0	13	7	1	2	1	0	1	1	2	-	0	1	0	16
4	1	13	19	4	6	0	1	-	-	4	-	24	6	1	65
20	1	79	24	2	19	4	7	0	9	2	1	6	3	-	76
0	0	10	9	3	2	0	12	0	0	0	-	4	2	1	33
1	1	25	17	2	6	1	0	2	1	5	-	0	3	0	38
0	0	3	2	1	1	0	3	0	0	0	-	1	1	0	8
0	0	8	5	1	1	0	0	1	0	1	-	0	1	0	10

35	71	106
23	38	60
58	109	166

Building Type 1 - Place Type 1 Trip Generation

STEP 1: USER INPUTS

Land Use	Res
Number of Bedrooms	1173
1000s of Square Feet	742
Distribute By	Placetype
Place Type	1
District Number	1
District Name	wntown/NorthBeach

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	4.5
Total Daily Person Trips	5279
PM Person Trip Rate	0.4
Total PM Person Trips	469.2

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	25%	116
Taxi TNC Split	6%	28
Public Transit	28%	131
Walk	38%	177
Bike	3%	14
	99%	466

Building Type 1 - Place Type 1 Trip Generation

STEP 1: USER INPUTS

Land Use	Ret
1000s of Square Feet	29.5
Distribute By	Placetype
Place Type	1
District Number	1
District Name	wntown/NorthBeach

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	150
Total Daily Person Trips	4425
PM Person Trip Rate	13.5
Total PM Person Trips	398.25

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	11%	45
Taxi TNC Split	5%	18
Public Transit	25%	101
Walk	55%	219
Bike	4%	15

Representative Building Type 2 - Place Type 2 Trip Generation

Person Trips by Mode

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Auto Split	110	-	14	-	-	-	-	124
Taxi TNC Split	10	-	1	-	-	-	-	11
Public Transit	54	-	6	-	-	-	-	60
Walk	97	-	31	-	-	-	-	128
Bike	11	-	2	-	-	-	-	13
	282		54					335

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.33936	0	0.0468	0	0	0	0	0.38616
Peak 15-minutes Spaces of Demand	0.67872	0	0.0936	0	0	0	0	0.77232
Freight Loading Demand								
Peak Hour Spaces of Demand	0.82465278	0	0.05092593	0	0	0	0	0.8755787

Representative Building Type 2 - Place Type 2 Trip Generation

OD PERSON TRIPS BY TRIP PURPOSE AND DIRECTION - DISTRICT

Outbound

		1 Downtown/ NorthBeach	2 SoMa	3 Marina/Western Market	4 Mission/Potrero	5 OuterMission/Hills	6 Bayshore	7 Richmond	8 Sunset	9 Islands	10 South Bay	11 East Bay
Auto Person Trips	**PM Work Trips**	0	0	1	0	0	-	0	0	-	0	0
	PM Non-Work Trips	2	0	8	3	3	0	3	1	-	3	2
Taxi / TNC Person Trips	**PM Work Trips**	0	0	0	0	0	-	0	0	-	0	0
	PM Non-Work Trips	0	0	1	0	0	0	0	0	-	0	0
Transit Person Trips	**PM Work Trips**	1	2	0	0	-	-	-	0	-	0	0
	PM Non-Work Trips	4	2	2	5	0	-	1	0	-	1	1
Auto VehicleTrips*	**PM Work Trips**	0	0	1	0	0	-	0	0	-	0	0
	PM Non-Work Trips	2	0	6	2	2	0	2	1	-	2	1
Taxi / TNC Vehicle Trips*	**PM Work Trips**	0	0	0	0	0	-	0	0	-	0	0
	PM Non-Work Trips	0	0	0	0	0	0	0	0	-	0	0

*Auto vehicle trips based on rolling up of shared ride 2, shared ride 3, and drive alone person trips divided by an AVO of 2,3.5, and 1, respectively

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.33936	0	0.0468	0	0	0	0	0.38616
Peak 15-minutes Spaces of Demand	0.67872	0	0.0936	0	0	0	0	0.77232
Freight Loading Demand								
Peak Hour Spaces of Demand	0.82465278	0	0.05092593	0	0	0	0	0.8755787

Inbound

12 North Bay	Total	1 Downtown/ NorthBeach	2 SoMa	3 Marina/Western Market	4 Mission/Potrero	5 OuterMission/Hills	6 Bayshore	7 Richmond	8 Sunset	9 Islands	10 South Bay	11 East Bay	12 North Bay	Total
0	2	3	2	8	1	3	0	4	1	-	8	1	1	32
2	28	4	3	24	14	4	0	4	2	-	3	2	2	61
0	0	0	0	1	0	0	0	0	0	-	1	0	0	3
0	2	0	0	2	1	0	0	0	0	-	0	0	0	5
-	3	9	4	1	1	3	-	-	0	-	5	2	-	25
0	16	5	0	7	1	0	0	1	1	-	-	0	0	16
0	2	2	1	6	0	2	0	3	0	-	5	1	1	22
1	20	2	2	17	10	3	0	2	1	-	2	1	1	42
0	0	0	0	0	0	0	0	0	0	-	0	0	0	2
0	2	0	0	1	1	0	0	0	0	-	0	0	0	4

21	21			64	64	85	85
3	2			11	6	15	7
25	23			75	69	99	92
	no 2x				no 2x		no 2x

INSTRUCTIONS:FILL IN INPUTS IN GREEN CELLS UNDER *STEP 1* ONLY

STEP 1: USER INPUTS

Land Use	Res
Number of Bedrooms	707
1000s of Square Feet	475
Distribute By	Placetype
Place Type	2
District Number	3
District Name	arina/WesternMarket

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	4.5
Total Daily Person Trips	3182
PM Person Trip Rate	0.4
Total PM Person Trips	282.8

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	39%	110
Taxi TNC Split	4%	10
Public Transit	19%	54
Walk	34%	97
Bike	4%	11
	100%	282

INSTRUCTIONS:FILL IN INPUTS IN GREEN CELLS UNDER *STEP 1* ONLY

STEP 1: USER INPUTS

Land Use	Ret
1000s of Square Feet	4
Distribute By	District
Place Type	2
District Number	3
District Name	arina/WesternMarket

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	150
Total Daily Person Trips	600
PM Person Trip Rate	13.5
Total PM Person Trips	54

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	26%	14
Taxi TNC Split	1%	1
Public Transit	12%	6
Walk	58%	31
Bike	3%	2

Representative Building Type 3 - Place Type 2 Trip Generation

Person Trips by Mode

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Auto Split	88	-	10	-	-	-	-	98
Taxi TNC Split	8	-	1	-	-	-	-	8
Public Transit	43	-	5	-	-	-	-	48
Walk	78	-	23	-	-	-	-	101
Bike	9	-	1	-	-	-	-	10
	225		40					265

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.2712	0	0.0351	0	0	0	0	0.3063
Peak 15-minutes Spaces of Demand	0.5424	0	0.0702	0	0	0	0	0.6126
Freight Loading Demand								
Peak Hour Spaces of Demand	0.54253472	0	0.03819444	0	0	0	0	0.58072917

Representative Building Type 3 - Place Type 2 Trip Generation

OD PERSON TRIPS BY TRIP PURPOSE AND DIRECTION - DISTRICT

		Outbound										
		1 Downtown/ NorthBeach	**2** SoMa	**3** Marina/Wes ternMarket	**4** Mission/Pot rero	**5** OuterMissio n/Hills	**6** Bayshore	**7** Richmond	**8** Sunset	**9** Islands	**10** South Bay	**11** East Bay
Auto Person Trips	**PM Work Trips**	0	0	1	0	0	-	0	0	-	0	0
	PM Non-Work Trips	2	0	7	2	2	0	3	1	-	2	2
Taxi / TNC Person Trips	**PM Work Trips**	0	0	0	0	0	-	0	0	-	0	0
	PM Non-Work Trips	0	0	1	0	0	0	0	0	-	0	0
Transit Person Trips	**PM Work Trips**	1	2	0	0	-	-	-	0	-	0	0
	PM Non-Work Trips	3	1	1	4	0	-	1	0	-	1	1
Auto VehicleTrips*	**PM Work Trips**	0	0	1	0	0	-	0	0	-	0	0
	PM Non-Work Trips	1	0	4	2	2	0	2	1	-	2	1
Taxi / TNC Vehicle Trips*	**PM Work Trips**	0	0	0	0	0	-	0	0	-	0	0
	PM Non-Work Trips	0	0	0	0	0	0	0	0	-	0	0

*Auto vehicle trips based on rolling up of shared ride 2, shared ride 3, and drive alone person trips divided by an AVO of 2,3.5, and 1, respectively

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.2712	0	0.0351	0	0	0	0	0.3063
Peak 15-minutes Spaces of Demand	0.5424	0	0.0702	0	0	0	0	0.6126
Freight Loading Demand								
Peak Hour Spaces of Demand	0.54253472	0	0.03819444	0	0	0	0	0.58072917

Inbound

12 North Bay	Total	1 Downtown/ NorthBeach	2 SoMa	3 Marina/Western Market	4 Mission/Potrero	5 OuterMission/Hills	6 Bayshore	7 Richmond	8 Sunset	9 Islands	10 South Bay	11 East Bay	12 North Bay	Total
0	2	3	1	6	1	2	0	3	1	-	6	1	1	25
1	22	3	2	19	11	3	0	3	1	-	3	1	1	49
0	0	0	0	1	0	0	0	0	0	-	1	0	0	2
0	2	0	0	2	1	0	0	0	0	-	0	0	0	4
-	3	7	3	1	0	2	-	-	0	-	4	2	-	20
0	12	4	0	6	1	0	0	0	1	-	-	0	0	13
0	1	2	1	4	0	2	0	2	0	-	4	1	1	17
1	15	2	1	13	8	2	0	2	1	-	2	1	1	33
0	0	0	0	0	0	0	0	0	0	-	0	0	0	2
0	1	0	0	1	1	0	0	0	0	-	0	0	0	3

17	17	51	51	67	67		
3	1	9	4	12	6		
19	18	60	55	79	73		
	no 2x		no 2x		no 2x		

INSTRUCTIONS:FILL IN INPUTS IN GREEN CELLS UNDER *STEP 1* ONLY

STEP 1: USER INPUTS

Land Use	Res
Number of Bedrooms	565
1000s of Square Feet	312.5
Distribute By	Placetype
Place Type	2
District Number	3
District Name	arina/WesternMarket

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	4.5
Total Daily Person Trips	2543
PM Person Trip Rate	0.4
Total PM Person Trips	226

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	39%	88
Taxi TNC Split	4%	8
Public Transit	19%	43
Walk	34%	78
Bike	4%	9
	100%	225

INSTRUCTIONS:FILL IN INPUTS IN GREEN CELLS UNDER *STEP 1* ONLY

STEP 1: USER INPUTS

Land Use	Ret
1000s of Square Feet	3
Distribute By	District
Place Type	2
District Number	3
District Name	arina/WesternMarket

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	150
Total Daily Person Trips	450
PM Person Trip Rate	13.5
Total PM Person Trips	40.5

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	26%	10
Taxi TNC Split	1%	1
Public Transit	12%	5
Walk	58%	23
Bike	3%	1

Representative Building Type 4 - Place Type 2 Trip Generation

Person Trips by Mode

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Auto Split	11	-	7	-	-	-	-	18
Taxi TNC Split	1	-	0	-	-	-	-	1
Public Transit	5	-	3	-	-	-	-	9
Walk	10	-	16	-	-	-	-	25
Bike	1	-	1	-	-	-	-	2
	28		27					55

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.03408	0	0.0234	0	0	0	0	0.05748
Peak 15-minutes Spaces of Demand	0.06816	0	0.0468	0	0	0	0	0.11
Freight Loading Demand								
Peak Hour Spaces of Demand	0.07638889	0	0.02546296	0	0	0	0	0.10

Representative Building Type 4 - Place Type 2 Trip Generation

OD PERSON TRIPS BY TRIP PURPOSE AND DIRECTION - DISTRICT

Outbound

		1 Downtown/ NorthBeach	2 SoMa	3 Marina/Western Market	4 Mission/Potrero	5 OuterMission/Hills	6 Bayshore	7 Richmond	8 Sunset	9 Islands	10 South Bay	11 East Bay
Auto Person Trips	**PM Work Trips**	0	0	1	0	0	-	0	0	-	0	0
	PM Non-Work Trips	0	0	1	1	1	0	1	0	-	0	0
Taxi / TNC Person Trips	**PM Work Trips**	0	0	0	0	0	-	0	0	-	0	0
	PM Non-Work Trips	0	0	0	0	0	0	0	0	-	0	0
Transit Person Trips	**PM Work Trips**	0	0	0	0	-	-	-	0	-	0	0
	PM Non-Work Trips	1	0	1	1	0	-	0	0	-	0	0
Auto VehicleTrips*	**PM Work Trips**	0	0	0	0	0	-	0	0	-	0	0
	PM Non-Work Trips	0	0	1	0	0	0	1	0	-	0	0
Taxi / TNC Vehicle Trips*	**PM Work Trips**	0	0	0	0	0	-	0	0	-	0	0
	PM Non-Work Trips	0	0	0	0	0	0	0	0	-	0	0

*Auto vehicle trips based on rolling up of shared ride 2, shared ride 3, and drive alone person trips divided by an AVO of 2,3.5, and 1, respectively

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.03408	0	0.0234	0	0	0	0	0.05748
Peak 15-minutes Spaces of Demand	0.06816	0	0.0468	0	0	0	0	0.11
Freight Loading Demand								
Peak Hour Spaces of Demand	0.07638889	0	0.02546296	0	0	0	0	0.10

Inbound

12 North Bay	Total	1 Downtown/ NorthBeach	2 SoMa	3 Marina/Western Market	4 Mission/Potrero	5 OuterMission/Hills	6 Bayshore	7 Richmond	8 Sunset	9 Islands	10 South Bay	11 East Bay	12 North Bay	Total
0	1	0	0	1	0	0	0	1	0	-	1	0	0	4
0	5	1	0	3	1	1	0	1	0	-	0	0	0	8
0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
0	0	0	0	0	0	0	0	0	0	-	0	0	0	1
-	1	1	0	0	0	0	-	-	0	-	1	0	-	3
0	3	1	0	1	0	0	0	0	0	-	-	0	0	2
0	1	0	0	1	0	0	0	0	0	-	1	0	0	3
0	4	0	0	2	1	0	0	0	0	-	0	0	0	5
0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
0	0	0	0	0	0	0	0	0	0	-	0	0	0	0

4	4			8	8	12	12
1	0			1	1	2	1
5	5			9	9	14	13
	no 2x				no 2x		no 2x

INSTRUCTIONS:FILL IN INPUTS IN GREEN CELLS UNDER *STEP 1* ONLY

STEP 1: USER INPUTS

Land Use	Res
Number of Bedrooms	71
1000s of Square Feet	44
Distribute By	Placetype
Place Type	2
District Number	3
District Name	arina/WesternMarket

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	4.5
Total Daily Person Trips	320
PM Person Trip Rate	0.4
Total PM Person Trips	28.4

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	39%	11
Taxi TNC Split	4%	1
Public Transit	19%	5
Walk	34%	10
Bike	4%	1
	100%	28

INSTRUCTIONS:FILL IN INPUTS IN GREEN CELLS UNDER *STEP 1* ONLY

STEP 1: USER INPUTS

Land Use	Ret
1000s of Square Feet	2
Distribute By	District
Place Type	2
District Number	3
District Name	arina/WesternMarket

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	150
Total Daily Person Trips	300
PM Person Trip Rate	13.5
Total PM Person Trips	27

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	26%	7
Taxi TNC Split	1%	0
Public Transit	12%	3
Walk	58%	16
Bike	3%	1

Representative Building Types 5 & 6 - Place Type 2 Trip Generation

Person Trips by Mode

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Auto Split	6	-	-	-	-	-	-	6
Taxi TNC Split	1	-	-	-	-	-	-	1
Public Transit	3	-	-	-	-	-	-	3
Walk	6	-	-	-	-	-	-	6
Bike	1	-	-	-	-	-	-	1
	16							16

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.01968	0	0	0	0	0	0	0.01968
Peak 15-minutes Spaces of Demand	0.03936	0	0	0	0	0	0	0.04
Freight Loading Demand								
Peak Hour Spaces of Demand	0.04340278	0	0	0	0	0	0	0.04

Representative Building Types 5 & 6 - Place Type 2 Trip Generation

OD PERSON TRIPS BY TRIP PURPOSE AND DIRECTION - DISTRICT

Outbound

		1 Downtown/ NorthBeach	2 SoMa	3 Marina/Western Market	4 Mission/Potrero	5 OuterMission/Hills	6 Bayshore	7 Richmond	8 Sunset	9 Islands	10 South Bay	11 East Bay
Auto Person Trips	**PM Work Trips**	0	0	0	-	-	-	-	-	-	-	-
	PM Non-Work Trips	0	0	0	0	0	0	0	0	-	0	0
Taxi / TNC Person Trips	**PM Work Trips**	0	0	0	-	-	-	-	-	-	-	-
	PM Non-Work Trips	0	0	0	0	0	0	0	0	-	0	0
Transit Person Trips	**PM Work Trips**	0	0	0	-	-	-	-	0	-	-	-
	PM Non-Work Trips	0	0	0	0	-	-	0	-	-	0	0
Auto VehicleTrips*	**PM Work Trips**	0	0	0	-	-	-	-	-	-	-	-
	PM Non-Work Trips	0	0	0	0	0	0	0	0	-	0	0
Taxi / TNC Vehicle Trips*	**PM Work Trips**	0	0	0	-	-	-	-	-	-	-	-
	PM Non-Work Trips	0	0	0	0	0	0	0	0	-	0	0

*Auto vehicle trips based on rolling up of shared ride 2, shared ride 3, and drive alone person trips divided by an AVO of 2,3.5, and 1, respectively

Loading Demand

	Residential	Office	Retail	Restaurant (Quality Sit Down)	Restaurant (Composite)	Supermarket	Hotel	Total
Pax Loading Demand								
Peak Hour Spaces of Demand	0.01968	0	0	0	0	0	0	0.01968
Peak 15-minutes Spaces of Demand	0.03936	0	0	0	0	0	0	0.04
Freight Loading Demand								
Peak Hour Spaces of Demand	0.04340278	0	0	0	0	0	0	0.04

Inbound

12 North Bay	Total	1 Downtown/ NorthBeach	2 SoMa	3 Marina/Western Market	4 Mission/Potrero	5 OuterMission/Hills	6 Bayshore	7 Richmond	8 Sunset	9 Islands	10 South Bay	11 East Bay	12 North Bay	Total
-	0	0	0	0	0	0	0	0	0	-	0	0	0	2
0	1	0	0	1	1	0	0	0	0	-	0	0	0	3
-	0	0	0	0	0	0	0	0	0	-	0	0	0	0
0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
-	0	0	0	0	0	0	-	-	0	-	0	0	-	1
-	1	0	0	0	0	0	0	0	0	-	-	-	-	1
-	0	0	0	0	0	0	0	0	0	-	0	0	0	1
0	1	0	0	1	1	0	0	0	0	-	0	0	0	2
-	0	0	0	0	0	0	0	0	0	-	0	0	0	0
0	0	0	0	0	0	0	0	0	0	-	0	0	0	0

1	1			3	3	4	4
0	0			1	0	1	0
1	1			4	4	5	5
	no 2x				no 2x		no 2x

INSTRUCTIONS:FILL IN INPUTS IN GREEN CELLS UNDER *STEP 1* ONLY

STEP 1: USER INPUTS

Land Use	Res
Number of Bedrooms	41
1000s of Square Feet	25
Distribute By	Placetype
Place Type	2
District Number	3
District Name	arina/WesternMarket

STEP 2: PERSON TRIP GEN (UPDATED 2018) - PLACETYPE

Daily Person Trip Rate	4.5
Total Daily Person Trips	185
PM Person Trip Rate	0.4
Total PM Person Trips	16.4

STEP 3: PM MODE SPLIT (UPDATED 2018) - PLACETYPE

Auto Split	39%	6
Taxi TNC Split	4%	1
Public Transit	19%	3
Walk	34%	6
Bike	4%	1
	100%	16

APPENDIX G.5. TRANSIT ANALYSIS APPROACH AND RESULTS

San Francisco Housing Element 2022 Update – Transit Analysis Approach

Transit delay analysis was completed consistent with San Francisco Transportation Impact Analysis Guidelines for the Housing Element Environmental Impact Report. Transit capacity analysis was completed for informational purposes at the request of SFMTA to be used as a Fleet Needs Assessment. These two analyses were conducted in tandem and used the same underlying data and forecasts.

This document describes the analysis setup, the delay analysis approach, the delay analysis results, the capacity analysis approach, and the capacity analysis results. The analysis is based on a combination of observed data and outputs from the San Francisco County Transportation Authority's (SFCTA) SF-CHAMP travel demand model. CHAMP analysis is itself built on statistically significant data products such as the Census and the California Household Travel Survey. Therefore, real-world data underlies all assumptions in this analysis and observations were used to validate the outputs and check the reasonableness of the results. The transportation team determined that the delay and capacity results were reasonable for each of the land use scenarios studied as part of the Housing Element 2022 update.

Analysis Setup

The scale of the analysis, study scenarios, model types, and model inputs used to develop the future year (2035 and 2050) forecasts for the EIR are described below.

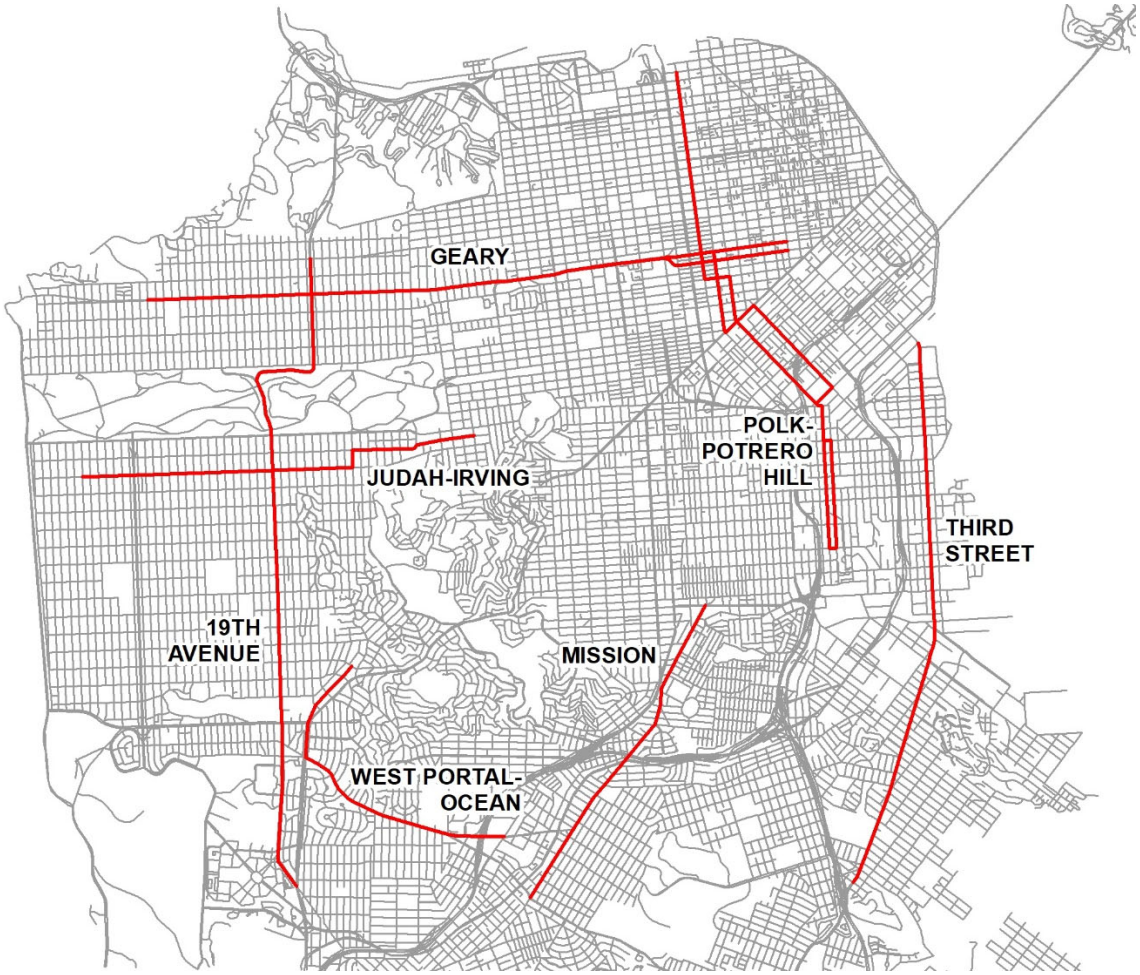
Analysis Scale

As outlined in the memorandum *San Francisco Housing Element Transportation Data Collection Methodology* (Fehr & Peers, February 24, 2021), the CEQA transit impact analysis focused on seven study corridors that provide a representative depiction of transportation conditions throughout San Francisco under the land use concepts. The Transportation Team, in coordination with the San Francisco Planning Department (Planning Department) and SFMTA, selected the seven representative study corridors shown in **Table 1** to represent a citywide cross-section of transportation facilities and land use types. The study corridors are listed below and shown with the selected representative streets within each corridor on **Figure 1**.

Table 1: Housing Element Study Corridors

Corridor Name	Muni Route	Begins At	Includes	Ends At
Geary	38 Geary/ 38R Geary Rapid	34th Avenue	Geary Boulevard, Geary Street, O'Farrell Street	Powell Street
Polk-Potrero Hill	19 Polk	North Point Street	Polk Street, Larkin Street, Hyde Street, Market Street, Seventh Street, Eighth Street, Rhode Island Street, De Haro Street	23rd Street
Third Street	T Third	Channel Street	Third Street	Le Conte Avenue
Mission	14 Mission/ 14R Mission Rapid	Cesar Chavez Street	Mission Street	Geneva Avenue
West Portal-Ocean	K Ingleside	Ulloa Street	West Portal Avenue, Junipero Serra Boulevard, Ocean Avenue	San Jose Avenue
19th Avenue	28 19th Avenue/ 28R 19th Avenue Rapid	California Street	Park-Presidio Boulevard, Crossover Drive, 19th Avenue	Junipero Serra Boulevard
Judah-Irving	N Judah	43rd Avenue	Judah Street, Irving Street, Carl Street	Cole Street

Figure 1: Housing Element Study Corridors



Analysis Scenarios

The Transportation Team analyzed SF-CHAMP model outputs for the following scenarios for the EIR impact analysis:

1. Existing conditions (2020)
2. 2035 and 2050 Baseline conditions (assumes a continuation of existing housing element plans and policies)
3. 2035 and 2050 Proposed Action
4. 2035 and 2050 Land Use Concept A – East Side
5. 2035 and 2050 Plan Bay Area 2050
6. 2050 Cumulative Scenario – Proposed Action + Waterfront Plan + Second Transbay Tube, Caltrain Business Plan, and Downtown Congestion Pricing (qualitative analysis only)

The existing conditions (2020) model outputs are used to describe the EIR existing conditions and compared to existing transit data. The remaining analysis scenarios allow for the development of 2035 and 2050 no project baseline conditions, and for a comparison of the no project baseline conditions to conditions under each land use concept for the EIR impact analysis.

Analysis Tools

The Transportation Team used two transportation models to prepare outputs for the transit delay analysis: the SF-CHAMP model and a Visum post-processing model.

Visum, developed by PTV Group, is a traffic analysis, travel demand forecasting, and GIS-based data-management software. The transportation team created a Visum model that serves as a GIS-based repository for the SF-CHAMP model's inputs and outputs, including land use tables, highway network, auto and transit assignment results, VMT results, etc. The Visum model was used to review the reasonableness of the SF-CHAMP model outputs, and to prepare visual and tabular summaries of the SF-CHAMP outputs for the EIR. Additionally, the Visum model was used to conduct the transit delay analysis for the Housing Element 2022 Update, by incorporating intersection capacities and revised assumptions provided by SFMTA for signal timing, transit-only lanes, and transit signal priority.

Public Transit Delay Approach

There are two components to transit travel time: dwell time and moving time. The dwell time includes the time for passengers to board or alight the transit vehicle. The moving time includes the time spent moving along a corridor and stopped at intersections or in congestion.

SF-CHAMP calculates the dwell time for each boarding and alighting. The Transportation Team adjusted the raw dwell time estimates from SF-CHAMP by using existing ridership data from Muni and forecasted ridership growth from SF-CHAMP to estimate future year ridership and dwell time, as described further under the Dwell Time section below.

In future year 2035 and 2050 scenarios, many of the transit study corridors are characterized by one or more of the following – planned bus-lane improvements, varying degrees of transit signal priority, and congested, mixed flow roadway conditions. These factors influence transit travel times in the future baseline and project alternative scenarios; however, travel time delays caused by congestion are not well captured in SF-CHAMP. To better account for these factors, the Transportation Team added additional calibration of the SF-CHAMP moving time outputs as described in the Moving Time section below.

Dwell Time

Ridership Calibration

Stop-level boards and alights are the key input to dwell time calculations. The Transportation Team applied the following steps to inbound and outbound routes in the AM and PM peak periods for each transit corridor to forecast future transit ridership.

Ridership Data Inputs

The ridership forecast drew on multiple data sources. Muni Metro (light rail) ridership data from 2016 was used as the light rail baseline. A combination of Muni bus ridership data from January/February 2020 and 2015 was used as the bus baseline.[1] The ridership forecast used SF-CHAMP outputs for future Housing Element baselines and land use concepts to scale the Muni transit ridership baseline in order to determine a forecast.

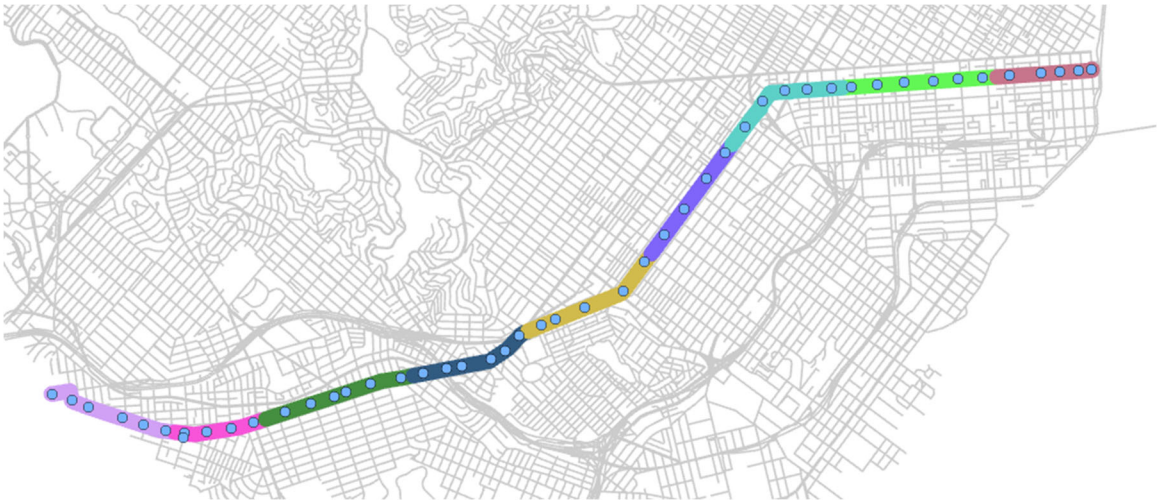
Segment Aggregation and Data Cleanup

The Transportation Team divided each Muni study corridor into segments. The rationale for using segments is primarily because there is not a one-to-one relationship between Muni 2020 stop locations, CHAMP 2020 baseline stop locations, and future year CHAMP stop locations. This is both a product of slight disagreement between Muni and CHAMP, and anticipated trends toward

[1] Muni Metro 2016 ridership data provided by SFMTA on March 12, 2021; Muni bus 2015 and 2019 ridership data provided by SFMTA on August 30, 2021.

stop consolidation and relocation in the future. Segment breakpoints were determined by considering service patterns (such as short patterns), major transfer points, and long stretches without stops, with a goal of 3-7 stops per segment, depending on the stop density. As an example, segments for the 14 Mission corridor are shown below.

Figure 2: Mission Corridor Study Segments



Muni stop-level data, CHAMP stop-level data, and raw automated passenger counter (APC) data were associated with a segment by route and direction using GIS spatial referencing tools.

All data were aggregated to both the segment level and route level for the AM and PM peak periods. Due to small discrepancies in both observed data and modeled SF-CHAMP outputs, both boards and alights were set to the larger of the two.

Exceptions

The K Ingleside and T Third Street Muni Metro routes occupy a unique place in this methodology, as they are currently interlined, but will not be so in the future. To compensate, this analysis made two modifications to the K and T data:

- Due to its interlining with the K, the T currently has a reversed directionality, where Sunnydale is inbound and downtown is outbound. This directionality was preserved in all baselines and land use concepts, even when the T is not interlined, for the sake of consistency. Therefore, "inbound T" should always be interpreted as the southbound T towards Sunnydale.
- In order to scale ridership on the K and T in future baseline and land use concept, it is necessary to have a separate K and T in 2020 for comparison. This was achieved by

artificially splitting the K and T along the Market Street Subway. All boards and alights between Metro Van Ness and Metro Embarcadero stations were divided between the two routes based on the direction of travel. All outbound boards and inbound alights were assigned to the K and all inbound boards and outbound alights were assigned to the T. The route-level boards and alights were then adjusted to be the larger of the two, in line with the methodology noted above.

Ridership Scaling

For the purpose of this analysis, "ridership" refers to the boards and alights for a given transit route, either at the stop, segment, or route scale.

Future-year transit ridership was forecast at the route-level. A scaling factor was developed by dividing Muni 2020 route-level ridership by the SF-CHAMP 2020 baseline route-level outputs. These scaling factors were applied to all future year SF-CHAMP baselines and land use concepts to generate scaled route-level ridership for each baseline or concept, in the AM and PM peak periods in the inbound and outbound directions.

Exceptions

An irregularity was noticed with the 28R 19th Avenue Rapid PM data in the outbound direction. Due to abnormally high Muni 2020 route-level ridership data and abnormally low SF-CHAMP 2020 baseline route-level outputs, the resulting scaling factor indicated that future-year CHAMP outputs should be scaled up by 23%. This is in contrast to the scaling factors for the other three time period/direction combinations, which indicated that future-year CHAMP outputs should be scaled down by 30-60%. This PM outbound scaling factor produced unreasonably high ridership estimates in the future, and it was determined that the scaling factor as calculated was the result of errors in either the Muni data or CHAMP outputs and was not representative of true future-year conditions. In order to produce a reasonable replacement scaling factor, the average of the other three time period/direction combinations was used to reflect appropriate scaling for the route as a whole.

Segment-level and Stop-level Ridership Generation

Muni observed board and alight data at the segment- and route-level were used to determine the proportion of route-level boards and alights that each segment represents. The same was done with SF-CHAMP outputs in all baseline and land use concepts. The data sources were averaged together to produce final board and alight splits by segment. These board and alight splits by segment were used to proportionally distribute the scaled route-level boards and alights among the segments.

Due to changes in routing and stop locations, only SF-CHAMP boards and alights for the appropriate baseline or land use concept were used to produce similar board and alight splits by

stop within each segment. These splits were used to proportionally distribute the scaled segment-level boards and alights among the stops within the segment. If SF-CHAMP reported no boards or alights in a given segment, the split was assumed to be equal between all stops in the segment.

Lastly, the number of buses in a peak period as assumed by SF-CHAMP was used to produce average stop-level boards and alights by peak period run, in addition to the aggregate boards and alights for the entire three-hour peak period produced above.

Exceptions

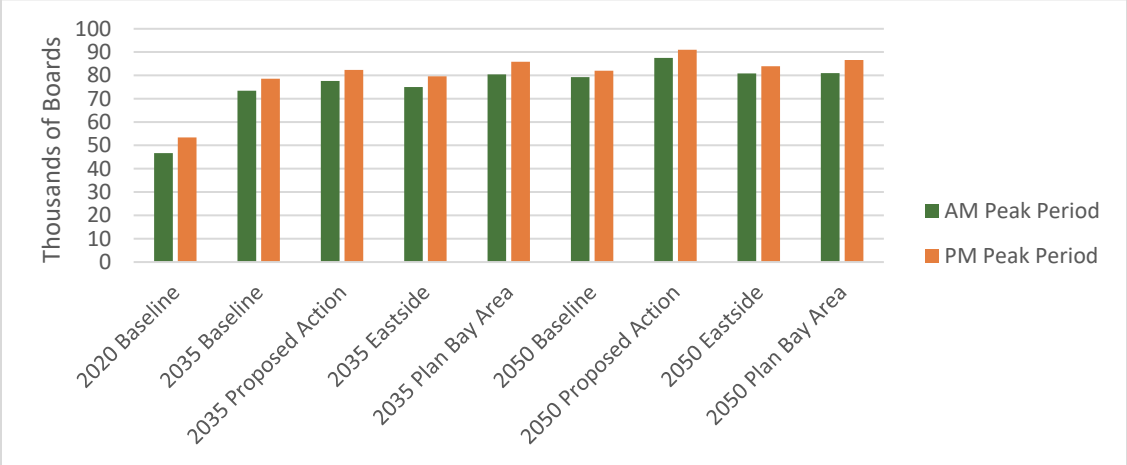
When producing segment-level boards and alights, some routes simply used the reported SF-CHAMP splits rather than averaging them with the Muni 2020 splits. This is a result of routing differences that would make using the Muni 2020 data unreasonable. As an example, the available Muni data for the 5 Fulton includes boards and alights all the way to Ocean Beach, while the SF-CHAMP data assumes the bus to stop at Eighth Avenue; therefore, SF-CHAMP splits were used in all baselines and land use concepts, including the 2020 baseline. In the case of five other routes, the future routing assumed in SF-CHAMP differs significantly from the existing routing: the K, T, 19, 47, and 28R; therefore, SF-CHAMP splits were used in all future year baselines and land use concepts.

Ridership Forecast Results

The high-level transit ridership forecasts align with trends observed in the broader Housing Element Update travel demand analysis. As shown in **Figure 3**, total boards for all study routes increase substantially between the 2020 Existing Baseline and 2035 Midpoint Baseline. Of the three 2035 land use scenarios, the Plan Bay Area scenario adds the most ridership to the study corridors, followed by the Proposed Action scenario. The Eastside scenario does not substantially change ridership in the study corridors (which are skewed more towards the west side) when compared to the 2035 Midpoint Baseline.

The 2050 Environmental Baseline sees higher ridership than the 2035 Midpoint Baseline, but the increase between the two analysis years is not as great as the increase between 2020 Existing and the 2035 Midpoint Baseline. This likely reflects the substantial investment in transit upgrades (service increases, transit-only lanes, signal priority, etc.) before 2035 and then no known further upgrades between 2035 and 2050. By 2050, the Proposed Action scenario adds more ridership to the study corridors than either the Eastside or Plan Bay Area scenarios.

Figure 3: Total Boards for All Study Routes by Land Use Concept



Dwell Time Calculation

Dwell times were calculated using the method prescribed by SF-CHAMP. Due to their more streamlined boarding experience, SF-CHAMP assumes a constant dwell time per stop for all Muni Metro lines. As a result, Muni Metro lines do not see a change in future dwell time. For bus routes, SF-CHAMP assumes a constant delay time per stop based on transit vehicle type that is unaffected by ridership, as well as a delay time per board and a delay time per alight. The full equation is:

$$Stop\ dwell\ time = constant\ delay + (delay\ per\ board * boards) + (delay\ per\ alight * alights)$$

Moving Time

The moving time adjustments incorporate intersection capacities and traffic signal delay to supplement the link-level capacities and delay estimated by the SF-CHAMP model.

This was achieved by coding the intersection lane configuration and control type (signalized, two-way stop etc.) for intersections along the study corridor in the Visum platform. Based on the lane configurations, typical capacities were assigned to individual turning movements at the intersection. The intersection capacity is estimated as follows:

$$Intersection\ Capacity\ (C) = K * (sum\ of\ entering\ lane\ capacities)$$

Where the coefficient 'K' is used to simulate the effect that a green time-to-cycle length (g/C) ratio has at a signalized intersection. Typical values for K are in the range of 0.4 to 0.6 – when similar roadway classes intersect, the g/C ratio is typically even (around 0.5), and as the class difference between intersecting roadways increases, the g/C ratio increases for the major facility and decreases for the minor facility.

Next, the *TModel*[2] methodology was applied in the Visum model to estimate the delay at the intersection based on the following relationship:

$$Intersection\ Delay\ (t) = a + d * \left(\frac{V}{C} + f\right)^{b}$$

Where:

V = entering volume at the intersection
C = intersection capacity

The parameters of the turn delay equation are based on typical values in published research and previously calibrated models[3] and include a step function to better model the effects of increased delay once a defined saturation (V/C) threshold is exceeded. Typical parameters for signalized intersection are below:

	a	**d**	**f**	**b**
V/C <= 0.95	1	15	0.05	3.6
V/C > 0.95	3	15	0.05	5

The transit travel times were further adjusted to incorporate the effect of transit-only lanes and transit signal priority:

- Transit only lanes – to account for buses bypassing vehicle queues, delay was estimated based on the cycle length of the intersection, typical green times and the arrival (uniformly distributed) of the bus at the intersection.
- Transit signal priority (TSP) – travel time savings for transit signal priority was based on assumptions confirmed by SFMTA.

The transit-only lane and transit signal priority assumptions for existing and future year conditions are presented in Attachment A. All planned transit-only lane and transit signal improvements are planned to be in place by 2035, which means that they would also be in place in 2050.

The final moving time estimate is the sum of the link-level moving time, intersection/turn delay, transit-lane adjustments, and TSP adjustments.

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[2] TMODEL Reports, Volume 6, Number 1, TMODEL Corporation, Vashon, WA, April 1996.
Travel Model Speed Estimation and Post Processing Methods for Air Quality Analysis, Travel Model Improvement Program (TMIP), October 1997. Travel Demand Model Documentation, 2018 Update, YVCOG, 2018

[3] City of South San Francisco Sub-Area Travel Demand Model, Fehr & Peers, 2020
Travel Demand Model Documentation, 2018 Update, YVCOG, 2018. Comprehensive Transportation Study for City of Deming/Luna County, WHPacific, 2009

Total Travel Time

The final travel time estimate for the corridor is the sum of all the segment level moving times and individual stop dwell times.

Travel Time Forecasting Results

Travel time forecasts and deltas between the 2020, 2035, and 2050 analysis years confirm the effectiveness of SFMTA's transit improvement plans, particularly those illustrated in Attachment A. As seen in **Table 2** and **Table 3,** all transit routes in the study corridors are faster in 2035 than observed travel times in the 2020 Existing (pre-Covid) baseline. Travel times slow somewhat by 2050, but all 2050 Environmental Baseline travel times are still faster than 2020 observed travel times for the routes in the study corridors. Land use concepts (Eastside, Plan Bay Area, and Proposed) generally add travel time when compared to the 2035 and 2050 baseline scenarios (there are a few exceptions such as the K Ingleside in the Eastside scenario, which is equal to the baseline travel time or a few seconds quicker than in the relevant baseline).

The Plan Bay Area and Proposed Action scenarios show the greatest travel time increases in the corridors when compared to the 2035 and 2050 baseline scenarios. The Geary corridor shows travel times increases under both scenarios while other travel time effects are scenario-specific; the T-Third is slowest with the Eastside and Plan Bay Area scenarios while the 28 19th Avenue is slowest with the Proposed Action scenario. Because of route changes to the 19 Polk in the Civic Center area by 2035 midpoint conditions, the total travel distance will be less than under existing conditions. Thus, due to the route alignment changes, the existing and future travel times are not comparable.

Notes: IB = inbound, OB = outbound. Within each row, a green-to-red spectrum is used to show the quickest and slowest travel times. The 19 Polk bus route extends between North Point and 23rd streets. Because of route changes in the Civic Center area by 2050 environmental baseline conditions, the total travel distance will be less than under 2020 conditions. Thus, due to the route alignment changes, the 2020 and 2050 environmental baseline conditions are not comparable.

Table 4 shows moving time and dwell time deltas separately when comparing each of the 2050 land use concepts with the 2050 Environmental Baseline. As shown in this table, vehicle congestion (or moving time delay) is the predominant factor contributing to transit delay rather than additional transit ridership (or dwell time delay).

Table 2: AM Total Travel Time by Route and Land Use Concept

	AM								
	2020	2035				2050			
Route	Observed	Baseline	Eastside	PBA	Proposed	Baseline	Eastside	PBA	Proposed
14 Mission IB	20:18	15:42	15:41	15:36	15:42	15:53	15:49	16:06	15:57
14 Mission OB	17:12	13:06	13:10	13:19	13:06	13:28	13:30	13:49	13:30
14R Mission Rapid IB	15:48	12:17	12:14	12:14	12:15	12:26	12:22	12:44	12:32
14R Mission Rapid OB	13:30	10:06	10:07	10:13	10:06	10:24	10:24	10:43	10:27
19 Polk IB (2020)	52:06								
19 Polk OB (2020)	46:42								
19 Polk IB (Future)		37:53	38:49	40:14	37:46	40:12	42:50	45:02	40:45
19 Polk OB (Future)		33:07	34:07	36:31	33:15	36:06	38:49	41:26	36:51
28 19th Avenue IB	33:12	29:41	29:50	29:52	30:25	30:17	30:35	30:54	31:45
28 19th Avenue OB	27:18	23:43	23:44	24:03	24:18	24:04	24:18	25:00	25:25
28R 19th Avenue Rapid IB	28:00	25:13	25:18	25:33	25:42	25:43	25:51	26:27	26:46
28R 19th Avenue OB	28:30	25:46	25:53	26:11	26:19	26:22	26:33	27:11	27:33
38 Geary IB	27:36	22:32	22:40	23:51	23:54	22:53	23:20	25:04	24:57
38 Geary OB	34:24	30:46	30:53	32:22	32:00	31:13	31:35	33:28	33:02
38R Geary Rapid IB	22:18	20:47	21:00	22:36	22:28	21:12	21:47	23:50	23:53
38R Geary Rapid OB	28:42	27:54	28:02	29:14	29:05	28:21	28:47	30:19	30:05
K Ingleside IB	22:54	17:06	17:05	17:11	17:13	17:07	17:07	17:16	17:27
K Ingleside OB	19:12	14:31	14:31	14:36	14:38	14:32	14:32	14:41	14:52
N Judah IB	19:06	16:19	16:20	16:21	16:33	16:26	16:27	16:40	17:00
N Judah OB	16:30	14:05	14:05	14:09	14:16	14:11	14:12	14:25	14:29
T Third IB	27:42	26:30	26:40	28:04	26:41	27:19	27:45	30:23	27:45
T Third OB	28:24	27:21	27:31	28:53	27:30	28:17	28:43	31:23	28:41

Notes: IB = inbound, OB = outbound.
Within each row, a green-to-red spectrum is used to show the quickest and slowest travel times.
The 19 Polk bus route extends between North Point and 23rd streets. Because of route changes in the Civic Center area by 2050 environmental baseline conditions, the total travel distance will be less than under 2020 conditions. Thus, due to the route alignment changes, the 2020 and 2050 environmental baseline conditions are not comparable.

Table 3: PM Total Travel Time by Route and Land Use Concept

	PM								
	2020	2035				2050			
Route	Observed	Baseline	Eastside	PBA	Proposed	Baseline	Eastside	PBA	Proposed
14 Mission IB	21:30	20:17	20:19	20:22	20:23	20:26	20:23	20:53	20:41
14 Mission OB	21:42	18:33	18:36	18:31	18:36	18:48	18:50	19:02	18:55
14R Mission Rapid IB	15:18	12:45	12:49	12:47	12:50	13:00	13:00	13:17	13:10
14R Mission Rapid OB	16:36	14:45	14:51	14:41	14:50	15:01	15:01	15:12	15:10
19 Polk IB (2020)	57:12								
19 Polk OB (2020)	52:18								
19 Polk IB (Future)		41:40	42:39	44:32	41:52	44:57	48:18	50:44	46:28
19 Polk OB (Future)		40:54	42:03	43:03	40:30	44:15	48:33	50:31	45:12
28 19th Avenue IB	33:24	29:37	29:39	29:49	30:28	29:57	30:18	30:59	32:07
28 19th Avenue OB	33:48	31:05	31:05	31:12	32:04	31:32	31:48	32:26	33:44
28R 19th Avenue Rapid IB	22:30	20:17	20:27	20:33	21:13	20:36	20:50	21:32	22:29
28R 19th Avenue OB	31:48	29:07	29:13	29:34	29:58	29:37	29:50	30:40	31:20
38 Geary IB	31:06	25:39	25:51	27:10	26:52	26:10	26:41	28:27	27:55
38 Geary OB	38:00	33:48	34:01	34:58	34:59	34:16	34:47	36:18	36:01
38R Geary Rapid IB	25:30	22:43	22:56	24:04	23:53	23:19	23:48	25:21	25:07
38R Geary Rapid OB	30:42	29:47	30:00	31:11	31:17	30:07	30:45	32:31	32:38
K Ingleside IB	23:42	16:03	16:04	16:09	16:14	16:08	16:06	16:26	16:36
K Ingleside OB	21:24	14:56	14:56	15:02	15:07	15:00	14:59	15:19	15:28
N Judah IB	18:18	15:39	15:39	15:41	15:52	15:44	15:48	16:11	16:18
N Judah OB	18:36	16:13	16:13	16:11	16:31	16:20	16:23	16:48	17:09
T Third IB	27:24	26:30	26:37	27:48	26:37	27:13	27:41	29:52	27:39
T Third OB	30:00	29:06	29:14	30:25	29:12	29:48	30:19	32:29	30:13

Notes: IB = inbound, OB = outbound. Within each row, a green-to-red spectrum is used to show the quickest and slowest travel times. The 19 Polk bus route extends between North Point and 23rd streets. Because of route changes in the Civic Center area by 2050 environmental baseline conditions, the total travel distance will be less than under 2020 conditions. Thus, due to the route alignment changes, the 2020 and 2050 environmental baseline conditions are not comparable.

Table 4: Change in Travel Time from 2050 Baseline by Route and Land Use Concept
(decimal minutes)

Notes: shading is used to highlight the largest travel time changes
IB = inbound, OB = outbound. The 19 Polk bus route extends between North Point and 23rd streets. Because of route changes in the Civic Center area by 2050 environmental baseline conditions, the total travel distance will be less than under 2020 conditions. Thus, due to the route alignment changes, the 2020 and 2050 environmental baseline conditions are not comparable.

	AM						PM					
	Proposed Action 2050		Plan Bay Area 2050		Eastside 2050		Proposed Action 2050		Plan Bay Area 2050		Eastside 2050	
Route	Moving	Dwell	Moving	Dwell	Moving	Dwell	Moving	Dwell	Moving	Dwell	Moving	Dwell
14 Mission IB	0.1	0.0	0.3	-0.1	0.0	-0.1	0.1	0.1	0.2	0.3	0.1	-0.1
14 Mission OB	0.1	-0.1	0.3	0.0	0.0	0.0	0.1	0.0	0.2	0.1	0.1	0.0
14R Mission Rapid IB	0.1	0.0	0.3	0.0	0.0	-0.1	0.1	0.1	0.2	0.1	0.1	-0.1
14R Mission Rapid OB	0.1	0.0	0.3	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.1	-0.1
19 Polk IB (2020)	0.5	0.0	4.4	0.4	2.6	0.1	1.4	0.1	5.1	0.7	3.5	-0.1
19 Polk OB (2020)	0.7	0.0	4.8	0.6	2.8	-0.1	0.9	0.1	5.8	0.5	4.1	0.2
19 Polk IB (Future)	1.1	0.4	0.6	0.0	0.2	0.1	1.7	0.4	0.8	0.2	0.3	0.1
19 Polk OB (Future)	1.0	0.4	0.6	0.3	0.2	0.1	1.8	0.4	0.8	0.1	0.3	0.0
28 19th Avenue IB	1.0	0.1	0.6	0.1	0.1	0.0	1.7	0.2	0.8	0.1	0.2	0.0
28 19th Avenue OB	1.0	0.2	0.6	0.2	0.1	0.1	1.7	0.0	0.8	0.2	0.2	0.0
28R 19th Avenue Rapid IB	1.8	0.3	2.0	0.2	0.5	0.0	1.5	0.3	1.7	0.6	0.5	0.0
28R 19th Avenue OB	1.6	0.3	1.7	0.5	0.4	0.0	1.6	0.2	1.8	0.3	0.5	0.0
38 Geary IB	1.8	0.9	2.0	0.7	0.5	0.1	1.5	0.3	1.7	0.3	0.5	0.0
38 Geary OB	1.6	0.2	1.7	0.3	0.4	0.1	1.6	0.9	1.8	0.6	0.5	0.1
38R Geary Rapid IB	0.3	0.0	0.1	0.0	0.0	0.0	0.5	0.0	0.3	0.0	0.0	0.0
38R Geary Rapid OB	0.3	0.0	0.1	0.0	0.0	0.0	0.5	0.0	0.3	0.0	0.0	0.0
K Ingleside IB	0.6	0.0	0.2	0.0	0.0	0.0	0.6	0.0	0.5	0.0	0.1	0.0
K Ingleside OB	0.3	0.0	0.2	0.0	0.0	0.0	0.8	0.0	0.5	0.0	0.1	0.0
N Judah IB	0.4	0.0	3.1	0.0	0.4	0.0	0.4	0.0	2.7	0.0	0.5	0.0
N Judah OB	0.4	0.0	3.1	0.0	0.4	0.0	0.4	0.0	2.7	0.0	0.5	0.0

Public Transit Capacity Approach

The capacity analysis and Fleet Needs Assessment compare the ridership forecasts described in the delay section above to bus or train passenger capacity. This analysis was completed for the AM and PM weekday peak hours and evaluated for the average bus or train during the peak hour. Capacity results are presented for the 2035 Midpoint and 2050 Environmental Baseline.

Capacity was evaluated for the routes on the Housing Element Corridors as well as eight additional corridors jointly selected with SFMTA including:

1. Van Ness Avenue – 47 and 49
2. Fulton – 5 and 5R
3. Bayshore – 8
4. Sunset – 29
5. Haight/Noriega – 7
6. Ocean – M
7. Taraval – L
8. O'Shaughnessy – 44

Defining Capacity

Muni uses three capacity values in their planning work:

- Planning Capacity – used to schedule service and measure utilization in the near future
- Crowding Capacity – used to measure the percent of trips where crowding is experienced and for longer-term planning
- Crush Capacity – used to measure runs where passengers can no longer board due to overcrowding

Passenger Capacity Standards (December 2019)

Vehicle Type		Seats	Standing Sq. Ft.	Running Board (Cable Car)	Total Load		
					Planning Capacity	Crowding Capacity	Crush Capacity
					4.5 ft^2/s	3.0 ft^2/s	1.5 ft^2/s
Rubber Tire	32 ft Bus	24	41.0		33	38	51
	40 ft Bus	31	59.6		44	51	71
	60 ft Bus	44	111.3		69	81	118
					3.7 ft^2/s	2.7 ft^2/s	1.8 ft^2/s
Rail	LRV	60	292.1		139	168	222
	Streetcar	33	132.0		69	82	106
	Cable Car (Powell)	30	28.8	14	52	55	60
	Cable Car (California)	36	28.8	16	60	63	68

Total Load = Total seated & standing passengers for specified capacity.

- ft^2/s = square feet per standing passenger [A lower value equates to less space per person.]
- = seats + (standing sq. ft. / sq. ft. per standing passenger)
- For cable cars, the total load includes passengers standing on the running boards.

For 40' & 60' buses, LRVs, and streetcars, the number of seats and the standing sq. ft. are based on a representative vehicle from each sub fleet.

The calculation parameters for each capacity level are shown in in the table above, which is an excerpt from SFMTA's Vehicle Capacity Standards.

Transit Capacity Results

The transportation team included the Crowding Capacity, Crush Capacity and CHAMP capacity (which falls somewhere between Crowding and Crush) values in the analysis for the Housing Element. The Crush Capacity is included to test whether transit access breaks down with the Housing Element. The results shown on the following pages confirm that no routes exceed Crush Capacity because of the Housing Element.

The Crowding Capacity is used for the Fleet Needs Assessment and is the basis of the utilization values presented in the results table. The results confirm that some routes will exceed Crowding Capacity with the Housing Element. A little over one-third of the routes that exceed capacity with the Housing Element also exceed capacity in the 2035 or 2050 Baseline.

San Francisco Housing Element 2022 Update

TRANSIT FLEET NEEDS ASSESSMENT - 2035

This analysis assumes perfect spreading in ridership across the peak period. Ridership represents an average bus during the peak period and is based on CHAMP ridership that has been adjusted using observed, pre-pandemic Muni data.

Inbound

		Existing Ridership	Existing Capacity	Existing MLP	Baseline Ridership	Baseline Capacity	Baseline MLP	Proposed Action Ridership	Proposed Action MLP	PBA Ridership	PBA MLP	LUC A Ridership	LUC A MLP	Existing Utilization	Baseline Utilization	Proposed Action Utilization	PBA Utilization	LUC A Utilization
		2020_Base	2020_Ba	2020_Baseline	2035_Base	2035_Bas	2035_Baseline	2035_Proj	2035_ProposedAction	2035_Scer	2035_ScenarioD_pba2040	2035_Scen	2035_ScenarioA					
Weekday AM																		
CEQA Routes																		
38 Geary	38	61	81	Larkin/O Farrell	20	81	Geary/Scott	23	Geary/Peter Yorke/Gough	21	Geary/Scott	21	Geary/Scott	75%	25%	28%	26%	25%
38R Geary Rapid	38R	68	81	Van Ness/O Farrell	55	81	Geary/Fillmore	63	Geary/Fillmore	70	Geary/Fillmore	56	Geary/Fillmore	84%	68%	78%	87%	69%
19 Polk/Future Route TBD	19	41	51	Townsend/7th	8	51	De Haro/16th	8	Townsend/7th	21	Brannan/7th	9	Townsend/7th	81%	16%	16%	41%	19%
T Third*	T	156	168	Muni Van Ness Station	309	336	CS Stockton/Geary	317	CS Stockton/Geary	269	CS Stockton/Geary	309	CS Stockton/Geary	93%	92%	94%	80%	92%
14 Mission	14	37	81	26th/Mission	46	81	26th/Mission	46	26th/Mission	43	30th/Mission	45	26th/Mission	46%	56%	57%	53%	56%
14R Mission Rapid	14R	51	81	30th/Mission	83	81	30th/Mission	83	30th/Mission	79	30th/Mission	82	30th/Mission	63%	103%	103%	98%	101%
K Ingleside	K	156	168	Muni Van Ness Station	124	168	Muni Van Ness Station	139	Muni Van Ness Station	131	Muni Van Ness Station	127	Muni Van Ness Station	93%	74%	83%	78%	76%
28 19th Avenue**	28	37	51	Banbury/19th	30	51	19th/Junipero Serra	31	19th/Junipero Serra	31	19th/Junipero Serra	29	19th/Junipero Serra	72%	59%	60%	61%	56%
28R 19th Avenue Rapid***	28R	13	51	Banbury/19th	30	51	Mission/Geneva	29	Mission/Geneva	33	Mission/Geneva	29	Mission/Geneva	25%	59%	57%	64%	57%
N Judah	N	189	336	Muni Van Ness Station	217	504	Muni Van Ness Station	253	Muni Van Ness Station	250	Muni Van Ness Station	225	Muni Van Ness Station	56%	43%	50%	50%	45%
Non-CEQA Routes																		
47 Van Ness****	47	34	51	Van Ness/Mc Allister	26	81	Market/Van Ness	28	Market/Van Ness	24	Market/Van Ness	30	Market/Van Ness	66%	33%	34%	29%	37%
49 Van Ness/Mission	49	45	81	14th/Mission	37	81	Market/Van Ness	37	Market/Van Ness	41	Market/Van Ness	37	Market/Van Ness	55%	46%	46%	51%	46%
5 Fulton	5	46	51	Mc Allister/Laguna	21	51	Mc Allister/Fillmore	22	Mc Allister/Fillmore	27	Mc Allister/Laguna	21	Mc Allister/Laguna	91%	42%	43%	53%	40%
5R Fulton Rapid	5R	28	51	Mc Allister/Fillmore	32	51	Mc Allister/Fillmore	33	Mc Allister/Fillmore	37	Mc Allister/Fillmore	33	Mc Allister/Fillmore	55%	63%	65%	72%	64%
8 Bayshore^	8	43	81	Bryant/I-80 E Off-ramp/4th	37	81	San Bruno/Silver	39	San Bruno/Silver	37	San Bruno/Silver	38	6th/Bryant	54%	46%	48%	45%	46%
29 Sunset^^	29	34	51	Meda/Ocean/Otsego	25	51	Ocean/Watson	25	Cayuga/Ocean	22	Cayuga/Ocean	24	Cayuga/Ocean	66%	49%	49%	44%	47%
7 Haight/Noriega	7	35	81	Haight/Laguna	54	81	Haight/Laguna	56	Haight/Laguna	57	Haight/Laguna	52	Haight/Laguna	43%	66%	69%	70%	65%
M Ocean	M	125	336	Muni Church Station	154	336	Muni Church Station	166	Muni Church Station	180	Muni Church Station	165	Muni Church Station	37%	46%	49%	54%	49%
L Taraval	L	147	336	Muni Church Station	180	336	Muni Church Station	209	Muni Church Station	187	Muni Church Station	182	Muni Church Station	44%	54%	62%	56%	54%
44 O'Shaugnessy^^^	44	67	51	Bosworth/Still/Lyell	52	51	Bosworth/Still/Lyell	48	Bosworth/Still/Lyell	57	Cayuga/Rousseau	51	Bosworth/Still/Lyell	131%	101%	95%	112%	101%
Weekday PM																		
		2020_Base	2020_Ba	2020_Baseline	2035_Base	2035_Bas	2035_Baseline	2035_Proj	2035_ProposedAction	2035_Scer	2035_ScenarioD_pba2040	2035_Scen	2035_ScenarioA					
CEQA Routes																		
38 Geary	38	79	81	Van Ness/O Farrell	21	81	Geary/Peter Yorke/Gough/S	24	Geary/Peter Yorke/Gough	32	Geary/Peter Yorke/Gough/S	21	Geary/Peter Yorke/Gough/St	97%	26%	29%	39%	26%
38R Geary Rapid	38R	48	81	Van Ness/O Farrell	33	81	Van Ness/O Farrell	36	Van Ness/O Farrell	42	Van Ness/O Farrell	33	Van Ness/O Farrell	59%	41%	44%	52%	41%
19 Polk/Future Route TBD	19	35	51	Bryant/I-80 E Off-ramp/7th	8	51	7th/Harrison	8	7th/Harrison	31	7th/Harrison	8	7th/Harrison	68%	17%	15%	61%	15%
T Third*	T	108	168	Embarcadero/Brannan	210	336	3rd/20th	211	3rd/20th	244	3rd/20th	217	3rd/20th	64%	62%	63%	73%	65%
14 Mission	14	64	81	15th/Mission	73	81	Mission/20th	77	Mission/20th	76	26th/Mission	75	Mission/20th	79%	90%	95%	93%	92%
14R Mission Rapid	14R	31	81	Mission/11th	44	81	30th/Mission	46	30th/Mission	46	30th/Mission	44	30th/Mission	38%	54%	57%	56%	55%
K Ingleside	K	108	168	Embarcadero/Brannan	49	168	Muni Van Ness Station	53	Muni Van Ness Station	68	Muni Van Ness Station	52	Muni Van Ness Station	64%	29%	31%	41%	31%
28 19th Avenue**	28	24	51	Taraval/19th	20	51	Taraval/19th	21	Taraval/19th	22	Taraval/19th	20	Taraval/19th	47%	39%	42%	42%	40%
28R 19th Avenue Rapid***	28R	10	51	19th/Judah	30	51	I-280 N Off-ramp/I-280 N O	32	I-280 N Off-ramp/I-280 N	19	I-280 N Off-ramp/I-280 N O	33	I-280 N Off-ramp/I-280 N On	20%	59%	63%	37%	66%
N Judah	N	78	336	Duboce/Noe	100	504	Muni Van Ness Station	111	Muni Van Ness Station	100	Muni Van Ness Station	103	Muni Van Ness Station	23%	20%	22%	20%	20%
Non-CEQA Routes																		
47 Van Ness****	47	33	51	Van Ness/Mc Allister	33	81	Market/Van Ness	35	Van Ness/O Farrell	34	Van Ness/O Farrell	35	Van Ness/O Farrell	64%	41%	43%	42%	43%
49 Van Ness/Mission	49	43	81	Van Ness/Mc Allister	39	81	Market/Van Ness	39	Van Ness/Mc Allister	40	Van Ness/Mc Allister	41	Van Ness/Mc Allister	53%	48%	48%	50%	51%
5 Fulton	5	18	51	Van Ness/Mc Allister	12	51	Mc Allister/Laguna	12	Mc Allister/Laguna	13	Mc Allister/Laguna	13	Mc Allister/Laguna	36%	23%	24%	26%	25%
5R Fulton Rapid	5R	16	51	Van Ness/Mc Allister	18	51	Van Ness/Mc Allister	19	Mc Allister/Fillmore	23	Van Ness/Mc Allister	19	Van Ness/Mc Allister	32%	36%	37%	44%	38%
8 Bayshore^	8	45	81	Naples/Geneva	46	81	Naples/Geneva	46	Naples/Geneva	56	Naples/Geneva	46	Naples/Geneva	56%	56%	56%	70%	57%
29 Sunset^^	29	29	51	Phelan/Ocean/Geneva	27	51	Phelan/Ocean/Geneva	29	Phelan/Ocean/Geneva	23	Plymouth/Holloway	27	Phelan/Ocean/Geneva	58%	53%	57%	46%	54%
7 Haight/Noriega	7	33	81	Haight/Laguna	39	81	Haight/Laguna	42	Haight/Laguna	45	Haight/Laguna	41	Haight/Laguna	41%	48%	52%	55%	50%
M Ocean	M	58	336	Muni Van Ness Station	78	336	Muni Van Ness Station	81	Muni Van Ness Station	107	Muni Van Ness Station	82	Muni Van Ness Station	17%	23%	24%	32%	24%
L Taraval	L	43	336	Muni Van Ness Station	63	336	Muni Van Ness Station	68	Muni Van Ness Station	79	Muni Van Ness Station	64	Muni Van Ness Station	13%	19%	20%	24%	19%
44 O'Shaugnessy^^^	44	29	51	Silver/Lisbon	24	51	Cambridge/Silver	24	Cambridge/Silver	26	Cambridge/Silver	24	Cambridge/Silver	56%	47%	47%	51%	47%

Existing is the scaled CHAMP 2020 Baseline

Outbound

		Existing Ridership	Existing Capacity	Existing MLP	Baseline Ridership	Baseline Capacity	Baseline MLP	Proposed Action Ridership	Proposed Action MLP	PBA Ridership	PBA MLP	LUC A Ridership	LUC A MLP	Existing Utilization	Baseline Utilization	Proposed Action Utilization	PBA Utilization	LUC A Utilization
		2020_Base	2020_Ba	2020_Baseline	2035_Base	2035_Bas	2035_Baseline	2035_Proj	2035_ProposedAction	2035_Scer	2035_ScenarioD_pba2040	2035_Scen	2035_ScenarioA					
Weekday AM																		
CEQA Routes																		
38 Geary	38	60	81	Geary/Larkin	29	81	Geary/Taylor	33	Geary/Taylor	46	Geary/Taylor	30	Geary/Taylor	74%	36%	41%	56%	38%
38R Geary Rapid	38R	48	81	Geary/Stockton	48	81	Geary/Stockton	49	Geary/Stockton	58	Geary/Leavenworth	49	Geary/Stockton	59%	59%	61%	72%	60%
19 Polk/Future Route TBD	19	29	51	8th/Mission	5	51	8th/Mission	6	8th/Mission	28	8th/Mission	5	8th/Mission	56%	10%	11%	56%	10%
T Third*	T	82	168	3rd/20th	145	336	3rd/Mission Rock	141	3rd/Mission Rock	167	3rd/Mission Rock	153	3rd/Mission Rock	49%	43%	42%	50%	46%
14 Mission	14	40	81	Mission/19th	50	81	Mission/18th	52	Mission/18th	58	Mission/18th	52	Mission/18th	49%	62%	64%	71%	65%
14R Mission Rapid	14R	22	81	Mission/16th	35	81	Mission/16th	35	Mission/16th	40	24th/Mission	36	24th/Mission	27%	43%	44%	49%	45%
K Ingleside	K	82	168	3rd/20th	22	168	Muni Civic Center Station	19	Muni Civic Center Station	33	Muni Civic Center Station	22	Muni Civic Center Station	49%	13%	11%	20%	13%
28 19th Avenue**	28	20	51	19th/Ortega	12	51	19th/Ortega	13	19th/Ortega	16	19th/Ortega	12	19th/Ortega	39%	23%	26%	31%	23%
28R 19th Avenue Rapid***	28R	10	51	Ulloa/19th	12	51	Winston/19th	13	Winston/19th	13	Winston/19th	13	Winston/19th	19%	23%	26%	26%	26%
N Judah	N	50	336	Duboce/Church	59	504	Muni Civic Center Station	63	Duboce/Church	55	Muni Civic Center Station	60	Muni Civic Center Station	15%	12%	12%	11%	12%
Non-CEQA Routes																		
47 Van Ness****	47	37	51	Van Ness/Eddy	34	81	Van Ness/Eddy	37	Van Ness/Eddy	35	Van Ness/Sacramento	37	Van Ness/Eddy	73%	42%	45%	43%	45%
49 Van Ness/Mission	49	29	81	Van Ness/Eddy	29	81	Van Ness/Eddy	31	Van Ness/Eddy	35	Van Ness/Eddy	31	Van Ness/Eddy	36%	36%	38%	43%	39%
5 Fulton	5	18	51	Larkin/Mc Allister	19	51	Larkin/Mc Allister	19	Larkin/Mc Allister	23	Larkin/Mc Allister	19	Larkin/Mc Allister	35%	36%	37%	44%	38%
5R Fulton Rapid	5R	7	51	Jones/Market	6	51	Cyril Magnin/5th/Market	6	Cyril Magnin/5th/Market	8	Mc Allister/Divisadero	7	Mc Allister/Divisadero	14%	12%	12%	16%	13%
8 Bayshore^	8	38	81	Mission/Geneva	46	81	Mission/Geneva	46	Mission/Geneva	54	Madrid/Geneva	46	Mission/Geneva	47%	57%	56%	66%	57%
29 Sunset^^	29	34	51	Ocean/Lee	35	51	Plymouth/Ocean	38	Plymouth/Ocean	38	Plymouth/Ocean	34	Plymouth/Ocean	67%	68%	74%	75%	67%
7 Haight/Noriega	7	20	81	Market/Van Ness	25	81	Haight/Gough/Market	25	Haight/Gough/Market	28	Haight/Gough/Market	25	Haight/Gough/Market	25%	31%	31%	35%	31%
M Ocean	M	40	336	Muni Church Station	55	336	Muni Church Station	53	Muni Church Station	94	Muni Castro Station	57	Muni Church Station	12%	16%	16%	28%	17%
L Taraval	L	27	336	Muni Civic Center Station	37	336	Muni Civic Center Station	36	Muni Civic Center Station	51	Muni Civic Center Station	36	Muni Civic Center Station	8%	11%	11%	15%	11%
44 O'Shaugnessy^^^	44	29	51	Princeton/Silver	22	51	Princeton/Silver	23	Princeton/Silver	25	Princeton/Silver	21	Princeton/Silver	57%	44%	46%	50%	42%
Weekday PM																		
		2020_Base	2020_Ba	2020_Baseline	2035_Base	2035_Bas	2035_Baseline	2035_Proj	2035_ProposedAction	2035_Scer	2035_ScenarioD_pba2040	2035_Scen	2035_ScenarioA					
CEQA Routes																		
38 Geary	38	98	81	Geary/Jones	44	81	Geary/Taylor	42	Geary/Taylor	44	Geary/Taylor	44	Geary/Taylor	121%	54%	52%	54%	54%
38R Geary Rapid	38R	84	81	Powell/Geary	80	81	Powell/Geary	92	Powell/Geary	91	Powell/Geary	81	Powell/Geary	104%	98%	114%	113%	100%
19 Polk/Future Route TBD	19	35	51	Brannan/8th	10	51	Division/Henry Adams	9	Division/Henry Adams	26	8th/Mission	10	Brannan/8th	69%	19%	17%	50%	19%
T Third*	T	99	168	Muni Powell Station	229	336	3rd/Mission Rock	226	3rd/Mission Rock	260	3rd/Mission Rock	234	3rd/Mission Rock	59%	68%	67%	77%	70%
14 Mission	14	57	81	Mission/16th	61	81	Mission/16th	63	Mission/16th	64	Mission/16th	61	Mission/16th	70%	76%	78%	79%	75%
14R Mission Rapid	14R	60	81	Mission/16th	85	81	Mission/16th	88	Mission/16th	86	Mission/16th	87	Mission/16th	75%	104%	109%	107%	107%
K Ingleside	K	99	168	Muni Powell Station	112	168	Muni Civic Center Station	122	Muni Civic Center Station	123	Muni Civic Center Station	114	Muni Civic Center Station	59%	67%	72%	73%	68%
28 19th Avenue**	28	19	51	Park Presidio/Park Presidio Bypass/Fulton	19	51	19th/Judah	20	19th/Judah	18	South/Cross Over	18	19th/Judah	36%	38%	40%	34%	35%
28R 19th Avenue Rapid***	28R	7	51	19th/Irving	40	51	San Jose/Geneva	39	San Jose/Geneva	47	San Jose/Geneva	41	San Jose/Geneva	13%	79%	77%	93%	81%
N Judah	N	171	336	Muni Civic Center Station	204	504	Muni Civic Center Station	227	Muni Civic Center Station	237	Muni Civic Center Station	208	Muni Civic Center Station	51%	41%	45%	47%	41%
Non-CEQA Routes																		
47 Van Ness****	47	30	51	Van Ness/Eddy	32	81	Van Ness/Eddy	34	Van Ness/Eddy	32	Van Ness/Eddy	32	Van Ness/Eddy	59%	39%	42%	39%	39%
49 Van Ness/Mission	49	58	81	Mission/16th	47	81	Van Ness/Mc Allister	47	Van Ness/Mc Allister	51	Van Ness/Mc Allister	47	Van Ness/Mc Allister	72%	57%	58%	63%	58%
5 Fulton	5	40	51	Larkin/Mc Allister	39	51	Van Ness/Mc Allister	41	Van Ness/Mc Allister	50	Van Ness/Mc Allister	40	Van Ness/Mc Allister	79%	76%	79%	98%	79%
5R Fulton Rapid	5R	50	51	Van Ness/Mc Allister	42	51	Van Ness/Mc Allister	45	Van Ness/Mc Allister	53	Van Ness/Mc Allister	43	Van Ness/Mc Allister	98%	83%	88%	105%	84%
8 Bayshore^	8	74	81	O Farrell/Stockton	71	81	O Farrell/Stockton	73	O Farrell/Stockton	76	O Farrell/Stockton	70	O Farrell/Stockton	92%	87%	90%	94%	86%
29 Sunset^^	29	24	51	San Jose/Ocean	22	51	San Jose/Ocean	22	San Jose/Ocean	24	San Jose/Ocean	22	San Jose/Ocean	47%	42%	42%	48%	44%
7 Haight/Noriega	7	50	81	Haight/Gough/Market	76	81	Haight/Gough/Market	82	Haight/Gough/Market	76	Haight/Gough/Market	73	Haight/Gough/Market	61%	93%	101%	94%	91%
M Ocean	M	146	336	Muni Van Ness Station	172	336	Muni Civic Center Station	186	Muni Civic Center Station	203	Muni Civic Center Station	182	Muni Civic Center Station	43%	51%	55%	61%	54%
L Taraval	L	203	336	Muni Van Ness Station	260	336	Muni Civic Center Station	291	Muni Civic Center Station	269	Muni Civic Center Station	264	Muni Civic Center Station	60%	77%	87%	80%	79%
44 O'Shaugnessy^^^	44	60	51	Silver/Mission	51	51	Silver/Mission	50	Silver/Mission	57	Silver/Mission	51	Silver/Mission	117%	100%	98%	111%	100%

Notes:Toward Downtown is inbound with the following exceptions.
* Toward Sunnydale is inbound in all years
** Toward Marina is inbound
*** Toward Richmond District is inbound
**** Toward Fisherman's Wharf is inbound
^ The 8 Bayshore also includes the 8AX and 8BX Bayshore Expresses. In SF-CHAMP the 8 only operates in the countercommute direction, while the 8AX and 8BX only operate in the commute direction
^^Toward Presidio is inbound
^^^ Toward Richmond District is inbound

San Francisco Housing Element 2022 Update

TRANSIT FLEET NEEDS ASSESSMENT - 2050

This analysis assumes perfect spreading in ridership across the peak period. Ridership represents an average bus during the peak period and is based on CHAMP ridership that has been adjusted using observed, pre-pandemic Muni data.

Inbound

Weekday AM

		Existing Ridership	Existing Capacity	Existing MLP	Baseline Ridership	Baseline Capacity	Baseline MLP	Proposed Action Ridership	Proposed Action MLP	PBA Ridership	PBA MLP	LUC A Ridership	LUC A MLP	Existing Utilization	Baseline Utilization	Proposed Action Utilization	PBA Utilization	LUC A Utilization
		AM Peak 2020_Base	AM Peak 2020_Ba	AM Peak 2020_Baseline	AM Peak 2050_Base	AM Peak 2050_Bas	AM Peak 2050_Baseline	AM Peak 2050_Proj	AM Peak 2050_ProposedAction	AM Peak 2050_Scer	AM Peak 2050_ScenarioD_pba2040	AM Peak 2050_Scen	AM Peak 2050_ScenarioA	AM Peak	AM Peak	AM Peak	AM Peak	AM Peak
CEQA Routes																		
38 Geary	38	61	81	Larkin/O Farrell	20	81	Geary/Peter Yorke/Gough/St	23	Geary/Webster	21	Geary/Scott	20	Geary/Webster	75%	25%	28%	26%	24%
38R Geary Rapid	38R	68	81	Van Ness/O Farrell	55	81	Geary/Fillmore	76	Geary/Fillmore	70	Geary/Fillmore	56	O Farrell/Leavenworth	84%	68%	93%	87%	69%
19 Polk/Future Route TBD	19	41	51	Townsend/7th	17	51	Townsend/7th	17	Brannan/7th	22	Brannan/7th	18	Townsend/7th	81%	33%	33%	43%	34%
T Third*	T	156	168	Muni Van Ness Station	360	336	CS Stockton/Geary	382	CS Stockton/Geary	269	CS Stockton/Geary	352	CS Stockton/Geary	93%	107%	114%	80%	105%
14 Mission	14	37	81	26th/Mission	44	81	Mission/Powers	43	Mission/Powers	43	30th/Mission	42	26th/Mission	46%	55%	54%	53%	52%
14R Mission Rapid	14R	51	81	30th/Mission	80	81	30th/Mission	80	30th/Mission	79	30th/Mission	77	30th/Mission	63%	98%	99%	98%	95%
K Ingleside	K	156	168	Muni Van Ness Station	127	168	Muni Van Ness Station	166	Muni Van Ness Station	131	Muni Van Ness Station	129	Muni Van Ness Station	93%	76%	99%	78%	77%
28 19th Avenue**	28	37	51	Banbury/19th	31	51	19th/Junipero Serra	28	19th/Vicente	31	19th/Junipero Serra	32	19th/Junipero Serra	72%	60%	56%	61%	63%
28R 19th Avenue Rapid***	28R	13	51	Banbury/19th	34	81	Mission/Geneva	32	Mission/Geneva	39	Mission/Geneva	37	Mission/Geneva	25%	42%	40%	49%	45%
N Judah	N	189	336	Muni Van Ness Station	219	504	Muni Van Ness Station	286	Muni Van Ness Station	250	Muni Van Ness Station	229	Muni Van Ness Station	56%	44%	57%	50%	45%
Non-CEQA Routes																		
47 Van Ness****	47	34	51	Van Ness/Mc Allister	27	81	Market/Van Ness	26	Market/Van Ness	24	Market/Van Ness	29	Market/Van Ness	66%	33%	32%	29%	36%
49 Van Ness/Mission	49	45	81	14th/Mission	36	81	Market/Van Ness	36	Market/Van Ness	41	Market/Van Ness	36	Market/Van Ness	55%	45%	44%	51%	45%
5 Fulton	5	46	51	Mc Allister/Laguna	20	51	Mc Allister/Gough	23	Mc Allister/Laguna	27	Mc Allister/Laguna	19	Mc Allister/Laguna	91%	40%	45%	53%	38%
5R Fulton Rapid	5R	28	51	Mc Allister/Fillmore	32	51	Mc Allister/Fillmore	35	Mc Allister/Fillmore	37	Mc Allister/Fillmore	33	Mc Allister/Fillmore	55%	62%	68%	72%	64%
8 Bayshore^	8	43	81	Bryant/I-80 E Off-ramp/4th	38	81	San Bruno/Silver	40	San Bruno/Silver	37	San Bruno/Silver	37	6th/Bryant	54%	47%	49%	45%	45%
29 Sunset^^	29	34	51	Meda/Ocean/Otsego	35	51	Garfield/Beverly	36	Garfield/Beverly	38	Garfield/Beverly	35	Garfield/Beverly	66%	68%	70%	74%	69%
7 Haight/Noriega	7	35	81	Haight/Laguna	53	81	Haight/Laguna	58	Haight/Laguna	57	Haight/Laguna	52	Haight/Laguna	43%	66%	72%	70%	64%
M Ocean	M	125	336	Muni Church Station	180	336	Muni Church Station	222	Muni Church Station	180	Muni Church Station	180	Muni Van Ness Station	37%	54%	66%	54%	54%
L Taraval	L	147	336	Muni Church Station	182	336	Muni Church Station	246	Muni Church Station	187	Muni Church Station	183	Muni Van Ness Station	44%	54%	73%	56%	55%
44 O'Shaugnessy^^^	44	67	51	Bosworth/Still/Lyell	51	81	Bosworth/Still/Lyell	51	Bosworth/Still/Lyell	57	Cayuga/Rousseau	51	Bosworth/Still/Lyell	131%	63%	63%	71%	63%

Weekday PM

		PM Peak 2020_Base	PM Peak 2020_Ba	PM Peak 2020_Baseline	PM Peak 2050_Base	PM Peak 2050_Bas	PM Peak 2050_Baseline	PM Peak 2050_Proj	PM Peak 2050_ProposedAction	PM Peak 2050_Scer	PM Peak 2050_ScenarioD_pba2040	PM Peak 2050_Scen	PM Peak 2050_ScenarioA	PM Peak	PM Peak	PM Peak	PM Peak	PM Peak
CEQA Routes																		
38 Geary	38	79	81	Van Ness/O Farrell	22	81	Geary/Peter Yorke/Gough/St	27	Geary/Peter Yorke/Gough/St	32	Geary/Peter Yorke/Gough/S	22	Geary/Scott	97%	27%	33%	39%	27%
38R Geary Rapid	38R	48	81	Van Ness/O Farrell	36	81	Van Ness/O Farrell	42	Van Ness/O Farrell	42	Van Ness/O Farrell	36	Van Ness/O Farrell	59%	44%	52%	52%	44%
19 Polk/Future Route TBD	19	35	51	Bryant/I-80 E Off-ramp/7th	22	51	7th/Harrison	23	Mission/7th	32	7th/Harrison	21	7th/Harrison	68%	44%	45%	62%	41%
T Third*	T	108	168	Embarcadero/Brannan	204	336	3rd/20th	210	3rd/20th	244	3rd/20th	222	3rd/20th	64%	61%	63%	73%	66%
14 Mission	14	64	81	15th/Mission	72	81	26th/Mission	74	26th/Mission	76	26th/Mission	69	26th/Mission	79%	89%	91%	93%	86%
14R Mission Rapid	14R	31	81	Mission/11th	43	81	30th/Mission	44	30th/Mission	46	30th/Mission	42	30th/Mission	38%	54%	55%	56%	52%
K Ingleside	K	108	168	Embarcadero/Brannan	53	168	Muni Van Ness Station	59	Muni Van Ness Station	68	Muni Van Ness Station	53	Muni Van Ness Station	64%	31%	35%	41%	32%
28 19th Avenue**	28	24	51	Taraval/19th	20	51	Taraval/19th	25	Taraval/19th	22	Taraval/19th	20	Taraval/19th	47%	39%	49%	42%	40%
28R 19th Avenue Rapid***	28R	10	51	19th/Judah	40	81	I-280 N Off-ramp/I-280 N On	40	Executive Park/Harney	58	Executive Park/Harney	43	I-280 N Off-ramp/I-280 N On	20%	49%	49%	72%	53%
N Judah	N	78	336	Duboce/Noe	111	504	Muni Van Ness Station	121	Muni Van Ness Station	100	Muni Van Ness Station	112	Muni Van Ness Station	23%	22%	24%	20%	22%
Non-CEQA Routes																		
47 Van Ness****	47	33	51	Van Ness/Mc Allister	30	81	Van Ness/O Farrell	34	Van Ness/O Farrell	34	Van Ness/O Farrell	35	Van Ness/O Farrell	64%	37%	42%	42%	43%
49 Van Ness/Mission	49	43	81	Van Ness/Mc Allister	38	81	Market/Van Ness	40	Market/Van Ness	40	Van Ness/Mc Allister	43	Van Ness/Mc Allister	53%	47%	49%	50%	53%
5 Fulton	5	18	51	Van Ness/Mc Allister	14	51	Mc Allister/Laguna	14	Mc Allister/Laguna	13	Mc Allister/Laguna	14	Mc Allister/Laguna	36%	27%	27%	26%	28%
5R Fulton Rapid	5R	16	51	Van Ness/Mc Allister	20	51	Van Ness/Mc Allister	20	Van Ness/Mc Allister	23	Van Ness/Mc Allister	20	Mc Allister/Fillmore	32%	40%	40%	44%	40%
8 Bayshore^	8	45	81	Naples/Geneva	48	81	Naples/Geneva	45	Naples/Geneva	56	Naples/Geneva	43	Mission/Geneva	56%	59%	56%	70%	53%
29 Sunset^^	29	29	51	Phelan/Ocean/Geneva	29	51	Phelan/Ocean/Geneva	37	Phelan/Ocean/Geneva	29	Plymouth/Holloway	28	Phelan/Ocean/Geneva	58%	56%	72%	58%	56%
7 Haight/Noriega	7	33	81	Haight/Laguna	42	81	Haight/Laguna	45	Haight/Laguna	45	Haight/Laguna	40	Haight/Laguna	41%	52%	55%	55%	50%
M Ocean	M	58	336	Muni Van Ness Station	86	336	Muni Van Ness Station	94	Muni Van Ness Station	107	Muni Van Ness Station	87	Muni Van Ness Station	17%	26%	28%	32%	26%
L Taraval	L	43	336	Muni Van Ness Station	65	336	Muni Van Ness Station	75	Muni Van Ness Station	79	Muni Van Ness Station	66	Muni Van Ness Station	13%	19%	22%	24%	20%
44 O'Shaugnessy^^^	44	29	51	Silver/Lisbon	23	81	Bosworth/Still/Lyell	24	Cambridge/Silver	26	Cambridge/Silver	22	Cambridge/Silver	56%	28%	30%	32%	27%

Outbound

Weekday AM

		Existing Ridership	Existing Capacity	Existing MLP	Baseline Ridership	Baseline Capacity	Baseline MLP	Proposed Action Ridership	Proposed Action MLP	PBA Ridership	PBA MLP	LUC A Ridership	LUC A MLP	Existing Utilization	Baseline Utilization	Proposed Action Utilization	PBA Utilization	LUC A Utilization
		AM Peak 2020_Bas	AM Peak 2020_Ba	AM Peak 2020_Baseline	AM Peak 2050_Bas	AM Peak 2050_Bas	AM Peak 2050_Baseline	AM Peak 2050_Proj	AM Peak 2050_ProposedAction	AM Peak 2050_Scer	AM Peak 2050_ScenarioD_pba2040	AM Peak 2050_Scen	AM Peak 2050_ScenarioA	AM Peak	AM Peak	AM Peak	AM Peak	AM Peak
CEQA Routes																		
38 Geary	38	60	81	Geary/Larkin	34	81	Geary/Taylor	39	Geary/Taylor	46	Geary/Taylor	32	Geary/Taylor	74%	42%	48%	56%	40%
38R Geary Rapid	38R	48	81	Geary/Stockton	53	81	Geary/Stockton	55	Geary/Stockton	58	Geary/Leavenworth	54	Powell/Geary	59%	65%	68%	72%	67%
19 Polk/Future Route TBD	19	29	51	8th/Mission	21	51	8th/Mission	22	8th/Mission	28	8th/Mission	19	8th/Mission	56%	42%	43%	56%	38%
T Third*	T	82	168	3rd/Mission Rock	136	336	3rd/Mission Rock	138	3rd/Mission Rock	167	3rd/Mission Rock	158	3rd/Mission Rock	49%	40%	41%	50%	47%
14 Mission	14	40	81	Mission/16th	55	81	Mission/16th	56	Mission/18th	58	Mission/18th	57	Mission/16th	49%	68%	69%	71%	71%
14R Mission Rapid	14R	22	81	Mission/16th	38	81	24th/Mission	38	24th/Mission	40	24th/Mission	40	24th/Mission	27%	47%	47%	49%	49%
K Ingleside	K	82	168	3rd/20th	26	168	Muni Montgomery Station	23	Muni Civic Center Station	36	Muni Civic Center Station	26	Muni Civic Center Station	49%	15%	14%	21%	15%
28 19th Avenue**	28	20	51	19th/Ortega	12	51	19th/Ortega	15	19th/Rivera	16	19th/Ortega	12	19th/Ortega	39%	23%	29%	31%	23%
28R 19th Avenue Rapid***	28R	10	51	Ulloa/19th	18	81	55,252	19	55,252	33	Executive Park/Harney	18	55,252	19%	22%	24%	41%	22%
N Judah	N	50	336	Duboce/Church	66	504	Muni Civic Center Station	66	Muni Civic Center Station	55	Muni Civic Center Station	66	Muni Civic Center Station	15%	13%	13%	11%	13%
Non-CEQA Routes																		
47 Van Ness****	47	37	51	Van Ness/Eddy	31	81	Van Ness/Eddy	35	Van Ness/Eddy	35	Van Ness/Sacramento	35	Van Ness/Eddy	73%	38%	43%	43%	43%
49 Van Ness/Mission	49	29	81	Van Ness/Eddy	27	81	Van Ness/Eddy	31	Van Ness/Eddy	35	Van Ness/Eddy	33	Van Ness/Mc Allister	36%	33%	38%	43%	40%
5 Fulton	5	18	51	Larkin/Mc Allister	23	51	Cyril Magnin/5th/Market	23	Cyril Magnin/5th/Market	23	Larkin/Mc Allister	20	Cyril Magnin/5th/Market	35%	44%	45%	44%	40%
5R Fulton Rapid	5R	7	51	Jones/Market	7	51	Mc Allister/Divisadero	7	Cyril Magnin/5th/Market	8	Mc Allister/Divisadero	7	Mc Allister/Divisadero	14%	13%	13%	16%	14%
8 Bayshore^	8	38	81	Mission/Geneva	44	81	Mission/Geneva	44	Mission/Geneva	54	Madrid/Geneva	42	Cayuga/Geneva	47%	54%	54%	66%	52%
29 Sunset^^	29	34	51	Ocean/Lee	38	51	Plymouth/Ocean	45	Ocean/Lee	40	Plymouth/Ocean	36	Ocean/Lee	67%	74%	89%	79%	71%
7 Haight/Noriega	7	20	81	Market/Van Ness	27	81	Haight/Gough/Market	28	Haight/Gough/Market	28	Haight/Gough/Market	26	Haight/Gough/Market	25%	33%	35%	35%	32%
M Ocean	M	40	336	Muni Church Station	62	336	Muni Church Station	67	Muni Church Station	94	Muni Castro Station	70	Muni Church Station	12%	19%	20%	28%	21%
L Taraval	L	27	336	Muni Civic Center Station	41	336	Muni Civic Center Station	43	Muni Civic Center Station	51	Muni Civic Center Station	41	Muni Civic Center Station	8%	12%	13%	15%	12%
44 O'Shaugnessy^^^	44	29	51	Princeton/Silver	23	81	Princeton/Silver	24	Princeton/Silver	25	Princeton/Silver	22	Princeton/Silver	57%	28%	30%	31%	27%

Weekday PM

		PM Peak 2020_Bas	PM Peak 2020_Ba	PM Peak 2020_Baseline	PM Peak 2050_Bas	PM Peak 2050_Bas	PM Peak 2050_Baseline	PM Peak 2050_Proj	PM Peak 2050_ProposedAction	PM Peak 2050_Scer	PM Peak 2050_ScenarioD_pba2040	PM Peak 2050_Scen	PM Peak 2050_ScenarioA	PM Peak	PM Peak	PM Peak	PM Peak	PM Peak
CEQA Routes																		
38 Geary	38	98	81	Geary/Jones	45	81	Geary/Taylor	41	Geary/Taylor	44	Geary/Taylor	43	Geary/Taylor	121%	56%	51%	54%	54%
38R Geary Rapid	38R	84	81	Powell/Geary	78	81	Powell/Geary	108	Powell/Geary	91	Powell/Geary	82	Powell/Geary	104%	97%	133%	113%	101%
19 Polk/Future Route TBD	19	35	51	Brannan/8th	21	51	8th/Mission	22	8th/Mission	26	8th/Mission	22	8th/Mission	69%	40%	43%	50%	43%
T Third*	T	99	168	Muni Powell Station	239	336	3rd/Mission Rock	246	3rd/Mission Rock	260	3rd/Mission Rock	252	3rd/Mission Rock	59%	71%	73%	77%	75%
14 Mission	14	57	81	Mission/16th	59	81	Mission/16th	60	Mission/16th	64	Mission/16th	58	Mission/16th	70%	72%	74%	79%	71%
14R Mission Rapid	14R	60	81	Mission/16th	86	81	24th/Mission	87	Mission/16th	86	Mission/16th	81	24th/Mission	75%	106%	108%	107%	100%
K Ingleside	K	99	168	Muni Powell Station	116	168	Muni Powell Station	147	Muni Civic Center Station	124	Muni Civic Center Station	122	Muni Powell Station	59%	69%	88%	74%	73%
28 19th Avenue**	28	19	51	Park Presidio/Park Presidio B	18	51	19th/Judah	23	19th/Judah	18	South/Cross Over	18	19th/Judah	36%	36%	45%	34%	36%
28R 19th Avenue Rapid***	28R	7	51	19th/Irving	52	81	San Jose/Geneva	50	San Jose/Geneva	49	San Jose/Geneva	55	San Jose/Geneva	13%	64%	62%	60%	68%
N Judah	N	171	336	Muni Civic Center Station	212	504	Muni Civic Center Station	269	Muni Civic Center Station	237	Muni Civic Center Station	222	Muni Civic Center Station	51%	42%	53%	47%	44%
Non-CEQA Routes																		
47 Van Ness****	47	30	51	Van Ness/Eddy	30	81	Van Ness/Eddy	35	Van Ness/Eddy	32	Van Ness/Eddy	32	Van Ness/Mc Allister	59%	37%	43%	39%	40%
49 Van Ness/Mission	49	58	81	Mission/16th	44	81	Van Ness/Mc Allister	48	Van Ness/Mc Allister	51	Van Ness/Mc Allister	47	Van Ness/Mc Allister	72%	55%	59%	63%	58%
5 Fulton	5	40	51	Larkin/Mc Allister	43	51	Van Ness/Mc Allister	46	Van Ness/Mc Allister	50	Van Ness/Mc Allister	41	Van Ness/Mc Allister	79%	83%	90%	98%	80%
5R Fulton Rapid	5R	50	51	Van Ness/Mc Allister	45	51	Van Ness/Mc Allister	49	Van Ness/Mc Allister	53	Van Ness/Mc Allister	45	Van Ness/Mc Allister	98%	88%	96%	105%	88%
8 Bayshore^	8	74	81	O Farrell/Stockton	69	81	O Farrell/Stockton	72	O Farrell/Stockton	76	O Farrell/Stockton	65	O Farrell/Stockton	92%	86%	89%	94%	81%
29 Sunset^^	29	24	51	San Jose/Ocean	24	51	Crespi	25	Crespi/19th	25	Ocean/I-280 S Off-ramp	24	Crespi	47%	47%	49%	49%	47%
7 Haight/Noriega	7	50	81	Haight/Gough/Market	75	81	Haight/Gough/Market	82	Haight/Gough/Market	76	Haight/Gough/Market	70	Haight/Gough/Market	61%	92%	101%	94%	87%
M Ocean	M	146	336	Muni Van Ness Station	190	336	Muni Civic Center Station	228	Muni Civic Center Station	203	Muni Civic Center Station	200	Muni Civic Center Station	43%	57%	68%	61%	60%
L Taraval	L	203	336	Muni Van Ness Station	265	336	Muni Civic Center Station	338	Muni Civic Center Station	269	Muni Civic Center Station	277	Muni Civic Center Station	60%	79%	101%	80%	83%
44 O'Shaugnessy^^^	44	60	51	Silver/Mission	45	81	Silver/Mission	45	Silver/Mission	57	Silver/Mission	45	Silver/Mission	117%	56%	56%	70%	56%

Existing is the scaled CHAMP 2020 Baseline

Notes:Toward Downtown is inbound with the following exceptions.
* Toward Sunnydale is inbound in all years
** Toward Marina is inbound
*** Toward Richmond District is inbound
**** Toward Fisherman's Wharf is inbound
^ The 8 Bayshore also includes the 8AX and 8BX Bayshore Expresses. In SF-CHAMP the 8 only operates in the countercommute direction, while the 8AX and 8BX only operate in the commute direction
^^Toward Presidio is inbound
^^^ Toward Richmond District is inbound

APPENDIX G.6. ADDITIONAL TRANSIT DELAY CALCULATIONS

Purpose: This appendix provides calculations that show a land use project's considerable contribution to significant transit delay impacts.

Land use projects would contribute considerably to significant impacts if they generate the following:

	AM Peak	PM Peak	Average	
Geary	20	27	24	vehicle trips
19th Avenue	-	64	64	vehicle trips

A cumulatively considerable contribution is calculated as follows:

As shown on Attachment D, page I-18, of the 2019 SF TIA Guidelines:

> "Each conflicting turning vehicle adds approximately five seconds of delay and 350 inbound vehicles are anticipated to create a significant impact to the most frequent routes."

However, when evaluating land use growth at the district level, developments spread throughout the planning district would generate vehicle trips that would all converge along the primary roadways in that district. Therefore, the amount of vehicle trips that would contribute one second to the average travel time along the corridor would represent a considerable contribution.

For a corridor with a frequent transit service, such as Geary, a building that generates approximately 25 vehicle trips during the peak hour is representative of the type of development anticipated under the Proposed Action. Every second of added delay to a significant transit impact would represent a considerable contribution, as people may begin to switch ways of travel when transit travel times becomes longer or less reliable. This finding is consistent with the City's Transit First Policy.

Considerable Contribution Calculations for Geary Corridor

1.How much additional delay would vehicle trips generated by the Proposed Action add to the Geary corridor under 2050 conditions?

Values shown in decimal minutes	AM Peak Hour				PM Peak Hour			
Planning District	Inbound		Outbound		Inbound		Outbound	
Richmond	1.45	81%	1.46	94%	1.35	92%	1.36	86%
Western Addition	0.09	5%	0.08	5%	0.04	3%	0.04	3%
Downtown	0.24	13%	0.02	1%	0.08	5%	0.19	12%
Total	1.78		1.56		1.47		1.59	
Total peak hour delay		3.34				3.06		

2. Where are the additional delay and additional vehicles coming from?

Land use and vehicle trip growth in the Richmond generates a much higher proportion of delay compared to the Western Addition.

Housing Units		
Richmond	13,000	68%
Western Addition	6,000	32%
Downtown[1]	-1,000	
Total	19,000	

Peak Hour Vehicle Trips	AM Peak Hour		PM Peak Hour	
Richmond	2,730	69%	3,400	68%
Western Addition	1,240	31%	1,610	32%
Downtown[1]	-170		-80	
Total	3,970		5,010	

Notes:

1. Assigns responsibility for transit delay to planning districts with growth. Exclude Downtown due to decreased households and trips.

3. How many vehicle trips contribute one second of delay to the Proposed Action's impact?

	AM Peak Hour	PM peak hour	
Delay per unit	0.011	0.010	seconds
Delay per new vehicle	0.050	0.037	seconds
To reach 1 second of delay (average to buses over peak hour)			
	95	103	units
	20	**27**	**vehicle trips**

Considerable Contribution Calculations for 19th Avenue Corridor

1.How much additional delay would vehicle trips generated by the Proposed Action add to the 19th Avenue corridor under 2050 conditions?

Values shown in demical minutes	PM Peak Hour			
Planning District	Inbound		Outbound	
Richmond	0.57	33%	0.42	23%
Sunset (Inner and Outer)	1.06	62%	1.06	59%
Ingleside	0.09	5%	0.33	18%
Total	1.72		1.81	
Total peak hour delay		3.53		

Note: No impact under AM peak hour to 19th Ave Corridor

2. Where are the additional delay and additional vehicles coming from?

Land use and vehicle trip growth in each neighborhood is proportional to the amount of added delay.

Housing Units		
Richmond	13,000	29%
Inner Sunset	11,000	24%
Outer Sunset	14,000	31%
Ingleside	7,000	16%
Total	45,000	

Peak Hour Vehicle Trips		
Richmond	3,400	25%
Inner Sunset	3,200	24%
Outer Sunset	4,500	33%
Ingleside	2,400	18%
Total	13,500	

3. How many vehicle trips contribute one second of delay to the Proposed Action's impact?

	PM peak hour	
Delay per unit	0.005	seconds
Delay per new vehicle	0.016	seconds

To reach 1 second of delay (average to buses over peak hour)

212	units
64	**vehicle trips**

Housing Element 2022 Update

2050 Proposed Action Transit Delay by Planning District

These tables present the additional transit travel times associated with vehicles generated by the proposed action under 2050 conditions.

Geary Corridor

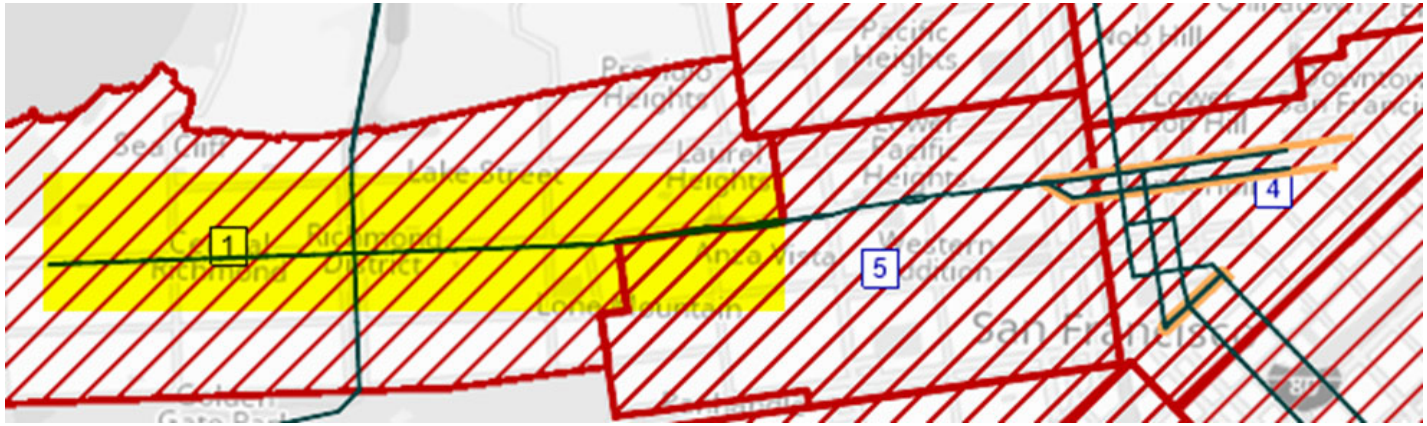
	Richmond	Western Addition	Downtown	Total
Proposed Action Additional Moving Time Delay (minutes)				
AM				
IB	1.45	0.09	0.24	1.78
OB	1.46	0.08	0.02	1.56
Average	1.46	0.09	0.13	1.67
PM				
IB	1.35	0.04	0.08	1.47
OB	1.36	0.04	0.19	1.59
Average	1.36	0.04	0.14	1.53
				1.685
Percent of Total				
AM				
IB	81%	5%	13%	100%
OB	94%	5%	1%	100%
Average	88%	5%	7%	100%
PM				
IB	92%	3%	5%	100%
OB	86%	3%	12%	100%
Average	89%	3%	9%	100%

19th Avenue Corridor

	Sunset	Richmond	Ingleside	Total
Proposed Action Additional Moving Time Delay (minutes)				
AM				
IB	0.56	0.48	0.06	1.1
OB	0.6	0.12	0.23	0.95
Average	0.58	0.30	0.15	1.03
PM				
IB	1.06	0.57	0.09	1.72
OB	1.06	0.42	0.33	1.81
Average	1.06	0.50	0.21	1.77
Percent of Total				
AM				
IB	51%	44%	5%	100%
OB	63%	13%	24%	100%
Average	57%	28%	15%	100%
PM				
IB	62%	33%	5%	100%
OB	59%	23%	18%	100%
Average	60%	28%	12%	100%

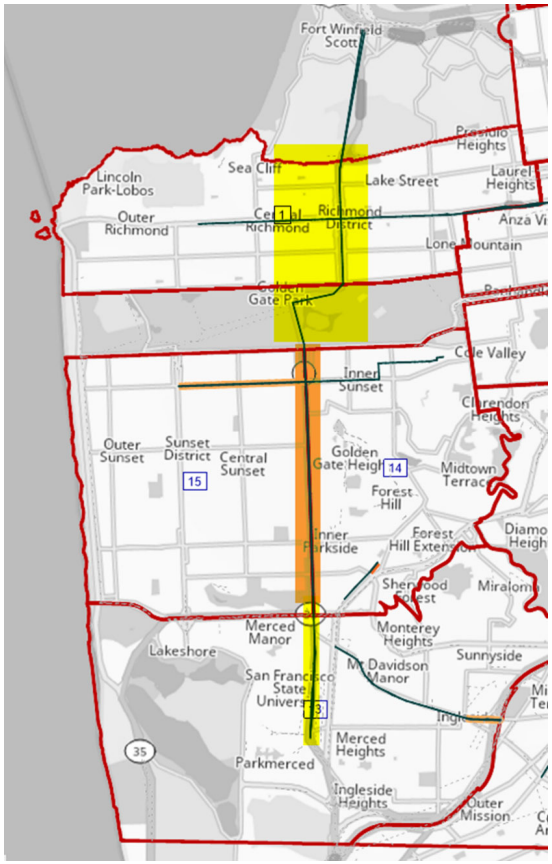
Notes:

1. For geographic extents, please see the following page with maps



Geary Corridor

Planning District	**Starts**	**Ends**
Richmond	34th Avenue	Baker Street
Western Addition	Baker Street	Van Ness Avenue
Downtown	Van Ness Avenue	Powell Street



19th Ave Corridor

Planning District	**Starts**	**Ends**
Richmond	California Street	Lincoln Way
Sunset (Inner and Outer)	Lincoln Way	Wawona Street
Ingleside	Wawona Street	Holloway Avenue

Changes in AM Peak Hour Vehicle Trips by Planning District

	2050 Base	2050 Proposed Action	Change
Richmond	13,452	16,186	2,730
Western Addition	11,806	13,050	1,240
Downtown	22,756	22,590	(170)
Inner Sunset	9,569	12,342	2,770
Outer Sunset	11,991	15,926	3,930
Ingleside	17,033	18,985	1,950
Total	86,607	99,078	12,470

Note: Trips within the district are subtracted once to avoid double counting those trips.

2050 Baseline - Vehicle Trips from SF-CHAMP

AM Peak Period

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	100	101	102	1000
Name		Richmond	Marina	Northeast	Downtown	Western Addition	Buena Vista	Central	Mission	South of Market	South Bayshore	Bernal Heights	South Central	Ingleside	Inner Sunset	Outer Sunset	Presidio	Treasure Island	Golden Gate Park	Non SF
	Sum	18606	12354	22042	44146	18934	7452	11548	25479	61146	34192	5375	21403	24185	15066	15749	3030	1023	513	3088309
1 Richmond	24586	4536	987	1009	1897	1817	571	493	886	1991	580	104	344	825	1269	1470	386	3	77	5342
2 Marina	10946	664	1138	1115	1323	851	215	199	508	1621	299	62	166	159	257	173	186	11	16	1983
3 Northeast	17842	557	1090	2872	3514	1063	215	206	771	3019	532	99	260	208	248	154	144	65	10	2814
4 Downtown	27550	847	1018	2837	6305	1782	479	459	1608	5284	1006	206	509	433	405	263	127	87	16	3877
5 Western Addition	16840	1167	913	1108	2073	1850	624	495	1101	2385	572	127	273	392	526	341	158	12	24	2699
6 Buena Vista	9570	486	362	371	854	763	442	391	733	1627	358	93	210	315	444	268	79	7	20	1748
7 Central	15295	499	333	414	1011	679	473	1079	1342	2256	1000	320	781	806	655	452	76	5	19	3096
8 Mission	23601	536	504	846	2129	1125	580	976	2953	4899	1621	507	864	700	592	384	103	13	13	4255
9 South of Market	43413	709	959	2926	7517	1581	591	719	2921	11993	2683	414	1059	987	593	365	145	92	24	7135
10 South Bayshore	26706	267	245	499	1202	460	226	615	1498	3418	7157	527	2305	910	355	264	53	7	6	6691
11 Bernal Heights	7242	126	109	168	433	186	109	350	644	1151	851	302	559	380	178	97	18	1	4	1577
12 South Central	29263	407	313	563	1418	566	271	938	1445	2225	3672	581	4407	2441	754	575	65	4	19	8598
13 Ingleside	29325	840	300	453	1026	546	329	882	953	1535	1334	365	2156	4563	1513	1654	111	3	35	10727
14 Inner Sunset	13856	956	283	301	681	619	394	549	637	829	493	121	494	1127	1425	1251	82	3	32	3581
15 Outer Sunset	22677	1646	384	449	979	665	377	536	767	1024	673	136	597	1816	1840	3968	154	3	58	6605
100 Presidio	1488	215	116	86	107	101	33	34	44	121	34	8	21	48	51	61	51	3	1	354
101 Treasure Island	3904	14	67	282	517	57	11	11	78	833	90	6	7	9	13	7	10	558	2	1332
102 Golden Gate Park	190	30	4	3	11	17	10	5	9	9	2	2	8	13	18	19	0	0	2	29
1000 Non SF	3106258	4104	3228	5740	11149	4207	1501	2611	6583	14925	11235	1395	6385	8052	3930	3984	1082	147	137	3015865

AM Peak Hour **0.348**

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	100	101	102	1000
Name		Richmond	Marina	Northeast	Downtown	Western Addition	Buena Vista	Central	Mission	South of Market	South Bayshore	Bernal Heights	South Central	Ingleside	Inner Sunset	Outer Sunset	Presidio	Treasure Island	Golden Gate Park	Non SF
	Sum	6475	4299	7670	15363	6589	2593	4019	8867	21279	11899	1870	7448	8416	5243	5481	1054	356	179	1074732
1 Richmond	8556	1579	343	351	660	632	199	171	308	693	202	36	120	287	442	511	134	1	27	1859
2 Marina	3809	231	396	388	460	296	75	69	177	564	104	22	58	55	89	60	65	4	6	690
3 Northeast	6209	194	379	999	1223	370	75	72	268	1051	185	34	91	72	86	54	50	23	3	979
4 Downtown	9587	295	354	987	2194	620	167	160	560	1839	350	72	177	151	141	92	44	30	6	1349
5 Western Addition	5860	406	318	386	721	644	217	172	383	830	199	44	95	137	183	119	55	4	8	939
6 Buena Vista	3330	169	126	129	297	265	154	136	255	566	125	32	73	110	155	93	27	2	7	608
7 Central	5323	174	116	144	352	236	165	376	467	785	348	111	272	280	228	157	27	2	7	1077
8 Mission	8213	186	175	295	741	392	202	340	1028	1705	564	177	301	244	206	134	36	5	4	1481
9 South of Market	15108	247	334	1018	2616	550	206	250	1017	4173	934	144	369	343	206	127	50	32	8	2483
10 South Bayshore	9294	93	85	174	418	160	79	214	521	1189	2491	183	802	317	123	92	19	3	2	2329
11 Bernal Heights	2520	44	38	59	151	65	38	122	224	401	296	105	194	132	62	34	6	0	1	549
12 South Central	10184	142	109	196	493	197	94	326	503	774	1278	202	1534	850	262	200	22	2	7	2992
13 Ingleside	10205	292	104	158	357	190	114	307	332	534	464	127	750	1588	526	576	39	1	12	3733
14 Inner Sunset	4822	333	98	105	237	215	137	191	222	288	172	42	172	392	496	435	29	1	11	1246
15 Outer Sunset	7891	573	134	156	341	232	131	186	267	356	234	47	208	632	640	1381	54	1	20	2299
100 Presidio	518	75	40	30	37	35	11	12	15	42	12	3	7	17	18	21	18	1	0	123
101 Treasure Island	1359	5	23	98	180	20	4	4	27	290	31	2	2	3	5	3	3	194	1	464
102 Golden Gate Park	66	10	2	1	4	6	3	2	3	3	1	1	3	4	6	7	0	0	1	10
1000 Non SF	1080978	1428	1123	1998	3880	1464	522	908	2291	5194	3910	486	2222	2802	1368	1386	377	51	48	1049521

2050 Proposed Action - Vehicle Trips from SF-CHAMP

AM Peak Period

Name		1 Richmond	2 Marina	3 Northeast	4 Downtown	5 Western Addition	6 Buena Vista	7 Central	8 Mission	9 South of Market	10 South Bayshore	11 Bernal Heights	12 South Central	13 Ingleside	14 Inner Sunset	15 Outer Sunset	100 Presidio	101 Treasure Island	102 Golden Gate Park	1000 Non SF
	Sum	21188	13117	22324	44167	20023	7948	12123	25545	62855	34881	5455	21695	26463	17488	19388	3157	975	614	3101969
1 Richmond	30837	5513	1252	1275	2368	2252	704	619	1067	2649	726	153	384	1031	1607	1876	434	11	99	6817
2 Marina	12668	759	1318	1251	1538	1034	231	220	563	1941	401	77	154	171	251	244	179	9	12	2313
3 Northeast	17931	608	1124	2790	3499	979	228	210	771	3049	587	92	272	212	259	166	135	60	14	2874
4 Downtown	26696	841	978	2781	5950	1770	460	446	1538	5166	994	171	449	427	436	283	139	76	16	3776
5 Western Addition	19619	1480	1055	1146	2419	2143	664	530	1179	2921	626	148	322	434	696	443	187	17	29	3179
6 Buena Vista	10534	594	377	400	994	799	517	417	782	1716	403	108	212	317	516	298	93	2	29	1959
7 Central	16769	529	389	429	1059	718	438	1135	1372	2574	1067	341	844	916	784	479	82	5	22	3586
8 Mission	23180	550	514	849	2109	1044	558	1026	2824	4712	1544	458	882	736	571	400	88	19	15	4283
9 South of Market	40714	702	862	2637	6853	1465	489	699	2721	11106	2619	384	1021	923	570	376	131	86	29	7040
10 South Bayshore	26147	287	235	533	1148	437	208	560	1379	3440	7052	539	2198	942	376	256	45	6	11	6495
11 Bernal Heights	7100	131	112	134	390	205	99	358	612	1109	816	281	547	363	183	134	18	1	5	1604
12 South Central	29102	429	302	529	1311	503	250	913	1394	2227	3605	629	4352	2409	755	642	61	5	23	8763
13 Ingleside	33403	868	344	505	1113	656	375	976	1098	1642	1547	376	2361	5311	1795	2181	132	3	36	12085
14 Inner Sunset	20168	1344	351	455	950	873	526	761	863	1268	688	194	630	1577	2190	1922	145	1	50	5378
15 Outer Sunset	32065	2279	550	615	1262	1005	559	715	1029	1434	925	214	770	2587	2595	5690	200	4	75	9558
100 Presidio	1578	226	120	102	126	101	37	26	43	130	28	5	26	41	69	57	54	0	4	384
101 Treasure Island	3885	24	44	289	493	56	14	11	81	909	100	5	8	7	14	7	10	540	0	1273
102 Golden Gate Park	236	47	5	5	7	18	14	6	9	11	3	4	7	15	22	21	2	0	1	41
1000 Non SF	3108740	3977	3186	5599	10576	3965	1578	2494	6222	14850	11148	1275	6257	8044	3799	3914	1021	130	144	3020562

AM Peak Hour **0.348**

Name		1 Richmond	2 Marina	3 Northeast	4 Downtown	5 Western Addition	6 Buena Vista	7 Central	8 Mission	9 South of Market	10 South Bayshore	11 Bernal Heights	12 South Central	13 Ingleside	14 Inner Sunset	15 Outer Sunset	100 Presidio	101 Treasure Island	102 Golden Gate Park	1000 Non SF
	Sum	7373	4565	7769	15370	6968	2766	4219	8890	21873	12139	1898	7550	9209	6086	6747	1099	339	214	1079485
1 Richmond	10731	1919	436	444	824	784	245	216	371	922	253	53	134	359	559	653	151	4	34	2372
2 Marina	4409	264	459	435	535	360	80	76	196	676	140	27	54	60	87	85	62	3	4	805
3 Northeast	6240	212	391	971	1218	341	79	73	268	1061	204	32	95	74	90	58	47	21	5	1000
4 Downtown	9290	293	340	968	2071	616	160	155	535	1798	346	60	156	148	152	98	48	26	6	1314
5 Western Addition	6827	515	367	399	842	746	231	184	410	1017	218	52	112	151	242	154	65	6	10	1106
6 Buena Vista	3666	207	131	139	346	278	180	145	272	597	140	37	74	110	180	104	32	1	10	682
7 Central	5836	184	135	149	369	250	152	395	477	896	371	119	294	319	273	167	29	2	8	1248
8 Mission	8067	191	179	295	734	363	194	357	983	1640	537	159	307	256	199	139	31	6	5	1491
9 South of Market	14168	244	300	918	2385	510	170	243	947	3865	911	134	355	321	198	131	46	30	10	2450
10 South Bayshore	9099	100	82	186	399	152	72	195	480	1197	2454	187	765	328	131	89	16	2	4	2260
11 Bernal Heights	2471	46	39	47	136	71	34	125	213	386	284	98	190	126	64	46	6	0	2	558
12 South Central	10128	149	105	184	456	175	87	318	485	775	1255	219	1515	838	263	223	21	2	8	3049
13 Ingleside	11624	302	120	176	387	228	131	340	382	571	538	131	822	1848	625	759	46	1	12	4206
14 Inner Sunset	7018	468	122	158	331	304	183	265	300	441	239	68	219	549	762	669	51	0	17	1872
15 Outer Sunset	11159	793	191	214	439	350	194	249	358	499	322	75	268	900	903	1980	70	1	26	3326
100 Presidio	549	79	42	35	44	35	13	9	15	45	10	2	9	14	24	20	19	0	1	134
101 Treasure Island	1352	8	15	101	171	20	5	4	28	316	35	2	3	2	5	2	4	188	0	443
102 Golden Gate Park	82	16	2	2	2	6	5	2	3	4	1	1	2	5	8	7	1	0	0	14
1000 Non SF	1081842	1384	1109	1948	3681	1380	549	868	2165	5168	3879	444	2177	2799	1322	1362	355	45	50	1051156

Changes in PM Peak Hour Vehicle Trips by Planning District

	2050 Base	2050 Proposed Action	Change
Richmond	16,631	20,000	3,370
Western Addition	15,443	17,057	1,610
Downtown	31,344	31,266	(80)
Inner Sunset	11,799	15,037	3,240
Outer Sunset	14,910	19,360	4,450
Ingleside	20,213	22,645	2,430
Total	110,339	125,366	15,030

Note: Trips within the district are subtracted once to avoid double counting those trips.

2050 Baseline - Vehicle Trips from SF-CHAMP

PM Peak Period

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	100	101	102	1000
Name		Richmond	Marina	Northeast	Downtown	Western Addition	Buena Vista	Central	Mission	South of Market	South Bayshore	Bernal Heights	South Central	Ingleside	Inner Sunset	Outer Sunset	Presidio	Treasure Island	Golden Gate Park	Non SF
	Sum	30493	15152	26270	46011	24445	12906	19495	33255	60378	33172	9021	35742	35952	18395	27828	2310	3272	426	3938210
1 Richmond	25674	6818	1013	849	1374	1989	841	653	774	1013	320	168	488	1047	1448	2257	380	17	82	4142
2 Marina	15507	1337	1891	1538	1483	1393	467	432	744	1165	289	139	303	300	326	383	196	60	9	3051
3 Northeast	29485	1267	1744	5097	5116	1626	510	462	1119	3713	649	196	611	413	351	514	178	266	11	5643
4 Downtown	58745	2210	1938	5591	11748	3288	1192	1212	3189	10306	1577	466	1471	1080	831	1057	170	456	23	10940
5 Western Addition	24362	2308	1346	1421	2612	2982	1143	961	1631	2051	529	273	675	657	794	829	171	56	30	3893
6 Buena Vista	10667	859	389	351	696	1001	800	693	942	907	263	148	383	487	568	529	64	10	23	1556
7 Central	16042	655	306	340	683	795	641	1645	1612	1164	798	546	1241	1218	806	697	46	12	15	2821
8 Mission	33122	1083	727	1020	2474	1583	1093	1917	4769	4286	1855	935	1809	1253	820	871	66	66	18	6477
9 South of Market	76753	2021	1784	4243	9609	3132	1764	2363	6381	18062	4180	1263	2676	1697	966	1024	159	693	19	14716
10 South Bayshore	40260	611	371	697	1411	677	391	1263	2220	3793	9191	1095	4504	1556	549	673	37	66	8	11146
11 Bernal Heights	7453	163	84	133	306	180	134	515	769	633	828	440	872	511	187	181	13	3	3	1499
12 South Central	29178	420	211	347	809	464	310	1146	1324	1672	3257	751	6317	3081	701	780	32	7	10	7538
13 Ingleside	30465	1006	192	286	598	506	411	1116	965	1126	1125	504	3072	6437	1655	2476	56	4	29	8901
14 Inner Sunset	18860	1707	345	299	584	780	643	933	830	748	456	202	877	1838	2244	2448	87	6	35	3797
15 Outer Sunset	22576	2101	263	226	502	601	467	617	621	547	356	161	801	2523	2084	6161	105	5	39	4398
100 Presidio	3371	479	240	197	179	223	88	91	112	166	53	16	66	100	122	171	92	10	6	962
101 Treasure Island	1627	11	32	115	166	34	14	14	45	236	30	5	11	11	6	9	5	476	0	407
102 Golden Gate Park	613	104	16	15	28	25	27	22	23	26	12	3	17	44	55	60	6	0	2	128
1000 Non SF	3927974	5333	2260	3505	5634	3165	1969	3440	5186	8763	7403	1709	9549	11701	3882	6708	449	1061	64	3846195

PM Peak Hour **0.337**

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	100	101	102	1000
Name		Richmond	Marina	Northeast	Downtown	Western Addition	Buena Vista	Central	Mission	South of Market	South Bayshore	Bernal Heights	South Central	Ingleside	Inner Sunset	Outer Sunset	Presidio	Treasure Island	Golden Gate Park	Non SF
	Sum	10276	5106	8853	15506	8238	4349	6570	11207	20347	11179	3040	12045	12116	6199	9378	779	1103	143	1327177
1 Richmond	8652	2298	342	286	463	670	284	220	261	341	108	57	164	353	488	761	128	6	28	1396
2 Marina	5226	451	637	518	500	469	158	146	251	392	98	47	102	101	110	129	66	20	3	1028
3 Northeast	9936	427	588	1718	1724	548	172	156	377	1251	219	66	206	139	118	173	60	90	4	1902
4 Downtown	19797	745	653	1884	3959	1108	402	408	1075	3473	532	157	496	364	280	356	57	154	8	3687
5 Western Addition	8210	778	454	479	880	1005	385	324	550	691	178	92	228	221	268	279	57	19	10	1312
6 Buena Vista	3595	289	131	118	235	337	270	234	318	306	89	50	129	164	191	178	22	3	8	524
7 Central	5406	221	103	115	230	268	216	554	543	392	269	184	418	410	272	235	15	4	5	951
8 Mission	11162	365	245	344	834	533	368	646	1607	1444	625	315	610	422	276	293	22	22	6	2183
9 South of Market	25866	681	601	1430	3238	1055	595	796	2150	6087	1409	426	902	572	326	345	54	233	7	4959
10 South Bayshore	13567	206	125	235	475	228	132	426	748	1278	3097	369	1518	525	185	227	13	22	3	3756
11 Bernal Heights	2512	55	28	45	103	61	45	174	259	213	279	148	294	172	63	61	4	1	1	505
12 South Central	9833	142	71	117	273	156	104	386	446	564	1098	253	2129	1038	236	263	11	2	3	2540
13 Ingleside	10267	339	65	96	201	171	139	376	325	380	379	170	1035	2169	558	834	19	1	10	3000
14 Inner Sunset	6356	575	116	101	197	263	217	315	280	252	154	68	295	619	756	825	29	2	12	1279
15 Outer Sunset	7608	708	89	76	169	203	157	208	209	184	120	54	270	850	702	2076	35	2	13	1482
100 Presidio	1136	161	81	66	60	75	30	31	38	56	18	5	22	34	41	58	31	3	2	324
101 Treasure Island	548	4	11	39	56	11	5	5	15	80	10	2	4	4	2	3	2	161	0	137
102 Golden Gate Park	207	35	5	5	9	8	9	7	8	9	4	1	6	15	19	20	2	0	1	43
1000 Non SF	1323727	1797	762	1181	1898	1066	664	1159	1748	2953	2495	576	3218	3943	1308	2260	151	357	21	1296168

2050 Proposed Action - Vehicle Trips from SF-CHAMP

PM Peak Period

Name		1 Richmond	2 Marina	3 Northeast	4 Downtown	5 Western Addition	6 Buena Vista	7 Central	8 Mission	9 South of Market	10 South Bayshore	11 Bernal Heights	12 South Central	13 Ingleside	14 Inner Sunset	15 Outer Sunset	100 Presidio	101 Treasure Island	102 Golden Gate Park	1000 Non SF
	Sum	37868	17227	26374	45071	27576	14114	21484	33319	58309	33236	9053	34948	40703	24992	38027	2469	3423	508	3955303
1 Richmond	29958	8480	1172	983	1423	2306	992	812	854	1073	363	154	530	1221	1858	3081	421	24	89	4124
2 Marina	17030	1635	2183	1609	1597	1657	534	464	779	1168	285	106	362	378	408	530	218	48	10	3059
3 Northeast	29556	1534	1894	4952	4789	1727	488	536	1170	3590	585	179	593	474	517	646	161	255	12	5454
4 Downtown	58854	2812	2211	5481	11148	3701	1267	1358	3167	9481	1521	510	1449	1207	1119	1308	173	475	25	10443
5 Western Addition	26546	2869	1552	1460	2667	3507	1274	1045	1640	2075	530	237	605	780	1006	1133	195	43	33	3893
6 Buena Vista	11569	1059	398	353	768	1113	896	741	957	869	287	142	360	503	753	676	62	14	25	1594
7 Central	17388	801	351	338	755	848	732	1885	1671	1141	896	533	1232	1277	1114	922	59	10	20	2802
8 Mission	33977	1286	801	1010	2405	1664	1178	2062	4596	4137	1841	878	1795	1400	1098	1146	77	66	12	6525
9 South of Market	77178	2579	1992	4173	9141	3486	1889	2605	6110	16832	4224	1192	2570	1910	1341	1457	149	749	26	14751
10 South Bayshore	40883	743	407	728	1387	754	479	1319	2191	3629	9202	1069	4128	1785	747	969	35	70	8	11233
11 Bernal Heights	7593	171	106	139	329	218	140	534	733	645	796	438	813	503	252	218	13	7	4	1536
12 South Central	28876	533	236	351	781	513	324	1145	1386	1650	2951	790	5819	3210	886	993	36	7	11	7257
13 Ingleside	33968	1247	248	291	624	620	438	1257	1022	1186	1168	489	3239	7474	2205	3205	69	4	36	9146
14 Inner Sunset	22812	2086	361	375	697	920	765	1118	898	813	469	241	917	2406	3182	3485	107	6	50	3916
15 Outer Sunset	28175	2785	332	286	554	685	492	751	689	606	416	193	868	3033	2922	8752	114	7	62	4626
100 Presidio	3650	597	294	188	181	260	123	90	97	158	49	15	66	122	146	216	98	11	6	933
101 Treasure Island	1707	13	37	124	182	32	4	11	44	224	26	7	14	5	10	4	6	562	0	405
102 Golden Gate Park	734	119	17	16	33	45	23	25	28	23	7	6	19	51	70	94	9	0	1	147
1000 Non SF	3953552	6518	2636	3515	5612	3519	2075	3727	5287	9010	7620	1875	9570	12964	5359	9193	468	1065	78	3863460

PM Peak Hour **0.337**

Name		1 Richmond	2 Marina	3 Northeast	4 Downtown	5 Western Addition	6 Buena Vista	7 Central	8 Mission	9 South of Market	10 South Bayshore	11 Bernal Heights	12 South Central	13 Ingleside	14 Inner Sunset	15 Outer Sunset	100 Presidio	101 Treasure Island	102 Golden Gate Park	1000 Non SF
	Sum	12761	5805	8888	15189	9293	4757	7240	11228	19650	11201	3051	11778	13717	8422	12815	832	1154	171	1332937
1 Richmond	10096	2858	395	331	479	777	334	274	288	362	122	52	178	411	626	1038	142	8	30	1390
2 Marina	5739	551	736	542	538	558	180	156	262	393	96	36	122	127	138	179	73	16	3	1031
3 Northeast	9960	517	638	1669	1614	582	165	181	394	1210	197	60	200	160	174	218	54	86	4	1838
4 Downtown	19834	948	745	1847	3757	1247	427	458	1067	3195	512	172	488	407	377	441	58	160	9	3519
5 Western Addition	8946	967	523	492	899	1182	429	352	553	699	178	80	204	263	339	382	66	15	11	1312
6 Buena Vista	3899	357	134	119	259	375	302	250	322	293	97	48	121	170	254	228	21	5	8	537
7 Central	5860	270	118	114	254	286	247	635	563	385	302	179	415	430	375	311	20	3	7	944
8 Mission	11450	433	270	341	810	561	397	695	1549	1394	620	296	605	472	370	386	26	22	4	2199
9 South of Market	26009	869	671	1406	3081	1175	637	878	2059	5672	1424	402	866	644	452	491	50	253	9	4971
10 South Bayshore	13778	250	137	245	467	254	162	445	738	1223	3101	360	1391	602	252	327	12	24	3	3786
11 Bernal Heights	2559	58	36	47	111	74	47	180	247	217	268	148	274	169	85	73	4	2	1	518
12 South Central	9731	180	79	118	263	173	109	386	467	556	995	266	1961	1082	299	335	12	2	4	2445
13 Ingleside	11447	420	83	98	210	209	147	424	344	400	394	165	1092	2519	743	1080	23	1	12	3082
14 Inner Sunset	7688	703	122	126	235	310	258	377	302	274	158	81	309	811	1072	1174	36	2	17	1320
15 Outer Sunset	9495	939	112	97	187	231	166	253	232	204	140	65	292	1022	985	2949	38	3	21	1559
100 Presidio	1230	201	99	63	61	88	42	30	33	53	17	5	22	41	49	73	33	4	2	315
101 Treasure Island	575	4	12	42	61	11	1	4	15	75	9	2	5	2	3	1	2	189	0	136
102 Golden Gate Park	247	40	6	6	11	15	8	8	10	8	2	2	6	17	24	32	3	0	0	50
1000 Non SF	1332347	2197	888	1185	1891	1186	699	1256	1782	3037	2568	632	3225	4369	1806	3098	158	359	26	1301986

San Francisco Housing Element 2022 Update – Supplemental Information for Mitigation Measure M-TR-4c: Implement Transit Travel Time Measures to Reduce Transit Delay

This section describes the potential environmental effects associated with the redistribution of traffic if the city were to implement measures described under the Tier 2 improvements of Mitigation Measure M-TR-4c, which includes the conversion of mixed-traffic lanes to transit-only lanes. Conversion of mixed-traffic lanes to transit-only lanes were analyzed within the Muni Forward Project EIR as lane modification category in the Muni Forward TPS Toolkit.[1] The environmental effects of the measures included as part of the mitigation measure's Tier 1 improvements are also consistent with those analyzed as a part of Muni Forward's TPS Toolkit (i.e., within the transit stop changes, parking and turn restrictions, traffic signal and stop sign changes, and pedestrian improvements categories of toolkit elements). However, the geographic extent of Tier 2 improvements is currently unknown, and therefore, additional environmental review may be required to determine whether the potential impacts associated with redistributed vehicle traffic would be unusual and/or significant.

Transportation Impacts

The redistribution of traffic associated with Tier 2 improvements could affect the vehicle miles traveled (VMT) with San Francisco. VMT is by its nature largely a cumulative impact, which roadway changes and changes to traffic patterns can contribute to. In 2019, the department updated its Transportation Impact Guidelines (2019 Guidelines). The 2019 guidelines set further screening criteria for types of projects that would typically not result in significant VMT impacts. The current modified project would not result in significant VMT impacts. The following further substantiates this finding.

In general, reducing roadway capacity reduces overall vehicle travel and VMT. The Tier 2 improvements that convert mixed-traffic lanes to transit-only lanes would not change the amount of roadway volumes, although it may redirect them if the vehicle demand on the remaining travel lanes exceeds the roadway's capacity. For roadways where the traffic volume does not exceed the roadway's capacity, most drivers would continue to use the remaining mixed-traffic lanes and the diversion of traffic would be negligible. For roadways where the traffic volumes do exceed the roadway's capacity, Tier 2 improvements could slightly increase VMT and vehicle travel on parallel

[1] Muni Forward includes a toolbox of traffic engineering measures to address major causes of transit delay. These measures include transit stop changes, traffic lane modifications, parking and turn restrictions, traffic signal and stop sign changes, and pedestrian improvements. More information about the EIR conducted for the Muni Forward program is available at: https://sfplanning.org/project/muni-forward-transit-effectiveness-project-tep-environmental-review-process#info . Accessed November 23, 2021.

roadways from diverted vehicles. However, it is also likely that drivers would become familiar with the reduction in mixed-flow lanes and make travel behavior changes to adjust to the roadway changes to use the most direct pathway using nearby streets or change modes. The Tier 2 improvements meet the definition of an "active transportation… and transit project" and minor transportation project", as defined in the department's Transportation Impact Analysis Guidelines (2019). The department substantiates that these projects would not lead to substantial increases in VMT based on a literature review provided in the 2019 guidelines, Appendix L: Vehicle Miles Traveled/Induced Automobile Travel, Attachment C: Combined Vehicle Miles Traveled Annotate Bibliography. Furthermore, CEQA Guidelines section 15064.3(b)(2) states that transportation projects that reduce, or have no impact on, VMT should be presumed to have a less than significant transportation impact.

The conversion of mixed-traffic lanes to transit-only lanes analyzed within the Muni Forward Project EIR as lane modification category in the Muni Forward TPS Toolkit were not found to create significant impacts to other topic areas in the 2019 Guidelines, including potentially hazardous conditions, accessibility, public transit delay, loading, or parking.[2]

Noise and Air Quality Impacts

Tier 2 improvements that convert mixed-traffic lanes to transit-only lanes may redirect noise or air pollution levels through a diversion of existing traffic volumes to parallel roadways. For streets where a large diversion of existing traffic volumes could occur, long-term ambient noise levels are generally not substantial unless traffic volumes in the local area double and air pollutant changes are generally not substantial except when increases on parallel roadways exceed 10,000 vehicles per day or 1,000 trucks per day.[3] It is also anticipated that drivers from the diverted traffic would have multiple options for other travel routes such that traffic noise and air pollutants would not concentrate onto only one parallel street. Lastly, a review of other projects in the city that would divert a substantial number of vehicle trips to other streets because of the reduction in mixed-traffic lanes indicates that while traffic may slightly increase ambient noise levels and air pollution concentrations on adjacent and parallel streets, the increase in these projects remained well

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[3] Bay Area Air Quality Management District, Recommended Methods for Screening and Modeling Local Risks and Hazards, pg. 12, May 2011. Available online at: https://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CEQA/BAAQMD%20Modeling%20Approach.ashx

below the respective thresholds of significance.[4] Thus, diverted traffic from the conversion of mixed-traffic lanes to transit-only lanes as a part of Tier 2 improvements would not substantially increase ambient noise levels or air pollution concentrations on adjacent and parallel streets such that a significant noise or air quality impacts would occur. For these reasons, the Tier 2 improvements considered as a part of Mitigation Measure M-TR-4c are not anticipated to result in a less than significant noise and air quality impacts.

The cumulative context for traffic noise analyses are typically confined to the local roadways nearest the project. As vehicle trips that shift routes due to the conversion of mixed-traffic lanes to transit-only lanes would disperse throughout the roadway network, the contribution on any given segment would not likely result in a doubling of traffic volumes in the local area. Regional air pollution is by its nature a cumulative impact. Therefore, Tier 2 improvements considered as a part of Mitigation Measure M-TR-4c are not anticipated to not result in a considerable contribution to ambient noise levels or air pollution from projected traffic.

[4] The following projects with substantial vehicle trip diversions were reviewed: the Second Street Improvement Project (Case No. 2007.0347E), Sixth Street Pedestrian Safety Project (Case No. 2014.1010E), and the Better Market Street Project (Case No. 2014.0012E). The Second Street Improvement Project analyzed diversion of 950 vehicles during the p.m. peak hour. The Sixth Street Pedestrian Safety Project analyzed a range of diversion volumes during the p.m. peak hour, including over 1,000 vehicles at one intersection. The Better Market Street Project analyzed a range of diversion volumes during the p.m. peak hour, including diversions of between 200 and 300 vehicles at many intersections.

APPENDIX G.7. SUPPLEMENTAL INFORMATION FOR TRANSPORTATION MITIGATION MEASURES

San Francisco Housing Element 2022 Update – Supplemental Information for Mitigation Measure M-TR-4c: Implement Transit Travel Time Measures to Reduce Transit Delay

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[4] The following projects with substantial vehicle trip diversions were reviewed: the Second Street Improvement Project (Case No. 2007.0347E), Sixth Street Pedestrian Safety Project (Case No. 2014.1010E), and the Better Market Street Project (Case No. 2014.0012E). The Second Street Improvement Project analyzed diversion of 950 vehicles during the p.m. peak hour. The Sixth Street Pedestrian Safety Project analyzed a range of diversion volumes during the p.m. peak hour, including over 1,000 vehicles at one intersection. The Better Market Street Project analyzed a range of diversion volumes during the p.m. peak hour, including diversions of between 200 and 300 vehicles at many intersections.

APPENDIX H

Noise Supporting Information

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

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APPENDIX H.1. NOISE SCOPE OF WORK

San Francisco Housing Element 2022 Update
Final Noise Scope of Work

Submitted: November 5, 2021

The noise and vibration analysis will evaluate the Housing Element 2022 update policies and objectives and the physical environmental effects of potential zoning changes as well as individual subsequent development projects that could occur as a result of the Housing Element 2022 update. ICF will prepare the noise analysis in accordance with the current version of the city's Noise Impact Analysis Guidelines (city's noise guidelines) and planning department direction at the time of document preparation. The noise analysis will be presented in the form of a EIR section, and will include project background, regulatory background, the environmental setting of the city with respect to noise (including the results of the noise monitoring survey), and an impact analysis associated with project implementation (including a methodology section). Any additional technical background information that supports the analysis but is not necessary to present in the EIR section will be appended to the EIR.

It is generally assumed that the noise analysis will include the following topics, which are based on the city's noise guidelines.

- Construction noise impacts from implementation of housing element policies.
- Operational noise impacts from implementation of housing element policies.
- Construction and operations (if applicable) vibration impacts from implementation of housing element policies.
- Cumulative noise and vibration impacts from implementation of housing element policies.

The scope of work assumes the noise and vibration analysis will be conducted for the following scenarios:

- 2020 conditions
- Midpoint 2035 conditions and Environmental Baseline 2050 conditions, no project (assumes a continuation of existing housing element plans and policies)
- Proposed action (2035 and 2050)
- Plan Bay Area 2050 (2035 and 2050 conditions)
- Eastside Alternative (2035 and 2050 conditions)

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- Potentially Cumulative conditions in 2050, which is defined as Port of San Francisco's Waterfront Plan Update, BART's Second Transbay Tube Project, Downtown Congestion Pricing, and Increased Caltrain Service and Pennsylvania Avenue Extension (and other reasonably foreseeable projects like routine infrastructure repair, maintenance, and improvement projects) and the proposed action.

Task 1. Noise Monitoring

ICF will conduct a noise monitoring survey to characterize ambient noise levels in areas of the city that would be developed under one or more scenarios. Up to ten noise measurement sites will be selected. The location of monitoring sites will be determined based on the locations with projected housing growth and existing monitoring data. After a final set of measurement locations has been approved by the planning department, sound level meters will be set up to collect data continuously for a period of 24 to 72 hours at each site. Collected noise data will be supplemented with previously collected noise measurements in the existing setting section of the analysis.

A map (in kmz format) with ten proposed noise measurement sites and previously collected noise measurement sites for other completed city projects prepared by ICF, or otherwise readily available, is included with this scope of work for review and approval.[1] It is assumed that this map will be revised in consultation with EP after the representative building types are selected.

Assumptions:

- Noise measurements will be conducted by two ICF noise specialists in the field for up to four days of meter installation, transfer and removal.
- Noise measurement data will be collected between Monday and Friday by temporary installation of Type 2 sound level meters. Meters will collect one-hour time histories.
- Noise monitors would be installed in public locations, such as on utility poles.

Task 2. Roadway Segment Selection for Modeling

ICF will compile traffic volumes provided by the transportation consultant for modeling. The screening criteria will be based on traffic volume increases from midpoint conditions 2035 and 2050 environmental baseline conditions no project (which assumes a continuation of existing

[1] In the map, "M" indicates the ten proposed monitoring sites. The sites are proposed in areas where greater numbers of units are anticipated for one or more scenarios while also considering overall distribution of the sites through different areas of the city. For the previously collected noise measurement sites, the map indicates one measurement site from each completed project that was nearer to a residence or a structure that resembled residential use. All of the previously collected noise measurement sites are long term measurements of 24 hours or more. The project name, measurement location identification, and measurement date are provided in the map for each previously collected noise measurement. The Mission Bay Block 14 Project is a San Francisco Unified School District Project that is included in this map

housing element plans and policies) to scenarios. Each scenario will be analyzed for 2035 and 2050 conditions.

Task 3. Noise and Vibration Technical Analysis

The noise and vibration analysis will evaluate construction and operation of development consistent with the policies and objectives of the Housing Element 2022 Update, and the potential for these activities to increase ambient noise levels in excess of standards established in the city's noise ordinance or applicable standards of other agencies. The analysis will also evaluate the potential for vibration from development construction to result in vibration-related damage to adjacent buildings, structures, utilities, or vibration-sensitive equipment. The approach will conform to the city's noise guidelines. The following subtasks describe methods and approaches to developing the analysis content in the EIR.

Prior to the submittal of the first draft of the EIR section, ICF will prepare and submit two memos (one for construction impacts and one for operational impacts) briefly summarizing the results of the analysis. Following submittal of each memo, a meeting will be held with ICF and EP to discuss the results. The purpose of these memos and meetings is to provide a preview of results and resolve any outstanding questions. Following the meetings, only if necessary, ICF will revise the memo. If a memo does not warrant revisions, the conclusions and direction from the meeting will be reflected in the first draft of the EIR section.

Existing Setting

The existing setting will include information about existing noise levels and types of receptors in the development areas. This will include ambient noise levels obtained from monitoring under Task 1, noise levels measured for other completed city projects prepared by ICF or otherwise made available to ICF, and a generalized description of noise sources in these areas. The section will include information regarding existing traffic noise levels, based on traffic noise levels under year 2020 conditions. Land use types considered to be noise-sensitive receptors for the purposes of this analysis are single- and multi-family residences, senior housing/convalescent homes, hostels/hotels/motels, places of worship, day care, schools, and hospitals/clinics.

Assumptions:

- New land uses under each scenario would be assumed to be in compliance with the City of San Francisco General Plan and Title 24 guidelines and requirements, and there would be no analysis of noise effects to receptors within new development.

Construction Equipment Noise Analysis

ICF will evaluate noise levels from construction equipment using standard acoustical modeling methods used in the FTA Noise and Vibration Impact Assessment Manual (2018). Noise levels will be determined for representative building types. This analysis will inform the construction

noise analysis of each scenario. Seven representative building types (an upper range development and a lower range development) will be evaluated. ICF will coordinate with the planning department and Ramboll to determine equipment requirements for construction phases that would be used for representative building types under each of the scenarios where such information is not available. Where construction information from representative building types is available from similar previously completed projects, that construction information will be used in the analysis instead of generating new construction information. Noise levels will be estimated as a function of distance from the construction site for each construction phase.

Based on the city's noise guidelines, the quantitative construction noise analysis will determine whether daytime construction noise would exceed an hourly Leq of 90 dBA and/or would result in a construction-related noise increase of 10 dBA or more over ambient levels (the 12-hour daytime Leq, for the purposes of this analysis) at noise sensitive receptors during daytime hours. In addition, nighttime construction noise will be evaluated based on the potential for sleep disturbance at nearby residences to occur. This analysis will assess the potential for interior noise at nearby residential receptors to exceed an Leq of 45 dBA during nighttime hours (assuming a 25 dB reduction from exterior to interior noise with windows closed).

For both the daytime and nighttime construction noise evaluation, an assessment of the frequency, duration, and severity of the noise will also be included to supplement the quantitative noise criteria cited above. Where impacts are identified from representative building types for each of the scenarios, mitigation measures will be applied.

Should none of the representative building types require pile-driving, a programmatic analysis of the noise impacts of pile-driving will be included and mitigation measures will be applied.

Construction Equipment Vibration Analysis

ICF will evaluate vibration levels from construction equipment using standard acoustical modeling methods used in the FTA Noise and Vibration Impact Assessment Manual (2018). ICF will coordinate with Ramboll to determine equipment requirements for construction phases that would be used for representative building types under each of the scenarios. Vibration levels will be determined as a function of distance from the construction site for each construction phase. Mitigation measures will be applied, based on the city's standard construction vibration mitigation developed by EP or tailored measures as applicable, to address impacts from representative building types for each of the scenarios.

The construction vibration analysis will include the following quantitative analysis:

- Vibration impacts related to human annoyance will be evaluated based on whether construction activities generate vibration levels that would cause sleep disturbance, which will be determined based on the FTA Category 2 criteria (residences and buildings

where people normally sleep) for frequent events (72 VdB) at sensitive receptor locations occurring for a substantial period during nighttime hours.

- The construction vibration analysis will also evaluate the potential for building damage to occur under California Department of Transportation guidelines for vibration damage to building structures. Appropriate building damage criteria will be assigned to existing structures within the development areas under scenarios, but it is assumed that the most fragile building condition will be studied (as appropriate) to account for affected buildings for each of the representative building types. Construction vibration criteria analysis will evaluate effects on vibration sensitive equipment that may be in adjacent buildings.
- Should none of the representative building types require pile-driving, a programmatic analysis of the vibration impacts of pile-driving will be analyzed.

Assumptions:

- ICF will coordinate with Ramboll to develop an inventory of construction equipment and phases for evaluation under each representative building types, where such information is not already available from similar projects.

Traffic Noise Analysis

The traffic noise modeling will proceed using traffic data for the finalized set of roadway segments approved by the planning department under Task 2.

ICF will conduct a quantitative analysis of traffic noise levels for the scenarios identified by the planning department, as follows:

- 2020 conditions (for existing setting discussion)
- Midpoint 2035 conditions and 2050 environmental baseline conditions, assuming a continuation of existing housing element plans and policies
- 2035 and 2050 conditions under the proposed action
- 2035 and 2050 conditions under Plan Bay Area 2050
- 2035 and 2050 under the Eastside Alternative
- Potentially Cumulative conditions in 2050 defined as Port of San Francisco's Waterfront Plan Update, BART's Second Transbay Tube Project, Downtown Congestion Pricing, and Increased Caltrain Service and Pennsylvania Avenue Extension (and other reasonably foreseeable projects like routine infrastructure repair, maintenance, and improvement projects) and the proposed action.

Operational traffic noise will be evaluated in terms of the increase in traffic noise levels from Housing Element policies affecting existing noise sensitive land uses.

Baseline (2035 and 2050) traffic noise levels are categorized based on the San Francisco General Plan Environmental Protection Element land use compatibility chart. For land uses in the "acceptable" category, a substantial permanent increase in noise levels would be considered to occur if a Housing Element scenario results in a noise level increase of 5 dB (Ldn) or more, as compared to Baseline 2035 and 2050 conditions. For land uses not in the "acceptable" category, this substantial permanent increase criterion is reduced to 3 dB or more.

ICF will prepare figures depicting Ldn increases for scenarios compared to 2035 and 2050 baseline conditions that assume a continuation of existing housing element plans and policies. ICF will consult with the planning department regarding visual presentation of the figures.

Assumptions:

- ICF will calculate traffic noise levels for each Housing Element Scenario using SF-Champ traffic data. Traffic noise levels in terms of Ldn, or day-night levels will use counts by time intervals identified in SF-Champ datasets. A methodology describing the approach to the use of SF-Champ data in the analysis will be included in the EIR.
- ICF will prepare six figures depicting traffic noise level increases for inclusion in the traffic noise analysis section of the EIR and three setting figures (existing conditions, 2035 midpoint, and 2050 environmental baseline.
- ICF will prepare and supply the database of the total noise levels for each link for the 2020 existing conditions, 2050 environmental baseline, and 2050 Proposed Action for the equity analysis (which is not part of the CEQA work and would not be contained in the EIR or appendix to the EIR).

Operation Noise from New Development

New development operation of Heating, Ventilation, and Air Conditioning (HVAC), mechanical equipment and other fixed sources (e.g., loading docks, emergency generator equipment, entertainment venues) will be evaluated using standard acoustical modeling methods and operational assumptions for representative building types; ICF will confirm these methods and assumptions with planning department before modeling/evaluation. Operational noise would be subject to Section 2909 of the Noise Ordinance and evaluated as follows:

- Section 2909(a): Noise from operation of noise sources subject to section 2909 of the noise ordinance that occurs on residential properties shall not exceed existing ambient noise levels at any point outside of the property plane by more than 5 dBA. This noise limit is applied to stationary sources of noise on residential properties.
- Section 2909(b): Noise from operation of noise sources subject to section 2909 of the noise ordinance that occurs on commercial or industrial property shall not exceed existing ambient noise levels at any point outside of the property plane by more than 8

dBA. This noise limit is applied to stationary sources of noise on commercial (and mixed-use containing commercial) properties.

- Section 2909(d): To prevent sleep disturbance and protect public health, no fixed noise source may cause the noise level measured inside any sleeping or living room in any dwelling unit to exceed 45 dBA between the hours of 10 p.m. and 7 a.m. or 55 dBA between the hours of 7 a.m. and 10 p.m.
- Emergency standby generators are not currently subject to the noise ordinance. Based on recommendations from the department of public health, these noise sources will be evaluated for their potential to result in a noise level of 75 dBA at the property plane and for compliance with the noise limits under section 2909(d), discussed above.

Assumptions:

Where operational noise information from projects that are similar to the representative building types is not already available, ICF will develop assumptions for building mechanical equipment and other fixed sources and coordinate with the planning department and Ramboll to review assumptions for the 2035 and 2050 baselines and scenarios.

The scope of analysis for social equity factors related to traffic and operation noise will be developed at a later date.

Assumptions:

- The planning department will provide overlay data of social equity factors/definitions.
- ICF will prepare initial results of the analysis for discussion by videoconference. Based on planning department recommendations, ICF will prepare a policy approach for planning department approval.

Appendices

ICF will include the following materials in the technical appendix to the EIR:

- field sheets from the noise monitoring survey
- time history charts from sound level meter data
- a description of representative building types and assumptions used for the noise evaluation (it is assumed that the same description will be used for the construction air quality, construction traffic, and construction noise analyses)
- list of construction data by phase for each representative building types (it is assumed that the same list of construction data by phase will be used for the construction air quality and construction noise analyses)
- construction noise and vibration modeling

- traffic noise modeling
- other guidance or policy updates provided by the planning department

Deliverables

- Deliverable 5a: Draft 1 EIR Noise Section Scope of Work (complete)
- Deliverable 5b: Draft 2 EIR Noise Section Scope of Work (complete)
- Deliverable 5c: Screen check EIR Noise Section Scope of Work (complete)
- Deliverable 5d: Final EIR Noise Section Scope of Work (v1 complete, v2 is this draft)
- Deliverable 5e: Noise monitoring locations and previously collected measurements map (complete)
- Deliverable 5f: Brief summary memos of construction and operational conclusions
- Deliverable 5g: Meetings to discuss construction and operational conclusions
- Deliverable 5h: Revised summary memo of conclusions (if necessary) to reflect meeting
- Deliverable 5i: Draft 1 EIR Noise Section
- Deliverable 5j: Screen check EIR Noise Section
- Deliverable 5k: Final EIR Noise Section

APPENDIX H.2. NOISE MEASUREMENT SURVEY & NOISE MONITORING PICTURES

APPENDIX H.2A. NOISE MEASUREMENT SURVEY

Since the proposed action considers the whole city, the existing ambient noise environment is characterized as an urban environment (e.g., highway and local vehicular traffic, people walking, aircraft overflights, commercial noise, public transit). Traffic noise from nearby major roadways, including Interstate 80 and U.S. 101, is the dominant noise source in the city. To quantify existing ambient noise levels in the project area, long-term (48-hour) ambient noise measurements were conducted between the following days:

- Tuesday, March 30, and Thursday, April 1, 2021
- Tuesday, April 13, and Thursday, April 15, 2021
- Wednesday, June 2, and Friday, June 4, 2021

Equivalent continuous sound pressure level (Leq) measurements were conducted using Piccolo II Type-2 sound level meters (SLM) at locations where the project proposes rezoning and residential land development. Leq is measured as the constant noise level that would result over a given time interval, in this case being every hour for 48 hours. Conditions were clear, sunny, and breezy at the time of installation with an average wind speed of 10.4 mile per hour and temperatures ranging from 53 to 64 degrees Fahrenheit.

Monitoring locations were selected to capture noise levels in areas that are sensitive to noise or representative of ambient levels throughout the day and night for areas near anticipated future development consistent with the housing element update. Measurements were then used to calculate day-night average sound levels (Ldn) which applies an artificial 10dB increase during nighttime hours (10 p.m. to 7 a.m.).
The following tables summarize the results of the noise measurement survey. Existing noise levels vary between measurement locations, as some are located downtown while others were conducted in more residential areas.

Table H.2-1: Long-Term Noise Level Measurements

Site	Site Description	Time Period	Daytime L_{eq}[1]	Nighttime L_{eq}[1]	Peak L_{eq}[2] Time of Occurrence	Day 1 L_{dn}	Day 2 L_{dn}	Primary Noise Sources
LT-1	Washington Street/Van Ness Avenue	4/13/2021–4/15/2021	74.2	67.7	77.0 4/14/2021, 2 p.m.	76.9	77.0	Traffic and active construction
LT-2	Seymour Street/Turk Street	4/13/2021–4/15/2021	66.2	56.3	68.5 4/14/2021, 8 a.m.	67.9	69.3	Through-traffic
LT-3	Broad Street/Orizaba Avenue	3/30/2021–4/01/2021	68.3	59.3	72.1 3/3120/21, 11 a.m.	70.1	69.2	Traffic and MUNI track
LT-4	3rd Street/Oakdale Avenue	4/13/2021–4/15/2021	70.7	64.6	79.2 4/14/2021, 10 a.m.	73.1	73.9	--
LT-5	Balboa Street/44th Avenue	3/30/2021–4/01/2021	61.7	51.5	64.4 3/30/2021, 5 p.m.	64.9	64.9	Amplified music and traffic
LT-6	Panorama Drive/Clarendon Avenue	3/30/2021–4/01/2021	61.2	51.8	69.6 3/31/2021, 6 a.m.	61.6	69.0	Through-traffic
LT-7	Illinois Street/22nd Street	4/13/2021–4/15/2021	68.4	63.3	72.3 4/13/2021, 5 p.m.	72.0	73.7	Bus traffic and construction
LT-8	Judah Street/19th Avenue	3/30/2021–4/01/2021	69.7	61.2	74.9 3/30/2021 3 p.m.	72.0	71.2	Traffic
LT-9	Taraval Street/41st Avenue	6/02/2021–6/04/2021	64.7	58.2	72.7 4/13/2021, 4 p.m.	66.1	68.3	Low traffic and light roadwork
LT-10	Executive Park Boulevard/Alanna Way (Adjacent to U.S. 101)	4/13/2021–4/15/2021	70.1	64.2	72.7 4/13/2021, 4 p.m.	73.4	72.6	Highway noise and track traffic

Note: See Appendix H.3 for detailed hourly data.

LT = long-term (48-hour) ambient noise measurement.

[1] Daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) L_{eq} measurements were calculated using long-term measurement data to compare construction noise levels.

[2] Peak L_{eq} is the highest calculated L_{eq} level during a 48-hour period.

Table H.2-2: Day 1 of Noise Monitoring Statistics, Daytime Hours

Site	Site Description	L_{eq}[1]	L_{min}[2]	L_{max}[3]	L_{10}[4]	L_{25}[4]	L_{50}[4]	L_{90}[4]
LT-1	Washington Street/Van Ness Avenue	74.4	51.6	102.5	76.7	72.8	68.0	60.4
LT-2	Seymour Street/Turk Street	66.4	45.8	96.5	70.7	65.7	58.7	53.2
LT-3	Broad Street/Orizaba Avenue	68.6	42.3	101.5	69.4	64.5	58.4	52.7
LT-4	Third Street/Oakdale Avenue	70.9	53.6	97.1	74.3	70.5	66.4	61.0
LT-5	Balboa Street/44th Avenue	62.8	42.3	96.0	66.0	48.8	56.3	43.3
LT-6	Panorama Drive/Clarendon Avenue	61.4	36.4	92.4	63.4	59.1	53.8	45.6
LT-7	Illinois Street/22nd Street	68.6	53.7	92.2	70.7	67.1	62.9	58.6
LT-8	Judah Street/19th Avenue	70.1	49.8	101.8	71.5	68.8	66.1	61.4
LT-9	Taraval Street/41st Avenue	70.9	47.3	95.1	66.0	61.6	57.9	53.0
LT-10	Executive Park Boulevard/Alanna Way (Adjacent to U.S. 101)	70.9	59.9	100.8	72.6	70.5	69.0	66.9

Note: See Appendix H.3 for detailed hourly data.
LT = long-term (48-hour) ambient noise measurement.
[1] Daytime (7 a.m. to 10 p.m.) L_{eq} measurements were calculated using long-term measurement data.
[2] L_{min} is the minimum A-weighted sound pressure level recorded during the measurement.
[3] L_{max} is the maximum A-weighted sound pressure level recorded during the measurement.
[4] $L_{\%}$ is the noise threshold which occurs n% of the time (For example, L_{10} is the noise level that surpasses a threshold 10% of the time)

Table H.2-3: Day 1 of Noise Monitoring Statistics, Nighttime Hours

Site	Site Description	L_{eq}[1]	L_{min}[2]	L_{max}[3]	L_{10}[4]	L_{25}[4]	L_{50}[4]	L_{90}[4]
LT-1	Washington Street/Van Ness Avenue	64.2	40.8	98.8	69.6	63.7	56.8	49.5
LT-2	Seymour Street/Turk Street	58.1	40.1	88.4	56.2	50.4	47.0	44.2
LT-3	Broad Street/Orizaba Avenue	60.7	40.7	94.3	59.8	56.3	54.1	51.1
LT-4	Third Street/Oakdale Avenue	64.6	45.3	93.1	65.8	59.7	55.2	51.6
LT-5	Balboa Street/44th Avenue	53.5	41.1	44.7	43.7	43.2	42.8	41.7
LT-6	Panorama Drive/Clarendon Avenue	50.9	34.1	77.7	49.0	44.6	44.8	41.2
LT-7	Illinois Street/22nd Street	63.5	52.3	91.1	61.5	61.5	61.5	61.5
LT-8	Judah Street/19th Avenue	62.6	40.9	97.6	63.9	59.5	54.9	49.1
LT-9	Taraval Street/41st Avenue	65.1	44.6	88.3	56.3	52.1	49.7	47.7
LT-10	Executive Park Boulevard/Alanna Way (Adjacent to U.S. 101)	65.1	47.2	87.5	66.3	64.1	62.5	59.2

Note: See Appendix H.3 for detailed hourly data.

LT = long-term (48-hour) ambient noise measurement.

[1] Nighttime (10 p.m. to 7 a.m.) L_{eq} measurements were calculated using long-term measurement data.

[2] L_{min} is the minimum A-weighted sound pressure level recorded during the measurement.

[3] L_{max} is the maximum A-weighted sound pressure level recorded during the measurement.

[4] $L_{n\%}$ is the noise threshold which occurs n% of the time (For example, L_{10} is the noise level that surpasses a threshold 10% of the time)

Table H.2-4: Day 2 of Noise Monitoring Statistics, Daytime Hours

Site	Site Description	L_{eq}[1]	L_{min}[2]	L_{max}[3]	L_{10}[4]	L_{25}[4]	L_{50}[4]	L_{90}[4]
LT-1	Washington Street/Van Ness Avenue	74.2	51.8	103.8	76.4	72.7	68.1	60.6
LT-2	Seymour Street/Turk Street	66.9	43.6	108.1	70.9	66.1	58.3	51.9
LT-3	Broad Street/Orizaba Avenue	68.4	47.7	103.0	69.2	64.6	58.9	53.8
LT-4	Third Street/Oakdale Avenue	71.1	49.3	110.2	73.4	69.2	65.1	59.3
LT-5	Balboa Street/44th Avenue	62.9	41.9	99.9	66.0	61.9	56.6	49.8
LT-6	Panorama Drive/Clarendon Avenue	62.1	35.4	102.2	63.2	58.7	53.2	44.9
LT-7	Illinois Street/22nd Street	69.1	52.9	97.7	70.1	67.4	65.4	63.9
LT-8	Judah Street/19th Avenue	69.8	47.2	105.1	71.4	68.8	66.1	60.7
LT-9	Taraval Street/41st Avenue	69.3	48.0	97.9	67.0	62.8	58.9	54.0
LT-10	Executive Park Boulevard/Alanna Way (Adjacent to U.S. 101)	69.3	53.9	96.3	71.8	68.3	66.0	63.5

Note: See Appendix H.3 for detailed hourly data.

LT = long-term (48-hour) ambient noise measurement.

[1] Nighttime (10 p.m. to 7 a.m.) L_{eq} measurements were calculated using long-term measurement data.

[2] L_{min} is the minimum A-weighted sound pressure level recorded during the measurement.

[3] L_{max} is the maximum A-weighted sound pressure level recorded during the measurement.

[4] $L_{n\%}$ is the noise threshold which occurs n% of the time (For example, L_{10} is the noise level that surpasses a threshold 10% of the time)

Table H.2-5: Day 2 of Noise Monitoring Statistics, Nighttime Hours

Site	Site Description	L_{eq}[1]	L_{min}[2]	L_{max}[3]	L_{10}[4]	L_{25}[4]	L_{50}[4]	L_{90}[4]
LT-1	Washington Street/Van Ness Avenue	64.0	42.0	101.3	68.9	62.9	56.1	48.9
LT-2	Seymour Street/Turk Street	58.6	38.5	87.7	56.7	50.7	53.4	43.0
LT-3	Broad Street/Orizaba Avenue	59.4	38.7	85.6	59.6	56.0	53.6	50.0
LT-4	Third Street/Oakdale Avenue	65.6	40.2	93.6	67.6	60.4	54.3	48.8
LT-5	Balboa Street/44th Avenue	53.4	38.7	81.0	53.3	50.7	48.9	47.3
LT-6	Panorama Drive/Clarendon Avenue	58.7	32.8	92.8	50.2	45.6	38.8	36.2
LT-7	Illinois Street/22nd Street	65.6	52.4	98.1	61.2	57.8	56.5	54.6
LT-8	Judah Street/19th Avenue	61.9	39.1	93.1	63.4	59.1	56.4	48.4
LT-9	Taraval Street/41st Avenue	64.7	46.2	85.2	59.9	55.1	51.8	49.4
LT-10	Executive Park Boulevard/Alanna Way (Adjacent to U.S. 101)	64.7	45.9	87.4	65.8	63.2	61.3	57.9

Note: See Appendix H.3 for detailed hourly data.
LT = long-term (48-hour) ambient noise measurement.
[1] Nighttime (10 p.m. to 7 a.m.) L_{eq} measurements were calculated using long-term measurement data.
[2] L_{min} is the minimum A-weighted sound pressure level recorded during the measurement.
[3] L_{max} is the maximum A-weighted sound pressure level recorded during the measurement.
[4] $L_{\%}$ is the noise threshold which occurs n% of the time (For example, L_{10} is the noise level that surpasses a threshold 10% of the time)

APPENDIX H.2B. NOISE MONITORING LOCATION PICTURES

Noise Monitoring Site M1.
Location: Washington Street/Van Ness Avenue



Looking southeast toward the Van Ness Avenue and Washington Street intersection.



Looking south on Van Ness Avenue.



Looking north on Van Ness Avenue.



Van Ness Avenue, looking east.

Noise Monitoring Site M2.
Location: Seymour Street/Turk Street



Southwest corner of Seymour Street and Turk Street, looking north.



Southwest corner of Seymour Street and Turk Street, looking east.



Southwest corner of Seymour Street and Turk Street, looking west.



Looking northwest from the southeast corner of Seymour Street and Turk Street.

Noise Monitoring Site M3.
Location: Oceanview



Looking north on the northeast corner of Orizaba Avenue and Broad Street.



Looking northwest on the northeast corner of Orizaba Avenue and Broad Street.



Looking west on the northeast corner of Orizaba Avenue and Broad Street.



Looking south on the northeast corner of Orizaba Avenue and Broad Street.

Noise Monitoring Site M4.
Location: Bayview



On Oakdale Avenue, looking southeast.



On Oakdale Avenue, looking southwest.



Looking northwest on Oakdale Avenue, ~120 feet northwest of Oakdale Avenue and Third Street intersection.



On Oakdale Avenue, looking north toward the monitor location.

Noise Monitoring Site M5.
Location: Outer Richmond



The southwest corner of Balboa Street and 44th Avenue, looking northeast.



The southwest corner of Balboa Street and 44th Avenue, looking east.



The southwest corner of Balboa Street and 44th Avenue, looking north.



The southwest corner of Balboa Street and 44th Avenue, looking south.

Noise Monitoring Site M6.
Location: Midtown/Twin Peaks



Next to the monitor on Panorama Drive, looking northeast.



On Panorama Drive, looking east.



On Panorama Drive, looking west toward Clarendon Avenue.



On Panorama Drive, looking north.

Noise Monitoring Site M7.
Location: East of I-80/Illinois Street



On Illinois Street, 200 feet north of 22nd Street, looking south.



On Illinois Street, looking northwest.



On Illinois Street, looking west.

Noise Monitoring Site M8.
Location: Sunset



Northeast corner of Judah Street and 18th Avenue, looking west.



Northeast corner of Judah Street and 18th Avenue, looking southwest.



Northeast corner of Judah Street and 18th Avenue, looking northwest.



Northeast corner of Judah Street and 18th Avenue, looking east.

Noise Monitoring Site M9.
Location: Parkside



Northwest corner of 41st Avenue and Taraval Street.



Northwest corner of 41st Avenue and Taraval Street, looking east.



Northwest corner of 41st Avenue and Taraval Street, looking west.



Northwest corner of 41st Avenue and Taraval Street, looking south.

Noise Monitoring Site M10.
Location: Bayview



Along Executive Park Boulevard, ~120 feet from Alana Way, looking southwest.



Along Executive Park Boulevard, looking north.

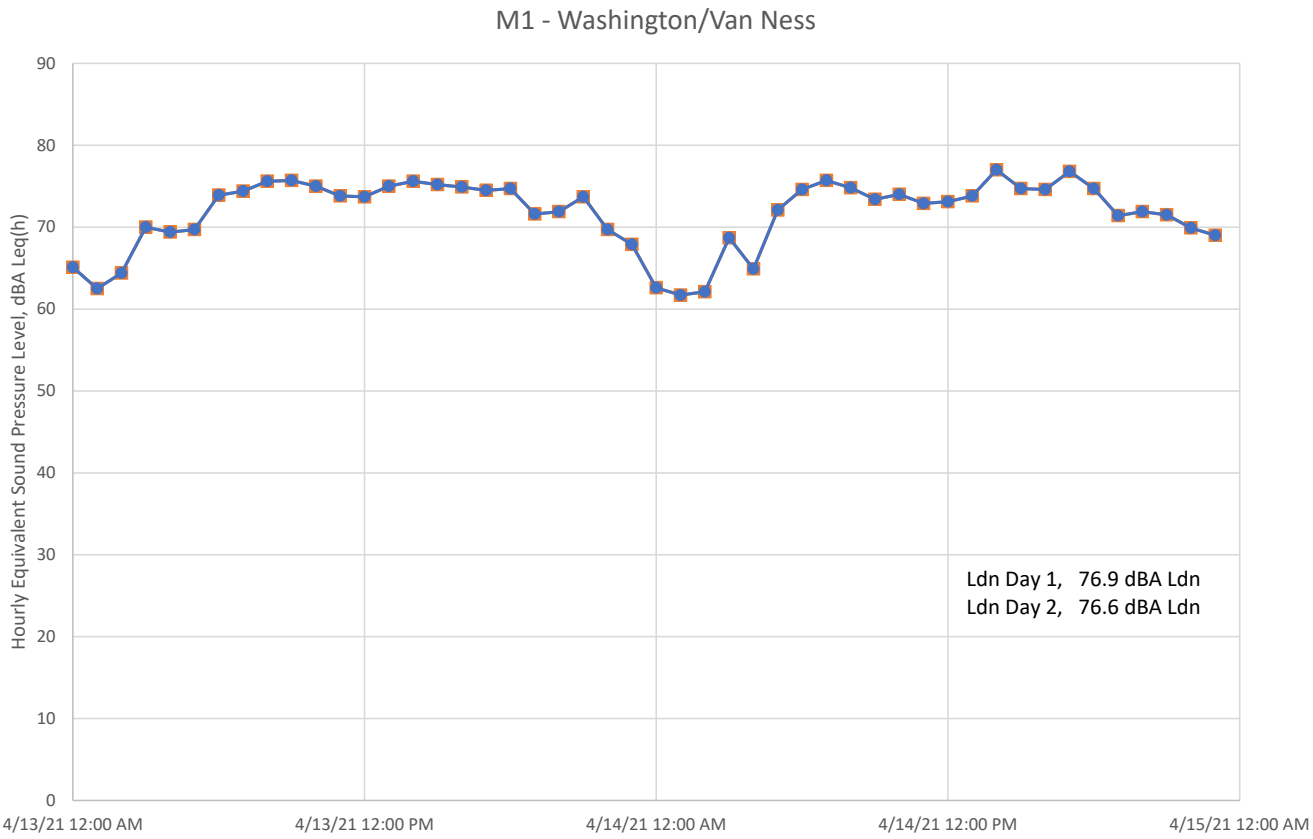


Along Executive Park Boulevard, looking east.



Along Executive Park Boulevard, looking south.

APPENDIX H.3. NOISE MONITORING HOURLY DATA



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2:00 AM	64.4	62.1
3:00 AM	70.0	68.7
4:00 AM	69.4	64.9
5:00 AM	69.7	72.1
6:00 AM	73.9	74.6
7:00 AM	74.4	75.7
8:00 AM	75.6	74.8
9:00 AM	75.7	73.4
10:00 AM	75.0	74.0
11:00 AM	73.8	72.9
12:00 PM	73.7	73.1
1:00 PM	75.0	73.8
2:00 PM	75.6	77.0
3:00 PM	75.2	74.7
4:00 PM	74.9	74.6
5:00 PM	74.5	76.8
6:00 PM	74.7	74.7
7:00 PM	71.6	71.4
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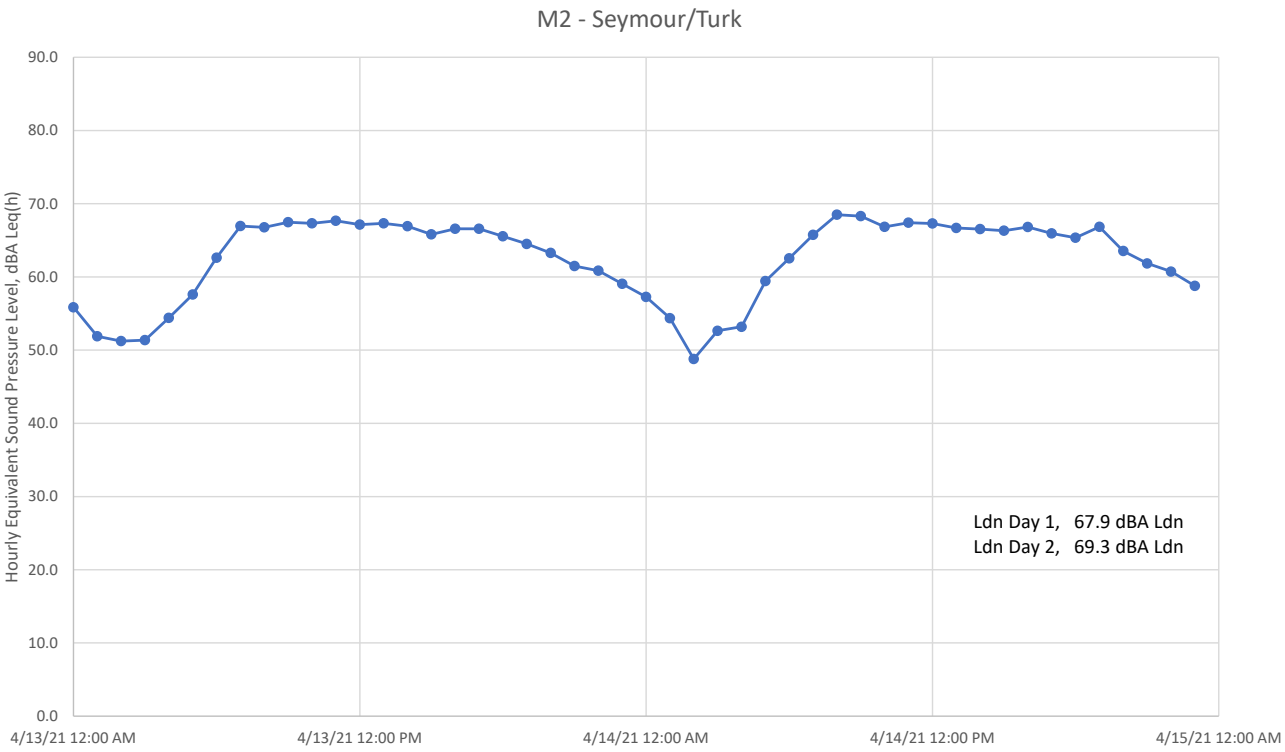
11:00 PM	67.9	69.0



Time	4/13/21, dBA Leq	4/14/21, dBA Leq
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1:00 AM	62.5	61.7
2:00 AM	64.4	62.1
3:00 AM	70.0	68.7
4:00 AM	69.4	64.9
5:00 AM	69.7	72.1
6:00 AM	73.9	74.6
7:00 AM	74.4	75.7
8:00 AM	75.6	74.8
9:00 AM	75.7	73.4
10:00 AM	75.0	74.0
11:00 AM	73.8	72.9
12:00 PM	73.7	73.1
1:00 PM	75.0	73.8
2:00 PM	75.6	77.0
3:00 PM	75.2	74.7
4:00 PM	74.9	74.6
5:00 PM	74.5	76.8
6:00 PM	74.7	74.7
7:00 PM	71.6	71.4
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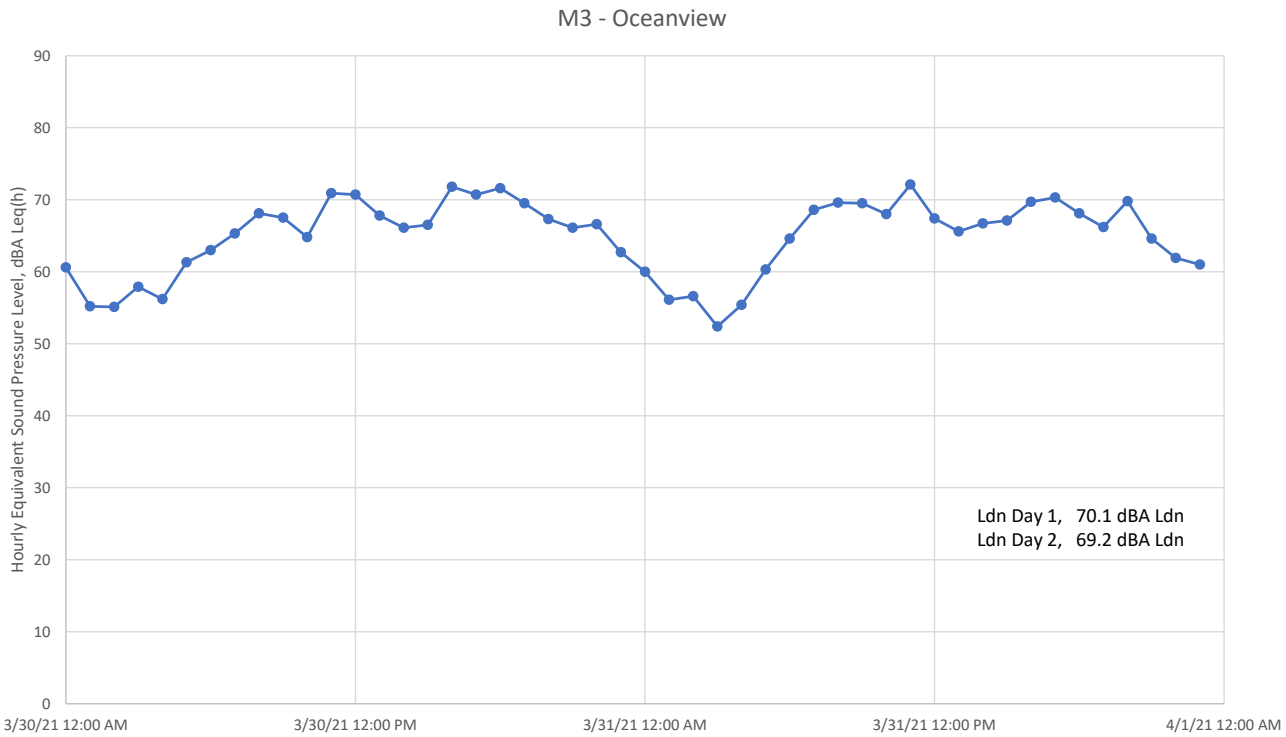
11:00 PM	67.9	69.0



Time	4/13/21, dBA Leq	4/14/21, dBA Leq
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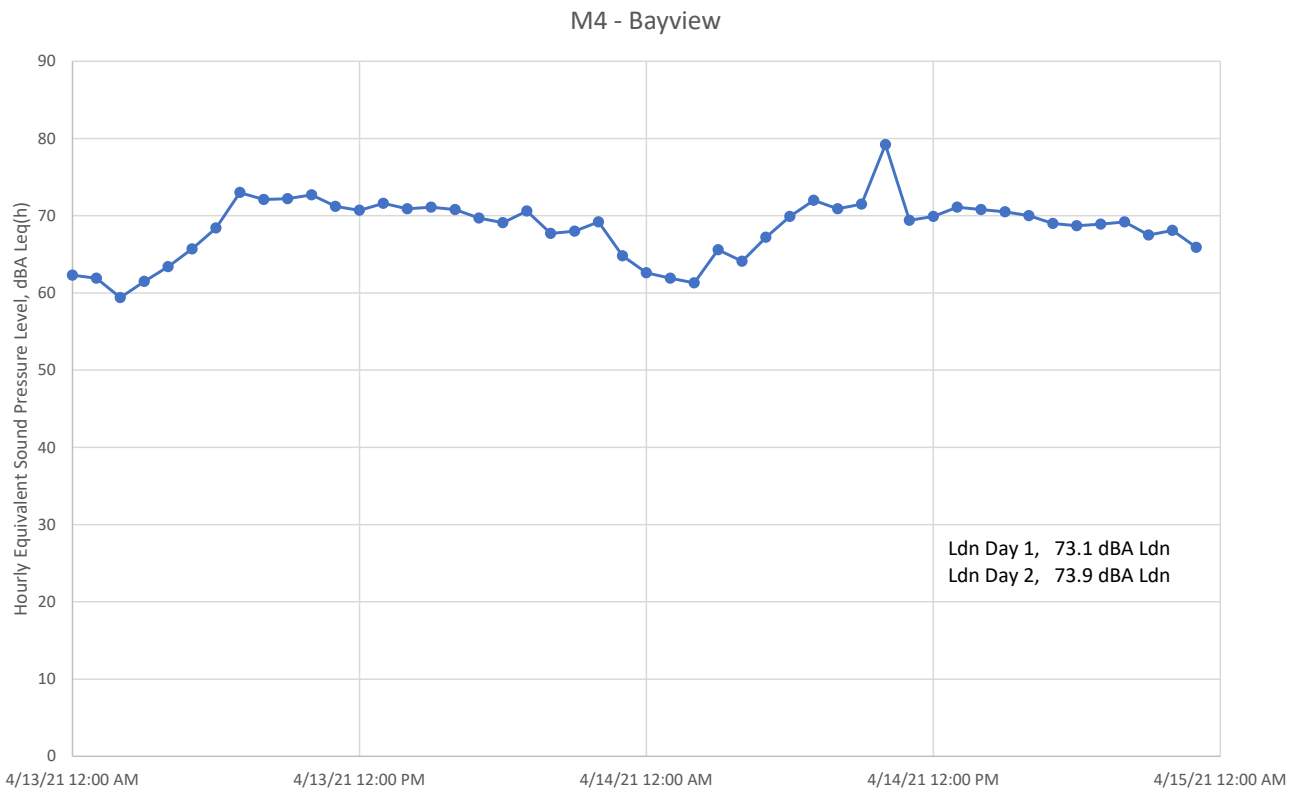
2:00 AM	55.1	56.6
3:00 AM	57.9	52.4
4:00 AM	56.2	55.4
5:00 AM	61.3	60.3
6:00 AM	63.0	64.6
7:00 AM	65.3	68.6
8:00 AM	68.1	69.6
9:00 AM	67.5	69.5
10:00 AM	64.8	68.0
11:00 AM	70.9	72.1
12:00 PM	70.7	67.4
1:00 PM	67.8	65.6
2:00 PM	66.1	66.7
3:00 PM	66.5	67.1
4:00 PM	71.8	69.7
5:00 PM	70.7	70.3
6:00 PM	71.6	68.1
7:00 PM	69.5	66.2
8:00 PM	67.3	69.8
9:00 PM	66.1	64.6
10:00 PM	66.6	61.9
11:00 PM	62.7	61.0



Time	4/13/21, dBA Leq	4/14/21, dBA Leq
12:00 AM	62.3	62.6
1:00 AM	61.9	61.9
2:00 AM	59.4	61.3
3:00 AM	61.5	65.6
4:00 AM	63.4	64.1
5:00 AM	65.7	67.2
6:00 AM	68.4	69.9
7:00 AM	73.0	72.0
8:00 AM	72.1	70.9
9:00 AM	72.2	71.5
10:00 AM	72.7	79.2
11:00 AM	71.2	69.4
12:00 PM	70.7	69.9
1:00 PM	71.6	71.1
2:00 PM	70.9	70.8
3:00 PM	71.1	70.5
4:00 PM	70.8	70.0
5:00 PM	69.7	69.0
6:00 PM	69.1	68.7
7:00 PM	70.6	68.9
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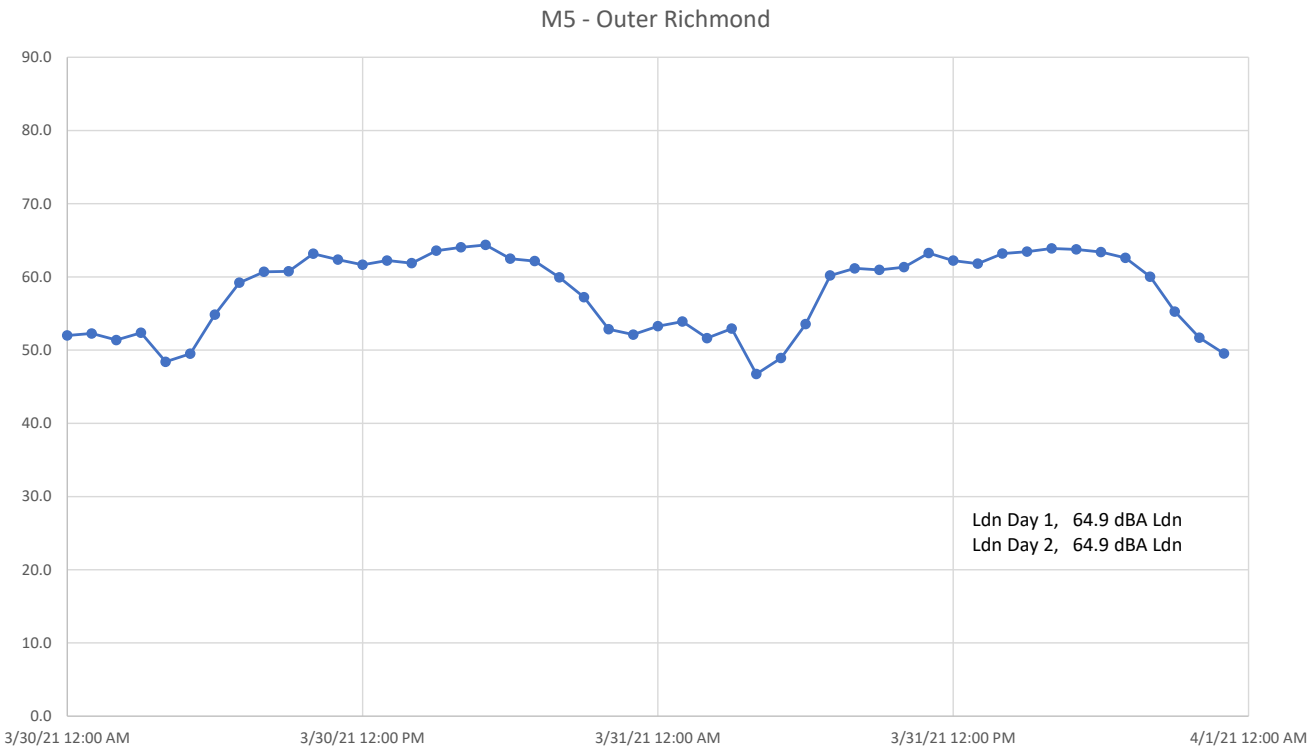
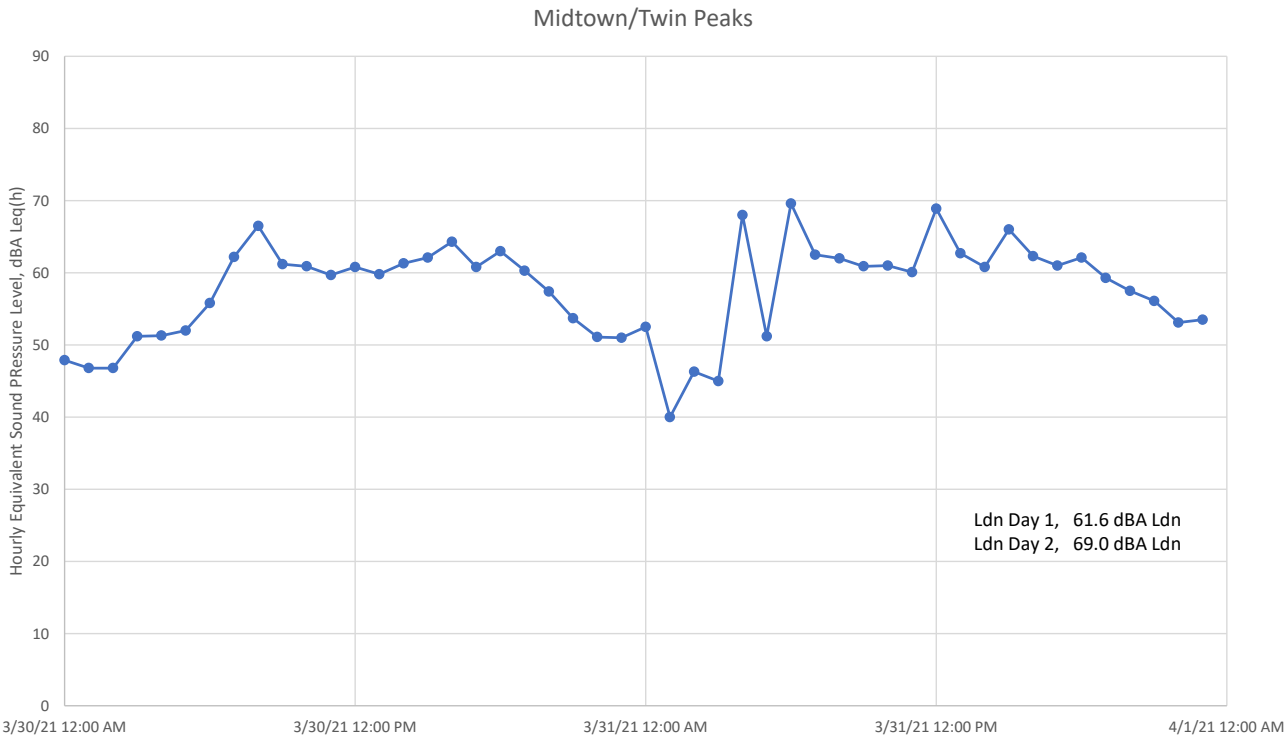
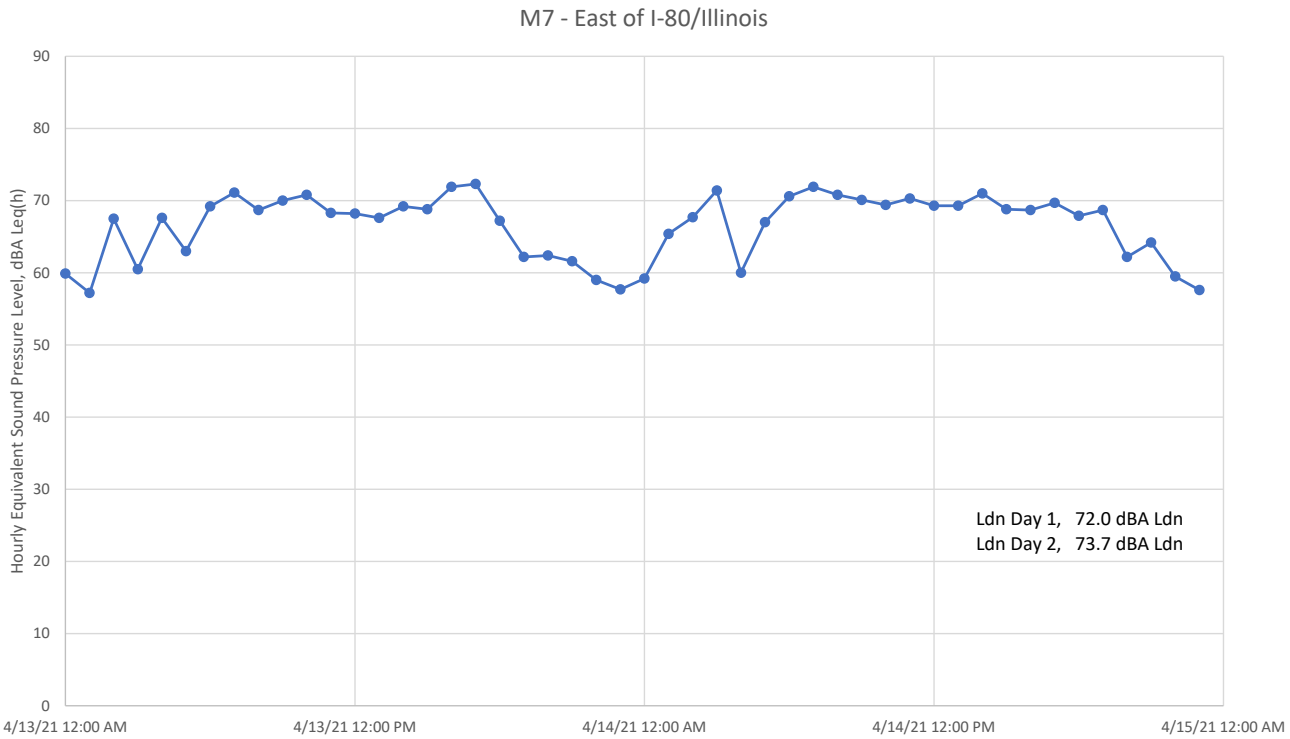
11:00 PM	64.8	65.9



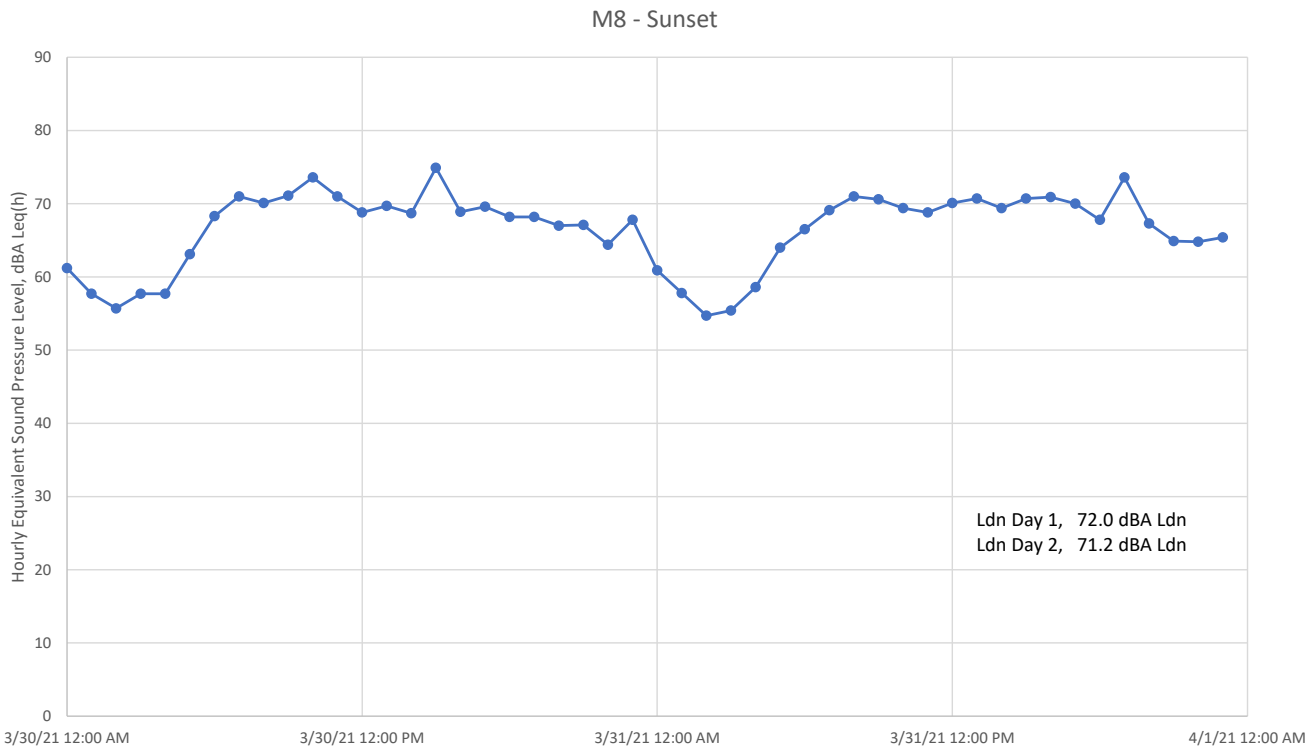
Time	4/13/21, dBA Leq	4/14/21, dBA Leq
12:00 AM	52.0	53.3
1:00 AM	52.3	53.9
2:00 AM	51.4	51.6
3:00 AM	52.4	52.9
4:00 AM	48.4	46.7
5:00 AM	49.5	48.9
6:00 AM	54.8	53.6
7:00 AM	59.2	60.2
8:00 AM	60.7	61.2
9:00 AM	60.8	61.0
10:00 AM	63.2	61.3
11:00 AM	62.4	63.2
12:00 PM	61.7	62.2
1:00 PM	62.2	61.8
2:00 PM	61.9	63.2
3:00 PM	63.6	63.4
4:00 PM	64.0	63.9
5:00 PM	64.4	63.7
6:00 PM	62.5	63.4
7:00 PM	62.2	62.6
8:00 PM	59.9	60.0
9:00 PM	57.2	55.3
10:00 PM	52.9	51.7
11:00 PM	52.1	49.5



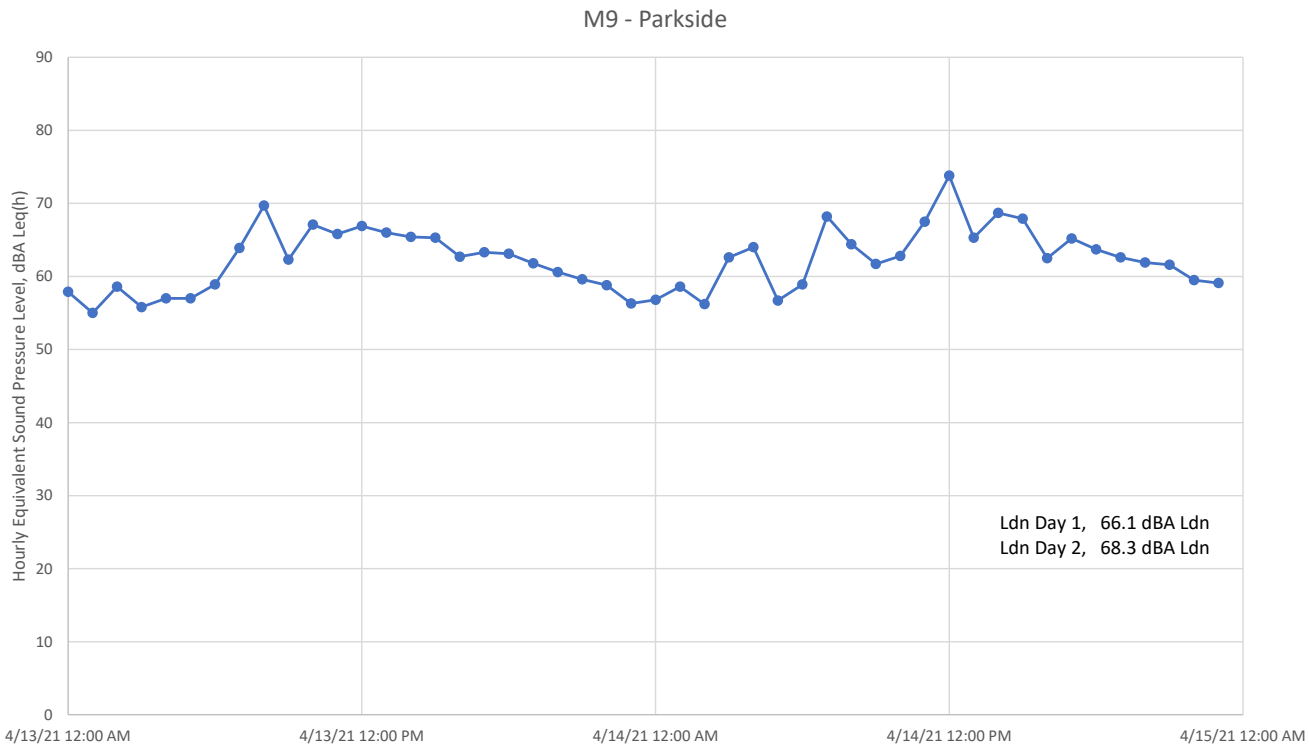
Time	4/13/21, dBA Leq	4/14/21, dBA Leq
12:00 AM	47.9	52.5
1:00 AM	46.8	40.0
2:00 AM	46.8	46.3
3:00 AM	51.2	45.0
4:00 AM	51.3	68.0
5:00 AM	52.0	51.2
6:00 AM	55.8	69.6
7:00 AM	62.2	62.5
8:00 AM	66.5	62.0
9:00 AM	61.2	60.9
10:00 AM	60.9	61.0
11:00 AM	59.7	60.1
12:00 PM	60.8	68.9
1:00 PM	59.8	62.7
2:00 PM	61.3	60.8
3:00 PM	62.1	66.0
4:00 PM	64.3	62.3
5:00 PM	60.8	61.0
6:00 PM	63.0	62.1
7:00 PM	60.3	59.3
8:00 PM	57.4	57.5
9:00 PM	53.7	56.1
10:00 PM	51.1	53.1
11:00 PM	51.0	53.5



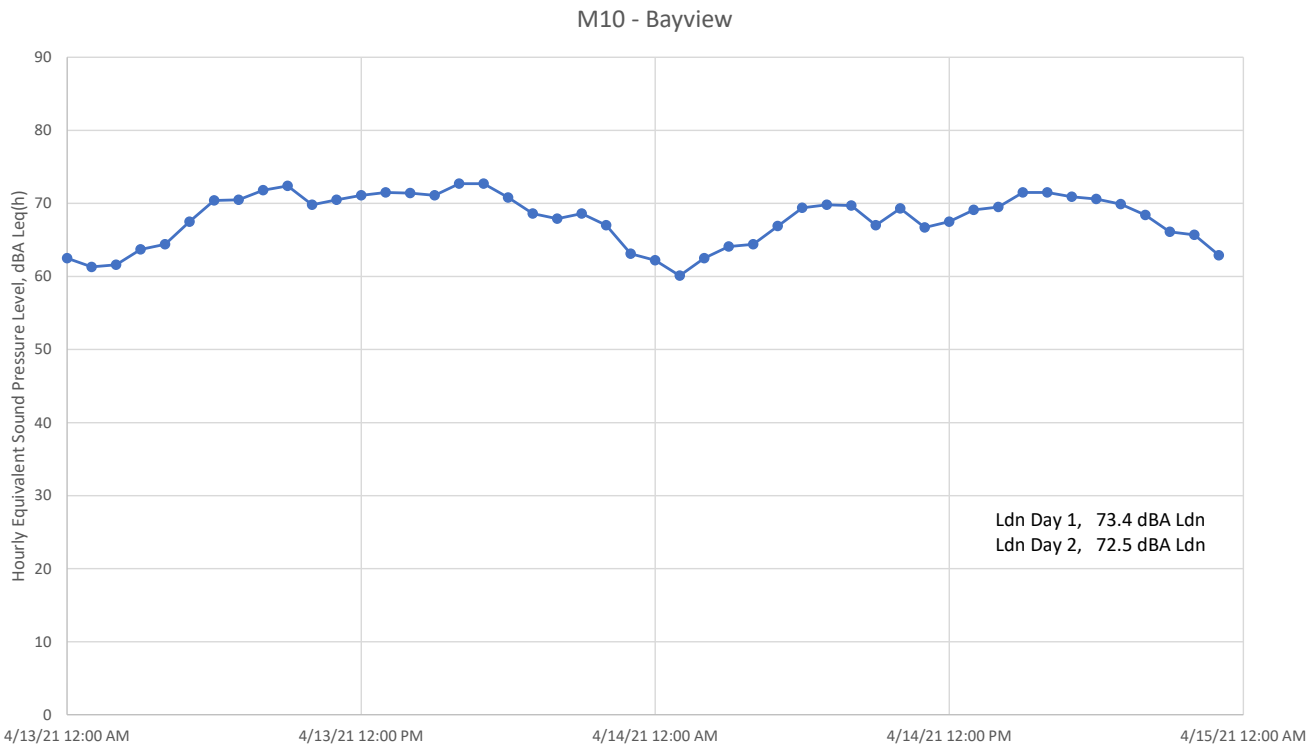
Time	4/13/21, dBA Leq	4/14/21, dBA Leq
12:00 AM	59.9	59.2
1:00 AM	57.2	65.4
2:00 AM	67.5	67.7
3:00 AM	60.5	71.4
4:00 AM	67.6	60.0
5:00 AM	63.0	67.0
6:00 AM	69.2	70.6
7:00 AM	71.1	71.9
8:00 AM	68.7	70.8
9:00 AM	70.0	70.1
10:00 AM	70.8	69.4
11:00 AM	68.3	70.3
12:00 PM	68.2	69.3
1:00 PM	67.6	69.3
2:00 PM	69.2	71.0
3:00 PM	68.8	68.8
4:00 PM	71.9	68.7
5:00 PM	72.3	69.7
6:00 PM	67.2	67.9
7:00 PM	62.2	68.7
8:00 PM	62.4	62.2
9:00 PM	61.6	64.2
10:00 PM	59.0	59.5
11:00 PM	57.7	57.6



Time	4/13/21, dBA Leq	4/14/21, dBA Leq
12:00 AM	61.2	60.9
1:00 AM	57.7	57.8
2:00 AM	55.7	54.7
3:00 AM	57.7	55.4
4:00 AM	57.7	58.6
5:00 AM	63.1	64.0
6:00 AM	68.3	66.5
7:00 AM	71.0	69.1
8:00 AM	70.1	71.0
9:00 AM	71.1	70.6
10:00 AM	73.6	69.4
11:00 AM	71.0	68.8
12:00 PM	68.8	70.1
1:00 PM	69.7	70.7
2:00 PM	68.7	69.4
3:00 PM	74.9	70.7
4:00 PM	68.9	70.9
5:00 PM	69.6	70.0
6:00 PM	68.2	67.8
7:00 PM	68.2	73.6
8:00 PM	67.0	67.3
9:00 PM	67.1	64.9
10:00 PM	64.4	64.8
11:00 PM	67.8	65.4



Time	4/13/21, dBA Leq	4/14/21, dBA Leq
12:00 AM	57.9	56.8
1:00 AM	55.0	58.6
2:00 AM	58.6	56.2
3:00 AM	55.8	62.6
4:00 AM	57.0	64.0
5:00 AM	57.0	56.7
6:00 AM	58.9	58.9
7:00 AM	63.9	68.2
8:00 AM	69.7	64.4
9:00 AM	62.3	61.7
10:00 AM	67.1	62.8
11:00 AM	65.8	67.5
12:00 PM	66.9	73.8
1:00 PM	66.0	65.3
2:00 PM	65.4	68.7
3:00 PM	65.3	67.9
4:00 PM	62.7	62.5
5:00 PM	63.3	65.2
6:00 PM	63.1	63.7
7:00 PM	61.8	62.6
8:00 PM	60.6	61.9
9:00 PM	59.6	61.6
10:00 PM	58.8	59.5
11:00 PM	56.3	59.1



Time	4/13/21, dBA Leq	4/14/21, dBA Leq
12:00 AM	62.5	62.2
1:00 AM	61.3	60.1
2:00 AM	61.6	62.5
3:00 AM	63.7	64.1
4:00 AM	64.4	64.4
5:00 AM	67.5	66.9
6:00 AM	70.4	69.4
7:00 AM	70.5	69.8
8:00 AM	71.8	69.7
9:00 AM	72.4	67.0
10:00 AM	69.8	69.3
11:00 AM	70.5	66.7
12:00 PM	71.1	67.5
1:00 PM	71.5	69.1
2:00 PM	71.4	69.5
3:00 PM	71.1	71.5
4:00 PM	72.7	71.5
5:00 PM	72.7	70.9
6:00 PM	70.8	70.6
7:00 PM	68.6	69.9
8:00 PM	67.9	68.4
9:00 PM	68.6	66.1
10:00 PM	67.0	65.7
11:00 PM	63.1	62.9

APPENDIX H.4. CONSTRUCTION NOISE LEVEL SUMMARY

Table H.4-1: Summary of Construction Noise Levels by Building Type

Building Type	Phase	Duration (Days)	Calculated L_{eq} at 25 feet (dBA)	Calculated L_{eq} at 50 feet (dBA)	Calculated L_{eq} at 100 feet (dBA)	Calculated L_{eq} at 200 feet (dBA)	Calculated L_{eq} at 400 feet (dBA)
Building Type 1: 590-foot tall residential mixed-use building	Demolition	52	88	82	76	70	64
	Grading, Excavation, and Shoring	158	91	85	79	73	67
	Foundation/Podium Construction	209	92	86	80	74	68
	Building Construction/Superstructure	234	92	86	80	74	68
	Superstructure/Skin	132	92	86	80	74	68
	Interior Work	392	84	78	72	66	60
Building Type 2: 240-foot tall residential building	Site Preparation/Demolition	20	84	78	72	66	60
	Excavation Shoring	45	89	83	77	71	65
	Foundation and Below-Grade Construction	45	80	74	68	62	56
	Building Construction	653	88	82	76	70	64
	Exterior Finishing	306	85	79	73	67	61
	Site Work and Paving	88	84	78	72	66	60
Building Type 3: 120-foot tall residential building	Demolition	42	88	82	76	70	64
	Site Preparation	4	89	83	77	71	65
	Grading	8	88	82	76	70	64
	Building Construction	423	89	83	77	71	65
	Paving	21	87	81	75	69	63
	Architectural Coating	21	81	75	69	63	57

Building Type	Phase	Duration (Days)	Calculated L_{eq} at 25 feet (dBA)	Calculated L_{eq} at 50 feet (dBA)	Calculated L_{eq} at 100 feet (dBA)	Calculated L_{eq} at 200 feet (dBA)	Calculated L_{eq} at 400 feet (dBA)
Building Type 4: 85-foot tall residential building	Demolition	18	88	82	76	70	64
	Site Preparation	2	89	83	77	71	65
	Grading	4	88	82	76	70	64
	Building Construction	177	89	83	77	71	65
	Paving	9	87	81	75	69	63
	Architectural Coating	9	81	75	69	63	57
Building Type 5: 65-foot tall residential building	Demolition	19.5	89	83	85	79	73
	Site Preparation and Grading	11.5	91	85	79	73	67
	Excavation and Shoring	28	88	82	76	70	64
	Drainage, Utilities, and Subgrade	39.5	88	82	76	70	64
	Building Construction	177.5	80	74	68	62	56
	Sitework	35	87	81	75	69	63
Building Type 6: 40-foot tall	Demolition	20	84	78	72	66	59
	Excavation	40	93	87	81	75	69
	Exterior Construction	120	89	83	77	71	65
	Structure	120	73	67	61	55	49

Table H.4-2: Summary of Construction Worker and Haul Truck Trips Noise

Building Type	Phase	ADT	% Heavy Truck	Duration (Days)	Modeled Distance (ft)	Assumed Speed Limit (MPH)	Calculated L_{dn} (dBA)	Calculated 1-hour L_{eq} (dBA)
Building Type 1: 590-foot tall residential mixed-use building	Demolition	10	80%	52			45.7	44.2
	Grading, Excavation, and Shoring	26	96%	158			48.1	48.5
	Foundation/Podium Construction	26	96%	209			48.1	48.5
	Building Construction/Superstructure	28	89%	234			48.1	48.5
	Superstructure/Skin	27	93%	132			48.1	48.5
	Interior Work	19	89%	392			47.1	46.9
Building Type 2: 240-foot tall residential building	Site Preparation/Demolition	161	93%	20			54.3	56.0
	Excavation Shoring	217	82%	45			55.0	56.7
	Foundation and Below-Grade Construction	48	17%	45			46.0	44.9
	Building Construction	387	2%	653			47.9	48.1
	Exterior Finishing	226	1%	306			46.3	45.4
	Site Work and Paving	30	0%	88			44.2	39.4
Building Type 3: 120-foot tall residential building	Demolition	26	81%	42	50	30	45.6	44.0
	Site Preparation	24	89%	4			49.6	50.5
	Grading	26	81%	8			52.1	53.5
	Building Construction	100	13%	423			47.1	46.8
	Paving Architectural Coating	9 17	0% 0%	21 21			44.0 44.1	38.1 38.7

Building Type	Phase	ADT	% Heavy Truck	Duration (Days)	Modeled Distance (ft)	Assumed Speed Limit (MPH)	Calculated L_{dn} (dBA)	Calculated 1-hour L_{eq} (dBA)
Building Type 4: 85-foot tall residential building	Demolition	23	78%	42			45.4	43.5
	Site Preparation	21	88%	2			50.9	52.1
	Grading	23	78%	4			53.5	55.1
	Building Construction	100	13%	200			47.1	46.8
	Paving	9	0%	10			44.0	38.1
	Architectural Coating	17	0%	10			44.1	38.7
Building Type 5: 65-foot tall residential building	Demolition	98	87%	19.5			52.1	53.6
	Site Preparation and Grading Excavation and Shoring Drainage, Utilities, and Subgrade	8	0%	11.5			44.0	38.1
		40	80%	28			48.8	49.5
		36	0%	39.5			44.3	39.7
	Building Construction	22	41%	177.5			46.0	44.8
	Sitework	23	70%	35			47.1	46.8
Building Type 6: 40-foot tall residential building	Demolition Excavation	45	32%	20			47.0	46.6
	Exterior Construction	44	31%	40			46.9	46.5
	Structure	32	4%	120			44.5	40.8
		32	4%	120			44.5	40.8

APPENDIX H.5. CONSTRUCTION AND HAUL TRUCK NOISE LEVEL ANALYSIS

Construction Equipment Noise Approach

The analysis of construction noise considers the equipment that would be required for each building type's construction phases, as determined by the city based on reasonably available information. Noise from construction varies, depending on the type of equipment in use, how many pieces of equipment are operating at any one time, the proximity of the equipment to a noise receptor, and the duration of equipment use.

Estimates of construction and demolition noise levels are based on reference noise levels from the Federal Highway Administration (FHWA) roadway construction noise model (Federal Highway Administration 2006) and the FTA general assessment construction noise analysis method (Federal Transit Administration 2018), which recommends combining noise levels from the two loudest pieces of equipment expected to operate simultaneously in roughly the same location. The noise data include the A-weighted L_{max} noise levels measured at a distance of 50 feet from the construction equipment as well as the utilization factors for the equipment. The utilization factor is the percentage of time each piece of construction equipment is typically operating at full power over the specified time period and used to estimate L_{eq} values from L_{max} values. For example, the L_{eq} value for a piece of equipment that operates at full power over 50 percent of the time is 3 dB less than the L_{max} value (Federal Highway Administration 2006). Utilization factors were provided for some equipment required during construction of the building types, while other building type construction equipment information had estimated hours of operation. For the latter, utilization factors were calculated as a ratio of hours used to the total workday duration; assuming the workday lasts for 13-hours.[1]

To determine if construction would result in noise impacts, a screening analysis was conducted to determine which phases of construction would require the loudest equipment, based on an equipment list confirmed by the city, and result in the greatest noise levels. Then, construction noise calculations were completed for each phase of construction for each building type specified to determine reasonable worst-case noise levels. This model assumed the two loudest pieces of equipment expected to be used during a given phase of construction would be operating simultaneously and close to one another on a site.

Construction Equipment Noise Calculations

Construction equipment by phase by building type was confirmed by the city. Many of the phases are consistent between building types. Example phases include demolition; site preparation; grading; building construction; paving; architectural coating; excavation and shoring; foundation and below-grade construction; exterior finishing; sitework; grading; drainage, utilities, and subgrade; exterior construction; and structure.

[1] Notes from the Project applicant of building type 1 state to assume 13-hour workdays.

Example equipment which may be used during construction include concrete/industrial saws, rubber tired dozers, road cleaner/sweepers/scrubbers, excavators, tractors/loaders/backhoes, boring/drill rigs, cranes, forklifts, tower cranes, man lifts, concrete pumps, welders, air compressors, dump trucks, dumper/tenders, skid steer loaders, off highway trucks, rough terrain forklift, electric powered welder, cement and mortar mixers, pavers, pressure washers, graders, rollers, crawler tractors, pumps, crushing/processing equipment, signal boards, plate compactors, generators, and excavators with hoe ram.

Concrete saws are generally used for relatively detailed demolition work, such as opening up a specific area of roadway or sidewalk. As such, the duration and frequency of their use is usually not extensive.

Combining the noise level from the two loudest pieces of equipment and assuming they are all operating very close to one another and very near the closest offsite sensitive receptor results in a reasonably representative worst-case combined noise level. This is the approach recommended by the Federal Transit Administration. Resulting construction noise levels for the building construction phase for each building type were estimated using the Federal Highway Administration's Roadway Construction Noise Model calculation methods.

Each building type is described below and a detailed discussion of the projected reasonable-worst case results from the two-loudest equipment models is presented.

Building Type 1

Construction phases for building type 1 include demolition; grading, excavation, and shoring; foundation/podium construction; building construction/superstructure; superstructure/skin; and interior work. Based on the example project from which this data was obtained, demolition would last about 52 days; grading, excavation, and shoring would last approximately 158 days; the duration of foundation/podium construction would about 209 days; building construction/superstructure would last approximately 234 days; superstructure/skin would last about 132 days; and interior work would have an approximate duration of 392 days. Received data for building type one did not include a load/utilization factor but did include a hourly duration of operation per day. It should be noted that data from the project applicant assumes building type 1 to have 13-hour workdays for the duration of the project. In this case, utilization factors were calculated as the ratio of usage hours per day over a complete 13-hour workday.

At a reference distance of 50 feet, noise levels of each of the phases from the model looking at the two loudest equipment per phases ranged between 78 dBA L_{eq} and 86 dBA L_{eq}. Three phases were tied for the loudest: foundation/podium construction, building construction/superstructure, and superstructure/skin. Quantitative construction noise levels are shown for the two loudest pieces of equipment operating during the foundation/podium construction phase.

The two loudest pieces of equipment are two loaders. Combining the noise level from these two pieces of equipment and assuming they are all operating very close to one another and very near the closest offsite sensitive receptor results in a reasonably representative worst-case combined noise level. At a reference distance of 50 feet, noise levels could be as high as 87 dBA L_{max} and 86 dBA L_{eq}. Table H.5-1 shows combined noise levels from the two loudest equipment at various distances for building type 1.

Table H.5-1: Worst-case Construction Noise Levels for Building Type 1 – Foundation/Podium Construction (L_{max} and L_{eq})

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	L_{eq} Sound Level (dBA)
Construction Condition: Building Type 1, Foundation/Podium Construction			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	77%	82.9
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	77%	82.9
Calculated Data			
All Sources Combined – L_{max} sound level (dBA) at 50 feet =			87 L_{max}
All Sources Combined – L_{eq} sound level (dBA) at 50 feet =			86 L_{eq}

Distance between Source and Receiver (feet)	Geometric Attenuation (dB)	Calculated L_{max} Sound Level (dBA)	Calculated L_{eq} Sound Level (dBA)
25	6	93	92
50	0	87	86
100	-6	81	80
150	-10	77	76
200	-12	75	74
250	-14	73	72
300	-16	71	70
350	-17	70	69
400	-18	69	68
450	-19	68	67
500	-20	67	66
550	-21	66	65
600	-22	65	64
650	-22	65	64
700	-23	64	63
750	-24	63	62
800	-24	63	62
850	-25	62	61
900	-25	62	61

Source: Federal Highway Administration. 2006. FHWA Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054. January. Available: https://www.fhwa.dot.gov/ENVIRonment/noise/construction_noise/rcnm/rcnm.pdf. Accessed: November 1, 2021.
Notes:

- Geometric attenuation based on a 6 dB per doubling of distance.
- This calculation does not include the effects, if any, of local shielding or ground attenuation from walls, topography, or other barriers that may reduce sound levels further.
- Noise levels are based on source noise levels from the FHWA Roadway Construction Noise Model.
- Tractor reference data is used to represent a forklift

Building Type 2

Building type 2 includes the following phases: site preparation, excavation and shoring, foundation and below-grade construction, building construction, exterior finishing, and site work and paving. Based on the example project from which this data was obtained, site preparation would last about 20 days, excavation and shoring would last 45 days, the duration of the foundation and sub-grad construction phase would about 45 days, building construction would last 653 days, exterior finishing would last 306 days. Lastly, site work and paving would have a duration of 88 days.

At a reference distance of 50 feet, noise levels of the phases from the model looking at the two loudest pieces of equipment per phases ranged between 74 dBA L_{eq} and 83 dBA L_{eq}. Excavation and shoring was the loudest phase for building type 2.

The two loudest pieces of equipment include an auger drill rig, and a tractor/loader. Combining the noise level from the two loudest pieces of equipment and assuming they are all operating very close to one another and very near the closest sensitive receptor results in a worst-case combined noise level. At a reference distance of 50 feet, noise levels could be as high as 87 dBA L_{max} and 83 dBA L_{eq}. Table H.5-2 shows combined noise levels from the two loudest equipment at various distances for building type 2.

Table H.5-2: Reasonable Worst-Case Construction Noise for Building Type 2 – Excavation and Shoring (L_{max} and L_{eq})

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	L_{eq} Sound Level (dBA)
Construction Condition: Building Type 2, Excavation and Shoring			
Source 1: Auger Drill Rig - Sound level (dBA) at 50 feet =	84	50%	81.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data			
All Sources Combined – Lmax sound level (dBA) at 50 feet =			87 L_{max}
All Sources Combined – Leq sound level (dBA) at 50 feet =			83 L_{eq}

Distance between Source and Receiver (feet)	Geometric Attenuation (dB)	Calculated L_{max} Sound Level (dBA)	Calculated L_{eq} Sound Level (dBA)
25	6	93	89
50	0	87	83
100	-6	81	77
150	-10	77	74
200	-12	75	71
250	-14	73	69
300	-16	71	68
350	-17	70	66
400	-18	69	65
450	-19	68	64
500	-20	67	63
550	-21	66	63
600	-22	65	62
650	-22	65	61
700	-23	64	60
750	-24	63	60
800	-24	63	59
850	-25	62	59
900	-25	62	58

Source: Federal Highway Administration. 2006. FHWA Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054. January. Available: https://www.fhwa.dot.gov/ENVIRonment/noise/construction_noise/rcnm/rcnm.pdf. Accessed: November 1, 2021.
Notes:

- Geometric attenuation based on a 6 dB per doubling of distance.
- This calculation does not include the effects, if any, of local shielding or ground attenuation from walls, topography, or other barriers that may reduce sound levels further.
- Noise levels are based on source noise levels from the FHWA Roadway Construction Noise Model.

Building Type 3

Building type 3 includes the following phases: demolition, site preparation, grading, building construction, paving, and architectural coating. Based on the example project from which this data was obtained, demolition would last 42 days, site preparation would last four days, the duration of the grading would be eight days, building construction would last 423 days, paving would last 21 days, and architectural coating would have a duration of 21 days.

At a reference distance of 50 feet, noise levels of the phases from the model looking at the top two loudest equipment per phases ranged between 75 dBA L_{eq} and 83 dBA L_{eq}. There are two phases which are tied for loudest phase for building type 3: site preparation and building construction. This memo indicates the modeling results for building construction because the duration of this phase is longer than site preparation.

The two loudest pieces of equipment include two tractors/loaders. Combining the noise level from the two loudest pieces of equipment and assuming they are all operating very close to one another and very near the closest offsite sensitive receptor results in a reasonably representative worst-case combined noise level. At a reference distance of 50 feet, noise levels could be as high as 87 dBA L_{max} and 83 dBA L_{eq}. Table H.5-3 shows combined noise levels from the two loudest equipment at various distances for building type 3.

Table H.5-3: Reasonable Worst-Case Construction Noise for Building Type 3 – Building Construction (L_{max} and L_{eq})

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	L_{eq} Sound Level (dBA)
Construction Condition: Building Type 3, Building Construction			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data			
All Sources Combined – L_{max} sound level (dBA) at 50 feet =			87 L_{max}
All Sources Combined – L_{eq} sound level (dBA) at 50 feet =			83 L_{eq}

Distance between Source and Receiver (feet)	Geometric Attenuation (dB)	Calculated L_{max} Sound Level (dBA)	Calculated L_{eq} Sound Level (dBA)
25	6	93	89
50	0	87	83
100	-6	81	77
150	-10	77	73
200	-12	75	71
250	-14	73	69
300	-16	71	67
350	-17	70	66
400	-18	69	65
450	-19	68	64
500	-20	67	63
550	-21	66	62
600	-22	65	61
650	-22	65	60
700	-23	64	60
750	-24	63	59
800	-24	63	59
850	-25	62	58
900	-25	62	58

Source: Federal Highway Administration. 2006. FHWA Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054. January. Available: https://www.fhwa.dot.gov/ENVIRonment/noise/construction_noise/rcnm/rcnm.pdf. Accessed: November 1, 2021.
Notes:

- Geometric attenuation based on a 6 dB per doubling of distance.
- This calculation does not include the effects, if any, of local shielding or ground attenuation from walls, topography, or other barriers that may reduce sound levels further.
- Noise levels are based on source noise levels from the FHWA Roadway Construction Noise Model.

Building Type 4

Building type 4 includes the following phases: demolition, site preparation, grading, building construction, paving, and architectural coating. Based on the example project from which this data was obtained, demolition would last 18 days, site preparation would last two days, grading would have a duration of four days, building construction would last 177 days, paving would last nine days, and architectural coating would have a duration of nine days.

At a reference distance of 50 feet, noise levels of construction phases from the model for the top two loudest equipment per phases ranged between 75 dBA L_{eq} and 83 dBA L_{eq}. As for building type 3, building type 4 has two phases which are tied for loudest phase: site preparation and building construction. The same preliminary equipment is proposed in both building types 3 and 4 for these phases. Although building construction is a longer phase than site preparation, site preparation is reported here since the discussion for building type 3 focused on building construction.

The two loudest pieces of equipment include a grader and a tractor/loader. Combining the noise level from the two loudest pieces of equipment and assuming they are all operating very close to one another and very near the closest offsite sensitive receptor results in a worst-case combined noise level. At a reference distance of 50 feet, noise levels could be as high as 88 dBA L_{max} and 83 dBA L_{eq}. Table H.5-4 shows combined noise levels from the two loudest equipment at various distances for building type 4.

Table H.5-4: Reasonable Worst-Case Construction Noise for Building Type 4 – Site Preparation (L_{max} and L_{eq})

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	L_{eq} Sound Level (dBA)
Construction Condition: Building Type 4, Site Preparation			
Source 1: Grader - Sound level (dBA) at 50 feet =	85	41%	81.1
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data			
All Sources Combined – L_{max} sound level (dBA) at 50 feet =			88 L_{max}
All Sources Combined – L_{eq} sound level (dBA) at 50 feet =			83 L_{eq}

Distance between Source and Receiver (feet)	Geometric Attenuation (dB)	Calculated L_{max} Sound Level (dBA)	Calculated L_{eq} Sound Level (dBA)
25	6	94	89
50	0	88	83
100	-6	82	77
150	-10	78	74
200	-12	75	71
250	-14	74	69
300	-16	72	68
350	-17	71	67
400	-18	69	65
450	-19	68	64
500	-20	68	63
550	-21	67	63
600	-22	66	62
650	-22	65	61
700	-23	65	61
750	-24	64	60
800	-24	63	59
850	-25	63	59
900	-25	62	58

Source: Federal Highway Administration. 2006. FHWA Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054. January. Available: https://www.fhwa.dot.gov/ENVIRonment/noise/construction_noise/rcnm/rcnm.pdf. Accessed: November 1, 2021.
Notes:

- Geometric attenuation based on a 6 dB per doubling of distance.
- This calculation does not include the effects, if any, of local shielding or ground attenuation from walls, topography, or other barriers that may reduce sound levels further.
- Noise levels are based on source noise levels from the FHWA Roadway Construction Noise Model.

Building Type 5

Building type 5 includes the following phases: demolition; site preparation and grading; excavation and shoring; drainage, utilities, and subgrade; building construction; and site work. Based on the example project from which this data was obtained, demolition would last 19.5 days. Site preparation and grading would have a duration of 11.5 days. Excavation and grading would last 28 days. Drainage, utilities, and subgrade work would have a duration of 39.5 days. Building construction would last 177.5 days. Site work would have a duration of 35 days.

At a reference distance of 50 feet, noise levels of the phases from the model looking at the top two loudest equipment per phases ranged between 74 dBA L_{eq} and 85 dBA L_{eq}. Site preparation and grading was the loudest phase for building type 5.

The two loudest pieces of equipment include a compactor and a tractor/loader.[2] Combining the noise level from the two loudest pieces of equipment and assuming they are all operating very close to one another and very near the closest offsite sensitive receptor results in a reasonably representative worst-case combined noise level. At a reference distance of 50 feet, noise levels could be as high as 87 dBA L_{max} and 85 dBA L_{eq}. Table H.5-5 shows combined noise levels from the two loudest equipment at various distances for building type 5.

[2] Concrete saws are also used for this phase, which have a source level of 90 dBA L_{max} at 50 feet. However, these would only be used during demolition of certain sections of roadways or sidewalks which would be an infrequent activity, and these would not generally be used for a prolonged duration.

Table H.5-5: Reasonable Worst-Case Construction Noise for Building Type 5 – Site Preparation and Grading (L_{max} and L_{eq})

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	L_{eq} Sound Level (dBA)
Construction Condition: Building Type 5, Site Preparation			
Source 1: Compactor (ground) - Sound level (dBA) at 50 feet =	83	35%	78.4
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	100%	84.0
Calculated Data			
All Sources Combined – L_{max} sound level (dBA) at 50 feet =			87 L_{max}
All Sources Combined – L_{eq} sound level (dBA) at 50 feet =			85 L_{eq}

Distance between Source and Receiver (feet)	Geometric Attenuation (dB)	Calculated L_{max} Sound Level (dBA)	Calculated L_{eq} Sound Level (dBA)
25	6	93	91
50	0	87	85
100	-6	81	79
150	-10	77	76
200	-12	74	73
250	-14	73	71
300	-16	71	70
350	-17	70	68
400	-18	68	67
450	-19	67	66
500	-20	67	65
550	-21	66	64
600	-22	65	63
650	-22	64	63
700	-23	64	62
750	-24	63	62
800	-24	62	61
850	-25	62	60
900	-25	61	60

Source: Federal Highway Administration. 2006. FHWA Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054. January. Available: https://www.fhwa.dot.gov/ENVIRonment/noise/construction_noise/rcnm/rcnm.pdf. Accessed: November 1, 2021.
Notes:

- Geometric attenuation based on a 6 dB per doubling of distance.
- This calculation does not include the effects, if any, of local shielding or ground attenuation from walls, topography, or other barriers that may reduce sound levels further.
- Noise levels are based on source noise levels from the FHWA Roadway Construction Noise Model.

Building Type 6

Building type 6 includes the following phases: demolition, excavation, exterior construction, and structure. Based on the example project from which this data was obtained, demolition would last about 20 days, excavation would have an approximate duration of 40 days, exterior construction would last 120 days, and structure would have a duration of 120 days. In addition, equipment was specified for the entire duration of this build, which is 300 days.

At a reference distance of 50 feet, noise levels of the phases from the model looking at the top two loudest equipment per phases ranged between 67 dBA L_{eq} and 87 dBA L_{eq}. Excavation was the loudest phase for building type 6.

The two loudest pieces of equipment are a mounted impact hammer (hoe ram) and a tractor/loader. Combining the noise level from these two pieces of equipment and assuming they are all operating very close to one another and very near the closest offsite sensitive receptor results in a reasonably representative worst-case combined noise level. At a reference distance of 50 feet, noise levels could be as high as 91 dBA L_{max} and 87 dBA L_{eq}. Table H.5-6 shows combined noise levels from the two loudest equipment at various distances for building type 6.

Table H.5-6: Reasonable Worst-Case Construction Noise for Building Type 6 – Excavation (L_{max} and L_{eq})

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	L_{eq} Sound Level (dBA)
Construction Condition: Building Type 6, Excavation			
Source 1: Mounted Impact Hammer (hoe ram) - Sound level (dBA) at 50 feet =	90	40%	86.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	40%	80.0
Calculated Data			
All Sources Combined – L_{max} sound level (dBA) at 50 feet =			91 L_{max}
All Sources Combined – L_{eq} sound level (dBA) at 50 feet =			87 L_{eq}

Distance between Source and Receiver (feet)	Geometric Attenuation (dB)	Calculated L_{max} Sound Level (dBA)	Calculated L_{eq} Sound Level (dBA)
25	6	97	93
50	0	91	87
100	-6	85	81
150	-10	81	77
200	-12	79	75
250	-14	77	73
300	-16	75	71
350	-17	74	70
400	-18	73	69
450	-19	72	68
500	-20	71	67
550	-21	70	66
600	-22	69	65
650	-22	69	65
700	-23	68	64
750	-24	67	63
800	-24	67	63
850	-25	66	62
900	-25	66	62

Source: Federal Highway Administration. 2006. FHWA Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054. January. Available: https://www.fhwa.dot.gov/ENVIRonment/noise/construction_noise/rcnm/rcnm.pdf. Accessed: November 1, 2021.
Notes:

- Geometric attenuation based on a 6 dB per doubling of distance.
- This calculation does not include the effects, if any, of local shielding or ground attenuation from walls, topography, or other barriers that may reduce sound levels further.
- Noise levels are based on source noise levels from the FHWA Roadway Construction Noise Model.

Construction Traffic Noise Approach

During project construction, noise levels would also be generated from construction-related traffic associated with worker trips and haul truck trips on local roadways. Received data included anticipated traffic counts in the following forms:

- One-way worker trips-per-day
- One-way vendor trips-per-day
- One-way haul truck trips-per-phase
- One-way non-hauling trips-per-day

From these traffic metrics, average daily traffic counts were calculated for each phase of each building type. Heavy truck percentages were calculated using a ratio of total trucks to total vehicles for each phase. This model only takes into account proposed construction traffic (i.e., worker vehicle trips, vendor truck trips, and haul truck trips). Worker vehicles and non-hauling vehicles are considered light duty automobiles (auto), while vendor trucks and haul trucks are labeled as heavy trucks.

Heavy truck metrics varied by building type. For example, vendor trucks for each building type are given in trips-per-day while haul trucks were provided as trips per phase. In general, haul truck counts were converted to trips-per-day by dividing the phase totals by the duration of the respective phase. Daily heavy trucks were calculated as the sum of daily vendor trucks and daily haul trucks for each phase of building types 1, 2, 5, and 6.

Received data for building types 3 and 4 concentrated haul truck trips in two phases, site preparation and grading, with a higher concentration in the grading phase. Although it is generally true that these phases require haul trucks, this analysis totaled the haul truck counts for these phases and distributed them evenly between their demolition, site preparation, and grading phases. This choice was made to better represent heavy truck counts during these three phases. This was calculated by the quotient of the sum of haul trucks per phase over the sum of the phase durations as shown below,

$$Daily\ Haul\ Trucks_{per\ \ phase} = \frac{Haul\ Truck\ Trips_{demolition} + Haul\ Truck\ Trips_{site\ preparation} + Haul\ Truck\ Trips_{grading}}{Duration_{\ demolition} + Duration_{\ site\ preparation} + Duration_{grading}}\ .$$

Daily heavy truck totals and daily auto are summed together to create the average daily traffic count (ADT) for each phase. To calculate a heavy truck percentage, a ratio of total heavy trucks over the ADT was used as follows,

$$Heavy\ Truck\ \% = \frac{Daily\ Heavy\ Trucks_{\ per\ phase}}{ADT_{\ per\ phase}}\ .$$

Once heavy truck percentages and ADT are calculated for each phase, a traffic noise model is developed to estimate noise levels associated with construction traffic.

This data only considers anticipated construction vehicles and ignores all other vehicle traffic; thus, truck percentages range between zero and 96-percent. In addition, it is assumed that these vehicles would be operating during peak daytime hours as a reasonable worst-case traffic noise model. Vehicle speed is assumed

to be 30 miles-per-hour as speed limits in the city are generally 30 miles-per-hour. Lastly, distance from the road centerline to the receiver is assumed to be 50 feet.

The analysis of roadway noise levels from a building type's construction traffic was conducted using a proprietary traffic noise model, with calculations based on data from the FHWA Traffic Noise Model, Version 2.5 (FHWA 2004). This model allows for the calculation of noise levels at specific distances from the center of the roadway based on traffic volumes, average speeds, and site environmental conditions. Using this model, the roadway noise levels resulting from a building type's construction-related traffic volumes along the local roadways used during construction to access a site were estimated. This analysis does not take into account uses existing traffic volumes noise calculations or ambient measurements as applicable to determine the increase in levels due to haul vehicles and worker trips on roadways in the city. Instead, it assumes an arbitrary straight-line model consisting of construction worker vehicles and heavy trucks.

Construction Traffic Noise Calculations

Construction traffic noise was calculated for each phase of each building type (except for Type 7). Building Type data prepared by Ramboll was used to determine average daily traffic counts and heavy truck percentages. Hauling truck data was processed as described in the methods section. Each section below includes an explanation of how daily heavy truck counts were calculated and summarizes which phases are projected to have the worst-case traffic noise.

Building Type 1

Construction traffic data for building type 1 was provided in the following metrics:

- One-way worker trips-per-day, by phase
- One-way vendor truck trips-per-day, by phase
- One-way haul truck trips-per-phase, by phase

The supplied worker and vendor truck counts were assumed to be vehicles that would be present on a project site each day of a given phase. Since haul trucks were provided as trips-per-phase, the following equation was used to calculate daily heavy truck trips,

$$Daily\ Heavy\ Truck\ Trips_{per\ phase} = Daily\ Vendor\ Trucks_{\ per\ Phase} + \frac{Haul\ \ Trucks_{\ per\ phase}}{Phase\ Duration},$$

where duration is provided in days.

Daily heavy truck totals and daily auto totals are summed together to create the average daily traffic count (ADT) for each phase. To calculate a heavy truck percentage, a ratio of total heavy trucks over the ADT was used as follows,

$$Heavy\ Truck\ \% = \frac{Daily\ Heavy\ Trucks\ Trips_{\ per\ phase}}{ADT_{\ per\ phase}}.$$

Once heavy truck percentages and ADT are calculated for each phase, a traffic noise model is developed to estimate noise levels associated with construction traffic.

Noise associated with construction traffic ranges between 44 dBA L_{eq} and 49 dBA L_{eq} for building type 1. The loudest phases happen to be grading, excavation, and shoring; foundation/podium construction; building construction/superstructure; and superstructure/skin, which all had an equivalent noise level of approximately 49 dBA L_{eq}. Grading, excavation, and shoring has an ADT of 26 vehicles and a heavy truck percentage of 96-percent. This phase would be active for approximately 158 days. Foundation/podium construction has an ADT of 26 vehicles and a heavy truck percentage of 96-percent. It would be active for approximately 209 days. Building construction/superstructure has an ADT of 28 vehicles and a heavy truck percentage of 89-percent. This phase would be active for approximately 234 days. Superstructure/skin has an ADT of 27 vehicles and a heavy truck percentage of 93-percent. Superstructure/skin would be active for approximately 132 days.

Building Type 2

Construction traffic data for building type 2 was provided in the following metrics:

- One-way worker trips-per-day, by phase
- One-way haul truck trips-per-day, by phase
- One-way haul truck trips-per-phase, by phase

The supplied worker and hauling vehicles were assumed to be vehicles that would be present on a project site each day of a given phase. Haul trucks data was provided as trips-per-day and trips-per-phase. Daily heavy truck trips were calculated with the following equation,

$$Daily\ Heavy\ Truck\ Trips_{per\ phase} = Daily\ Trucks\ _{per\ Phase} + \frac{Haul\ \ Trucks\ _{per\ phase}}{Phase\ Duration},$$

where duration is provided in days. ADT for each phase was calculated by the summation of heavy truck trips-per-day and auto trips-per-day. To calculate a heavy truck percentage, a ratio of total heavy trucks over the ADT was used as follows,

$$Heavy\ Truck\ \% = \frac{Daily\ Heavy\ Trucks\ _{per\ phase}}{ADT\ _{per\ phase}}.$$

Once heavy truck percentages and ADT are calculated for each phase, a traffic noise model is developed to estimate noise levels associated with construction traffic.

Noise associated with construction traffic ranges between 39 dBA L_{eq} and 57 dBA L_{eq} for building type 2. The phase when construction traffic is the loudest would be excavation and shoring, which has an equivalent noise level of approximately 57 dBA L_{eq}. This phase has an ADT of 214 vehicles and a heavy truck percentage of 82-percent. Excavation and shoring would be active for approximately 45 days.

Building Type 3

Construction traffic data for building type 3 was provided in the following metrics:

- One-way worker trips-per-day, by phase
- One-way vendor truck trips-per-day, by phase
- One-way haul truck trips-per-phase

As mentioned previously, haul truck data was evenly distributed over the duration of the first three phases, demolition, site preparation, and grading. This was done to provide a more accurate representation of how haul truck noise for these phases. The following equation was used to calculate daily haul truck trips for these phases,

$$Daily\ Haul\ Trucks_{per\ \ phase} = \frac{Haul\ Truck\ Trips_{demolition} + Haul\ Truck\ Trips_{site\ preparation} + Haul\ Truck\ Trips_{grading}}{Duration_{\ demolition} + Duration_{\ site\ preparation} + Duration_{grading}}\ .$$

Building type 3 only assumes haul trucks are present during demolition, site preparation, and grading. Daily haul truck trips and daily vendor truck trips are added together to calculate daily heavy truck trips for each phase. Daily heavy truck totals and daily auto are summed together to create the average daily traffic count (ADT) for each phase. To calculate a heavy truck percentage, a ratio of total heavy trucks over the ADT was used as follows,

$$Heavy\ Truck\ \% = \frac{Daily\ Heavy\ Trucks_{\ per\ phase}}{ADT_{\ per\ phase}}\ .$$

Once heavy truck percentages and ADT are calculated for each phase, a traffic noise model is developed to estimate noise levels associated with construction traffic.

Noise associated with construction traffic ranges between 38 dBA L_{eq} and 54 dBA L_{eq} for building type 3. The loudest phase happens to be grading, which has an equivalent noise level of approximately 54 dBA L_{eq}. Demolition has an ADT of 26 vehicles and a heavy truck percentage of 81-percent. Grading would be active for approximately eight days.

Building Type 4

Construction traffic data for building type 4 was provided in the following metrics:

- One-way worker trips-per-day, by phase
- One-way vendor truck trips-per-day, by phase
- One-way haul truck trips-per-phase

Haul truck data was evenly distributed over the duration of the first three phases, demolition, site preparation, and grading, similarly to building type 3. This was done to provide a more accurate representation of haul truck noise for these phases. The following equation was used to calculate daily haul truck trips for these phases,

$$Daily\ Haul\ Trucks_{per\ \ phase} = \frac{Haul\ Truck\ Trips_{demolition} + Haul\ Truck\ Trips_{site\ preparation} + Haul\ Truck\ Trips_{grading}}{Duration_{\ demolition} + Duration_{\ site\ preparation} + Duration_{grading}}\ .$$

Building type 4 only assumes haul trucks are present during demolition, site preparation, and grading. Daily haul truck trips and daily vendor truck trips are added together to calculate daily heavy truck trips for each phase. Daily heavy truck totals and daily auto are summed together to create the average daily traffic count (ADT) for each phase. To calculate a heavy truck percentage, a ratio of total heavy trucks over the ADT was used as follows,

$$Heavy\ Truck\ \% = \frac{Daily\ Heavy\ Trucks\ _{per\ phase}}{ADT\ _{per\ phase}}\ .$$

Once heavy truck percentages and ADT are calculated for each phase, a traffic noise model is developed to estimate noise levels associated with construction traffic.

Noise associated with construction traffic ranges between 38 dBA L_{eq} and 55 dBA L_{eq} for building type 4. The loudest phase happens to be grading, which has an equivalent noise level of approximately 55 dBA L_{eq}. Grading has an ADT of 23 vehicles and a heavy truck percentage of 78-percent. Grading would be active for approximately four days.

Building Type 5

Construction traffic data for building type 5 was provided in the following metrics:

- One-way worker trips-per-day, by phase
- One-way vendor truck trips-per-day, by phase
- One-way haul truck trips-per-phase, by phase

The supplied worker and hauling vehicles were assumed to be vehicles that would be present on a project site each day of a given phase. Haul trucks data was provided as trips-per-day and trips-per-phase. Daily heavy truck trips were calculated with the following equation,

$$Daily\ Heavy\ Truck\ Trips_{per\ phase} = Daily\ Vendor\ Trucks\ _{per\ Phase} + \frac{Haul\ \ Trucks\ _{per\ phase}}{Phase\ Duration}\ ,$$

where duration is provided in days. ADT for each phase was calculated by the summation of heavy truck trips-per-day and auto trips-per-day. To calculate a heavy truck percentage, a ratio of total heavy trucks over the ADT was used as follows,

$$Heavy\ Truck\ \% = \frac{Daily\ Heavy\ Trucks\ _{per\ phase}}{ADT\ _{per\ phase}}\ .$$

Once heavy truck percentages and ADT are calculated for each phase, a traffic noise model is developed to estimate noise levels associated with construction traffic.

Noise associated with construction traffic ranges between 38 dBA L_{eq} and 54 dBA L_{eq} for building type 5. The phase when construction traffic is the loudest would be demolition, which has an equivalent noise level of approximately 54 dBA L_{eq}. This phase has an ADT of 98 vehicles and a heavy truck percentage of 87-percent. Excavation and shoring would be active for approximately 19.5 days.

Building Type 6

Construction traffic data for building type 6 was provided in the following metrics:

- One-way worker trips-per-day, by project
- One-way vendor truck trips-per-day, by project
- One-way non-hauling trips-per-day, by project
- One-way haul truck trips, by phase

The supplied worker and hauling vehicles were assumed to be vehicles that would be present on a project site each day of a given phase. Haul trucks data was provided as trips-per-day and trips-per-phase. Daily heavy trucks truck trips were calculated with the following equation,

$$Daily\ Heavy\ Truck\ Trips_{per\ phase} = Daily\ Vendor\ Trucks + \frac{Haul\ \ Trucks\ _{per\ phase}}{Phase\ Duration},$$

where duration is provided in days. Daily worker trips and daily non-hauling trips were summed together to calculate daily auto trips, which was applied to each phase. ADT for each phase was calculated by the summation of heavy truck trips-per-day and auto trips-per-day. To calculate a heavy truck percentage, a ratio of total heavy trucks over the ADT was used as follows,

$$Heavy\ Truck\ \% = \frac{Daily\ Heavy\ Trucks\ _{per\ phase}}{ADT\ _{per\ phase}}.$$

Once heavy truck percentages and ADT are calculated for each phase, a traffic noise model is developed to estimate noise levels associated with construction traffic. Noise associated with construction traffic ranges between 41 dBA L_{eq} and 47 dBA L_{eq} for building type 6. The phase when construction traffic is the loudest would be demolition, which has an equivalent noise level of approximately 47 dBA L_{eq}. This phase has an ADT of 45 vehicles and a heavy truck percentage of 32-percent. Excavation and shoring would be active for approximately 20 days.

APPENDIX H.6. CONSTRUCTION NOISE MODELING RESULTS

Table H.6-1. Construction Noise Levels for Building Type 1 - Demolition

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 1, Demolition			
Source 1: Excavator - Sound level (dBA) at 50 feet =	81	62%	78.9
Source 2: Generator - Sound level (dBA) at 50 feet =	81	62%	78.9
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			84
All Sources Combined - Leq sound level (dBA) at 50 feet =			82

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		90	88
50	0	0.0		84	82
100	-6	0.0		78	76
150	-10	0.0		74	72
200	-12	0.0		72	70
250	-14	0.0		70	68
300	-16	0.0		68	66
350	-17	0.0		67	65
400	-18	0.0		66	64
450	-19	0.0		65	63
500	-20	0.0		64	62
550	-21	0.0		63	61
600	-22	0.0		62	60
650	-22	0.0		62	60
700	-23	0.0		61	59
750	-24	0.0		60	58
800	-24	0.0		60	58
850	-25	0.0		59	57
900	-25	0.0		59	57
950	-26	0.0		58	56
1000	-26	0.0		58	56
1200	-28	0.0		56	54
1400	-29	0.0		55	53
1600	-30	0.0		54	52
1800	-31	0.0		53	51
2000	-32	0.0		52	50

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Assuming a 13 hour work day per applicant details

Table H.6-2. Construction Noise Levels for Building Type 1 - Grading, Excavation, and Shoring

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 1, Grading, Excavation, and Shoring			
Source 1: Auger Drill Rig - Sound level (dBA) at 50 feet =	84	77%	82.9
Source 2: Pump - Sound level (dBA) at 50 feet =	81	100%	81.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			86
All Sources Combined - Leq sound level (dBA) at 50 feet =			85

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		92	91
50	0	0.0		86	85
100	-6	0.0		80	79
150	-10	0.0		76	75
200	-12	0.0		74	73
250	-14	0.0		72	71
300	-16	0.0		70	69
350	-17	0.0		69	68
400	-18	0.0		68	67
450	-19	0.0		67	66
500	-20	0.0		66	65
550	-21	0.0		65	64
600	-22	0.0		64	63
650	-22	0.0		63	63
700	-23	0.0		63	62
750	-24	0.0		62	62
800	-24	0.0		62	61
850	-25	0.0		61	60
900	-25	0.0		61	60
950	-26	0.0		60	59
1000	-26	0.0		60	59
1200	-28	0.0		58	57
1400	-29	0.0		57	56
1600	-30	0.0		56	55
1800	-31	0.0		55	54
2000	-32	0.0		54	53

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Assuming a 13 hour work day per applicant details

Table H.6-3. Construction Noise Levels for Building Type 1 - Foundation/Podium Construction

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 1, Foundation/Podium Construction			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	77%	82.9
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	77%	82.9
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			86

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	92
50	0	0.0		87	86
100	-6	0.0		81	80
150	-10	0.0		77	76
200	-12	0.0		75	74
250	-14	0.0		73	72
300	-16	0.0		71	70
350	-17	0.0		70	69
400	-18	0.0		69	68
450	-19	0.0		68	67
500	-20	0.0		67	66
550	-21	0.0		66	65
600	-22	0.0		65	64
650	-22	0.0		65	64
700	-23	0.0		64	63
750	-24	0.0		63	62
800	-24	0.0		63	62
850	-25	0.0		62	61
900	-25	0.0		62	61
950	-26	0.0		61	60
1000	-26	0.0		61	60
1200	-28	0.0		59	58
1400	-29	0.0		58	57
1600	-30	0.0		57	56
1800	-31	0.0		56	55
2000	-32	0.0		55	54

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Assuming a 13 hour work day per applicant details
Tractor reference data is used to represent a forklift

Table H.6-4. Construction Noise Levels for Building Type 1 - Building Construction/Superstructure

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 1, Building Construction/Superstructure			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	77%	82.9
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	77%	82.9
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			86

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	92
50	0	0.0		87	86
100	-6	0.0		81	80
150	-10	0.0		77	76
200	-12	0.0		75	74
250	-14	0.0		73	72
300	-16	0.0		71	70
350	-17	0.0		70	69
400	-18	0.0		69	68
450	-19	0.0		68	67
500	-20	0.0		67	66
550	-21	0.0		66	65
600	-22	0.0		65	64
650	-22	0.0		65	64
700	-23	0.0		64	63
750	-24	0.0		63	62
800	-24	0.0		63	62
850	-25	0.0		62	61
900	-25	0.0		62	61
950	-26	0.0		61	60
1000	-26	0.0		61	60
1200	-28	0.0		59	58
1400	-29	0.0		58	57
1600	-30	0.0		57	56
1800	-31	0.0		56	55
2000	-32	0.0		55	54

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Assuming a 13 hour work day per applicant details
Tractor reference data is used to represent a forklift

Table H.6-5. Construction Noise Levels for Building Type 1 - Superstructure/Skin

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 1, Superstructure/Skin			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	77%	82.9
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	77%	82.9
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			86

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	92
50	0	0.0		87	86
100	-6	0.0		81	80
150	-10	0.0		77	76
200	-12	0.0		75	74
250	-14	0.0		73	72
300	-16	0.0		71	70
350	-17	0.0		70	69
400	-18	0.0		69	68
450	-19	0.0		68	67
500	-20	0.0		67	66
550	-21	0.0		66	65
600	-22	0.0		65	64
650	-22	0.0		65	64
700	-23	0.0		64	63
750	-24	0.0		63	62
800	-24	0.0		63	62
850	-25	0.0		62	61
900	-25	0.0		62	61
950	-26	0.0		61	60
1000	-26	0.0		61	60
1200	-28	0.0		59	58
1400	-29	0.0		58	57
1600	-30	0.0		57	56
1800	-31	0.0		56	55
2000	-32	0.0		55	54

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Assuming a 13 hour work day per applicant details
Tractor reference data is used to represent a forklift

Table H.6-6. Construction Noise Levels for Building Type 1 - Interior Work

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 1, Interior Work			
Source 1: Man Lift - Sound level (dBA) at 50 feet =	75	92%	74.7
Source 2: Air Compressor - Sound level (dBA) at 50 feet =	78	62%	75.9
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			80
All Sources Combined - Leq sound level (dBA) at 50 feet =			78

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		86	84
50	0	0.0		80	78
100	-6	0.0		74	72
150	-10	0.0		70	69
200	-12	0.0		68	66
250	-14	0.0		66	64
300	-16	0.0		64	63
350	-17	0.0		63	61
400	-18	0.0		62	60
450	-19	0.0		61	59
500	-20	0.0		60	58
550	-21	0.0		59	57
600	-22	0.0		58	57
650	-22	0.0		57	56
700	-23	0.0		57	55
750	-24	0.0		56	55
800	-24	0.0		56	54
850	-25	0.0		55	54
900	-25	0.0		55	53
950	-26	0.0		54	53
1000	-26	0.0		54	52
1200	-28	0.0		52	51
1400	-29	0.0		51	49
1600	-30	0.0		50	48
1800	-31	0.0		49	47
2000	-32	0.0		48	46

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Assuming a 13 hour work day per applicant details

Table H.6-7. Construction Noise Levels for Building Type 2 - Site Preparation

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 2, Site Preparation			
Source 1: Dump truck - Sound level (dBA) at 50 feet =	76	38%	71.8
Source 2: Excavator - Sound level (dBA) at 50 feet =	81	38%	76.8
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			82
All Sources Combined - Leq sound level (dBA) at 50 feet =			78

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		88	84
50	0	0.0		82	78
100	-6	0.0		76	72
150	-10	0.0		73	68
200	-12	0.0		70	66
250	-14	0.0		68	64
300	-16	0.0		67	62
350	-17	0.0		65	61
400	-18	0.0		64	60
450	-19	0.0		63	59
500	-20	0.0		62	58
550	-21	0.0		61	57
600	-22	0.0		61	56
650	-22	0.0		60	56
700	-23	0.0		59	55
750	-24	0.0		59	54
800	-24	0.0		58	54
850	-25	0.0		58	53
900	-25	0.0		57	53
950	-26	0.0		57	52
1000	-26	0.0		56	52
1200	-28	0.0		55	50
1400	-29	0.0		53	49
1600	-30	0.0		52	48
1800	-31	0.0		51	47
2000	-32	0.0		50	46

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-8. Construction Noise Levels for Building Type 2 - Excavation and Shoring

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 2, Excavation and Shoring			
Source 1: Auger Drill Rig - Sound level (dBA) at 50 feet =	84	50%	81.0
Source 3: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			83

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	89
50	0	0.0		87	83
100	-6	0.0		81	77
150	-10	0.0		77	74
200	-12	0.0		75	71
250	-14	0.0		73	69
300	-16	0.0		71	68
350	-17	0.0		70	66
400	-18	0.0		69	65
450	-19	0.0		68	64
500	-20	0.0		67	63
550	-21	0.0		66	63
600	-22	0.0		65	62
650	-22	0.0		65	61
700	-23	0.0		64	60
750	-24	0.0		63	60
800	-24	0.0		63	59
850	-25	0.0		62	59
900	-25	0.0		62	58
950	-26	0.0		61	58
1000	-26	0.0		61	57
1200	-28	0.0		59	56
1400	-29	0.0		58	54
1600	-30	0.0		57	53
1800	-31	0.0		56	52
2000	-32	0.0		55	51

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-9. Construction Noise Levels for Building Type 2 - Foundation and Below-Grade Construction

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 2, Foundation and Below-Grade Construction			
Source 1: Man Lift - Sound level (dBA) at 50 feet =	75	31%	69.9
Source 2: Dump truck - Sound level (dBA) at 50 feet =	76	38%	71.8
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			79
All Sources Combined - Leq sound level (dBA) at 50 feet =			74

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		85	80
50	0	0.0		79	74
100	-6	0.0		73	68
150	-10	0.0		69	64
200	-12	0.0		66	62
250	-14	0.0		65	60
300	-16	0.0		63	58
350	-17	0.0		62	57
400	-18	0.0		60	56
450	-19	0.0		59	55
500	-20	0.0		59	54
550	-21	0.0		58	53
600	-22	0.0		57	52
650	-22	0.0		56	52
700	-23	0.0		56	51
750	-24	0.0		55	50
800	-24	0.0		54	50
850	-25	0.0		54	49
900	-25	0.0		53	49
950	-26	0.0		53	48
1000	-26	0.0		53	48
1200	-28	0.0		51	46
1400	-29	0.0		50	45
1600	-30	0.0		48	44
1800	-31	0.0		47	43
2000	-32	0.0		46	42

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-10. Construction Noise Levels for Building Type 2 - Building Construction

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 2, Building Construction			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	20%	77.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	40%	80.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			82

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	88
50	0	0.0		87	82
100	-6	0.0		81	76
150	-10	0.0		77	72
200	-12	0.0		75	70
250	-14	0.0		73	68
300	-16	0.0		71	66
350	-17	0.0		70	65
400	-18	0.0		69	64
450	-19	0.0		68	63
500	-20	0.0		67	62
550	-21	0.0		66	61
600	-22	0.0		65	60
650	-22	0.0		65	60
700	-23	0.0		64	59
750	-24	0.0		63	58
800	-24	0.0		63	58
850	-25	0.0		62	57
900	-25	0.0		62	57
950	-26	0.0		61	56
1000	-26	0.0		61	56
1200	-28	0.0		59	54
1400	-29	0.0		58	53
1600	-30	0.0		57	52
1800	-31	0.0		56	51
2000	-32	0.0		55	50

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Tractor reference data is used to represent a forklift and rough terrain forklift

Table H.6-11. Construction Noise Levels for Building Type 2 - Exterior Finishing

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 2, Exterior Finishing			
Source 1: Air Compressor - Sound level (dBA) at 50 feet =	78	48%	74.8
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	20%	77.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			85
All Sources Combined - Leq sound level (dBA) at 50 feet =			79

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		91	85
50	0	0.0		85	79
100	-6	0.0		79	73
150	-10	0.0		75	70
200	-12	0.0		73	67
250	-14	0.0		71	65
300	-16	0.0		69	63
350	-17	0.0		68	62
400	-18	0.0		67	61
450	-19	0.0		66	60
500	-20	0.0		65	59
550	-21	0.0		64	58
600	-22	0.0		63	57
650	-22	0.0		63	57
700	-23	0.0		62	56
750	-24	0.0		61	56
800	-24	0.0		61	55
850	-25	0.0		60	54
900	-25	0.0		60	54
950	-26	0.0		59	53
1000	-26	0.0		59	53
1200	-28	0.0		57	51
1400	-29	0.0		56	50
1600	-30	0.0		55	49
1800	-31	0.0		54	48
2000	-32	0.0		53	47

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Tractor reference data is used to represent a forklift and rough terrain forklift

Table H.6-12. Construction Noise Levels for Building Type 2 - Site Work and Paving

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 2, Site Work and Paving			
Source 1: Concrete mixer truck - Sound level (dBA) at 50 feet =	79	56%	76.5
Source 3: Air Compressor - Sound level (dBA) at 50 feet =	78	30%	72.8
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			82
All Sources Combined - Leq sound level (dBA) at 50 feet =			78

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		88	84
50	0	0.0		82	78
100	-6	0.0		76	72
150	-10	0.0		72	68
200	-12	0.0		69	66
250	-14	0.0		68	64
300	-16	0.0		66	62
350	-17	0.0		65	61
400	-18	0.0		63	60
450	-19	0.0		62	59
500	-20	0.0		62	58
550	-21	0.0		61	57
600	-22	0.0		60	56
650	-22	0.0		59	56
700	-23	0.0		59	55
750	-24	0.0		58	54
800	-24	0.0		57	54
850	-25	0.0		57	53
900	-25	0.0		56	53
950	-26	0.0		56	52
1000	-26	0.0		56	52
1200	-28	0.0		54	50
1400	-29	0.0		53	49
1600	-30	0.0		51	48
1800	-31	0.0		50	47
2000	-32	0.0		49	46

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-13. Construction Noise Levels for Building Type 3 - Demolition

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 3, Demolition			
Source 1: Dozer - Sound level (dBA) at 50 feet =	82	40%	78.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			86
All Sources Combined - Leq sound level (dBA) at 50 feet =			82

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		92	88
50	0	0.0		86	82
100	-6	0.0		80	76
150	-10	0.0		77	72
200	-12	0.0		74	70
250	-14	0.0		72	68
300	-16	0.0		71	66
350	-17	0.0		69	65
400	-18	0.0		68	64
450	-19	0.0		67	63
500	-20	0.0		66	62
550	-21	0.0		65	61
600	-22	0.0		65	60
650	-22	0.0		64	60
700	-23	0.0		63	59
750	-24	0.0		63	58
800	-24	0.0		62	58
850	-25	0.0		62	57
900	-25	0.0		61	57
950	-26	0.0		61	56
1000	-26	0.0		60	56
1200	-28	0.0		59	54
1400	-29	0.0		57	53
1600	-30	0.0		56	52
1800	-31	0.0		55	51
2000	-32	0.0		54	50

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Concrete saws are also used for this phase, and they have a source level of 90 dBA Lmax at 50 feet. However, these would only be used during demolition of certain sections of roadways or sidewalks which would be an infrequent activity and these would not generally not be used for a prolonged duration.

Table H.6-14. Construction Noise Levels for Building Type 3 - Site Preparation

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 3, Site Preparation			
Source 1: Grader - Sound level (dBA) at 50 feet =	85	41%	81.1
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			88
All Sources Combined - Leq sound level (dBA) at 50 feet =			83

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		94	89
50	0	0.0		88	83
100	-6	0.0		82	77
150	-10	0.0		78	74
200	-12	0.0		75	71
250	-14	0.0		74	69
300	-16	0.0		72	68
350	-17	0.0		71	67
400	-18	0.0		69	65
450	-19	0.0		68	64
500	-20	0.0		68	63
550	-21	0.0		67	63
600	-22	0.0		66	62
650	-22	0.0		65	61
700	-23	0.0		65	61
750	-24	0.0		64	60
800	-24	0.0		63	59
850	-25	0.0		63	59
900	-25	0.0		62	58
950	-26	0.0		62	58
1000	-26	0.0		62	57
1200	-28	0.0		60	56
1400	-29	0.0		59	55
1600	-30	0.0		57	53
1800	-31	0.0		56	52
2000	-32	0.0		55	51

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-15. Construction Noise Levels for Building Type 3 - Grading

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 3, Grading			
Source 1: Dozer - Sound level (dBA) at 50 feet =	82	40%	78.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			86
All Sources Combined - Leq sound level (dBA) at 50 feet =			82

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		92	88
50	0	0.0		86	82
100	-6	0.0		80	76
150	-10	0.0		77	72
200	-12	0.0		74	70
250	-14	0.0		72	68
300	-16	0.0		71	66
350	-17	0.0		69	65
400	-18	0.0		68	64
450	-19	0.0		67	63
500	-20	0.0		66	62
550	-21	0.0		65	61
600	-22	0.0		65	60
650	-22	0.0		64	60
700	-23	0.0		63	59
750	-24	0.0		63	58
800	-24	0.0		62	58
850	-25	0.0		62	57
900	-25	0.0		61	57
950	-26	0.0		61	56
1000	-26	0.0		60	56
1200	-28	0.0		59	54
1400	-29	0.0		57	53
1600	-30	0.0		56	52
1800	-31	0.0		55	51
2000	-32	0.0		54	50

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Concrete saws are also used for this phase, and they have a source level of 90 dBA Lmax at 50 feet. However, these would only be used during demolition of certain sections of roadways or sidewalks which would be an infrequent activity and these would not generally not be used for a prolonged duration.

Table H.6-16. Construction Noise Levels for Building Type 3 - Building Construction

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 3, Building Construction			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			83

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	89
50	0	0.0		87	83
100	-6	0.0		81	77
150	-10	0.0		77	73
200	-12	0.0		75	71
250	-14	0.0		73	69
300	-16	0.0		71	67
350	-17	0.0		70	66
400	-18	0.0		69	65
450	-19	0.0		68	64
500	-20	0.0		67	63
550	-21	0.0		66	62
600	-22	0.0		65	61
650	-22	0.0		65	60
700	-23	0.0		64	60
750	-24	0.0		63	59
800	-24	0.0		63	59
850	-25	0.0		62	58
900	-25	0.0		62	58
950	-26	0.0		61	57
1000	-26	0.0		61	57
1200	-28	0.0		59	55
1400	-29	0.0		58	54
1600	-30	0.0		57	53
1800	-31	0.0		56	52
2000	-32	0.0		55	51

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-17. Construction Noise Levels for Building Type 3 - Paving

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 3, Paving			
Source 1: Roller - Sound level (dBA) at 50 feet =	80	38%	75.8
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			85
All Sources Combined - Leq sound level (dBA) at 50 feet =			81

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		91	87
50	0	0.0		85	81
100	-6	0.0		79	75
150	-10	0.0		76	72
200	-12	0.0		73	69
250	-14	0.0		71	67
300	-16	0.0		70	66
350	-17	0.0		69	64
400	-18	0.0		67	63
450	-19	0.0		66	62
500	-20	0.0		65	61
550	-21	0.0		65	60
600	-22	0.0		64	60
650	-22	0.0		63	59
700	-23	0.0		63	58
750	-24	0.0		62	58
800	-24	0.0		61	57
850	-25	0.0		61	57
900	-25	0.0		60	56
950	-26	0.0		60	56
1000	-26	0.0		59	55
1200	-28	0.0		58	54
1400	-29	0.0		57	52
1600	-30	0.0		55	51
1800	-31	0.0		54	50
2000	-32	0.0		53	49

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-18. Construction Noise Levels for Building Type 3 - Architectural Coating

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 3, Architectural Coating			
Source 1: Air Compressor - Sound level (dBA) at 50 feet =	78	48%	74.8
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			78
All Sources Combined - Leq sound level (dBA) at 50 feet =			75

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		84	81
50	0	0.0		78	75
100	-6	0.0		72	69
150	-10	0.0		68	65
200	-12	0.0		66	63
250	-14	0.0		64	61
300	-16	0.0		62	59
350	-17	0.0		61	58
400	-18	0.0		60	57
450	-19	0.0		59	56
500	-20	0.0		58	55
550	-21	0.0		57	54
600	-22	0.0		56	53
650	-22	0.0		56	53
700	-23	0.0		55	52
750	-24	0.0		54	51
800	-24	0.0		54	51
850	-25	0.0		53	50
900	-25	0.0		53	50
950	-26	0.0		52	49
1000	-26	0.0		52	49
1200	-28	0.0		50	47
1400	-29	0.0		49	46
1600	-30	0.0		48	45
1800	-31	0.0		47	44
2000	-32	0.0		46	43

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-19. Construction Noise Levels for Building Type 4 - Demolition

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 4, Demolition			
Source 1: Dozer - Sound level (dBA) at 50 feet =	82	40%	78.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			86
All Sources Combined - Leq sound level (dBA) at 50 feet =			82

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		92	88
50	0	0.0		86	82
100	-6	0.0		80	76
150	-10	0.0		77	72
200	-12	0.0		74	70
250	-14	0.0		72	68
300	-16	0.0		71	66
350	-17	0.0		69	65
400	-18	0.0		68	64
450	-19	0.0		67	63
500	-20	0.0		66	62
550	-21	0.0		65	61
600	-22	0.0		65	60
650	-22	0.0		64	60
700	-23	0.0		63	59
750	-24	0.0		63	58
800	-24	0.0		62	58
850	-25	0.0		62	57
900	-25	0.0		61	57
950	-26	0.0		61	56
1000	-26	0.0		60	56
1200	-28	0.0		59	54
1400	-29	0.0		57	53
1600	-30	0.0		56	52
1800	-31	0.0		55	51
2000	-32	0.0		54	50

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Concrete saws are also used for this phase, and they have a source level of 90 dBA Lmax at 50 feet. However, these would only be used during demolition of certain sections of roadways or sidewalks which would be an infrequent activity and these would not generally not be used for a prolonged duration.

Table H.6-20. Construction Noise Levels for Building Type 4 - Site Preparation

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 4, Site Preparation			
Source 1: Grader - Sound level (dBA) at 50 feet =	85	41%	81.1
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			88
All Sources Combined - Leq sound level (dBA) at 50 feet =			83

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		94	89
50	0	0.0		88	83
100	-6	0.0		82	77
150	-10	0.0		78	74
200	-12	0.0		75	71
250	-14	0.0		74	69
300	-16	0.0		72	68
350	-17	0.0		71	67
400	-18	0.0		69	65
450	-19	0.0		68	64
500	-20	0.0		68	63
550	-21	0.0		67	63
600	-22	0.0		66	62
650	-22	0.0		65	61
700	-23	0.0		65	61
750	-24	0.0		64	60
800	-24	0.0		63	59
850	-25	0.0		63	59
900	-25	0.0		62	58
950	-26	0.0		62	58
1000	-26	0.0		62	57
1200	-28	0.0		60	56
1400	-29	0.0		59	55
1600	-30	0.0		57	53
1800	-31	0.0		56	52
2000	-32	0.0		55	51

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-21. Construction Noise Levels for Building Type 4 - Grading

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 4, Grading			
Source 1: Dozer - Sound level (dBA) at 50 feet =	82	40%	78.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			86
All Sources Combined - Leq sound level (dBA) at 50 feet =			82

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		92	88
50	0	0.0		86	82
100	-6	0.0		80	76
150	-10	0.0		77	72
200	-12	0.0		74	70
250	-14	0.0		72	68
300	-16	0.0		71	66
350	-17	0.0		69	65
400	-18	0.0		68	64
450	-19	0.0		67	63
500	-20	0.0		66	62
550	-21	0.0		65	61
600	-22	0.0		65	60
650	-22	0.0		64	60
700	-23	0.0		63	59
750	-24	0.0		63	58
800	-24	0.0		62	58
850	-25	0.0		62	57
900	-25	0.0		61	57
950	-26	0.0		61	56
1000	-26	0.0		60	56
1200	-28	0.0		59	54
1400	-29	0.0		57	53
1600	-30	0.0		56	52
1800	-31	0.0		55	51
2000	-32	0.0		54	50

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Concrete saws are also used for this phase, and they have a source level of 90 dBA Lmax at 50 feet. However, these would only be used during demolition of certain sections of roadways or sidewalks which would be an infrequent activity and these would not generally not be used for a prolonged duration.

Table H.6-22. Construction Noise Levels for Building Type 4 - Building Construction

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 4, Building Construction			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			83

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	89
50	0	0.0		87	83
100	-6	0.0		81	77
150	-10	0.0		77	73
200	-12	0.0		75	71
250	-14	0.0		73	69
300	-16	0.0		71	67
350	-17	0.0		70	66
400	-18	0.0		69	65
450	-19	0.0		68	64
500	-20	0.0		67	63
550	-21	0.0		66	62
600	-22	0.0		65	61
650	-22	0.0		65	60
700	-23	0.0		64	60
750	-24	0.0		63	59
800	-24	0.0		63	59
850	-25	0.0		62	58
900	-25	0.0		62	58
950	-26	0.0		61	57
1000	-26	0.0		61	57
1200	-28	0.0		59	55
1400	-29	0.0		58	54
1600	-30	0.0		57	53
1800	-31	0.0		56	52
2000	-32	0.0		55	51

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-23. Construction Noise Levels for Building Type 4 - Paving

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 4, Paving			
Source 1: Roller - Sound level (dBA) at 50 feet =	80	38%	75.8
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	37%	79.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			85
All Sources Combined - Leq sound level (dBA) at 50 feet =			81

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		91	87
50	0	0.0		85	81
100	-6	0.0		79	75
150	-10	0.0		76	72
200	-12	0.0		73	69
250	-14	0.0		71	67
300	-16	0.0		70	66
350	-17	0.0		69	64
400	-18	0.0		67	63
450	-19	0.0		66	62
500	-20	0.0		65	61
550	-21	0.0		65	60
600	-22	0.0		64	60
650	-22	0.0		63	59
700	-23	0.0		63	58
750	-24	0.0		62	58
800	-24	0.0		61	57
850	-25	0.0		61	57
900	-25	0.0		60	56
950	-26	0.0		60	56
1000	-26	0.0		59	55
1200	-28	0.0		58	54
1400	-29	0.0		57	52
1600	-30	0.0		55	51
1800	-31	0.0		54	50
2000	-32	0.0		53	49

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-24. Construction Noise Levels for Building Type 4 - Architectural Coating

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 4, Architectural Coating			
Source 1: Air Compressor - Sound level (dBA) at 50 feet =	78	48%	74.8
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			78
All Sources Combined - Leq sound level (dBA) at 50 feet =			75

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		84	81
50	0	0.0		78	75
100	-6	0.0		72	69
150	-10	0.0		68	65
200	-12	0.0		66	63
250	-14	0.0		64	61
300	-16	0.0		62	59
350	-17	0.0		61	58
400	-18	0.0		60	57
450	-19	0.0		59	56
500	-20	0.0		58	55
550	-21	0.0		57	54
600	-22	0.0		56	53
650	-22	0.0		56	53
700	-23	0.0		55	52
750	-24	0.0		54	51
800	-24	0.0		54	51
850	-25	0.0		53	50
900	-25	0.0		53	50
950	-26	0.0		52	49
1000	-26	0.0		52	49
1200	-28	0.0		50	47
1400	-29	0.0		49	46
1600	-30	0.0		48	45
1800	-31	0.0		47	44
2000	-32	0.0		46	43

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-25. Construction Noise Levels for Building Type 5 - Demolition

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 5, Demolition			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	15%	75.8
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	67%	82.3
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			83

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	89
50	0	0.0		87	83
100	-6	0.0		81	77
150	-10	0.0		77	74
200	-12	0.0		75	71
250	-14	0.0		73	69
300	-16	0.0		71	68
350	-17	0.0		70	66
400	-18	0.0		69	65
450	-19	0.0		68	64
500	-20	0.0		67	63
550	-21	0.0		66	62
600	-22	0.0		65	62
650	-22	0.0		65	61
700	-23	0.0		64	60
750	-24	0.0		63	60
800	-24	0.0		63	59
850	-25	0.0		62	59
900	-25	0.0		62	58
950	-26	0.0		61	58
1000	-26	0.0		61	57
1200	-28	0.0		59	56
1400	-29	0.0		58	54
1600	-30	0.0		57	53
1800	-31	0.0		56	52
2000	-32	0.0		55	51

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Concrete saws are also used for this phase, and they have a source level of 90 dBA Lmax at 50 feet. However, these would only be used during demolition of certain sections of roadways or sidewalks which would be an infrequent activity and these would not generally not be used for a prolonged duration.

Table H.6-26. Construction Noise Levels for Building Type 5 - Site Preparation and Grading

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 5, Site Preparation and Grading			
Source 1: Compactor (ground) - Sound level (dBA) at 50 feet =	83	35%	78.4
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	100%	84.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			85

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	91
50	0	0.0		87	85
100	-6	0.0		81	79
150	-10	0.0		77	76
200	-12	0.0		74	73
250	-14	0.0		73	71
300	-16	0.0		71	70
350	-17	0.0		70	68
400	-18	0.0		68	67
450	-19	0.0		67	66
500	-20	0.0		67	65
550	-21	0.0		66	64
600	-22	0.0		65	63
650	-22	0.0		64	63
700	-23	0.0		64	62
750	-24	0.0		63	62
800	-24	0.0		62	61
850	-25	0.0		62	60
900	-25	0.0		61	60
950	-26	0.0		61	59
1000	-26	0.0		61	59
1200	-28	0.0		59	57
1400	-29	0.0		58	56
1600	-30	0.0		56	55
1800	-31	0.0		55	54
2000	-32	0.0		54	53

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-27. Construction Noise Levels for Building Type 5 - Excavation and Shoring

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 5, Excavation and Shoring			
Source 1: Auger Drill Rig - Sound level (dBA) at 50 feet =	84	50%	81.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	13%	75.1
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			82

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	88
50	0	0.0		87	82
100	-6	0.0		81	76
150	-10	0.0		77	72
200	-12	0.0		75	70
250	-14	0.0		73	68
300	-16	0.0		71	66
350	-17	0.0		70	65
400	-18	0.0		69	64
450	-19	0.0		68	63
500	-20	0.0		67	62
550	-21	0.0		66	61
600	-22	0.0		65	60
650	-22	0.0		65	60
700	-23	0.0		64	59
750	-24	0.0		63	58
800	-24	0.0		63	58
850	-25	0.0		62	57
900	-25	0.0		62	57
950	-26	0.0		61	56
1000	-26	0.0		61	56
1200	-28	0.0		59	54
1400	-29	0.0		58	53
1600	-30	0.0		57	52
1800	-31	0.0		56	51
2000	-32	0.0		55	50

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-28. Construction Noise Levels for Building Type 5 - Drainage, Utilities, and Subgrade

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 5, Drainage, Utilities, and Subgrade			
Source 1: Compactor (ground) - Sound level (dBA) at 50 feet =	83	16%	75.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	47%	80.7
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			82

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	88
50	0	0.0		87	82
100	-6	0.0		81	76
150	-10	0.0		77	72
200	-12	0.0		74	70
250	-14	0.0		73	68
300	-16	0.0		71	66
350	-17	0.0		70	65
400	-18	0.0		68	64
450	-19	0.0		67	63
500	-20	0.0		67	62
550	-21	0.0		66	61
600	-22	0.0		65	60
650	-22	0.0		64	59
700	-23	0.0		64	59
750	-24	0.0		63	58
800	-24	0.0		62	58
850	-25	0.0		62	57
900	-25	0.0		61	57
950	-26	0.0		61	56
1000	-26	0.0		61	56
1200	-28	0.0		59	54
1400	-29	0.0		58	53
1600	-30	0.0		56	52
1800	-31	0.0		55	51
2000	-32	0.0		54	50

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-29. Construction Noise Levels for Building Type 5 - Building Construction

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 5, Building Construction			
Source 1: Auger Drill Rig - Sound level (dBA) at 50 feet =	84	5%	71.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	5%	71.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			87
All Sources Combined - Leq sound level (dBA) at 50 feet =			74

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		93	80
50	0	0.0		87	74
100	-6	0.0		81	68
150	-10	0.0		77	64
200	-12	0.0		75	62
250	-14	0.0		73	60
300	-16	0.0		71	58
350	-17	0.0		70	57
400	-18	0.0		69	56
450	-19	0.0		68	55
500	-20	0.0		67	54
550	-21	0.0		66	53
600	-22	0.0		65	52
650	-22	0.0		65	52
700	-23	0.0		64	51
750	-24	0.0		63	50
800	-24	0.0		63	50
850	-25	0.0		62	49
900	-25	0.0		62	49
950	-26	0.0		61	48
1000	-26	0.0		61	48
1200	-28	0.0		59	46
1400	-29	0.0		58	45
1600	-30	0.0		57	44
1800	-31	0.0		56	43
2000	-32	0.0		55	42

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-30. Construction Noise Levels for Building Type 5 - Sitework

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 5, Sitework			
Source 1: Grader - Sound level (dBA) at 50 feet =	85	4%	71.0
Source 3: Tractor/Loader - Sound level (dBA) at 50 feet =	84	50%	81.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			88
All Sources Combined - Leq sound level (dBA) at 50 feet =			81

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		94	87
50	0	0.0		88	81
100	-6	0.0		82	75
150	-10	0.0		78	72
200	-12	0.0		75	69
250	-14	0.0		74	67
300	-16	0.0		72	66
350	-17	0.0		71	65
400	-18	0.0		69	63
450	-19	0.0		68	62
500	-20	0.0		68	61
550	-21	0.0		67	61
600	-22	0.0		66	60
650	-22	0.0		65	59
700	-23	0.0		65	58
750	-24	0.0		64	58
800	-24	0.0		63	57
850	-25	0.0		63	57
900	-25	0.0		62	56
950	-26	0.0		62	56
1000	-26	0.0		62	55
1200	-28	0.0		60	54
1400	-29	0.0		59	52
1600	-30	0.0		57	51
1800	-31	0.0		56	50
2000	-32	0.0		55	49

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-31. Construction Noise Levels for Building Type 6 - Demolition

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 6, Demolition			
Source 1: Air Compressor - Sound level (dBA) at 50 feet =	78	40%	74.0
Source 2: Front end loader - Sound level (dBA) at 50 feet =	79	40%	75.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			82
All Sources Combined - Leq sound level (dBA) at 50 feet =			78

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		88	84
50	0	0.0		82	78
100	-6	0.0		76	72
150	-10	0.0		72	68
200	-12	0.0		69	66
250	-14	0.0		68	64
300	-16	0.0		66	62
350	-17	0.0		65	61
400	-18	0.0		63	59
450	-19	0.0		62	58
500	-20	0.0		62	58
550	-21	0.0		61	57
600	-22	0.0		60	56
650	-22	0.0		59	55
700	-23	0.0		59	55
750	-24	0.0		58	54
800	-24	0.0		57	53
850	-25	0.0		57	53
900	-25	0.0		56	52
950	-26	0.0		56	52
1000	-26	0.0		56	52
1200	-28	0.0		54	50
1400	-29	0.0		53	49
1600	-30	0.0		51	47
1800	-31	0.0		50	46
2000	-32	0.0		49	46

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-32. Construction Noise Levels for Building Type 6 - Excavation

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 6, Excavation			
Source 1: Mounted Impact Hammer (hoe ram) - Sound level (dBA) at 50 feet =	90	40%	86.0
Source 2: Tractor/Loader - Sound level (dBA) at 50 feet =	84	40%	80.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			91
All Sources Combined - Leq sound level (dBA) at 50 feet =			87

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		97	93
50	0	0.0		91	87
100	-6	0.0		85	81
150	-10	0.0		81	77
200	-12	0.0		79	75
250	-14	0.0		77	73
300	-16	0.0		75	71
350	-17	0.0		74	70
400	-18	0.0		73	69
450	-19	0.0		72	68
500	-20	0.0		71	67
550	-21	0.0		70	66
600	-22	0.0		69	65
650	-22	0.0		69	65
700	-23	0.0		68	64
750	-24	0.0		67	63
800	-24	0.0		67	63
850	-25	0.0		66	62
900	-25	0.0		66	62
950	-26	0.0		65	61
1000	-26	0.0		65	61
1200	-28	0.0		63	59
1400	-29	0.0		62	58
1600	-30	0.0		61	57
1800	-31	0.0		60	56
2000	-32	0.0		59	55

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

Table H.6-33. Construction Noise Levels for Building Type 6 - Exterior Construction

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 6, Exterior Construction			
Source 1: Tractor/Loader - Sound level (dBA) at 50 feet =	84	40%	80.0
Source 2: Roller - Sound level (dBA) at 50 feet =	80	83%	79.2
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			85
All Sources Combined - Leq sound level (dBA) at 50 feet =			83

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		91	89
50	0	0.0		85	83
100	-6	0.0		79	77
150	-10	0.0		76	73
200	-12	0.0		73	71
250	-14	0.0		71	69
300	-16	0.0		70	67
350	-17	0.0		69	66
400	-18	0.0		67	65
450	-19	0.0		66	64
500	-20	0.0		65	63
550	-21	0.0		65	62
600	-22	0.0		64	61
650	-22	0.0		63	60
700	-23	0.0		63	60
750	-24	0.0		62	59
800	-24	0.0		61	59
850	-25	0.0		61	58
900	-25	0.0		60	58
950	-26	0.0		60	57
1000	-26	0.0		59	57
1200	-28	0.0		58	55
1400	-29	0.0		57	54
1600	-30	0.0		55	53
1800	-31	0.0		54	52
2000	-32	0.0		53	51

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.
Tractor reference data is used to represent a forklift and rough terrain forklift

Table H.6-34. Construction Noise Levels for Building Type 6 - Interior Structure

Source Data:	Maximum Sound Level (dBA)	Utilization Factor	Leq Sound Level (dBA)
Construction Condition: Building Type 6, Interior Structure			
Source 1: Pump - Sound level (dBA) at 50 feet =	81	4%	67.0
Calculated Data:			
All Sources Combined - Lmax sound level (dBA) at 50 feet =			81
All Sources Combined - Leq sound level (dBA) at 50 feet =			67

Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)		Calculated Lmax Sound Level (dBA)	Calculated Leq Sound Level (dBA)
25	6	0.0		87	73
50	0	0.0		81	67
100	-6	0.0		75	61
150	-10	0.0		71	57
200	-12	0.0		69	55
250	-14	0.0		67	53
300	-16	0.0		65	51
350	-17	0.0		64	50
400	-18	0.0		63	49
450	-19	0.0		62	48
500	-20	0.0		61	47
550	-21	0.0		60	46
600	-22	0.0		59	45
650	-22	0.0		59	45
700	-23	0.0		58	44
750	-24	0.0		57	43
800	-24	0.0		57	43
850	-25	0.0		56	42
900	-25	0.0		56	42
950	-26	0.0		55	41
1000	-26	0.0		55	41
1200	-28	0.0		53	39
1400	-29	0.0		52	38
1600	-30	0.0		51	37
1800	-31	0.0		50	36
2000	-32	0.0		49	35

Geometric attenuation based on 6 dB per doubling of distance.
Note: This calculation does not include the effects, if any, of local shielding
from walls, topography or other barriers which may reduce sound levels further.
Assuming hard ground type.

APPENDIX H.7. PROCEDURE FOR CALCULATING DAY-NIGHT NOISE LEVEL VALUES FROM SF-CHAMP TRAFFIC DATA

Traffic noise levels for construction and operation of the proposed action and alternatives were calculated using data from the vehicle noise emissions tables developed from the Federal Highway Administration Traffic Noise Model, version 2.5, and the Traffic Noise Model-Lookup program. This model calculates the vehicular traffic noise level at a fixed distance of 50 feet, which is the typical distance between a street centerline and adjacent buildings, and considers the vehicular traffic volume, traffic speed, and vehicle mix that is predicted to occur under each condition.

SF-CHAMP traffic data uses five time-of-day categories for reporting of traffic volumes on city road links throughout a 24-hour day, to account for temporal distribution during peak and off-peak periods. For noise modeling, traffic volumes were assumed to be distributed evenly across each time-of-day category. The SF-CHAMP time-of-day categories and their assignment to day-night categories in the noise model calculations are shown in Table H.7-1.

Table H.7-1: SF-CHAMP Time-of-Day Volume Conversions to Day-Night Volumes

Time-of-Day Category	Hours of the Day	Proportion of SF-CHAMP Volume assigned to Day or Night Volumes	
		Daytime (7:00 a.m. to 10:00 p.m.)	Nighttime (10:00 p.m. to 7:00 a.m.)
AM (a.m. peak)	6:00 am to 9:00 am	67%	33%
MD (midday off-peak)	9:00 am to 3:30 pm	100%	0%
PM (p.m. peak)	3:30 pm to 6:30 pm	100%	0%
EV (evening)	6:30 pm to 3:00 am	41%	59%
EA (early a.m.)	3:00 am to 6:00 am	0%	100%

As shown in Table H.7-1, the SF-CHAMP time-of-day categories do not perfectly align with standard day-night categories used to calculate L_{dn} values during two time periods: a.m. peak and evening. As such, any variation in traffic demand hour-to-hour within each category would not be considered, because SF-CHAMP data do not include hour-to-hour resolution of volume data. For example, while volumes are assigned to the noise model equally by hour during the evening period, i.e., 41% during daytime hours and 59% during nighttime hours, travel demand is likely higher during the early evening hours than during the post-midnight hours.

The methods used in this analysis are conservative and potentially result in slightly higher modeled noise levels. However, the same method is used across all modeled scenarios. As such, this approach would not result in an over- or under-estimate of traffic noise impacts of the proposed action (or alternatives), because impacts are determined by the difference between the 2050 environmental baseline and the proposed action (or the alternatives or Plan Bay Area 2050), using consistent methodology. However, the magnitude of overprediction may be estimated by comparison to noise monitoring data collected for the housing element update. While sound level monitoring accounts for values from all noise sources occurring during measurements, traffic noise is the most common source of noise in the city,

and as such the sound energy recorded during monitoring provides a reasonable approximation for comparison to SF-CHAMP traffic volume data.

To determine the potential overprediction between day-night noise modeling calculations and SF-Champ Volume distributions, the average sound energy from noise monitoring was obtained from hourly collected sound level data, as described in Section 4.5, Noise, of the EIR and shown in detail in Appendices H.8 and H.9. Hourly sound levels were averaged across sites.

Assigning traffic volumes by hour-of-day splits as described in Table H.7-1, total passenger car equivalent volumes were found to fall into the daytime category at a rate of 81% of the time, and into the nighttime category 19% of the time, on average. Traffic volumes were assigned accordingly to daytime and nighttime hours, as described above.

The comparison of SF-CHAMP volume data to monitoring data is shown in Table H.7-2. Based on sound energy calculations from monitoring data, the proportion of sound energy occurring during nighttime hours had a range of 5 to 19% among the ten measurement sites, with an average of 12% across all ten sites. According to calculations on an hourly L_{eq} basis, model calculations using SF-CHAMP time-of-day splits would have an average L_{dn} value of 1.1 dBA over measured L_{dn} levels, with a minimum of 0.0 dBA and a maximum of 2.7 dBA. Therefore, while use of SF-CHAMP volume data would result in some model overprediction of traffic noise levels, the magnitude would be less than 3 dBA, and model accuracy is usually considered sufficient when the difference between measured and model sound levels is less than 3 dBA.[1]

Table H.7-2: Difference in Modeled Sound Levels Using SF-Champ Data Compared to Sound Level Measurements Taken for the Housing Element Update

Measurement Site	Proportion of Total Measured Sound Energy, Nighttime Hours	Model Predictions using SF-Champ Volume Data Compared to Measured Sound Energy (dBA)
M1	16%	0.4
M2	8%	1.9
M3	9%	1.7
M4	11%	1.3
M5	5%	2.7
M6	13%	0.9
M7	19%	0.0
M8	11%	1.3
M9	10%	1.5
M10	17%	0.3
Average	12%	1.1
SF-Champ Volume Data	19%	--

[1] California Department of Transportation, Division of Environmental Analysis, *Technical Noise Supplement to the Traffic Noise Analysis Protocol,* September, 2013.

APPENDIX H.8. INCREASE IN TRAFFIC NOISE LEVELS FOR ALTERNATIVES

Table H.8-1: Plan Bay Area 2050: Change in Traffic Noise Levels from 2035 Midpoint Conditions, by Planning District

Planning District	Minimum (Greatest Reduction in Traffic Noise Level), dBA	Maximum Increase in Traffic Noise Level, dBA	Average Change in Traffic Noise Level, dBA
Bernal Heights	-9.0	+2.1	-0.5
Buena Vista	-6.6	+5.7	-0.2
Central	-16.9	+7.0	-0.1
Downtown	-8.4	+4.6	0.0
Golden Gate Park	-13.4	+19.3	+0.1
Ingleside	-6.0	+12.8	0.0
Inner Sunset	-10.8	+19.1	0.0
Marina	-9.9	+5.0	-0.7
Mission	-3.9	+4.0	-0.1
Northeast	-8.9	+15.5	-0.4
Outer Sunset	-8.6	+11.6	-0.5
Presidio	-20.5	+9.4	-2.4
Richmond	-10.9	+13.3	0.0
South Bayshore	-8.5	+20.2	+0.9
South Central	-9.1	+5.2	-0.1
South of Market	-10.6	+5.9	-0.2
Treasure Island	-5.8	+5.3	+0.1
Western Addition	-4.6	+9.0	0.0
City (all districts)	-20.5	+20.2	-0.1

Table H.8-2: Plan Bay Area 2050: Change in Traffic Noise Levels from 2050 Environmental Baseline, by Planning District

Planning District	Minimum (Greatest Reduction in Traffic Noise Level), dBA	Maximum Increase in Traffic Noise Level, dBA	Average Change in Traffic Noise Level, dBA
Bernal Heights	-3.4	+4.7	0.0
Buena Vista	-3.5	+5.5	+0.3
Central	-15.1	+10.2	+0.4
Downtown	-5.9	+5.7	+0.2
Golden Gate Park	-13.3	+22.9	+0.5
Ingleside	-4.3	+15.7	+0.4
Inner Sunset	-10.4	+19.5	+0.5
Marina	-7.3	+5.2	-0.4
Mission	-4.1	+11.3	+0.8
Northeast	-7.8	+4.9	-0.1
Outer Sunset	-8.2	+9.2	-0.1
Presidio	-20.4	+10.0	-2.4
Richmond	-4.8	+13.3	+0.5
South Bayshore	-7.3	+19.9	+0.6
South Central	-6.0	+13.0	+0.2
South of Market	-8.0	+8.8	+0.3
Treasure Island	-5.9	+1.2	-0.4
Western Addition	-5.7	+9.6	+0.4
City (all districts)	-20.4	+22.9	+0.2

Table H.8-3: Eastside Alternative: Change in Traffic Noise Levels from 2035 Midpoint Conditions, by Planning District

Planning District	Minimum (Greatest Reduction in Traffic Noise Level), dBA	Maximum Increase in Traffic Noise Level, dBA	Average Change in Traffic Noise Level, dBA
Bernal Heights	-5.3	+4.9	0.0
Buena Vista	-3.4	+1.3	+0.1
Central	-10.2	+15.5	+0.1
Downtown	-0.5	+1.1	0.0
Golden Gate Park	-0.7	+0.8	0.0
Ingleside	-2.4	+4.2	+0.1
Inner Sunset	-9.5	+11.4	0.0
Marina	-1.8	+7.0	+0.1
Mission	-1.0	+5.6	+0.1
Northeast	-6.2	+16.1	+0.1
Outer Sunset	-10.5	+1.8	-0.1
Presidio	-0.6	+1.0	0.0
Richmond	-0.7	+2.6	0.0
South Bayshore	-11.4	+9.7	0.0
South Central	-4.4	+8.2	0.0
South of Market	-2.4	+5.5	+0.1
Treasure Island	0.0	+2.2	+0.3
Western Addition	-4.3	+1.6	+0.1
City (all districts)	-11.4	+16.1	+0.1

Table H.8-4: Eastside Alternative: Change in Traffic Noise Levels from 2050 Environmental Baseline, by Planning District

Planning District	Minimum (Greatest Reduction in Traffic Noise Level), dBA	Maximum Increase in Traffic Noise Level, dBA	Average Change in Traffic Noise Level, dBA
Bernal Heights	-3.4	+6.5	+0.1
Buena Vista	-4.6	+3.2	+0.2
Central	-6.6	+7.4	+0.1
Downtown	-3.9	+7.5	+0.1
Golden Gate Park	-0.4	+1.1	+0.1
Ingleside	-3.0	+3.8	+0.0
Inner Sunset	-4.7	+7.6	0.0
Marina	-2.2	+6.7	+0.4
Mission	-3.1	+4.6	+0.2
Northeast	-2.1	+10.0	+0.2
Outer Sunset	-1.8	+5.2	0.0
Presidio	-0.8	+4.8	+1.3
Richmond	-4.8	+8.2	+0.4
South Bayshore	-4.1	+4.5	+0.1
South Central	-3.4	+4.0	0.0
South of Market	-1.9	+8.0	+0.3
Treasure Island	-1.7	+0.2	0.0
Western Addition	-3.8	+5.8	+0.3
City (all districts)	-6.6	+10.0	+0.2

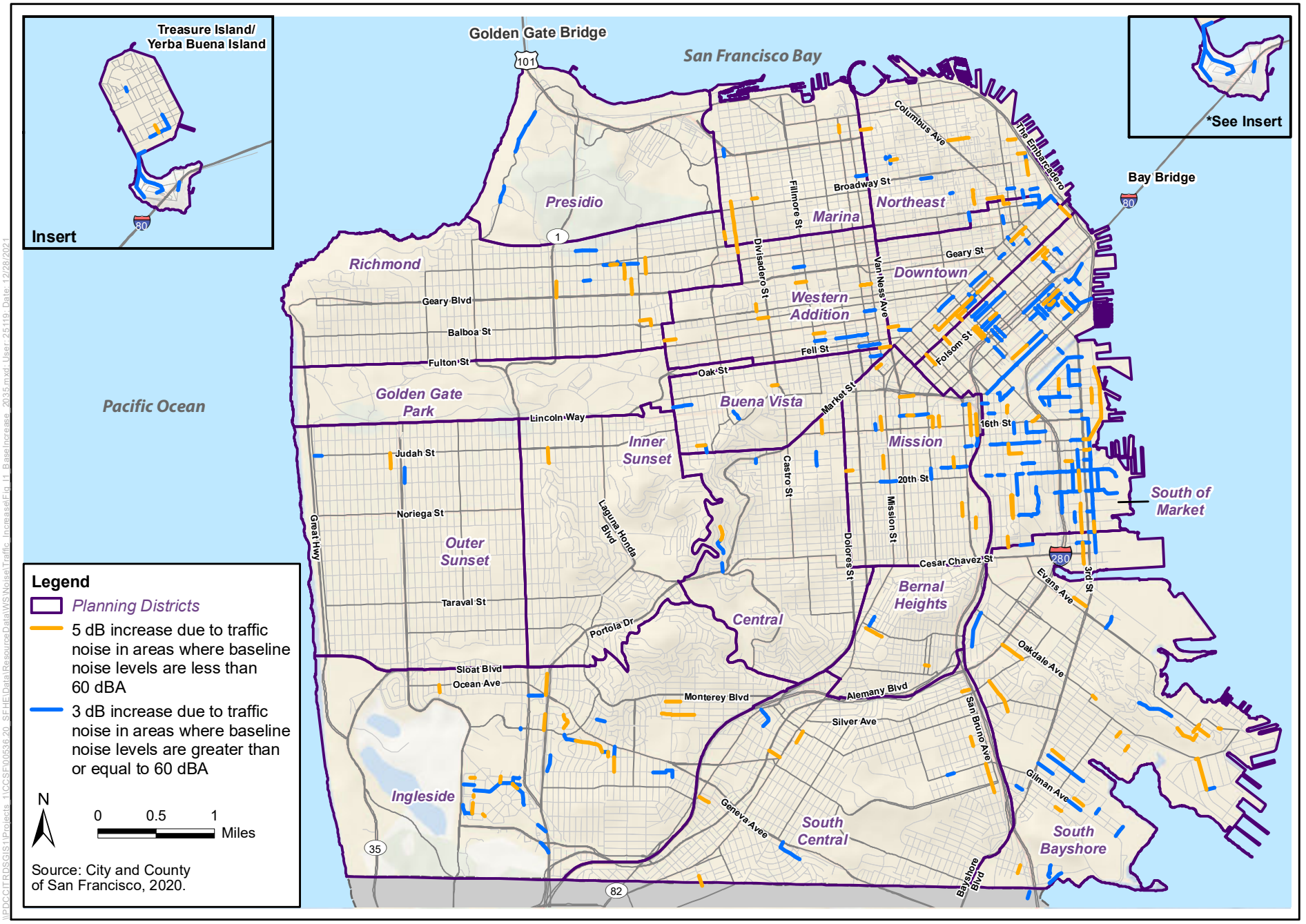
Table H.8-5: Dispersed Growth Alternative: Change in Traffic Noise Levels from 2035 Midpoint Conditions, by Planning District

Planning District	Minimum (Greatest Reduction in Traffic Noise Level), dBA	Maximum Increase in Traffic Noise Level, dBA	Average Change in Traffic Noise Level, dBA
Bernal Heights	-6.7	+5.1	+0.1
Buena Vista	-2.1	+1.9	+0.1
Central	-3.2	+10.3	+0.1
Downtown	-0.8	+2.8	0.0
Golden Gate Park	-1.8	+0.9	+0.1
Ingleside	-1.5	+5.3	+0.2
Inner Sunset	-9.5	+11.6	+0.2
Marina	-2.8	+6.3	+0.1
Mission	-4.6	+4.4	+0.1
Northeast	-4.7	+15.3	0.0
Outer Sunset	-4.8	+2.8	+0.2
Presidio	-0.5	+1.6	0.0
Richmond	-1.1	+7.8	+0.1
South Bayshore	-11.4	+6.3	0.0
South Central	-1.9	+9.2	+0.1
South of Market	-5.8	+5.1	+0.1
Treasure Island	-0.7	+1.8	+0.2
Western Addition	-1.1	+3.6	+0.1
City (all districts)	-11.4	+15.3	+0.1

Table H.8-6: Dispersed Growth Alternative: Change in Traffic Noise Levels from 2050 Environmental Baseline, by Planning District

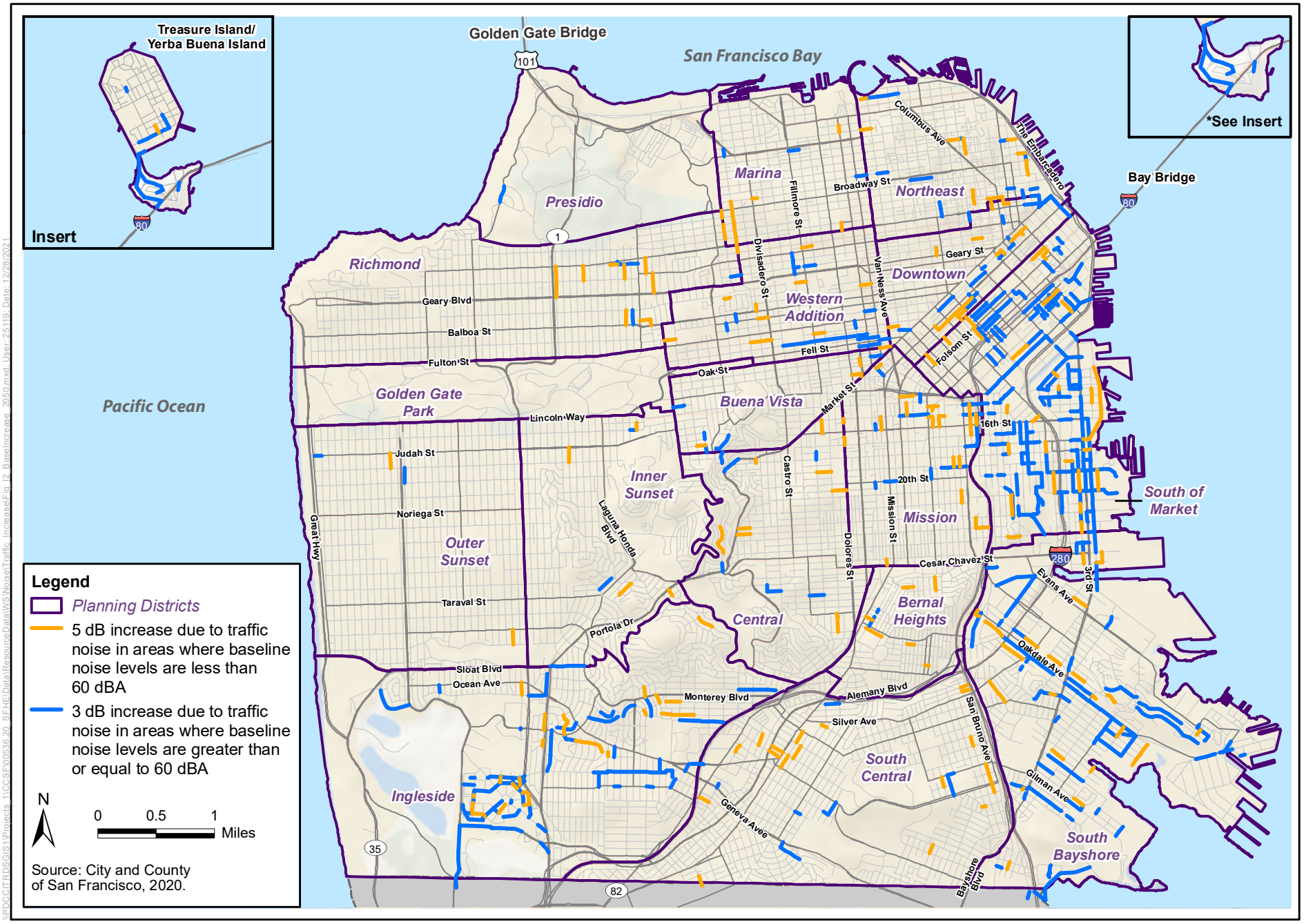
Planning District	Minimum (Greatest Reduction in Traffic Noise Level), dBA	Maximum Increase in Traffic Noise Level, dBA	Average Change in Traffic Noise Level, dBA
Bernal Heights	-5.7	+4.0	0.0
Buena Vista	-4.8	+4.0	+0.2
Central	-5.0	+7.7	+0.1
Downtown	-6.7	+6.4	0.0
Golden Gate Park	-0.6	+2.8	+0.4
Ingleside	-5.6	+19.5	+0.3
Inner Sunset	-6.6	+8.8	+0.3
Marina	-3.6	+5.1	+0.2
Mission	-11.1	+2.9	-0.1
Northeast	-8.4	+11.7	-0.1
Outer Sunset	-2.7	+4.9	+0.4
Presidio	-2.3	+4.5	+1.3
Richmond	-3.3	+8.0	+0.7
South Bayshore	-6.2	+3.8	-0.1
South Central	-8.8	+2.8	0.0
South of Market	-3.1	+7.3	0.0
Treasure Island	-0.7	+0.4	0.0
Western Addition	-4.1	+5.0	+0.3
City (all districts)	-11.1	+19.5	+0.2

APPENDIX H.9. TRAFFIC NOISE MODEL RESULTS FOR ALTERNATIVES



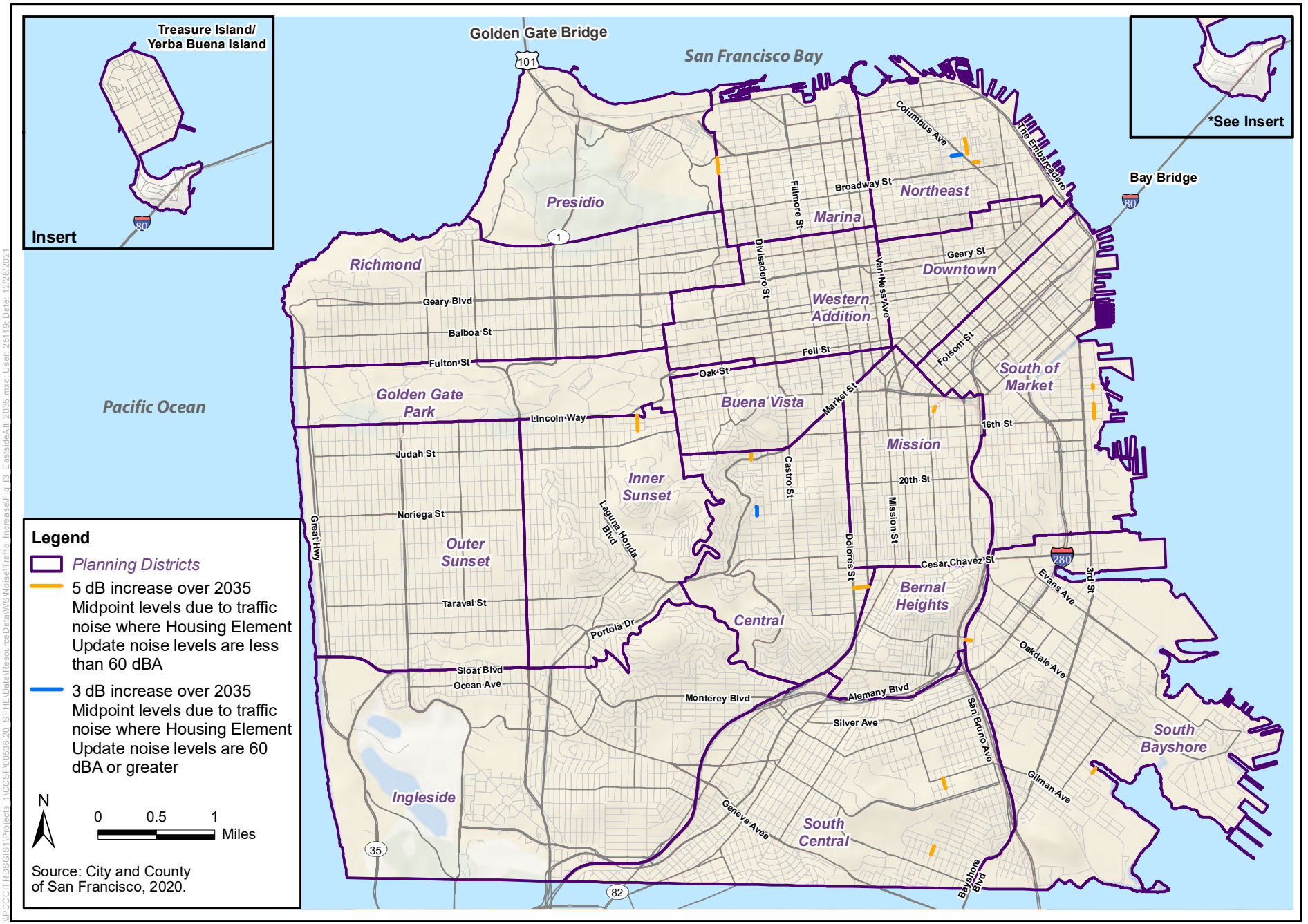
San Francisco Housing Element 2022 Update
Case No. 2019-016230ENV

Figure H-1
Increase in Traffic Noise Under 2035 Midpoint Conditions Compared to Existing Conditions 2020



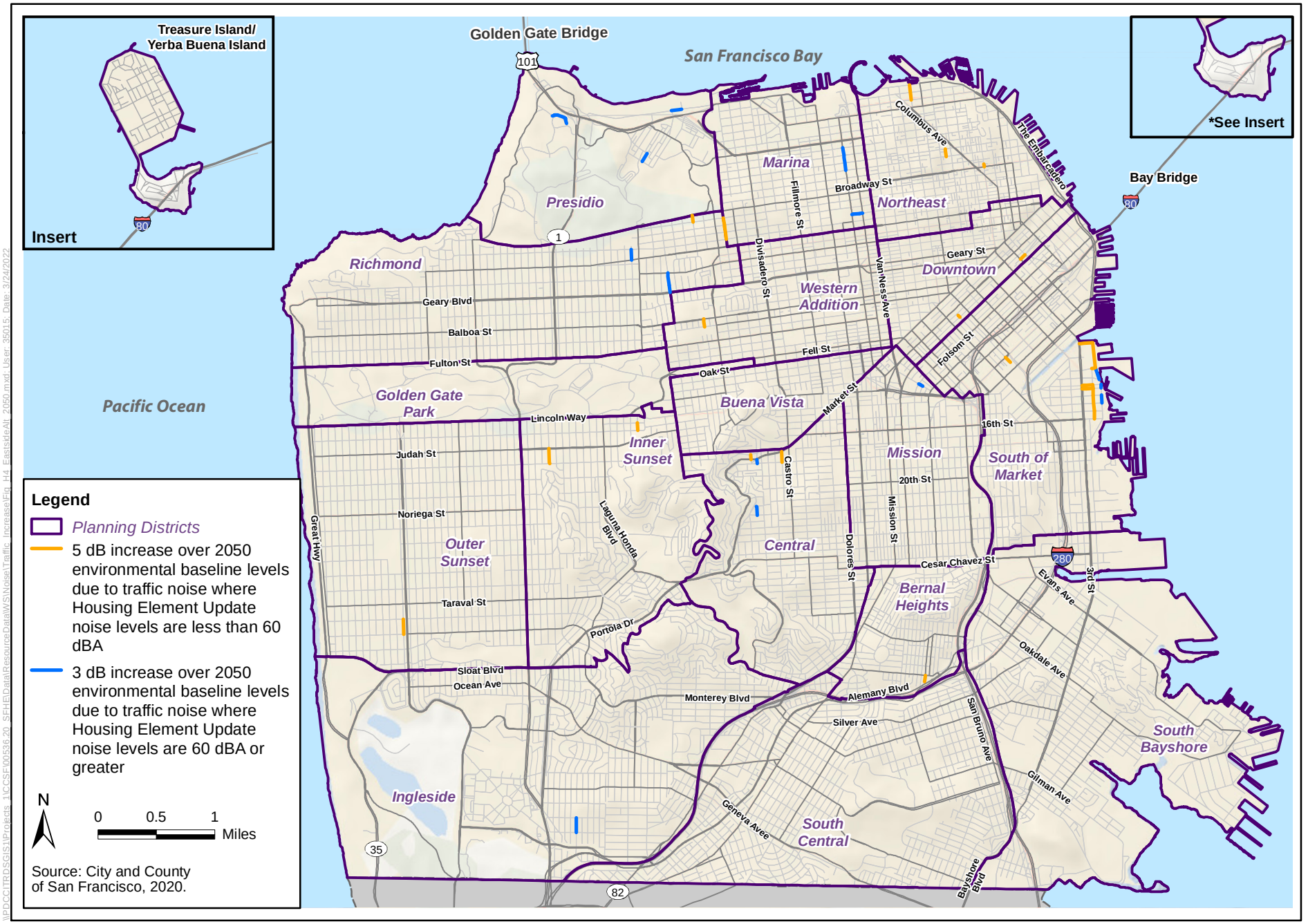
San Francisco Housing Element 2022 Update
Case No. 2019-016230ENV

Figure H-2
Increase in Traffic Noise Under 2050 Environmental Baseline Compared to Existing Conditions 2020



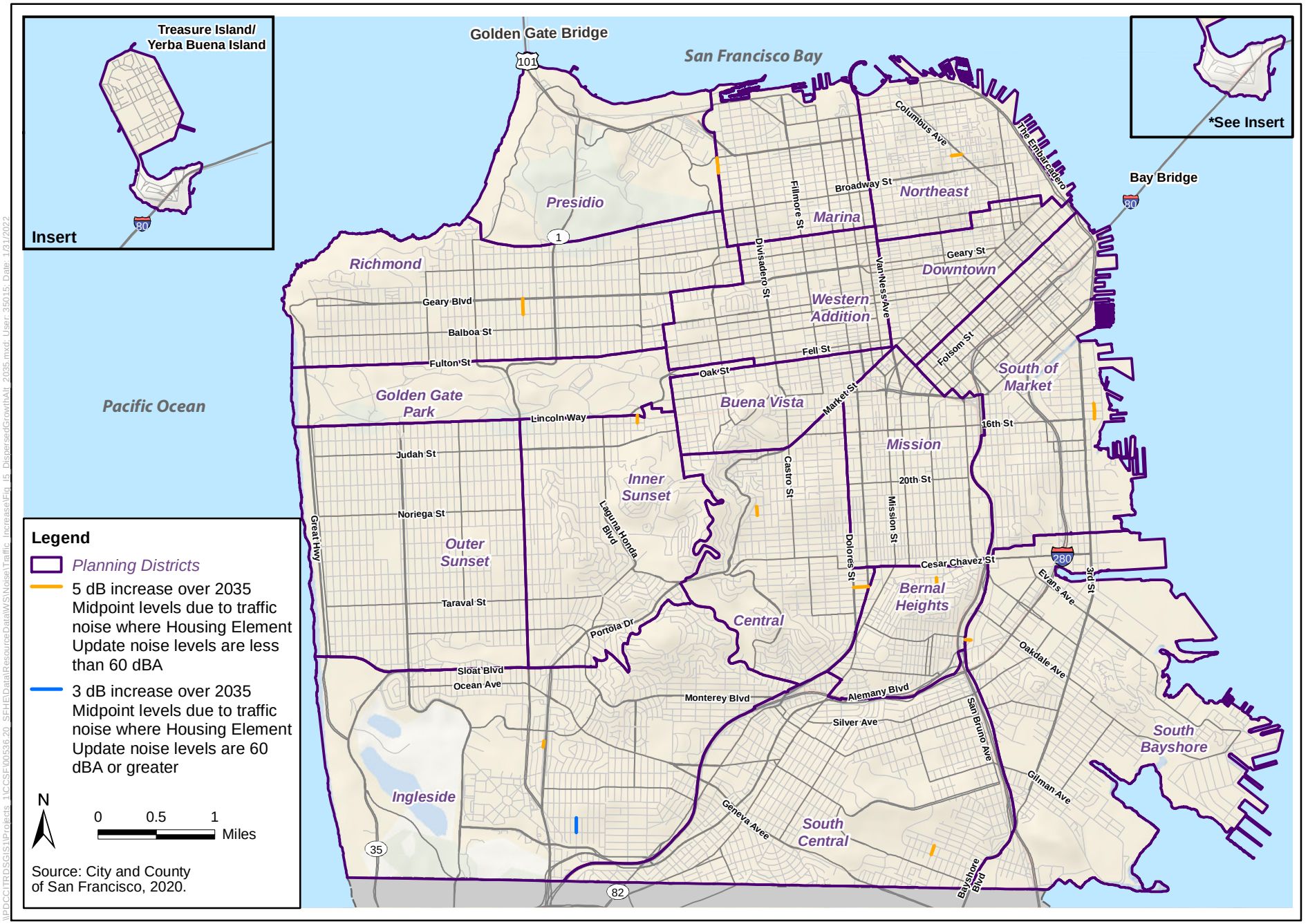
San Francisco Housing Element 2022 Update
Case No. 2019-016230ENV

Figure H-3
Increase in Traffic Noise Under the Eastside Alternative Compared to 2035 Midpoint Conditions



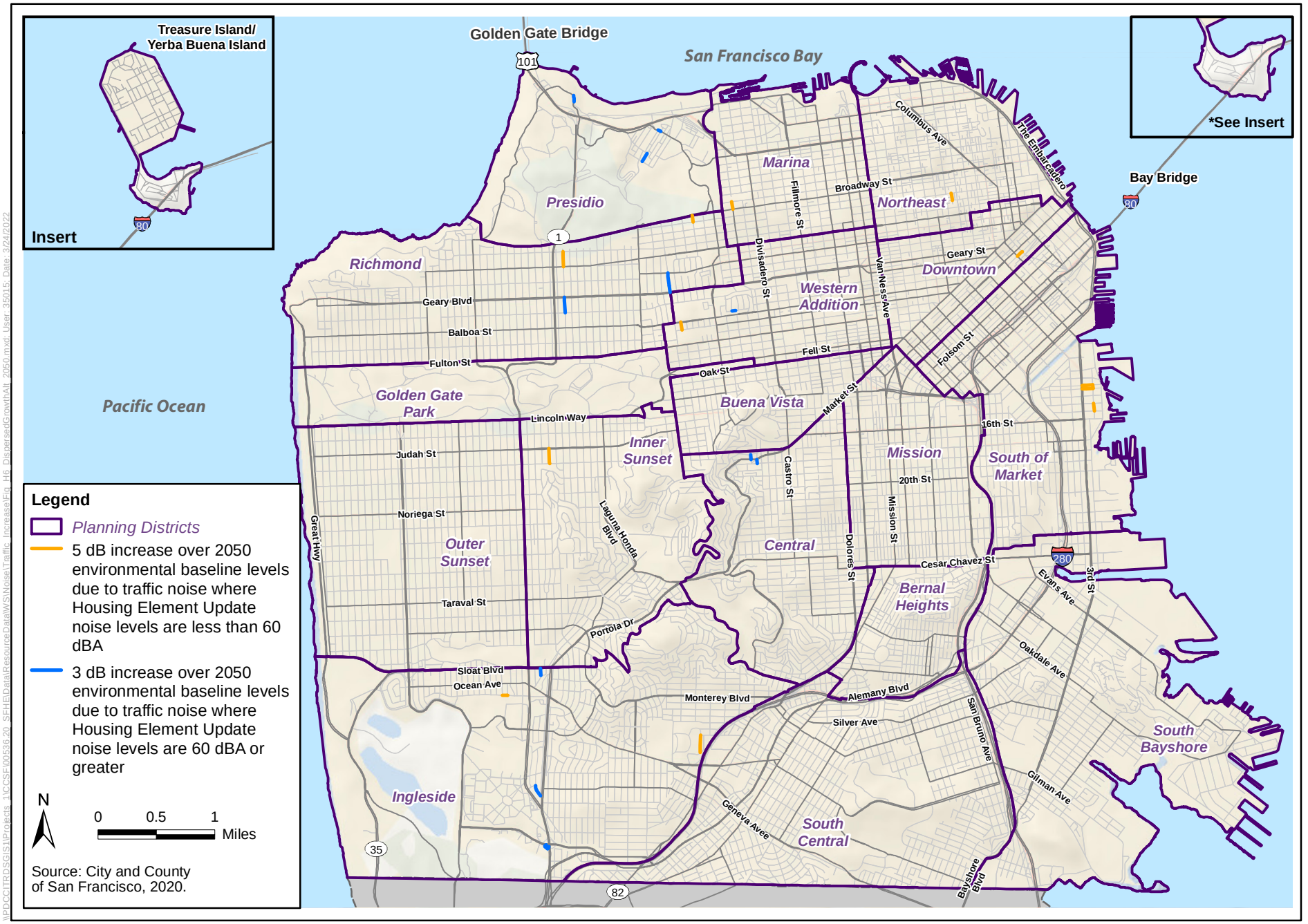
San Francisco Housing Element 2022 Update
Case No. 2019-016230ENV

Figure H-4
Increase in Traffic Noise Under the Eastside Alternative Compared to 2050 Environmental Baseline



San Francisco Housing Element 2022 Update
Case No. 2019-016230ENV

Figure H-5
Increase in Traffic Noise Under the Dispersed Growth Alternative Compared to 2035 Midpoint Conditions



San Francisco Housing Element 2022 Update
Case No. 2019-016230ENV

Figure H-6
Increase in Traffic Noise Under the Dispersed Growth Alternative Compared to 2050 Environmental Baseline

APPENDIX I

Air Quality Supporting Information

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

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Appendix I.2: Air Quality and Health Risk Assessment Results for Roadway Modeling

Appendix I.3: Air Quality and Health Risk Assessment Results for Building Types

APPENDIX I.1. CEQA AIR QUALITY AND HEALTH RISK ASSESSMENT METHODOLOGY

Prepared for
San Francisco Planning Department
San Francisco, California

Prepared by
Ramboll US Consulting, Inc.
San Francisco, California

Project Number
1690017135

Date
December 3, 2021

CEQA AIR QUALITY AND HEALTH RISK ASSESSMENT METHODOLOGY

SAN FRANCISCO HOUSING ELEMENT 2022 UPDATE
SAN FRANCISCO, CALIFORNIA

RAMBOLL

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ACRONYMS AND ABBREVIATIONS

ADU	Accessory Dwelling Unit
AERMOD	USEPA's atmospheric dispersion modeling system
APEZ	Air Pollution Exposure Zone
ARB	(California) Air Resources Board
ASF	age sensitivity factor
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
Cal/EPA	California Environmental Protection Agency
CalEEMod®	California Emissions Estimator Model
CAP	criteria air pollutant
CEQA	California Environmental Quality Act
CPF	cancer potency factor
Citywide HRA	San Francisco Citywide Health Risk Analysis database
DPM	diesel particulate matter
EIR	Environmental Impact Report
g/s	gram per second
HHDT	Heavy-Heavy Duty Trucks
HRA	health risk assessment
MHDT	Medium-Heavy Duty Trucks
MUNI	Municipal Railway
OEHHA	Office of Environmental Health Hazard Assessment
OFFROAD	(ARB) In-Use Off-Road Equipment model
PBA	Plan Bay Area
PM	particulate matter
$PM_{2.5}$	fine particulate matter less than 2.5 micrometers in aerodynamic diameter
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
PS	Project Scenario
Ramboll	Ramboll US Consulting, Inc.
RH	Residential Housing
RM	Residential Mixed
ROG	Reactive Organic Gases
SF-CHAMP	San Francisco Chained Activity Modeling Process
SF DPH	San Francisco Department of Public Health
SFEP	San Francisco Planning Department Environmental Planning Division
SF Planning	San Francisco Planning Department
TAC	toxic air contaminant
TOG	total organic gases
$\mu g/m^3$	microgram per cubic meter
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VMT	Vehicle Miles Traveled
VOC	volatile organic compounds

1. INTRODUCTION

At the request of ICF International, Ramboll US Consulting, Inc. (Ramboll) will conduct a California Environmental Quality Act (CEQA) analysis of criteria air pollutants and precursors and local air quality and health impacts associated with the construction and operation of residential developments that may be included in the proposed San Francisco Housing Element 2022 Update in San Francisco (referred to hereafter as housing element update or proposed action) on sensitive receptors. This emissions and Health Risk Assessment (HRA) methodology describes the scope and methodology for evaluation of air quality and health impacts from construction sources, operational sources, and total offsite sources at onsite and adjacent offsite sensitive receptors. This analysis will be performed to support the proposed action's CEQA documentation at the request of the San Francisco Planning Department's (department) Environmental Planning Division.

1.1 Project Understanding

The department is proposing to update the housing element of the San Francisco General Plan (general plan). The Environmental Impact Report (EIR) will evaluate the impacts that could result from adoption and implementation of the housing element update, which is an update to the adopted 2014 Housing Element of the general plan. The Housing Element is a series of plans and policies; no legislative zoning changes or development projects are proposed as part of the housing element update. However, implementation of the plans and policies could result in potential physical environmental impacts from future actions that would implement the policies.

The overall objective of the housing element update is to improve housing affordability and equity throughout the city. To achieve this objective, the housing element update seeks to increase housing production to an average of approximately 5,000 housing units per year with at least one third permanently affordable by 2050. The department evaluated the Eastside Alternative, housing element update, and Plan Bay Area 2050 (each discussed in detail below) to reach this objective and to inform the housing element update.

The scenarios are summarized below.

1.1.1 Baseline Scenario

The EIR assumes that if the proposed housing element update is not adopted, housing development would continue to occur under the policies and implementing measures of the existing housing element. As such, the environmental impact analysis presented in the EIR uses projected future conditions (2050) as a baseline against which the significance of environmental impacts are assessed, and not existing conditions (2020). Using existing conditions as a baseline would be misleading and would have no informative value for decision makers and the public because growth would continue to occur in the city whether or not the policies in the housing element are updated.

Currently (2020), it is estimated that there are approximately 407,000 housing units and 771,000 jobs in the city. Under baseline 2050 conditions, it is estimated that there would be approximately 508,730 housing units and 882,000 jobs in the city, an increase of 102,000 housing units and 111,000 jobs compared to 2020 conditions.

Generally, the highest housing densities in the city exist in the downtown area, at an average density of 218 dwelling units per acre, while lower densities (as low as 5 dwelling units per acre) exist in the western and southern areas of the city. Under the baseline scenario, most areas in the city allow residential uses; the eastern portion of the city comprises commercial, mixed, and industrial uses. The tallest height districts occur in the downtown and South of Market (SoMa) neighborhoods.

1.1.2 Eastside Alternative

The Eastside Alternative would be similar to the existing development pattern in the city that focuses development on the east side of the city and maintains lower density in the western neighborhoods. Policies under this alternative would focus the projected growth for the city through 2050 to the east side, primarily in neighborhoods with existing area plans, along existing Neighborhood Commercial districts, and along corridors in the eastern part of the city such as Van Ness Avenue, Mission Street, and Third Street. Policies and objectives under this alternative would also encourage infill development through increased residential density in commercial or industrial areas.

1.1.3 Plan Bay Area (PBA)

In addition to the proposed housing element update, the EIR will also evaluate the environmental impacts that could result from growth forecasted in San Francisco as a result of the 35 strategies in Plan Bay Area 2050. Plan Bay Area 2050 serves as a long-range regional vision for transportation, housing, the economy, and the environment, defined by strategies – policies and investments advanced by state, regional, and local governments. These strategies would further intensify the existing development pattern in the city to achieve regional climate, equity, and jobs-housing balance goals, among others. Development would be focused primarily in San Francisco's locally-adopted priority development areas. It would also focus development on the east side of the city while encouraging increased land use density and intensity along transit corridors and nodes.

1.1.4 Housing Element Update: Proposed Action

The proposed action would direct a greater portion of the projected growth for the city to the California State Treasurer's high opportunity areas by recommending 1) increases in height and the removal of density limits along existing and projected rapid network transit corridors and certain transit nodes, 2) removing density limits, without increase in height, in low-density areas within approximately 800 feet of these corridors, and 3) increasing density limits in low-density areas (RHs) to four units in areas beyond 800 feet of these corridors. The existing and projected rapid network transit corridors in high opportunity areas include:

- Van Ness Avenue
- California Street
- Geary Boulevard
- Irving/Judah streets
- Taraval Street
- Park Presidio and 19th Avenue
- Ocean Avenue
- Union Street
- Lombard Street
- Church Street
- West Portal Avenue
- Transit Nodes
- 500-foot radius at Castro and Market streets
- 500-foot radius of Forest Hill Station
- 500-foot radius of 19th Avenue and Taraval Street

Low-density areas in high opportunity include Residential Housing (RH) and Residential Mixed (RM) zoning districts and Neighborhood Commercial (NC-1 thru NC-3) districts.

The corridors selected for analysis are located in high-opportunity areas, which currently provide amenities for local residents. An increase in housing units along these corridors and nodes could result in the development of new or improved amenities, such as transit, playgrounds, recreation centers, health clinics, or the development of additional commercial and retail uses.

1.2 2035 and 2050 Citywide Modeling

San Francisco's Citywide Health Risk Assessment Modeling (2020 Citywide HRA) identifies and maps regions of the City where current residents are exposed to high levels of air pollution and where future residents, in new development areas, may also be exposed. To identify areas with elevated exposure to air pollution, air dispersion modeling with inputs such as estimates of emissions from major sources, source characteristics and local meteorological data was used to estimate air pollutant concentrations. Air pollutants considered in the 2020 Citywide HRA dispersion modeling were emissions of primary particulate matter (PM), and toxic air contaminants (TACs). Major sources that were included in the 2020 Citywide HRA modeling were:

1) Roadway activity (number of vehicles and vehicle type on roadway segments) developed from San Francisco Chained Activity Modeling Process (SF-CHAMP) for on-road cars and trucks
2) Permitted stationary sources, including gasoline dispensing stations, prime and standby diesel generators, wastewater treatment plants, recycling facilities, dry cleaners, large boilers, and other industrial facilities
3) Caltrain passenger diesel locomotives
4) Ships and harbor craft, including ocean going vessels, cruise ships, excursion boats, and tugboats
5) Ferry boats

As a part of the 2022 Housing Element update, the 2020 Citywide HRA will be updated with roadway network, traffic pattern and fleet information to reflect the conditions in future years 2035 and 2050. The 2035 and 2050 Citywide HRA update will incorporate changes to source characteristics for roadway activity; all other sources will rely on the existing data from the 2020 Citywide HRA.

1.3 Objective and Methodology

At the direction of the department and in accordance with the applicable Bay Area Air Quality Management District's (air district) CEQA Air Quality Guidelines (including additional analyses for plans), Ramboll will prepare a programmatic air quality analysis addressing regional air pollutants (criteria air pollutants or "CAPs") and a localized HRA to document the potential impacts of the proposed action.

The purpose of the air quality analysis is to assess potential criteria air pollutant and health risks and hazards that would result from the construction and operation of projects in each scenario consistent with guidelines and methodologies from air quality agencies, specifically, the air district, the California Air Resources Board (ARB), the California Office of Environmental Health Hazard Assessment (OEHHA), and the US Environmental Protection Agency (USEPA). Consistent with guidelines and recommended methods from these agencies, the HRA will evaluate the estimated incremental increase in cancer risk from diesel particulate matter (DPM) and fine PM concentrations (specifically particulate matter less than 2.5 microns in aerodynamic diameter [$PM_{2.5}$]). The regional criteria air pollutant analysis will qualitatively describe potential short-term construction impacts and long-term operational impacts that could be generated by development that is consistent with the policies and objectives of the proposed Housing Element 2022 update. The construction and operational emission sources included in the HRA for the proposed action include diesel-powered construction equipment, on-road haul trucks, and proposed action-related operation of diesel-powered emergency generators. Traffic emissions associated with operation of the Housing Element 2022 update will be evaluated quantitatively in the HRA, as described in more detail below.

As discussed above, the Housing Element is a series of plans and policies; no legislative zoning changes or development projects are proposed as part of the housing element update. However, future actions consistent with the proposed action could result in potential physical environmental impacts. The proposed action, Eastside Alternative, and Plan Bay Area could facilitate the construction of multiple building types. To assess potential operational and construction air quality impacts of the various scenarios, the department identified building types that might occur pursuant to the implementation of each scenario. The building types were identified to represent a range of impacts from likely development projects that could occur pursuant to each scenario. The health risk analyses will estimate excess lifetime cancer risks and $PM_{2.5}$ concentrations that are attributable to construction of building types, operational emergency generators associated with building types (as applicable), and operational traffic associated with the expected overall housing development of each concept.

The department has identified several recent projects in San Francisco that are similar to the building types that might occur under each of the scenarios, as shown in **Table A**. Ramboll coordinated with the department to select Building Types from this list for each scenario. Previously analyzed projects that were similar to each building type were identified so that information on construction and operational characteristics from the previously analyzed project could inform the construction and operational characteristics of the building types analyzed for each scenario. Ramboll will rely on construction and operational characteristics of the previously analyzed project to estimate the air quality and health risk impacts associated with each building type analyzed for the Eastside Alternative Plan Bay Area, and other scenarios. Ramboll will augment the construction and operational characteristics as needed to ensure that the air quality analysis adequately reflects that which would be expected from each building type.

In addition to estimating the air quality and health risk impacts for each building type in each scenario, Ramboll will conduct a Citywide HRA which evaluates total cancer risk and $PM_{2.5}$ concentrations from existing known sources of air pollution in addition to cancer risk and $PM_{2.5}$ concentrations anticipated from traffic emissions as a result of the Housing Element 2022 update for years 2035 and 2050. For the purposes of this report, the database developed for that effort is referred to as the "2035 Citywide HRA" and "2050 Citywide HRA".

For the purposes of air quality impacts, the existing housing element plans and policies will also be analyzed in years 2035 and 2050 (referred to herein as 2035 midpoint conditions and 2050 Baseline). The following cases will be analyzed in this work:

1) 2020 existing conditions, represented by the 2020 Citywide HRA
2) 2035 midpoint conditions (assumes a continuation of existing housing element plans and policies)
3) 2050 baseline (assumes a continuation of existing housing element plans and policies)
4) 2035 Eastside Alternative
5) 2035 Plan Bay Area
6) 2035 proposed action
7) 2050 Eastside Alternative
8) 2050 Plan Bay Area
9) 2050 proposed action

For a cumulative analysis, Ramboll will qualitatively evaluate the air quality findings of the most recent Waterfront Plan Update and other cumulative projects identified by the department in conjunction with the 2050 Baseline.

In summary, the proposed air quality analysis will include:

1) Net increases in mass emissions of CAPs from both construction and operational sources, for each building type;
2) Building type HRAs consisting of net increases in excess lifetime cancer risks and $PM_{2.5}$ concentrations from construction emissions and emergency generator emissions;
3) Citywide HRAs for each scenario for years 2035 and 2050, as described above.

The results of the analysis will be documented in a series of summary result memos to be presented to ICF and the department before being incorporated into the Draft EIR as applicable chapter text and technical appendices.

1.4 Document Organization

This scope of work is divided into seven sections as follows:

Section 1.0 – Introduction: describes the purpose and scope of the air quality analysis, the objectives and methodology to be used, and outlines the document organization;

Section 2.0 – Building Types: describes the building types and development assumptions for each scenario analyzed in this work;

Section 3.0 – Emission Estimation: describes the methods that will be used to estimate CAP and TAC emissions from various sources for the proposed action;

Section 4.0 – 2035 and 2050 Citywide Modeling: describes the methods that will be used to update citywide traffic modeling for use in the updated Citywide HRA for each scenario;

Section 5.0 – Estimated Air Concentrations: discusses the air dispersion modeling, the selection of the dispersion models, the data to be used in the dispersion models (*e.g.*, terrain, meteorology, source characterization), and the identification of receptor locations evaluated in the HRA;

Section 6.0 – Risk Characterization Methods: provides an overview of the methodology for conducting the HRA;

Section 7.0 – Scenarios Evaluated: summarizes the approach to be used in the citywide analyses;

Section 8.0 – Cumulative Analysis: summarizes the approach to be used in the HRA cumulative analysis.

Section 9.0 – Uncertainties: summaries sources of uncertainty in the analyses.

Section 10.0 – Summary Results Memo: outlines the process and deliverables associated with the development of results documentation

Section 11.0 – References: includes a listing of all references cited in this report.

2. BUILDING TYPES

Seven building types have been identified to represent a range of development projects that may be encouraged under each scenario. Descriptions of each building type are summarized in **Table 1**. In order to inform the analysis of each building type, previously analyzed projects that were similar to each building type were identified. Construction and operational characteristics from the previously analyzed projects provide the basis for the construction and operational characteristics of the building types analyzed for each scenario. Where appropriate in order to estimate likely impacts from redevelopment of a site, construction and operational characteristics of the building types have been modified. For example, where a previously analyzed project assumed redevelopment of a vacant parking lot, the assumptions for the building type have been modified to account for sites that would require demolition of existing development. Each building type is identified below as well as a matrix identifying which building types are anticipated to be encouraged under each scenario.

2.1 Building Type 1: 590-foot-tall residential mixed-use building

The Eastside Alternative and Plan Bay Area could encourage the construction of Building Type 1: 590-foot-tall residential mixed-use development. This building type represents the upper end (largest) of the building types anticipated to be encouraged under the Eastside Alternative and Plan Bay Area. The construction and operational land use characteristics from Building Type 1 were taken entirely from the 10 South Van Ness Avenue project.[1] Modeled land use characteristics from this building type include:

- Demolition: Removal of the existing 91,088 square-foot, two-story, 30- to 45-foot-tall Honda Dealership and Service Center .
- New Construction: 1,071,100 square feet of new construction to a maximum height of 590 feet (55 stories) consisting of 984 residential units that total 935,745 square feet and ground floor retail totaling 30,350 square feet. This building type also includes a total of 518 parking spaces on two levels of below-grade garage and would require one 2,011 horsepower Tier 4 compliant emergency generator that is permitted for up to 50 hours/year for testing purposes.
- Construction Activities: Construction of this building type is anticipated to occur for a period of 36 months and require 100,000 cubic yards of excavation. Construction phases include the following (some of which may occur simultaneously):
  - Demolition (2 months)
  - Grading, shoring, and excavation (6 months)
  - Foundation/building construction (9 months)
  - Building construction/superstructure (9 months)
  - Superstructure/skin (5 months)
  - Interior work (15 months)

[1] San Francisco Planning Department, 10 South Van Ness Avenue, 2015-004568ENV, https://sfplanning.org/environmental-review-documents?title=10+south+van+ness, accessed November 5, 2021.

2.2 Building Type 2: 240-foot tall residential building

The Eastside Alternative, proposed action, and Plan Bay Area could encourage the construction of Building Type 2: 240-foot-tall residential development. This building type represents the lower end (smaller) of the building types anticipated to be encouraged under Eastside Alternative and the upper end (larger) of the building types anticipated to be encouraged under the proposed action. This building type is also a part of the baseline and Plan Bay Area. The construction and operational land use characteristics from Building Type 2 were mostly taken from the 469 Stevenson Street Draft EIR.[2] However, because the 469 Stevenson Project did not require demolition of existing buildings on the site, additional demolition characteristics were modeled for Building Type 2 to account for the likelihood that this building type could require demolition of an existing building on a project site. It was also assumed that vertical construction for building type 2 would be similar to that of the 469 Stevenson Street project even though the 469 Stevenson Street Project would be about 35 feet taller than building type 2. Modeled land use characteristics from this building type include:

- Demolition: Removal of 4-5 story structure maximum; lot size is approximately 20,000 square feet; 75% coverage of the lot; 90,000 square feet for demolition of structure.[3]
- New Construction: 535,000 gross square feet of new construction containing 495 dwelling units, 4,000 square feet of commercial space, and 25,000 square feet of private and common open space. In addition, this building type includes up to 178 vehicles in 3 below-grade enclosed parking levels. This building type would require two 1,005 horsepower Tier 4 compliant emergency generators that are each permitted for up to 50 hours/year for testing purposes.
- Construction Activities: Construction of this building type is anticipated to occur over 36 months and require 55,850 cubic yards of soil disturbance. Construction phases include the following (some of which may occur simultaneously):
  - Site preparation (1 month)
  - Excavation shoring (2 months)
  - Foundation and below-grade construction (2 months)
  - Building construction (30 months)
  - Exterior finishing (14 months)
  - Site work and paving (4 months)

2.3 Building Type 3: 120-foot-tall residential building

The proposed action and Plan Bay Area could encourage the construction of Building Type 3: 120-foot-tall residential building. This building type represents the mid-scale building type anticipated to be encouraged under the proposed action and Plan Bay Area. The construction and operational land use characteristics from Building Type 2 were mostly taken from a prior development proposal at 900 7th

[2] San Francisco Planning Department, 469 Stevenson Street Environmental Impact Report *https://sfplanning.org/environmental-review-documents?title=469+stevenson&field_environmental_review_categ_target_id=All&items_per_page=10*, Accessed October 29, 2021.

[3] Parameter has been modified from the similar project example to reflect more likely parameter anticipated under the building type.

Street, Parcel C.[4] The development proposed on 900 7th Street Parcel C included new construction of a 105-foot-tall building with between 156-200 dwelling units. It was assumed that the construction activities required to construction the project at 900 7th Parcel C (a 105-foot-tall building) would be substantially similar to that associated with construction of a 120-foot-tall building. Therefore, the construction assumptions developed for the 900 7th Street Parcel C project were used to approximate the construction activity required for development of Building Type 3: 120-foot-tall residential building. Modeled land use characteristics include:

- Demolition: removal of an approximately 39,049-square-foot industrial structure
- New Construction: 120,000 square feet of new construction containing up to 200 dwelling units, 3,000 square feet of commercial space, and 11,000 square feet of private and common open space for building occupants. In addition, this building type includes 60 parking spaces in 24,000 square feet of one level of underground enclosed parking. This building type would require one 1,005 horsepower Tier 4 compliant emergency generator that is permitted for up to 50 hours/year for testing purposes.
- Construction Activities: Construction of this building type is anticipated to occur over 24 months and require 8,800 cubic yards of soil disturbance. Construction phases include the following (some of which may occur simultaneously):
  - Demolition (2 months)
  - Site preparation (1 week)
  - Grading (2 weeks)
  - Building construction (20 months)
  - Paving (1 month)
  - Architectural coating (1 month)

2.4 Building Type 4: 85-foot tall residential building

The proposed action and Plan Bay Area could encourage the construction of Building Type 4: 85-foot-tall residential development with 50 units. The construction information was derived primarily from the 120 foot-tall residential building, and the operational land use characteristics from Building Type 4 were taken mostly CalEEMod® defaults for a mid-rise building.[5] The demolition characteristics for the 85-foot tall building is assumed to be the same as Building Type 3 (120 foot-tall building). Modeled land use characteristics include:

- Demolition: removal of an approximately 39,049-square-foot industrial structure
- New Construction: new construction of a 50,000 square foot residential building containing 50 dwelling units. Buildings of this size typically do not have a generator.

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[4] San Francisco Planning Department, 2019a, 900 7th Street Mixed-Use Project Notice of Preparation, *https://sfplanning.org/environmental-review-documents?title=900+7th&field_environmental_review_categ_target_id=All&items_per_page=10*, accessed October 18, 2021.

[8] CalEEMod® defines a mid-rise building as "apartments in rental buildings that have between 3 and 10 levels." CalEEmod Users Guide, Table 1. Available online at: http://www.caleemod.com/. Accessed June 25, 2021.

- Construction Activities: Construction of this building type is anticipated to occur over 11 months and require approximately 6,650 cubic yards of soil disturbance.[6] Construction phases include the following (some of which may occur simultaneously):
  - Demolition (1 month)
  - Site Preparation and Grading (6 days)
  - Building Construction (9 months)
  - Paving and Architectural Coating (4 weeks)

2.5 Building Type 5: 65-foot-tall residential building

The proposed action and Plan Bay Area could encourage the construction of Building Type 5: 65-foot-tall residential development. This building type represents the lower end (smaller) of the building types anticipated to be encouraged under Plan Bay Area. This building type represents a mid-size development that is anticipated to occur under the proposed action Scenario. The construction and operational land use characteristics from Building Type 5 were taken from one of the buildings (Building A7) to be developed under the 3700 California Street project.[7] Specifically, building type 5 is anticipated to be similar to the portion of the 3700 California Street project that would demolish a five-story, 88,000 square foot parking garage and construct Building A7, a new five-story, approximately 65-foot tall residential development containing 29 dwelling units. Modeled land use characteristics include:

- Demolition: Removal of five-story, 88,000 square foot parking garage
- New Construction: new construction of a 61,200 square foot residential building containing 29 dwelling units, 7,500 square feet of private and common open space, and 57 parking spaces in two levels of below-grade parking. No emergency generators would be required for a building of this size and scale.
- Construction Activities: Construction of this building type is anticipated to occur over 10 months and require approximately 5,425 cubic yards of soil disturbance.[8] Construction phases include the following (some of which may occur simultaneously):
  - Demolition (1 months)
  - Site preparation and grading (2 weeks)
  - Excavation and shoring (1 month)
  - Drainage, utilities, and subgrade (2 months)

[6] The soil disturbance quantity was linearly interpolated based on the soil disturbance quantity for a 65-foot building (5,425 cubic yards) and a 120-foot building (8,800 cubic yards).

[7] San Francisco Planning Department, 2020, 3700 California St Environmental Impact Report, *https://sfplanning.org/environmental-review-documents?title=3700+California+Street&field_environmental_review_categ_target_id=All&items_per_page=10*, accessed October 18, 2021.

[8] The construction data for the 3700 California Street Project was developed for the project on a block-by-block basis. Building A7 is approximately 50 percent of the total building footprint of new construction proposed on Block A so construction activity for Building A7 was assumed to be equal to half of the construction activity associated with the entire Block A.

- Building construction (9 months)
- Sitework (2 months)

2.6 Building Type 6: 40-foot-tall residential building

The proposed action and Plan Bay Area could encourage the construction of Building Type 6: 40-foot-tall residential development. This type represents the lower end (smaller) of the building types anticipated to be encouraged under Plan Bay Area and the proposed action. The construction and operational land use characteristics from Building Type 6 were taken mostly from one of the buildings to be developed under the 3333 California Street project.[9] Specifically, building type 6 is anticipated to be similar to the proposed Mayfair building evaluated as part of the 3333 California Street project. The 3333 California Street project assumed demolition of over 455,000 gross square feet of office and medical space over the entire project site. This demolition assumption was determined to not represent the typical demolition that could be expected under this building type. Therefore, demolition characteristics were developed that would be generally representative of that associated with demolition on a soft site. Modeled land use characteristics include:

- Demolition: Removal of 2 story maximum structure; not greater a 35-foot by 100-foot lot; 40% lot coverage; roughly 2,000 square feet.[10]
- New Construction: new construction of a 43,071 square foot residential building containing 30 dwelling units and 39 parking spaces in one level of below-grade parking. No emergency generators would be required for a building of this size and scale.
- Construction Activities: Construction of this building type is anticipated to occur over 20 months and require approximately 11,000 cubic yards of soil disturbance.[11] Construction phases include the following (some of which may occur simultaneously):
  - Demolition (1 month)
  - Excavation (2 months)
  - Exterior construction (6 months)
  - Interior structure (6 months)

2.7 Building Type 7: Accessory Dwelling Units

The proposed action and Plan Bay Area could encourage the construction of Building Type 7: Accessory Dwelling Units. This building type represents the lowest end (smallest) of the building types anticipated to be encouraged under Plan Bay Area and the proposed action. This building type assumes new units would be constructed per the Accessory Dwelling Unit (ADU) program or additions

[9] San Francisco Planning Department, 2020, 3333 California St Environmental Impact Report, *https://sfplanning.org/environmental-review-documents?title=3333+california+street&field_environmental_review_categ_target_id=All&items_per_page=10*, accessed October 18, 2021.

[10] Parameter has been modified from the similar project example to reflect more likely parameter anticipated under the building type.

[11] The construction data for the 3333 California Street Project was developed for phases of construction. The Mayfair building was included in phase 4. The Mayfair building is approximately 40 percent of the total building footprint of new construction proposed during phase 4. Construction activity for the Mayfair building was therefore assumed to be 40 percent of the phase 4 activity.

to single family homes allowing limited number of new units. This concept assumes no full demolition of buildings and limited construction. Air quality impacts from this type will be described qualitatively.

Table A. Summary of Building Types for Each Scenario[A]

Building Type	Housing Element Update			
	Eastside Alternative	PBA: Plan Bay Area	Proposed Action	Baseline Land Use: No Proposed Action/Continuation of Existing Housing Element Policies
Type 1: 590-foot-tall residential mixed-use building	X	X		X; in Downtown geography
Type 2: 240-foot tall residential building	X	X	X	X; in Downtown geography
Type 3: 120-foot-tall residential building		X	X	X; limited potential for this building type along specific areas of Market Street and Van Ness Avenue
Type 4: 85-foot-tall residential building		X	X	X; potential for this building type along specific areas of Market Street between Van Ness Avenue and Church Street and in South of Market Neighborhood
Type 5: 65-foot-tall residential building		X	X	X; along transit corridors
Type 6: 40-foot-tall residential building		X	X	
Type 7 Accessory Dwelling Units		X	X	X; in residential districts

[A.] The Proposed Action, Eastside Alternative, and Plan Bay Area do not prohibit construction of any type of housing in areas that are allowed, including areas with height limits that would allow for buildings 500 feet and taller. However, the scenarios would shift an increased share of future housing to specific building types and locations in the city.

3. EMISSIONS ESTIMATION FOR BUILDING TYPES

Ramboll will estimate the incremental CAP and TAC emissions associated with construction and operation of each building type[12] and overall operational traffic from each scenario. Methodologies to be used to calculate CAP and TAC emissions for the building types are summarized below.

3.1 Calculation Methodologies for Construction Emissions from Building Types

Construction emission calculation methodologies cover off-road equipment (primarily diesel-fueled) and on-road vehicles.

As described in Section 2 above, Ramboll will rely on project-specific data from similar projects identified for each building type when it is available and appropriate for this analysis. For building types that do not have available project-specific construction data, the equipment list and/or activity (horsepower-hours) will be estimated using California Emissions Estimator Model (CalEEMod®) defaults based on each individual parcel size. **Tables 2a** through **2e** present the construction activity assumptions for each building type analyzed quantitatively. For purposes of this analysis, Ramboll will assume that all construction off-road equipment is diesel powered, and that all off-road equipment emissions of PM with an aerodynamic diameter less than 10 microns (PM_{10}) are DPM, which is a TAC. Emissions will be estimated using CalEEMod® or equivalent methods, as summarized in **Table 3**.

3.1.1 Off-road Equipment

For diesel-powered off-road construction equipment, Ramboll will use CalEEMod® and methodologies consistent with CalEEMod® to estimate emissions. The CalEEMod® emissions methodology for off-road construction equipment relies on the ARB In-Use Off-Road Equipment model (OFFROAD2011), which incorporates statewide survey data to develop emission factors based on the fleet average for each year of construction.[13] The OFFROAD2011 model also identifies average horsepower and load factor for each type of equipment. Load factors for each piece of equipment will be based on the default load factor in OFFROAD2011, which are included in CalEEMod®. The methodology to be used to calculate emissions from off-road equipment is presented in **Table 3**.

Emissions without control measures will be calculated assuming fleet average equipment, meaning the emission factors used reflect the fleet predicted to be in use in the OFFROAD2011 model.

3.1.2 Construction On-road Mobile Sources

On-road mobile sources include vehicle trips associated with workers, vendors, and demolition hauling trips.

The emission factors for running emissions of criteria pollutants in CalEEMod® are from EMFAC2017, the ARB Emission Factors model for on-road emissions. Since the last release of CalEEMod®, ARB released a new version of its model for on-road emissions, EMFAC2021, which will be used in this assessment. Emission factors vary by vehicle type, fuel type, and calendar year. Consistent with CalEEMod® methodology, Ramboll will assume that construction worker trips are 50% Light-Duty Auto (LDA), 25% Light-Duty Truck 1 (LDT1) and 25% LDT2 vehicle classes, vendor trips are 100% diesel

[12] With the exception of Building Type 7. Air quality impacts from Building Type 7: Accessory Dwelling Units will be described qualitatively.

[13] Although ARB has released an updated model as OFFROAD2017, the newer version does not generate "default" fleet data the way OFFROAD2011 does. As such, OFFROAD2011 is still used in CalEEMod® version 2020.4.0. Until ARB updates default fleet mix data, OFFROAD2011 will continue to be used.

Medium-Heavy Duty Trucks (MHDT), and haul trips are 100% diesel Heavy-Heavy Duty Trucks (HHDT). EMFAC2021 incorporates the Pavley Clean Car Standards and the Advanced Clean Cars program.

For HRA purposes, Ramboll will only consider DPM and $PM_{2.5}$ emissions from vendor and hauling trucks because construction worker vehicle trips from construction required for each building type is not expected to exceed an average of 5,000 worker trips per day. As shown in **Table 2a**, the maximum worker trip rate across all building types included in this analysis is 900 trips per day. The air district recommends a traffic screening criteria of 10,000 vehicles per day for lifetime cancer risk exposure analyses. This screening criteria was derived from 2003 OEHHA Guidance, which has since been updated. The current OEHHA Guidance roughly increases lifetime cancer risk exposure by a factor of 40%. To be conservative, Ramboll has established a revised screening criteria of 5,000 vehicles per day, consistent with a 100% increase in lifetime exposure. This is especially conservative for construction analyses as the actual exposure period would be much shorter.

The methodology used to calculate emissions from on-road sources is presented in **Table 3**.

3.2 Calculation Methodologies for Operational Emissions from Building Types

As discussed above, Ramboll will evaluate the CAP operational emissions for each Building Type[14] and each scenario. The analysis will assume that any prior development on a site that would be demolished and replaced with one of the building types. Thus, the CAP operational emissions for each building type are assumed to be new emissions. Sources of operational emissions from each Building Type include emergency diesel generators (for Building Types 1, 2, and 3 only), on-road vehicles, energy use, and area sources. CAP emissions for each Building Type will be calculated based on the number of housing units added in each Building Type and CalEEMod® default emissions per housing unit, based on the type of housing (e.g., high-rise apartment), and emissions associated with any ground-floor retail or office that is assumed to be part of the larger building types. Vehicle trip rates will be provided by the planning department for each Building Type, and Ramboll will use that data rather than CalEEMod® default trip rates.

The operational emissions analysis for each Building Type will conservatively assume operations begin in year 2025, which would reflect the most conservative (worst-case) emissions likely from any development project encouraged as a result of the housing element. This is because the housing element is not anticipated to be adopted until year 2023. Any development project proposed pursuant to the housing element would require a building permit, and in most cases, would require environmental review under CEQA, and would take time to construct. Construction of building types 1-6 would take between 11-36 months. Therefore, 2025 was the first year assumed operations associated with building types could take place. Operational emissions occurring beyond years 2025 would likely be lower due to reductions in vehicle emissions due to vehicle turn over and increasingly stringent regulatory requirements.

3.2.1 Operational On-road Mobile Sources

Vehicles on the roadway emit TACs in their exhaust and CAPs through exhaust, tire wear, and brake wear. In addition, gasoline vehicles emit CAPs and TACs through fuel evaporation. To estimate on-

[14] With the exception of Building Type 7. Air quality impacts from Building Type 7: Accessory Dwelling Units will be described qualitatively in the results memorandum.

road vehicle emissions for each building type, Ramboll will rely on the traffic analyses and methods used in the example projects for each building type.

As mentioned above, ARB released a new version of its on-road emissions model (EMFAC2021) after the development of the latest version of CalEEMod®, so the latest on-road emissions model (EMFAC2021) will be used in this assessment. The emission factors used for operation of each Building Type will be provided from EMFAC2021 for operational year 2025. Entrained roadway dust is calculating using CARB's methodology as shown in **Table 4** and described further in Section 4**.**

For HRA purposes, Ramboll will not consider DPM and $PM_{2.5}$ emissions from operational vehicle trips for each building type separately because these building types are not expected to result in an average of 5,000 trips per day or more and are therefore below the screening level requiring to be included in a health risk analysis. The largest building type, represented by the 10 South Van Ness Avenue project, would result in 1,746 one-way vehicle trips per day. As discussed in Section 6.2.4, health risks from on-road mobile sources for each scenario will be evaluated on a citywide scale and that analysis would include the contribution of on-road mobile source TACs from building types.

3.2.2 Operational Onsite Generators

For the Building Types that include emergency generators, operational emissions for the emergency generators will be calculated assuming a maximum of 50 hours per year of non-emergency operation, consistent with the Airborne Toxic Control Measure for Stationary Toxic Compression Ignition Engines (Section 93115, Title 17, CCR).[15] CAP emissions will be calculated assuming the engine complies with air district's Best Available Control Technology (BACT) limits, which at this time requires all generators 1,000 horsepower or greater to be Tier 4 compliant.

3.2.3 Architectural Coating

Operational architectural coatings account for the reapplication of paint and coatings on interior and exterior surfaces, which would result in emissions of volatile organic compounds (VOCs). Ramboll will use the total building square footage developed in each Building Type and the projected total number of dwelling units and the CalEEMod® default values of architectural coatings per square footage or per dwelling unit. Ramboll will use CalEEMod®, or equivalent methodology, combined with CalEEMod® default assumptions to estimate emissions from architectural coatings.

3.2.4 Consumer Products

Consumer product emissions come from various non-industrial solvents, including cleaning supplies, kitchen aerosols, cosmetics and toiletries, which emit VOCs during their use. Using the estimated building square footage for each Building Type as described above, Ramboll will use CalEEMod® or equivalent methodology to estimate emissions from consumer products, except the emission factor will be updated to reflect a newer emission factor.

3.2.5 Energy Use

Consistent with the recent act of the San Francisco Board of Supervisors to ban the installation of new natural gas infrastructure in residential buildings, Ramboll will assume that all buildings associated

[15] California Air Resources Board, Final Regulation Order: Amendments to the Airborne Toxic Control Measure for Stationary Compression Ignition Engines, *https://ww3.arb.ca.gov/diesel/documents/finalreg2011.pdf*, accessed October 29, 2021

with each Building Type have no emissions associated with natural gas combustion.[16] There are no direct emissions of CAPs associated with onsite electricity usage.

3.2.6 Landscaping Equipment

Emissions from landscaping equipment will be calculated using CalEEMod® 2020.4.0 and based on information regarding building square footage and acreage.

3.3 Control Measures for Building Types

Ramboll, in consultation with the department and ICF will identify control measures to reduce emissions from the project following preliminary results of the project's emissions and health risks. The effectiveness of the control measures will be evaluated quantitatively. The control measures, methodology for evaluating their effectiveness and results will be provided in the results memorandum. The following are preliminary control measures that may be included in the analysis:

- Use of Tier 4 Final off-road construction equipment.
- Limit equipment idling to 2 minutes, although emissions reductions due to this control measure would not be quantified.
- Reduced generator testing hours for those building types that require generators.

The exact control measures to be quantitatively evaluated will be developed by Ramboll, in consultation with the department and ICF following preliminary results of the project's emissions and health risks.

[16] San Francisco Board of Supervisors, 2020, File No. 200701, Ordinance amending the building code (etc), *https://sfgov.legistar.com/View.ashx?M=F&ID=8911593&GUID=A0CEC5DB-30DE-4576-AAAD-6BF8266CC67C*, accessed November 18, 2021.

4. 2035 AND 2050 CITYWIDE HEALTH RISK MODELING

In addition to analyzing the CAP and TAC emissions from building types encouraged under each scenario, the air quality analysis will also evaluate the operational on-road health risks from each scenario including a midpoint and baseline scenario at the citywide scale for years 2035 and 2050. The 2035 and 2050 Citywide HRA will include updated citywide roadways and traffic modeling to reflect the changes in road segments and traffic volumes in certain parts of the City. All other major sources of air pollution in the City including rail, maritime and stationary sources will rely on the existing 2020 Citywide modeling. Consistent with the 2020 modeling, the 2035 and 2050 updated Citywide HRA modeling will utilize dispersion modeling and emissions of PM and TACs in order to calculate exposure concentrations and cancer risks across San Francisco. The dispersion modeling is based on only primary air pollutants and includes directly emitted PM and TACs. The dispersion models used do not account for the complex chemical reactions which produce secondary air pollutants in the atmosphere and near-source exposures tend to be driven by primary pollutants, so all emitted compounds are assumed to be nonreactive and secondary pollutants are not considered. Additionally, resuspended road dust of entrained surface materials by vehicles traveling on roads (i.e., roadway related fine $PM_{2.5}$) is also included in the Citywide HRA. Even though it is not feasible to directly measure the quantity of dust on all roadways, CARB recommends estimating emissions from this source based on an approach proposed in the AP-42 document from US EPA.[17] Accordingly, airborne PM defined as the total PM loading in a region annually is estimated based on vehicle weight, silt loading based on the road type, and number of precipitation days. Using CARB's recommended method, Ramboll will calculate a per mile emission factor for entrained road dust and apply to each roadway segment based on the distance of the segment. The calculation of this emission factor is shown in **Table 4.**

Roadway source (traffic) emissions for the Citywide HRA will be developed using the SFCHAMP model for year 2035 and 2050 for each scenario (including the baseline scenario), and dispersion modeling will be applied to all streets[18]. Emission factors will be derived based on CARB's Emission FACtors (EMFAC2021) traffic model for San Francisco County. Since cancer risk is evaluated over a 30-year period, emission factors will be calculated for the base year as well as the following 29 years. The EMFAC2021 model includes emission projections through year 2050, thus any years after 2050 will conservatively be set to 2050 emission factors. Hourly traffic activity (i.e., diurnal patterns) will be kept consistent with the prior 2020 citywide modeling. The emission dispersion will be modeled utilizing the American Meteorological Society/EPA Regulatory Model (AERMOD) version 21112. Further details on the assumptions for dispersion modeling is provided in Section 5.

All other sources of air pollution including stationary sources, maritime sources and railway sources will be based on the existing 2020 Citywide modeling even though TAC emissions from these sources may reduce with time as cleaner technologies are brought online. For example, maritime and ferry emissions are likely to decrease as the fleets turnover or are upgraded.

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[17] California Air Resources Board, 2021, Miscellaneous Processes Methodologies - Paved Entrained Road Dust, https://ww3.arb.ca.gov/ei/areasrc/fullpdf/2021_paved_roads_7_9.pdf, accessed November 18, 2021.

[18] Roadways with less than 1,000 vehicles per day were excluded from the 2020 citywide modeling. As this threshold of vehicles will change with each scenario modeled, Ramboll will conservatively include all roadways in the models completed.

5. ESTIMATED AIR CONCENTRATIONS

Consistent with the 2020 Citywide HRA, the air toxics analysis will evaluate cancer risks and $PM_{2.5}$ concentrations resulting from the housing element update upon the surrounding community. For the housing element update, this would include construction emissions, operational generator emissions, and operational traffic emissions. The methodologies used to evaluate emissions are based on the most recent air district CEQA Guidelines and the most recent Air Toxics Hot Spots Program Risk Assessment Guidelines.[19, 20]

5.1 Chemical Selection

The cancer risk analysis in the HRAs is based on DPM concentrations from on- and off-road equipment. Diesel exhaust, a complex mixture that includes hundreds of individual constituents (California Environmental Protection Agency [Cal/EPA] 1998), is identified by the State of California as a known carcinogen.[21, 22] Under California regulatory guidelines, DPM is used as a surrogate measure of exposure for the mixture of chemicals that make up diesel exhaust as a whole. Cal/EPA and other proponents of using the surrogate approach to quantifying cancer risks associated with the diesel mixture indicate that this method is preferable to use of a component-based approach. A component-based approach involves estimating risks for each of the individual components of a mixture. Critics of the component-based approach believe it will underestimate the risks associated with diesel as a whole mixture because the identity of all chemicals in the mixture may not be known and/or exposure and health effects information for all chemicals identified within the mixture may not be available. Furthermore, Cal/EPA has concluded that "potential cancer risk from inhalation exposure to whole diesel exhaust will outweigh the multi-pathway cancer risk from the speciated components".[23]

The cancer risk analysis in the Citywide HRAs will also include speciated TACs from gasoline-fueled mobile sources. For gasoline vehicles, exhaust and evaporative total organic gases (TOGs) from gasoline-fueled vehicles would be evaluated based on the organic chemical profiles from ARB.[24]

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[19] Bay Area Air Quality Management District, California Environmental Quality Act Air Quality Guidelines. May. Available online at: *http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en,* accessed October 29, 2021

[20] Office of Environmental Health Hazard Assessment, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments: Hazard Assessment, *http://www.oehha.ca.gov/air/hot_spots/pdf/HRAguidefinal.pdf,* accessed October 29, 2021.

[21] California Environmental Protection Agency, Office of Environmental Health Hazard Assessment: Findings of the Scientific Review Panel on The Report on Diesel Exhaust, as adopted at the Panel's April 22, 1998, meeting.

[22] Air Resources Board, Summary: Diesel Particulate Matter Health Impacts, *https://ww2.arb.ca.gov/resources/summary-diesel-particulate-matter-health-impacts,* accessed November 18, 2021.

[23] Office of Environmental Health Hazard Assessment (OEHHA), 2003, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, Office of Environmental Health Hazard Assessment. August. *https://oehha.ca.gov/media/downloads/crnr/hrafinalnoapp.pdf,* accessed November 18, 2021.

[24] Air Resources Board, 2021, Speciation profile 2301 for gasoline TOG exhaust and profile 2315 for gasoline TOG evaporative emissions, *https://ww3.arb.ca.gov/ei/speciate/speciate.htm#specprof*, accessed November 18, 2021.

5.2 Sources

As discussed in the next section, concentrations of TACs from the construction and operational emissions will be estimated using the USEPA's preferred atmospheric dispersion modeling system (AERMOD).

5.3 AERMOD Modeling

Ramboll will use the most recent version of the American Meteorological Society/Environmental Protection Agency regulatory air dispersion model (AERMOD Version 21112) to evaluate ambient air concentrations of TACs and $PM_{2.5}$ at on and offsite receptors.[25] For each receptor location, the model generates air concentrations (or air dispersion factors as unit emissions will be modeled) that result from emissions from multiple sources.

Air dispersion models such as AERMOD require a variety of inputs such as source parameters, meteorological data, topographical data, and receptor parameters. When site-specific information is unknown, Ramboll will use default parameter sets that are designed to produce conservative (i.e., overestimates of) air concentrations.

5.3.1 Meteorological Data

Air dispersion modeling applications require the use of meteorological data that ideally are spatially and temporally representative of conditions in the immediate vicinity of the site under consideration. For this HRA, the air district's Mission Bay meteorological data for the year 2008 will be used, which aligns with the San Francisco Citywide HRA Methodology.[26]

5.3.2 Terrain and Land Use Considerations

Elevation for all emissions sources will be imported from the National Elevation Dataset maintained by the United States Geological Survey.[27] Elevations for all receptors will be consistent with the Citywide HRA modeling.

An important consideration in an air dispersion modeling analysis is whether or not to model an area as urban. Due to the urban nature of San Francisco, the building type HRAs will be modeled with the urban population of 881,549, corresponding to the July 1, 2019 US Census population estimate.[28] The urban option in AERMOD accounts for increased turbulence associated with the urban heat island effect. To maintain consistency with 2020 citywide modeling, the citywide HRAs will be modeled with the rural land use option. This was originally selected in the 2020 citywide modeling to estimate conservative air pollutant concentrations, while acknowledging San Francisco fits the definition of an urban area.

[25] USEPA, 2021, User's Guide for the AMS/EPA Regulatory Model (AERMOD). Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina. EPA-454/B-21-001, April 2021), *https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_userguide.pdf*

[26] San Francisco Department of Public Health, San Francisco Planning Department, and Ramboll, 2020, San Francisco Citywide Health Risk Assessment: Technical Support Documentation, September.

[27] United States Geological Survey, 2013, National Elevation Dataset, *http://viewer.nationalmap.gov/viewer/*

[28] US Census Bureau, 2019, QuickFacts San Francisco County, California, *https://www.census.gov/quickfacts/sanfranciscocountycalifornia*

5.3.3 Emission Rates

Emissions will be modeled using the χ/Q ("chi over q") method, such that each source has a unit emission rate (i.e., 1 gram per second [g/s]), and the model estimates dispersion factors (with units of [µg/m^3]/[g/s]). Actual emission rates will be multiplied by the dispersion factors to obtain concentrations.

For annual average ambient air concentrations, the estimated annual average dispersion factors are multiplied by the annual average emission rates. The emission rates will vary day to day, with some days having no emissions. The model will assume a constant emission rate during the entire year.

5.3.4 Source Parameters

Source location and parameters are necessary to model the dispersion of air emissions. Source parameters for the housing element update building types are summarized in **Table 5**.

For construction, area sources will be used to represent the onsite activity in AERMOD. The onsite construction area sources will be modeled with the same release parameters used in the Citywide HRA: a release height of 5 meters and an initial vertical dimension of 1.4 meters.[29] Construction on-road activity will be included with the off-road area sources, to account for the potential for truck travel in any direction from the Building Types; construction on-road trip length was set at 500 meters (0.31 mi), the maximum modeled receptor distance from a building. As discussed in section 3.1.2 above, on-road construction worker trips are negligible and will therefore not be included in the HRA analysis.

For operational emissions, Ramboll will model stationary sources and model mobile sources. For the stationary sources, Ramboll will use default modeling parameters as provided in the Citywide HRA. Following the Citywide HRA methodology, emergency generator emissions will be modeled in AERMOD as point sources with a release height of 3.7 meters above ground level, an exit temperature of 872 degrees Fahrenheit, an exit velocity of 45 meters per second, and an exit diameter of 0.18 meters. The number of generators assumed for each building type is noted in **Table 1**. Generators will be modeled at ground level, consistent with the Citywide HRA. This may differ from the example projects for each building type when generators were modeled at elevated locations. Ground-level modeling will likely produce more conservative (worst-case) results.

On-road emissions (modeled for the citywide HRAs only) will be modeled (consistent with the Citywide HRA methodology) in AERMOD as adjacent volume sources, with the number of sources dependent on the length and width of the roadway segment. For AERMOD modeling, the release height of volume sources for on-road light duty vehicles will be set to 1.7 meters, and the initial vertical dimension will be set to 1.58 meters, consistent with Citywide HRA methodology.[30] For on-road trucks, the release height of volume sources will be set to 2.55 meters and the initial vertical dimension will be set to

[29] Bay Area Air Quality Management District, San Francisco Department of Public Health & San Francisco Planning Department, 2012, The San Francisco Community Risk Reduction Plan: Technical Support Documentation, http://ab900balboa.com/EIR_References/2012_1201_baaqmd_sfdph.pdf, accessed November 18, 2021.

[30] San Francisco Department of Public Health, San Francisco Planning Department (SF Planning), and Ramboll, 2020, San Francisco Citywide Health Risk Assessment: Technical Support Documentation, September.

2.37 meters, consistent with USEPA haul road guidance.[31] Initial lateral dimensions will be calculated for each segment based on the width of the modeled roadway plus a six meter mixing zone, all divided by a factor of 2.15 consistent with the USEPA AERMOD User's Guide.

5.3.5 Receptors

In order to evaluate health impacts to receptors, for the citywide HRAs, receptors will be placed at locations collocated with the receptors used in the Citywide HRA and within 1,000 meters of the modeled traffic sources. Receptors will be modeled at a height of 1.8 meters above terrain height, a default breathing height for ground-floor receptors, with the exception of roadway modeling which will model receptors at a height of 0 meters from terrain height to maintain consistency with prior 2020 modeling. As discussed previously, average annual dispersion factors will be estimated for each receptor location.

To evaluate impacts from construction and operation of each building type, Ramboll will model receptors in concentric rings at various distances from each building type. These rings will be placed at 5 and 10 meters from the building boundary, then at 10-meter intervals until a maximum distance of 500 meters, with receptors modeled every 10 meters on the rings. This will allow Ramboll to characterize impacts from each building type based on distance from emissions activities, as described in more detail in **Section 6.2.2** below.

[31] USEPA, 2012, Haul Road Workgroup Final Report Submission to EPA-OAQPS, U.S. EPA Office of Air Quality and Planning Standards, Research Triangle Park, North Carolina, *https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf*

6. RISK CHARACTERIZATION METHODS

In February 2015, OEHHA released the updated Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, which combines information from previously-released and adopted technical support documents to delineate OEHHA's revised risk assessment methodologies based on current science.[32] This updated Guidance Manual supersedes the 2003 Hot Spots Guidance Manual that previously provided methodologies for conducting HRAs under the Air Toxics Hot Spots Program (AB2588).[33] The air district has issued Guidelines on adopting the OEHHA 2015 Guidance Manual. This evaluation will utilize the 2015 methodology; details of this methodology are discussed below.

Ramboll will estimate health risk impacts from each building type[34] and for the 2035 and 2050 Citywide HRAs for each scenario, including the 2035 Midpoint Condition, 2050 Baseline, and Plan Bay Area.

6.1 Sources Evaluated

As discussed in **Section 5.1**, Ramboll will evaluate excess lifetime cancer risk and $PM_{2.5}$ concentration for nearby sensitive receptor exposure to emissions from construction and operation of each building type and for the 2035 and 2050 Citywide HRAs for each scenario. The health risks from each building type will account for construction activity (construction equipment and haul trucks) and operational activity (emergency generators). The Citywide HRAs will account for operational traffic emissions resulting from each scenario. All HRAs will be calculated using the methodology explained in the following sections.

6.1.1 Exposure Assessment

Ramboll will model receptors in concentric rings at various distances from each building type. These rings will be placed at 5 and 10 meters from the building boundary, then at 10-meter intervals until a maximum distance of 500 meters, with receptors modeled every 10 meters on the rings. For the Citywide HRAs Ramboll will conservatively model all existing Citywide HRA grid (20-meter spacing) receptors within 1 kilometer of each modeled source. Consistent with the Citywide HRA, all sensitive receptors will be analyzed as residents.

Potentially Exposed Populations: This analysis will evaluate health risks to residents based on OEHHA 2015 Hot Spots Guidelines.

For assessing impacts to exposed populations from emissions resulting from building types, sensitive receptors will be evaluated as a fetus *in utero* at the beginning of the third trimester for operational exposures, and for construction schedules that last longer than two years. For construction schedules less than two years, exposure will conservatively be assumed to start at birth to maximize the relevant exposure parameters.

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[32] Office of Environmental Health Hazard Assessment, 2015, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. Office of Environmental Health Hazard Assessment, August, *http://www.oehha.ca.gov/air/hot_spots/pdf/HRAguidefinal.pdf*, accessed October 21, 2021.

[33] Office of Environmental Health Hazard Assessment, 2003, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, Office of Environmental Health Hazard Assessment. August. *https://oehha.ca.gov/media/downloads/crnr/hrafinalnoapp.pdf*, accessed November 18, 2021.

[34] With the exception of Building Type 7. Air quality impacts from Building Type 7: Accessory Dwelling Units will be described qualitatively.

For assessing impacts to exposed populations from on-road vehicle emissions associated with each scenario in years 2035 and 2050, sensitive receptors will be conservatively evaluated as the same lifetime residents beginning *in utero* at the beginning of the third trimester until age 30.

Exposure Assumptions: The exposure parameters used to estimate excess lifetime cancer risks for all potentially exposed populations from construction and operational emissions will be obtained using risk assessment guidelines from OEHHA (2015) and the air district.[35,36] **Tables 6 and 7** show the proposed exposure duration, age sensitivity factor, and resulting exposure parameters that will be used for the HRA.

Calculation of Intake: The dose estimated for each exposure pathway is a function of the concentration of a chemical and the intake of that chemical. The intake factor for inhalation, IF_{inh}, can be calculated as follows:

$$IF_{inh} = \frac{DBR * FAH * EF * ED * CF}{AT}$$

Where:

IF_{inh}	=	Intake Factor for Inhalation (m^3/kg-day)
DBR	=	Daily Breathing Rate (L/kg-day)
FAH	=	Frequency of Time at Home (unitless)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
AT	=	Averaging Time (days)
CF	=	Conversion Factor, 0.001 (m^3/L)

The chemical intake or dose is estimated by multiplying the inhalation intake factor, IF_{inh}, by the chemical concentration in air, C_i. When coupled with the chemical concentration, this calculation is mathematically equivalent to the dose algorithm given in the current OEHHA Hot Spots guidance.

6.1.2 Toxicity Assessment

The toxicity assessment characterizes the relationship between the magnitude of exposure and the nature and magnitude of adverse health effects that may result from such exposure. For purposes of calculating exposure criteria to be used in risk assessments, adverse health effects are classified into two broad categories – cancer and non-cancer endpoints. Toxicity values that are used to estimate the

[35] Office of Environmental Health Hazard Assessment, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments: Hazard Assessment, *http://www.oehha.ca.gov/air/hot_spots/pdf/HRAguidefinal.pdf,* accessed October 29, 2021.

[36] Bay Area Air Quality Management District, Proposed Health Risk Assessment Guidelines. Air Toxics NSR Program, *http://www.baaqmd.gov/~/media/files/planning-and-research/rules-and-regs/workshops/2016/reg-2-5/hra-guidelines_clean_jan_2016-pdf.pdf?la=en,* accessed October 29, 2021.

likelihood of adverse effects occurring in humans at different exposure levels are identified as part of the toxicity assessment component of a risk assessment.

As discussed in **Section 5.1**, the carcinogenic effects of DPM will be evaluated in this HRA analysis. Ramboll will utilize the Cal/EPA-approved (Cal/EPA 2018) inhalation cancer potency factor for DPM to evaluate DPM emitted from construction sources. The cancer potency factor (CPF) for DPM that will be used for the HRA is 1.1 $(mg/kg\text{-}day)^{-1}$.

The cancer risk analysis in the Citywide HRAs will also include speciated TACs from gasoline-fueled mobile sources. CPFs for the chemicals evaluated in exhaust and evaporative TOGs are shown in **Table 8** and are from CARB's approved risk assessment health values.[37]

6.1.3 Age Sensitivity Factors

The estimated excess lifetime cancer risks for a resident will be adjusted using age sensitivity factors (ASFs) that account for an "anticipated special sensitivity to carcinogens" of infants and children as recommended in the OEHHA Technical Support Document38 and OEHHA 2015 Guidance (2015). Cancer risk estimates will be weighted by a factor of 10 for exposures that occur from the third trimester of pregnancy to two years of age and by a factor of three for exposures that occur from two years through 15 years of age. No weighting factor (i.e., an ASF of one, which is equivalent to no adjustment) is applied to ages 16 and older. **Table 7** presents the ASF values that will be used for the HRA.

6.2 Risk Characterization

6.2.1 Estimation of Cancer Risks

Excess lifetime cancer risks are estimated as the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens. The estimated risk is expressed as a unitless probability. The cancer risk attributed to a chemical is calculated by multiplying the chemical intake or dose at the human exchange boundaries (e.g., lungs) by the chemical-specific CPF.

The equation used to calculate the potential excess lifetime cancer risk for the inhalation pathway is as follows:

$$Risk_{inh} = C_i \times CF \times IF_{inh} \times CPF \times ASF$$

Where:

$Risk_{inh}$ = Cancer risk; the incremental probability of an individual developing cancer as a result of inhalation exposure to a particular potential carcinogen (unitless)

[37] California Air Resources Board. Consolidated Table of OEHHA /CARB Approved Risk Assessment Health Values, *https://ww2.arb.ca.gov/resources/documents/consolidated-table-oehha-carb-approved-risk-assessment-health-values.*

[38] Office of Environmental Health Hazard Assessment, 2009, Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures. Office of Environmental Health Hazard Assessment, May, *http://www.oehha.ca.gov/air/hot_spots/2009/TSDCancerPotency.pdf*

C_i	=	Annual average air concentration for chemical$_i$ ($\mu g/m^3$)
CF	=	Conversion factor (mg/µg)
IF_{inh}	=	Intake factor for inhalation (m^3/kg-day)
CPF_i	=	Cancer potency factor for chemical$_i$ (mg chemical/kg body weight-day)$^{-1}$
ASF	=	Age sensitivity factor (unitless)

6.2.2 Estimation of Health Risk from Building Types

As discussed above, the Building Types were selected to represent the types of projects that may be developed under each scenario. These projects may occur across geographic areas in the city. To account for this, Ramboll will assume that construction and operational impacts from the Building Types may occur at any receptor within the extent of each scenario as designated by the department. These impacts will be presented as maximum residential impacts (cancer risk and $PM_{2.5}$ concentrations) at each modeled distance from the Building Type, e.g., maximum cancer risk at 10 meters, 20 meters. These impacts would then be used in combination with the citywide HRA modeling to identify the background conditions required for various building types to result in significant health risk impacts, as determined by the department.

Results will be characterized for each building type. Results will include construction (and operational generator, as necessary) impacts at each modeled distance from each building type, as described above in **Section 5.3.5**. These construction impacts will be combined with the maximum operational impacts.

6.2.3 Estimation of Controlled Health Risks from Building Types

Ramboll, in consultation with the department and ICF will identify appropriate control measures that could apply to development projects encouraged under the various scenarios considered in the Housing Element Update 2022 and Plan Bay Area 2050 EIR. The results memorandum will outline the specific control strategies and methodologies used to quantitatively evaluate the effectiveness of those control strategies. The results memorandum will present a table with controlled health risks impacts (cancer risk and $PM_{2.5}$ concentrations) at each modeled distance from the Building Type, e.g., maximum cancer risk at 10 meters, 20 meters.

6.2.4 Estimation of Health Risk from Scenarios

As discussed above, the air quality analysis will also include evaluation of health risks (cancer risk and $PM_{2.5}$ concentrations) resulting from each scenario on a citywide scale under 2035 and 2050 conditions. This information will be used to evaluate – at a citywide level- the changes in health risks from both existing 2020 conditions to future projected conditions under 2035 and 2050 assuming continuation of existing housing element policies and to evaluate the changes in health risk between 2035 and 2050 baseline levels and each scenario. These concepts are further described in sections 7 and 8 below.

7. SCENARIOS EVALUATED

7.1 Existing Conditions (2020)

The housing element update will identify existing citywide health risks using the recently completed 2020 Citywide HRA modeling. This information will be presented in the existing environmental setting and will serve to evaluate the changes in health risks- at a citywide level- expected to occur under future horizon years for each scenario.

The existing conditions 2020 Citywide HRA includes $PM_{2.5}$ and cancer risk fields for the following (SF DPH 2020):

1) Existing Traffic (based on SF-CHAMP version 2015, modeled data for year 2020)
2) Permitted stationary sources (as of 2014)
3) Caltrain sources for year 2014
4) Maritime sources, including sources from port facilities and ferries in year 2017
5) Background $PM_{2.5}$ concentrations
6) Totals that sum the cancer risk and $PM_{2.5}$ concentrations from the above sources at all receptor locations.

7.2 Midpoint Conditions and Baseline (2035 and 2050)

The 2035 midpoint conditions and 2050 Baseline scenarios represent a continuation of the existing Housing Element plans and policies in years 2035 and 2050. The only sources that can reasonably be modeled and will change from the existing conditions 2020 Citywide HRA are on-road mobile sources. The databases for these two scenarios will consist of the exact same health risk information mentioned above for the existing conditions 2020 citywide HRA, with the exception of traffic which will be modeled assuming midpoint conditions and baseline traffic in 2035 and 2050, respectively. Databases for these two years will also include updated totals that sum the cancer risk and $PM_{2.5}$ concentrations from the sources included in the Citywide HRA using the updated traffic health risks for all receptor locations.

7.3 Eastside Alternative, Proposed Action, and Plan Bay Area 2050 (2035 and 2050)

This section discusses the 2035 and 2050 Eastside Alternative, Proposed Action, and Plan Bay Area analyses that incorporate, at a citywide level, health risks from on-road mobile sources under these scenarios. The only sources that can reasonably be modeled and will change from the existing 2020 Citywide HRA are on-road mobile sources. The databases will consist of the same health risk information mentioned above for the existing conditions 2020 citywide HRA, with the exception of traffic which will be modeled assuming scenario traffic in 2035 and 2050. Databases for these two years will also include updated totals that sum the cancer risk and $PM_{2.5}$ concentrations from the sources included in the Citywide HRA using the updated traffic health risks for each scenario for all receptor locations.

8. CUMULATIVE ANALYSIS

The housing element update encompasses all anticipated growth (i.e., all pipeline growth) in the city through 2050 and is essentially a cumulative analysis by nature. The cumulative projects in the city, which are not accounted for in the modeling associated with the 2050 environmental baseline or proposed action include the Waterfront Plan Project, Second Transbay Tube, Downtown Congestion Pricing, and Increased Caltrain Service plus Downtown Extension and Pennsylvania Avenue Extension. In addition, a number of infrastructure improvement projects are ongoing throughout the city and it is anticipated that future infrastructure improvement projects (e.g., Waterfront Resilience Program, Ocean Beach Climate Change Adaptation Project, Great Highway Project) would be constructed by 2050. Thus, the cumulative analysis also considers future infrastructure improvement projects. Ramboll will prepare a qualitative discussion of the potential cumulative health risk impacts to be presented in the EIR.

9. UNCERTAINTIES

While Ramboll will use appropriate engineering and scientific methods in the emissions calculations and HRA presented in these analyses, there is uncertainty associated with the process of risk assessment. In this context, uncertainty may be defined as what is not known and may be reduced with further scientific studies. Lack of data in many areas necessitates the use of assumptions, thus increasing the uncertainty. This section qualitatively describes some of the uncertainties that may influence the risk estimates produced in these analyses, including emissions estimation, the modeling approach, and risk estimation.

9.1.1 Emissions Estimates

There are a number of uncertainties associated with the estimation of emissions from each of the source categories considered that may affect the subsequent estimation of exposure concentrations and risk characterization. For example, uncertainties associated with the estimation of emissions from on-road motor vehicles may affect the subsequent estimation of exposure concentrations and risk characterization. Estimates of traffic volumes and truck fractions on specific roadways vary daily and these daily variations are not captured in the modeling. Traffic volumes for the citywide modeling will be based on the SF-CHAMP model, while trip rates for the building types will be based on representative scenarios, both of which have their own uncertainties and limitations. EMFAC2021 will be used to estimate on-road emission factors for cars, trucks, and buses in San Francisco and as with any emissions model, there are also uncertainties associated with these. In particular, this analysis takes into account emissions for future years, which are unknown. Thus, EMFAC2021's assumptions of how regulations will effect emissions in the future are a source of uncertainty.

Default emission factors were used to estimate emissions of all off-road equipment for the construction of building types. This assumes that emissions from all equipment will be equal to the default emissions when some emissions may vary from this rate. Furthermore, a load factor is included in the calculation of emissions. This load factor was obtained from CARB's OFFROAD model and is a fleet wide average. This load factor may not be representative of the exact piece of equipment in use but was the most reasonable estimate. In addition, the analysis only included evaluation of impacts associated with multi-year construction for each building type based on similar example project equipment types and schedules, but does not forecast refined future emissions associated with new construction of individual specific projects whose construction equipment and schedules may vary from these examples.

9.1.2 Modeling Approach

In addition to uncertainty associated with emission estimates, there is also uncertainty associated with the estimated exposure concentrations. The limitations of the air dispersion model provide a source of uncertainty in the estimation of exposure concentrations. According to USEPA, errors due to the limitation of the algorithms implemented in the air dispersion model in the highest estimated concentrations of +/- 10 percent to 40 percent are typical.[39]

In San Francisco, with its many multi-story and high-rise buildings, urban flow patterns are likely influenced by recirculation and channeling in urban canyons. The roadway dispersion modeling does

[39] USEPA. 2005. Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule. 40 CFR Part 51, Appendix W (Federal Register) 70216.

not account for such patterns. The urban heat island effect which results from surface heating of paved and built-up environment leads to longer periods of mixing and generally lower predicted air concentrations. The building downwash option in AERMOD accounts for the buildup of air pollution in the building cavity due to recirculating winds created by nearby buildings. The effects are governed by the building geometry and the wind direction. To take advantage of this option in the model, information on all the building heights and stacks within the City is required. Typically, building downwash effects often lead to higher concentrations downwind of a stack release (e.g., emergency generators). Not capturing these effects and using meteorological data from single monitoring site to represent transport throughout the city add to uncertainties in the modeling approach.

Throughout the city, receptors were placed at a height of 1.8 meters (commonly called flagpole receptor height) above the surface terrain, with the exception of roadway modeling where a receptor height of 0 meters was used. This option is used to conservatively model exposures within an individual's breathing zone at ground level. Using flagpole receptors may not always capture the highest predicted concentration in cases where both the source and the residential receptors are elevated above the surface terrain.

The source parameters used to model emission sources add uncertainty. Uncertainties in input parameters used to represent and model emission releases add uncertainty.

9.1.3 Overview of Health Risk Uncertainties

Numerous assumptions must be made in order to estimate human exposure to chemicals. These assumptions include parameters such as breathing rates, exposure time and frequency, exposure duration, and human activity patterns. While a mean value derived from scientifically defensible studies is a reasonable estimate of central tendency, the exposure variables used in this assessment are only estimates. In any risk evaluation, a number of assumptions are made in order to estimate human exposure and to calculate potential risks. These assumptions may, however, introduce uncertainty in risk calculations. Regulatory guidance requires that conservative assumptions be used to provide an upper-bound estimate of the risk and to avoid underestimating the potential exposures and associated health risks.

The key sources of uncertainty in this health risk evaluation include:

- Identification of building type and mobile source related chemicals,
- Estimation of exposure concentrations,
- Identification of exposure pathways,
- Exposure assumptions, and
- Selection of chemical toxicity values.

In all of these cases, conservative assumptions are made in this assessment. Thus, estimated excess cancer risks are upper-bound estimates and the actual incidence of cancer is likely to be lower.

9.1.4 Exposure Assumptions

Conservative assumptions on exposure duration will likely overestimate the health risks for the residential receptors. For the cancer risk analysis, this evaluation quantifies risk at all receptor locations assuming residential exposure parameters, while many receptors fall over workplace locations where the overall exposure would be less. Consistent with OEHHA Guidance, risks were estimated assuming that hypothetical residents at the receptor points spend 30 years at one location.

However, the United States Environmental Protection Agency (USEPA) has estimated that 50% of the population lives in the same residence for only eight years, while only 10% remain in the same house for 32 years.[40] Accordingly, the actual risks to hypothetical residents at the modeled receptor locations are likely lower than those calculated in this assessment. Additionally, this analysis assumes that the residents below the age of 16 years are exposed for 24 hours per day, 365 days per year at the same location. However, young residents usually leave their houses for school, shopping, vacation, etc. After age 16, this analysis assumes the residents spend 73% of their time at home, although older residents also usually leave their houses for large fractions of most days. In addition, there is a natural range or variability in the human population in such properties as height, weight, and susceptibility to air toxicants.

9.1.5 Dose-Response Assessment

The primary uncertainties associated with the toxicity assessment are related to derivation of toxicity values. Standard CPFs established by OEHHA were used to estimate potential carcinogenic effects from exposures to compounds emitted from the housing element construction and operational activities. These values are derived by applying conservative assumptions and are intended to protect the most sensitive individuals in the potentially exposed populations.

To derive the toxicity values, OEHHA makes several assumptions that tend to overestimate the actual hazard or risk to human health. CPFs used to estimate carcinogenic risk are also typically derived based on data from animal studies. These data are based on studies in which high doses of a test chemical were administered to laboratory animals, and the reported response is extrapolated to the much lower doses typical of human exposure. Very little experimental data are available on the nature of the dose-response relationship at low doses, such as whether a threshold exists or if the dose-response curve passes through the origin. Because of this uncertainty, a conservative model is used to estimate the low-dose relationship and uses an upper bound estimate (the 95 percent upper confidence limit of the slope predicted by the extrapolation model) as the CPF. With this factor, an upper-bound estimate of potential cancer risks is obtained.

9.1.6 Risk Calculation

The USEPA notes that the conservative assumptions used in a risk assessment are intended to assure that the estimated risks do not underestimate the actual risks posed by a site and that the estimated risks do not necessarily represent actual risks experienced by populations at or near a site.[41] The estimated risks in this risk assessment are based primarily on a series of conservative assumptions related to predicted environmental concentrations, exposure, and chemical toxicity. The use of conservative assumptions tends to produce upper-bound estimates of risk. Although it is difficult to quantify the uncertainties associated with all the assumptions made in this risk assessment, the use of conservative assumptions is likely to result in substantial overestimates of exposure, and hence, risk.

[40] USEPA, 2011, Exposure Factors Handbook: 2011 Edition, Office of Research and Development, Washington, D.C. September, *https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=236252*, accessed November 19, 2021.

[41] USEPA, 1989, Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part A). Interim Final, Office of Emergency and Remedial Response, EPA-540/1-89/002, Washington, DC. December, *http://rais.ornl.gov/documents/HHEMA.pdf*, accessed November 19, 2021.

10. SUMMARY RESULTS MEMORANDUM AND OTHER DELIVERABLES

Ramboll will complete preliminary analysis of the CAP and health risks from each building type at various distances from the modeled building and present that information to the department. Ramboll will meet with the department and ICF to determine preliminary control scenarios to be applied to the analysis of Building Types. Ramboll will then prepare a series of summary results memorandums. These memos will consist of the following:

- Documentation of any additional details or revisions from the approved CEQA Air Quality and Health Risk Assessment Methodology and reasons for those additions.
- CAP and HRA results for each Building Type for uncontrolled and controlled scenarios at various distances from the modeled building. This section will include listing the controlled strategies modeled and the methodology for modeling the effectiveness of the strategies.
- HRA results for roadway modeling performed for each scenario in 2035 and 2050, including the changes in health risks for each alternative and the proposed action, as compared to midpoint and baseline conditions.

In addition to the results memorandums for the building types and citywide traffic modeling, Ramboll will submit health risk databases with the citywide HRA results to the department. The databases will mirror the 2020 Citywide HRA and provide updated mobile source and total cancer risk and PM2.5 concentration at each receptor location for each scenario for years 2035 and 2050. Ramboll will also provide figures, up to 10, to assist in illustrating the citywide health risk anticipated from the scenarios evaluated in the EIR. Figures may include total health risks or $PM_{2.5}$ concentrations or may show incremental differences in health risks as compared to either the existing 2020 health risk conditions or future year health risks, or some combination thereof to be later determined by the department. Some figures may be included in the results memorandum only and others may be presented in the EIR. Ramboll will meet with the department and ICF to determine the figures to be presented in the Final Results Memorandums and in the EIR.

Summary of Deliverables:

1. Preliminary uncontrolled CAP and health risks from each building type at various distances[42] from the building
2. Draft Summary Results Memorandums
3. Final Results Memorandums
4. Up to 8 Citywide Health Risk databases that are easily integrated into GIS or other mapping software:
    - 2035 midpoint conditions Citywide HRA
    - 2050 Baseline Citywide HRA
    - 2035 Eastside Alternative Citywide HRA
    - 2050 Eastside Alternative Citywide HRA

[42] These rings will be placed at 5 and 10 meters from the building boundary, then at 10-meter intervals until a maximum distance of 500 meters, with receptors modeled every 10 meters on the rings.

- 2035 Proposed Action Citywide HRA
- 2050 Proposed Action Citywide HRA
- 2035 Plan Bay Area Citywide HRA
- 2050 Plan Bay Area Citywide HRA

11. REFERENCES

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TABLES

Table Methods-1
Representative Development Parameters
San Francisco Housing Element
San Francisco, California

HE Building Type	Similar Project Example	Example Project Height	No. of units/ mix of uses	Excavation Depth	Soil disturbance (cubic yards)	Soil Improvement?	Construction Duration - Example Project[1]	Demolition	Emergency Generators - Example Project[2]
Building Type 1: 590 ft tall residential/mixed use	10 South Van Ness (demolition and new construction residential, commercial)	590 foot tall building	984 units; 30.35 ksf retail 350 ksf office	50 ft bgs	100,000 cy	Yes	36 months	91,088 sq ft, two-story, 30-45 ft tall Honda Dealership and Service Center	1 x 2,012 HP (1,500 kW) Tier 4 Final, tested 50 hours/year
Building Type 2: 240-foot- tall primarily residential building	469 Stevenson Street- demo surface parking lot & new construction	274 feet tall	495 units; 4 ksf retail	55 ft bgs	55,850 cy	Yes	36 months	4-5 story structure maximum; lot size is approx. 20,000 square feet; 3/4 coverage of the lot; 90,000 square feet for demolition of structure.[3]	2 x 1,005 HP (750 kW), Tier 2 + DPF, tested 50 hours/year
Building Type 3: 120 foot primarily residential building	900 7th Street (Parcel C)	105 feet	156-200 units; 3ksf retail	10 feet bgs for Parcel C and 35 ft bgs for all other buildings	8,800 cy for Parcel C	n/a	Phase 1 would be 24 months; Phases 2-5 would start at 12-month mark of previous phase. Approx. 6 years total construction	39,049 sq ft general structure	1 x 1,005 HP (750 kW), Tier 4 Final, tested 50 hours/year
Building Type 4: 85-foot-tall residential building	Scale from Type 3 example	85 feet	50 units	10 feet bgs	6,652 cy	Yes	11 months	39,049 sq ft general structure	None

Table Methods-1
Representative Development Parameters
San Francisco Housing Element
San Francisco, California

HE Building Type	Similar Project Example	Example Project Height	No. of units/ mix of uses	Excavation Depth	Soil disturbance (cubic yards)	Soil Improvement?	Construction Duration - Example Project[1]	Demolition	Emergency Generators - Example Project[2]
Building Type 5: 66/65-foot-tall primarily residential building	3700 California- 3 buildings (Building A7 includes demolition of 5 story, 88 ksf parking garage and construction of 29 units; Building B8 includes 17 units; building B9 includes 14 units)	5 stories	14-29 units	13 ft bgs (Block A)	61,800 cy (total across all three Blocks)	Yes; Potentially: deep soil mixing (DSM), jet grouting, stone columns, and drilled displacement columns (DDCs)	23 months (entirety of Block A)	88,000 sq ft parking garage	None
Building Type 6: 40-foot-tall building	3333 California Street – either Mayfair Building (40-foot-tall building with 30 units)	40-foot-tall	Between 30 units	7 to 40 ft bgs (project net, not broken down by building)	241,300 cy (project total – not broken down by building)	Yes; soil compaction	20 months (includes construction of Mayfair and Laurel buildings)	2 story maximum structure; not greater than a 35 foot by 100 foot lot; 40% lot coverage; roughly 2,000 square feet.[3]	None

Notes

[1] Construction duration as described in a project schedule may vary slightly from duration modeled using CalEEMod® for some building types.

[2] Emergency generators larger than 1,000 kw are required to be Tier 4 Final in BAAQMD at this time and are modeled assuming 50 hours per year of testing for the Housing Element 2022 Update.

[3] Parameter has been modified from the similar project example to reflect more likely parameter anticipated under the building Type.

Abbreviations

bgs - below ground surface
cy - cubic yard
DDC - Drilled Displacement Columns
DPF - diesel particulate filter
DSM - Deep Soil Mixing
ft - foot
hp - horsepower
ksf - thousand square feet
kw - thousand watts

Table Methods-2a
Construction Parameters
Building Type 1: 590 ft Residential/Mixed Use - 10 South Van Ness
San Francisco Housing Element Update
San Francisco, California

Phase[1]	Total Construction Days[2]	Equipment Type[3]	Quantity	Horsepower	Hours per Day	One-Way Onroad Construction Trips		
						Worker (trips/day)	Vendor (trips/day)	Hauling (trips/phase)
Demolition	52	Air Compressors	2	78	8	80	0	414
		Excavators	4	158	8			
		Generator Sets	2	84	8			
		Signal Boards	1	6	8			
Grading, Shoring, & Excavation	158	Bore/Drill Rigs	3	221	10	120	0	3950
		Excavators	4	158	10			
		Generator Sets	2	84	10			
		Pumps	12	84	24			
		Signal Boards	1	6	10			
Foundation/Podium Construction	209	Aerial Lifts*	2	63	12	200	0	5,225
		Cranes*	2	231	12			
		Forklifts	2	89	10			
Building Construction/Superstructure	234	Aerial Lifts*	2	63	12	600	0	5850
		Cranes*	2	231	12			
		Forklifts	2	89	10			
Superstructure/Skin	132	Aerial Lifts*	2	63	12	200	0	3300
		Cranes*	2	231	12			
		Forklifts	2	89	10			
Interior Work	392	Aerial Lifts*	2	63	12	700	0	6500
		Aerial Lifts*	4	63	8			
		Air Compressors	1	78	8			

Notes:

1. Most assumptions are taken directly from the 10 South Van Ness project.–This is modeled as a 1-acre construction site. The typical construction schedule for 10 South Van Ness consisted of 6 day workweeks and 13 hour construction days, with typical work hours of 7am to 8pm Monday through Thursday, and 7am to 5pm Friday through Saturday.
2. Grading, Shoring, & Excavation and Foundation/Podium Construction phases are conservatively assumed to overlap, and the Superstructure/Skin phase is assumed to overlap with the Interior Work phase. Therefore, the total construction duration is shorter than the sum of the construction days for each phase.
3. * = assumed to be electric engine

Table Methods-2b
Construction Parameters
Building Type 2: 240 ft Residential - 469 Stevenson Street
San Francisco Housing Element
San Francisco, California

Phase	Total Construction Days[3]	Equipment[4]	Quantity	Horsepower	Load Factor	Hours per Day	Construction trips (trips/day)		Material Movement	
							Worker	Truck	Total One-Way Hauling Trips	Excavation Volume (cy)
Site Preparation/Demolition	20	Dump Truck	2	402	0.38	8	12	42	2,148	17,185
		Excavator	1	158	0.38	8				
Excavation Shoring	45	Bore/Drill Rigs	1	225	0.5	8	40	70	4,833	38,665
		Dumper/Tenders	1	97	0.38	8				
		Excavator	1	158	0.38	8				
		Skid Steer Loaders	1	97	0.37	8				
		Tractors/Loaders/Backhoes	1	97	0.37	8				
		Aerial Lift	1	63	0.31	8				
		Off-Highway Trucks	2	402	0.38	5				
Foundation/Below Grade Construction	45	Manlift	1	63	0.31	8	40	8.0	0	0
		Off-Highway Truck	1	402	0.38	5				
Building Construction	653	Aerial Lift, Manlifts, Scissor Lift	6	63	0.31	8	380	6.7		
		Cranes	1	231	0.29	7				
		Forklift	1	89	0.2	8				
		Rough Terrain Forklifts	1	89	0.4	8				
		Electric Powered Welders*	1	50	N/A	8				
		Off-Highway Truck	1	402	0.38	5				
		Welders	3	46	0.45	8				
Exterior Finishing[1]	306	Air Compressors	1	78	0.48	6	223	3.3		
		Forklift	1	89	0.2	8				
		Manlift	1	63	0.31	8				
		Welders	1	46	0.45	8				
Site Work/Paving	88	Cement and Mortar Mixers	1	9	0.56	8	30	0		
		Pavers	1	125	0.42	8				
		Paving Equipment	1	130	0.36	8				
		Pressure Washer	1	13	0.3	8				

Notes

1. In the original construction analysis for the 469 Stevenson Street Project, the exterior finishing took place over two years with a different number of worker and truck trips attributable to the phase in each year. The weighted average trip counts over the entire phase are presented here. This is modeled as a 0.67-acre construction site.
2. Demolition hauling trips calculated based on demolition assumptions in Table 1 provided by Citywide and CalEEMod default trips per square foot of building demolished.
3. Exterior finishing and site work/paving are conservatively assumed to overlap with the building construction phase. Therefore, the total construction duration is shorter than the sum of the construction days for each phase.
4. * = assumed to be electric engine

Abbreviations

cy - cubic yards

Table Methods-2c
Construction Parameters
Building Type 3: 120 ft Residential - 900 7th Street Parcel C
San Francisco Housing Element Update
San Francisco, California

Phase Name[1]	Total Construction Days	Offroad Construction Equipment					Average Daily One-Way Trips (trips/day)		Grading Material Movement		Cut and Fill		
		Equipment	Quantity	Horsepower	Load Factor	Hours/Day	Worker	Vendor	Total One-Way Hauling Trips	Excavation Volume (cy)	Total One-Way Hauling Trips	Cut Volume (cy)	Fill Volume (cy)
Demolition	42	Concrete/Industrial Saws	1	81	0.73	4	5.0	0	0	0	0	0	0
		Rubber Tired Dozers	1	247	0.40	1							
		Tractors/Loaders/Backhoes	2	97	0.37	3							
Site Preparation	4	Graders	1	187	0.41	4	2.5	0			35	47	231
		Tractors/Loaders/Backhoes	1	97	0.37	4							
Grading	8	Concrete/Industrial Saws	1	81	0.73	4	5.0	0	1,100	8,800	0	0	0
		Rubber Tired Dozers	1	247	0.40	1							
		Tractors/Loaders/Backhoes	2	97	0.37	3							
Building Construction	423	Cranes	1	231	0.29	2	87	13					
		Forklifts	2	89	0.20	3							
		Tractors/Loaders/Backhoes	2	97	0.37	4							
Paving	21	Cement and Mortar Mixers	4	9.0	0.56	3	8.8	0					
		Pavers	1	130	0.42	4							
		Rollers	1	80	0.38	4							
		Tractors/Loaders/Backhoes	1	97	0.37	4							
Architectural Coating	21	Air Compressors	1	78	0.48	3	17	0					

Notes
1. This is modeled as a 0.5-acre construction site based on a 20,000 square foot lot size.

Abbreviations
cy - cubic yards

Table Methods-2d
Construction Parameters
Building Type 4: 85 ft Residential - CalEEMod Defaults
San Francisco Housing Element Update
San Francisco, California

Phase Name[1]	Total Construction Days	Offroad Construction Equipment					Average Daily One-Way Trips (trips/day)		Grading Material Movement[3]		Cut and Fill		
		Equipment	Quantity	Horsepower	Load Factor	Hours/Day	Worker	Vendor	Total One-Way Hauling Trips	Excavation Volume (cy)	Total One-Way Hauling Trips	Cut Volume (cy)	Fill Volume (cy)
Demolition	18	Concrete/Industrial Saws	1	81	0.73	4	5.0	0	0	0	0	0	0
		Rubber Tired Dozers	1	247	0.40	1							
		Tractors/Loaders/Backhoes	2	97	0.37	3							
Site Preparation	2	Graders	1	187	0.41	4	2.5	0			35	47	231
		Tractors/Loaders/Backhoes	1	97	0.37	4							
Grading	4	Concrete/Industrial Saws	1	81	0.73	4	5.0	0	831	6,650	0	0	0
		Rubber Tired Dozers	1	247	0.40	1							
		Tractors/Loaders/Backhoes	2	97	0.37	3							
Building Construction	177	Cranes	1	231	0.29	2	87	13					
		Forklifts	2	89	0.20	3							
		Tractors/Loaders/Backhoes	2	97	0.37	4							
Paving	9	Cement and Mortar Mixers	4	9.0	0.56	3	8.8	0					
		Pavers	1	130	0.42	4							
		Rollers	1	80	0.38	4							
		Tractors/Loaders/Backhoes	1	97	0.37	4							
Architectural Coating	9	Air Compressors	1	78	0.48	3	17	0					

[1.] Construction information was derived from Building Type 3, for a 120-ft building; total construction days for each phase of construction were scaled based on square footage. This is modeled as a 0.3-acre construction site based on a 10,000-11,000 square foot lot size.

[2.] The soil disturbance quantity was linearly interpolated based on the soil disturbance quantity for a 65-foot building (5,425 cubic yards) and a 120-foot building (8,800 cubic yards). The total number of hauling trips were calculated based on CalEEMod defaults for trips per cubic yard of soil disturbance. The site preparation cut and fill volumes were taken directly from Building Type 3 assumptions, since this is depends on lot size rather than vertical construction height.

Abbreviations

cy - cubic yards

Table Methods-2e
Construction Parameters
Building Type 5: 65 ft Residential - 3700 California Street
San Francisco Housing Element
San Francisco, California

Phase	Total Construction Days[1]	Offroad Construction Equipment					One-Way Onroad Construction Trips		
		Equipment Type	Quantity	Horsepower	Avg. Usage Hours per Day	Utilization (%)	Worker (trips/day)	Vendor (trips/day)	Hauling (trips/phase)
Demolition	19.5	Aerial Lifts	1	63	2	15%	96	0	1,664
		Concrete/Industrial Saws	1	81	8	67%			
		Cranes	1	231	8	15%			
		Crawler Tractors	2	212	4	15%			
		Dumper/Tender	4	16	8	67%			
		Excavators	1	158	8	33%			
		Forklifts	1	89	8	33%			
		Generator Sets	1	84	6	67%			
		Pumps	1	84	8	13%			
		Rubber Tired Dozers	2	247	7	13%			
		Skid Steer Loaders (Bobcat)	2	97	7	67%			
		Tractors/Loaders/Backhoes	1	97	8	67%			
		Welders	1	46	4	33%			
Site Preparation & Grading	11.5	Crushing/proc. Equipment	1	85	8	35%	76	0	0
		Dumper/Tender	4	16	8	78%			
		Excavators	1	158	8	100%			
		Pumps	1	84	8	100%			
		Signal Boards	1	6.0	8	100%			
		Sweepers/Scrubbers	1	64	2	100%			
		Tractors/Loaders/Backhoes	1	97	8	100%			
Excavation & Shoring	28	Bore/Drill Rigs	1	221	8	50%	56	0	896
		Crawler Tractors	1	212	8	13%			
		Dumper/Tender	2	16	6	50%			
		Excavators	1	158	8	50%			
		Pumps	1	84	8	25%			
Drainage/Utilities/Subgrade	39.5	Cement and Mortar Mixers	1	9.0	4	6%	76	0	0
		Excavators	1	158	4	47%			
		Plate Compactors	1	8.0	4	16%			
		Rough Terrain Forklifts	1	100	2	47%			
		Trenchers	1	78	4	47%			
Building Construction	177.5	Bore/Drill Rigs	1	221	8	5%	58	9.2	0
		Cement and Mortar Mixers	1	9.0	4	20%			
		Dumper/Tender	1	16	8	20%			
		Forklifts	1	89	4	5%			
		Other General Industrial Equipment	1	88	6	20%			
		Pressure Washers	1	13	2	5%			
		Pumps	1	84	6	5%			
		Rubber Tired Loaders	1	203	6	20%			
		Sweepers/Scrubbers	1	64	2	5%			
Sitework	35	Dumper/Tender	2	16	4	50%	60	0	560
		Excavators	1	158	4	50%			
		Graders	1	187	8	4%			
		Pressure Washers	1	13	2	50%			
		Pumps	1	84	8	50%			
		Sweepers/Scrubbers	1	64	2	14%			
		Tractors/Loaders/Backhoes	1	97	4	50%			

Notes:

1. Original construction schedule provided for all of 3700 California St Block A. Phase lengths divided by 2 on the basis that building A7 is approximately 50% of the total Block A footprint. This is modeled as a 0.3-acre construction site based on a 10,000-11,000 square foot lot size.

Table Methods-2f
Construction Parameters
Building Type 6: 40 ft Residential - 3333 California Street
San Francisco Housing Element Update
San Francisco, California

Subphase	Total Construction Days[1]	Offroad Construction Equipment					One-Way Onroad Construction Trips			
		Equipment Type	Quantity	Horsepower	Avg. Usage Hours per Day	Equipment Utilization	Worker (trips/day)	Non-Hauling (trips/day)	Vendor (trips/day)	Hauling (trips/phase)[2]
Demolition	20	Air Compressors	2	78	5	40%	--	--	--	269
		Skid Steer Loaders (Bobcat)	1	65	8	40%	--	--	--	
Excavation	40	Crawler Tractors with Rippers	1	208	8	40%	--	--	--	501
		Excavators	2	163	8	40%	--	--	--	
		Excavators with Hoe Ram	2	163	8	40%	--	--	--	
		Tractors/Loaders/Backhoes	2	98	8	40%	--	--	--	
Exterior	120	Aerial Lifts	2	63	8	40%	--	--	--	0
		Forklifts	1	89	8	40%	--	--	--	
		Pavers	1	126	8	0.83%	--	--	--	
		Paving Equipment	1	131	8	0.83%	--	--	--	
		Rollers	1	81	6	0.83%	--	--	--	
Structure	120	Pumps	1	84	8	4%	--	--	--	
All	300	Rough Terrain Forklifts	2	100	8	40%	30	0.53	1.13	
		Sweepers/Scrubbers	1	64	3	32%				

Notes:

1. Construction information is from the Mayfair/Townhouse/Euclid Park Phase 4 of construction of the 3333 California St project. Construction activity was scaled to be 40% of Phase 4 activity based on the fraction of building footprint occupied by the Mayfair Building. This is modeled as a 0.1-acre construction site based on a 3,500 square foot lot size.
2. Demolition hauling trips calculated based on demolition assumptions in Table 1 provided by Citywide and CalEEMod default trips per square foot of building demolished.

Table Methods-3
Emissions Calculation Methodology
San Francisco Housing Element Update
San Francisco, California

Type	Source	Methodology and Formula	Reference
Construction Equipment	Off-Road Equipment[1]	$Ec = \Sigma(EFc * HP * LF * Hr * C)$	OFFROAD2011 and ARB/USEPA Engine Standards
Construction On-Road Mobile Sources[2]	Exhaust – Running	$E_R = \Sigma(EF_R * VMT * C)$, where VMT = Trip Length * Trip Number	EMFAC2021
	Exhaust - Idling	$E_I = \Sigma(EF_I * Trip\ Number * T_I * C)$	EMFAC2021
Operational Generator Emissions[3]	Stationary Source	$E_{SS} = EF_{SS} * Hr * C$	--
Operational On-Road Mobile Sources[2]	Exhaust - Running	$E_R = \Sigma(EF_R * VMT * C)$, where VMT = Trip Length * Trip Number	EMFAC2021
	Brake Wear and Tire Wear	$E_{BW,TW} = \Sigma(EF_{BW,TW} * VMT * C)$, where VMT = Roadway Link Length * Vehicle Counts	EMFAC2021
	Exhaust - Idling	$E_I = \Sigma(EF_I * Trip\ Number * T_I * C)$	EMFAC2021
	Exhaust - Running Losses	$E_R = \Sigma(EF_{RL} * VMT * C)$, where VMT = Trip Length * Trip Number	EMFAC2021
Other Operational Sources	Area, Energy	CalEEMod®	CalEEMod®

Notes:

1. E_c: off-road equipment exhaust emissions (lb)
   EF_c: emission factor (g/hp-hr). CalEEMod 2020.4.0 default emission factors used
   HP: equipment horsepower from original buidling Type analysis
   LF: equipment load factor. OFFROAD2011
   Hr: equipment hours
   C: unit conversion factor
2. On-road mobile sources include truck and passenger vehicle trips. Emissions associated with mobile sources were calculated using the following formulas.
   E_R: running exhaust and running losses emissions (lb)
   EF_R: running emission factor (g/mile). From EMFAC2021
   VMT: vehicle miles traveled
   C: unit conversion factor
   The calculation involves the following assumptions:
   a. All material transporting and soil hauling trucks are heavy-heavy duty trucks.
   b. Trip Length: The one-way trip length as calculated based on the truck route or the default length from CalEEMod.
   c. Trip Number: from original building Type analysis
   E_I: vehicle idling emissions (lb).
   EF_I: vehicle idling emission factor (g/hr-trip). From EMFAC2021
   T_I: idling time
   C: unit conversion factor
3. Operational emissions from the generator were calculated using the following formulas:
   E_{SS}: Stationary Source emissions.
   EF_{SS}: Stationary Source emission factor
   Hr: hours of operation per year (hr)
   C: unit conversion factor

Abbreviations:

ARB: California Air Resources Board
EF: Emission Factor
EMFAC: EMission FACtor Model
g: gram
HP: horsepower
lb: pound
LF: Load Factor
mi: mile
USEPA: United States Environmental Protection Agency
VMT: vehicle miles traveled

References:

ARB/USEPA. 2013. Table 1: ARB and USEPA Off-Road Compression-Ignition (Diesel) Engine Standards. Available online at: http://www.arb.ca.gov/msprog/ordiesel/documents/Off-Road_Diesel_Stds.xls
ARB. 2021. EMission FACtors Model, 2021 (EMFAC2021). Available online at: https://arb.ca.gov/emfac/emissions-inventory

Table Methods-4
Emission Factor for Entrained Roadway Dust
San Francisco Housing Element
San Francisco, California

Entrained Roadway Dust Constants for San Francisco County		
Roadway Category	**Silt Loading[1] (g/m^2)**	**Travel Fraction[1]**
Freeway	0.015	39%
Major	0.032	41%
Collector	0.032	7%
Local	0.32	13%
Weighted Silt Loading Factor	0.063	100%

Road Dust Equation[2]

E [lb/VMT] = k*(sL)^0.91 * (W)^1.02 * (1-P/4N)

Parameters	**Value**
k = particle size multiplier for particle size range	
PM_{10} (lb/VMT)	0.0022
$PM_{2.5}$ (lb/VMT)	3.3E-04
sL = roadway silt loading [grams per square meter - g/m^2]	0.063
W = average weight of vehicles traveling the road [tons]	2.4
P = number of "wet" days in county with at least 0.01 in of precipitation during the annual averaging period	65
N = number of days in the averaging period	365

Entrained Road Dust Emission Factors	
PM_{10} Emission Factor [lb/VMT]	4.1E-04
$PM_{2.5}$ Emission Factor [lb/VMT]	6.2E-05

Notes:

1. Travel fraction by roadway category and silt loading are from the ARB's March 2021 update to Entrained Road Travel Emission Inventory Source Methodology, Tables 2 and 4, respectively.
2. Road dust equation and parameters are from the California Air Resources Board's (ARB) March 2021 Miscellaneous Process Methodology 7.9 for Entrained Road Travel, Paved Road Dust. The silt loading emission factor assumes San Francisco county default roadway fractions and silt loading levels from ARB 2021. The number of "wet" days for San Francisco county is from ARB 2018. This is slightly higher than the default from CalEEMod® Appendix D Table 1.1 (64 days), which was based on older historic data and would result in slightly higher emissions. Other parameters (average weight of vehicles, size multipliers) are from ARB 2021. $PM_{2.5}$ is assumed to be 15% of PM_{10} based on paved road dust sampling in California (ARB Speciation Profile #471), which is a more representative fraction than provided in the older AP-42 fugitive dust methodology as discussed in ARB 2018 (page 17 and 36).

Abbreviations:

ARB - California Air Resources Board
CalEEMod® - California Emissions Estimator Model
EMFAC - EMission FACtor Model
g - gram
lb - pound
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns
PM_{10} - particulate matter less than 10 microns
VMT - vehicle miles traveled

References:

California ARB. 2021. Miscellaneous Processes Methodologies - Paved Entrained Road Dust. Available online at: https://ww3.arb.ca.gov/ei/areasrc/fullpdf/2021_paved_roads_7_9.pdf

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod), Version 2016.3.2. Available online at http://www.caleemod.com/

Table Methods-5
Modeling Parameters
San Francisco Housing Element Update
San Francisco, California

Construction Sources

Source	Source Type[1]	Number of Sources[2]	Source Dimension [m]	Release Height[3] [m]	Initial Vertical Dimension[4] [m]	Initial Lateral Dimension[5] [m]
Construction Equipment	Area	5	Parcel Area	5.0	1.4	--
On-Road Haul Trucks	Volume	Variable	Variable	2.6	2.4	Variable

Operational Sources

Source[6]	Source Type	Number of Sources[2]	Stack Height [m]	Stack Velocity [m/s]	Exit Diameter [m]	Stack Temperature °F
Generators	Point	5	3.7	45	0.2	872

Source	Source Type	Number of Sources[2]	Source Dimension [m]	Release Height[3] [m]	Initial Vertical Dimension[4] [m]	Initial Lateral Dimension[5] [m]
On-Road Light Duty Vehicles	Volume	Variable	Variable	1.7	1.6	Variable
On-Road Trucks	Volume	Variable	Variable	2.6	2.4	Variable

Notes:

1. Construction off-road equipment is modeled as an area source covering the parcel under construction, consistent with the Citywide HRA (SF DPH, SF Planning, Ramboll, 2020).
2. The number of on-road sources is based on the geometry of the truck or traffic routes. The number of generator sources was developed assuming the total number of generators per building Type listed in Table 1.
3. According to the Community HRA methodology, release height of a modeled area source representing construction equipment was set to 5 meters. On-road truck release height based on CRRP modeling and USEPA haul road guidance.
4. According to the Community HRA methodology, initial vertical dimension of the modeled construction equipment volume sources was set to 1.4 meters. On-road truck and car initial vertical dimension based on previous CRRP modeling and USEPA haul road guidance.
5. According to USEPA AERMOD User's Guide, for a line source modeled as adjacent volume sources, the initial lateral dimension is the length of the side divided by 2.15.
6. Generators were modeled assuming default parameters in Table 7 of the Community HRA technical guidance documen (SF DPH, SF Planning, and Ramboll. 2020.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
CRRP - Community Risk Reduction Plan
HRA - Health risk assessment
m - meter
s - second
USEPA - United States Environmental Protection Agency

References:

San Francisco Department of Public Health (SF DPH), San Francisco Planning Department (SF Planning), and Ramboll. 2020. San Francisco Citywide Health Risk Assessment: Technical Support Documentation.

USEPA. 2012. Haul Road Workgroup Final Report Submissoin to EPA-OAQPS. March. Available at: https://www3.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf

USEPA. 2021. User's Guide for the AMS/EPA Regulatory Model (AERMOD). Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina. EPA-454/B-20-001, April 2021). Available at: https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_userguide.pdf

Table Methods-6
Exposure Parameters
San Francisco Housing Element Update
San Francisco, California

Construction Scenario

Receptor Type	Year	Age Group	Daily Breathing Rate[1]	Exposure Duration	Fraction of Time at Home[2]	Exposure Frequency[3]	Age Sensitivity Factor	Averaging Time	ASF-Weighted Intake Factor, Inhalation	Annual Intake Factor, Inhalation[4]
			[L/kg-day]	[years]	[unitless]	[days/year]		[days]	[m^3/kg-day]	[m^3/kg-day]
Residential	2023	3rd Trimester	361	0.25	1	350	10	25,550	0.012	0.12
		0-<2	1,090	0.75					0.112	
	2024			1					0.149	0.15
	2025			0.25					0.04	0.05
				0.75			3		0.0176	
	2026	2-<16	572	1					0.0235	0.024
	2027			1					0.0235	0.024
	2028			1					0.0235	0.024
	2029			1					0.0235	0.024
	2030			1					0.0235	0.024
	2031			1					0.0235	0.024
	2032			1					0.0235	0.024
	2033			1					0.0235	0.024
	2034			1					0.0235	0.024
	2035			1					0.0235	0.024
	2036			1					0.0235	0.024
	2037			1					0.0235	0.024
	2038			1					0.0235	0.024
	2039			0.25					0.0059	0.008
		16-30	261	0.75	0.73		1		0.0020	
	2040			1					0.0026	0.003
	2041			1					0.0026	0.003
	2042			1					0.0026	0.003
	2043			1					0.0026	0.003
	2044			1					0.0026	0.003
	2045			1					0.0026	0.003
	2046			1					0.0026	0.003
	2047			1					0.0026	0.003
	2048			1					0.0026	0.003
	2049			1					0.0026	0.003
	2050			1					0.0026	0.003
	2051			1					0.0026	0.003
	2052			1					0.0026	0.003
	2053			0.25					0.0007	0.001
Total Intake Factor for 30-Year Citywide Traffic and Emergency Generator Exposure[5]										**0.677**

Table Methods-6
Exposure Parameters
San Francisco Housing Element Update
San Francisco, California

Notes:

1. Daily breathing rates reflect default breathing rates from OEHHA 2015 and BAAQMD 2016 as follows: 95th percentile 24-hour daily breathing rate for 3rd trimester and age 0-<2 years; 80th percentile for ages 2 years and older (per BAAQMD 2016 guidance).
2. Fraction of time spent at home is conservatively assumed to be 1 (i.e., 24 hours/day) for age groups from the third trimester to less than 16 years old based on the recommendation from BAAQMD (BAAQMD 2016) and OEHHA (OEHHA 2015). The fraction of time at home for adults age 16-30 reflects default OEHHA guidance (OEHHA 2015) as recommended by BAAQMD (2016).
3. Exposure frequency reflects default residential exposure frequency from OEHHA 2015.
4. Annual intake factor by calendar year is used to develop the construction health risk assessment. For types 1 and 2, the annual intake factor calculated in this column is used starting from the third trimester (2023). For types 3 through 6, because construction lasts at most 2 years, the annual intake factors for a child in the 0- to 2-year age group (0.149) are used for each year of construction as the most conservative approach.
5. For the emergency generators, the maximally exposed resident is assumed to be exposed to risks for 30 years, beginning at the start of operation. This is a conservative approach; if health risks from operations here are summed with health risks from building construction, total risk will be overestimated because the earliest exposure parameters (e.g., third trimester through age 2+) will be repeated.

Abbreviations:

AT - averaging time
Cal/EPA - California Environmental Protection Agency
DBR - daily breathing rate
EF - exposure frequency
FAH - fraction of time at home
kg - kilogram
L - liter

Reference:

Cal/EPA. 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.
BAAQMD. 2016. Air Toxics NSR ProgramHealth Risk Assessment (HRA) Guidelines. January.

Table Methods-7
Age Sensitivity Factors
San Francisco Housing Element Update
San Francisco, California

Receptor Age Group	Value[1]
3rd Trimester	10
Age 0-<2 Years	10
Age 2-<9 Years	3
Age 2-<16 Years	3
Age >16 Years	1

Note:

1. Based on OEHHA 2015. Age sensitivity factors are unitless.

Abbreviation:

OEHHA - Office of Environmental Health Hazard Assessment

Source:

OEHHA. 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. February.

Table Methods-8
Exhaust and Evaporative TOG Cancer Potency Factors
San Francisco Housing Element Update
San Francisco, California

Emissions Type	Chemical	CAS #	Weight Fraction	Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$
Gasoline Catalytic Evaporative Losses	Benzene	71432	0.014	0.10
	Ethyl benzene	100414	0.0093	0.0087
	Hexane	110543	0.011	0
	Methanol	67561	0.050	0
	Propylene	115071	2.0E-04	0
	Toluene	108883	0.064	0
Gasoline Catalytic Exhaust	1,3-Butadiene	106990	0.0071	0.60
	Acetaldehyde	75070	0.010	0.010
	Acrolein	107028	6.9E-05	0
	Benzene	71432	0.028	0.10
	Ethyl benzene	100414	0.014	0.0087
	Formaldehyde	50000	0.015	0.021
	Hexane	110543	0.010	0
	Methyl ethyl ketone {2-Butanone}	78933	8.4E-04	0
	Methyl tert-butyl ether	1634044	5.0E-04	0.0018
	Naphthalene	91203	6.4E-04	0.12
	Propylene	115071	0.048	0
	Styrene	100425	0.0028	0
	Toluene	108883	0.080	0

Abbreviation:

TOG- Total Organic Gas

Source:

CARB. 2020. Consolidated Table of OEHHA /CARB Approved Risk Assessment Health Values. October. Available at: https://ww2.arb.ca.gov/resources/documents/consolidated-table-oehha-carb-approved-risk-assessment-health-values.

APPENDIX I.2. AIR QUALITY AND HEALTH RISK ASSESSMENT RESULTS FOR ROADWAY MODELING

RAMBOLL

ENVIRONMENT
& HEALTH

MEMO

Project name	San Francisco Housing Element 2022 Update
Project no.	1690017135
To	San Francisco Planning Department San Francisco, California
From	Taylor Vencill Shaena Ulissi Michael Keinath
Subject	San Francisco Housing Element 2022 Update Air Quality and Health Risk Assessment Results for Roadway Modeling

April 5, 2022

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1 Introduction

At the request of ICF International, Ramboll US Consulting, Inc. (Ramboll) conducted a citywide health risk assessment (HRA) to evaluate the cancer risk[1] and $PM_{2.5}$ concentrations from existing known sources of air pollution in addition to cancer risk and $PM_{2.5}$ concentrations anticipated from traffic emissions as a result of the San Francisco Housing Element 2022 Update (referred to hereafter as "housing element update" or "proposed action") for years 2035 and 2050. Details on the modeling methodology and assumptions are described in the "CEQA Air Quality and Health Risk Methodology" (Ramboll, 2021, referred to hereafter as "Methodology Report"). Additional details on these assumptions are presented in this report.

This technical memorandum presents a brief summary of the methodology, noting any details not included in the Methodology Report, and provides the results for evaluation of air quality and health impacts from traffic emissions that could occur under future actions consistent with the San Francisco Housing Element 2022 Update. This analysis has been performed to support the CEQA documentation at the request of the San Francisco Planning Department.

2 Methodology

The purpose of this air quality analysis is to assess potential health risks and hazards that would result from traffic emissions that could occur under future actions consistent with the San Francisco Housing Element 2022 Update. Potential health risks and hazards are analyzed consistent with the guidelines and methodologies from air quality agencies, specifically: Bay Area Air Quality Management District (BAAQMD), California Air Resources Board (CARB), California Office of Environmental Health Hazard Assessment (OEHHA), and USEPA.

[1] Cancer risk is the incremental probability (expressed per one million) that an individual will develop cancer over a lifetime as a direct result of exposure to carcinogens potentially present in the emission sources modeled.

The steps conducted in performing this air quality analysis are as follows:

(1) Quantify emissions from roadway activity for each baseline and proposed land use concept;

(2) Perform air dispersion modeling for roadways included in the SFCHAMP model, extending out to the San Francisco County line;

(3) Calculate resulting cancer risk and fine particulate matter ($PM_{2.5}$) concentrations resulting from the modeled vehicle travel.

2.1 Vehicle Activity

For each scenario evaluated, Ramboll was provided vehicle activity data from the SFCHAMP model. The following adjustments were made to produce data sets with daily vehicle volume counts:

(1) Roadway links were truncated at the San Francisco County line.

(2) The following roadway types were removed: Facility Type (FT) = 6 (centroid connector), 8 (not used), 13 (bike only), 14 (not used).

(3) Vehicle volumes were summed over AM, MD, PM, EV, and EA[2] time periods to calculate total daily vehicles.

(4) Loaded speeds were averaged over AM, MD, PM, EV, and EA time periods to calculate an average daily speed and mapped to EMFAC speeds bins as follows:

Table 2.1-1. SFCHAMP Speeds Mapped to EMFAC Speed Bin

Average Loaded Speed	EMFAC Speed Bin
0 <= Avg Speed <= 5	5
5 < Avg Speed <= 10	10
10 < Avg Speed <= 15	15
15 < Avg Speed <= 20	20
20 < Avg Speed <= 25	25
25 < Avg Speed <= 30	30
30 < Avg Speed <= 35	35
35 < Avg Speed <= 40	40
40 < Avg Speed <= 45	45
45 < Avg Speed <= 50	50
45 < Avg Speed <= 50	55
55 < Avg Speed <= 60	60
[1]In cases where average speeds were zero, the given link was mapped to the 5 mph speed bin.	

(5) SFCHAMP vehicle categories were mapped to the car (CAR), Medium Duty Truck (MDT), Heavy Duty Truck (HDT), and bus (BUS) vehicle types as follows, to allow alignment with vehicle emission factors (discussed in the following section):

[2] AM = AM Peak (6am-9am), MD = Midday (9am-3:30pm), PM = PM Peak (3:30pm-6:30pm), EV = Evening (6:30pm-3am), EA = Early Morning (3am-6am).

Table 2.1-2 SFCHAMP Vehicle Categories Mapped to EMFAC Vehicle Categories

SFCHAMP Vehicle Category[1]	EMFAC Vehicle Category
DA	CAR
SR2	CAR
SR3	CAR
COM	MDT/HDT[2]
TRK	MDT/HDT[2]
BUS	BUS
TNC	CAR

[1]DA = drive alone,
SR2 = shared ride with two persons,
SR3 = shared ride with three+ persons,
COM = commercial vehicles,
TRK = trucks,
BUS = buses,
TNC = transportation network company vehicles

[2]The COM and TRK categories were split into MDT (medium duty truck) and HDT (heavy duty truck) based on neighborhood and street level breakdowns provided by the San Francisco Planning Department. For any roadway links outside of identified neighborhoods, an average split was applied by roadway type.

(6) To maintain a consistent fleet mix across model scenarios within a given year, the fleet mix of SFCHAMP vehicle categories from the relevant baseline year (2035 or 2050) was applied to the total ADT for the Proposed Action and Plan Bay Area scenarios. This fleet mix mapping was applied at the link level.[3] In cases where a roadway link was not assigned any traffic volumes in the baseline scenarios, the fleet mix was kept consistent with SFCHAMP data provided for the scenario modeled.

In prior citywide roadway modeling runs, roadways with average daily traffic rates less than 1,000 vehicles were removed from the model due to their low impact. Since the traffic rates are variable by Project scenario, Ramboll conservatively modeled all roadway links, including those under 1,000 daily vehicles. Ramboll confirmed the overall impact from these roadways is small[4].

2.2 Emission Factors

As described in the Methodology Report, emission factors were derived from the EMFAC2021 model, the latest on-road mobile emissions model available from CARB at the time this analysis was prepared. Emission factors were derived for the year or years in consideration, specific to fuel type and speed as applicable. Since cancer risk is evaluated over a 30-year period, emission factors were calculated for the

[3] In cases where two-way roadway links were combined when the link distance and speed bins were equivalent, the fleet mix mapping was applied for that consolidated link.

[4] As verified with the 2035 midpoint conditions roadway modeling, the modeled $PM_{2.5}$ concentrations and cancer risk results are on average 3% lower when filtering out roadways with <1,000 ADT. Roadways filtered out for this test case were also limited to those with <50% HDT+BUS.

scenario years (2035 or 2050) as well as the following 29 years. The EMFAC2021 model includes emission projections through year 2050, thus any years after 2050 were set to 2050 emission factors.

EMFAC vehicle types were mapped to the CAR, MDT, HDT, and BUS categories based on the breakdown below.

Table 2.2-1: EMFAC Categories with Associated EMFAC Vehicle Types

EMFAC Category	Vehicle Types Included
CAR	Passenger Cars (LDA), light duty trucks LDT1 (<3,750 lbs), LDT2 (between 3,751-5,750 lbs), motorcycles (MCY), and motor homes (MH)
Medium Duty Trucks (MDT)	Medium duty vehicles (MDV) (5,751-8,500 lbs), + light heavy duty trucks (LHDT1 (8,501-10,000 lbs), and LHDT2 (10,001-14,000 lbs))
Heavy Duty Trucks (HDT)	Medium heavy duty trucks (MHDT (14,001-33,000 lbs) and heavy-heavy duty trucks (HHDT (>33,000 lbs)
BUS	Urban, suburban, and other buses

Emission factors were developed for the following types of emissions: diesel vehicle exhaust (particulate matter less than 10 microns in diameter, PM_{10}/DPM), gasoline vehicle exhaust (total organic gases, TOG), gasoline vehicle running loss evaporative emissions (TOG), particulate matter exhaust less than 2.5 microns in diameter ($PM_{2.5}$) from all vehicle types, and $PM_{2.5}$ brake wear and tire wear emissions from all vehicle types. TOG emissions were speciated as noted in the Methodology Document, consistent with past citywide roadway modeling.

Entrained roadway dust was also calculated for $PM_{2.5}$, based on CalEEMod® methodology but incorporating ARB's newest Entrained Roadway Dust methodology, as discussed in the Methodology Report.

All emission factors were derived in units of emissions per mile traveled.

2.3 Emissions

Using the daily vehicle counts derived from the SFCHAMP model,[5] and the distance of each roadway link[6], daily vehicle miles travelled (VMT) were calculated for each unique roadway link for each vehicle type (CAR, MDT, HDT, BUS). Two-way roadway links were combined when the link distance and speed bins were equivalent. Emission factors were then applied to calculated VMT, accounting for speed and vehicle type variations.

EMFAC2021 also separates emissions into different activity modes; emissions due to starting, idling, and resting evaporative emissions (diurnal and hot soak) were not included in this analysis, consistent with past citywide roadway modeling. Potential risk and $PM_{2.5}$ concentrations from natural gas vehicles were also assumed to be minimal and were not quantified here.

[5] As previously noted, vehicle counts for non-baseline scenarios were derived by applying the baseline fleet mix to the total traffic volumes on each link.

[6] For highway links that crossed the county line, the distance of the link used in the emissions calculations was updated to reflect the portion within the model boundary.

2.4 Air Dispersion Modeling

As described in the Methodology Report, Ramboll performed refined air dispersion modeling using the American Meteorological Society/USEPA Regulatory Model Improvement Committee Model (AERMOD) (version 21112), with representative meteorological data to determine DPM, TOG, and $PM_{2.5}$ concentrations for potentially exposed individuals. Roadways within the San Francisco County line were modeled, with segment links represented by a series of volume sources. As noted in the Methodology Report, receptors within 1 kilometer (km) of each modeled source were included.

Model runs were split into two categories: one for "Trucks" including the HDT and BUS vehicle categories and one for "Cars" including CAR and MDT vehicle categories. Source parameters used in the modeling are listed in the table below.

Table 2.4-1: Source Modeling Parameters for AERMOD

Vehicle Type	Emission Rate (g/s)	Release Height (m)[1]	Initial Lateral Dimension of the Volume (m)[2]	Initial Vertical Dimension of the Volume (m)[3]
Trucks	=1/# sources in source group	2.55	variable, depends on roadway width	2.37
Cars		1.70		1.58

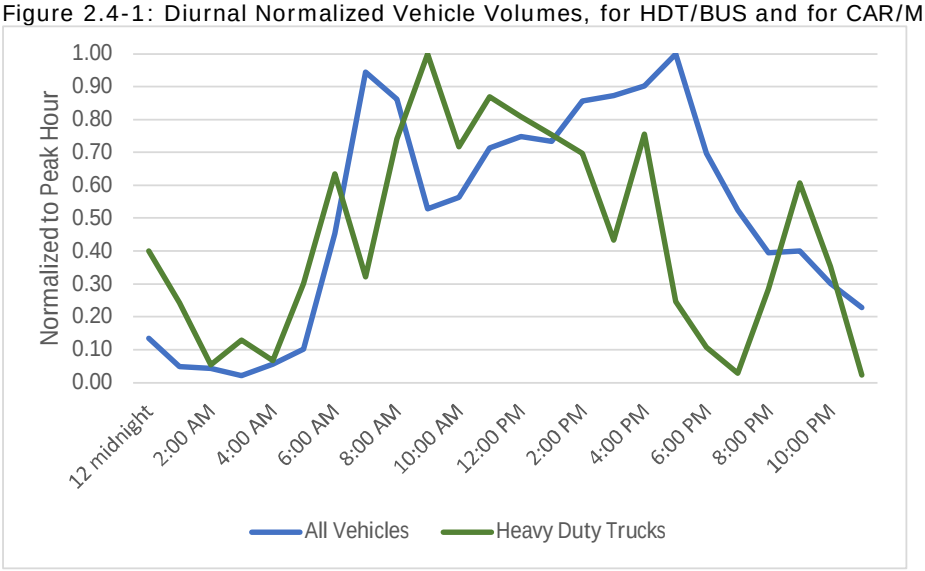
[1] Release height = (1.7 x vehicle height) / 2. Heavy-duty truck and bus vehicle height was set to 3 m; car and medium-duty vehicle height was set to 2 m.

[2] Surface streets were modeled with an equivalent 3 lanes (3.7 m standard lane width), plus 6 m for the mixing zone, for a total of 17.1 meters. Highways were modeled based on the actual number of lanes, plus 6 m for the mixing zone. Initial Lateral Dimension is divided by 2.15 consistent with the USEPA AERMOD User's Guide.

[3] Initial Vertical Dimension = (1.7 x vehicle height) / 2.15.

The diurnal patterns used for HDT/BUS vehicles and CAR/MDT vehicles are shown below (All Vehicles was used to represent CAR and MDT travel and Heavy Duty Trucks was used to represent TRK and BUS categories). These diurnal patterns are consistent with past citywide roadway modeling runs, and were derived from the EMFAC model.

Figure 2.4-1: Diurnal Normalized Vehicle Volumes, for HDT/BUS and for CAR/MDT Vehicle Groups



2.5 Risk Characterization and Exposure Assumptions

The Methodology Report discusses the assumptions related to risk characterization and exposure assumptions utilized in this roadway modeling analysis. Cancer risk estimates incorporate variable emission rates over the assumed 30-year exposure duration, noting the emission rates were held constant after year 2050, as discussed in Section 2.2. Refer to the Methodology Report for details of the exposure parameters used, assuming a 30-year residential exposure across all receptors.

3 Health Risk Results

3.1 2020, 2035 Midpoint, and 2050 Baseline Conditions

Modeled cancer risk and $PM_{2.5}$ concentrations from roadway sources for years 2020, 2035 midpoint conditions, and 2050 baseline are shown below. 2020 model results are presented from the San Francisco Citywide HRA.[7]

While overall VMT does increase in future years, cancer risk contributions in 2035 midpoint baseline and 2050 baseline conditions drop substantially relative to 2020 primarily due to changes in emission factors as a result of vehicle fleet turnover, regulation, and EMFAC model updates. The average cancer risk from roadway sources in 2020 is 64 in a million, as compared to an average of 12 in a million in the 2035 midpoint baseline and 8.3 in a million in the 2050 baseline. $PM_{2.5}$ concentrations do not see as substantial of a drop, and in fact increase on average between 2035 and 2050, as they are largely driven by brakewear, tirewear, and fugitive dust emissions that are tied more directly to VMT rather than exhaust emissions that are tied to vehicle characteristics such as fuel type, engine efficiency, and emission controls. The average $PM_{2.5}$ concentration from roadway sources in 2020 is 1.1 $\mu g/m^3$, as compared to an average of 0.78 $\mu g/m^3$ in the 2035 midpoint baseline and 0.80 $\mu g/m^3$ in the 2050 baseline.

EMFAC model updates between the 2020 modeling conducted as part of the San Francisco Citywide HRA (utilizing EMFAC2014) and the 2035 and 2050 modeling (utilizing EMFAC2021) reflect considerable changes to the model including improved data sources and the adoption of several emission reducing regulations. The update from EMFAC2014 to EMFAC2017 incorporated the first updates to running and starting emissions rates since EMFAC2000, using the most recent data at the time of model development from the USEPA and CARB.[8] Additionally, from EMFAC2017 to EMFAC2021, particulate matter from brakewear was updated to no longer rely on limited data collected from 2000-2003. Additionally, motorcycle emissions were updated for the first time since 2000.[9] Such data improvements demonstrate two decades of technological advancements to vehicle emissions, resulting in many emission factors being reduced by a considerable margin. Perhaps an even more substantial difference between the 2020 modeling and the 2035/2050 modeling is how increasingly ambitious regulations have been integrated into EMFAC's forecasting. EMFAC2021 includes projections relating to recently adopted policies including updates to CARB's heavy-duty vehicle warranty, the Innovative Clean Transit regulation, the Advanced Clean Truck regulation, and California's Framework Agreements on Clean Cars. Under these regulations, vehicles are expected to meet stringent emissions-related targets and deadlines, many of which are before 2035 and thus are reflected in both the 2035/2050 baseline modeling.

[7] SFDPH. 2020. San Francisco Citywide Health Risk Assessment: Technical Support Documentation. Available online at: https://www.sfdph.org/dph/files/EHSdocs/AirQuality/Air_Pollutant_Exposure_Zone_Technical_Documentation_2020.pdf

[8] CARB. 2018. EMFAC2017 Volume III- Technical Documentation. Available online at: https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf

[9] CARB. 2021. EMFAC2021 Volume III Technical Document. Available online at: https://ww2.arb.ca.gov/sites/default/files/2021-08/emfac2021_technical_documentation_april2021.pdf

Figure 3.1A. 2020 Traffic-Related Cancer Risk Contributions

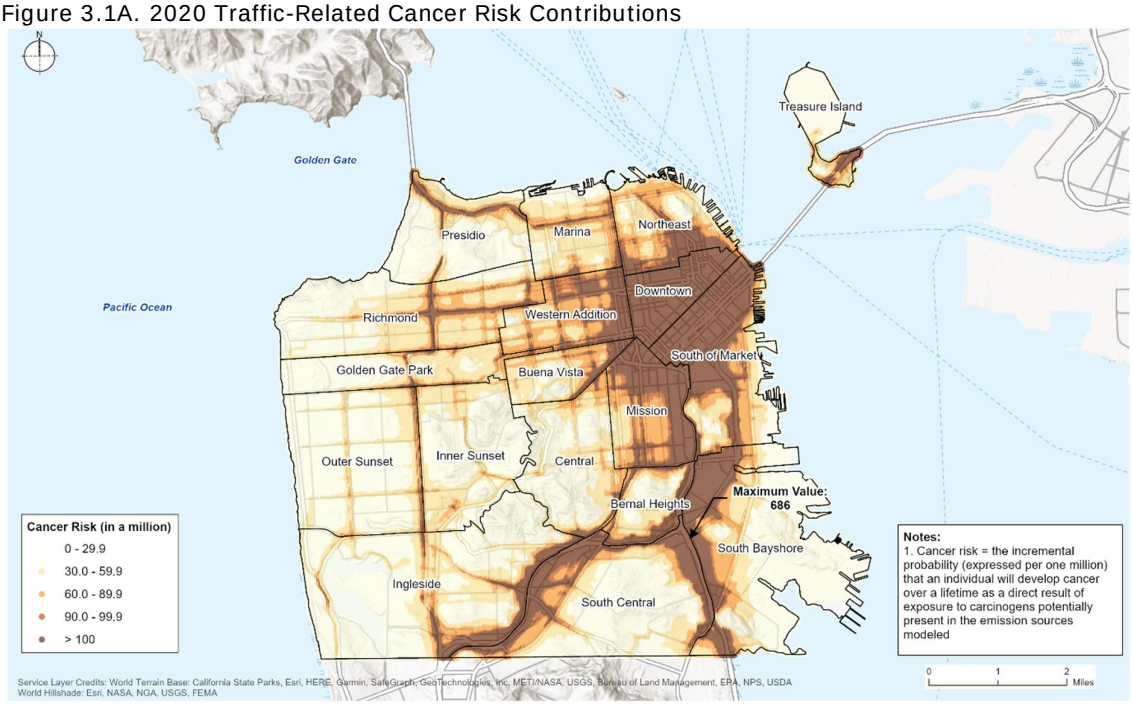


Figure 3.1B. 2035 Midpoint Conditions Traffic-Related Cancer Risk Contributions

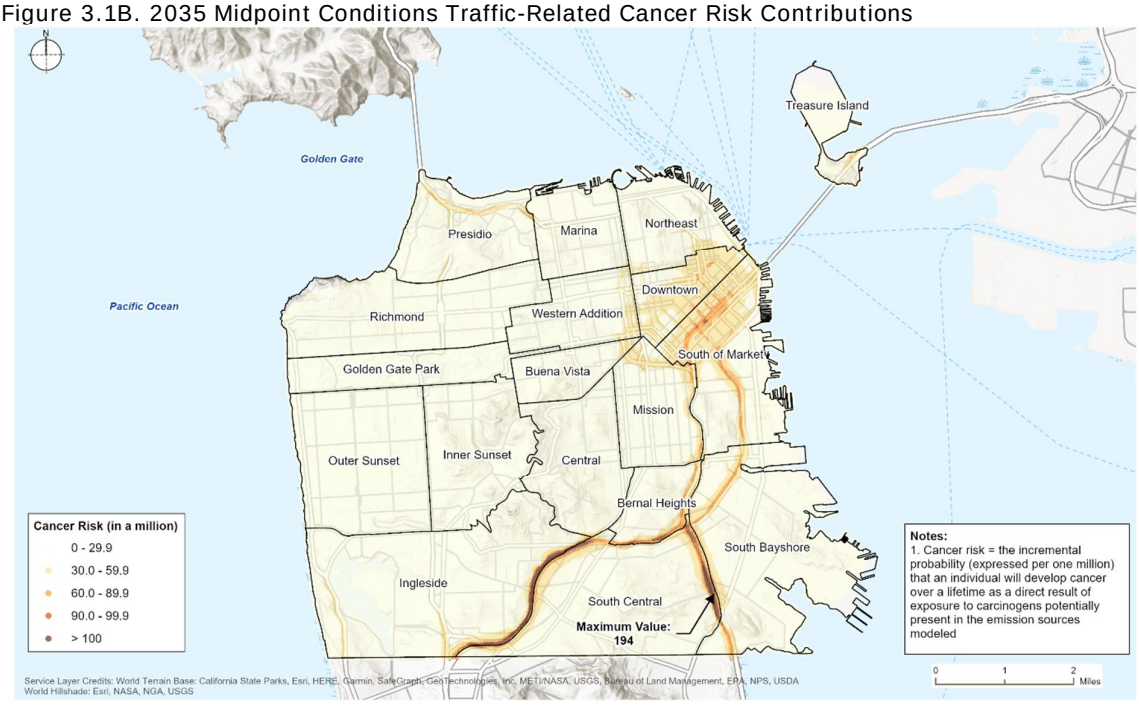


Figure 3.1C. 2050 Baseline Traffic-Related Cancer Risk Contributions



Figure 3.1D. 2020 Traffic-Related Annual Average $PM_{2.5}$ Contributions

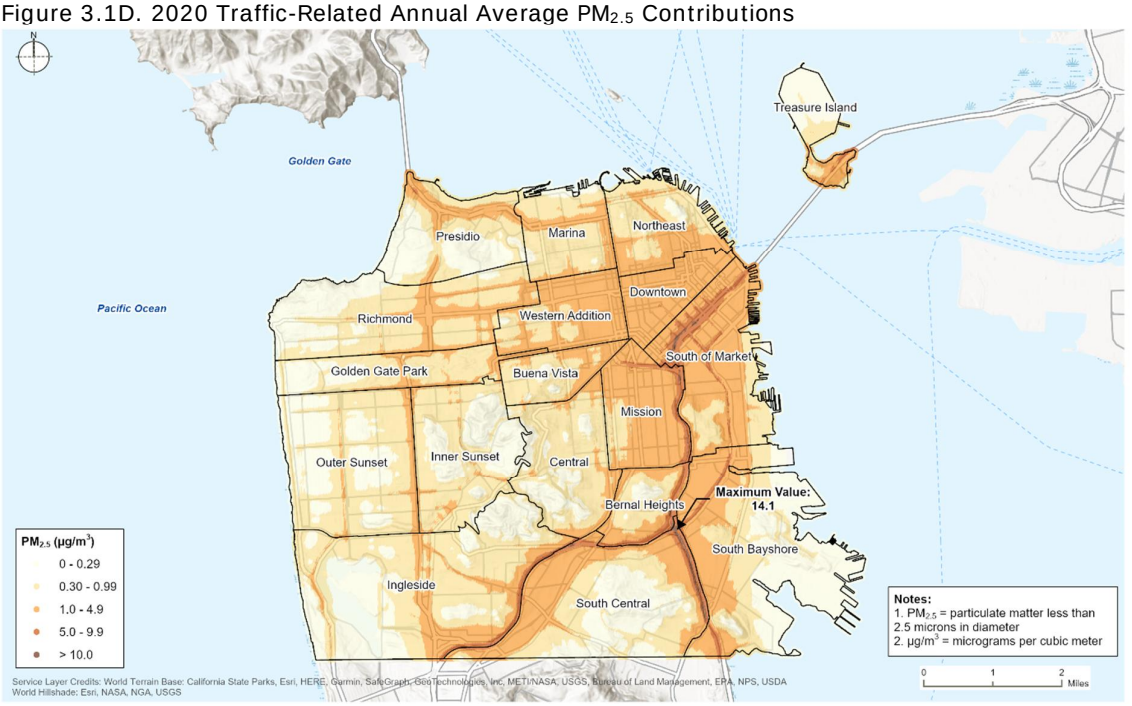


Figure 3.1E. 2035 Midpoint Conditions Traffic-Related Annual Average $PM_{2.5}$ Contributions

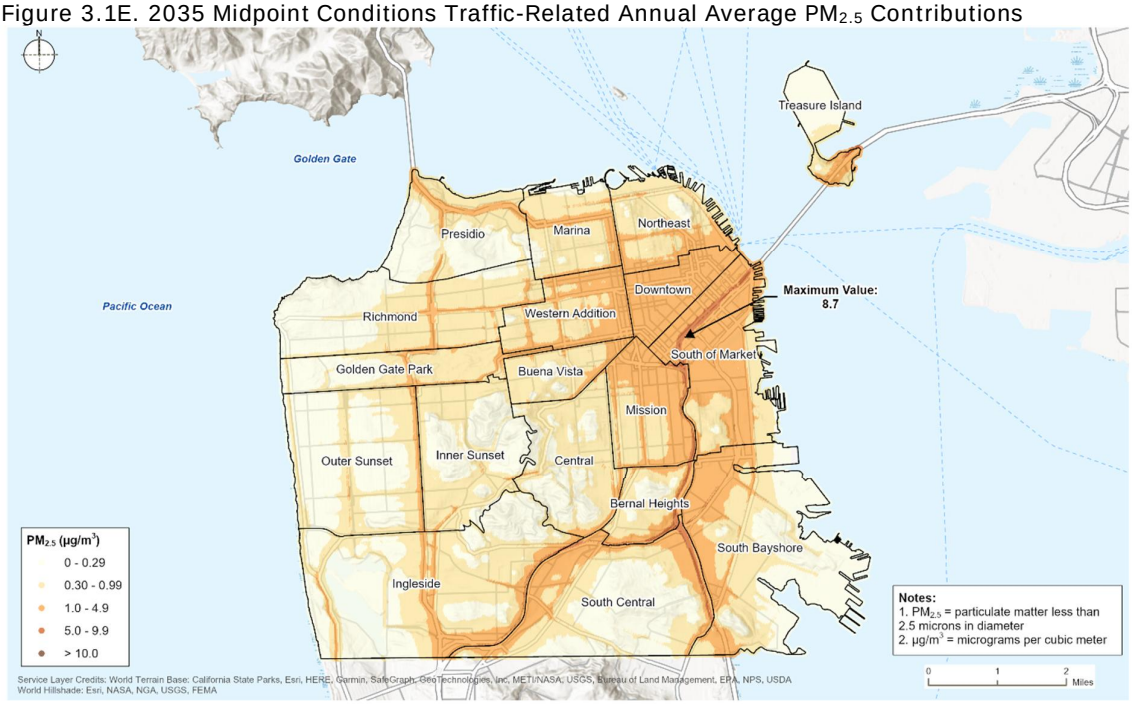
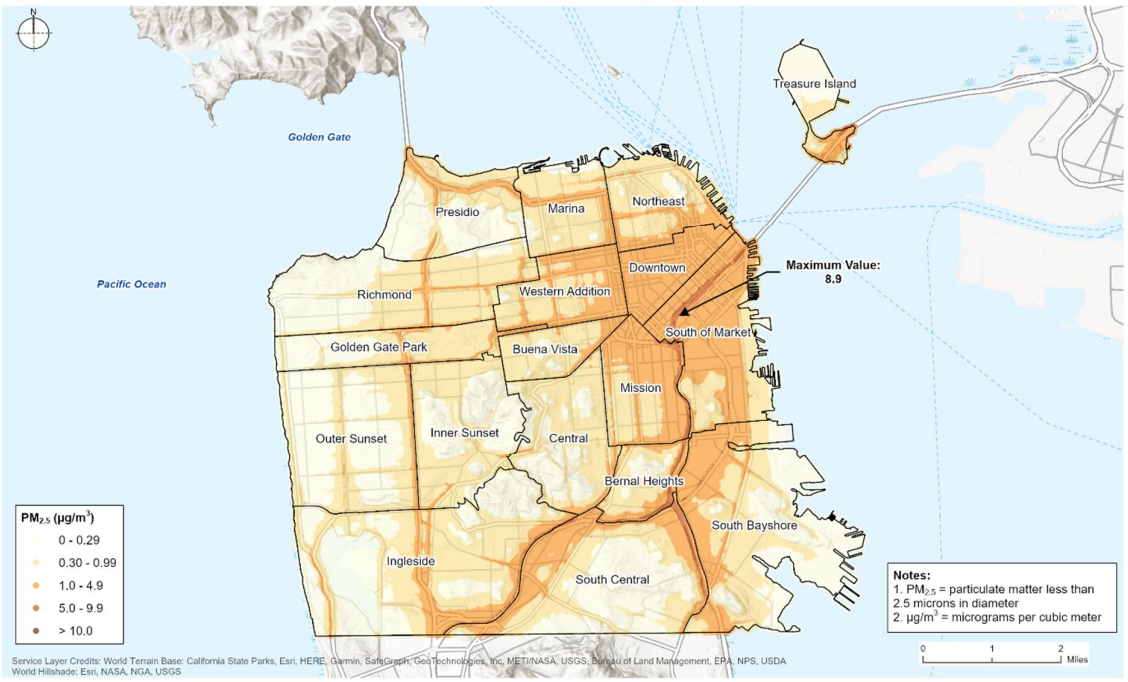


Figure 3.1F. 2050 Baseline Traffic-Related Annual Average $PM_{2.5}$ Contributions



3.2 Plan Bay Area

The modeled changes in cancer risk and $PM_{2.5}$ concentrations from roadway sources for Plan Bay Area in 2035 and 2050, as compared to 2035 midpoint conditions and the 2050 baseline, respectively, are shown below.

The pattern of changes across the City and County of San Francisco generally align with the comparison of average daily traffic (ADT) counts, as shown in Appendix A. $PM_{2.5}$ concentrations in particular, which are driven largely by changes in VMT, align closely with ADT changes, while cancer risks may sometimes show alternate patterns given the reliance on details of vehicle travel including vehicle types, speeds, etc.

As shown in Figure 3.2A, potential cancer risk contributions from roadway sources increase by a maximum of 31.3 in a million and decrease by up to 23.7 in a million, with an average change of 0.64 in a million for Plan Bay Area 2035 as compared to 2035 midpoint conditions. As shown in Figure 3.2B, $PM_{2.5}$ concentrations from roadway sources increase by a maximum of 0.73 µg/m^3 and decrease by up to 0.24 µg/m^3, with an average change of 0.031 µg/m^3 for Plan Bay Area 2035 as compared to 2035 midpoint conditions.

Changes by Planning District for Plan Bay Area 2035 as compared to 2035 midpoint conditions are summarized in Tables 3.2-1 and 3.2-2 below.

In the Plan Bay Area 2035 modeling, there are four roadways where the change in cancer risk is 10 in a million or greater as the roadways cross the county line (see Figure 3.2A): Highway 101 as it approaches the southern edge of the South Bayshore Planning District, Highway 280 as it approaches the southern edge of the Ingleside and South Central Planning Districts, Skyline Boulevard as it approaches the southern edge of the Ingleside Planning District, and Highway 1 as it approaches the southern edge of the Ingleside and South Central Planning Districts. As such, similar impacts are expected to occur as traffic continues to travel along these roadways. As derived from roadway segments within 1 km of the southern county line, the change in cancer risk remains at levels above 10 in a million for up to 118 meters (386 feet) from Highway 101, up to 75 meters (246 feet) from Highway 280, up to 42 meters (140 feet) from Skyline Boulevard, and up to 63 meters (208 feet) from Highway 1.

In the Plan Bay Area 2035 modeling, there are two roadways where the change in $PM_{2.5}$ concentrations are 0.3 µg/m^3 or greater as the roadways cross the county line (see Figure 3.2B): Highway 101 as it approaches the southern edge of the South Bayshore Planning District, and Highway 280 as it approaches the southern edge of the Ingleside and South Central Planning Districts. As such, similar impacts are expected to occur as traffic continues to travel along these roadways. As derived from roadway segments within 1 km of the southern county line, the change in $PM_{2.5}$ concentration remains at levels above 0.3 µg/m^3 for up to 82 meters (270 feet) from Highway 101, and up to 67 meters (2184 feet) from Highway 280.

Figure 3.2A. Plan Bay Area 2035: Change in Traffic-related Cancer Risk from 2035 Midpoint Conditions

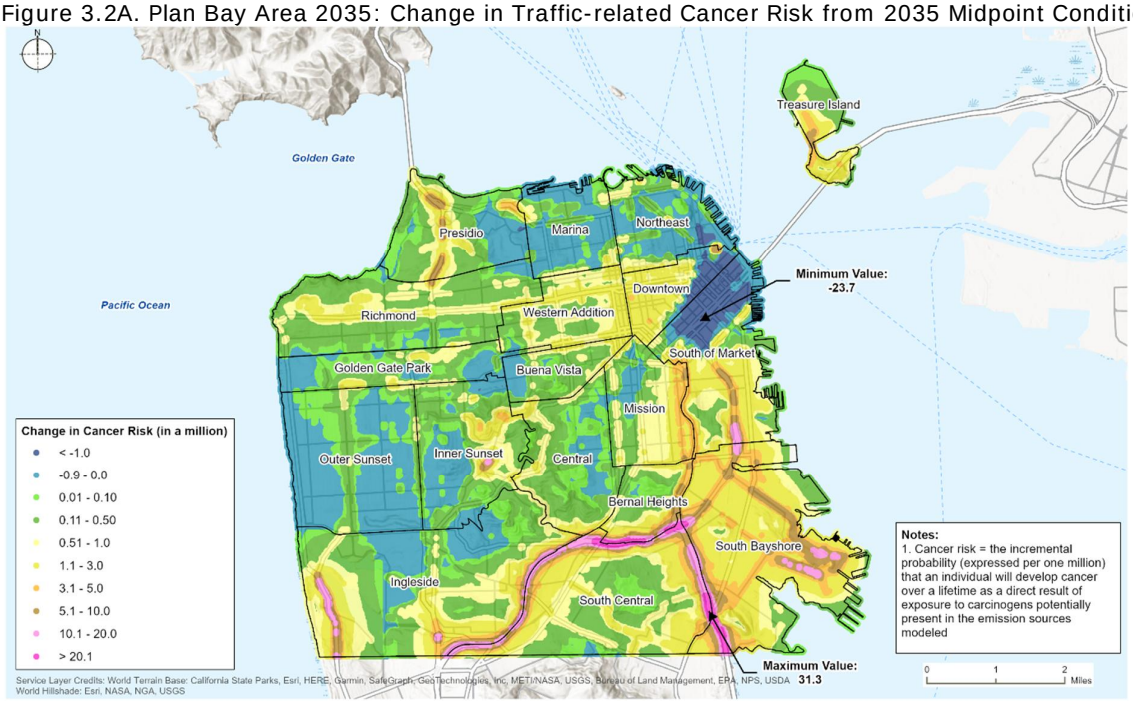


Table 3.2-1. Plan Bay Area 2035: Change in Traffic-Related Cancer Risk (in a million) from 2035 Midpoint Conditions, by Planning District

Planning District	Minimum	Maximum	Mean
Bernal Heights	-0.42	24.5	1.7
Buena Vista	-1.4	1.8	0.065
Central	-0.53	4.8	0.17
Downtown	-8.3	9.8	0.075
Golden Gate Park	-2.0	2.1	0.023
Ingleside	-1.1	14.5	0.71
Inner Sunset	-3.1	10.3	0.13
Marina	-2.9	1.9	-0.18
Mission	-2.3	5.4	0.61
Northeast	-3.2	5.2	-0.27
Outer Sunset	-0.44	1.3	-0.044
Presidio	-3.5	9.6	0.31
Richmond	-1.1	5.6	0.24
South Bayshore	-0.088	28.3	2.3
South Central	-1.6	31.3	1.8
South of Market	-23.7	15.4	-0.13
Treasure Island	-0.44	5.4	0.71
Western Addition	-2.9	2.9	0.56

Figure 3.2B. Plan Bay Area 2035: Change in Traffic-Related $PM_{2.5}$ Contributions from 2035 Midpoint Conditions

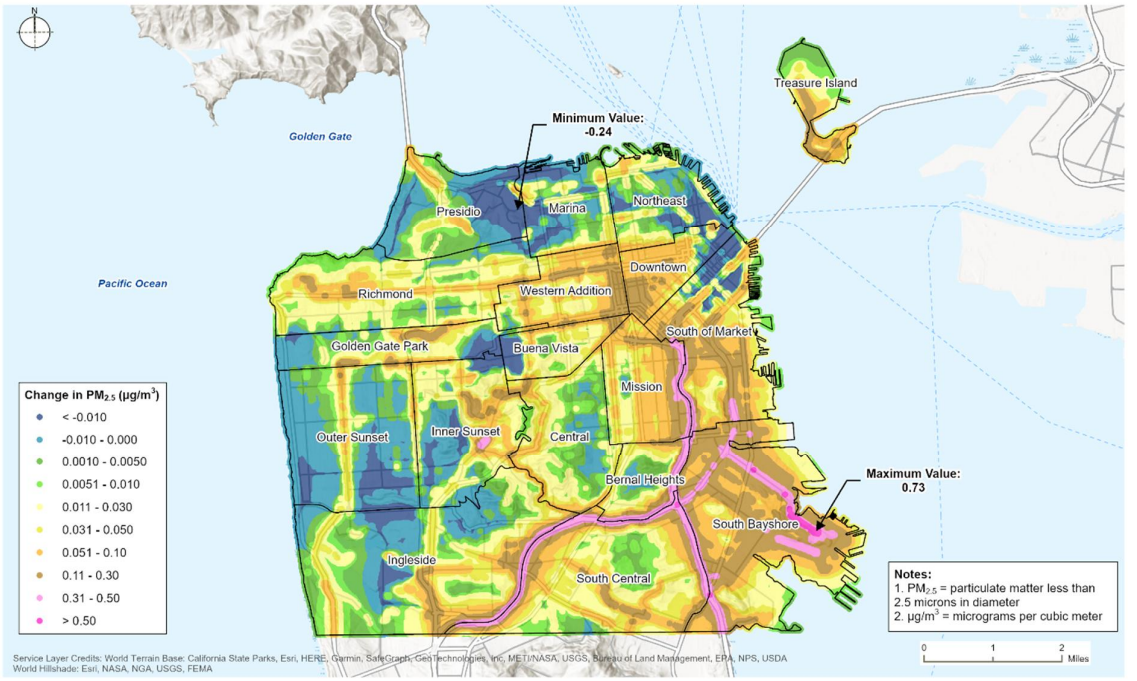


Table 3.2-2. Plan Bay Area 2035: Change in Traffic-Related $PM_{2.5}$ Concentration (µg/m^3) from 2035 Midpoint Conditions, by Planning District

Planning District	Minimum	Maximum	Mean
Bernal Heights	-0.025	0.50	0.057
Buena Vista	-0.12	0.15	0.010
Central	-0.031	0.18	0.012
Downtown	-0.11	0.17	0.043
Golden Gate Park	-0.12	0.18	0.010
Ingleside	-0.094	0.45	0.017
Inner Sunset	-0.15	0.41	0.010
Marina	-0.16	0.078	-0.0077
Mission	-0.024	0.48	0.069
Northeast	-0.14	0.087	-0.0058
Outer Sunset	-0.045	0.14	-0.0032
Presidio	-0.24	0.10	-0.0078
Richmond	-0.056	0.17	0.014
South Bayshore	-0.036	0.73	0.10
South Central	-0.041	0.51	0.056
South of Market	-0.16	0.44	0.049
Treasure Island	-0.012	0.20	0.033
Western Addition	-0.043	0.18	0.047

As shown in Figure 3.2C, potential cancer risk contributions from roadway sources increase by a maximum of 43.3 in a million and decrease by up to 2.3 in a million, with an average change of 1.0 in a million for Plan Bay Area 2050 as compared to 2050 baseline conditions. As shown in Figure 3.2D, $PM_{2.5}$ concentrations from roadway sources increase by a maximum of 0.73 µg/m^3 and decrease by up to 0.21 µg/m^3, with an average change of 0.077 µg/m^3 for Plan Bay Area 2050 as compared to 2050 baseline conditions.

Changes by Planning District for Plan Bay Area 2050 as compared to 2050 baseline conditions are summarized in Tables 3.2-3 and 3.2-4 below.

In the Plan Bay Area 2050 modeling, there is one roadway where the change in cancer risk is 10 in a million or greater as the roadway crosses the county line (see Figure 3.2C): Highway 280 as it approaches the southern edge of the Ingleside and South Central Planning Districts. As such, similar impacts are expected to occur as traffic continues to travel along this roadway. As derived from roadway segments within 1 km of the southern county line, the change in cancer risk remains at levels above 10 in a million for up to 156 meters (512 feet) from Highway 280.

In the Plan Bay Area 2050 modeling, there are three roadways where the change in $PM_{2.5}$ concentrations are 0.3 µg/m^3 or greater as the roadways cross the county line (see Figure 3.2D): Highway 101 as it approaches the southern edge of the South Bayshore Planning District, Highway 280 as it approaches the southern edge of the Ingleside and South Central Planning Districts, and Highway 1 as it approaches the southern edge of the Ingleside Planning District. As such, similar impacts are expected to occur as traffic continues to travel along those roadways. As derived from roadway segments within 1 km of the southern county line, the change in $PM_{2.5}$ concentration remains at levels above 0.3 µg/m^3 for up to 99 meters (324 feet) from Highway 101, up to 101 meters (3330 feet) from Highway 280, and up to 58 meters (189 feet) from Highway 1.

Figure 3.2C. Plan Bay Area 2050: Change in Traffic-related Cancer Risk from 2050 Baseline Conditions

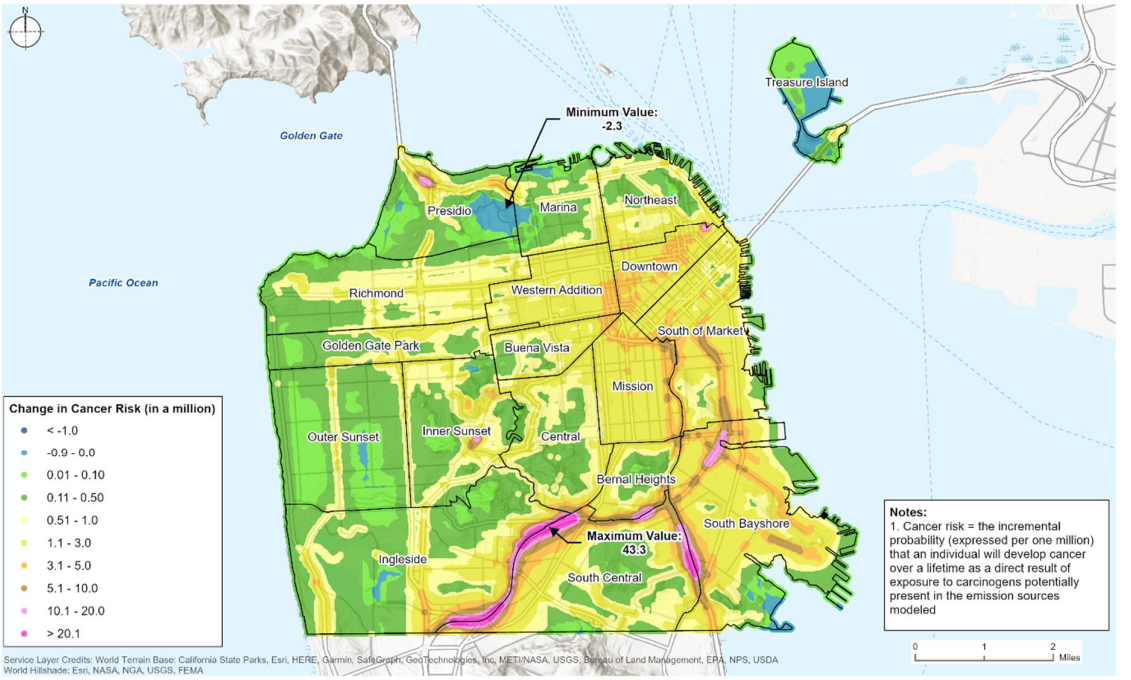


Table 3.2-3. Plan Bay Area 2050: Change in Traffic-Related Cancer Risk (in a million) from 2050 Baseline, by Planning District

Planning District	Minimum	Maximum	Mean
Bernal Heights	-1.7	19.0	1.3
Buena Vista	-0.15	5.0	0.76
Central	0.046	8.1	0.64
Downtown	-0.0049	14.1	2.3
Golden Gate Park	0.0088	2.3	0.45
Ingleside	-0.35	37	0.93
Inner Sunset	-1.6	10.1	0.44
Marina	-1.3	3.7	0.30
Mission	0.35	6.5	1.9
Northeast	-0.31	11.6	0.64
Outer Sunset	-0.13	2.2	0.16
Presidio	-2.3	13.4	0.32
Richmond	-0.40	2.5	0.46
South Bayshore	-0.83	30.1	1.7
South Central	-0.11	43.3	2.4
South of Market	-1.6	10.0	1.5
Treasure Island	-1.2	1.0	-0.057
Western Addition	0.13	4.0	1.4

Figure 3.2D. Plan Bay Area 2050: Change in Traffic-Related $PM_{2.5}$ Contributions from 2050 Baseline Conditions

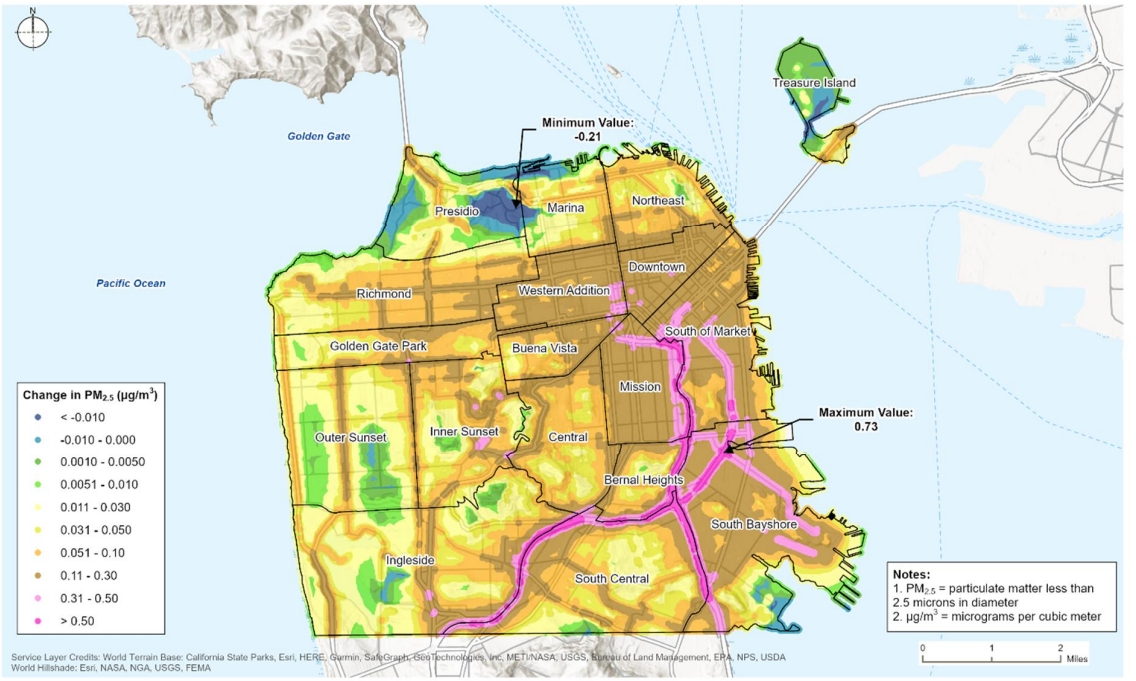


Table 3.2-4. Plan Bay Area 2050: Change in Traffic-Related $PM_{2.5}$ Concentration ($\mu g/m^3$) from 2050 Baseline, by Planning District

Planning District	Minimum	Maximum	Mean
Bernal Heights	0.0068	0.68	0.12
Buena Vista	-0.0082	0.33	0.079
Central	0.0025	0.33	0.060
Downtown	0.034	0.31	0.17
Golden Gate Park	0.0018	0.31	0.059
Ingleside	-0.050	0.64	0.045
Inner Sunset	-0.13	0.49	0.049
Marina	-0.13	0.17	0.025
Mission	0.039	0.66	0.19
Northeast	-0.018	0.25	0.053
Outer Sunset	-0.017	0.30	0.023
Presidio	-0.21	0.12	0.0040
Richmond	-0.028	0.29	0.053
South Bayshore	-0.045	0.73	0.12
South Central	-0.016	0.73	0.092
South of Market	-0.0015	0.61	0.15
Treasure Island	-0.072	0.14	0.0045
Western Addition	0.015	0.35	0.14

3.3 Proposed Action

The modeled changes in cancer risk and $PM_{2.5}$ concentrations from roadway sources for the Proposed Action in 2035 and 2050, as compared to 2035 midpoint conditions and the 2050 baseline, respectively, are shown below.

The pattern of changes across the City and County of San Francisco generally align with the comparison of average daily traffic (ADT) counts, as shown in Appendix A. $PM_{2.5}$ concentrations in particular, which are driven largely by changes in VMT, align closely with ADT changes, while cancer risks may sometimes show alternate patterns given the reliance on details of vehicle travel including vehicle types, speeds, etc.

As shown in Figure 3.3A, potential cancer risk contributions from roadway sources increase by a maximum of 31.7 in a million and decrease by up to 19.5 in a million, with an average change of 0.63 in a million for the 2035 Proposed Action as compared to 2035 midpoint conditions. As shown in Figure 3.3B, $PM_{2.5}$ concentrations from roadway sources increase by a maximum of 0.54 µg/m^3 and decrease by up to 0.076 µg/m^3, with an average change of 0.035 µg/m^3 for the 2035 Proposed Action as compared to 2035 midpoint conditions.

Changes by Planning District for the 2035 Proposed Action as compared to 2035 midpoint conditions are summarized in Tables 3.3-1 and 3.3-2 below.

In the Proposed Action 2035 modeling, there are two roadways where the change in cancer risk is 10 in a million or greater as the roadways cross the county line (see Figure 3.3A): Highway 101 as it approaches the southern edge of the South Bayshore Planning District, and Highway 280 as it approaches the southern edge of the Ingleside and South Central Planning Districts. As such, similar impacts are expected to occur as traffic continues to travel along those roadways. As derived from roadway segments within 1 km of the southern county line, the change in cancer risk remains at levels above 10 in a million for up to 118 meters (386 feet) from Highway 101 and up to 68 meters (222 feet) from Highway 280.

In the Proposed Action 2035 modeling, there is one roadway where the change in $PM_{2.5}$ concentrations is 0.3 µg/m^3 or greater as the roadway crosses the county line (see Figure 3.3B): Highway 101 as it approaches the southern edge of the South Bayshore Planning District. As such, similar impacts are expected to occur as traffic continues to travel along this roadway. As derived from roadway segments within 1 km of the southern county line, the change in $PM_{2.5}$ concentration remains at levels above 0.3 µg/m^3 for up to 78 meters (257 feet) from Highway 101.

Figure 3.3A. Proposed Action 2035: Change in Traffic-related Cancer Risk from 2035 Midpoint Conditions

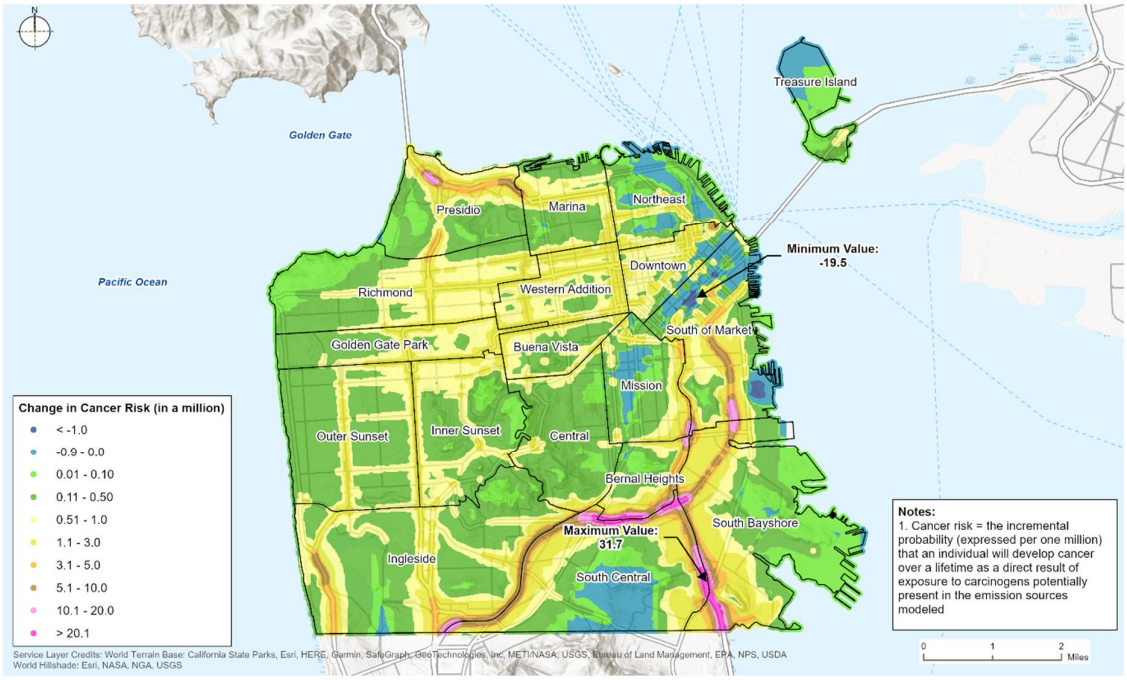


Table 3.3-1. Proposed Action 2035: Change in Traffic-Related Cancer Risk (in a million) from 2035 Midpoint Conditions, by Planning District

Planning District	Minimum	Maximum	Mean
Bernal Heights	-1.0	23.2	1.7
Buena Vista	-1.5	2.2	0.43
Central	-0.26	4.8	0.24
Downtown	-4.7	10.0	0.34
Golden Gate Park	0.064	2.7	0.54
Ingleside	-1.1	13.2	0.61
Inner Sunset	-0.22	2.8	0.37
Marina	-1.8	5.2	0.46
Mission	-2.1	11.4	0.35
Northeast	-1.7	7.3	0.064
Outer Sunset	0.070	2.4	0.34
Presidio	-0.19	11.1	0.65
Richmond	-0.31	3.2	0.44
South Bayshore	-0.52	27.3	1.1
South Central	-1.9	31.7	1.4
South of Market	-19.5	15.2	0.34
Treasure Island	-0.051	0.82	0.041
Western Addition	-2.6	2.4	0.72

Figure 3.3B. Proposed Action 2035: Change in Traffic-Related PM2.5 Contributions from 2035 Midpoint Conditions

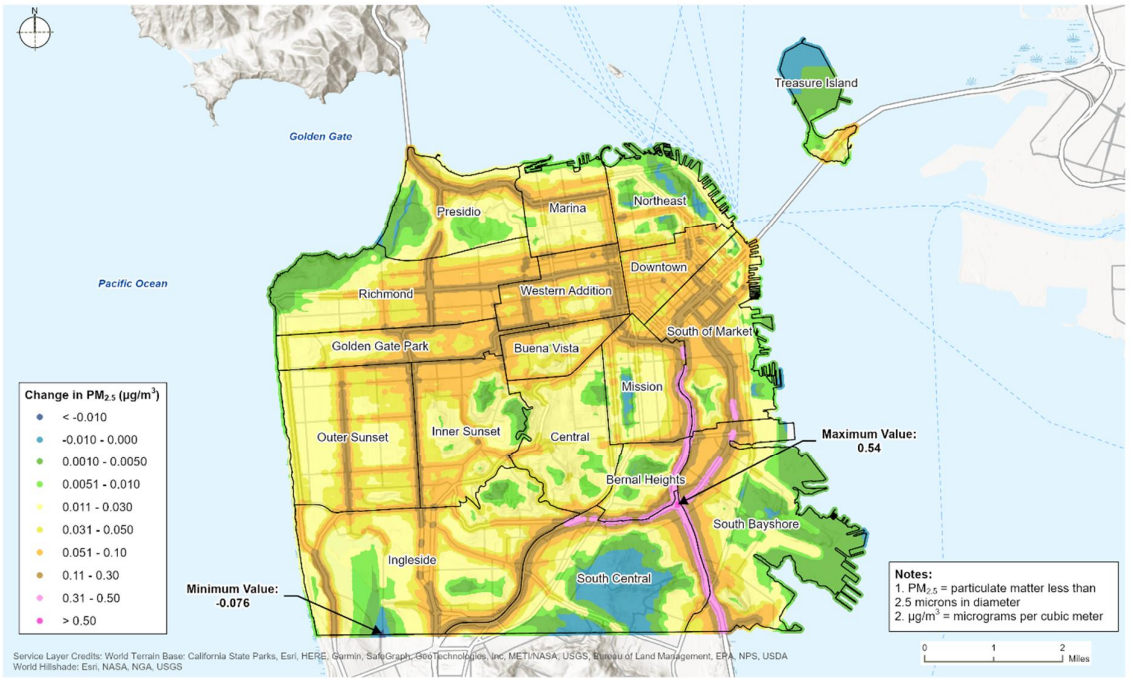


Table 3.3-2. Proposed Action 2035: Change in Traffic-Related $PM_{2.5}$ Concentration ($\mu g/m^3$) from 2035 Midpoint Conditions, by Planning District

Planning District	Minimum	Maximum	Mean
Bernal Heights	-0.0047	0.41	0.053
Buena Vista	0.0035	0.17	0.039
Central	-0.013	0.13	0.017
Downtown	-0.024	0.11	0.045
Golden Gate Park	0.0062	0.23	0.048
Ingleside	-0.076	0.29	0.028
Inner Sunset	0.0011	0.20	0.034
Marina	-0.012	0.26	0.032
Mission	-0.025	0.40	0.042
Northeast	-0.034	0.11	0.010
Outer Sunset	0.0070	0.23	0.033
Presidio	-0.021	0.24	0.024
Richmond	-0.017	0.20	0.035
South Bayshore	-0.023	0.45	0.037
South Central	-0.028	0.54	0.037
South of Market	-0.048	0.38	0.054
Treasure Island	-0.0013	0.073	0.0053
Western Addition	-0.010	0.20	0.061

As shown in Figure 3.3C, potential cancer risk contributions from roadway sources increase by a maximum of 38.9 in a million and decrease by up to 6.6 in a million, with an average change of 0.80 in a million for the Proposed Action as compared to 2050 baseline conditions. As shown in Figure 3.3D, $PM_{2.5}$ concentrations from roadway sources increase by a maximum of 0.52 µg/m^3 and decrease by up to 0.42 µg/m^3, with an average change of 0.053 µg/m^3 for the Proposed Action as compared to 2050 baseline conditions.

Changes by Planning District for the Proposed Action as compared to 2050 baseline conditions are summarized in Tables 3.3-3 and 3.3-4 below.

In the Proposed Action 2050 modeling, there are two roadways where the change in cancer risk is 10 in a million or greater as the roadways cross the county line (see Figure 3.3C): Highway 101 as it approaches the southern edge of the South Bayshore Planning District, and Highway 280 as it approaches the southern edge of the Ingleside and South Central Planning Districts. As such, similar impacts are expected to occur as traffic continues to travel along these roadways. As derived from roadway segments within 1 km of the southern county line, the change in cancer risk remains at levels above 10 in a million for up to 91 meters (299 feet) from Highway 101, and up to 152 meters (497 feet) from Highway 280.

In the Proposed Action 2050 modeling, there are three roadways where the change in $PM_{2.5}$ concentrations are 0.3 µg/m^3 or greater as the roadway crosses the county line (see Figure 3.3D): Highway 101 as it approaches the southern edge of the South Bayshore Planning District, Highway 280 as it approaches the southern edge of the Ingleside and South Central Planning Districts, and Highway 1 as it approaches the southern edge of the Ingleside and South Central Planning Districts. As such, similar impacts are expected to occur as traffic continues to travel along these roadways. As derived from roadway segments within 1 km of the southern county line, the change in $PM_{2.5}$ concentration remains at levels above 0.3 µg/m^3 for up to 74 meters (241 feet) from Highway 101, up to 50 meters (164 feet) from Highway 280, and up to 60 meters (196 feet) from Highway 1.

Figure 3.3C. Proposed Action 2050: Change in Traffic-related Cancer Risk from 2050 Baseline Conditions

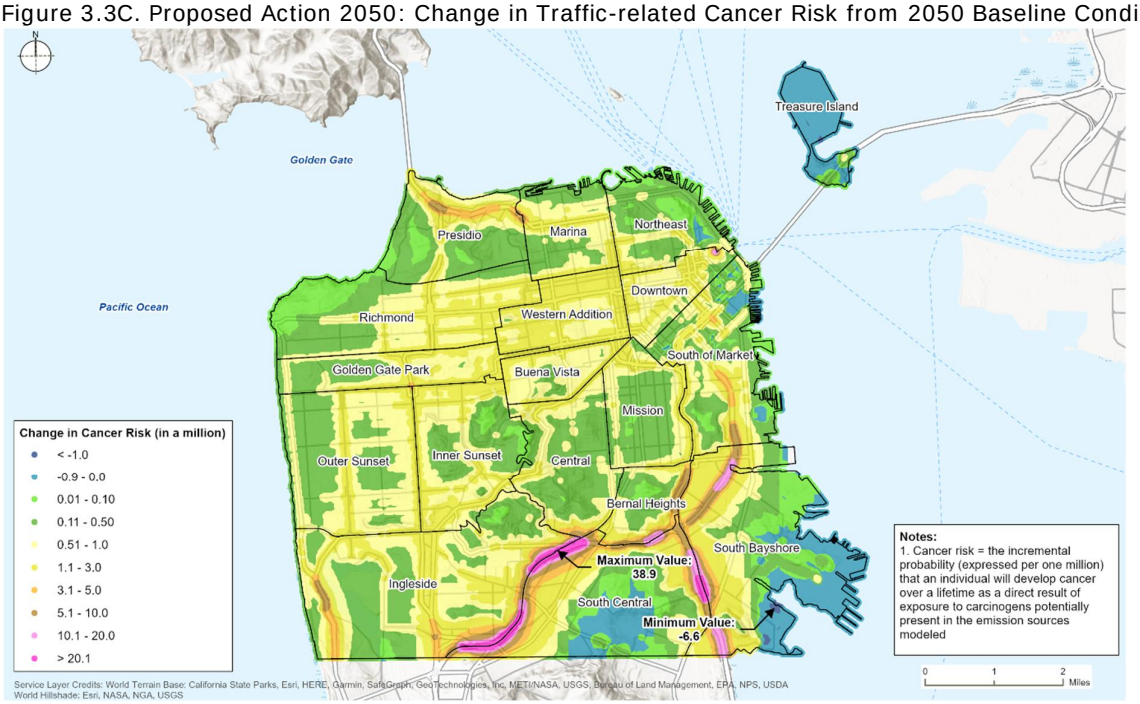


Table 3.3-3. Proposed Action 2050: Change in Traffic-Related Cancer Risk (in a million) from 2050 Baseline, by Planning District

Planning District	Minimum	Maximum	Mean
Bernal Heights	0.015	16.9	1.2
Buena Vista	0.032	2.1	0.65
Central	0.023	7.4	0.47
Downtown	-1.02	10.9	0.70
Golden Gate Park	0.105	3.1	0.67
Ingleside	-0.11	35.3	1.1
Inner Sunset	0.021	2.9	0.58
Marina	-0.055	5.1	0.54
Mission	-0.8	2.6	0.41
Northeast	-0.84	8.5	0.22
Outer Sunset	0.108	3.1	0.52
Presidio	0.01	8.4	0.57
Richmond	-0.02	2.8	0.52
South Bayshore	-6.6	29.4	0.9
South Central	-0.54	38.9	2.1
South of Market	-2.0	8.0	0.43
Treasure Island	-5.3	0.59	-0.30
Western Addition	-0.4	2.5	1.02

Figure 3.3D. Proposed Action 2050: Change in Traffic-Related PM2.5 Contributions from 2050 Baseline Conditions

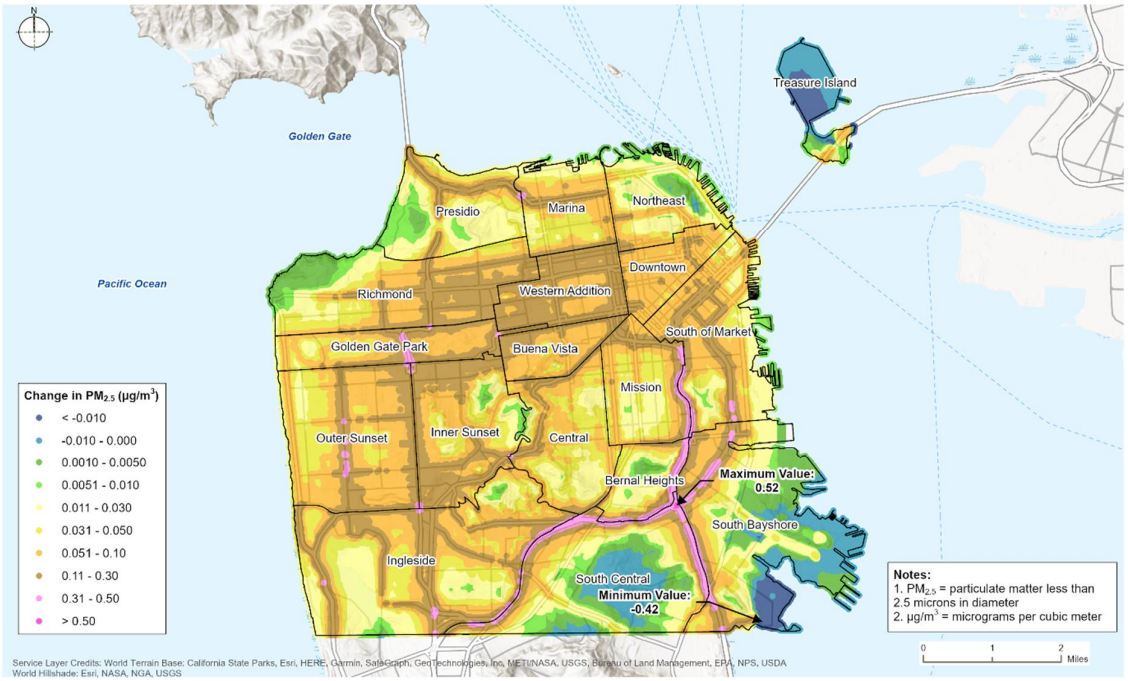


Table 3.3-4. Proposed Action 2050: Change in Traffic-Related $PM_{2.5}$ Concentration ($\mu g/m^3$) from 2050 Baseline, by Planning District

Planning District	Minimum	Maximum	Mean
Bernal Heights	-0.0031	0.42	0.061
Buena Vista	0.0075	0.24	0.072
Central	0.0029	0.31	0.043
Downtown	-0.018	0.13	0.060
Golden Gate Park	0.013	0.41	0.082
Ingleside	-0.010	0.37	0.058
Inner Sunset	0.0027	0.38	0.071
Marina	-0.0025	0.33	0.049
Mission	0.0014	0.40	0.059
Northeast	-0.030	0.12	0.020
Outer Sunset	0.015	0.40	0.069
Presidio	0.0013	0.31	0.033
Richmond	-0.00068	0.30	0.061
South Bayshore	-0.42	0.43	0.027
South Central	-0.023	0.52	0.041
South of Market	-0.024	0.37	0.059
Treasure Island	-0.33	0.095	-0.017
Western Addition	0.017	0.30	0.11

4 Totaled Modeled Cancer Risk and $PM_{2.5}$ Concentrations

Modeled cancer risk and $PM_{2.5}$ concentrations from roadway sources for years 2020, 2035 midpoint conditions, 2050 baseline, Proposed Action 2050, and Plan Bay Area 2050 are combined with modeled impacts from existing known sources of air pollution including permitted stationary sources, Caltrain passenger diesel locomotives, ships and harbor craft, and ferry boats. Modeled cancer risk and $PM_{2.5}$ concentrations from all sources other than roadway are reflective of the modeling performed under the 2020 San Francisco Citywide HRA, and do not reflect any changes in these emission sources that may occur in future years. Resulting total modeled cancer risk and $PM_{2.5}$ concentrations are shown in Appendix B. Total $PM_{2.5}$ concentrations shown also incorporate a background concentration of 7.8 $\mu g/m^3$, consistent with the 2020 San Francisco Citywide HRA.

5 Uncertainty Characterization

In any risk evaluation, a number of assumptions are made in order to estimate human exposure and to calculate potential risks. Please refer to the Methodology report for a discussion of uncertainties and how they apply to the results presented in this memorandum.

Of particular note is the sensitivity of modeled emissions and resulting risks to vehicle speeds. Two models contribute to the variations by speed incorporated into this analysis: the SF-CHAMP model and the EMFAC model. Average daily speeds are calculated from SF-CHAMP model outputs, which have their own uncertainties and limitations. The EMFAC model also outputs vehicle emission factors by speed bin, which have associated uncertainties.

In addition, when performing a regional model of this nature, there is additional uncertainty in the results presented near the physical boundaries of the model. This is due to the truncation of data and emission sources at the county line. In some cases, this may cause an overestimation of impacts near the model bounds if emissions from a full traffic link are condensed into a smaller truncated link, for example. Conversely, the receptors near the edge of the model may represent a less conservative estimate of potential risk as sources (roadway or other) from beyond the county line may impact receptors within the county. It is recognized that air dispersion of emissions into and out of the region evaluated does not end at the county line, and thus results near the edge of the model domain should be viewed with additional uncertainty.

APPENDIX A

AVERAGE DAILY TRAFFIC COMPARISONS

Figure A1. Average Daily Traffic Comparison: Plan Bay Area 2035 vs 2035 Midpoint Conditions

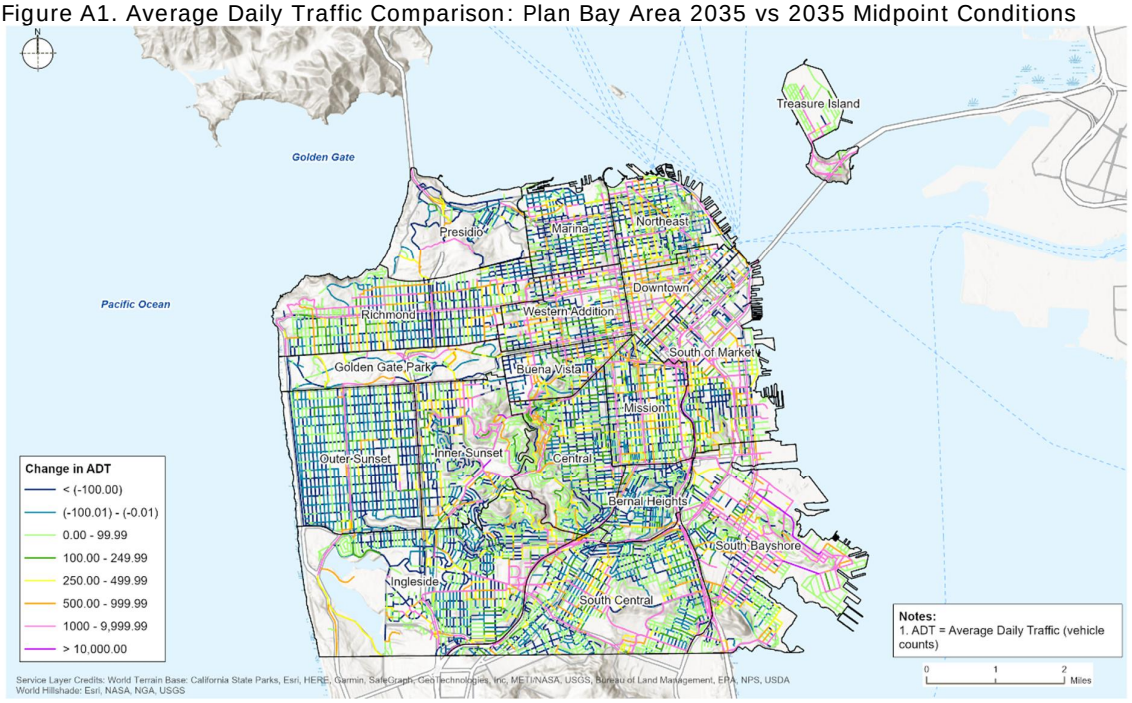


Figure A2. Average Daily Traffic Comparison: Plan Bay Area 2050 vs 2050 Baseline

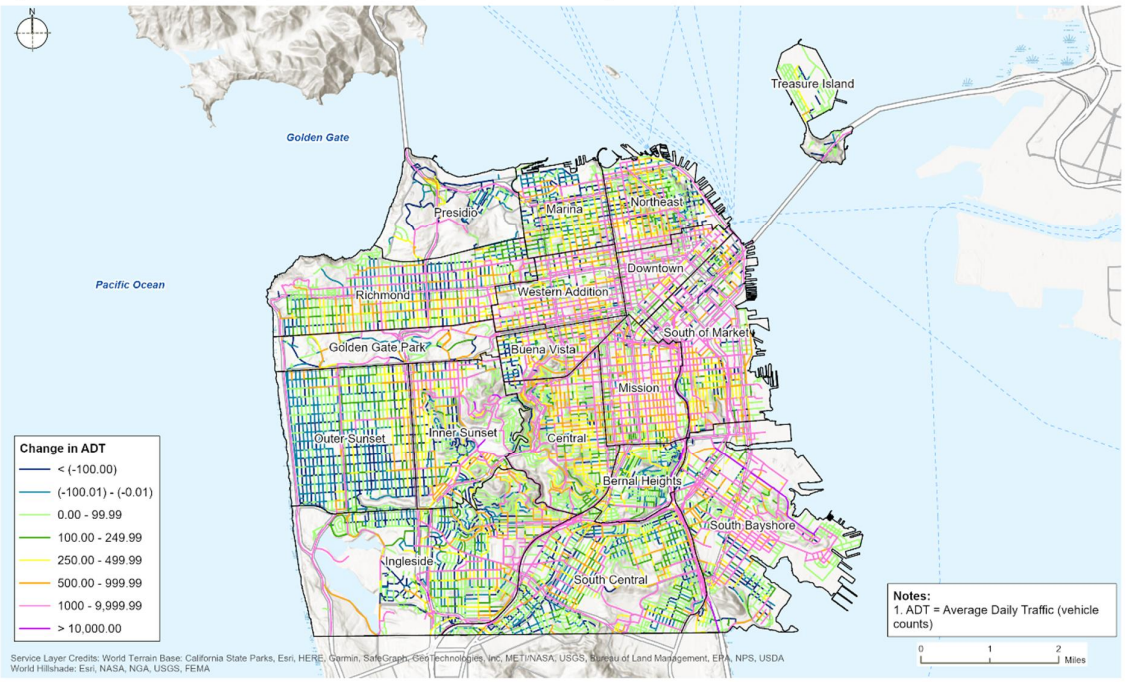


Figure A3. Average Daily Traffic Comparison: Proposed Action 2035 vs 2035 Midpoint Conditions

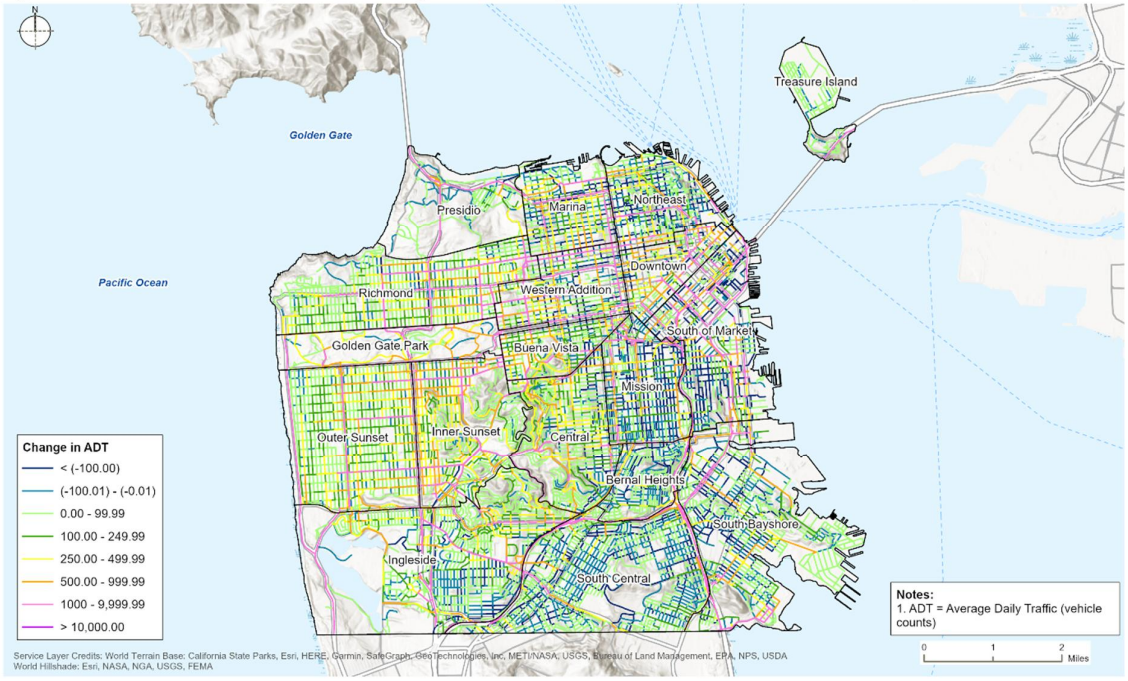
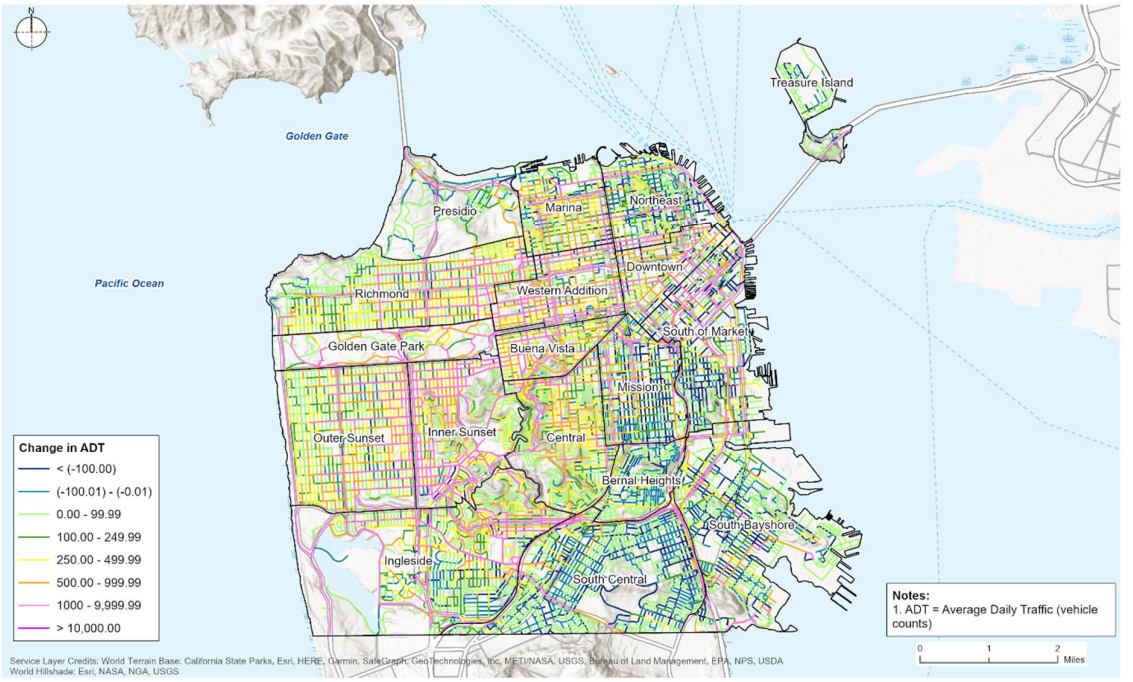


Figure A4. Average Daily Traffic Comparison: Proposed Action 2050 vs 2050 Baseline



APPENDIX B
TOTAL MODELED CANCER RISK AND $PM_{2.5}$ CONCENTRATIONS

2020, 2035 MIDPOINT CONDITIONS, 2050 BASELINE, PROPOSED ACTION 2050, AND PLAN BAY AREA 2050

Figure B1. Total Modeled Cancer Risk in 2020

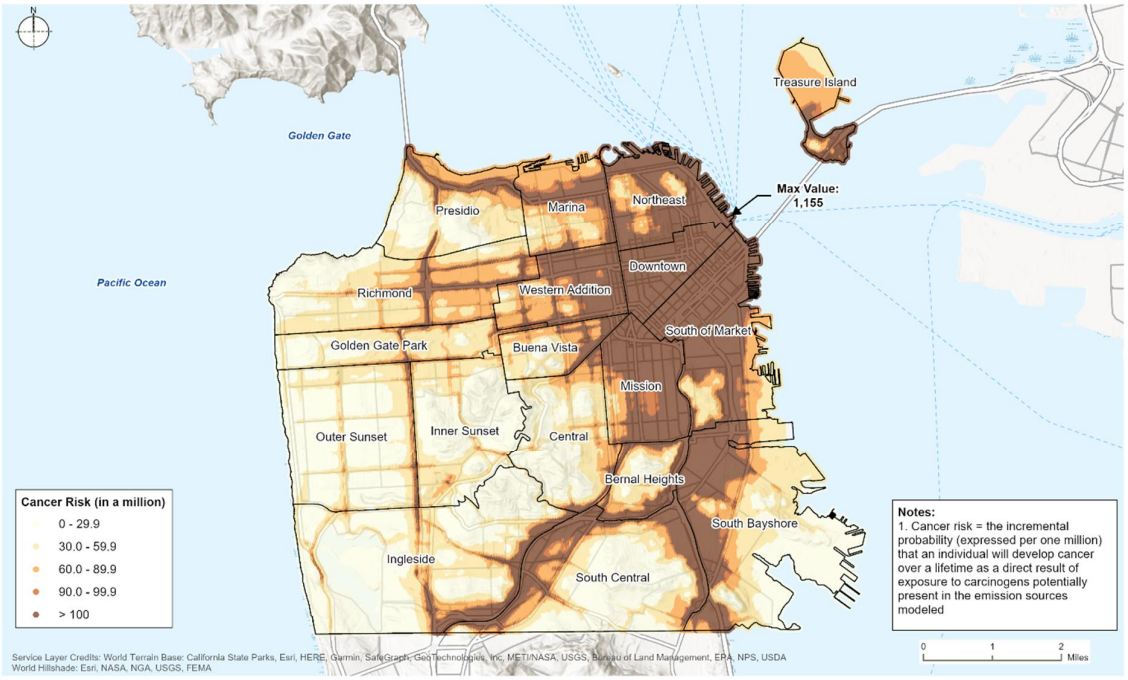


Figure B2. Total Annual Average $PM_{2.5}$ Concentrations (including Modeled Sources and Background) in 2020

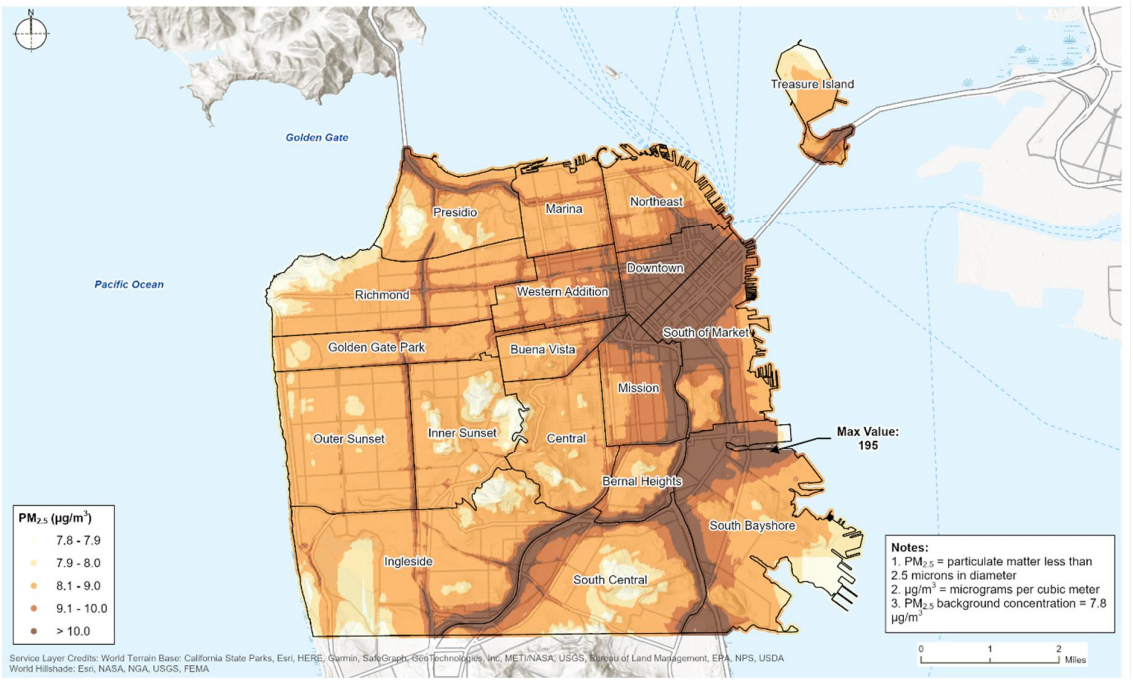


Figure B3. Total Modeled Cancer Risk in 2035 Midpoint Conditions

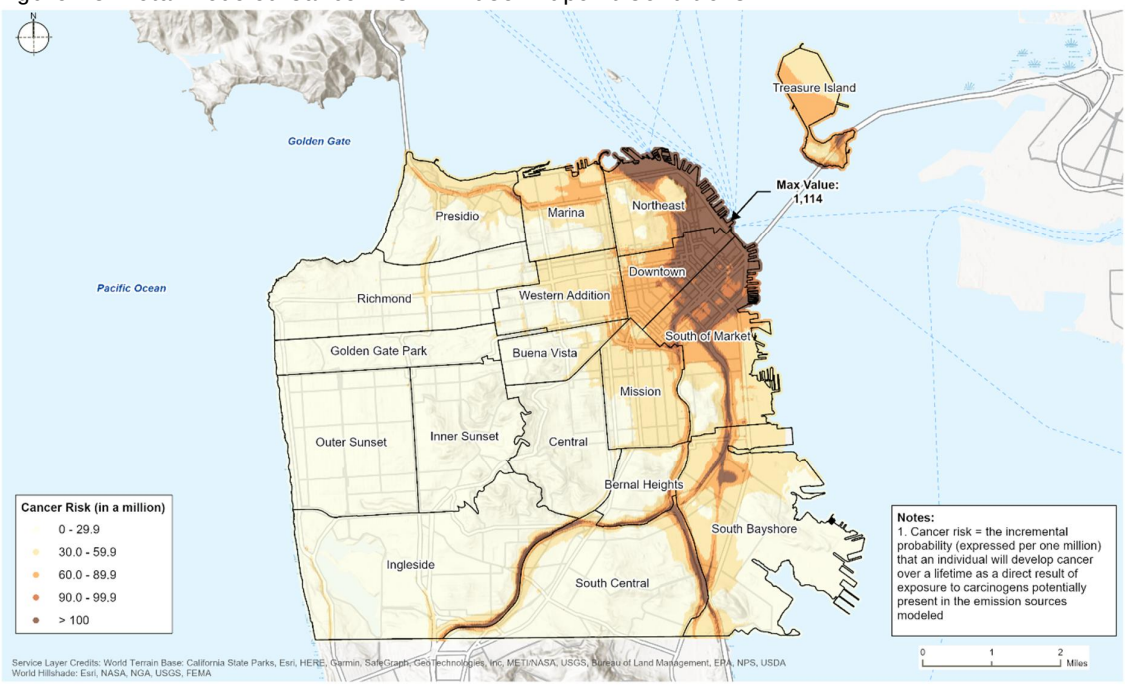


Figure B4. Total Annual Average $PM_{2.5}$ Concentrations (including Modeled Sources and Background) in 2035 Midpoint Conditions

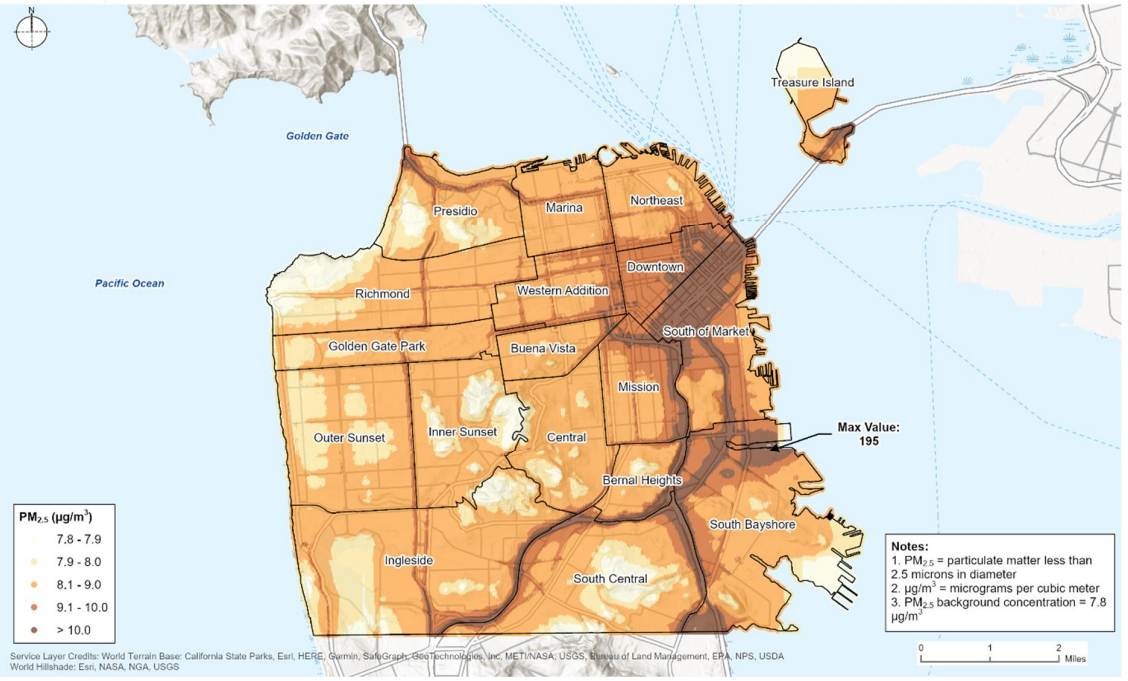


Figure B5. Total Modeled Cancer Risk in 2050 Baseline Conditions

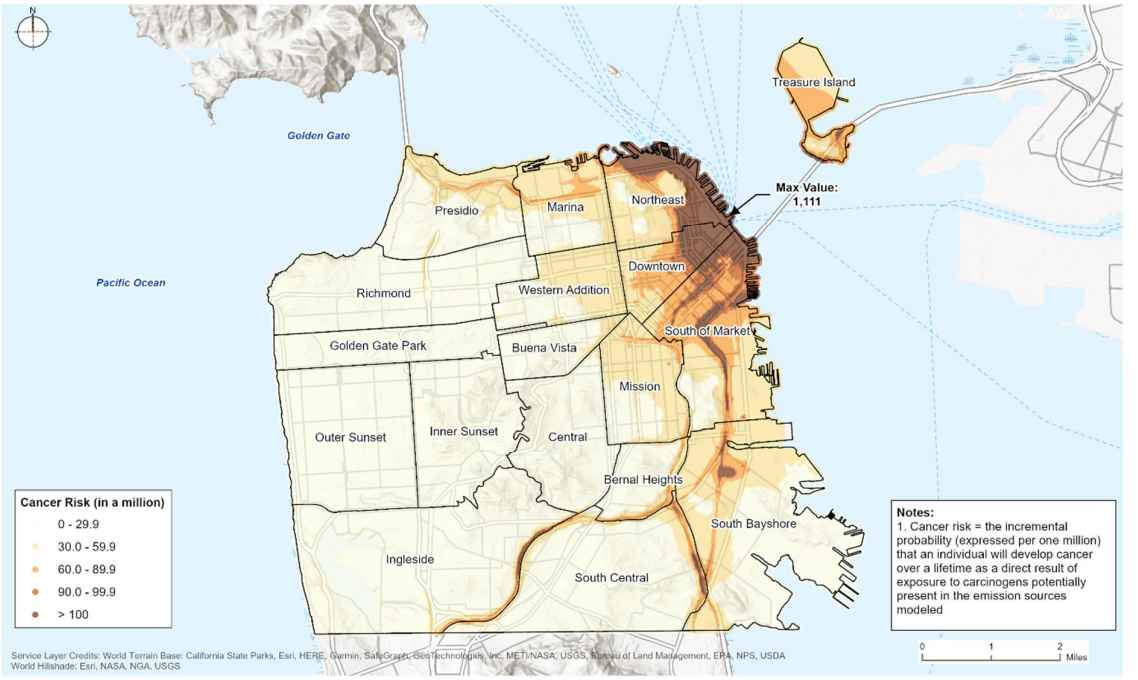


Figure B6. Total Annual Average $PM_{2.5}$ Concentrations (including Modeled Sources and Background) in 2050 Baseline Conditions

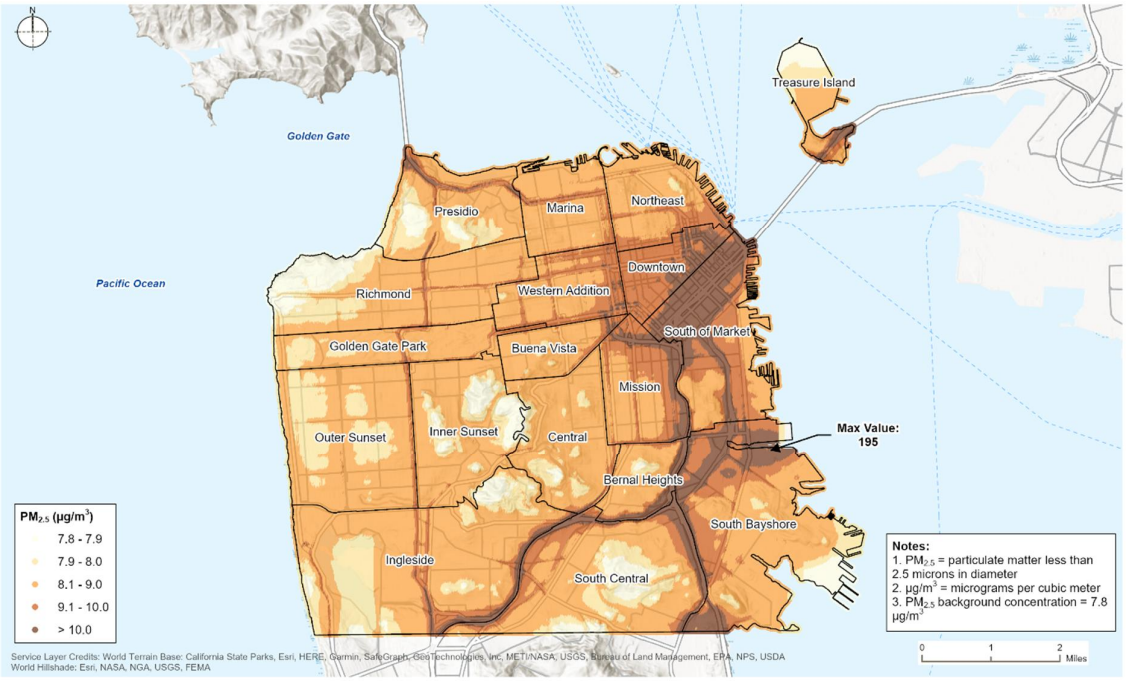


Figure B7. Total Modeled Cancer Risk in Proposed Action 2050

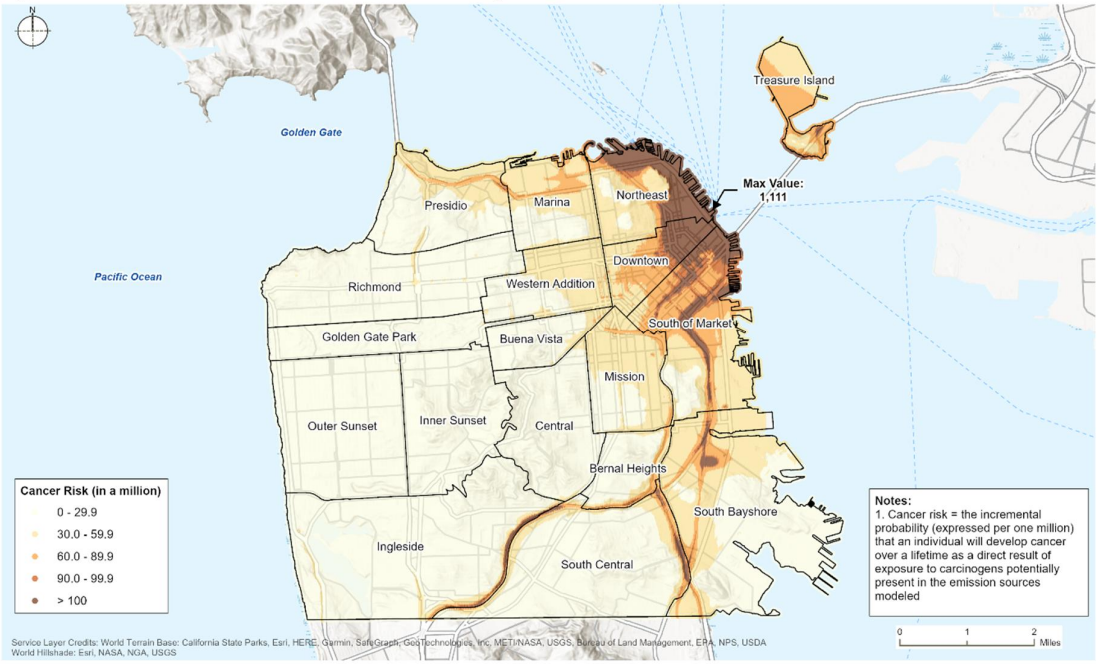


Figure B8. Total Annual Average $PM_{2.5}$ Concentrations (including Modeled Sources and Background) in Proposed Action 2050

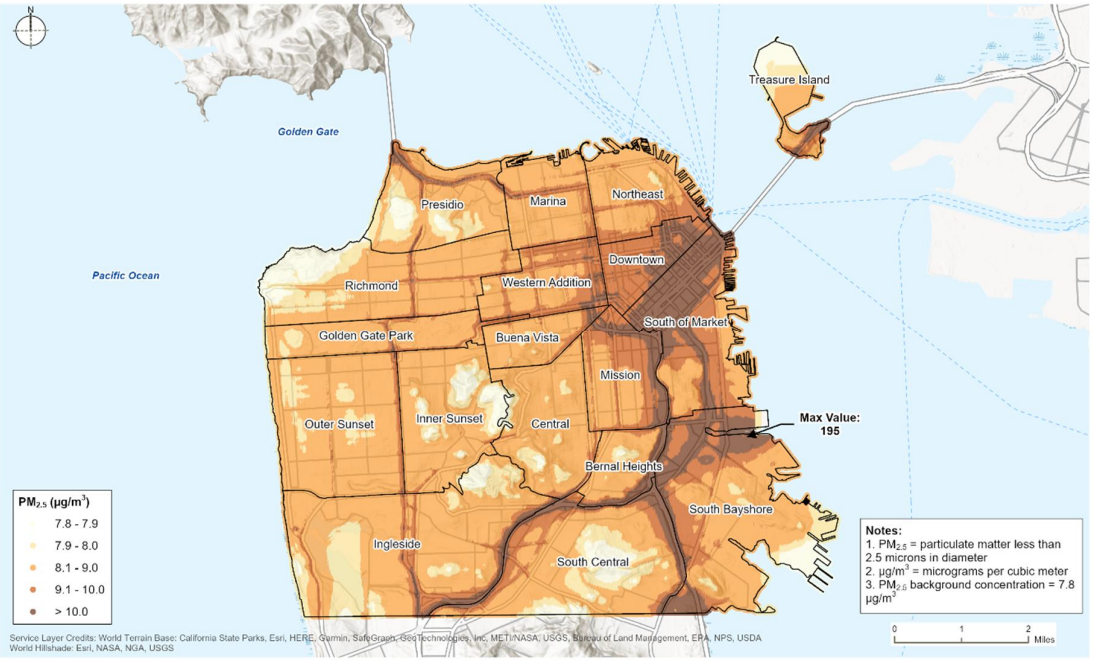


Figure B9. Total Modeled Cancer Risk in Plan Bay Area 2050

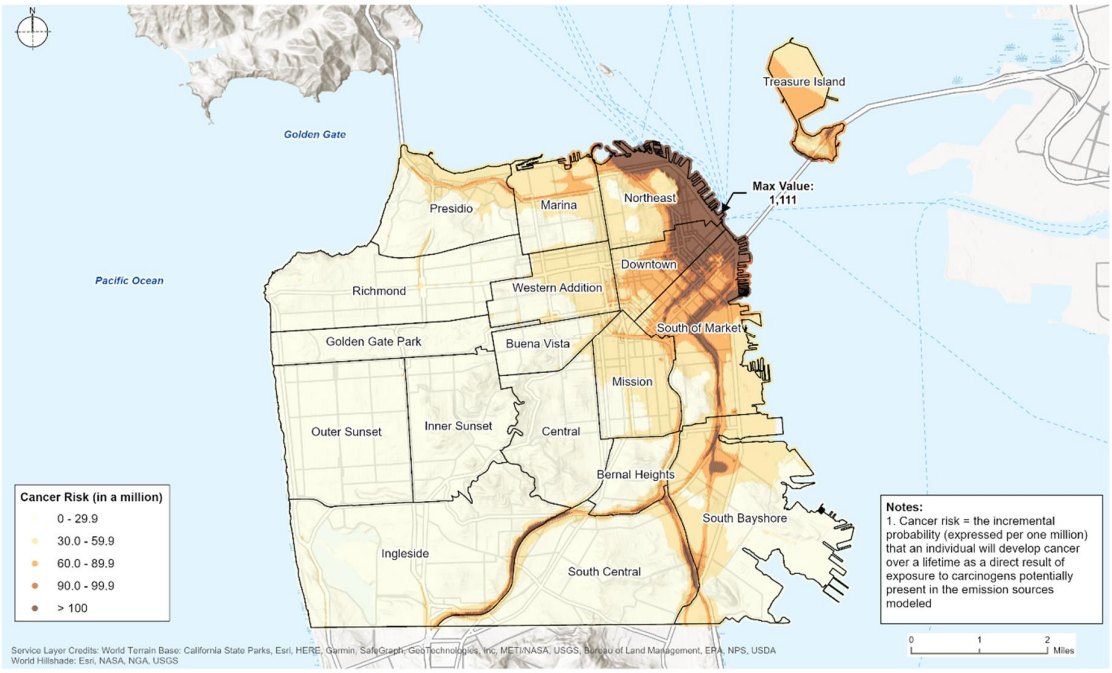
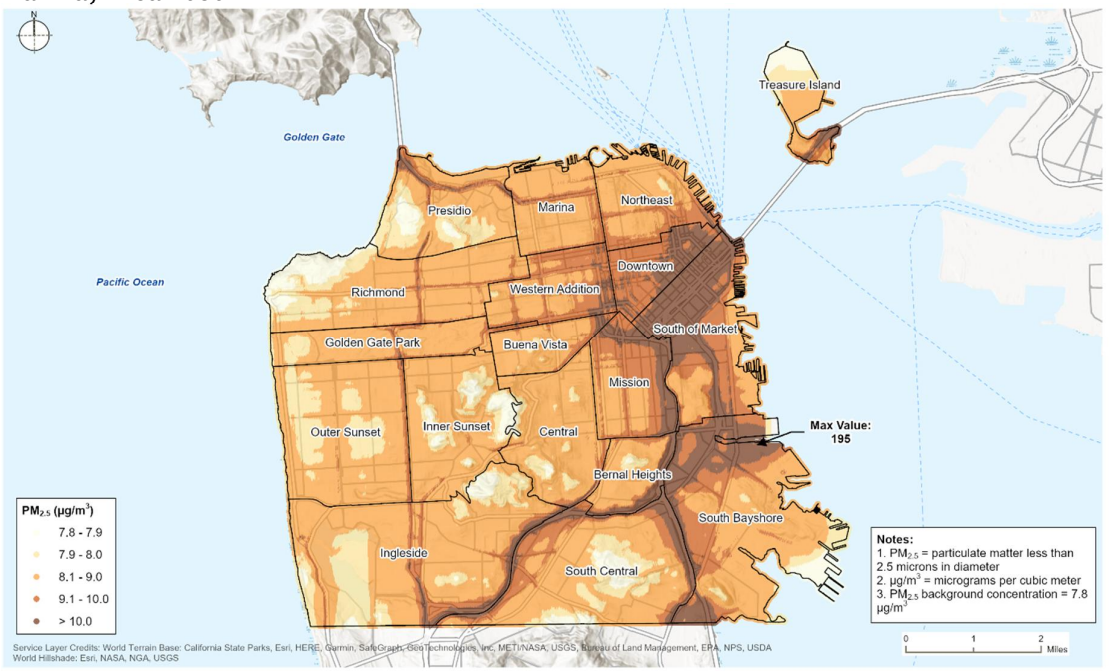


Figure B10. Total Annual Average $PM_{2.5}$ Concentrations (including Modeled Sources and Background) in Plan Bay Area 2050



APPENDIX I.3. AIR QUALITY AND HEALTH RISK ASSESSMENT RESULTS FOR BUILDING TYPES

RAMBOLL

ENVIRONMENT
& HEALTH

MEMO

Project name	**San Francisco Housing Element 2022 Update**
Project no.	**1690017135**
To	**San Francisco Planning Department** **San Francisco, California**
From	**Shaena Ulissi** **Michael Keinath**
Subject	**San Francisco Housing Element 2022 Update Project Air Quality and Health Risk Assessment Results for Building Types**

November 15, 2021

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1 Introduction

At the request of ICF International, Ramboll US Consulting, Inc. (Ramboll) is conducting a California Environmental Quality Act (CEQA) analysis of criteria air pollutants and precursors and local air quality and health impacts associated with the construction and operation of future developments consistent with the San Francisco Housing Element 2022 Update in San Francisco (referred to hereafter as the housing element update or proposed action) on sensitive receptors. Details on the alternatives, building types, construction assumptions, and operational assumptions are described in the "CEQA Air Quality and Health Risk Methodology" (Ramboll, 2021, referred to hereafter as "Methodology Report"). Additional details on these assumptions are presented in this report.

This technical memorandum presents a brief summary of the methodology, noting any deviations from the Methodology Report, and provides the results for evaluation of air quality and health impacts from construction and operation of potential building types on offsite sensitive receptors. This analysis has been performed to support the Project's CEQA documentation at the request of the San Francisco Planning Department's Environmental Planning Division.

2 Methodology

The purpose of this air quality analysis is to assess potential criteria air pollutant emissions and health risks and hazards that would result from the construction and operation of a range of potential building types consistent with the proposed action; and consistent with the guidelines and methodologies from air quality agencies, specifically: Bay Area Air Quality Management District (air district), California Air Resources Board (CARB), California Office of Environmental Health Hazard Assessment (OEHHA), and USEPA.

The steps conducted in performing this air quality analysis are as follows:

If you require assistance to access all the features of this PDF, please contact Elizabeth White, 628.652.7557, CPC.HousingElementUpdateEIR@sfgov.org.

(1) develop emissions inventories for each building type;
(2) perform air dispersion modeling for pollutant concentrations.

2.1 Building Types Evaluated

Criteria air pollutant (CAP) and toxic air contaminant (TAC) construction and operational emissions resulting from the building types shown in **Table Summary-1** were quantitatively evaluated.

Table Summary-1: Building Types

Building Type	Height (feet)	Assumed Land Use Mix	
		Residential (number of dwelling units)	Commercial/Retail (square feet)
Type 1	590	984	29,500
Type 2	240	495	4,000
Type 3	120	200	3,000
Type 4	85	50	N/A
Type 5	65	29	N/A
Type 6	40	30	N/A

N/A= no applicable land use

These emissions estimates and the health risk assessment are described in more detail below. In addition to the above building types Building Type 7: Accessory Dwelling Units, is evaluated qualitatively.

3 Emissions Inventory Development

As described in the Methodology Report, Ramboll primarily utilized the methodology from the California Emissions Estimator Model (CalEEMod®) version 2020.4.01 to assist in quantifying the criteria pollutant emissions presented in this report for the building types. For the construction emissions inventories, a Python-based tool was used to perform these calculations, while for the operational emissions inventories, CalEEMod® software was run with refinements described in the Methodology Report and below.

3.1 Construction Emissions Inventory

Details of the land use assumptions, construction schedules, equipment lists, and worker, vendor, and hauling trips used to develop the construction emissions inventory and risk assessment were presented in the Methodology Report. Additional tables supporting these calculations are presented in this memorandum. **Table 1** shows the construction on-road mobile emission factors that were used in the analysis; these were developed using the newest version of the California Air Resources Board (CARB) emission factor model, EMFAC2021. Construction was assumed to begin in 2023 for all building types; therefore, emissions presented here would be lower for any buildings constructed in later years when vehicle fleets and off-road equipment continue to become lower-emitting. **Table 2** shows the calculation

[1] California Air Pollution Control Officers Association, California Emissions Estimator Model®, http://www.CalEEMod.com/, accessed November 1, 2021.

of architectural coating reactive organic compound (ROG) emissions, which use methodology consistent with CalEEMod®. This includes the architectural coating emissions from interior and exterior paint of buildings as well as parking structure marking; because these are infill projects, parking is assumed to take place within parking garages constructed with concrete and not asphalt lots. Therefore, parking-related emissions are calculated for striping only and not off-gassing.

Tables 3.1 through **3.6** show the detailed uncontrolled CAP emissions from construction of Building Types 1 through 6, respectively. Controlled emissions were quantified assuming the use of Tier 4 Final construction equipment. **Tables 4.1** through **4.6** show the detailed controlled CAP emissions from construction of Building Types 1 through 6, respectively. These table sets show the emissions from each construction activity by phase and year in terms of pounds per year and average pounds per day.

Tables 5 and **6** summarize the uncontrolled and controlled construction emissions by building type and year. As shown in **Tables 5** and **6**, the larger buildings (e.g., building types 1 and 2) are assumed to span a longer time period than the smaller buildings and result in higher total emissions and generally higher average daily emissions.

Type 7 (Accessory Dwelling Units [ADUs]) was not analyzed quantitatively; however, construction of ADUs require less construction equipment than construction of a type 6, 40-foot-tall building (with 30 residential units) and therefore would result in lower emissions than a type 6 building. ADUs can include conversion of existing building space that would require very little construction equipment or ground disturbance and rather would focus on interior renovations; or ADUs can be attached or detached new structures that may require excavation, utility installation, and construction. There are three ADU programs recognized by the city (state program, local program and hybrid program). ADUs under the State program are restricted to a maximum size of 1,000 square feet or 50 percent of the existing primary dwelling unit, whichever is greater; ADUs under the local city program are restricted in size based on available buildable area[2]. Construction of ADUs would release a fraction of the emissions calculated from a type 6 40-foot-tall building with 30 dwelling units that is evaluated here.

The average daily uncontrolled emissions for the maximum year for each building type is summarized below in **Table Summary-2a**, while uncontrolled emissions per dwelling unit is summarized in **Table Summary-2b**.

[2] San Francisco Planning, State ADU Fact Sheet, https://sfplanning.org/sites/default/files/documents/adu/ADU_programs_comparison_chart.pdf, accessed November 1, 2021.

Table Summary-2a: Uncontrolled Construction Criteria Air Pollutant Emissions				
Building Type	**Average Daily Construction Emissions for Maximum Year[1]**			
	ROG	**NOx**	**PM_{10}**	**$PM_{2.5}$**
	lb/day			
1 (590 foot tall building)	54	85	3.8	3.8
2 (240 foot tall building)	30	19	0.62	0.59
3 (120 foot tall building)	14	4.5	0.17	0.16
4 (85 foot tall building)	3.7	3.3	0.14	0.13
5 (65 foot tall building)	2.0	4.5	0.12	0.12
6 (40 foot tall building)	2.1	3.4	0.11	0.11

Notes:

1. Average daily construction emissions for the maximum year depend on the construction schedules for the representative projects described in detail in the Methodology Report. Given variation in representative project construction schedules and equipment, phases may overlap one or more years which may cause higher emissions in the maximum year.

Abbreviations:
lb – pounds
NO_x – nitrogen oxides
PM – particulate matter
ROG – reactive organic gases

Table Summary-2b: Uncontrolled Construction Criteria Air Pollutant Emissions per Unit					
Building Type	**Number of Dwelling Units Assumed per Building Type**	**Average Per Unit Daily Construction Emissions for Maximum Year**			
		ROG	**NOx**	**PM_{10}**	**$PM_{2.5}$**
		lb/day			
1(590 foot tall building)	984	0.05	0.09	0.004	0.004
2(240 foot tall building)	495	0.06	0.04	0.001	0.001
3(120 foot tall building)	200	0.07	0.02	0.001	0.001
4 (85 foot tall building)	50	0.07	0.07	0.003	0.003
5 (65 foot tall building)	29	0.07	0.15	0.004	0.004
6 (40 foot tall building)	30	0.07	0.11	0.004	0.004

Abbreviations:
lb – pounds
NO_x – nitrogen oxides
PM – particulate matter
ROG – reactive organic gases

The average daily controlled emissions for the maximum year for each building type is summarized below in **Table Summary-3a**, while controlled emissions per dwelling unit is summarized in **Table Summary-3b**.

Table Summary-3a: Controlled[1] Construction Criteria Air Pollutant Emissions

Building Type	Average Daily Construction Emissions for Maximum Year[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
1 (590 foot tall building)	53	16	0.33	0.33
2 (240 foot tall building)	28	11	0.10	0.09
3 (120 foot tall building)	14	1.5	0.020	0.019
4 (85 foot tall building)	3.5	1.0	0.013	0.013
5 (65 foot tall building)	2.0	2.5	0.024	0.023
6 (40 foot tall building)	1.9	1.3	0.016	0.015

Notes:
1. Note that for the uncontrolled modeling, most equipment is assumed to meet Tier 3 emissions standards by 2023 based on CARB's OFFROAD inventory.
2. Average daily construction emissions for the maximum year depend on the construction schedules for the representative projects described in detail in the Methodology Report. Given variation in representative project construction schedules and equipment, phases may overlap one or more years which may cause higher emissions in the maximum year.

Abbreviations:
lb – pounds
NO_x – nitrogen oxides
PM – particulate matter
ROG – reactive organic gases

Table Summary-3b: Controlled Construction Criteria Air Pollutant Emissions per Unit

Building Type	Number of Dwelling Units Assumed per Building Type	Average Per Unit Daily Construction Emissions for Maximum Year			
		ROG	NOx	PM_{10}	$PM_{2.5}$
		lb/day			
1(590 foot tall building)	984	0.05	0.02	0.0003	0.0003
2(240 foot tall building)	495	0.06	0.02	0.0002	0.0002
3(120 foot tall building)	200	0.07	0.01	0.0001	0.0001
4 (85 foot tall building)	50	0.07	0.02	0.0003	0.0003
5 (65 foot tall building)	29	0.07	0.09	0.0008	0.0008
6 (40 foot tall building)	30	0.06	0.04	0.0005	0.0005

Abbreviations:	
lb – pounds	PM – particulate matter
NO_x – nitrogen oxides	ROG – reactive organic gases

3.2 Proposed Project Operational Emissions Inventory

As described in the Methodology Report, operational emissions were calculated using CalEEMod®, with any additional adjustments for type-specific or site-specific data described in the subsections below.

Table 7 presents the land uses as input into CalEEMod®. Where the Methodology Report provided a range of potential unit numbers, the maximum number of units from each category was selected to conservatively represent potential air quality impacts.

3.2.1 Architectural Coating

Operational architectural coatings account for the reapplication of paint and coatings on interior and exterior surfaces, which result in emissions of VOCs. Architectural coating emissions were estimated for each building type using CalEEMod®. CalEEMod® defaults were used for the coating areas for all land uses and the default coating emission factors from the air district were used. Additionally, the CalEEMod® assumption that 10 percent of surfaces are coated each year was used. Because parking structures are assumed only to have emissions associated with architectural coating and electricity use (and electricity use does not generate CAP emissions), parking structure emissions from reapplication of paints were quantified outside of the CalEEMod® platform with the assumptions listed in **Table 2**.

3.2.2 Consumer Products

Consumer product emissions come from various non-industrial solvents, including cleaning supplies, kitchen aerosols, cosmetics and toiletries, which emit VOCs during their use. The consumer products VOC emission factor was derived using methodology consistent with CalEEMod® but with updated statewide parameters. The CalEEMod® default emissions factor assumes 2008 statewide VOC inventory and building square footage. An updated VOC inventory for 2017 was taken from the ARB, and 2017 population estimates based on the State of California's Department of Finance demographic projections were used to estimate a statewide VOC emission factor for 2017. This calculation is shown in **Table 8**. The emission factor for the parking area is the default value from the CalEEMod® User's Guide.

3.2.3 Hearths

San Francisco enacted a natural gas ban ordinance that goes into effect in 2021. All buildings constructed in the future will need to comply with the ordinance. Therefore, future housing will be prohibited from having hearths.[3]

3.2.4 Energy Use

CAP emissions are generated from buildings as a result of activities for which natural gas are typically used as energy sources (such as space/water heating or cooking). Combustion of any type of fuel, including natural gas, emits CAPs directly into the atmosphere; these emissions are considered direct emissions associated with a building. As described above, no natural gas is assumed to be used; therefore, energy use-related CAP emissions associated with each building type are zero.

[3] San Francisco Planning and San Francisco County Transportation Authority, San Francisco Building Inspection Commission Codes, *https://codelibrary.amlegal.com/codes/san_francisco/latest/sf_building/0-0-0-91622*, accessed November 1, 2021.

3.2.5 On-road Mobile Sources

Building type-specific vehicle trip rates were calculated using the SF Travel Demand Model.[4] The vehicle trip generation is based on place-type, which changes depending on location in the city. San Francisco Planning Department provided the trip generation for the building typologies based on the type characteristics (number of units and square footage of other uses) and address for each example project (e.g., using 10 South Van Ness address for the 590-foot-tall building type). The 85-foot-tall building type is not based on an example project so San Francisco Planning Department conservatively ran the model assuming a place type that is likely to result in higher vehicle trips (e.g., Sunset Neighborhood). These trip generation outputs for the building types are included as **Appendix A.**

To convert this data for use in CalEEMod®, the total person-trips were converted into vehicle trips by dividing by the average vehicle occupancy for the place type and multiplying by the mode share for car and taxis. Total vehicle trips were then divided by the number of units assumed for the building type from **Table 7** to derive trips per unit. Trip rates are shown in **Table 9.** CalEEMod® default trip lengths and trip types were used; because CalEEMod® average trip lengths are from California Household Travel Survey (CHTS) data, which is also used in the more detailed Citywide traffic model (SF-CHAMP), use of CHTS data is expected to be a good representation of trip lengths.

CalEEMod® methodology estimates mobile CAP emissions from running, idling, and starting exhaust, evaporative emissions (running loss, resting loss, hot soak, and diurnal), brakewear, and tirewear for the projected vehicle fleet in a given calendar year and county. Emission factors were obtained from ARB's EMFAC2021 for San Francisco County and are summarized in **Table 10**. In addition, Ramboll estimated entrained roadway dust consistent with CalEEMod® methodology but incorporating ARB's newest Entrained Roadway Dust methodology.[5] The calculation for the revised silt loading factor is shown in the Methodology Report.

3.2.6 Stationary Sources

Operation of emergency diesel generators results in direct emissions of CAPs and TACs. Building Types 1, 2, and 3 may include emergency generators for life safety requirements. Therefore, emissions were calculated using the parameters described in the Methodology Report. Since all generators are greater than 1,000 horsepower, all were modeled assuming they meet the Tier 4 Final standards consistent with air district requirements.[6,7] To account for the possibility that a type 3 building may install a generator that is below the air district size that requires Tier 4 Final standards, an uncontrolled scenario was also evaluated that assumed the use of a Tier 2 generator. Emissions are shown in **Table 11.**

3.2.7 Summary of Operational Emissions Inventory

Annual average and daily operational CAP emissions by emissions source (area, energy, mobile and stationary [generator]) are presented for each building type in **Table 12**. **Table Summary-3a** summarizes the total emissions for each building type. **Table Summary-3b** summarizes the total per unit emissions for each building type. As shown in these tables, while total emissions are higher for the

[4] San Francisco Travel Demand Tool, https://sftraveldemand.sfcta.org/ , accessed November 1, 2021.
[5] CARB, Miscellaneous Processes Methodologies - Paved Entrained Road Dust, https://ww3.arb.ca.gov/ei/areasrc/fullpdf/2021_paved_roads_7_9.pdf, accessed November 1, 2021.
[6] BAAQMD, Revised BACT Guideline for Diesel Backup Generators >1000 BHP, https://www.baaqmd.gov/~/media/files/engineering/backup-diesel-generators/faq_bact_for_large_diesel-pdf.pdf?la=en, accessed November 1, 2021.
[7] BAAQMD, BACT Guideline, https://www.baaqmd.gov/~/media/files/engineering/bact-tbact-workshop/combustion/96-1-5.pdf?la=en, accessed November 1, 2021.

larger building types than the smaller types, per-unit emissions are similar across all units. Variations in ROG emissions per unit arise from differences in total structure areas (including parking) that require architectural coating; while differences in NOx, PM_{10}, and $PM_{2.5}$ arise from different vehicle trip rates associated with each building type and its place type. For example, Building Type 3 (120-foot-tall building with 200 dwelling units) is located in an urban medium density place type, resulting in 813 daily vehicle trips whereas Building Type 2 (240-foot-tall building with 495 dwelling units) is located in an urban high density place type, resulting in 714 daily vehicle trips. The variation in number of units, number of bedrooms per unit, and place type ultimately result in 99 more daily vehicle trips generated by a type 3 building than a type 2 building even though the type 2 building contains 295 more dwelling units than the type 3 building. As shown in **Table Summary-3a**, the differences in overall mass emissions, while minor, do indicate slightly higher emissions occurring from a type 3 building than a type 2 building (taller and higher density than a type 3 building).

Building type 7 (ADUs) were not analyzed quantitatively; however, given that construction of ADUs do not require provision of additional car parking and that ADUs are size-restricted and must follow San Francisco Planning codes,[8] their operational emissions would be much less than the operational emissions of building type 6 (40-foot-tall building with 30 dwelling units).

[8] SF Planning, ADU Handbook, *https://sfplanning.org/sites/default/files/resources/2019-01/ADU_Handbook.pdf*, accessed November 1, 2021.

Table Summary-3a: Operational Emissions				
Building Type	**Total Annual Operational Emissions**			
	ROG	**NOx**	**PM_{10}**	**$PM_{2.5}$**
	ton/year			
1 (590 foot tall building)	4.3	0.80	0.77	0.23
2 (240 foot tall building)	2.2	0.42	0.39	0.12
3 (120 foot tall building, Uncontrolled)	1.1	0.64	0.45	0.13
3 (120 foot tall building, Controlled)	1.1	0.43	0.44	0.12
4 (85 foot tall building)	0.22	0.046	0.049	0.014
5 (65 foot tall building)	0.13	0.028	0.030	0.0088
6 (40 foot tall building)	0.14	0.028	0.030	0.0088
Building Type	**Average Daily Operational Emissions**			
	ROG	**NOx**	**PM_{10}**	**$PM_{2.5}$**
	lb/day			
1 (590 foot tall building)	23	4.4	4.2	1.3
2 (240 foot tall building)	12	2.3	2.1	0.65
3 (120 foot tall building, Uncontrolled)	5.9	3.5	2.5	0.71
3 (120 foot tall building, Controlled)	5.9	2.4	2.4	0.68
4 (85 foot tall building)	1.2	0.25	0.27	0.079
5 (65 foot tall building)	0.72	0.15	0.17	0.048
6 (40 foot tall building)	0.74	0.15	0.17	0.048

Abbreviations:
lb – pounds
NO_x – nitrogen oxides
PM – particulate matter
ROG – reactive organic gases

Table Summary-3b: Operational Emissions per Unit					
Building Type	**Number of Dwelling Units Assumed per Building Type**	**Total Per Unit Annual Operational Emissions**			
		ROG	**NOx**	**PM_{10}**	**$PM_{2.5}$**
		ton/year			
1 (590 foot tall building)	984	0.0043	0.0008	0.0008	0.0002
2 (240 foot tall building)	495	0.0044	0.0009	0.0008	0.0002
3 (120 foot tall building, Uncontrolled)	200	0.0054	0.0032	0.0023	0.0007
3 (120 foot tall building, Controlled)	200	0.0054	0.0021	0.0022	0.0006
4 (85 foot tall building)	50	0.0045	0.0009	0.0010	0.0003
5 (65 foot tall building)	29	0.0045	0.0010	0.0010	0.0003
6 (40 foot tall building)	30	0.0045	0.0009	0.0010	0.0003
Building Type	**Number of Dwelling Units Assumed per Building Type**	**Average Per Unit Daily Operational Emissions**			
		ROG	**NOx**	**PM_{10}**	**$PM_{2.5}$**
		lb/day			
1 (590 foot tall building)	984	0.02	0.004	0.004	0.001
2 (240 foot tall building)	495	0.02	0.005	0.004	0.001
3 (120 foot tall building, Uncontrolled)	200	0.03	0.018	0.012	0.004
3 (120 foot tall building, Controlled)	200	0.03	0.012	0.012	0.003
4 (85 foot tall building)	50	0.02	0.005	0.005	0.002
5 (65 foot tall building)	29	0.02	0.005	0.006	0.002
6 (40 foot tall building)	30	0.02	0.005	0.006	0.002

Abbreviations:
lb – pounds
NO_x – nitrogen oxides
PM – particulate matter
ROG – reactive organic gases

4 Health Risk Assessment

The purpose of the human health risk assessment (HRA) is to analyze potential health impacts that would result from construction and operation of building types that could be constructed in the future. The HRA in this report evaluates the estimated cancer risk and fine particulate matter ($PM_{2.5}$) concentration associated with construction and operation of each building type. The methodology for the health risk assessment used is detailed in the Methodology Report.

4.1 Construction Refined Health Risk Assessment

As described in the Methodology Report, Ramboll performed refined air dispersion modeling using the American Meteorological Society/USEPA Regulatory Model Improvement Committee Model (AERMOD) (version 21112), with representative meteorological data to determine DPM and $PM_{2.5}$ concentrations for potentially exposed individuals. These concentrations were used to assess the potential human health risk. **Appendix B** contains all AERMOD input files, meteorological data, and consolidated output files. A summary of the results of the construction HRA are presented below.

Emission rates were calculated using the emissions inventory described for construction in Section 3.1.1. Emissions were divided by phase and year, and emissions within 500 meters (1,640 feet) of each construction site from haul trucks were conservatively evaluated as onsite emissions. These emission rates are shown in **Appendix B**. A controlled scenario was also evaluated that assumed the use of all Tier 4 Final construction off-road equipment.

Exposure parameters were developed to determine annual inhalation factors for purpose of the construction HRA (where emissions vary by construction year). These are presented in the Methodology Report.

Maximum cancer risk and $PM_{2.5}$ concentration by distance from construction of each building type are shown in **Tables 13.1** through **13.6** for building types 1 through 6, respectively. These tables also show the controlled cancer risk and $PM_{2.5}$ concentrations, which are substantially lower than the uncontrolled cancer risk and $PM_{2.5}$ concentrations. **Figure 1** shows the maximum uncontrolled cancer risk by distance; this illustrates that the cancer risk peaks near the construction boundary and declines with increasing distance. **Figure 2** shows the maximum controlled risk by distance. As described in section 3.1.1, construction emissions would be much lower for type 7 (ADUs) than types 5 or 6; therefore, risks would also be lower.

Construction of the larger building types generally results in higher cancer risk and $PM_{2.5}$ concentrations than smaller building types due to the larger amount of equipment use. However, health impacts are also affected by the construction lot acreage. If total emissions were identical, construction on a 1-acre lot would result in lower health risks near the construction boundary than construction on a 0.25-acre lot; as emissions would be more concentrated on the smaller lot. A 1-acre lot is roughly 200 feet by 200 feet, and emissions would occur throughout that area including the center. The construction boundary and what this analysis modeled as the nearest offsite receptor would be over 100 feet away from those emissions at the center of the 1-acre construction site; whereas a 0.25-acre lot is roughly 100 feet by 100 feet, and the nearest offsite receptor as modeled would be just 50 feet away from the center of construction.

4.2 Operational Refined Health Risk Assessment

Consistent with the air district and Cal/EPA OEHHA guidance described in the Methodology Report, Ramboll performed a refined HRA for operational sources of TACs that could be included in building types 1, 2, and 3, namely emergency diesel generators. As discussed in the Methodology Report, the operational refined health risk assessment uses a screening size of 5,000 vehicle trips for determining whether to conduct dispersion modeling of traffic-related health risks from building types. This screening size is derived from BAAQMD recommendations and updated OEHHA health risk methodology. Building Type 1 would result in the greatest number of daily vehicle trips, at 1,459 (average daily including weekends, per CalEEMod® methodology). This is well below the daily 5,000-vehicle trip screening size. However, the Citywide traffic modeling will separately evaluate health risk associated with the changes in traffic due to the housing element and alternative(s) and will be detailed in a separate memorandum.

4.3 Emergency Generators

Health risks from emergency generators that could be included in building types 1, 2, and 3 were calculated using the same overall methodology as the construction risks, except those sources were modeled as point sources and emissions were those described above in Section 3.1.2. As a conservative approach, risks at the maximally exposed receptor by distance from emergency generators are calculated starting over at the third trimester for a 30-year duration.

Maximum cancer risk and $PM_{2.5}$ concentration by distance from generators are shown in **Tables 14.1, 14.2,** and **14.3** for building types 1, 2, and 3, respectively. For type 3, both the uncontrolled and controlled risks are evaluated, where the controlled risk assumes use of a Tier 4 generator while the uncontrolled risk assumes a Tier 2 generator. **Figure 3** shows the maximum risk by distance.

4.4 Combined Refined Health Risk Assessment

Building types 1, 2, and 3 may result in both construction and operational emergency generator health risks. **Tables 15.1, 15.2,** and **15.3** show the combined construction plus operational maximum cancer risk and $PM_{2.5}$ concentration by distance from the construction boundaries, respectively. Several conservative assumptions are included in this analysis. If health risks from emergency generator operations here are summed with health risks from building construction, total risk will be overestimated because the earliest exposure parameters will be repeated and because the maximum exposed receptor location may differ between construction activities and generator emissions. In addition, the emergency generator may not be located at ground-level on the site boundary on the side of the site closest to the maximum exposed receptor.

TABLES

Table 1
Emission Factors for On-Road Construction Mobile Sources
San Francisco Housing Element
San Francisco, California

Parameter	Value
Fleet Mix	Worker: LDA, LDT1, LDT2
	Vendor: MHDT
	Hauling: HHDT
Emission Factor	EMFAC2021 Web Database for San Francisco County, 2023 through 2029, Annual, Aggregated model years and speeds

Abbreviations:

LDA - light duty auto
LDT - light duty truck
MHDT - medium heavy duty truck
HHDT - heavy heavy duty truck

References:

California Air Resources Board (ARB) 2021. EMFAC2021. Available at: https://arb.ca.gov/emfac/emissions-inventory/

Table 2
Estimated Emissions from Construction Architectural Coating Off-Gassing
San Francisco Housing Element
San Francisco, California

Building Type	Parking Facility	Land Use Subtype	Parking Capacity (spaces)	Asphalt-Paved Area (sqft)[1]
Building Type 1: 590 ft tall residential/mixed use	2 levels of below-grade garage	Enclosed Parking with Elevator	518	102,000
Building Type 2: 240 ft tall primarily residential building	3 below-grade parking levels	Enclosed Parking with Elevator	178	71,200
Building Type 3: 120 ft tall primarily residential building	1 level underground enclosed parking	Enclosed Parking with Elevator	69	24,000
Building Type 4: 85 ft tall residential building	Scaled based on Type 5	Enclosed Parking with Elevator	98	39,200
Building Type 5: 66/65 ft tall primarily residential building	2 levels of below-grade garage	Enclosed Parking with Elevator	57	22,800
Building Type 6: 40 ft tall building	1 level of below-grade parking	Enclosed Parking with Elevator	39	15,600

Inputs[1,2]

Parameter		Input	Units
Residential Surface Area to Floor Area Ratio		2.7	--
Non-Residential Surface Area to Floor Area Ratio		2.0	
Painted Area in Parking Structures		6%	--
Application Rate		100%	--
Reapplication Rate		10%	--
Fraction of Surface Area	Interior Surfaces	25%	--
	Exterior Shell	75%	--
Indoor Paint VOC Content		100	g/L
Outdoor and Parking Paint VOC Content		150	g/L

Table 2
Estimated Emissions from Construction Architectural Coating Off-Gassing
San Francisco Housing Element
San Francisco, California

Emissions

Type	Land Use	CalEEMod® Land Use	Square Footage[2] (square feet)	Surface Area[2] (square feet)	Architectural Coating Construction VOC emissions[3] (lb/yr)	Architectural Coating Operational VOC emissions[3] (lb/yr)
Building Type 1: 590 ft tall residential/mixed use	Residential	Apartment high rise	935,745	2,526,512	16,106	1,611
	Retail	Strip Mall	30,350	60,700	387	39
	Parking Structure	--	102,000	102,000	43	4.3
Building Type 2: 240 ft tall primarily residential building	Residential	Apartment high rise	495,000	1,336,500	8,520	852
	Retail	Strip Mall	4,000	8,000	51	5.1
	Parking Structure	--	71,200	71,200	30	3.0
Building Type 3: 120 ft tall primarily residential building	Residential	Apartment high rise	200,000	540,000	3,442	344
	Retail	Strip Mall	3,000	6,000	38	3.8
	Parking Structure	--	24,000	24,000	10	1.0
Building Type 4: 85 ft tall residential building	Residential	Apartment mid rise	50,000	135,000	861	86
	Parking Structure	--	39,200	39,200	16	1.6
Building Type 5: 66/65 ft tall primarily residential building	Residential	Apartment mid rise	29,000	78,300	499	50
	Parking Structure	--	22,800	22,800	10	1.0
Building Type 6: 40 ft tall building	Residential	Apartment mid rise	30,000	81,000	516	52
	Parking Structure	--	15,600	15,600	6.5	0.65

Notes:

1. Inputs and assumptions are consistent with CalEEMod® 2020.4.0 for San Francisco
2. Building type square footage is based on Methodology Report. Residential building surface area assumed to be 2.7 times the square footage and non-residential square footage is assumed to be 2.0 times the square footage, consistent with CalEEMod® Appendix A.
3. Calculated based on CalEEMod® Appendix A assumption that 1 gallon of paint covers 180 square feet and that building area is assumed to be 75% indoors and 25% outdoors. The percent of parking lot area assumed to be painted is 6%.

Abbreviations:

CalEEMod® - California Emissions Estimator Model
EF - Emission Factor
g - grams
L - liter
lb/yr - pounds per year
VOC - Volatile Organic Compound

References:

California Air Pollution Control Officers Association (CAPCOA). California Emissions Estimator Model (CalEEMod), 2021. Available online at http://www.caleemod.com/

Table 3.1
Estimated Uncontrolled Emissions from Construction for Type 1
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 1	Demolition	2023	On-Site Exhaust	101	804	40	38
			Mobile Exhaust	13.7	83	0.66	0.62
	Grading, Shoring, & Excavation	2023	On-Site Exhaust	2,273	19,234	919	912
			Mobile Exhaust	68	750	5.2	5.0
	Foundation/Podium Construction	2023	On-Site Exhaust	40	374	23	21
			Mobile Exhaust	105	768	5.8	5.5
		2024	On-Site Exhaust	12	117	6.8	6.2
			Mobile Exhaust	33.7	244	1.9	1.8
	Building Construction/Superstructure	2024	On-Site Exhaust	55	517	30	27
			Mobile Exhaust	416	1265	12.8	12.0
	Superstructure/Skin	2024	On-Site Exhaust	6.1	57	3.3	3.1
			Mobile Exhaust	16.5	120	0.93	0.88
		2025	On-Site Exhaust	23	217	12	11
			Mobile Exhaust	64.0	455	3.7	3.5
	Interior Work	2024	On-Site Exhaust	6.3	42	2.1	2.1
			Mobile Exhaust	53.1	109	1.32	1.23
			Architectural Coating	1,097	--	--	--
		2025	On-Site Exhaust	71	478	21	21
			Mobile Exhaust	609	1217	15.2	14.2
			Architectural Coating	13,203	--	--	--
		2026	On-Site Exhaust	12	81	3.6	3.6
			Mobile Exhaust	98.3	192	2.47	2.30
			Architectural Coating	2,236	--	--	--

Table 3.1
Estimated Uncontrolled Emissions from Construction for Type 1
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	10.0	85	3.8	3.8
2024	6.5	9.5	0.23	0.21
2025	54	9.1	0.20	0.19
2026	9.0	1.05	0.023	0.023

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 3.2
Estimated Uncontrolled Emissions from Construction for Type 2
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 2	Site Preparation/Demolition	2023	On-Site Exhaust	24	174	6.7	6.1
			Mobile Exhaust	7.8	410	2.5	2.4
	Excavation Shoring	2023	On-Site Exhaust	79	642	24	23
			Mobile Exhaust	23	960	6.1	5.8
	Foundation/Below Grade Construction	2023	On-Site Exhaust	16	124	4.0	3.7
			Mobile Exhaust	5.9	14	0.17	0.16
	Building Construction	2023	On-Site Exhaust	269	2,285	81	77
			Mobile Exhaust	174	153	3.1	2.8
		2024	On-Site Exhaust	446	3,807	128	120
			Mobile Exhaust	287	244	5.1	4.7
		2025	On-Site Exhaust	388	3,295	105	99
			Mobile Exhaust	251	207	4.4	4.1
	Exterior Finishing	2024	On-Site Exhaust	35	261	11	11
			Mobile Exhaust	42	34	0.73	0.67
			Architectural Coating	1,827	--	--	--
		2025	On-Site Exhaust	123	922	35	34
			Mobile Exhaust	147	118	2.6	2.4
			Architectural Coating	6,774	--	--	--
	Site Work/Paving	2025	On-Site Exhaust	36	302	14	13
			Mobile Exhaust	7.2	4.8	0.12	0.11

Table 3.2
Estimated Uncontrolled Emissions from Construction for Type 2
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	2.3	18	0.49	0.46
2024	10	17	0.56	0.52
2025	30	19	0.62	0.59

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 3.3
Estimated Uncontrolled Emissions from Construction for Type 3
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 3	Demolition	2023	On-Site Exhaust	15	140	6.8	6.4
			Mobile Exhaust	0.64	0.46	0.010	0.010
	Site Preparation	2023	On-Site Exhaust	1.1	12	0.45	0.42
			Mobile Exhaust	0.13	6.3	0.039	0.037
	Grading	2023	On-Site Exhaust	2.9	27	1.3	1.2
			Mobile Exhaust	3.1	198	1.2	1.1
	Building Construction	2023	On-Site Exhaust	65	661	33	30
			Mobile Exhaust	58	115	1.5	1.4
		2024	On-Site Exhaust	65	648	31	28
			Mobile Exhaust	57	112	1.5	1.4
	Paving	2024	On-Site Exhaust	6.8	61	2.8	2.7
			Mobile Exhaust	0.53	0.37	0.0087	0.0080
	Architectural Coating	2024	On-Site Exhaust	1.9	13	0.64	0.64
			Mobile Exhaust	1.0	0.71	0.017	0.016
			Architectural Coating	3,491	--	--	--

Table 3.3
Estimated Uncontrolled Emissions from Construction for Type 3
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	0.56	4.5	0.17	0.16
2024	14	3.2	0.14	0.13

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 3.4
Estimated Uncontrolled Emissions from Construction for Type 4
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 4	Demolition	2023	On-Site Exhaust	6.6	60	2.9	2.8
			Mobile Exhaust	0.71	0.51	0.012	0.011
	Site Preparation	2023	On-Site Exhaust	0.53	6.2	0.23	0.21
			Mobile Exhaust	0.048	0.035	7.9E-04	7.3E-04
	Grading	2023	On-Site Exhaust	1.5	13	0.64	0.61
			Mobile Exhaust	2.4	149	0.91	0.87
	Building Construction	2023	On-Site Exhaust	56	568	28	26
			Mobile Exhaust	21	39	0.52	0.49
	Paving	2023	On-Site Exhaust	3.0	28	1.3	1.2
			Mobile Exhaust	0.35	0.25	0.0058	0.0053
	Architectural Coating	2023	On-Site Exhaust	0.86	5.9	0.32	0.32
			Mobile Exhaust	0.19	0.14	0.0031	0.0029
			Architectural Coating	877	--	--	--

Table 3.4
Estimated Uncontrolled Emissions from Construction for Type 4
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	3.7	3.3	0.14	0.13

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 3.5
Estimated Uncontrolled Emissions from Construction for Type 5
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 5	Demolition	2023	On-Site Exhaust	24	214	9.4	9.0
			Mobile Exhaust	10	303	1.9	1.8
	Site Preparation & Grading	2023	On-Site Exhaust	13	100	4.8	4.6
			Mobile Exhaust	2.5	1.8	0.041	0.038
	Excavation & Shoring	2023	On-Site Exhaust	11	97	4.0	3.8
			Mobile Exhaust	7.2	164	1.1	1.0
	Drainage/Utilities/Subgrade	2023	On-Site Exhaust	5.6	51	3.0	2.8
			Mobile Exhaust	9.0	6.5	0.15	0.14
	Building Construction	2023	On-Site Exhaust	19	165	7.0	6.6
			Mobile Exhaust	31	63	0.81	0.76
		2024	On-Site Exhaust	1.5	13	0.54	0.50
			Mobile Exhaust	2.5	5.0	0.065	0.060
	Sitework	2024	On-Site Exhaust	10	88	3.9	3.8
			Mobile Exhaust	7.4	98	0.69	0.66
			Architectural Coating	509	--	--	--

Table 3.5
Estimated Uncontrolled Emissions from Construction for Type 5
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	0.50	4.5	0.12	0.12
2024	2.0	0.79	0.020	0.019

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 3.6
Estimated Uncontrolled Emissions from Construction for Type 6
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 6	Demolition	2023	On-Site Exhaust	3.1	24	1.2	1.2
			Mobile Exhaust	0.74	48	0.29	0.28
	Excavation	2023	On-Site Exhaust	24	232	11	10
			Mobile Exhaust	1.4	90	0.55	0.52
	Exterior	2023	On-Site Exhaust	8.7	102	4.0	3.7
	Structure	2023	On-Site Exhaust	1.0	8.8	0.43	0.43
		2024	On-Site Exhaust	0.49	4.1	0.19	0.19
	All	2023	On-Site Exhaust	28	346	13	12
			Mobile Exhaust	24	29	0.49	0.45
			Architectural Coating	453	--	--	--
		2024	On-Site Exhaust	4.1	51	1.8	1.6
			Mobile Exhaust	3.5	4.1	0.070	0.065
			Architectural Coating	70	--	--	--

Table 3.6
Estimated Uncontrolled Emissions from Construction for Type 6
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	2.1	3.4	0.12	0.11
2024	0.30	0.23	0.0079	0.0073

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 4.1
Estimated Controlled Emissions from Construction for Type 1
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 1	Demolition	2023	On-Site Exhaust	25	117	3.3	3.3
			Mobile Exhaust	13.7	83	0.66	0.62
	Grading, Shoring, & Excavation	2023	On-Site Exhaust	522	2,299	69	69
			Mobile Exhaust	68	750	5.2	5.0
	Foundation/Podium Construction	2023	On-Site Exhaust	7.3	32	1.0	1.0
			Mobile Exhaust	105	768	5.8	5.5
		2024	On-Site Exhaust	2.5	11	0.33	0.33
			Mobile Exhaust	33.7	244	1.9	1.8
	Building Construction/Superstructure	2024	On-Site Exhaust	11	48	1.5	1.5
			Mobile Exhaust	416	1265	12.8	12.0
	Superstructure/Skin	2024	On-Site Exhaust	1.2	5.3	0.16	0.16
			Mobile Exhaust	16.5	120	0.93	0.88
		2025	On-Site Exhaust	5.0	22	0.67	0.67
			Mobile Exhaust	64.0	455	3.7	3.5
	Interior Work	2024	On-Site Exhaust	1.0	4.5	0.14	0.14
			Mobile Exhaust	53.1	109	1.32	1.23
			Architectural Coating	1,097	--	--	--
		2025	On-Site Exhaust	12	54	1.7	1.7
			Mobile Exhaust	609	1217	15.2	14.2
			Architectural Coating	13,203	--	--	--
		2026	On-Site Exhaust	2.1	9.1	0.28	0.28
			Mobile Exhaust	98.3	192	2.47	2.30
			Architectural Coating	2,236	--	--	--

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	2.8	16	0.33	0.33
2024	6.3	6.9	0.073	0.069
2025	53	6.7	0.082	0.077
2026	9.0	0.77	0.0106	0.0099

Notes:

Table 4.1
Estimated Controlled Emissions from Construction for Type 1
San Francisco Housing Element
San Francisco, California

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 4.2
Estimated Controlled Emissions from Construction for Type 2
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 2	Site Preparation/Demolition	2023	On-Site Exhaust	7.7	34	1.0	1.0
			Mobile Exhaust	7.8	410	2.5	2.4
	Excavation Shoring	2023	On-Site Exhaust	24	121	3.1	3.1
			Mobile Exhaust	23	960	6.1	5.8
	Foundation/Below Grade Construction	2023	On-Site Exhaust	6.1	44	0.73	0.73
			Mobile Exhaust	5.9	14	0.17	0.16
	Building Construction	2023	On-Site Exhaust	84	1,074	8.2	8.2
			Mobile Exhaust	174	153	3.1	2.8
		2024	On-Site Exhaust	146	1,866	14	14
			Mobile Exhaust	287	244	5.1	4.7
		2025	On-Site Exhaust	134	1,708	13	13
			Mobile Exhaust	251	207	4.4	4.1
	Exterior Finishing	2024	On-Site Exhaust	8.3	113	0.79	0.79
			Mobile Exhaust	42	34	0.73	0.67
			Architectural Coating	1,827	--	--	--
		2025	On-Site Exhaust	30	418	2.9	2.9
			Mobile Exhaust	147	118	2.6	2.4
			Architectural Coating	6,774	--	--	--
	Site Work/Paving	2025	On-Site Exhaust	11	78	1.3	1.3
			Mobile Exhaust	7.2	4.8	0.12	0.11

Table 4.2
Estimated Controlled Emissions from Construction for Type 2
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	1.3	11	0.10	0.093
2024	8.9	8.7	0.080	0.079
2025	28	10	0.094	0.092

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 4.3
Estimated Controlled Emissions from Construction for Type 3
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 3	Demolition	2023	On-Site Exhaust	3.1	13	0.41	0.41
			Mobile Exhaust	0.64	0.46	0.010	0.010
	Site Preparation	2023	On-Site Exhaust	0.24	1.0	0.032	0.032
			Mobile Exhaust	0.13	6.3	0.039	0.037
	Grading	2023	On-Site Exhaust	0.58	2.5	0.078	0.078
			Mobile Exhaust	3.1	198	1.2	1.1
	Building Construction	2023	On-Site Exhaust	14	62	1.9	1.9
			Mobile Exhaust	58	115	1.5	1.4
		2024	On-Site Exhaust	15	66	2.0	2.0
			Mobile Exhaust	57	112	1.5	1.4
	Paving	2024	On-Site Exhaust	1.7	14	0.20	0.20
			Mobile Exhaust	0.53	0.37	0.0087	0.0080
	Architectural Coating	2024	On-Site Exhaust	0.31	1.4	0.042	0.042
			Mobile Exhaust	1.0	0.71	0.017	0.016
			Architectural Coating	3,491	--	--	--

Table 4.3
Estimated Controlled Emissions from Construction for Type 3
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	0.31	1.5	0.020	0.019
2024	14	0.74	0.014	0.014

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 4.4
Estimated Controlled Emissions from Construction for Type 4
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 4	Demolition	2023	On-Site Exhaust	1.3	5.7	0.17	0.17
			Mobile Exhaust	0.71	0.51	0.012	0.011
	Site Preparation	2023	On-Site Exhaust	0.12	0.52	0.016	0.016
			Mobile Exhaust	0.048	0.035	7.9E-04	7.3E-04
	Grading	2023	On-Site Exhaust	0.29	1.3	0.039	0.039
			Mobile Exhaust	2.4	149	0.91	0.87
	Building Construction	2023	On-Site Exhaust	12	54	1.6	1.6
			Mobile Exhaust	21	39	0.52	0.49
	Paving	2023	On-Site Exhaust	0.72	5.8	0.086	0.086
			Mobile Exhaust	0.35	0.25	0.0058	0.0053
	Architectural Coating	2023	On-Site Exhaust	0.13	0.58	0.018	0.018
			Mobile Exhaust	0.19	0.14	0.0031	0.0029
			Architectural Coating	877	--	--	--

Table 4.4
Estimated Controlled Emissions from Construction for Type 4
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	3.5	1.0	0.013	0.013

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 4.5
Estimated Controlled Emissions from Construction for Type 5
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 5	Demolition	2023	On-Site Exhaust	5.2	37	0.64	0.64
			Mobile Exhaust	10	303	1.9	1.8
	Site Preparation & Grading	2023	On-Site Exhaust	2.8	26	0.33	0.33
			Mobile Exhaust	2.5	1.8	0.041	0.038
	Excavation & Shoring	2023	On-Site Exhaust	3.6	21	0.46	0.46
			Mobile Exhaust	7.2	164	1.1	1.0
	Drainage/Utilities/Subgrade	2023	On-Site Exhaust	1.2	5.8	0.16	0.16
			Mobile Exhaust	9.0	6.5	0.15	0.14
	Building Construction	2023	On-Site Exhaust	4.8	35	0.60	0.60
			Mobile Exhaust	31	63	0.81	0.76
		2024	On-Site Exhaust	0.42	3.0	0.051	0.051
			Mobile Exhaust	2.5	5.0	0.065	0.060
	Sitework	2024	On-Site Exhaust	2.5	17	0.31	0.31
			Mobile Exhaust	7.4	98	0.69	0.66
			Architectural Coating	509	--	--	--

Table 4.5
Estimated Controlled Emissions from Construction for Type 5
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	0.30	2.5	0.024	0.023
2024	2.0	0.48	0.0043	0.0041

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 4.6
Estimated Controlled Emissions from Construction for Type 6
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Source

Building Type	Construction Activity	Year	Source	Total Construction Emissions[1]			
				ROG	NOx	PM_{10}	$PM_{2.5}$
				lb/yr			
Type 6	Demolition	2023	On-Site Exhaust	0.80	8.6	0.080	0.080
			Mobile Exhaust	0.74	48	0.29	0.28
	Excavation	2023	On-Site Exhaust	6.9	30	0.92	0.92
			Mobile Exhaust	1.4	90	0.55	0.52
	Exterior	2023	On-Site Exhaust	4.4	56	0.40	0.40
	Structure	2023	On-Site Exhaust	0.21	0.91	0.028	0.028
		2024	On-Site Exhaust	0.11	0.46	0.014	0.014
	All	2023	On-Site Exhaust	11	83	1.3	1.3
			Mobile Exhaust	24	29	0.49	0.45
			Architectural Coating	453	--	--	--
		2024	On-Site Exhaust	1.7	13	0.20	0.20
			Mobile Exhaust	3.5	4.1	0.070	0.065
			Architectural Coating	70	--	--	--

Table 4.6
Estimated Controlled Emissions from Construction for Type 6
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Year

Year	Average Daily CAP Emissions[2]			
	ROG	NOx	PM_{10}	$PM_{2.5}$
	lb/day			
2023	1.9	1.3	0.016	0.015
2024	0.29	0.067	0.0011	0.0011

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. On-Site Exhaust represents emissions from offroad equipment, while mobile exhaust includes emissions from worker, vendor, and hauling trucks.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 5
Summary of Uncontrolled Construction Emissions
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Type

Type	Year	Average Daily Construction Emissions[1,2]			
		ROG	NOx	PM_{10}	$PM_{2.5}$
		lb/day			
Type 1	2023	10.0	85	3.8	3.8
	2024	6.5	9.5	0.23	0.21
	2025	54	9.1	0.20	0.19
	2026	9.0	1.05	0.02	0.02
Type 2	2023	2.3	18	0.49	0.46
	2024	10	17	0.56	0.52
	2025	30	19	0.62	0.59
Type 3	2023	0.56	4.5	0.17	0.16
	2024	14	3.2	0.14	0.13
Type 4	2023	3.7	3.3	0.14	0.13
Type 5	2023	0.50	4.5	0.12	0.12
	2024	2.0	0.79	0.02	0.02
Type 6	2023	2.1	3.4	0.12	0.11
	2024	0.30	0.23	0.01	0.01

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 6
Summary of Controlled Construction Emissions
San Francisco Housing Element
San Francisco, California

Summary of Construction Emissions by Type

Type	Year	Average Daily Construction Emissions[1,2]			
		ROG	NOx	PM_{10}	$PM_{2.5}$
		lb/day			
Type 1	2023	2.8	16	0.33	0.33
	2024	6.3	6.9	0.073	0.069
	2025	53	6.7	0.082	0.077
	2026	9.0	0.77	0.0106	0.0099
Type 2	2023	1.3	11	0.10	0.093
	2024	8.9	8.7	0.080	0.079
	2025	28	10	0.094	0.092
Type 3	2023	0.31	1.5	0.020	0.019
	2024	14	0.74	0.014	0.014
Type 4	2023	3.5	1.0	0.013	0.013
Type 5	2023	0.30	2.5	0.024	0.023
	2024	2.0	0.48	0.0043	0.0041
Type 6	2023	1.9	1.3	0.016	0.015
	2024	0.29	0.067	0.0011	0.0011

Notes:

1. Construction emissions were estimated with methodology equivalent to CalEEMod® 2020.4.0. The controlled scenario assumes all construction off-road equipment meets Tier 4 Final standards.
2. Daily emissions are conservatively averaged over 260 days (one calendar year, not including weekends).

Abbreviations:

CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

Table 7
Land Uses as Modeled in CalEEMod®
San Francisco Housing Element
San Francisco, California

Type	CalEEMod Analysis[1]			
	Land Use Type	**Land Use SubType**	**Land Use Unit Amount**	**Land Use Size Metric**
Building Type 1: 590 ft tall residential/mixed use	Residential	Apartment high rise	984	units
	Retail	Strip Mall	30.35	ksf
Building Type 2: 240 ft tall primarily residential building	Residential	Apartment high rise	495	units
	Retail	Strip Mall	4	ksf
Building Type 3: 120 ft tall primarily residential building	Residential	Apartment high rise	200	units
	Retail	Strip Mall	3	ksf
Building Type 4: 85 ft tall residential building	Residential	Apartment mid rise	50	units
Building Type 5: 66/65 ft tall primarily residential building	Residential	Apartment mid rise	29	units
Building Type 6: 40 ft tall building	Residential	Apartment mid rise	30	units

Notes:

[1] Land Uses were mapped to representative types in CalEEMod®. Where the Methodology Report provided a range of potential unit sizes, the maximum size from each category was selected to conservatively represent potential air quality impacts. Lot acreage and population were modeled as CalEEMod® defaults because these fields do not affect operational criteria air pollutant emissions. Building Type 1 retail was conservatively modeled as slightly larger than the final type (30.35 compared to 29.5 ksf)

Abbreviations

ft - foot

ksf - thousand square feet

Table 8
Consumer Product Emission Factor Update
San Francisco Housing Element
San Francisco, California

CARB Consumer Products Regulations Since 2008

Year	Proposed VOC Emissions Reductions following Regulatory Amendments (tons/day)	Statewide VOC Emissions from Consumer Products (tons/day)
2013 Inventory [1]	-	205
2010 Amendments effective January 1, 2014[1]	-5.0	200
2010 Amendments effective January 1, 2015[1]	-0.20	200
2013 Amendments effective January 1, 2017[1]	-4.1	196
2017 Inventory (Post Amendment Adjustments)	-	196

Statewide Parameters for Development of 2017 VOC Emission Factor for Consumer Products

Year	Total VOC Inventory (tons/day)[2]	California Population[3]	Total Building Square Footage[4]	Consumer Products VOC Emission Factor (lb/square foot/day)	2017 Reduction from CalEEMod® Emission Factor
2008 statewide, from CalEEMod®	240	36,457,375	22,435,267,518	0.0000214	24.1%
2017	196	39,523,613	24,158,505,108	0.0000162	

Notes:

1. Available at: http://www.arb.ca.gov/regact/2013/cp2013/cp13isor.pdf.
2. 2008 value from CalEEMod® Users Guide, Appendix E. 2017 value calculated from http://www.arb.ca.gov/regact/2013/cp2013/cp13isor.pdf.
3. Population estimates based on State of California, Department of Finance, Estimates. 2017 data available at: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-1/. 2008 data available at: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-4/2001-10/.
4. 2008 value from CalEEMod® Users Guide, Appendix E. 2017 value calculated by Ramboll using the growth in California population and the 2008 total building square footage.

Abbreviations:

CalEEMod® - California Emissions Model
CARB - California Air Resources Board
lb - pound
VOC - Volatile Organic Compound

Table 9
Estimated Mobile Trip Generation for Each Type
San Francisco Housing Element
San Francisco, California

Category	CalEEMod Inputs						
	Land Use Type	Vehicle Trips LandUse SubType	Vehicle Trips Land Use Size Metric	Quantity	Derived Trip Rate[1]		
					Weekday	Saturday	Sunday
Building Type 1: 590 ft tall residential/mixed use	Residential	Apartment high rise	units	984	1.10	1.12	0.89
	Retail	Strip Mall	ksf	30.35	14.49	13.74	6.68
Building Type 2: 240 ft tall primarily residential building	Residential	Apartment high rise	units	495	1.32	1.34	1.06
	Retail	Strip Mall	ksf	4	14.91	14.14	6.87
Building Type 3: 120 ft tall primarily residential building	Residential	Apartment high rise	units	200	3.85	3.92	3.11
	Retail	Strip Mall	ksf	3	25.59	24.28	11.80
Building Type 4: 85 ft tall residential building	Residential	Apartment mid rise	units	50	1.81	1.63	1.36
Building Type 5: 66/65 ft tall primarily residential building	Residential	Apartment mid rise	units	29	1.93	1.74	1.45
Building Type 6: 40 ft tall building	Residential	Apartment mid rise	units	30	1.86	1.68	1.40

Notes

[1] Type-specific vehicle trip rates were calculated using the SF Travel Demand Model. SFEP provided the trip generation for the building types based on the Type characteristics (number of units and square footage of other uses) and address for each example project (e.g., using 10 South Van Ness address for the 590 foot tall building Type). For building types that aren't based on an example project (e.g., 85 foot tall building), SFEP conservatively ran the model assuming a place type that is likely to result in higher vehicle trips (e.g., Sunset Neighborhood). The Saturday and Sunday trip rates were determined using the CalEEMod default ratio of Saturday to weekday and Sunday to weekday trip rates by land use.

Abbreviations

ft - foot

ksf - thousand square feet

Table 10
Emission Factors for On-Road Operational Mobile Sources
San Francisco Housing Element
San Francisco, California

Year	Pollutant	Emission Factors by Vehicle Category[2]												
		LDA	LDT1	LDT2	MDV	LHDT1	LHDT2	MHDT	HHDT	OBUS	UBUS	MCY	SBUS	MH
Fleet Mix		53%	4.0%	23%	11%	2.8%	0.67%	1.7%	1.2%	0.534%	0.777%	0.55%	0.11%	0.043%
2025	NOX_IDLEX	0	0	0	0	0.029582	0.081893	0.954315	3.948609	0.367311	0	0	0.686784	0
	NOX_RUNEX	0.034758	0.085162	0.052844	0.061591	0.316299	0.540395	1.180494	3.243772	1.209786	0.350904	0.619388	0.437806	1.347309
	NOX_STREX	0.228572	0.335757	0.293565	0.308994	0.469375	0.252024	1.282931	2.710435	1.072269	0.057899	0.139089	0.695167	0.272287
	PM10_IDLEX	0	0	0	0	0.000487	0.001282	0.001630	0.004745	0.000928	0	0	0.000344	0
	PM10_PMBW	0.008642	0.011845	0.011331	0.011204	0.077570	0.090497	0.045472	0.111876	0.048983	0.108292	0.012000	0.044853	0.044943
	PM10_PMTW	0.008000	0.008000	0.008000	0.008000	0.009100	0.010542	0.012000	0.034713	0.012000	0.032485	0.004000	0.009671	0.013285
	PM10_RUNEX	0.001507	0.002099	0.001725	0.001620	0.007749	0.016531	0.010779	0.022858	0.028393	0.006695	0.002401	0.002768	0.022080
	PM10_STREX	0.001933	0.002562	0.002101	0.001950	0.000194	0.000086	0.000108	0.000004	0.000125	0.000024	0.003548	0.000098	0.000374
	PM25_IDLEX	0	0	0	0	0.000466	0.001227	0.001559	0.004533	0.000887	0	0	0.000327	0
	PM25_PMBW	0.003025	0.004146	0.003966	0.003921	0.027149	0.031674	0.015915	0.039157	0.017144	0.037902	0.004200	0.015699	0.015730
	PM25_PMTW	0.002000	0.002000	0.002000	0.002000	0.002275	0.002635	0.003000	0.008678	0.003000	0.008121	0.001000	0.002418	0.003321
	PM25_RUNEX	0.001387	0.001931	0.001587	0.001493	0.007375	0.015798	0.010304	0.021856	0.027156	0.006401	0.002247	0.002622	0.021072
	PM25_STREX	0.001777	0.002356	0.001932	0.001793	0.000179	0.000079	0.000099	0.000004	0.000115	0.000022	0.003340	0.000090	0.000344
	ROG_DIURN	0.270198	0.463415	0.241940	0.244479	0.106369	0.056601	0.029873	0.001095	0.047006	0.012847	1.873348	0.042873	29.938141
	ROG_HTSK	0.083013	0.135824	0.072263	0.071127	0.029644	0.015649	0.007955	0.000325	0.012607	0.004601	3.586659	0.015723	8.887403
	ROG_IDLEX	0	0	0	0	0.023264	0.016290	0.027305	0.254161	0.033976	0	0	0.415046	0
	ROG_RESTL	0	0	0	0	0	0	0	0	0	0	0	0	0
	ROG_RUNEX	0.008787	0.021240	0.010944	0.012950	0.056104	0.087214	0.035832	0.041565	0.073809	0.065799	1.410735	0.013920	0.084458
	ROG_RUNLS	0.026830	0.054748	0.025297	0.023448	0.054372	0.026585	0.018690	0.000331	0.012672	0.000650	1.385584	0.007376	0.001912
	ROG_STREX	0.290161	0.442749	0.340251	0.370462	0.114629	0.059512	0.058858	0.000001	0.068388	0.020052	1.396292	0.048748	0.117287
	SO2_IDLEX	0	0	0	0	0.000082	0.000127	0.001464	0.005710	0.000782	0	0	0	0
	SO2_RUNEX	0.002558	0.003391	0.003501	0.004128	0.007640	0.007925	0.011913	0.015595	0.012829	0.011245	0.002032	0.008742	0.016376
	SO2_STREX	0.000630	0.000825	0.000834	0.000969	0.000200	0.000105	0.000108	0.000002	0.000113	0.000053	0.000486	0.000081	0.000222
	TOG_DIURN	0.270198	0.463415	0.241940	0.244479	0.106369	0.056601	0.029873	0.001095	0.047006	0.012847	1.873348	0.042873	29.938141
	TOG_HTSK	0.083013	0.135824	0.072263	0.071127	0.029644	0.015649	0.007955	0.000325	0.012607	0.004601	3.586659	0.015723	8.887403
	TOG_IDLEX	0	0	0	0	0.033335	0.022161	0.048849	0.681967	0.046501	0	0	0.698450	0
	TOG_RESTL	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOG_RUNEX	0.012792	0.030973	0.015935	0.018798	0.070967	0.101749	0.053041	0.456164	0.096216	0.388652	1.698764	0.177616	0.113004
	TOG_RUNLS	0.026830	0.054748	0.025297	0.023448	0.054372	0.026585	0.018690	0.000331	0.012672	0.000650	1.385584	0.007376	0.001912
	TOG_STREX	0.317690	0.484755	0.372532	0.405609	0.125504	0.065158	0.064442	0.000001	0.074876	0.021954	1.517910	0.053373	0.128415

Notes:

1. Emission factor units are consistent with CalEEMod® default units. Emission factors were derived using CalEEMod® methodology. EMFAC2021 revised its ROG/TOG quantification methodology. It no longer outputs specific RUNLOSS outputs but includes these emissions in DIURN; therefore, this input shows zero for RUNLOSS.
2. Emission factors were estimated using EMFAC2021 for San Francisco County with EMFAC2007 default vehicle categories and fleet mix assumptions.

Abbreviations

HHDT - heavy-heavy duty truck
LDA - light duty autos (passenger gars)
LDT1 - light duty trucks (lighter weight class)
LDT2 - light duty trucks (heavier weight class)
LHDT1 - light-heavy-duty trucks (lighter weight class
LHDT2 - light-heavy-duty trucks (heavier weight clas
MCY - motorcycles
MDV - medium-duty trucks
MH - motor homes
MHDT - medium heavy duty trucks
NOx - oxides of nitrogen
OBUS - other buses
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases
SBUS - school buses
UBUS - urban buses

Table 11
Emergency Generator Emissions from Building Operations
San Francisco Housing Element
San Francisco, California

Generator Information

Location	Number of Generators	Engine Control	Size		Fuel Type	Annual Operation[1]
			kW	HP		hr/yr
Building Type 1	1	Tier 4	1,500	2,012	Diesel	50
Building Type 2	2	Tier 4	750	1,006	Diesel	50
Building Type 3 (Uncontrolled)	1	Tier 2	700	939	Diesel	50
Building Type 3 (Controlled)	1	Tier 4	700	939	Diesel	50

Emissions

Annual Emissions[2] (ton/yr)						
Location	TOG	ROG	NO_x	DPM	PM_{10}	$PM_{2.5}$
Building Type 1	0.017	0.017	0.055	0.0022	0.0022	0.0022
Building Type 2	0.017	0.017	0.055	0.0022	0.0022	0.0022
Building Type 3 (Uncontrolled)	0.014	0.013	0.24	0.0078	0.0078	0.0078
Building Type 3 (Controlled)	0.0079	0.0078	0.026	0.0010	0.0010	0.0010

Notes:

1. Operation for routine maintenance and testing is conservatively assumed to be 50 hours per year, the maximum allowable by the Airborne Toxics Control Measure (ATCM) for Stationary Compression Ignition Engines (17 CCR 93115).
2. For the health risk assessment, DPM emissions are converted to emission rates in grams per second.

Abbreviations:

ATCM - Airborne Toxics Control Measure
DPM - diesel particulate matter
g - grams
hp - horsepower
hr - hour
kW - kilowatt
NOx - oxides of nitrogen
PM - particulate matter
ROG - reactive organic gases
TOG - total organic gases
yr - year

References:

California Air Resources Board. Airborne Toxic Control Measures (ATCM), 17 CCR § 93115. Available online at: https://www.arb.ca.gov/diesel/documents/FinalReg2011.pdf

California Building Code, Part 2, Volume 2, Chapter 27 - Electrical. Available online at: https://up.codes/viewer/california/ca-building-code-2016-v2/chapter/27/electrical#27.

USEPA. 1995. AP 42, Volume I, Fifth Edition. §3.4. Large Stationary Diesel and All Stationary Dual-Fuel Engines. Available online at: http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s04.pdf

Table 12
Summary of Operational Emissions
San Francisco Housing Element
San Francisco, California

Summary of Operational Emissions by Type

Type	Emissions Source	Total Annual Operational Emissions[1,2]			
		ROG	NOx	PM_{10}	$PM_{2.5}$
		ton/yr			
Type 1	Area[3]	3.8	0.084	0.041	0.041
	Energy[4]	0	0	0	0
	Mobile	0.49	0.66	0.72	0.19
	Generators	0.017	0.055	0.0022	0.0022
	Total	4.3	0.80	0.77	0.23
Type 2	Area[3]	1.9	0.042	0.020	0.020
	Energy[4]	0	0	0	0
	Mobile	0.24	0.33	0.37	0.10
	Generators	0.017	0.055	0.0022	0.0022
	Total	2.2	0.42	0.39	0.12
Type 3	Area[3]	0.79	0.017	0.0082	0.0082
	Energy[4]	0	0	0	0
	Mobile	0.28	0.39	0.44	0.11
	Generators (Uncontrolled)	0.013	0.24	0.0078	0.0078
	Generators (Controlled)	0.0078	0.026	0.0010	0.0010
	Total (Uncontrolled)	1.1	0.64	0.45	0.13
	Total (Controlled)	1.1	0.43	0.44	0.12
Type 4	Area[3]	0.20	0.0043	0.0021	0.0021
	Energy[4]	0	0	0	0
	Mobile	0.029	0.041	0.047	0.012
	Total	0.22	0.046	0.049	0.014
Type 5	Area[3]	0.11	0.0025	0.0012	0.0012
	Energy[4]	0	0	0	0
	Mobile	0.018	0.026	0.029	0.0076
	Total	0.13	0.028	0.030	0.0088
Type 6	Area[3]	0.12	0.0026	0.0012	0.0012
	Energy[4]	0	0	0	0
	Mobile	0.018	0.026	0.029	0.0076
	Total	0.14	0.028	0.030	0.0088

Table 12
Summary of Operational Emissions
San Francisco Housing Element
San Francisco, California

Type	Year	Average Daily Operational Emissions[2]			
		ROG	NOx	PM_{10}	$PM_{2.5}$
		lb/day			
Type 1	Area[3]	21	0.46	0.22	0.22
	Energy[4]	0	0	0	0
	Mobile	2.7	3.6	4.0	1.0
	Generators	0.091	0.30	0.012	0.012
	Total	23	4.4	4.2	1.3
Type 2	Area[3]	11	0.23	0.11	0.11
	Energy[4]	0	0	0	0
	Mobile	1.3	1.8	2.0	0.53
	Generators	0.091	0.30	0.012	0.012
	Total	12	2.3	2.1	0.65
Type 3	Area[3]	4.3	0.094	0.045	0.045
	Energy[4]	0	0	0	0
	Mobile	1.5	2.1	2.4	0.63
	Generators (Uncontrolled)	0.073	1.3	0.043	0.043
	Generators (Controlled)	0.042	0.14	0.0057	0.0057
	Total (Uncontrolled)	5.9	3.5	2.5	0.71
	Total (Controlled)	5.9	2.4	2.4	0.68
Type 4	Area[3]	1.1	0.023	0.011	0.011
	Energy[4]	0	0	0	0
	Mobile	0.16	0.23	0.26	0.067
	Total	1.2	0.25	0.27	0.079
Type 5	Area	0.62	0.014	0.0065	0.0065
	Energy[4]	0	0	0	0
	Mobile	0.10	0.14	0.16	0.042
	Total	0.72	0.15	0.17	0.048
Type 6	Area	0.64	0.014	0.0067	0.0067
	Energy[4]	0	0	0	0
	Mobile	0.10	0.14	0.16	0.042
	Total	0.74	0.15	0.17	0.048

Table 12
Summary of Operational Emissions
San Francisco Housing Element
San Francisco, California

Notes:

1. Operational emissions were estimated with CalEEMod® 2020.4.0, with updates to silt loading, consumer products, mobile emission factors, trip rates, natural gas use, architectural coating for parking structures, and the addition of emergency generators as shown in the supporting tables.
2. The emissions included assume the first operational year is 2025. This is likely conservative, as most buildings under the new SF Housing Element will be constructed in later years when emission factors are lower.
3. Parking lot ROG emissions were calculated in Table 2 and using the CalEEMod® default reapplication rate of 10% for operational emissions. This value was added to each of the total Area ROG emissions.
4. CAP emissions from building energy are zero, because natural gas is banned in new construction in San Francisco and the BAAQMD CEQA guidance does not require inclusion of indirect emissions from electricity generation.

Abbreviations:

BAAQMD - Bay Area Air Quality Management District
CalEEMod® - California Emissions Estimator Model®
CAP - Criteria Air Pollutants
CEQA - California Environmental Quality Act
NOx - nitrogen oxides
PM_{10} - particulate matter less than 10 microns
$PM_{2.5}$ - particulate matter less than 2.5 microns
ROG - reactive organic gases

Reference:

California Emissions Estimator Model (CalEEMod). 2021. CAPCOA. Available online at: http://www.caleemod.com

California Environmental Quality Act (CEQA) Guidelines. 2017. Bay Area Air Quality Management District (BAAQMD). May. Available online at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

Table 13.1
Maximum Health Impacts by Distance for Construction of Type 1
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	1,392	9.4	103	0.72
10m/33ft	1,215	8.2	90	0.63
20m/66ft	907	6.1	67	0.47
30m/98ft	694	4.7	52	0.36
40m/131ft	551	3.7	41	0.28
50m/164ft	448	3.0	33	0.23
60m/197ft	373	2.5	28	0.19
70m/230ft	316	2.1	23	0.16
80m/262ft	273	1.8	20	0.14
90m/295ft	238	1.6	18	0.12
100m/328ft	210	1.4	16	0.11
110m/361ft	187	1.3	14	0.10
120m/394ft	168	1.1	12	0.087
130m/427ft	152	1.0	11	0.079
140m/459ft	138	0.93	10	0.071
150m/492ft	126	0.85	9.4	0.065
160m/525ft	116	0.78	8.6	0.060
170m/558ft	107	0.72	7.9	0.055
180m/591ft	99	0.67	7.3	0.051
190m/623ft	92	0.62	6.8	0.048
200m/656ft	86	0.58	6.4	0.044
210m/689ft	80	0.54	6.0	0.041
220m/722ft	75	0.51	5.6	0.039
230m/755ft	71	0.48	5.2	0.037
240m/787ft	67	0.45	4.9	0.034
250m/820ft	63	0.43	4.7	0.033
260m/853ft	59	0.40	4.4	0.031
270m/886ft	56	0.38	4.2	0.029
280m/919ft	53	0.36	4.0	0.028
290m/951ft	51	0.34	3.8	0.026
300m/984ft	48	0.33	3.6	0.025
310m/1017ft	46	0.31	3.4	0.024
320m/1050ft	44	0.30	3.3	0.023
330m/1083ft	42	0.29	3.1	0.022
340m/1115ft	40	0.27	3.0	0.021
350m/1148ft	39	0.26	2.9	0.020

Table 13.1
Maximum Health Impacts by Distance for Construction of Type 1
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	37	0.25	2.8	0.019
370m/1214ft	36	0.24	2.6	0.018
380m/1247ft	34	0.23	2.5	0.018
390m/1280ft	33	0.22	2.5	0.017
400m/1312ft	32	0.22	2.4	0.016
410m/1345ft	31	0.21	2.3	0.016
420m/1378ft	30	0.20	2.2	0.015
430m/1411ft	29	0.19	2.1	0.015
440m/1444ft	28	0.19	2.0	0.014
450m/1476ft	27	0.18	2.0	0.014
460m/1509ft	26	0.17	1.9	0.013
470m/1542ft	25	0.17	1.9	0.013
480m/1575ft	24	0.16	1.8	0.013
490m/1608ft	23	0.16	1.7	0.012
500m/1640ft	23	0.15	1.7	0.012

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 13.2
Maximum Health Impacts by Distance for Construction of Type 2
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	579	1.8	65	0.22
10m/33ft	497	1.8	56	0.19
20m/66ft	360	1.5	40	0.14
30m/98ft	269	1.10	30	0.10
40m/131ft	210	0.82	23	0.080
50m/164ft	168	0.64	19	0.064
60m/197ft	139	0.51	15	0.053
70m/230ft	117	0.42	13	0.044
80m/262ft	100	0.36	11	0.038
90m/295ft	86	0.30	10	0.033
100m/328ft	76	0.26	8.5	0.029
110m/361ft	67	0.23	7.5	0.026
120m/394ft	60	0.20	6.7	0.023
130m/427ft	54	0.18	6.0	0.021
140m/459ft	49	0.16	5.5	0.019
150m/492ft	45	0.15	5.0	0.017
160m/525ft	41	0.14	4.6	0.016
170m/558ft	38	0.12	4.2	0.014
180m/591ft	35	0.11	3.9	0.013
190m/623ft	32	0.11	3.6	0.012
200m/656ft	30	0.098	3.4	0.011
210m/689ft	28	0.091	3.1	0.011
220m/722ft	26	0.085	2.9	0.010
230m/755ft	25	0.080	2.7	0.0093
240m/787ft	23	0.075	2.6	0.0088
250m/820ft	22	0.071	2.4	0.0083
260m/853ft	21	0.067	2.3	0.0078
270m/886ft	19	0.063	2.2	0.0074
280m/919ft	18	0.060	2.1	0.0070
290m/951ft	18	0.056	2.0	0.0067
300m/984ft	17	0.054	1.9	0.0064
310m/1017ft	16	0.051	1.8	0.0061
320m/1050ft	15	0.049	1.7	0.0058
330m/1083ft	15	0.046	1.6	0.0055
340m/1115ft	14	0.044	1.6	0.0053
350m/1148ft	13	0.042	1.5	0.0051

Table 13.2
Maximum Health Impacts by Distance for Construction of Type 2
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	13	0.041	1.4	0.0049
370m/1214ft	12	0.039	1.4	0.0047
380m/1247ft	12	0.037	1.3	0.0045
390m/1280ft	11	0.036	1.3	0.0043
400m/1312ft	11	0.035	1.2	0.0041
410m/1345ft	10	0.033	1.2	0.0040
420m/1378ft	10	0.032	1.1	0.0038
430m/1411ft	10	0.031	1.1	0.0037
440m/1444ft	9.4	0.030	1.1	0.0036
450m/1476ft	9.1	0.029	1.0	0.0035
460m/1509ft	8.8	0.028	1.0	0.0034
470m/1542ft	8.5	0.027	1.0	0.0032
480m/1575ft	8.3	0.026	0.9	0.0031
490m/1608ft	8.0	0.025	0.90	0.0030
500m/1640ft	7.8	0.024	0.87	0.0030

0.023722969

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 13.3
Maximum Health Impacts by Distance for Construction of Type 3
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	173	0.54	11	0.036
10m/33ft	148	0.46	9	0.031
20m/66ft	105	0.33	6.7	0.022
30m/98ft	77	0.24	4.9	0.016
40m/131ft	59	0.18	3.8	0.012
50m/164ft	47	0.15	3.0	0.010
60m/197ft	39	0.12	2.4	0.0081
70m/230ft	32	0.10	2.0	0.0068
80m/262ft	27	0.085	1.7	0.0058
90m/295ft	24	0.073	1.5	0.0050
100m/328ft	21	0.064	1.3	0.0043
110m/361ft	18	0.057	1.2	0.0038
120m/394ft	16	0.050	1.0	0.0034
130m/427ft	15	0.045	0.9	0.0031
140m/459ft	13	0.041	0.84	0.0028
150m/492ft	12	0.037	0.76	0.0025
160m/525ft	11	0.034	0.70	0.0023
170m/558ft	10	0.031	0.64	0.0021
180m/591ft	9.3	0.029	0.59	0.0020
190m/623ft	8.6	0.027	0.55	0.0018
200m/656ft	8.0	0.025	0.51	0.0017
210m/689ft	7.5	0.023	0.47	0.0016
220m/722ft	7.0	0.022	0.44	0.0015
230m/755ft	6.5	0.020	0.42	0.0014
240m/787ft	6.1	0.019	0.39	0.0013
250m/820ft	5.8	0.018	0.37	0.0012
260m/853ft	5.5	0.017	0.35	0.0011
270m/886ft	5.2	0.016	0.33	0.0011
280m/919ft	4.9	0.015	0.31	0.0010
290m/951ft	4.6	0.014	0.30	0.0010
300m/984ft	4.4	0.014	0.28	9.3E-04
310m/1017ft	4.2	0.013	0.27	8.8E-04
320m/1050ft	4.0	0.012	0.25	8.4E-04
330m/1083ft	3.8	0.012	0.24	8.0E-04
340m/1115ft	3.7	0.011	0.23	7.7E-04
350m/1148ft	3.5	0.011	0.22	7.4E-04

Table 13.3
Maximum Health Impacts by Distance for Construction of Type 3
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	3.4	0.010	0.21	7.1E-04
370m/1214ft	3.2	0.010	0.20	6.8E-04
380m/1247ft	3.1	0.010	0.20	6.5E-04
390m/1280ft	3.0	0.0092	0.19	6.3E-04
400m/1312ft	2.9	0.0089	0.18	6.0E-04
410m/1345ft	2.8	0.0086	0.18	5.8E-04
420m/1378ft	2.7	0.0083	0.17	5.6E-04
430m/1411ft	2.6	0.0080	0.16	5.4E-04
440m/1444ft	2.5	0.0077	0.16	5.2E-04
450m/1476ft	2.4	0.0074	0.15	5.0E-04
460m/1509ft	2.3	0.0072	0.15	4.9E-04
470m/1542ft	2.2	0.0070	0.14	4.7E-04
480m/1575ft	2.2	0.0067	0.14	4.6E-04
490m/1608ft	2.1	0.0065	0.13	4.4E-04
500m/1640ft	2.0	0.0063	0.13	4.3E-04

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 13.4
Maximum Health Impacts by Distance for Construction of Type 4
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	98	0.55	5.9	0.036
10m/33ft	82	0.46	4.9	0.030
20m/66ft	56	0.32	3.4	0.021
30m/98ft	40	0.23	2.4	0.015
40m/131ft	30	0.17	1.8	0.011
50m/164ft	24	0.13	1.4	0.0088
60m/197ft	19	0.11	1.1	0.0071
70m/230ft	16	0.089	0.9	0.0059
80m/262ft	13	0.075	0.80	0.0049
90m/295ft	11	0.064	0.68	0.0042
100m/328ft	10	0.056	0.59	0.0037
110m/361ft	8.7	0.049	0.52	0.0032
120m/394ft	7.7	0.044	0.46	0.0029
130m/427ft	6.9	0.039	0.41	0.0026
140m/459ft	6.2	0.035	0.37	0.0023
150m/492ft	5.6	0.032	0.34	0.0021
160m/525ft	5.1	0.029	0.31	0.0019
170m/558ft	4.7	0.027	0.28	0.0017
180m/591ft	4.3	0.024	0.26	0.0016
190m/623ft	4.0	0.023	0.24	0.0015
200m/656ft	3.7	0.021	0.22	0.0014
210m/689ft	3.5	0.019	0.21	0.0013
220m/722ft	3.2	0.018	0.19	0.0012
230m/755ft	3.0	0.017	0.18	0.0011
240m/787ft	2.8	0.016	0.17	0.0011
250m/820ft	2.7	0.015	0.16	0.0010
260m/853ft	2.5	0.014	0.15	0.0009
270m/886ft	2.4	0.013	0.14	0.0009
280m/919ft	2.3	0.013	0.13	8.3E-04
290m/951ft	2.1	0.012	0.13	7.9E-04
300m/984ft	2.0	0.011	0.12	7.5E-04
310m/1017ft	1.9	0.011	0.12	7.2E-04
320m/1050ft	1.8	0.010	0.11	6.8E-04
330m/1083ft	1.8	0.010	0.10	6.5E-04
340m/1115ft	1.7	0.009	0.10	6.2E-04
350m/1148ft	1.6	0.0090	0.10	5.9E-04

Table 13.4
Maximum Health Impacts by Distance for Construction of Type 4
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	1.5	0.0087	0.092	5.7E-04
370m/1214ft	1.5	0.0083	0.088	5.5E-04
380m/1247ft	1.4	0.0080	0.085	5.2E-04
390m/1280ft	1.4	0.0077	0.081	5.0E-04
400m/1312ft	1.3	0.0074	0.078	4.8E-04
410m/1345ft	1.3	0.0071	0.075	4.7E-04
420m/1378ft	1.2	0.0068	0.073	4.5E-04
430m/1411ft	1.2	0.0066	0.070	4.3E-04
440m/1444ft	1.1	0.0064	0.068	4.2E-04
450m/1476ft	1.1	0.0061	0.065	4.0E-04
460m/1509ft	1.1	0.0059	0.063	3.9E-04
470m/1542ft	1.0	0.0057	0.061	3.8E-04
480m/1575ft	1.0	0.0056	0.059	3.7E-04
490m/1608ft	1.0	0.0054	0.057	3.5E-04
500m/1640ft	0.93	0.0052	0.055	3.4E-04

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 13.5
Maximum Health Impacts by Distance for Construction of Type 5
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	75	0.38	6.1	0.033
10m/33ft	64	0.32	5.2	0.028
20m/66ft	46	0.23	3.7	0.020
30m/98ft	34	0.17	2.7	0.015
40m/131ft	26	0.13	2.1	0.011
50m/164ft	20	0.10	1.7	0.0090
60m/197ft	17	0.084	1.4	0.0073
70m/230ft	14	0.070	1.1	0.0061
80m/262ft	12	0.059	1.0	0.0052
90m/295ft	10	0.051	0.83	0.0045
100m/328ft	8.9	0.045	0.72	0.0039
110m/361ft	7.9	0.040	0.64	0.0035
120m/394ft	7.0	0.035	0.57	0.0031
130m/427ft	6.3	0.032	0.51	0.0028
140m/459ft	5.7	0.029	0.46	0.0025
150m/492ft	5.2	0.026	0.42	0.0023
160m/525ft	4.7	0.024	0.38	0.0021
170m/558ft	4.4	0.022	0.35	0.0019
180m/591ft	4.0	0.020	0.33	0.0018
190m/623ft	3.7	0.019	0.30	0.0016
200m/656ft	3.5	0.017	0.28	0.0015
210m/689ft	3.2	0.016	0.26	0.0014
220m/722ft	3.0	0.015	0.24	0.0013
230m/755ft	2.8	0.014	0.23	0.0012
240m/787ft	2.7	0.013	0.22	0.0012
250m/820ft	2.5	0.013	0.20	0.0011
260m/853ft	2.4	0.012	0.19	0.0010
270m/886ft	2.2	0.011	0.18	0.0010
280m/919ft	2.1	0.011	0.17	9.3E-04
290m/951ft	2.0	0.010	0.16	8.8E-04
300m/984ft	1.9	0.010	0.15	8.4E-04
310m/1017ft	1.8	0.0091	0.15	8.0E-04
320m/1050ft	1.7	0.0087	0.14	7.6E-04
330m/1083ft	1.7	0.0083	0.13	7.3E-04
340m/1115ft	1.6	0.0079	0.13	7.0E-04
350m/1148ft	1.5	0.0076	0.12	6.7E-04

Table 13.5
Maximum Health Impacts by Distance for Construction of Type 5
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	1.5	0.0073	0.12	6.4E-04
370m/1214ft	1.4	0.0070	0.11	6.1E-04
380m/1247ft	1.3	0.0067	0.11	5.9E-04
390m/1280ft	1.3	0.0065	0.10	5.7E-04
400m/1312ft	1.2	0.0062	0.10	5.5E-04
410m/1345ft	1.2	0.0060	0.10	5.3E-04
420m/1378ft	1.2	0.0058	0.09	5.1E-04
430m/1411ft	1.1	0.0056	0.090	4.9E-04
440m/1444ft	1.1	0.0054	0.087	4.7E-04
450m/1476ft	1.0	0.0052	0.084	4.6E-04
460m/1509ft	1.0	0.0050	0.081	4.4E-04
470m/1542ft	1.0	0.0049	0.079	4.3E-04
480m/1575ft	0.94	0.0047	0.076	4.1E-04
490m/1608ft	0.91	0.0046	0.074	4.0E-04
500m/1640ft	0.88	0.0044	0.071	3.9E-04

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 13.6
Maximum Health Impacts by Distance for Construction of Type 6
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	136	0.72	13	0.075
10m/33ft	109	0.58	11	0.061
20m/66ft	70	0.37	6.8	0.039
30m/98ft	48	0.25	4.6	0.026
40m/131ft	35	0.18	3.3	0.019
50m/164ft	26	0.14	2.5	0.015
60m/197ft	21	0.11	2.0	0.011
70m/230ft	17	0.089	1.6	0.0093
80m/262ft	14	0.074	1.3	0.0077
90m/295ft	12	0.062	1.1	0.0065
100m/328ft	10	0.054	1.0	0.0056
110m/361ft	8.8	0.047	0.85	0.0049
120m/394ft	7.8	0.041	0.75	0.0043
130m/427ft	6.9	0.037	0.67	0.0038
140m/459ft	6.2	0.033	0.60	0.0034
150m/492ft	5.6	0.029	0.54	0.0031
160m/525ft	5.1	0.027	0.49	0.0028
170m/558ft	4.6	0.024	0.45	0.0026
180m/591ft	4.2	0.022	0.41	0.0024
190m/623ft	3.9	0.021	0.38	0.0022
200m/656ft	3.6	0.019	0.35	0.0020
210m/689ft	3.4	0.018	0.32	0.0019
220m/722ft	3.1	0.016	0.30	0.0017
230m/755ft	2.9	0.015	0.28	0.0016
240m/787ft	2.7	0.014	0.26	0.0015
250m/820ft	2.6	0.014	0.25	0.0014
260m/853ft	2.4	0.013	0.23	0.0013
270m/886ft	2.3	0.012	0.22	0.0013
280m/919ft	2.2	0.011	0.21	0.0012
290m/951ft	2.0	0.011	0.20	0.0011
300m/984ft	1.9	0.010	0.19	0.0011
310m/1017ft	1.8	0.010	0.18	0.0010
320m/1050ft	1.8	0.0092	0.17	0.0010
330m/1083ft	1.7	0.0088	0.16	9.3E-04
340m/1115ft	1.6	0.0084	0.15	8.8E-04
350m/1148ft	1.5	0.0080	0.15	8.4E-04

Table 13.6
Maximum Health Impacts by Distance for Construction of Type 6
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	1.5	0.0077	0.14	8.1E-04
370m/1214ft	1.4	0.0074	0.13	7.7E-04
380m/1247ft	1.3	0.0071	0.13	7.4E-04
390m/1280ft	1.3	0.0068	0.12	7.1E-04
400m/1312ft	1.2	0.0065	0.12	6.9E-04
410m/1345ft	1.2	0.0063	0.11	6.6E-04
420m/1378ft	1.1	0.0060	0.11	6.3E-04
430m/1411ft	1.1	0.0058	0.11	6.1E-04
440m/1444ft	1.1	0.0056	0.10	5.9E-04
450m/1476ft	1.0	0.0054	0.10	5.7E-04
460m/1509ft	1.0	0.0052	0.10	5.5E-04
470m/1542ft	1.0	0.0051	0.093	5.3E-04
480m/1575ft	0.93	0.0049	0.090	5.1E-04
490m/1608ft	0.90	0.0047	0.087	5.0E-04
500m/1640ft	0.87	0.0046	0.084	4.8E-04

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 14.1
Maximum Health Impacts by Distance for Emergency Generator Operation of Type 1
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Maximum Health Impacts[1]	
	Cancer Risk	$PM_{2.5}$ Concentration
5m/16ft	0.063	8.4E-05
10m/33ft	0.43	5.7E-04
20m/66ft	1.3	0.0017
30m/98ft	1.6	0.0022
40m/131ft	1.6	0.0021
50m/164ft	1.5	0.0020
60m/197ft	1.3	0.0018
70m/230ft	1.2	0.0016
80m/262ft	1.1	0.0014
90m/295ft	1.0	0.0013
100m/328ft	0.86	0.0012
110m/361ft	0.78	0.0010
120m/394ft	0.71	0.0010
130m/427ft	0.65	8.8E-04
140m/459ft	0.60	8.0E-04
150m/492ft	0.55	7.4E-04
160m/525ft	0.52	6.9E-04
170m/558ft	0.48	6.4E-04
180m/591ft	0.45	6.1E-04
190m/623ft	0.43	5.7E-04
200m/656ft	0.40	5.4E-04
210m/689ft	0.38	5.1E-04
220m/722ft	0.36	4.9E-04
230m/755ft	0.34	4.6E-04
240m/787ft	0.33	4.4E-04
250m/820ft	0.32	4.3E-04
260m/853ft	0.31	4.1E-04
270m/886ft	0.29	4.0E-04
280m/919ft	0.28	3.8E-04
290m/951ft	0.27	3.7E-04
300m/984ft	0.27	3.6E-04
310m/1017ft	0.26	3.5E-04
320m/1050ft	0.25	3.4E-04
330m/1083ft	0.25	3.3E-04
340m/1115ft	0.24	3.2E-04
350m/1148ft	0.23	3.1E-04

Table 14.1
Maximum Health Impacts by Distance for Emergency Generator Operation of Type 1
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Maximum Health Impacts[1]	
	Cancer Risk	$PM_{2.5}$ Concentration
360m/1181ft	0.23	3.1E-04
370m/1214ft	0.22	3.0E-04
380m/1247ft	0.22	2.9E-04
390m/1280ft	0.21	2.9E-04
400m/1312ft	0.21	2.8E-04
410m/1345ft	0.20	2.7E-04
420m/1378ft	0.20	2.7E-04
430m/1411ft	0.20	2.6E-04
440m/1444ft	0.19	2.6E-04
450m/1476ft	0.19	2.5E-04
460m/1509ft	0.19	2.5E-04
470m/1542ft	0.18	2.4E-04
480m/1575ft	0.18	2.4E-04
490m/1608ft	0.18	2.4E-04
500m/1640ft	0.17	2.3E-04

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the project boundary.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 14.2
Maximum Health Impacts by Distance for Emergency Generator Operation of Type 2
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Maximum Health Impacts[1]	
	Cancer Risk	$PM_{2.5}$ Concentration
5m/16ft	0.047	4.7E-04
10m/33ft	0.24	0.0024
20m/66ft	0.95	0.010
30m/98ft	1.2	0.012
40m/131ft	1.3	0.013
50m/164ft	1.2	0.012
60m/197ft	1.1	0.011
70m/230ft	1.0	0.010
80m/262ft	0.93	0.0093
90m/295ft	0.84	0.0084
100m/328ft	0.76	0.0077
110m/361ft	0.69	0.0070
120m/394ft	0.63	0.0064
130m/427ft	0.58	0.0059
140m/459ft	0.54	0.0054
150m/492ft	0.50	0.0050
160m/525ft	0.46	0.0047
170m/558ft	0.43	0.0044
180m/591ft	0.41	0.0041
190m/623ft	0.38	0.0039
200m/656ft	0.36	0.0036
210m/689ft	0.34	0.0034
220m/722ft	0.32	0.0033
230m/755ft	0.31	0.0031
240m/787ft	0.30	0.0030
250m/820ft	0.28	0.0028
260m/853ft	0.27	0.0027
270m/886ft	0.26	0.0026
280m/919ft	0.25	0.0025
290m/951ft	0.24	0.0024
300m/984ft	0.23	0.0024
310m/1017ft	0.23	0.0023
320m/1050ft	0.22	0.0022
330m/1083ft	0.21	0.0022
340m/1115ft	0.21	0.0021
350m/1148ft	0.20	0.0020

Table 14.2
Maximum Health Impacts by Distance for Emergency Generator Operation of Type 2
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Maximum Health Impacts[1]	
	Cancer Risk	$PM_{2.5}$ Concentration
360m/1181ft	0.20	0.0020
370m/1214ft	0.19	0.0019
380m/1247ft	0.19	0.0019
390m/1280ft	0.18	0.0019
400m/1312ft	0.18	0.0018
410m/1345ft	0.18	0.0018
420m/1378ft	0.17	0.0017
430m/1411ft	0.17	0.0017
440m/1444ft	0.17	0.0017
450m/1476ft	0.16	0.0017
460m/1509ft	0.16	0.0016
470m/1542ft	0.16	0.0016
480m/1575ft	0.16	0.0016
490m/1608ft	0.15	0.0015
500m/1640ft	0.15	0.0015

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the project boundary.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 14.3
Maximum Health Impacts by Distance for Emergency Generator Operation of Type 3
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	0.22	3.0E-04	0.029	3.9E-05
10m/33ft	1.5	0.0020	0.20	2.7E-04
20m/66ft	4.4	0.0059	0.59	7.9E-04
30m/98ft	5.6	0.0076	0.75	0.0010
40m/131ft	5.6	0.0075	0.74	0.0010
50m/164ft	5.2	0.0070	0.69	9.3E-04
60m/197ft	4.7	0.0063	0.63	8.4E-04
70m/230ft	4.2	0.0056	0.56	7.5E-04
80m/262ft	3.7	0.0050	0.50	6.7E-04
90m/295ft	3.3	0.0045	0.45	6.0E-04
100m/328ft	3.0	0.0041	0.40	5.4E-04
110m/361ft	2.7	0.0037	0.36	4.9E-04
120m/394ft	2.5	0.0033	0.33	4.5E-04
130m/427ft	2.3	0.0031	0.30	4.1E-04
140m/459ft	2.1	0.0028	0.28	3.7E-04
150m/492ft	1.9	0.0026	0.26	3.5E-04
160m/525ft	1.8	0.0024	0.24	3.2E-04
170m/558ft	1.7	0.0023	0.22	3.0E-04
180m/591ft	1.6	0.0021	0.21	2.8E-04
190m/623ft	1.5	0.0020	0.20	2.7E-04
200m/656ft	1.4	0.0019	0.19	2.5E-04
210m/689ft	1.3	0.0018	0.18	2.4E-04
220m/722ft	1.3	0.0017	0.17	2.3E-04
230m/755ft	1.2	0.0016	0.16	2.2E-04
240m/787ft	1.2	0.0016	0.15	2.1E-04
250m/820ft	1.1	0.0015	0.15	2.0E-04
260m/853ft	1.1	0.0014	0.14	1.9E-04
270m/886ft	1.0	0.0014	0.14	1.8E-04
280m/919ft	1.0	0.0013	0.13	1.8E-04
290m/951ft	1.0	0.0013	0.13	1.7E-04
300m/984ft	0.93	0.0013	0.12	1.7E-04
310m/1017ft	0.91	0.0012	0.12	1.6E-04
320m/1050ft	0.88	0.0012	0.12	1.6E-04
330m/1083ft	0.86	0.0012	0.11	1.5E-04
340m/1115ft	0.84	0.0011	0.11	1.5E-04

Table 14.3
Maximum Health Impacts by Distance for Emergency Generator Operation of Type 3
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
350m/1148ft	0.82	0.0011	0.11	1.5E-04
360m/1181ft	0.80	0.0011	0.11	1.4E-04
370m/1214ft	0.78	0.0010	0.10	1.4E-04
380m/1247ft	0.76	0.0010	0.10	1.4E-04
390m/1280ft	0.75	0.0010	0.10	1.3E-04
400m/1312ft	0.73	0.0010	0.10	1.3E-04
410m/1345ft	0.72	0.0010	0.10	1.3E-04
420m/1378ft	0.70	9.4E-04	0.094	1.3E-04
430m/1411ft	0.69	9.3E-04	0.092	1.2E-04
440m/1444ft	0.68	9.1E-04	0.090	1.2E-04
450m/1476ft	0.66	8.9E-04	0.088	1.2E-04
460m/1509ft	0.65	8.7E-04	0.087	1.2E-04
470m/1542ft	0.64	8.6E-04	0.085	1.1E-04
480m/1575ft	0.63	8.4E-04	0.084	1.1E-04
490m/1608ft	0.62	8.3E-04	0.082	1.1E-04
500m/1640ft	0.60	8.1E-04	0.080	1.1E-04

Notes:
1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment.

Abbreviations:
HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 15.1
Maximum Health Impacts by Distance for Construction and Emergency Generator Operation of Type 1
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	1,392	9.4	103	0.72
10m/33ft	1,215	8.2	91	0.63
20m/66ft	908	6.1	69	0.47
30m/98ft	695	4.7	53	0.36
40m/131ft	553	3.7	42	0.29
50m/164ft	449	3.0	35	0.23
60m/197ft	374	2.5	29	0.19
70m/230ft	317	2.1	25	0.17
80m/262ft	274	1.8	21	0.14
90m/295ft	239	1.6	19	0.12
100m/328ft	211	1.4	16	0.11
110m/361ft	188	1.3	15	0.10
120m/394ft	169	1.1	13	0.088
130m/427ft	152	1.0	12	0.079
140m/459ft	139	0.94	11	0.072
150m/492ft	127	0.86	10	0.066
160m/525ft	116	0.79	9.1	0.061
170m/558ft	107	0.72	8.4	0.056
180m/591ft	99	0.67	7.8	0.052
190m/623ft	92	0.62	7.3	0.048
200m/656ft	86	0.58	6.8	0.045
210m/689ft	81	0.54	6.3	0.042
220m/722ft	76	0.51	5.9	0.039
230m/755ft	71	0.48	5.6	0.037
240m/787ft	67	0.45	5.3	0.035
250m/820ft	63	0.43	5.0	0.033
260m/853ft	60	0.40	4.7	0.031
270m/886ft	57	0.38	4.5	0.030
280m/919ft	54	0.36	4.3	0.028
290m/951ft	51	0.34	4.1	0.027
300m/984ft	49	0.33	3.9	0.025
310m/1017ft	46	0.31	3.7	0.024
320m/1050ft	44	0.30	3.5	0.023
330m/1083ft	42	0.29	3.4	0.022
340m/1115ft	41	0.27	3.2	0.021
350m/1148ft	39	0.26	3.1	0.020

Table 15.1
Maximum Health Impacts by Distance for Construction and Emergency Generator Operation of Type 1
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	37	0.25	3.0	0.020
370m/1214ft	36	0.24	2.9	0.019
380m/1247ft	35	0.23	2.8	0.018
390m/1280ft	33	0.22	2.7	0.017
400m/1312ft	32	0.22	2.6	0.017
410m/1345ft	31	0.21	2.5	0.016
420m/1378ft	30	0.20	2.4	0.016
430m/1411ft	29	0.19	2.3	0.015
440m/1444ft	28	0.19	2.2	0.015
450m/1476ft	27	0.18	2.2	0.014
460m/1509ft	26	0.18	2.1	0.014
470m/1542ft	25	0.17	2.0	0.013
480m/1575ft	24	0.16	2.0	0.013
490m/1608ft	24	0.16	1.9	0.012
500m/1640ft	23	0.15	1.9	0.012

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 15.2
Maximum Health Impacts by Distance for Construction and Emergency Generator Operation of Type 2
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	579	1.8	65	0.22
10m/33ft	497	1.8	56	0.19
20m/66ft	361	1.5	41	0.15
30m/98ft	270	1.11	31	0.11
40m/131ft	211	0.83	25	0.093
50m/164ft	169	0.65	20	0.076
60m/197ft	140	0.52	17	0.064
70m/230ft	118	0.43	14	0.055
80m/262ft	100	0.37	12	0.047
90m/295ft	87	0.31	10	0.041
100m/328ft	77	0.27	9	0.036
110m/361ft	68	0.24	8.2	0.033
120m/394ft	61	0.21	7.4	0.029
130m/427ft	55	0.19	6.6	0.026
140m/459ft	49	0.17	6.0	0.024
150m/492ft	45	0.15	5.5	0.022
160m/525ft	41	0.14	5.0	0.020
170m/558ft	38	0.13	4.6	0.019
180m/591ft	35	0.12	4.3	0.017
190m/623ft	33	0.11	4.0	0.016
200m/656ft	30	0.10	3.7	0.015
210m/689ft	28	0.095	3.5	0.014
220m/722ft	26	0.089	3.3	0.013
230m/755ft	25	0.083	3.1	0.012
240m/787ft	23	0.078	2.9	0.012
250m/820ft	22	0.073	2.7	0.011
260m/853ft	21	0.069	2.6	0.011
270m/886ft	20	0.065	2.4	0.010
280m/919ft	19	0.062	2.3	0.010
290m/951ft	18	0.059	2.2	0.0091
300m/984ft	17	0.056	2.1	0.0087
310m/1017ft	16	0.053	2.0	0.0083
320m/1050ft	15	0.051	1.9	0.0080
330m/1083ft	15	0.049	1.8	0.0077
340m/1115ft	14	0.046	1.8	0.0074
350m/1148ft	13	0.044	1.7	0.0071

Table 15.2
Maximum Health Impacts by Distance for Construction and Emergency Generator Operation of Type 2
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	13	0.043	1.6	0.0068
370m/1214ft	12	0.041	1.6	0.0066
380m/1247ft	12	0.039	1.5	0.0064
390m/1280ft	11	0.038	1.4	0.0062
400m/1312ft	11	0.036	1.4	0.0060
410m/1345ft	11	0.035	1.4	0.0058
420m/1378ft	10	0.034	1.3	0.0056
430m/1411ft	10	0.033	1.3	0.0054
440m/1444ft	10	0.032	1.2	0.0053
450m/1476ft	9.3	0.030	1.2	0.0051
460m/1509ft	9.0	0.029	1.1	0.0050
470m/1542ft	8.7	0.029	1.1	0.0048
480m/1575ft	8.4	0.028	1.1	0.0047
490m/1608ft	8.2	0.027	1.0	0.0046
500m/1640ft	7.9	0.026	1.0	0.0045

Notes:

1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

Table 15.3
Maximum Health Impacts by Distance for Construction and Emergency Generator Operation of Type 3
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
5m/16ft	174	0.54	11	0.036
10m/33ft	149	0.46	10	0.031
20m/66ft	110	0.33	7.3	0.023
30m/98ft	83	0.25	5.7	0.017
40m/131ft	65	0.19	4.5	0.013
50m/164ft	52	0.15	3.7	0.011
60m/197ft	43	0.13	3.1	0.0089
70m/230ft	36	0.11	2.6	0.0075
80m/262ft	31	0.090	2.2	0.0064
90m/295ft	27	0.078	1.9	0.0056
100m/328ft	24	0.068	1.7	0.0049
110m/361ft	21	0.060	1.5	0.0043
120m/394ft	19	0.054	1.4	0.0039
130m/427ft	17	0.048	1.2	0.0035
140m/459ft	15	0.044	1.1	0.0031
150m/492ft	14	0.040	1.0	0.0029
160m/525ft	13	0.036	0.9	0.0026
170m/558ft	12	0.034	0.86	0.0024
180m/591ft	11	0.031	0.80	0.0022
190m/623ft	10	0.029	0.75	0.0021
200m/656ft	9.4	0.027	0.69	0.0019
210m/689ft	8.8	0.025	0.65	0.0018
220m/722ft	8.2	0.023	0.61	0.0017
230m/755ft	7.7	0.022	0.58	0.0016
240m/787ft	7.3	0.021	0.54	0.0015
250m/820ft	6.9	0.019	0.52	0.0014
260m/853ft	6.5	0.018	0.49	0.0013
270m/886ft	6.2	0.017	0.47	0.0013
280m/919ft	5.9	0.017	0.44	0.0012
290m/951ft	5.6	0.016	0.42	0.0011
300m/984ft	5.4	0.015	0.41	0.0011
310m/1017ft	5.1	0.014	0.39	0.0010
320m/1050ft	4.9	0.014	0.37	0.0010
330m/1083ft	4.7	0.013	0.36	0.0010
340m/1115ft	4.5	0.013	0.34	9.2E-04
350m/1148ft	4.3	0.012	0.33	8.8E-04

Table 15.3
Maximum Health Impacts by Distance for Construction and Emergency Generator Operation of Type 3
San Francisco Housing Element
San Francisco, California

Distance from Construction Project Boundary	Uncontrolled Maximum Health Impacts[1]		Controlled Maximum Health Impacts[2]	
	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)	Cancer Risk	$PM_{2.5}$ Concentration (ug/m^3)
360m/1181ft	4.2	0.012	0.32	8.5E-04
370m/1214ft	4.0	0.011	0.31	8.2E-04
380m/1247ft	3.9	0.011	0.30	7.9E-04
390m/1280ft	3.7	0.010	0.29	7.6E-04
400m/1312ft	3.6	0.010	0.28	7.3E-04
410m/1345ft	3.5	0.010	0.27	7.1E-04
420m/1378ft	3.4	0.0092	0.26	6.8E-04
430m/1411ft	3.3	0.0089	0.26	6.6E-04
440m/1444ft	3.2	0.0086	0.25	6.4E-04
450m/1476ft	3.1	0.0083	0.24	6.2E-04
460m/1509ft	3.0	0.0081	0.23	6.0E-04
470m/1542ft	2.9	0.0078	0.23	5.9E-04
480m/1575ft	2.8	0.0076	0.22	5.7E-04
490m/1608ft	2.7	0.0074	0.22	5.5E-04
500m/1640ft	2.6	0.0071	0.21	5.4E-04

Notes:

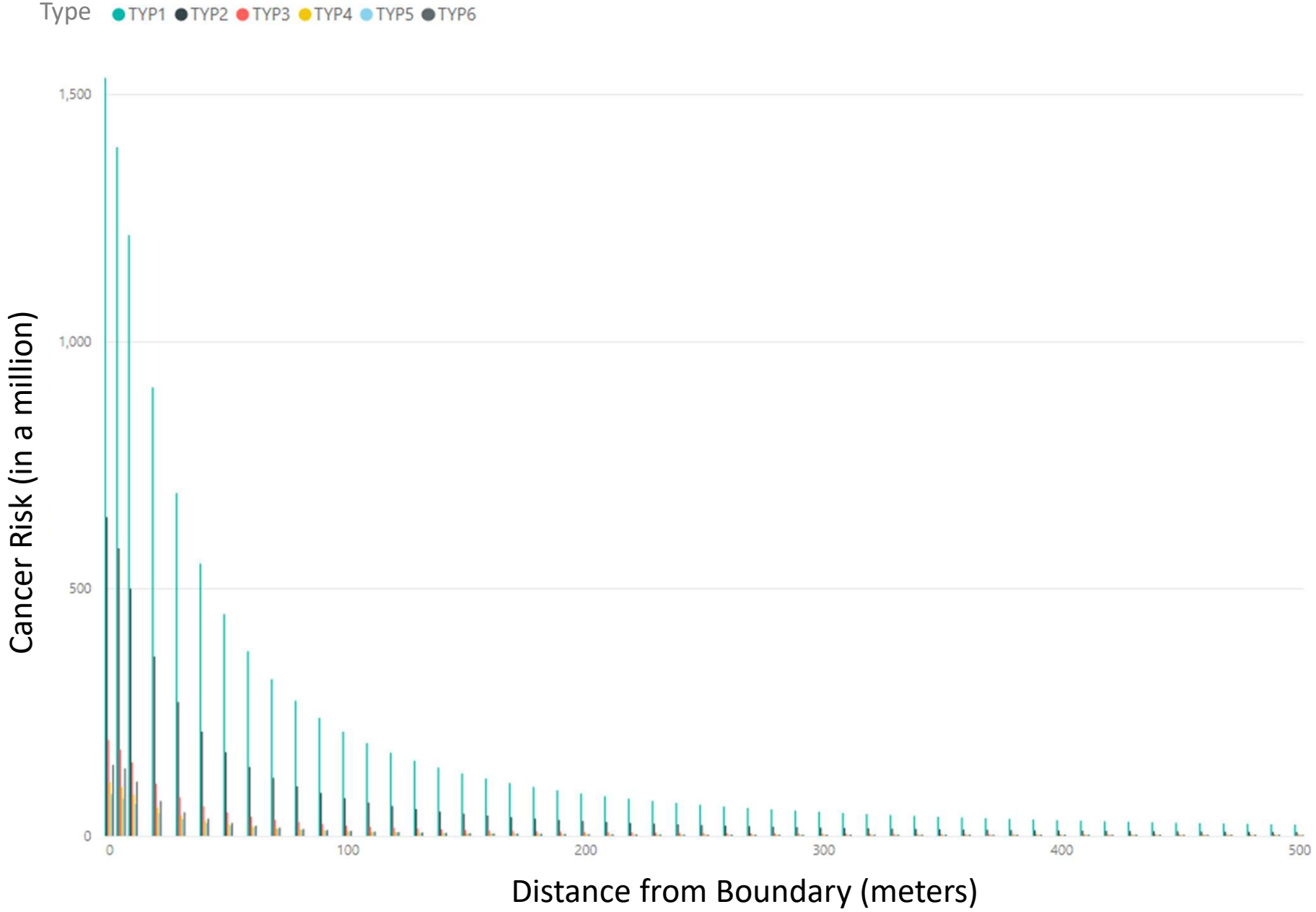
1. Lifetime excess cancer risk and $PM_{2.5}$ concentrations are shown for the maximally exposed receptor at each distance from the construction boundary.
2. The Controlled modeling scenario assumed Tier 4 equipment for all construction phases.

Abbreviations:

HRA - health risk assessment
ft - feet
m - meter
$PM_{2.5}$ - particulate matter less than 2.5 microns

FIGURES

Cancer Risk (in a Million) by Buffer Distance (m) and Type



RAMBOLL

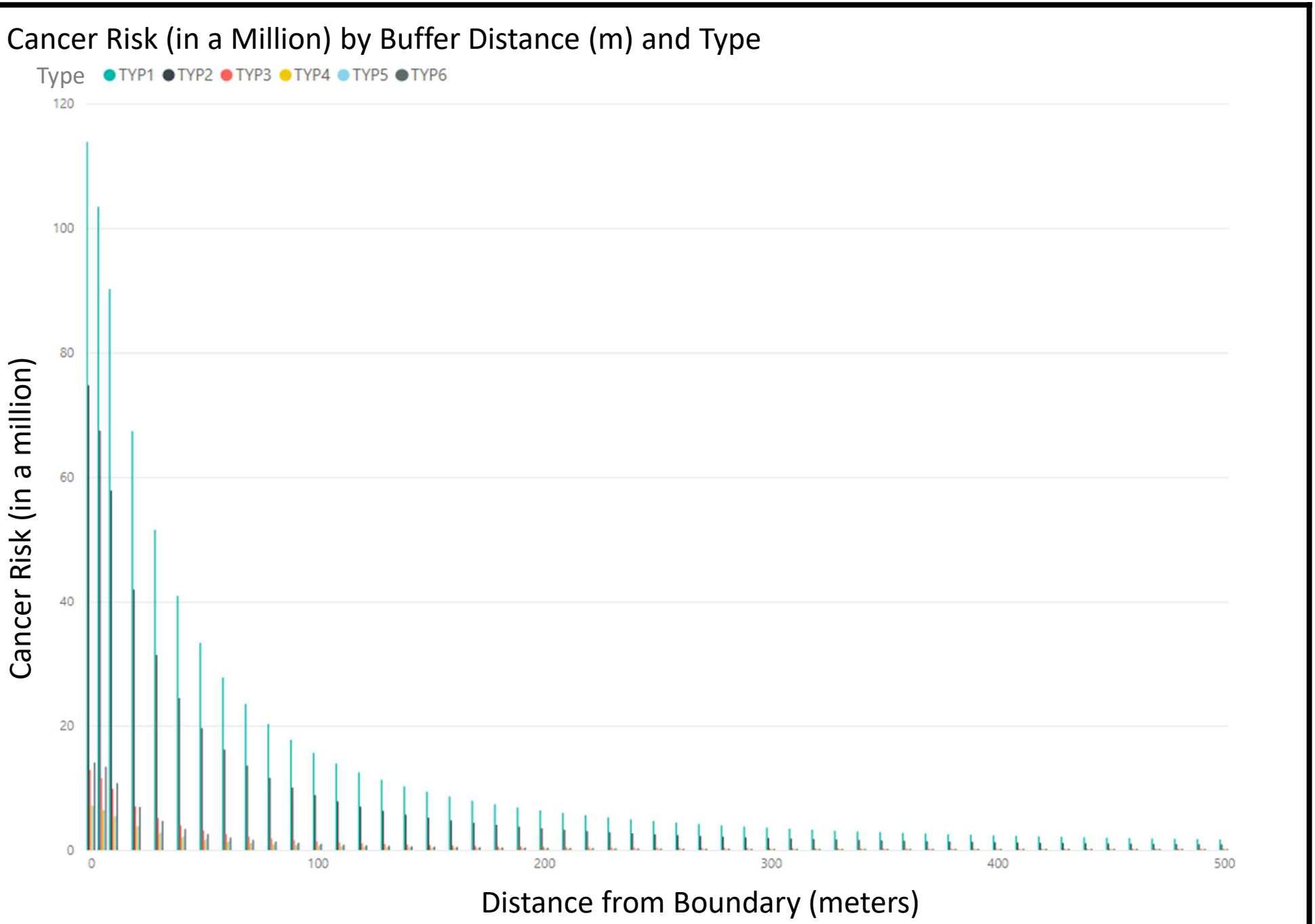
Uncontrolled Construction Maximum Cancer Risk
San Francisco Housing Element 2022 Update
San Francisco, California

FIGURE
1

DRAFTED BY: RZ

DATE: 10/4/2021

PROJECT:
1690017135



RAMBOLL

Controlled Construction Maximum Cancer Risk
San Francisco Housing Element 2022 Update
San Francisco, California

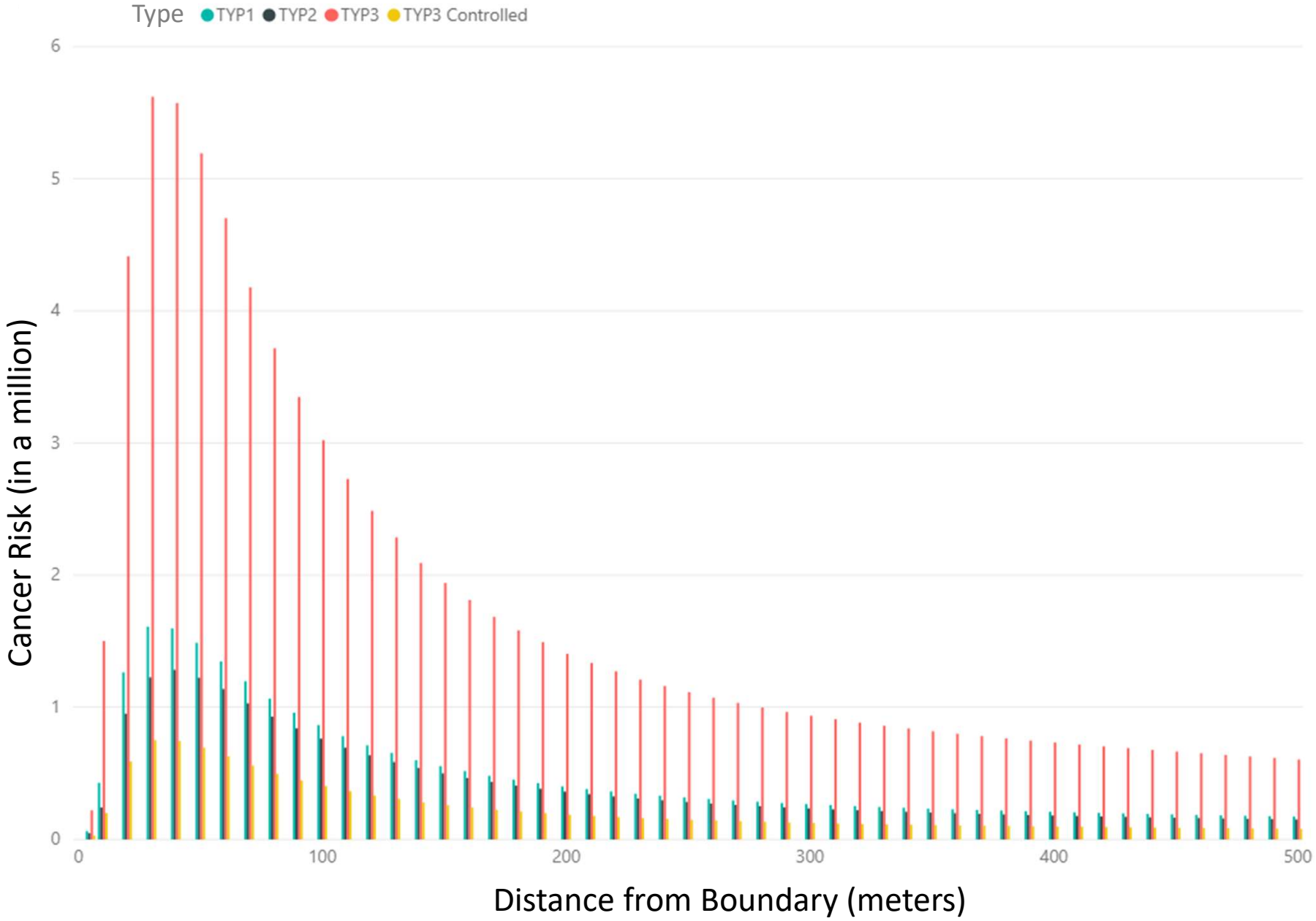
FIGURE
2

DRAFTED BY: RZ

DATE: 10/4/2021

PROJECT:
1690017135

Cancer Risk (in a Million) by Buffer Distance (m) and Type



RAMBOLL

Emergency Generator Maximum Cancer Risk
San Francisco Housing Element 2022 Update
San Francisco, California

FIGURE
3

DRAFTED BY: RZ

DATE: 10/4/2021

PROJECT:
1690017135

APPENDIX A
TRIP RATES

SAN FRANCISCO TRAVEL DEMAND TOOL INFO

Building Type 1

WEBSITE VERSION: 0.3.2
DATA VERSION: 0.3

PROJECT LOCATION ATTRIBUTES

Address: 10 South Van Ness
District: SoMa
Place Type: Urban high density
City: San Francisco

SELECTED FILTERS

Time Perio daily
Purpose: work and non-work
Direction: inbound and outbound
Distributio district

Average vehicle occupancy

Landuse	District AVO	Place Type	City AVO
Residential	1.2	1.5	1.5
Hotel	1.5	1.6	1.6
Retail	1.5	1.6	1.6
Supermark	1.5	1.6	1.6
Office	1.2	1.2	1.2
Restaurant	1.5	1.6	1.6
Composite	1.5	1.6	1.6

Total Trips Generated by Land Use and Time

Landuse	Amount	Unit	Daily Perso	Daily Perso	PM Person	PM Person Trips
Residential	1173	Bedrooms	4.5	5278.5	0.4	469.2
Hotel	null	Rooms	8.4	0	0.6	0
Retail	29.5	1K Square I	150	4425	13.5	398.3
Supermark	0	1K Square I	297	0	21.7	0
Office	0	1K Square I	15.7	0	1.4	0
Restaurant	0	1K Square I	200	0	27	0
Composite	0	1K Square I	600	0	81	0
Total				9703.5		867.5

Mode Split Distribution

Landuse	Auto	TNC/Taxi	Transit	Private Shu	Walk	Bike
Residential	0.248	0.06	0.28	0.005	0.377	0.029
Hotel	0.175	0.196	0.059	0.018	0.551	0
Retail	0.113	0.046	0.254	0	0.549	0.037
Supermark	0.113	0.046	0.254	0	0.549	0.037
Office	0.184	0.061	0.288	0.006	0.423	0.037
Restaurant	0.113	0.046	0.254	0	0.549	0.037
Composite	0.113	0.046	0.254	0	0.549	0.037

Total Trips by Mode

Mode	Total Perso	Filtered Pe	Total Vehic	Filtered Vehicle Trips
Auto	1809.1	1809.1	1399	1399
TNC/Taxi	520.3	520.3	346.8	346.8
Transit	2601.9	2601.9		
Private Shu	26.4	26.4		
Walk	4419.3	4419.3		
Bike	316.8	316.8		

auto Person Trips Distribution by District

Landuse	Downtown	SoMa	Marina/We	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	168.1	273.7	165.3	61.6	309.3	33.8	0	0	67.2	196.3	0	33.8
Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Retail	37.5	42.6	57.7	34.7	35.1	51.9	35.7	0	113.2	67.5	12.6	11.6
Supermark	0	0	0	0	0	0	0	0	0	0	0	0
Office	0	0	0	0	0	0	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
Composite	0	0	0	0	0	0	0	0	0	0	0	0
Total	205.6	316.3	223.1	96.3	344.5	85.6	35.7	0	180.3	263.8	12.6	45.4

auto Vehicle Trips Distribution by District

Landuse	Downtown	SoMa	Marina/We	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	135.9	221.2	133.6	49.8	250	27.3	0	0	54.3	158.6	0	27.3
Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Retail	25.6	29	39.4	23.7	24	35.4	24.3	0	77.2	46	8.6	7.9
Supermark	0	0	0	0	0	0	0	0	0	0	0	0
Office	0	0	0	0	0	0	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
Composite	0	0	0	0	0	0	0	0	0	0	0	0
Total	161.4	250.3	173	73.5	274	62.7	24.3	0	131.5	204.7	8.6	35.2

SAN FRANCISCO TRAVEL DEMAND TOOL INFO

Building Type 2

WEBSITE VERSION: 0.3.2
DATA VERSION: 0.3

PROJECT LOCATION ATTRIBUTES

Address: 469 Stevenson
District: Downtown/NorthBeach
Place Type Urban high density
City: San Francisco

SELECTED FILTERS

Time Perio daily
Purpose: work and non-work
Direction: inbound and outbound
Distributio district

Average vehicle occupancy

Landuse	District AV	Place Type	City AVO
Residential	1.5	1.5	1.5
Hotel	1.6	1.6	1.6
Retail	1.6	1.6	1.6
Supermark	1.6	1.6	1.6
Office	1.2	1.2	1.2
Restaurant	1.6	1.6	1.6
Composite	1.6	1.6	1.6

Total Trips Generated by Land Use and Time

Landuse	Amount	Unit	Daily Person Trip Rate	Daily Person Trips	PM Person Trip Rate	PM Person Trips
Residential	707	Bedrooms	4.5	3181.5	0.4	282.8
Hotel	null	Rooms	8.4	0	0.6	0
Retail	4	1K Square I	150	600	13.5	54
Supermark	0	1K Square I	297	0	21.7	0
Office	0	1K Square I	15.7	0	1.4	0
Restaurant	0	1K Square I	200	0	27	0
Composite	0	1K Square I	600	0	81	0
Total				3781.5		336.8

Mode Split Distribution

Landuse	Auto	TNC/Taxi	Transit	Private Shuttle	Walk	Bike
Residential	0.248	0.06	0.28	0.005	0.377	0.029
Hotel	0.175	0.196	0.059	0.018	0.551	0
Retail	0.113	0.046	0.254	0	0.549	0.037
Supermark	0.113	0.046	0.254	0	0.549	0.037
Office	0.184	0.061	0.288	0.006	0.423	0.037
Restaurant	0.113	0.046	0.254	0	0.549	0.037
Composite	0.113	0.046	0.254	0	0.549	0.037

Total Trips by Mode

Mode	Total Perso	Filtered Pe	Total Vehicle Trips	Filtered Vehicle Trips
Auto	856.8	856.8	568.2	568.2
TNC/Taxi	218.5	218.5	145.7	145.7
Transit	1043.2	1043.2		
Private Shu	15.9	15.9		
Walk	1528.8	1528.8		
Bike	114.5	114.5		

auto Person Trips Distribution by District

Landuse	Downtown	SoMa	Marina/Western	Market	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	223.1	48.8	199.5	41	17.2	8.9	24.8	0	83.7	43	5.7	93.1	
Hotel	0	0	0	0	0	0	0	0	0	0	0	0	
Retail	15.6	3.6	9.3	4.9	1.1	2.3	1.8	0	9.9	9.6	2.3	7.5	
Supermark	0	0	0	0	0	0	0	0	0	0	0	0	
Office	0	0	0	0	0	0	0	0	0	0	0	0	
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0	
Composite	0	0	0	0	0	0	0	0	0	0	0	0	
Total	238.7	52.4	208.8	45.9	18.4	11.3	26.6	0	93.6	52.6	7.9	100.6	

auto Vehicle Trips Distribution by District

Landuse	Downtown	SoMa	Marina/Western	Market	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	148.8	32.6	133.1	27.4	11.5	6	16.5	0	55.8	28.7	3.8	62.1	
Hotel	0	0	0	0	0	0	0	0	0	0	0	0	
Retail	9.6	2.2	5.7	3	0.7	1.4	1.1	0	6.1	5.9	1.4	4.6	
Supermark	0	0	0	0	0	0	0	0	0	0	0	0	
Office	0	0	0	0	0	0	0	0	0	0	0	0	
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0	
Composite	0	0	0	0	0	0	0	0	0	0	0	0	
Total	158.4	34.8	138.8	30.4	12.2	7.4	17.7	0	61.9	34.6	5.2	66.7	

SAN FRANCISCO TRAVEL DEMAND TOOL INFO **Building Type 3**

WEBSITE VERSION: 0.3.2
DATA VERSION: 0.3

PROJECT LOCATION ATTRIBUTES

Address: 900 7th Street
District: Mission/
Place Type: Urban medium density
City: San Francisco

SELECTED FILTERS

Time Perio: daily
Purpose: work and non-work
Direction: inbound and outbound
Distributio: district

Average vehicle occupancy

Landuse	District AVO	Place Type	City AVO
Residential	1.5	1.4	1.5
Hotel	1.5	1.6	1.6
Retail	1.5	1.6	1.6
Supermark	1.5	1.6	1.6
Office	1.1	1.1	1.2
Restaurant	1.5	1.6	1.6
Composite	1.5	1.6	1.6

Total Trips Generated by Land Use and Time

Landuse	Amount	Unit	Daily Perso	Daily Perso	PM Person	PM Person Trips
Residential	565	Bedrooms	4.5	2542.5	0.4	226
Hotel	null	Rooms	8.4	0	0.6	0
Retail	3	1K Square I	150	450	13.5	40.5
Supermark	0	1K Square I	297	0	21.7	0
Office	0	1K Square I	15.7	0	1.4	0
Restaurant	0	1K Square I	200	0	27	0
Composite	0	1K Square I	600	0	81	0
Total				2992.5		266.5

Mode Split Distribution

Landuse	Auto	TNC/Taxi	Transit	Private Shu	Walk	Bike
Residential	0.389	0.035	0.19	0.003	0.343	0.039
Hotel	0.269	0.157	0.147	0.042	0.384	0
Retail	0.259	0.014	0.118	0.005	0.576	0.028
Supermark	0.259	0.014	0.118	0.005	0.576	0.028
Office	0.374	0.111	0.186	0.129	0.171	0.028
Restaurant	0.259	0.014	0.118	0.005	0.576	0.028
Composite	0.259	0.014	0.118	0.005	0.576	0.028

Total Trips by Mode

Mode	Total Person Trips	Filtered Pe	Total Vehic	Filtered Vehicle Trips
Auto	1105.6	1105.6	749.9	749.9
TNC/Taxi	95.3	95.3	63.5	63.5
Transit	536.2	536.2		
Private Shu	9.9	9.9		
Walk	1131.3	1131.3		
Bike	111.8	111.8		

auto Person Trips Distribution by District

Landuse	Downtown/North	Beach	SoMa	Marina/We	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	Outer	Mission/Hills
Residential	65.9	41.4	174.8	345.8	10.5	3.8	23.1	0	53.4	131.5	0	138.9		
Hotel	0	0	0	0	0	0	0	0	0	0	0	0		
Retail	7.5	3.4	10.4	35.1	8.4	0.9	0.9	0	14	9.3	3.6	23.1		
Supermark	0	0	0	0	0	0	0	0	0	0	0	0		
Office	0	0	0	0	0	0	0	0	0	0	0	0		
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0		
Composite	0	0	0	0	0	0	0	0	0	0	0	0		
Total	73.4	44.8	185.2	380.9	18.9	4.7	24	0	67.4	140.8	3.6	162		

auto Vehicle Trips Distribution by District

Landuse	Downtown/North	Beach	SoMa	Marina/We	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	Outer	Mission/Hills
Residential	44.9	28.2	119	235.5	7.2	2.6	15.7	0	36.4	89.5	0	94.6		
Hotel	0	0	0	0	0	0	0	0	0	0	0	0		
Retail	4.9	2.2	6.8	23	5.5	0.6	0.6	0	9.2	6.1	2.3	15.2		
Supermark	0	0	0	0	0	0	0	0	0	0	0	0		
Office	0	0	0	0	0	0	0	0	0	0	0	0		
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0		
Composite	0	0	0	0	0	0	0	0	0	0	0	0		
Total	49.8	30.5	125.8	258.5	12.6	3.2	16.3	0	45.5	95.6	2.3	109.7		

SAN FRANCISCO TRAVEL DEMAND TOOL INFO **Building Type 4**

WEBSITE VERSION: 0.3.2
DATA VERSION: 0.3

PROJECT LOCATION ATTRIBUTES

Address: 1400 19th Avenue
District: Sunset
Place Type: Urban low density
City: San Francisco

SELECTED FILTERS

Time Perio daily
Purpose: work and non-work
Direction: inbound and outbound
Distributio district

Average vehicle occupancy

Landuse	District AV(	Place Type	City AVO
Residential	1.6	1.5	1.5
Hotel	1.8	1.8	1.6
Retail	1.8	1.8	1.6
Supermark	1.8	1.8	1.6
Office	1.2	1.1	1.2
Restaurant	1.8	1.8	1.6
Composite	1.8	1.8	1.6

Total Trips Generated by Land Use and Time

Landuse	Amount	Unit	Daily Perso	Daily Perso	PM Person	PM Person Trips
Residential	71	Bedrooms	4.5	319.5	0.4	28.4
Hotel	null	Rooms	8.4	0	0.6	0
Retail	2	1K Square I	150	300	13.5	27
Supermark	0	1K Square I	297	0	21.7	0
Office	0	1K Square I	15.7	0	1.4	0
Restaurant	0	1K Square I	200	0	27	0
Composite	0	1K Square I	600	0	81	0
Total				619.5		55.4

Mode Split Distribution

Landuse	Auto	TNC/Taxi	Transit	Private Shu	Walk	Bike
Residential	0.389	0.035	0.19	0.003	0.343	0.039
Hotel	0.455	0.075	0.015	0	0.456	0
Retail	0.54	0.01	0.158	0.003	0.278	0.011
Supermark	0.54	0.01	0.158	0.003	0.278	0.011
Office	0.694	0.02	0.036	0.186	0.057	0.006
Restaurant	0.54	0.01	0.158	0.003	0.278	0.011
Composite	0.54	0.01	0.158	0.003	0.278	0.011

Total Trips by Mode

Mode	Total Perso	Filtered Pe	Total Vehic	Filtered Vehicle Trips
Auto	286.3	286.3	166	166
TNC/Taxi	14.2	14.2	9.5	9.5
Transit	108.1	108.1		
Private Shu	1.9	1.9		
Walk	193	193		
Bike	15.8	15.8		

auto Person Trips Distribution by District

Landuse	Downtown	SoMa	Marina/We	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	3	1.9	11.7	1.6	4.4	14.8	55	0	17.5	1.9	5.1	7.4
Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Retail	1.5	1.9	8.4	1.6	1.1	7.8	73.8	0	28.1	3.6	2.2	32.1
Supermark	0	0	0	0	0	0	0	0	0	0	0	0
Office	0	0	0	0	0	0	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
Composite	0	0	0	0	0	0	0	0	0	0	0	0
Total	4.5	3.8	20.1	3.2	5.5	22.6	128.8	0	45.6	5.4	7.3	39.5

auto Vehicle Trips Distribution by District

Landuse	Downtown	SoMa	Marina/We	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	1.9	1.2	7.4	1	2.8	9.3	34.6	0	11	1.2	3.2	4.6
Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Retail	0.8	1	4.5	0.9	0.6	4.2	40	0	15.2	1.9	1.2	17.4
Supermark	0	0	0	0	0	0	0	0	0	0	0	0
Office	0	0	0	0	0	0	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
Composite	0	0	0	0	0	0	0	0	0	0	0	0
Total	2.7	2.2	11.9	1.9	3.3	13.5	74.6	0	26.2	3.1	4.4	22

SAN FRANCISCO TRAVEL DEMAND TOOL INFO **Building Type 5**

WEBSITE VERSION: 0.3.2
DATA VERSION: 0.3

PROJECT LOCATION ATTRIBUTES

Address: 3700 California
District: Marina/WesternMarket
Place Type Urban medium density
City: San Francisco

SELECTED FILTERS

Time Perio daily
Purpose: work and non-work
Direction: inbound and outbound
Distributio district

Average vehicle occupancy

Landuse	District AV	Place Type	City AVO
Residential	1.2	1.4	1.5
Hotel	1.6	1.6	1.6
Retail	1.6	1.6	1.6
Supermark	1.6	1.6	1.6
Office	1.2	1.1	1.2
Restaurant	1.6	1.6	1.6
Composite	1.6	1.6	1.6

Total Trips Generated by Land Use and Time

Landuse	Amount	Unit	Daily Perso	Daily Perso	PM Person	PM Person Trips
Residential	41	Bedrooms	4.5	184.5	0.4	16.4
Hotel	null	Rooms	8.4	0	0.6	0
Retail	0	1K Square I	150	0	13.5	0
Supermark	0	1K Square I	297	0	21.7	0
Office	0	1K Square I	15.7	0	1.4	0
Restaurant	0	1K Square I	200	0	27	0
Composite	0	1K Square I	600	0	81	0
Total				184.5		16.4

Mode Split Distribution

Landuse	Auto	TNC/Taxi	Transit	Private Shu	Walk	Bike
Residential	0.389	0.035	0.19	0.003	0.343	0.039
Hotel	0.269	0.157	0.147	0.042	0.384	0
Retail	0.259	0.014	0.118	0.005	0.576	0.028
Supermark	0.259	0.014	0.118	0.005	0.576	0.028
Office	0.374	0.111	0.186	0.129	0.171	0.028
Restaurant	0.259	0.014	0.118	0.005	0.576	0.028
Composite	0.259	0.014	0.118	0.005	0.576	0.028

Total Trips by Mode

Mode	Total Persc	Filtered Pe	Total Vehic	Filtered Vehicle Trips
Auto	71.8	71.8	59.8	59.8
TNC/Taxi	6.5	6.5	4.3	4.3
Transit	35.1	35.1		
Private Shu	0.6	0.6		
Walk	63.3	63.3		
Bike	7.2	7.2		

auto Person Trips Distribution by District

Landuse	Downtown	SoMa	Marina/W	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	8.4	2.4	26.8	2.1	0.2	9.5	3.7	0	8.4	2.9	3	4.4
Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Retail	0	0	0	0	0	0	0	0	0	0	0	0
Supermark	0	0	0	0	0	0	0	0	0	0	0	0
Office	0	0	0	0	0	0	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
Composite	0	0	0	0	0	0	0	0	0	0	0	0
Total	8.4	2.4	26.8	2.1	0.2	9.5	3.7	0	8.4	2.9	3	4.4

auto Vehicle Trips Distribution by District

Landuse	Downtown	SoMa	Marina/W	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	7	2	22.3	1.7	0.2	7.9	3.1	0	7	2.4	2.5	3.7
Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Retail	0	0	0	0	0	0	0	0	0	0	0	0
Supermark	0	0	0	0	0	0	0	0	0	0	0	0
Office	0	0	0	0	0	0	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
Composite	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	2	22.3	1.7	0.2	7.9	3.1	0	7	2.4	2.5	3.7

SAN FRANCISCO TRAVEL DEMAND TOOL INFO **Building Type 6**

WEBSITE VERSION: 0.3.2
DATA VERSION: 0.3

PROJECT LOCATION ATTRIBUTES

Address: 3333 California
District: Marina/WesternMarket
Place Type: Urban medium density
City: San Francisco

SELECTED FILTERS

Time Perio daily
Purpose: work and non-work
Direction: inbound and outbound
Distributio district

Average vehicle occupancy

Landuse	District AVO	Place Type	City AVO
Residential	1.2	1.4	1.5
Hotel	1.6	1.6	1.6
Retail	1.6	1.6	1.6
Supermark	1.6	1.6	1.6
Office	1.2	1.1	1.2
Restaurant	1.6	1.6	1.6
Composite	1.6	1.6	1.6

Total Trips Generated by Land Use and Time

Landuse	Amount	Unit	Daily Perso	Daily Perso	PM Person	PM Person Trips
Residential	41	Bedrooms	4.5	184.5	0.4	16.4
Hotel	null	Rooms	8.4	0	0.6	0
Retail	0	1K Square I	150	0	13.5	0
Supermark	0	1K Square I	297	0	21.7	0
Office	0	1K Square I	15.7	0	1.4	0
Restaurant	0	1K Square I	200	0	27	0
Composite	0	1K Square I	600	0	81	0
Total				184.5		16.4

Mode Split Distribution

Landuse	Auto	TNC/Taxi	Transit	Private Shu	Walk	Bike
Residential	0.389	0.035	0.19	0.003	0.343	0.039
Hotel	0.269	0.157	0.147	0.042	0.384	0
Retail	0.259	0.014	0.118	0.005	0.576	0.028
Supermark	0.259	0.014	0.118	0.005	0.576	0.028
Office	0.374	0.111	0.186	0.129	0.171	0.028
Restaurant	0.259	0.014	0.118	0.005	0.576	0.028
Composite	0.259	0.014	0.118	0.005	0.576	0.028

Total Trips by Mode

Mode	Total Perso	Filtered Pe	Total Vehic	Filtered Vehicle Trips
Auto	71.8	71.8	59.8	59.8
TNC/Taxi	6.5	6.5	4.3	4.3
Transit	35.1	35.1		
Private Shu	0.6	0.6		
Walk	63.3	63.3		
Bike	7.2	7.2		

auto Person Trips Distribution by District

Landuse	Downtown	SoMa	Marina/We	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	8.4	2.4	26.8	2.1	0.2	9.5	3.7	0	8.4	2.9	3	4.4
Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Retail	0	0	0	0	0	0	0	0	0	0	0	0
Supermark	0	0	0	0	0	0	0	0	0	0	0	0
Office	0	0	0	0	0	0	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
Composite	0	0	0	0	0	0	0	0	0	0	0	0
Total	8.4	2.4	26.8	2.1	0.2	9.5	3.7	0	8.4	2.9	3	4.4

auto Vehicle Trips Distribution by District

Landuse	Downtown	SoMa	Marina/We	Mission/	Bayshore	Richmond	Sunset	Islands	South Bay	East Bay	North Bay	OuterMission/Hills
Residential	7	2	22.3	1.7	0.2	7.9	3.1	0	7	2.4	2.5	3.7
Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Retail	0	0	0	0	0	0	0	0	0	0	0	0
Supermark	0	0	0	0	0	0	0	0	0	0	0	0
Office	0	0	0	0	0	0	0	0	0	0	0	0
Restaurant	0	0	0	0	0	0	0	0	0	0	0	0
Composite	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	2	22.3	1.7	0.2	7.9	3.1	0	7	2.4	2.5	3.7

APPENDIX B
B-1 OPERATIONAL CALEEMOD OUTPUTS

SF Housing Element - Typology 1 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

SF Housing Element - Typology 1

San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments High Rise	984.00	Dwelling Unit	15.87	935,745.00	2814
Strip Mall	30.35	1000sqft	0.70	30,350.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	4.6	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Typology Land Uses Only, Residential area based on DEIR

Construction Phase - Operational emissions only

Grading -

Vehicle Trips - Weekday trip rates provided by SFEP from the SFCTA Travel Deman Tool for each typology and district including auto and TNC/taxi modes. Trip lengths and types are from CalEEMod defaults. Weekend trip rates are scaled by CalEEMod default ratios between weekend/weekday.

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Road Dust - Updated silt loading factor for SF county from CARB 2018 Miscellaneaous Process Methodology 7.9 for Erntrained Road Travel, Paved Road Dust.

Woodstoves - Natural gas fireplaces or woodstoves are not allowed in new San Francisco buildings.

SF Housing Element - Typology 1 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Consumer Products - CalEEMod default missions factor assumes 2008 statewide VOC inventory and building square footage. An updated 2017 VOC inventory from CARB and population estimates based on the CA DOF demographic projections were used to estimate a statewide VOC EF for 2017.

Energy Use - San Francisco has banned the installation of new natural gas infrastructure in residential buildings.

Fleet Mix - EMFAC2021 outputs converted to CalEEMod fleet mix

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	300.00	0.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	30.00	0.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	10.00	0.00
tblConsumerProducts	ROG_EF	2.14E-05	1.62E-05
tblEnergyUse	NT24NG	2,615.00	0.00
tblEnergyUse	NT24NG	0.70	0.00
tblEnergyUse	T24NG	5,828.01	0.00
tblEnergyUse	T24NG	3.86	0.00
tblFireplaces	FireplaceDayYear	11.14	0.00
tblFireplaces	FireplaceHourDay	3.50	0.00
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	147.60	0.00
tblFireplaces	NumberNoFireplace	39.36	0.00
tblFireplaces	NumberWood	167.28	0.00
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT2	0.19	0.23

SF Housing Element - Typology 1 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.7500	0.0841	7.2997	3.9000e-004		0.0405	0.0405		0.0405	0.0405						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.4923	0.6567	4.6755	0.0127	0.7137	9.5600e-003	0.7233	0.1807	8.9200e-003	0.1896						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**4.2423**	**0.7408**	**11.9752**	**0.0131**	**0.7137**	**0.0501**	**0.7638**	**0.1807**	**0.0494**	**0.2301**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	3.7500	0.0841	7.2997	3.9000e-004		0.0405	0.0405		0.0405	0.0405						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.4923	0.6567	4.6755	0.0127	0.7137	9.5600e-003	0.7233	0.1807	8.9200e-003	0.1896						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**4.2423**	**0.7408**	**11.9752**	**0.0131**	**0.7137**	**0.0501**	**0.7638**	**0.1807**	**0.0494**	**0.2301**						

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/30/2021	7/29/2021	5	0	
2	Site Preparation	Site Preparation	8/27/2021	8/26/2021	5	0	
3	Grading	Grading	9/10/2021	9/9/2021	5	0	

SF Housing Element - Typology 1 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.4923	0.6567	4.6755	0.0127	0.7137	9.5600e-003	0.7233	0.1807	8.9200e-003	0.1896						
Unmitigated	0.4923	0.6567	4.6755	0.0127	0.7137	9.5600e-003	0.7233	0.1807	8.9200e-003	0.1896						

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments High Rise	1,083.85	1,103.34	874.39	2,440,590	2,440,590
Strip Mall	439.73	417.11	202.70	620,080	620,080
Total	1,523.59	1,520.45	1,077.09	3,060,671	3,060,671

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments High Rise	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3
Strip Mall	9.50	7.30	7.30	16.60	64.40	19.00	45	40	15

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments High Rise	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429
Strip Mall	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429

SF Housing Element - Typology 2 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.3505					0.0000	0.0000		0.0000	0.0000						
Consumer Products	1.4753					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	0.1103	0.0423	3.6720	1.9000e-004		0.0204	0.0204		0.0204	0.0204						
Total	**1.9361**	**0.0423**	**3.6720**	**1.9000e-004**		**0.0204**	**0.0204**		**0.0204**	**0.0204**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.3505					0.0000	0.0000		0.0000	0.0000						
Consumer Products	1.4753					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	0.1103	0.0423	3.6720	1.9000e-004		0.0204	0.0204		0.0204	0.0204						
Total	**1.9361**	**0.0423**	**3.6720**	**1.9000e-004**		**0.0204**	**0.0204**		**0.0204**	**0.0204**						

7.0 Water Detail

7.1 Mitigation Measures Water

SF Housing Element - Typology 2 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

SF Housing Element - Typology 2

San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments High Rise	495.00	Dwelling Unit	7.98	495,000.00	1416
Strip Mall	4.00	1000sqft	0.09	4,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	4.6	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Typology Land Uses Only

Construction Phase - Operational emissions only

Grading -

Vehicle Trips - Weekday trip rates provided by SFEP from the SFCTA Travel Deman Tool for each typology and district including auto and TNC/taxi modes. Trip lengths and types are from CalEEMod defaults. Weekend trip rates are scaled by CalEEMod default ratios between weekend/weekday.

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Road Dust - Updated silt loading factor for SF county from CARB 2018 Miscellaneaous Process Methodology 7.9 for Erntrained Road Travel, Paved Road Dust.

Woodstoves - Natural gas fireplaces or woodstoves are not allowed in new San Francisco buildings.

SF Housing Element - Typology 2 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Consumer Products - CalEEMod default missions factor assumes 2008 statewide VOC inventory and building square footage. An updated 2017 VOC inventory from CARB and population estimates based on the CA DOF demographic projections were used to estimate a statewide VOC EF for 2017.

Energy Use - San Francisco has banned the installation of new natural gas infrastructure in residential buildings.

Fleet Mix - EMFAC2021 outputs converted to CalEEMod fleet mix

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	230.00	0.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	10.00	0.00
tblConsumerProducts	ROG_EF	2.14E-05	1.62E-05
tblEnergyUse	NT24NG	2,615.00	0.00
tblEnergyUse	NT24NG	0.70	0.00
tblEnergyUse	T24NG	5,828.01	0.00
tblEnergyUse	T24NG	3.86	0.00
tblFireplaces	FireplaceDayYear	11.14	0.00
tblFireplaces	FireplaceHourDay	3.50	0.00
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	74.25	0.00
tblFireplaces	NumberNoFireplace	19.80	610.00
tblFireplaces	NumberWood	84.15	0.00
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT2	0.19	0.23

SF Housing Element - Typology 2 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.9361	0.0423	3.6720	1.9000e-004		0.0204	0.0204		0.0204	0.0204						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.2356	0.3257	2.3118	6.4100e-003	0.3624	4.8100e-003	0.3672	0.0917	4.4900e-003	0.0962						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**2.1717**	**0.3680**	**5.9838**	**6.6000e-003**	**0.3624**	**0.0252**	**0.3876**	**0.0917**	**0.0249**	**0.1166**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.9361	0.0423	3.6720	1.9000e-004		0.0204	0.0204		0.0204	0.0204						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.2356	0.3257	2.3118	6.4100e-003	0.3624	4.8100e-003	0.3672	0.0917	4.4900e-003	0.0962						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**2.1717**	**0.3680**	**5.9838**	**6.6000e-003**	**0.3624**	**0.0252**	**0.3876**	**0.0917**	**0.0249**	**0.1166**						

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/30/2021	7/29/2021	5	0	
2	Site Preparation	Site Preparation	8/27/2021	8/26/2021	5	0	
3	Grading	Grading	9/10/2021	9/9/2021	5	0	

SF Housing Element - Typology 2 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.2356	0.3257	2.3118	6.4100e-003	0.3624	4.8100e-003	0.3672	0.0917	4.4900e-003	0.0962						
Unmitigated	0.2356	0.3257	2.3118	6.4100e-003	0.3624	4.8100e-003	0.3672	0.0917	4.4900e-003	0.0962						

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments High Rise	653.40	663.30	524.70	1,469,900	1,469,900
Strip Mall	59.64	56.56	27.48	84,095	84,095
Total	713.04	719.86	552.18	1,553,995	1,553,995

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments High Rise	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3
Strip Mall	9.50	7.30	7.30	16.60	64.40	19.00	45	40	15

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Strip Mall	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429
Apartments High Rise	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429

SF Housing Element - Typology 2 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.3505					0.0000	0.0000		0.0000	0.0000						
Consumer Products	1.4753					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	0.1103	0.0423	3.6720	1.9000e-004		0.0204	0.0204		0.0204	0.0204						
Total	**1.9361**	**0.0423**	**3.6720**	**1.9000e-004**		**0.0204**	**0.0204**		**0.0204**	**0.0204**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.3505					0.0000	0.0000		0.0000	0.0000						
Consumer Products	1.4753					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	0.1103	0.0423	3.6720	1.9000e-004		0.0204	0.0204		0.0204	0.0204						
Total	**1.9361**	**0.0423**	**3.6720**	**1.9000e-004**		**0.0204**	**0.0204**		**0.0204**	**0.0204**						

7.0 Water Detail

7.1 Mitigation Measures Water

SF Housing Element - Typology 3 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

SF Housing Element - Typology 3

San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments High Rise	200.00	Dwelling Unit	3.23	200,000.00	572
Strip Mall	3.00	1000sqft	0.07	3,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	4.6	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Typology Land Uses Only

Construction Phase - Operational emissions only

Grading -

Vehicle Trips - Weekday trip rates provided by SFEP from the SFCTA Travel Deman Tool for each typology and district including auto and TNC/taxi modes. Trip lengths and types are from CalEEMod defaults. Weekend trip rates are scaled by CalEEMod default ratios between weekend/weekday.

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Road Dust - Updated silt loading factor for SF county from CARB 2018 Miscellaneaous Process Methodology 7.9 for Erntrained Road Travel, Paved Road Dust.

Woodstoves - Natural gas fireplaces or woodstoves are not allowed in new San Francisco buildings.

SF Housing Element - Typology 3 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Consumer Products - CalEEMod default missions factor assumes 2008 statewide VOC inventory and building square footage. An updated 2017 VOC inventory from CARB and population estimates based on the CA DOF demographic projections were used to estimate a statewide VOC EF for 2017.

Energy Use - San Francisco has banned the installation of new natural gas infrastructure in residential buildings.

Fleet Mix - EMFAC2021 outputs converted to CalEEMod fleet mix

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	18.00	0.00
tblConstructionPhase	NumDays	230.00	0.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	8.00	0.00
tblConstructionPhase	NumDays	18.00	0.00
tblConstructionPhase	NumDays	5.00	0.00
tblConsumerProducts	ROG_EF	2.14E-05	1.62E-05
tblEnergyUse	NT24NG	2,615.00	0.00
tblEnergyUse	NT24NG	0.70	0.00
tblEnergyUse	T24NG	5,828.01	0.00
tblEnergyUse	T24NG	3.86	0.00
tblFireplaces	FireplaceDayYear	11.14	0.00
tblFireplaces	FireplaceHourDay	3.50	0.00
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	30.00	0.00
tblFireplaces	NumberNoFireplace	8.00	0.00
tblFireplaces	NumberWood	34.00	0.00
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT2	0.19	0.23

SF Housing Element - Typology 3 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.7871	0.0171	1.4836	8.0000e-005		8.2300e-003	8.2300e-003		8.2300e-003	8.2300e-003						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.2799	0.3865	2.7433	7.6100e-003	0.4296	5.7100e-003	0.4353	0.1087	5.3300e-003	0.1141						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**1.0669**	**0.4036**	**4.2269**	**7.6900e-003**	**0.4296**	**0.0139**	**0.4436**	**0.1087**	**0.0136**	**0.1223**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.7871	0.0171	1.4836	8.0000e-005		8.2300e-003	8.2300e-003		8.2300e-003	8.2300e-003						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.2799	0.3865	2.7433	7.6100e-003	0.4296	5.7100e-003	0.4353	0.1087	5.3300e-003	0.1141						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**1.0669**	**0.4036**	**4.2269**	**7.6900e-003**	**0.4296**	**0.0139**	**0.4436**	**0.1087**	**0.0136**	**0.1223**						

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/30/2021	7/29/2021	5	0	
2	Site Preparation	Site Preparation	8/27/2021	8/26/2021	5	0	
3	Grading	Grading	9/10/2021	9/9/2021	5	0	

SF Housing Element - Typology 3 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.7 Architectural Coating - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

SF Housing Element - Typology 3 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.2799	0.3865	2.7433	7.6100e-003	0.4296	5.7100e-003	0.4353	0.1087	5.3300e-003	0.1141						
Unmitigated	0.2799	0.3865	2.7433	7.6100e-003	0.4296	5.7100e-003	0.4353	0.1087	5.3300e-003	0.1141						

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments High Rise	770.00	784.00	622.00	1,734,185	1,734,185
Strip Mall	76.78	72.83	35.39	108,271	108,271
Total	846.78	856.83	657.39	1,842,456	1,842,456

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments High Rise	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3
Strip Mall	9.50	7.30	7.30	16.60	64.40	19.00	45	40	15

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments High Rise	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429
Strip Mall	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429

SF Housing Element - Typology 3 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1424					0.0000	0.0000		0.0000	0.0000						
Consumer Products	0.6002					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	0.0446	0.0171	1.4836	8.0000e-005		8.2300e-003	8.2300e-003		8.2300e-003	8.2300e-003						
Total	**0.7871**	**0.0171**	**1.4836**	**8.0000e-005**		**8.2300e-003**	**8.2300e-003**		**8.2300e-003**	**8.2300e-003**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1424					0.0000	0.0000		0.0000	0.0000						
Consumer Products	0.6002					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	0.0446	0.0171	1.4836	8.0000e-005		8.2300e-003	8.2300e-003		8.2300e-003	8.2300e-003						
Total	**0.7871**	**0.0171**	**1.4836**	**8.0000e-005**		**8.2300e-003**	**8.2300e-003**		**8.2300e-003**	**8.2300e-003**						

7.0 Water Detail

7.1 Mitigation Measures Water

SF Housing Element - Typology 4 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

SF Housing Element - Typology 4

San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments Mid Rise	50.00	Dwelling Unit	1.32	50,000.00	143

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	4.6	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Typology Land Uses Only

Construction Phase - Operational emissions only

Grading -

Vehicle Trips - Weekday trip rates provided by SFEP from the SFCTA Travel Deman Tool for each typology and district including auto and TNC/taxi modes. Trip lengths and types are from CalEEMod defaults. Weekend trip rates are scaled by CalEEMod default ratios between weekend/weekday.

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Road Dust - Updated silt loading factor for SF county from CARB 2018 Miscellaneaous Process Methodology 7.9 for Erntrained Road Travel, Paved Road Dust.

Woodstoves - Natural gas fireplaces or woodstoves are not allowed in new San Francisco buildings.

SF Housing Element - Typology 4 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Consumer Products - CalEEMod default missions factor assumes 2008 statewide VOC inventory and building square footage. An updated 2017 VOC inventory from CARB and population estimates based on the CA DOF demographic projections were used to estimate a statewide VOC EF for 2017.

Energy Use - San Francisco has banned the installation of new natural gas infrastructure in residential buildings.

Fleet Mix - EMFAC2021 outputs converted to CalEEMod fleet mix

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	10.00	0.00
tblConstructionPhase	NumDays	200.00	0.00
tblConstructionPhase	NumDays	20.00	0.00
tblConstructionPhase	NumDays	4.00	0.00
tblConstructionPhase	NumDays	10.00	0.00
tblConstructionPhase	NumDays	2.00	0.00
tblConsumerProducts	ROG_EF	2.14E-05	1.62E-05
tblEnergyUse	NT24NG	2,615.00	0.00
tblEnergyUse	T24NG	5,828.01	0.00
tblFireplaces	FireplaceDayYear	11.14	0.00
tblFireplaces	FireplaceHourDay	3.50	0.00
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	7.50	0.00
tblFireplaces	NumberNoFireplace	2.00	610.00
tblFireplaces	NumberWood	8.50	0.00
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT2	0.19	0.23
tblFleetMix	LHD1	0.02	0.03
tblFleetMix	LHD2	5.0320e-003	6.7010e-003
tblFleetMix	MCY	0.03	5.4680e-003
tblFleetMix	MDV	0.10	0.11
tblFleetMix	MH	1.7150e-003	4.2900e-004

SF Housing Element - Typology 4 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.1942	4.2700e-003	0.3709	2.0000e-005		2.0600e-003	2.0600e-003		2.0600e-003	2.0600e-003						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.0294	0.0413	0.2926	8.2000e-004	0.0463	6.1000e-004	0.0469	0.0117	5.7000e-004	0.0123						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**0.2236**	**0.0455**	**0.6635**	**8.4000e-004**	**0.0463**	**2.6700e-003**	**0.0490**	**0.0117**	**2.6300e-003**	**0.0144**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.1942	4.2700e-003	0.3709	2.0000e-005		2.0600e-003	2.0600e-003		2.0600e-003	2.0600e-003						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.0294	0.0413	0.2926	8.2000e-004	0.0463	6.1000e-004	0.0469	0.0117	5.7000e-004	0.0123						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**0.2236**	**0.0455**	**0.6635**	**8.4000e-004**	**0.0463**	**2.6700e-003**	**0.0490**	**0.0117**	**2.6300e-003**	**0.0144**						

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/30/2021	7/29/2021	5	0	
2	Site Preparation	Site Preparation	8/27/2021	8/26/2021	5	0	
3	Grading	Grading	9/10/2021	9/9/2021	5	0	

SF Housing Element - Typology 4 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0294	0.0413	0.2926	8.2000e-004	0.0463	6.1000e-004	0.0469	0.0117	5.7000e-004	0.0123						
Unmitigated	0.0294	0.0413	0.2926	8.2000e-004	0.0463	6.1000e-004	0.0469	0.0117	5.7000e-004	0.0123						

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Mid Rise	90.50	81.50	68.00	198,626	198,626
Total	90.50	81.50	68.00	198,626	198,626

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Mid Rise	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments Mid Rise	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429

SF Housing Element - Typology 4 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.1942	4.2700e-003	0.3709	2.0000e-005		2.0600e-003	2.0600e-003		2.0600e-003	2.0600e-003						
Unmitigated	0.1942	4.2700e-003	0.3709	2.0000e-005		2.0600e-003	2.0600e-003		2.0600e-003	2.0600e-003						

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0352					0.0000	0.0000		0.0000	0.0000						
Consumer Products	0.1478					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	0.0111	4.2700e-003	0.3709	2.0000e-005		2.0600e-003	2.0600e-003		2.0600e-003	2.0600e-003						
Total	**0.1942**	**4.2700e-003**	**0.3709**	**2.0000e-005**		**2.0600e-003**	**2.0600e-003**		**2.0600e-003**	**2.0600e-003**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0352					0.0000	0.0000		0.0000	0.0000						
Consumer Products	0.1478					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	0.0111	4.2700e-003	0.3709	2.0000e-005		2.0600e-003	2.0600e-003		2.0600e-003	2.0600e-003						
Total	**0.1942**	**4.2700e-003**	**0.3709**	**2.0000e-005**		**2.0600e-003**	**2.0600e-003**		**2.0600e-003**	**2.0600e-003**						

7.0 Water Detail

7.1 Mitigation Measures Water

SF Housing Element - Typology 5 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

SF Housing Element - Typology 5

San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments Mid Rise	29.00	Dwelling Unit	0.76	29,000.00	83

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	4.6	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Typology Land Uses Only

Construction Phase - Operational emissions only

Grading -

Vehicle Trips - Weekday trip rates provided by SFEP from the SFCTA Travel Deman Tool for each typology and district including auto and TNC/taxi modes. Trip lengths and types are from CalEEMod defaults. Weekend trip rates are scaled by CalEEMod default ratios between weekend/weekday.

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Road Dust - Updated silt loading factor for SF county from CARB 2018 Miscellaneaous Process Methodology 7.9 for Erntrained Road Travel, Paved Road Dust.

Woodstoves - Natural gas fireplaces or woodstoves are not allowed in new San Francisco buildings.

SF Housing Element - Typology 5 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Consumer Products - CalEEMod default missions factor assumes 2008 statewide VOC inventory and building square footage. An updated 2017 VOC inventory from CARB and population estimates based on the CA DOF demographic projections were used to estimate a statewide VOC EF for 2017.

Energy Use - San Francisco has banned the installation of new natural gas infrastructure in residential buildings.

Fleet Mix - EMFAC2021 outputs converted to CalEEMod fleet mix

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	5.00	0.00
tblConstructionPhase	NumDays	100.00	0.00
tblConstructionPhase	NumDays	10.00	0.00
tblConstructionPhase	NumDays	2.00	0.00
tblConstructionPhase	NumDays	5.00	0.00
tblConstructionPhase	NumDays	1.00	0.00
tblConsumerProducts	ROG_EF	2.14E-05	1.62E-05
tblEnergyUse	NT24NG	2,615.00	0.00
tblEnergyUse	T24NG	5,828.01	0.00
tblFireplaces	FireplaceDayYear	11.14	0.00
tblFireplaces	FireplaceHourDay	3.50	0.00
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	4.35	0.00
tblFireplaces	NumberNoFireplace	1.16	610.00
tblFireplaces	NumberWood	4.93	0.00
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT2	0.19	0.23
tblFleetMix	LHD1	0.02	0.03
tblFleetMix	LHD2	5.0320e-003	6.7010e-003
tblFleetMix	MCY	0.03	5.4680e-003
tblFleetMix	MDV	0.10	0.11
tblFleetMix	MH	1.7150e-003	4.2900e-004

SF Housing Element - Typology 5 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.1126	2.4800e-003	0.2151	1.0000e-005		1.1900e-003	1.1900e-003		1.1900e-003	1.1900e-003						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.0182	0.0255	0.1810	5.1000e-004	0.0287	3.8000e-004	0.0290	7.2500e-003	3.5000e-004	7.6100e-003						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**0.1308**	**0.0280**	**0.3961**	**5.2000e-004**	**0.0287**	**1.5700e-003**	**0.0302**	**7.2500e-003**	**1.5400e-003**	**8.8000e-003**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.1126	2.4800e-003	0.2151	1.0000e-005		1.1900e-003	1.1900e-003		1.1900e-003	1.1900e-003						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.0182	0.0255	0.1810	5.1000e-004	0.0287	3.8000e-004	0.0290	7.2500e-003	3.5000e-004	7.6100e-003						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**0.1308**	**0.0280**	**0.3961**	**5.2000e-004**	**0.0287**	**1.5700e-003**	**0.0302**	**7.2500e-003**	**1.5400e-003**	**8.8000e-003**						

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/30/2021	7/29/2021	5	0	
2	Site Preparation	Site Preparation	8/27/2021	8/26/2021	5	0	
3	Grading	Grading	9/10/2021	9/9/2021	5	0	

SF Housing Element - Typology 5 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0182	0.0255	0.1810	5.1000e-004	0.0287	3.8000e-004	0.0290	7.2500e-003	3.5000e-004	7.6100e-003						
Unmitigated	0.0182	0.0255	0.1810	5.1000e-004	0.0287	3.8000e-004	0.0290	7.2500e-003	3.5000e-004	7.6100e-003						

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Mid Rise	55.97	50.46	42.05	122,858	122,858
Total	55.97	50.46	42.05	122,858	122,858

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Mid Rise	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments Mid Rise	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429

SF Housing Element - Typology 5 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.1126	2.4800e-003	0.2151	1.0000e-005		1.1900e-003	1.1900e-003		1.1900e-003	1.1900e-003						
Unmitigated	0.1126	2.4800e-003	0.2151	1.0000e-005		1.1900e-003	1.1900e-003		1.1900e-003	1.1900e-003						

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0204					0.0000	0.0000		0.0000	0.0000						
Consumer Products	0.0857					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	6.4600e-003	2.4800e-003	0.2151	1.0000e-005		1.1900e-003	1.1900e-003		1.1900e-003	1.1900e-003						
Total	**0.1126**	**2.4800e-003**	**0.2151**	**1.0000e-005**		**1.1900e-003**	**1.1900e-003**		**1.1900e-003**	**1.1900e-003**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0204					0.0000	0.0000		0.0000	0.0000						
Consumer Products	0.0857					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	6.4600e-003	2.4800e-003	0.2151	1.0000e-005		1.1900e-003	1.1900e-003		1.1900e-003	1.1900e-003						
Total	**0.1126**	**2.4800e-003**	**0.2151**	**1.0000e-005**		**1.1900e-003**	**1.1900e-003**		**1.1900e-003**	**1.1900e-003**						

7.0 Water Detail

7.1 Mitigation Measures Water

SF Housing Element - Typology 6 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

SF Housing Element - Typology 6

San Francisco County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Apartments Mid Rise	30.00	Dwelling Unit	0.79	30,000.00	86

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	4.6	**Precipitation Freq (Days)**	64
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Typology Land Uses Only

Construction Phase - Operational emissions only

Grading -

Vehicle Trips - Weekday trip rates provided by SFEP from the SFCTA Travel Deman Tool for each typology and district including auto and TNC/taxi modes. Trip lengths and types are from CalEEMod defaults. Weekend trip rates are scaled by CalEEMod default ratios between weekend/weekday.

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Vehicle Emission Factors - EMFAC2021 outputs converted to CalEEMod EFs

Road Dust - Updated silt loading factor for SF county from CARB 2018 Miscellaneaous Process Methodology 7.9 for Erntrained Road Travel, Paved Road Dust.

Woodstoves - Natural gas fireplaces or woodstoves are not allowed in new San Francisco buildings.

SF Housing Element - Typology 6 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Consumer Products - CalEEMod default missions factor assumes 2008 statewide VOC inventory and building square footage. An updated 2017 VOC inventory from CARB and population estimates based on the CA DOF demographic projections were used to estimate a statewide VOC EF for 2017.

Energy Use - San Francisco has banned the installation of new natural gas infrastructure in residential buildings.

Fleet Mix - EMFAC2021 outputs converted to CalEEMod fleet mix

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	5.00	0.00
tblConstructionPhase	NumDays	100.00	0.00
tblConstructionPhase	NumDays	10.00	0.00
tblConstructionPhase	NumDays	2.00	0.00
tblConstructionPhase	NumDays	5.00	0.00
tblConstructionPhase	NumDays	1.00	0.00
tblConsumerProducts	ROG_EF	2.14E-05	1.62E-05
tblEnergyUse	NT24NG	2,615.00	0.00
tblEnergyUse	T24NG	5,828.01	0.00
tblFireplaces	FireplaceDayYear	11.14	0.00
tblFireplaces	FireplaceHourDay	3.50	0.00
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	4.50	0.00
tblFireplaces	NumberNoFireplace	1.20	610.00
tblFireplaces	NumberWood	5.10	0.00
tblFleetMix	HHD	4.2330e-003	0.01
tblFleetMix	LDA	0.56	0.53
tblFleetMix	LDT1	0.06	0.04
tblFleetMix	LDT2	0.19	0.23
tblFleetMix	LHD1	0.02	0.03
tblFleetMix	LHD2	5.0320e-003	6.7010e-003
tblFleetMix	MCY	0.03	5.4680e-003
tblFleetMix	MDV	0.10	0.11
tblFleetMix	MH	1.7150e-003	4.2900e-004

SF Housing Element - Typology 6 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.1165	2.5600e-003	0.2225	1.0000e-005		1.2300e-003	1.2300e-003		1.2300e-003	1.2300e-003						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.0182	0.0255	0.1805	5.1000e-004	0.0286	3.8000e-004	0.0290	7.2300e-003	3.5000e-004	7.5900e-003						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**0.1347**	**0.0280**	**0.4031**	**5.2000e-004**	**0.0286**	**1.6100e-003**	**0.0302**	**7.2300e-003**	**1.5800e-003**	**8.8200e-003**						

SF Housing Element - Typology 6 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.1165	2.5600e-003	0.2225	1.0000e-005		1.2300e-003	1.2300e-003		1.2300e-003	1.2300e-003						
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Mobile	0.0182	0.0255	0.1805	5.1000e-004	0.0286	3.8000e-004	0.0290	7.2300e-003	3.5000e-004	7.5900e-003						
Waste						0.0000	0.0000		0.0000	0.0000						
Water						0.0000	0.0000		0.0000	0.0000						
Total	**0.1347**	**0.0280**	**0.4031**	**5.2000e-004**	**0.0286**	**1.6100e-003**	**0.0302**	**7.2300e-003**	**1.5800e-003**	**8.8200e-003**						

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/30/2021	7/29/2021	5	0	
2	Site Preparation	Site Preparation	8/27/2021	8/26/2021	5	0	
3	Grading	Grading	9/10/2021	9/9/2021	5	0	

SF Housing Element - Typology 6 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0182	0.0255	0.1805	5.1000e-004	0.0286	3.8000e-004	0.0290	7.2300e-003	3.5000e-004	7.5900e-003						
Unmitigated	0.0182	0.0255	0.1805	5.1000e-004	0.0286	3.8000e-004	0.0290	7.2300e-003	3.5000e-004	7.5900e-003						

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Mid Rise	55.80	50.40	42.00	122,541	122,541
Total	55.80	50.40	42.00	122,541	122,541

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Mid Rise	10.80	4.80	5.70	31.00	15.00	54.00	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments Mid Rise	0.528450	0.040108	0.234894	0.112535	0.027509	0.006701	0.017284	0.012460	0.005344	0.007768	0.005468	0.001050	0.000429

SF Housing Element - Typology 6 - San Francisco County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.1165	2.5600e-003	0.2225	1.0000e-005		1.2300e-003	1.2300e-003		1.2300e-003	1.2300e-003						
Unmitigated	0.1165	2.5600e-003	0.2225	1.0000e-005		1.2300e-003	1.2300e-003		1.2300e-003	1.2300e-003						

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0211					0.0000	0.0000		0.0000	0.0000						
Consumer Products	0.0887					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	6.6800e-003	2.5600e-003	0.2225	1.0000e-005		1.2300e-003	1.2300e-003		1.2300e-003	1.2300e-003						
Total	**0.1165**	**2.5600e-003**	**0.2225**	**1.0000e-005**		**1.2300e-003**	**1.2300e-003**		**1.2300e-003**	**1.2300e-003**						

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0211					0.0000	0.0000		0.0000	0.0000						
Consumer Products	0.0887					0.0000	0.0000		0.0000	0.0000						
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000						
Landscaping	6.6800e-003	2.5600e-003	0.2225	1.0000e-005		1.2300e-003	1.2300e-003		1.2300e-003	1.2300e-003						
Total	**0.1165**	**2.5600e-003**	**0.2225**	**1.0000e-005**		**1.2300e-003**	**1.2300e-003**		**1.2300e-003**	**1.2300e-003**						

7.0 Water Detail

7.1 Mitigation Measures Water

APPENDIX B
B-2 HRA INPUTS

Table 1
Emission Factors for On-Road Mobile Sources
San Francisco Housing Element
San Francisco, California

Year	Pollutant	Emission Factors by Trip Type[1]		
Fleet Mix		Worker	Vendor	Hauling
2023	CH4_IDLEX	--	0.025	0.53
	CH4_RUNEX	0.0037	0.012	0.45
	CH4_STREX	0.080	0.0093	3.9E-08
	CO_IDLEX	--	0.69	4.7
	CO_RUNEX	0.93	0.47	2.7
	CO_STREX	3.8	1.1	0.0055
	CO2_IDLEX	--	173	803
	CO2_RUNEX	317	1,295	1,980
	CO2_STREX	77	9.2	0.063
	N2O_IDLEX	--	0.027	0.14
	N2O_RUNEX	0.0058	0.15	0.32
	N2O_STREX	0.034	0.0064	4.0E-06
	NH3_RUNEX	0.033	0.18	0.26
	NOx_IDLEX	--	1.1	4.1
	NOx_RUNEX	0.064	1.4	3.7
	NOx_STREX	0.30	1.3	2.5
	PM10_EXH_IDLEX	--	0.0025	0.0055
	PM10_EXH_RUNEX	0.0019	0.014	0.024
	PM10_EXH_STREX	0.0023	9.6E-05	2.4E-06
	PM10_FUG_PMBW	0.010	0.046	0.11
	PM10_FUG_PMTW	0.0080	0.012	0.035
	PM25_EXH_IDLEX	--	0.0024	0.0053
	PM25_EXH_RUNEX	0.0017	0.013	0.023
	PM25_EXH_STREX	0.0021	8.9E-05	2.2E-06
	PM25_FUG_PMBW	0.0036	0.016	0.040
	PM25_FUG_PMTW	0.0020	0.0030	0.0087
	ROG_DIURN	0.33	0.026	5.0E-04
	ROG_HOTSOAK	0.10	0.0072	1.5E-04
	ROG_IDLEX	--	0.028	0.25
	ROG_RUNEX	0.016	0.048	0.049
	ROG_RUNLOSS	0.036	0.023	8.1E-04
	ROG_STREX	0.39	0.051	2.1E-07
	SO2_IDLEX	--	0.0016	0.0058
	SO2_RUNEX	0.0031	0.012	0.017
	SO2_STREX	7.6E-04	9.1E-05	6.2E-07
	TOG_DIURN	0.33	0.026	5.0E-04
	TOG_HOTSOAK	0.10	0.0072	1.5E-04
	TOG_IDLEX	--	0.056	0.81
	TOG_RUNEX	0.023	0.068	0.51
	TOG_RUNLOSS	0.036	0.023	8.1E-04
	TOG_STREX	0.43	0.056	2.3E-07

Table 1
Emission Factors for On-Road Mobile Sources
San Francisco Housing Element
San Francisco, California

Year	Pollutant	Emission Factors by Trip Type[1]		
Fleet Mix		Worker	Vendor	Hauling
2024	CH4_IDLEX	--	0.025	0.52
	CH4_RUNEX	0.0034	0.012	0.43
	CH4_STREX	0.076	0.0086	3.8E-08
	CO_IDLEX	--	0.69	4.7
	CO_RUNEX	0.87	0.41	2.6
	CO_STREX	3.6	1.0	0.0058
	CO2_IDLEX	--	173	795
	CO2_RUNEX	311	1,277	1,934
	CO2_STREX	75	8.6	0.053
	N2O_IDLEX	--	0.027	0.13
	N2O_RUNEX	0.0055	0.15	0.32
	N2O_STREX	0.033	0.0061	2.0E-06
	NH3_RUNEX	0.034	0.18	0.26
	NOx_IDLEX	--	1.1	4.0
	NOx_RUNEX	0.057	1.3	3.5
	NOx_STREX	0.28	1.3	2.6
	PM10_EXH_IDLEX	--	0.0021	0.0051
	PM10_EXH_RUNEX	0.0018	0.012	0.024
	PM10_EXH_STREX	0.0022	8.8E-05	1.6E-06
	PM10_FUG_PMBW	0.010	0.046	0.11
	PM10_FUG_PMTW	0.0080	0.012	0.035
	PM25_EXH_IDLEX	--	0.0020	0.0048
	PM25_EXH_RUNEX	0.0016	0.012	0.023
	PM25_EXH_STREX	0.0020	8.1E-05	1.5E-06
	PM25_FUG_PMBW	0.0035	0.016	0.039
	PM25_FUG_PMTW	0.0020	0.0030	0.0087
	ROG_DIURN	0.32	0.024	3.8E-04
	ROG_HOTSOAK	0.10	0.0065	1.2E-04
	ROG_IDLEX	--	0.027	0.25
	ROG_RUNEX	0.014	0.042	0.045
	ROG_RUNLOSS	0.034	0.020	5.3E-04
	ROG_STREX	0.36	0.047	2.1E-07
	SO2_IDLEX	--	0.0016	0.0057
	SO2_RUNEX	0.0031	0.012	0.016
	SO2_STREX	7.4E-04	8.5E-05	5.2E-07
	TOG_DIURN	0.32	0.024	3.8E-04
	TOG_HOTSOAK	0.10	0.0065	1.2E-04
	TOG_IDLEX	--	0.056	0.80
	TOG_RUNEX	0.020	0.060	0.48
	TOG_RUNLOSS	0.034	0.020	5.3E-04
	TOG_STREX	0.40	0.052	2.3E-07

Table 1
Emission Factors for On-Road Mobile Sources
San Francisco Housing Element
San Francisco, California

Year	Pollutant	Emission Factors by Trip Type[1]		
Fleet Mix		Worker	Vendor	Hauling
2025	CH4_IDLEX	--	0.026	0.51
	CH4_RUNEX	0.0031	0.012	0.41
	CH4_STREX	0.071	0.0080	4.4E-08
	CO_IDLEX	--	0.69	4.8
	CO_RUNEX	0.82	0.35	2.6
	CO_STREX	3.3	0.91	0.0055
	CO2_IDLEX	--	171	785
	CO2_RUNEX	304	1,255	1,883
	CO2_STREX	73	8.1	0.044
	N2O_IDLEX	--	0.027	0.13
	N2O_RUNEX	0.0051	0.15	0.31
	N2O_STREX	0.032	0.0057	3.1E-06
	NH3_RUNEX	0.034	0.18	0.26
	NOx_IDLEX	--	1.0	3.8
	NOx_RUNEX	0.052	1.2	3.2
	NOx_STREX	0.27	1.3	2.6
	PM10_EXH_IDLEX	--	0.0018	0.0046
	PM10_EXH_RUNEX	0.0017	0.011	0.023
	PM10_EXH_STREX	0.0021	8.0E-05	1.0E-06
	PM10_FUG_PMBW	0.010	0.045	0.11
	PM10_FUG_PMTW	0.0080	0.012	0.035
	PM25_EXH_IDLEX	--	0.0017	0.0044
	PM25_EXH_RUNEX	0.0016	0.010	0.022
	PM25_EXH_STREX	0.0019	7.3E-05	9.5E-07
	PM25_FUG_PMBW	0.0035	0.016	0.039
	PM25_FUG_PMTW	0.0020	0.0030	0.0087
	ROG_DIURN	0.31	0.022	2.9E-04
	ROG_HOTSOAK	0.093	0.0059	8.6E-05
	ROG_IDLEX	--	0.025	0.25
	ROG_RUNEX	0.012	0.036	0.042
	ROG_RUNLOSS	0.033	0.019	3.3E-04
	ROG_STREX	0.34	0.044	2.4E-07
	SO2_IDLEX	--	0.0016	0.0055
	SO2_RUNEX	0.0030	0.012	0.016
	SO2_STREX	7.3E-04	8.0E-05	4.3E-07
	TOG_DIURN	0.31	0.022	2.9E-04
	TOG_HOTSOAK	0.093	0.0059	8.6E-05
	TOG_IDLEX	--	0.0551	0.78
	TOG_RUNEX	0.018	0.053	0.46
	TOG_RUNLOSS	0.033	0.0187	3.3E-04
	TOG_STREX	0.37	0.048	2.6E-07

Table 1
Emission Factors for On-Road Mobile Sources
San Francisco Housing Element
San Francisco, California

Year	Pollutant	Emission Factors by Trip Type[1]		
Fleet Mix		Worker	Vendor	Hauling
2026	CH4_IDLEX	--	0.027	5.0E-01
	CH4_RUNEX	0.0028	0.012	0.38
	CH4_STREX	0.067	0.0074	4.3E-08
	CO_IDLEX	--	0.69	4.8
	CO_RUNEX	0.77	0.30	2.5
	CO_STREX	3.2	0.84	0.0051
	CO2_IDLEX	--	169	775
	CO2_RUNEX	298	1,232	1,832
	CO2_STREX	72	7.6	0.040
	N2O_IDLEX	--	0.026	0.13
	N2O_RUNEX	0.0049	0.1504	0.30
	N2O_STREX	0.031	0.0054	2.5E-06
	NH3_RUNEX	0.035	0.19	0.27
	NOx_IDLEX	0.000	0.9906	3.7
	NOx_RUNEX	0.047	1.0684	3.0E+00
	NOx_STREX	0.26	1.3	2.6E+00
	PM10_EXH_IDLEX	0.000	0.0015	0.0042
	PM10_EXH_RUNEX	0.002	0.0094	0.022
	PM10_EXH_STREX	0.0020	0.0001	9.8E-07
	PM10_FUG_PMBW	0.010	0.045	1.1E-01
	PM10_FUG_PMTW	0.008	0.012	0.035
	PM25_EXH_IDLEX	0.000	0.0014	0.0040
	PM25_EXH_RUNEX	0.0015	0.0090	2.1E-02
	PM25_EXH_STREX	0.0019	6.8E-05	9.1E-07
	PM25_FUG_PMBW	0.004	0.016	0.039
	PM25_FUG_PMTW	0.002	0.0030	0.0087
	ROG_DIURN	0.30	0.0203	2.5E-04
	ROG_HOTSOAK	0.089	0.0053	7.8E-05
	ROG_IDLEX	0.000	0.0242	0.24
	ROG_RUNEX	0.011	0.0309	3.9E-02
	ROG_RUNLOSS	0.033	0.0173	3.0E-04
	ROG_STREX	0.316	0.0402	2.3E-07
	SO2_IDLEX	0.000	0.0015	5.3E-03
	SO2_RUNEX	0.003	0.0117	1.5E-02
	SO2_STREX	0.001	0.0001	3.9E-07
	TOG_DIURN	0.299	0.0203	2.5E-04
	TOG_HOTSOAK	0.089	0.0053	7.8E-05
	TOG_IDLEX	0.000	0.0545	7.7E-01
	TOG_RUNEX	0.016	0.0474	4.3E-01
	TOG_RUNLOSS	0.033	0.0173	3.0E-04
	TOG_STREX	0.346	0.0440	2.6E-07

Table 1
Emission Factors for On-Road Mobile Sources
San Francisco Housing Element
San Francisco, California

[1]

Emission factor units are consistent with CalEEMod® default units. Emission factors were derived using CalEEMod® methodology and were estimated using EMFAC2021 for San Francisco County with EMFAC2007 default vehicle categories and fleet mix assumptions. Consistent with CalEEMod® methodology, Ramboll assumed that construction worker trips are 50% Light-Duty Auto (LDA), 25% Light-Duty Truck 1 (LDT1) and 25% LDT2 vehicle classes, vendor trips are 100% diesel Medium-Heavy Duty Trucks (MHDT), and haul trips are 100% diesel Heavy-Heavy Duty Trucks (HHDT).

Table 2
Emission Factors for Offroad Mobile Sources
San Francisco Housing Element
San Francisco, California

CalEEMod Equipment Name	Year	Emission Factor[1] (g/bhp-hr)				Controlled Emission Factor[2] (g/bhp-hr)			
		ROG	NOx	PM_{10}	$PM_{2.5}$	ROG	NOx	PM_{10}	$PM_{2.5}$
Aerial Lifts	2023	0.10	1.5	0.027	0.025	0.10	1.5	0.0080	0.0080
Aerial Lifts	2024	0.10	1.5	0.026	0.024	0.10	1.5	0.0080	0.0080
Aerial Lifts	2025	0.10	1.5	0.026	0.024	0.10	1.5	0.0080	0.0080
Air Compressors	2023	0.39	2.6	0.14	0.14	0.060	0.26	0.0080	0.0080
Air Compressors	2024	0.37	2.5	0.12	0.12	0.060	0.26	0.0080	0.0080
Air Compressors	2025	0.35	2.3	0.10	0.10	0.060	0.26	0.0080	0.0080
Air Compressors	2026	0.35	2.3	0.10	0.10	0.060	0.26	0.0080	0.0080
Bore/Drill Rigs	2023	0.11	1.0	0.034	0.031	0.060	0.26	0.0080	0.0080
Bore/Drill Rigs	2024	0.11	1.0	0.032	0.030	0.060	0.26	0.0080	0.0080
Cement and Mortar Mixers	2025	0.66	4.1	0.16	0.16	0.12	2.8	0.0080	0.0080
Cement and Mortar Mixers	2024	0.66	4.1	0.16	0.16	0.12	2.8	0.0080	0.0080
Cement and Mortar Mixers	2023	0.66	4.1	0.16	0.16	0.12	2.8	0.0080	0.0080
Concrete/Industrial Saws	2023	0.32	2.5	0.12	0.12	0.060	0.26	0.0080	0.0080
Cranes	2023	0.30	3.2	0.13	0.12	0.060	0.26	0.0080	0.0080
Cranes	2024	0.28	3.0	0.12	0.11	0.060	0.26	0.0080	0.0080
Cranes	2025	0.26	2.7	0.11	0.10	0.060	0.26	0.0080	0.0080
Crawler Tractors	2023	0.28	3.2	0.12	0.11	0.060	0.26	0.0080	0.0080
Crushing/Proc. Equipment	2023	0.39	2.6	0.13	0.13	0.060	0.26	0.0080	0.0080
Dumpers/Tenders	2023	0.69	4.3	0.16	0.16	0.060	0.26	0.0080	0.0080
Dumpers/Tenders	2024	0.69	4.3	0.16	0.16	0.12	2.8	0.0080	0.0080
Excavators	2023	0.18	1.5	0.072	0.066	0.060	0.26	0.0080	0.0080
Excavators	2024	0.17	1.3	0.065	0.060	0.060	0.26	0.0080	0.0080
Forklifts	2023	0.33	3.1	0.19	0.17	0.060	0.26	0.0080	0.0080
Forklifts	2024	0.30	2.8	0.16	0.15	0.060	0.26	0.0080	0.0080
Forklifts	2025	0.28	2.6	0.14	0.13	0.060	0.26	0.0080	0.0080
Generator Sets	2023	0.28	2.5	0.12	0.12	0.060	0.26	0.0080	0.0080
Graders	2023	0.28	3.4	0.11	0.10	0.060	0.26	0.0080	0.0080
Graders	2024	0.26	3.1	0.10	0.092	0.060	0.26	0.0080	0.0080

Table 2
Emission Factors for Offroad Mobile Sources
San Francisco Housing Element
San Francisco, California

CalEEMod Equipment Name	Year	Emission Factor[1] (g/bhp-hr)				Controlled Emission Factor[2] (g/bhp-hr)			
		ROG	NOx	PM_{10}	$PM_{2.5}$	ROG	NOx	PM_{10}	$PM_{2.5}$
Off-Highway Trucks	2023	0.19	1.3	0.048	0.044	0.060	0.26	0.0080	0.0080
Off-Highway Trucks	2024	0.18	1.2	0.044	0.041	0.060	0.26	0.0080	0.0080
Off-Highway Trucks	2025	0.18	1.1	0.038	0.035	0.060	0.26	0.0080	0.0080
Other General Industrial Equipment	2023	0.31	2.9	0.17	0.16	0.060	0.26	0.0080	0.0080
Other General Industrial Equipment	2024	0.29	2.7	0.15	0.13	0.060	0.26	0.0080	0.0080
Pavers	2025	0.18	1.6	0.077	0.071	0.060	0.26	0.0080	0.0080
Pavers	2024	0.19	1.8	0.084	0.078	0.060	0.26	0.0080	0.0080
Pavers	2023	0.20	2.0	0.092	0.085	0.060	0.26	0.0080	0.0080
Paving Equipment	2025	0.18	1.5	0.075	0.069	0.060	0.26	0.0080	0.0080
Paving Equipment	2023	0.20	1.9	0.093	0.086	0.060	0.26	0.0080	0.0080
Plate Compactors	2023	0.66	4.1	0.16	0.16	0.12	2.8	0.0080	0.0080
Pressure Washers	2025	0.61	4.3	0.18	0.18	0.12	2.8	0.0080	0.0080
Pressure Washers	2023	0.62	4.3	0.19	0.19	0.12	2.8	0.0080	0.0080
Pressure Washers	2024	0.61	4.3	0.18	0.18	0.12	2.8	0.0080	0.0080
Pumps	2023	0.30	2.5	0.12	0.12	0.060	0.26	0.0080	0.0080
Pumps	2024	0.28	2.4	0.11	0.11	0.060	0.26	0.0080	0.0080
Rollers	2024	0.27	2.8	0.15	0.14	0.060	0.26	0.0080	0.0080
Rollers	2023	0.29	3.0	0.17	0.15	0.060	0.26	0.0080	0.0080
Rough Terrain Forklifts	2023	0.15	2.0	0.064	0.059	0.060	0.26	0.0080	0.0080
Rough Terrain Forklifts	2024	0.15	1.9	0.058	0.054	0.060	0.26	0.0080	0.0080
Rough Terrain Forklifts	2025	0.14	1.8	0.051	0.047	0.060	0.26	0.0080	0.0080
Rubber Tired Dozers	2023	0.39	4.1	0.18	0.17	0.060	0.26	0.0080	0.0080
Rubber Tired Loaders	2023	0.21	2.1	0.069	0.063	0.060	0.26	0.0080	0.0080
Rubber Tired Loaders	2024	0.20	1.8	0.060	0.056	0.060	0.26	0.0080	0.0080
Signal Boards	2023	0.66	4.1	0.16	0.16	0.12	2.8	0.0080	0.0080
Skid Steer Loaders	2023	0.15	2.0	0.069	0.063	0.060	0.26	0.0080	0.0080
Sweepers/Scrubbers	2023	0.35	3.3	0.21	0.19	0.12	2.7	0.0080	0.0080
Sweepers/Scrubbers	2024	0.33	3.1	0.19	0.17	0.12	2.7	0.0080	0.0080
Tractors/Loaders/Backhoes	2023	0.24	2.4	0.12	0.11	0.060	0.26	0.0080	0.0080

Table 2
Emission Factors for Offroad Mobile Sources
San Francisco Housing Element
San Francisco, California

CalEEMod Equipment Name	Year	Emission Factor[1] (g/bhp-hr)				Controlled Emission Factor[2] (g/bhp-hr)			
		ROG	NOx	PM_{10}	$PM_{2.5}$	ROG	NOx	PM_{10}	$PM_{2.5}$
Tractors/Loaders/Backhoes	2024	0.23	2.3	0.11	0.10	0.060	0.26	0.0080	0.0080
Trenchers	2023	0.50	4.7	0.33	0.30	0.060	0.26	0.0080	0.0080
Welders	2023	0.70	3.9	0.15	0.15	0.12	2.8	0.0080	0.0080
Welders	2024	0.65	3.8	0.13	0.13	0.12	2.8	0.0080	0.0080
Welders	2025	0.60	3.7	0.11	0.11	0.12	2.8	0.0080	0.0080

1. Emission factors in (g/bhp-hr) were sourced from CalEEMod 2021 for the equipment and years specified in the client's construction schedule.
2. For equipment with a mitigated Tier 4 emission factor higher than the default equipment emission factor, the default equipment emission factor was used.

Table 3
Modeled Emission Rates From Construction Sources
San Francisco Housing Element
San Francisco, California

Building Type	Year	Source Type	Phase	Equipment	Uncontrolled Emission Rate (g/s)		Controlled Emission Rate (g/s)	
					DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Type 1	2023	Offroad	Demolition	Air Compressors	1.4E-04	1.4E-04	7.9E-06	7.9E-06
		Offroad	Demolition	Excavators	2.3E-04	2.1E-04	2.5E-05	2.5E-05
		Offroad	Demolition	Generator Sets	1.9E-04	1.9E-04	1.3E-05	1.3E-05
		Onroad	Demolition	Hauling	1.7E-07	1.6E-07	1.7E-07	1.6E-07
		Offroad	Demolition	Signal Boards	1.0E-05	1.0E-05	5.2E-07	5.2E-07
		Onroad	Demolition	Worker	--	3.5E-07	--	3.5E-07
		Offroad	Foundation/Podium Construction	Forklifts	3.3E-04	3.1E-04	1.4E-05	1.4E-05
		Onroad	Foundation/Podium Construction	Hauling	1.6E-06	1.5E-06	1.6E-06	1.5E-06
		Onroad	Foundation/Podium Construction	Worker	--	2.6E-06	--	2.6E-06
		Offroad	Grading, Shoring, & Excavation	Bore/Drill Rigs	5.6E-04	5.2E-04	1.3E-04	1.3E-04
		Offroad	Grading, Shoring, & Excavation	Excavators	8.6E-04	7.9E-04	9.6E-05	9.6E-05
		Offroad	Grading, Shoring, & Excavation	Generator Sets	7.3E-04	7.3E-04	5.0E-05	5.0E-05
		Onroad	Grading, Shoring, & Excavation	Hauling	1.6E-06	1.6E-06	1.6E-06	1.6E-06
		Offroad	Grading, Shoring, & Excavation	Pumps	1.1E-02	1.1E-02	7.2E-04	7.2E-04
		Offroad	Grading, Shoring, & Excavation	Signal Boards	4.0E-05	4.0E-05	2.0E-06	2.0E-06
		Onroad	Grading, Shoring, & Excavation	Worker	--	1.6E-06	--	1.6E-06
	2024	Offroad	Building Construction/Superstructure	Forklifts	4.3E-04	3.9E-04	2.1E-05	2.1E-05
		Onroad	Building Construction/Superstructure	Hauling	2.3E-06	2.2E-06	2.3E-06	2.2E-06
		Onroad	Building Construction/Superstructure	Worker	--	1.1E-05	--	1.1E-05
		Offroad	Foundation/Podium Construction	Forklifts	9.7E-05	8.9E-05	4.8E-06	4.8E-06
		Onroad	Foundation/Podium Construction	Hauling	5.2E-07	5.0E-07	5.2E-07	5.0E-07
		Onroad	Foundation/Podium Construction	Worker	--	8.5E-07	--	8.5E-07
		Offroad	Interior Work	Air Compressors	3.0E-05	3.0E-05	2.0E-06	2.0E-06
		Onroad	Interior Work	Hauling	1.7E-07	1.6E-07	1.7E-07	1.6E-07
		Onroad	Interior Work	Worker	--	1.5E-06	--	1.5E-06
		Offroad	Superstructure/Skin	Forklifts	4.8E-05	4.4E-05	2.3E-06	2.3E-06
		Onroad	Superstructure/Skin	Hauling	2.6E-07	2.4E-07	2.6E-07	2.4E-07
		Onroad	Superstructure/Skin	Worker	--	4.2E-07	--	4.2E-07
	2025	Offroad	Interior Work	Air Compressors	3.1E-04	3.1E-04	2.4E-05	2.4E-05
		Onroad	Interior Work	Hauling	1.9E-06	1.8E-06	1.9E-06	1.8E-06
		Onroad	Interior Work	Worker	--	1.7E-05	--	1.7E-05
		Offroad	Superstructure/Skin	Forklifts	1.7E-04	1.5E-04	9.6E-06	9.6E-06
		Onroad	Superstructure/Skin	Hauling	9.8E-07	9.4E-07	9.8E-07	9.4E-07
		Onroad	Superstructure/Skin	Worker	--	1.6E-06	--	1.6E-06
	2026	Offroad	Interior Work	Air Compressors	5.2E-05	5.2E-05	4.0E-06	4.0E-06
		Onroad	Interior Work	Hauling	3.1E-07	2.9E-07	3.1E-07	2.9E-07
		Onroad	Interior Work	Worker	--	2.8E-06	--	2.8E-06

Table 3
Modeled Emission Rates From Construction Sources
San Francisco Housing Element
San Francisco, California

Building Type	Year	Source Type	Phase	Equipment	Uncontrolled Emission Rate (g/s)		Controlled Emission Rate (g/s)	
					DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Type 2	2023	Offroad	Building Construction	Aerial Lifts	1.2E-04	1.1E-04	3.6E-05	3.6E-05
		Offroad	Building Construction	Cranes	3.0E-04	2.8E-04	1.8E-05	1.8E-05
		Offroad	Building Construction	Forklifts	1.3E-04	1.2E-04	5.4E-06	5.4E-06
		Offroad	Building Construction	Off-Highway Trucks	1.7E-04	1.6E-04	2.9E-05	2.9E-05
		Offroad	Building Construction	Rough Terrain Forklifts	8.6E-05	7.9E-05	1.1E-05	1.1E-05
		Onroad	Building Construction	Vendor	2.2E-07	2.1E-07	2.2E-07	2.1E-07
		Offroad	Building Construction	Welders	3.6E-04	3.6E-04	1.9E-05	1.9E-05
		Onroad	Building Construction	Worker	--	4.7E-06	--	4.7E-06
		Offroad	Excavation Shoring	Aerial Lifts	6.0E-06	5.5E-06	1.8E-06	1.8E-06
		Offroad	Excavation Shoring	Bore/Drill Rigs	4.4E-05	4.0E-05	1.0E-05	1.0E-05
		Offroad	Excavation Shoring	Dumpers/Tenders	6.8E-05	6.8E-05	3.4E-06	3.4E-06
		Offroad	Excavation Shoring	Excavators	4.9E-05	4.5E-05	5.5E-06	5.5E-06
		Onroad	Excavation Shoring	Hauling	2.0E-06	1.9E-06	2.0E-06	1.9E-06
		Offroad	Excavation Shoring	Off-Highway Trucks	1.0E-04	9.6E-05	1.7E-05	1.7E-05
		Offroad	Excavation Shoring	Skid Steer Loaders	2.8E-05	2.6E-05	3.3E-06	3.3E-06
		Offroad	Excavation Shoring	Tractors/Loaders/Backhoes	4.9E-05	4.5E-05	3.3E-06	3.3E-06
		Onroad	Excavation Shoring	Vendor	6.9E-07	6.6E-07	6.9E-07	6.6E-07
		Onroad	Excavation Shoring	Worker	--	1.5E-07	--	1.5E-07
		Offroad	Foundation/Below Grade Construction	Aerial Lifts	6.0E-06	5.5E-06	1.8E-06	1.8E-06
		Offroad	Foundation/Below Grade Construction	Off-Highway Trucks	5.2E-05	4.8E-05	8.7E-06	8.7E-06
		Onroad	Foundation/Below Grade Construction	Vendor	7.9E-08	7.6E-08	7.9E-08	7.6E-08
		Onroad	Foundation/Below Grade Construction	Worker	--	1.5E-07	--	1.5E-07
		Offroad	Site Preparation/Demolition	Excavators	2.2E-05	2.0E-05	2.4E-06	2.4E-06
		Onroad	Site Preparation/Demolition	Hauling	8.9E-07	8.5E-07	8.9E-07	8.5E-07
		Offroad	Site Preparation/Demolition	Off-Highway Trucks	7.4E-05	6.8E-05	1.2E-05	1.2E-05
		Onroad	Site Preparation/Demolition	Vendor	1.8E-07	1.8E-07	1.8E-07	1.8E-07
		Onroad	Site Preparation/Demolition	Worker	--	2.0E-08	--	2.0E-08
	2024	Offroad	Building Construction	Aerial Lifts	2.1E-04	1.9E-04	6.2E-05	6.2E-05
		Offroad	Building Construction	Cranes	4.8E-04	4.4E-04	3.1E-05	3.1E-05
		Offroad	Building Construction	Forklifts	1.9E-04	1.8E-04	9.5E-06	9.5E-06
		Offroad	Building Construction	Off-Highway Trucks	2.8E-04	2.6E-04	5.1E-05	5.1E-05
		Offroad	Building Construction	Rough Terrain Forklifts	1.4E-04	1.3E-04	1.9E-05	1.9E-05
		Onroad	Building Construction	Vendor	3.3E-07	3.2E-07	3.3E-07	3.2E-07
		Offroad	Building Construction	Welders	5.4E-04	5.4E-04	3.3E-05	3.3E-05
		Onroad	Building Construction	Worker	--	8.0E-06	--	8.0E-06
		Offroad	Exterior Finishing	Aerial Lifts	8.5E-06	7.8E-06	2.6E-06	2.6E-06
		Offroad	Exterior Finishing	Air Compressors	5.7E-05	5.7E-05	3.7E-06	3.7E-06
		Offroad	Exterior Finishing	Forklifts	4.8E-05	4.4E-05	2.3E-06	2.3E-06
		Onroad	Exterior Finishing	Vendor	4.1E-08	3.9E-08	4.1E-08	3.9E-08
		Offroad	Exterior Finishing	Welders	4.4E-05	4.4E-05	2.7E-06	2.7E-06
		Onroad	Exterior Finishing	Worker	--	1.2E-06	--	1.2E-06

Table 3
Modeled Emission Rates From Construction Sources
San Francisco Housing Element
San Francisco, California

Building Type	Year	Source Type	Phase	Equipment	Uncontrolled Emission Rate (g/s)		Controlled Emission Rate (g/s)	
					DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Type 2	2025	Offroad	Building Construction	Aerial Lifts	1.9E-04	1.7E-04	5.7E-05	5.7E-05
		Offroad	Building Construction	Cranes	4.1E-04	3.8E-04	2.9E-05	2.9E-05
		Offroad	Building Construction	Forklifts	1.5E-04	1.4E-04	8.7E-06	8.7E-06
		Offroad	Building Construction	Off-Highway Trucks	2.2E-04	2.0E-04	4.7E-05	4.7E-05
		Offroad	Building Construction	Rough Terrain Forklifts	1.1E-04	1.0E-04	1.7E-05	1.7E-05
		Onroad	Building Construction	Vendor	2.7E-07	2.5E-07	2.7E-07	2.5E-07
		Offroad	Building Construction	Welders	4.3E-04	4.3E-04	3.0E-05	3.0E-05
		Onroad	Building Construction	Worker	--	7.1E-06	--	7.1E-06
		Offroad	Exterior Finishing	Aerial Lifts	3.1E-05	2.8E-05	9.6E-06	9.6E-06
		Offroad	Exterior Finishing	Air Compressors	1.8E-04	1.8E-04	1.4E-05	1.4E-05
		Offroad	Exterior Finishing	Forklifts	1.5E-04	1.4E-04	8.7E-06	8.7E-06
		Onroad	Exterior Finishing	Vendor	1.3E-07	1.2E-07	1.3E-07	1.2E-07
		Offroad	Exterior Finishing	Welders	1.4E-04	1.4E-04	1.0E-05	1.0E-05
		Onroad	Exterior Finishing	Worker	--	4.1E-06	--	4.1E-06
		Offroad	Site Work/Paving	Cement and Mortar Mixers	1.8E-05	1.8E-05	9.0E-07	9.0E-07
		Offroad	Site Work/Paving	Pavers	9.0E-05	8.3E-05	9.4E-06	9.4E-06
		Offroad	Site Work/Paving	Paving Equipment	7.8E-05	7.2E-05	8.4E-06	8.4E-06
		Offroad	Site Work/Paving	Pressure Washers	1.5E-05	1.5E-05	7.0E-07	7.0E-07
		Onroad	Site Work/Paving	Worker	--	2.0E-07	--	2.0E-07

Table 3
Modeled Emission Rates From Construction Sources
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Building Type	Year	Source Type	Phase	Equipment	Uncontrolled Emission Rate (g/s)		Controlled Emission Rate (g/s)	
					DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Type 3	2023	Offroad	Building Construction	Cranes	1.2E-04	1.1E-04	7.0E-06	7.0E-06
		Offroad	Building Construction	Forklifts	1.3E-04	1.2E-04	5.6E-06	5.6E-06
		Offroad	Building Construction	Tractors/Loaders/Backhoes	2.2E-04	2.1E-04	1.5E-05	1.5E-05
		Onroad	Building Construction	Vendor	5.9E-07	5.6E-07	5.9E-07	5.6E-07
		Onroad	Building Construction	Worker	--	1.5E-06	--	1.5E-06
		Offroad	Demolition	Concrete/Industrial Saws	3.9E-05	3.9E-05	2.5E-06	2.5E-06
		Offroad	Demolition	Rubber Tired Dozers	2.4E-05	2.2E-05	1.1E-06	1.1E-06
		Offroad	Demolition	Tractors/Loaders/Backhoes	3.4E-05	3.2E-05	2.3E-06	2.3E-06
		Onroad	Demolition	Worker	--	1.7E-08	--	1.7E-08
		Offroad	Grading	Concrete/Industrial Saws	7.4E-06	7.4E-06	4.8E-07	4.8E-07
		Onroad	Grading	Hauling	4.6E-07	4.4E-07	4.6E-07	4.4E-07
		Offroad	Grading	Rubber Tired Dozers	4.6E-06	4.2E-06	2.0E-07	2.0E-07
		Offroad	Grading	Tractors/Loaders/Backhoes	6.5E-06	6.0E-06	4.4E-07	4.4E-07
		Onroad	Grading	Worker	--	3.3E-09	--	3.3E-09
		Offroad	Site Preparation	Graders	4.3E-06	4.0E-06	3.1E-07	3.1E-07
		Onroad	Site Preparation	Hauling	1.5E-08	1.4E-08	1.5E-08	1.4E-08
		Offroad	Site Preparation	Tractors/Loaders/Backhoes	2.2E-06	2.0E-06	1.5E-07	1.5E-07
		Onroad	Site Preparation	Worker	--	8.3E-10	--	8.3E-10
	2024	Offroad	Architectural Coating	Air Compressors	9.2E-06	9.2E-06	6.0E-07	6.0E-07
		Onroad	Architectural Coating	Worker	--	2.9E-08	--	2.9E-08
		Offroad	Building Construction	Cranes	1.1E-04	1.0E-04	7.4E-06	7.4E-06
		Offroad	Building Construction	Forklifts	1.2E-04	1.1E-04	5.9E-06	5.9E-06
		Offroad	Building Construction	Tractors/Loaders/Backhoes	2.1E-04	1.9E-04	1.6E-05	1.6E-05
		Onroad	Building Construction	Vendor	5.4E-07	5.1E-07	5.4E-07	5.1E-07
		Onroad	Building Construction	Worker	--	1.5E-06	--	1.5E-06
		Offroad	Paving	Cement and Mortar Mixers	6.5E-06	6.5E-06	3.2E-07	3.2E-07
		Offroad	Paving	Pavers	1.2E-05	1.1E-05	1.2E-06	1.2E-06
		Offroad	Paving	Rollers	1.2E-05	1.1E-05	6.5E-07	6.5E-07
		Offroad	Paving	Tractors/Loaders/Backhoes	1.0E-05	9.2E-06	7.6E-07	7.6E-07
		Onroad	Paving	Worker	--	1.5E-08	--	1.5E-08

Table 3
Modeled Emission Rates From Construction Sources
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Building Type	Year	Source Type	Phase	Equipment	Uncontrolled Emission Rate (g/s)		Controlled Emission Rate (g/s)	
					DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Type 4	2023	Offroad	Architectural Coating	Air Compressors	4.6E-06	4.6E-06	2.6E-07	2.6E-07
		Onroad	Architectural Coating	Worker	--	5.2E-09	--	5.2E-09
		Offroad	Building Construction	Cranes	1.0E-04	9.3E-05	6.0E-06	6.0E-06
		Offroad	Building Construction	Forklifts	1.1E-04	1.0E-04	4.8E-06	4.8E-06
		Offroad	Building Construction	Tractors/Loaders/Backhoes	1.9E-04	1.8E-04	1.3E-05	1.3E-05
		Onroad	Building Construction	Vendor	1.9E-07	1.9E-07	1.9E-07	1.9E-07
		Onroad	Building Construction	Worker	--	5.3E-07	--	5.3E-07
		Offroad	Demolition	Concrete/Industrial Saws	1.7E-05	1.7E-05	1.1E-06	1.1E-06
		Offroad	Demolition	Rubber Tired Dozers	1.0E-05	9.6E-06	4.5E-07	4.5E-07
		Offroad	Demolition	Tractors/Loaders/Backhoes	1.5E-05	1.4E-05	9.8E-07	9.8E-07
		Onroad	Demolition	Worker	--	1.9E-08	--	1.9E-08
		Offroad	Grading	Concrete/Industrial Saws	3.7E-06	3.7E-06	2.4E-07	2.4E-07
		Onroad	Grading	Hauling	3.5E-07	3.3E-07	3.5E-07	3.3E-07
		Offroad	Grading	Rubber Tired Dozers	2.3E-06	2.1E-06	1.0E-07	1.0E-07
		Offroad	Grading	Tractors/Loaders/Backhoes	3.3E-06	3.0E-06	2.2E-07	2.2E-07
		Onroad	Grading	Worker	--	2.7E-09	--	2.7E-09
		Offroad	Paving	Cement and Mortar Mixers	2.8E-06	2.8E-06	1.4E-07	1.4E-07
		Offroad	Paving	Pavers	5.7E-06	5.3E-06	5.0E-07	5.0E-07
		Offroad	Paving	Rollers	5.7E-06	5.3E-06	2.8E-07	2.8E-07
		Offroad	Paving	Tractors/Loaders/Backhoes	4.9E-06	4.5E-06	3.3E-07	3.3E-07
		Onroad	Paving	Worker	--	9.7E-09	--	9.7E-09
		Offroad	Site Preparation	Graders	2.2E-06	2.0E-06	1.6E-07	1.6E-07
		Offroad	Site Preparation	Tractors/Loaders/Backhoes	1.1E-06	1.0E-06	7.3E-08	7.3E-08
		Onroad	Site Preparation	Worker	--	1.3E-09	--	1.3E-09

Table 3
Modeled Emission Rates From Construction Sources
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San Francisco, California

Building Type	Year	Source Type	Phase	Equipment	Uncontrolled Emission Rate (g/s)		Controlled Emission Rate (g/s)	
					DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Type 5	2023	Offroad	Building Construction	Bore/Drill Rigs	7.7E-06	7.1E-06	1.8E-06	1.8E-06
		Offroad	Building Construction	Cement and Mortar Mixers	3.4E-06	3.4E-06	1.7E-07	1.7E-07
		Offroad	Building Construction	Dumpers/Tenders	8.1E-06	8.1E-06	4.0E-07	4.0E-07
		Offroad	Building Construction	Forklifts	3.5E-06	3.2E-06	1.5E-07	1.5E-07
		Offroad	Building Construction	Other General Industrial Equipment	3.1E-05	2.9E-05	1.5E-06	1.5E-06
		Offroad	Building Construction	Pressure Washers	3.7E-07	3.7E-07	1.6E-08	1.6E-08
		Offroad	Building Construction	Pumps	1.2E-05	1.2E-05	7.7E-07	7.7E-07
		Offroad	Building Construction	Rubber Tired Loaders	3.1E-05	2.9E-05	3.6E-06	3.6E-06
		Offroad	Building Construction	Sweepers/Scrubbers	3.2E-06	3.0E-06	1.2E-07	1.2E-07
		Onroad	Building Construction	Vendor	3.3E-07	3.1E-07	3.3E-07	3.1E-07
		Onroad	Building Construction	Worker	--	7.9E-07	--	7.9E-07
		Offroad	Demolition	Aerial Lifts	9.7E-08	8.9E-08	2.9E-08	2.9E-08
		Offroad	Demolition	Concrete/Industrial Saws	2.3E-05	2.3E-05	1.5E-06	1.5E-06
		Offroad	Demolition	Cranes	6.7E-06	6.2E-06	4.0E-07	4.0E-07
		Offroad	Demolition	Crawler Tractors	8.4E-06	7.7E-06	5.4E-07	5.4E-07
		Offroad	Demolition	Dumpers/Tenders	1.3E-05	1.3E-05	6.3E-07	6.3E-07
		Offroad	Demolition	Excavators	6.9E-06	6.4E-06	7.7E-07	7.7E-07
		Offroad	Demolition	Forklifts	5.4E-06	5.0E-06	2.3E-07	2.3E-07
		Offroad	Demolition	Generator Sets	1.8E-05	1.8E-05	1.2E-06	1.2E-06
		Onroad	Demolition	Hauling	6.9E-07	6.6E-07	6.9E-07	6.6E-07
		Offroad	Demolition	Pumps	4.7E-06	4.7E-06	3.1E-07	3.1E-07
		Offroad	Demolition	Rubber Tired Dozers	2.0E-05	1.8E-05	8.5E-07	8.5E-07
		Offroad	Demolition	Skid Steer Loaders	1.4E-05	1.3E-05	1.6E-06	1.6E-06
		Offroad	Demolition	Tractors/Loaders/Backhoes	1.4E-05	1.3E-05	9.2E-07	9.2E-07
		Offroad	Demolition	Welders	2.5E-06	2.5E-06	1.3E-07	1.3E-07
		Onroad	Demolition	Worker	--	1.5E-07	--	1.5E-07
		Offroad	Drainage/Utilities/Subgrade	Cement and Mortar Mixers	2.5E-07	2.5E-07	1.3E-08	1.3E-08
		Offroad	Drainage/Utilities/Subgrade	Excavators	1.0E-05	9.2E-06	1.1E-06	1.1E-06
		Offroad	Drainage/Utilities/Subgrade	Plate Compactors	4.5E-07	4.5E-07	2.2E-08	2.2E-08
		Offroad	Drainage/Utilities/Subgrade	Rough Terrain Forklifts	3.0E-06	2.7E-06	3.7E-07	3.7E-07
		Offroad	Drainage/Utilities/Subgrade	Trenchers	2.9E-05	2.7E-05	7.2E-07	7.2E-07
		Onroad	Drainage/Utilities/Subgrade	Worker	--	2.5E-07	--	2.5E-07
		Offroad	Excavation & Shoring	Bore/Drill Rigs	1.3E-05	1.2E-05	3.1E-06	3.1E-06
		Offroad	Excavation & Shoring	Crawler Tractors	1.0E-05	9.2E-06	6.5E-07	6.5E-07
		Offroad	Excavation & Shoring	Dumpers/Tenders	5.2E-06	5.2E-06	2.6E-07	2.6E-07
		Offroad	Excavation & Shoring	Excavators	1.5E-05	1.4E-05	1.7E-06	1.7E-06
		Onroad	Excavation & Shoring	Hauling	3.7E-07	3.6E-07	3.7E-07	3.6E-07
		Offroad	Excavation & Shoring	Pumps	1.4E-05	1.4E-05	8.8E-07	8.8E-07
		Onroad	Excavation & Shoring	Worker	--	1.3E-07	--	1.3E-07
		Offroad	Site Preparation & Grading	Crushing/Proc. Equipment	8.5E-06	8.5E-06	5.1E-07	5.1E-07
		Offroad	Site Preparation & Grading	Dumpers/Tenders	8.6E-06	8.6E-06	4.2E-07	4.2E-07
		Offroad	Site Preparation & Grading	Excavators	1.2E-05	1.1E-05	1.3E-06	1.3E-06
		Offroad	Site Preparation & Grading	Pumps	2.1E-05	2.1E-05	1.4E-06	1.4E-06
		Offroad	Site Preparation & Grading	Signal Boards	2.2E-06	2.2E-06	1.1E-07	1.1E-07
		Offroad	Site Preparation & Grading	Sweepers/Scrubbers	4.3E-06	4.0E-06	1.6E-07	1.6E-07
		Offroad	Site Preparation & Grading	Tractors/Loaders/Backhoes	1.2E-05	1.1E-05	8.0E-07	8.0E-07
		Onroad	Site Preparation & Grading	Worker	--	7.0E-08	--	7.0E-08

Table 3
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Building Type	Year	Source Type	Phase	Equipment	Uncontrolled Emission Rate (g/s)		Controlled Emission Rate (g/s)	
					DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Type 5	2024	Offroad	Building Construction	Bore/Drill Rigs	6.3E-07	5.8E-07	1.6E-07	1.6E-07
		Offroad	Building Construction	Cement and Mortar Mixers	2.9E-07	2.9E-07	1.4E-08	1.4E-08
		Offroad	Building Construction	Dumpers/Tenders	7.0E-07	7.0E-07	3.5E-08	3.5E-08
		Offroad	Building Construction	Forklifts	2.6E-07	2.4E-07	1.3E-08	1.3E-08
		Offroad	Building Construction	Other General Industrial Equipment	2.3E-06	2.1E-06	1.3E-07	1.3E-07
		Offroad	Building Construction	Pressure Washers	3.1E-08	3.1E-08	1.4E-09	1.4E-09
		Offroad	Building Construction	Pumps	8.9E-07	8.9E-07	6.6E-08	6.6E-08
		Offroad	Building Construction	Rubber Tired Loaders	2.4E-06	2.2E-06	3.1E-07	3.1E-07
		Offroad	Building Construction	Sweepers/Scrubbers	2.5E-07	2.3E-07	1.1E-08	1.1E-08
		Onroad	Building Construction	Vendor	2.5E-08	2.3E-08	2.5E-08	2.3E-08
		Onroad	Building Construction	Worker	--	6.5E-08	--	6.5E-08
		Offroad	Sitework	Dumpers/Tenders	4.3E-06	4.3E-06	2.2E-07	2.2E-07
		Offroad	Sitework	Excavators	8.7E-06	8.0E-06	1.1E-06	1.1E-06
		Offroad	Sitework	Graders	2.9E-06	2.7E-06	2.3E-07	2.3E-07
		Onroad	Sitework	Hauling	2.2E-07	2.1E-07	2.2E-07	2.1E-07
		Offroad	Sitework	Pressure Washers	7.8E-07	7.8E-07	3.5E-08	3.5E-08
		Offroad	Sitework	Pumps	3.0E-05	3.0E-05	2.2E-06	2.2E-06
		Offroad	Sitework	Sweepers/Scrubbers	1.8E-06	1.6E-06	7.5E-08	7.5E-08
		Offroad	Sitework	Tractors/Loaders/Backhoes	8.4E-06	7.7E-06	6.4E-07	6.4E-07
		Onroad	Sitework	Worker	--	1.7E-07	--	1.7E-07

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Building Type	Year	Source Type	Phase	Equipment	Uncontrolled Emission Rate (g/s)		Controlled Emission Rate (g/s)	
					DPM	$PM_{2.5}$	DPM	$PM_{2.5}$
Type 6	2023	Offroad	All	Rough Terrain Forklifts	1.4E-04	1.2E-04	1.7E-05	1.7E-05
		Offroad	All	Sweepers/Scrubbers	4.9E-05	4.5E-05	1.9E-06	1.9E-06
		Onroad	All	Vendor	9.5E-08	9.1E-08	9.5E-08	9.1E-08
		Onroad	All	Worker	--	6.5E-07	--	6.5E-07
		Offroad	Demolition	Air Compressors	1.4E-05	1.4E-05	7.6E-07	7.6E-07
		Onroad	Demolition	Hauling	1.1E-07	1.1E-07	1.1E-07	1.1E-07
		Offroad	Demolition	Skid Steer Loaders	3.4E-06	3.1E-06	3.9E-07	3.9E-07
		Onroad	Demolition	Vendor	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Onroad	Demolition	Worker	--	0.0E+00	--	0.0E+00
		Offroad	Excavation	Crawler Tractors	4.5E-05	4.1E-05	2.9E-06	2.9E-06
		Offroad	Excavation	Excavators	7.2E-05	6.6E-05	8.0E-06	8.0E-06
		Onroad	Excavation	Hauling	2.1E-07	2.0E-07	2.1E-07	2.0E-07
		Offroad	Excavation	Tractors/Loaders/Backhoes	3.5E-05	3.2E-05	2.4E-06	2.4E-06
		Onroad	Excavation	Vendor	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Onroad	Excavation	Worker	--	0.0E+00	--	0.0E+00
		Offroad	Exterior	Aerial Lifts	1.3E-05	1.2E-05	3.8E-06	3.8E-06
		Offroad	Exterior	Forklifts	4.1E-05	3.8E-05	1.7E-06	1.7E-06
		Offroad	Exterior	Pavers	1.2E-06	1.1E-06	1.1E-07	1.1E-07
		Offroad	Exterior	Paving Equipment	1.1E-06	1.0E-06	9.5E-08	9.5E-08
		Offroad	Exterior	Rollers	9.6E-07	8.8E-07	4.7E-08	4.7E-08
		Onroad	Exterior	Vendor	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Onroad	Exterior	Worker	--	0.0E+00	--	0.0E+00
		Offroad	Structure	Pumps	6.2E-06	6.2E-06	4.0E-07	4.0E-07
		Onroad	Structure	Vendor	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Onroad	Structure	Worker	--	0.0E+00	--	0.0E+00
	2024	Offroad	All	Rough Terrain Forklifts	1.9E-05	1.7E-05	2.6E-06	2.6E-06
		Offroad	All	Sweepers/Scrubbers	6.8E-06	6.2E-06	2.9E-07	2.9E-07
		Onroad	All	Vendor	1.3E-08	1.2E-08	1.3E-08	1.2E-08
		Onroad	All	Worker	--	9.6E-08	--	9.6E-08
		Offroad	Structure	Pumps	2.7E-06	2.7E-06	2.0E-07	2.0E-07
		Onroad	Structure	Vendor	0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Onroad	Structure	Worker	--	0.0E+00	--	0.0E+00

Table 4
Modeled Emission Rates From Operational Sources
San Francisco Housing Element
San Francisco, California

Building Type	Source Group	Year[1]	Uncontrolled Emission Rate (g/s)	Controlled Emission Rate (g/s)
			DPM	DPM
Type 1	TYP1G	2022+	6.4E-05	--
Type 2	TYP2G	2022+	3.2E-05	--
Type 3	TYP3G	2022+	2.2E-04	3.0E-05

1. Operational emissions for emergency generators were conservatively modeled for 30 years starting at the third trimester for the maximally exposed receptor. Type 1 and Type 2 generators were only modeled as Tier 4 Final due to regulatory compliance.

APPENDIX B
B-3 AERMOD DATA [PROVIDED ELECTRONICALLY]

APPENDIX J

Wind Supporting Information

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

PEDESTRIAN LEVEL WIND ASSESSMENT

SAN FRANCISCO HOUSING ELEMENT UPDATE 2022 EIR

SAN FRANCISCO, CA

PROJECT #: 2002166
MARCH 21, 2022

SUBMITTED TO

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1. INTRODUCTION & PROJECT INFORMATION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by ICF to assess the pedestrian wind conditions for the proposed development of the San Francisco Housing Element Update 2022 EIR. This qualitative assessment is based on the following:

This assessment was based on the following:

- a review of regional long-term meteorological data for San Francisco;
- ArcGIS models received from Prevision Design received on October 13, 2021;
- wind-tunnel studies and desktop assessments undertaken by RWDI for similar and nearby projects in San Francisco;
- our engineering judgement and knowledge of wind flows around buildings[1-3]; and,
- The use of 3D software developed by RWDI (*WindEstimator*[2]) for estimating the potential wind conditions around generalized building forms.

This approach provides a screening-level estimation of potential wind conditions. Scale model wind tunnel testing was not carried out for this assessment. Conceptual wind control measures to improve wind comfort are recommended, where necessary.

1. H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", *Journal of Wind Engineering and Industrial Aerodynamics*, vol.104-106, pp.397-407.
2. H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004,* Nashville, Tennessee.
3. C.J. Williams, H. Wu, W.F. Waechter and H.A. Baker (1999), "Experience with Remedial Solutions to Control Pedestrian Wind Problems", *10th International Conference on Wind Engineering*, Copenhagen, Denmark.

Project Overview:

The San Francisco Planning Department (department) is proposing to update the adopted 2014 housing element (existing housing element) of the San Francisco General Plan (general plan).

The purpose of this project is to evaluate the impacts on the environment that could result from adoption and implementation of the San Francisco Housing Element 2022 Update (housing element update or proposed action), which is an update to the existing housing element of the general plan. The housing element update is mandated by state law, Government Code section 65583.

The proposed action would occur entirely within the city and county of San Francisco. San Francisco is a consolidated city and county and approximately 49 square miles in size.

For the purpose of the Pedestrian Wind Assessment, four scenarios of development density were reviewed across 8 areas of the City.

1. 2050 environmental baseline
2. Housing Element Update (Proposed Action)
3. Plan Bay Area 2050
4. Eastside Alternative

OVERVIEW OF KEY AREAS



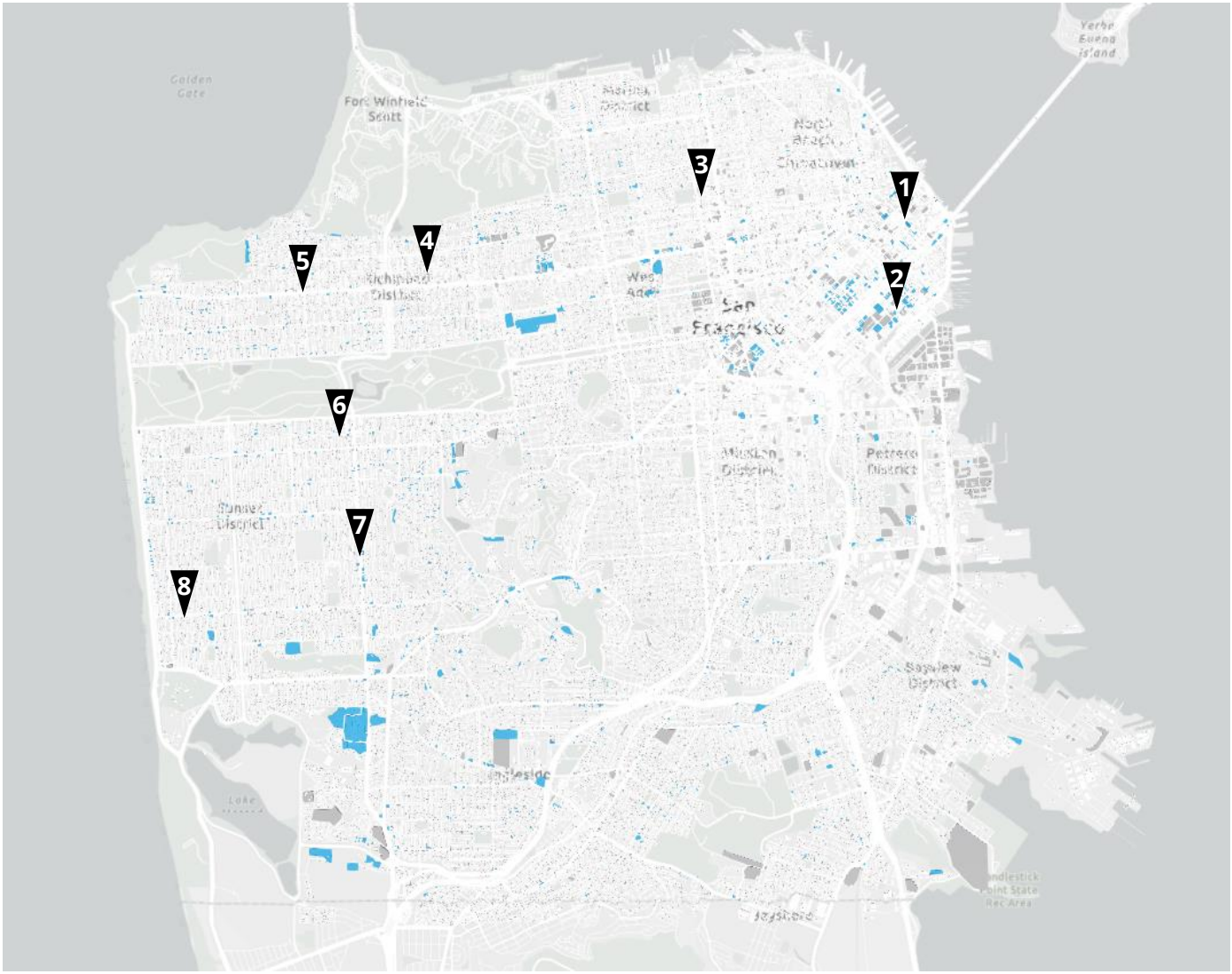
LIST OF KEY AREAS

1. Downtown Area Surrounding the Transbay Center Bound by Market Street to the North, Main Street to the East, Folsom Street to the South and 3rd Street to the West
2. Central SoMA Area Bound by Harrison Street to the North, 3rd Street to the East, Townsend Street to the South and 5th Street to the West
3. Area near Lafayette Park Bound by Jackson Street to the North, Polk Street to the East, Sutter Street to the South and Laguna Street to the West
4. Area Bound by Lake Street to the North, Arguello Boulevard to the East, Anza Street to the South And Funston Avenue to the West
5. Geary Boulevard between 16th Avenue and 28th Avenue
6. Irving Street between 19th Avenue to the east and 27th Avenue to the west
7. 19th Avenue between Ortega Street and Santiago Street
8. Taraval Street between 40th Avenue and 48th Avenue

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

2050 ENVIRONMENTAL BASELINE



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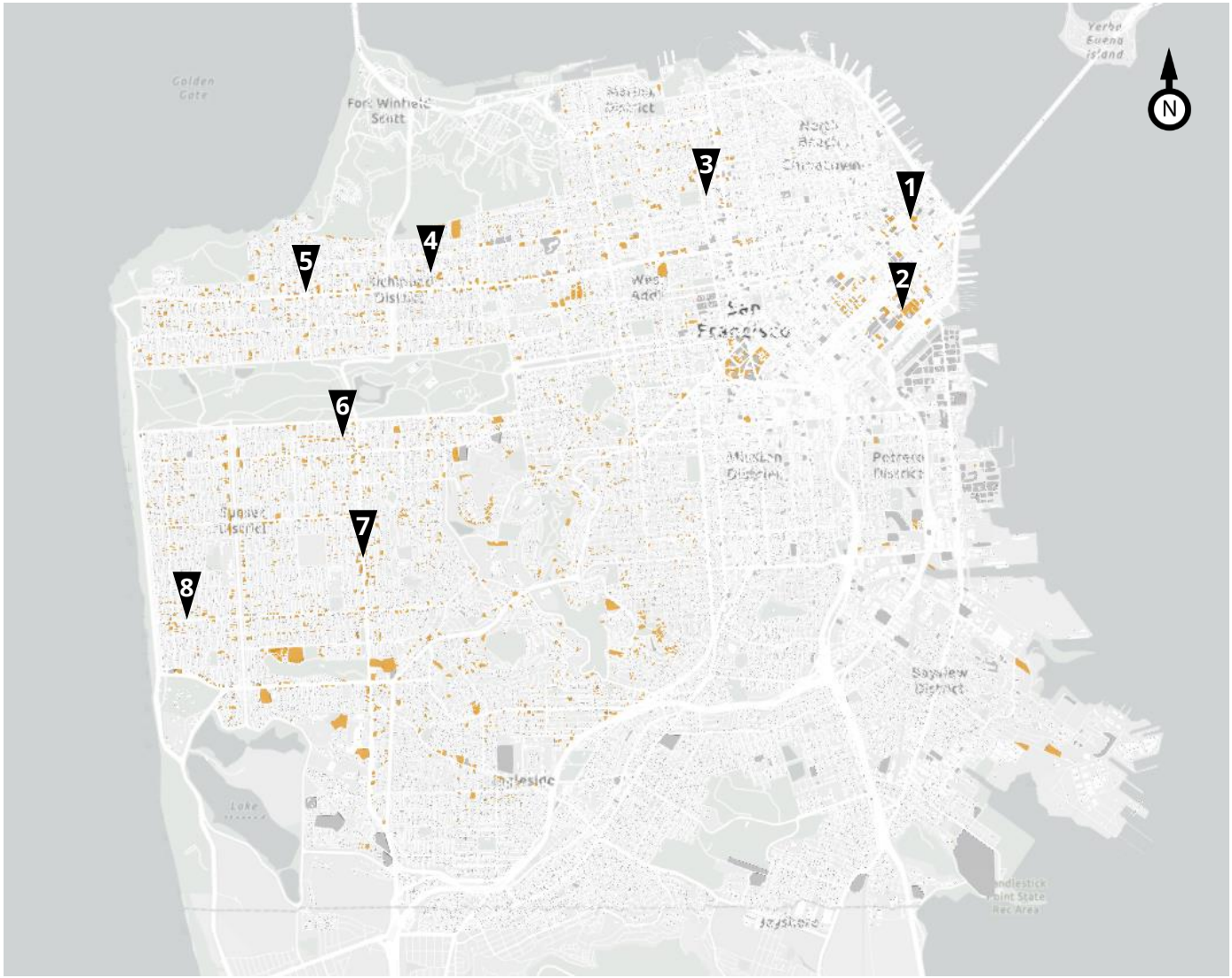
HOUSING ELEMENT UPDATE



Project #: 2002166
March 21, 2022

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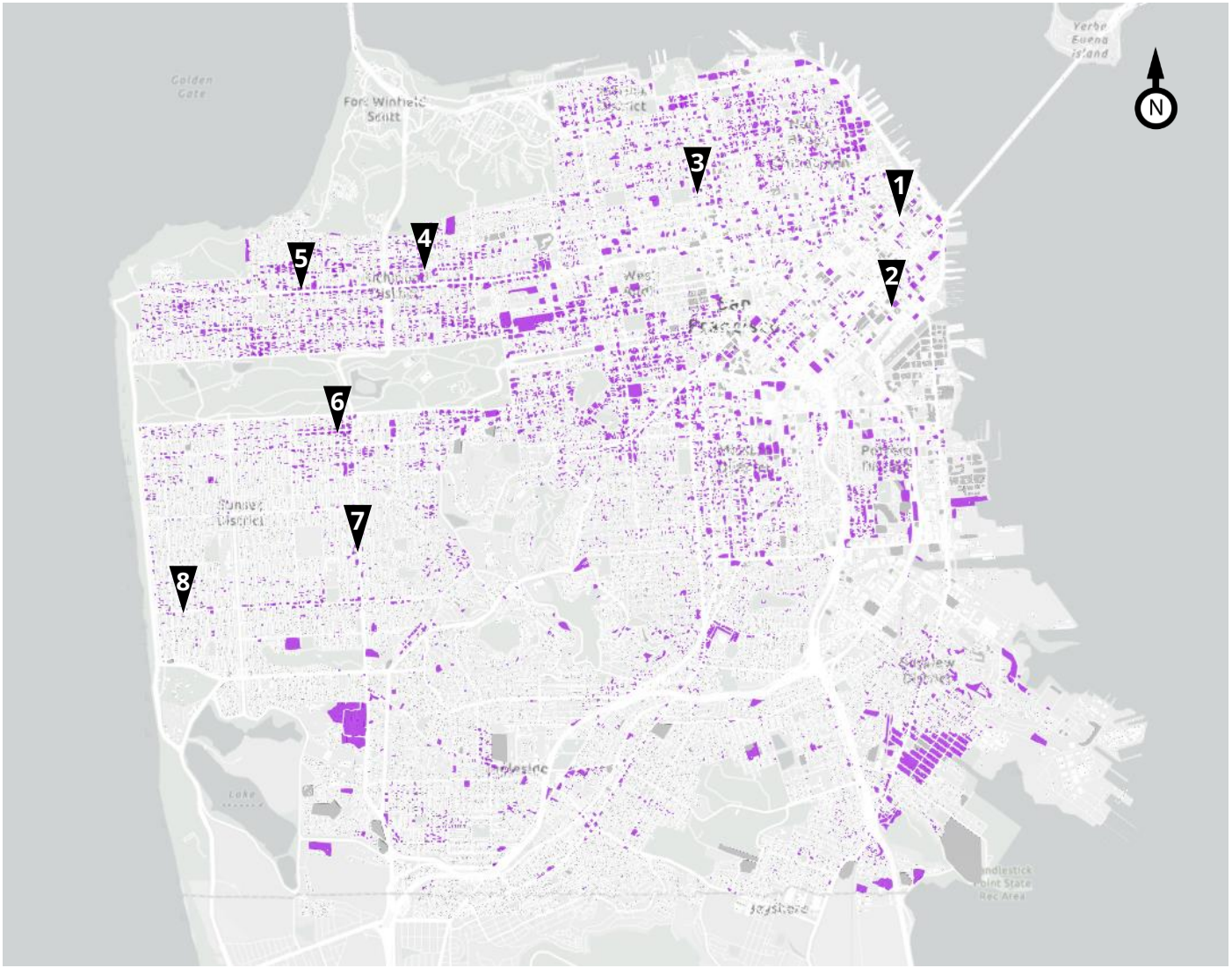
PLAN BAY AREA 2050



Project #: 2002166
March 21, 2022

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EASTSIDE ALTERNATIVE



Project #: 2002166
March 21, 2022

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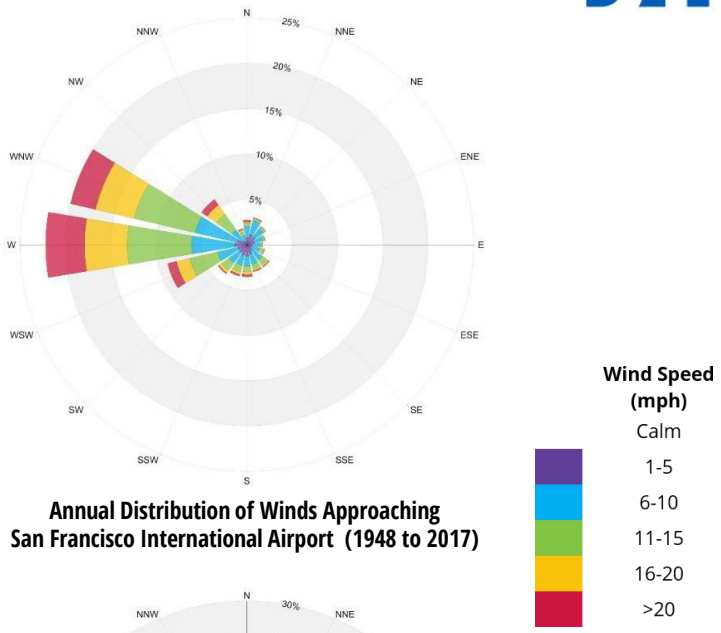
2. WIND DATA

Long-term wind data recorded at a height of 33 ft at San Francisco International Airport between 1948 and 2017 is used as a reference for this wind assessment.

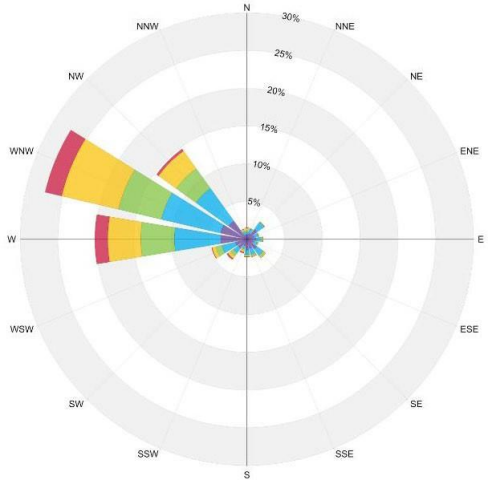
Another set of wind data is often used in San Francisco for projects that are subject to the San Francisco Planning Code requirements in Section 148. This data was collected at a height of 132 ft above grade during the period of 1945 to 1950 during day-time hours only.

Both records, presented in the images to the right, show similar wind directionality. However, the data from the Airport Station is of longer period of record and is more current than the traditional data set from the Downtown Station (which was recorded between 1945 to 1950). This longer period of record provides a greater robustness to the data.

Average wind speeds in San Francisco are the highest in the summer and lowest in winter. However, the strongest peak winds occur in winter. Of the primary wind directions, four have the greatest frequencies of occurrence and make up the majority of the strong winds that occur. These wind directions are west-northwest, west, northwest and west-southwest. Winds from these directions are most important for the current project, but winds from other directions are also considered in our analysis.



Annual Distribution of Winds Approaching San Francisco International Airport (1948 to 2017)



Annual Distribution of Winds Approaching San Francisco Downtown Station (6:00 to 20:00, 1945 to 1950)

3. PLANNING CODE REQUIREMENTS

The San Francisco Planning Code Section 148, Reduction of Ground-level Wind Currents in C-3 Districts, requires buildings to be shaped so as not to cause ground-level wind currents to exceed defined comfort and hazard criteria. Although this project extends past these districts, these requirements are often used for other zoning districts in San Francisco. For the purposes of environmental review under the California Environmental Quality Act (CEQA), the wind hazard criterion is used to determine if a proposed project would have significant impacts.

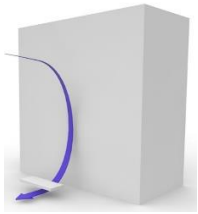
The hazard criterion is based on winds that are measured for one hour and averaged. The corresponding one-minute hazard criterion speed is 36 mph. The Planning Code defines these wind speeds in terms of equivalent wind speeds, which are average wind speed (mean velocity), adjusted to include the level of gustiness and turbulence. The text in the report simply refers to the data as wind speeds.

4. PREDICTED WIND CONDITIONS

Predicting wind speeds and occurrence frequencies is complicated. It involves the combined assessment of building geometry, orientation, position and height of surrounding buildings, upstream terrain and the local wind climate. Over the years, RWDI has conducted thousands of wind-tunnel model studies on pedestrian wind conditions around buildings, yielding a broad knowledge base. This knowledge has been incorporated into RWDI's proprietary software that allows, in many situations, for a qualitative, screening-level numerical estimation of pedestrian wind conditions without wind tunnel testing.

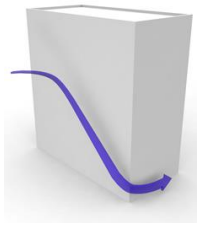
In our discussion of anticipated wind conditions, reference is made to the generalized wind flows illustrated and defined on the right side. Buildings taller than their immediate surrounds tend to intercept the naturally stronger winds at higher elevations and redirect them down to pedestrian level. Such a downwashing flow is often the main cause for wind accelerations around tall buildings. These winds can be relatively strong and turbulent, especially around exposed building corners and in relatively narrow passageways between buildings.

If these building and wind combinations occur for prevailing directions, there is a greater potential for increased wind activity and wind hazard concerns.



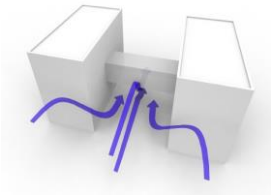
Downwashing

Tall buildings tend to intercept the stronger winds at higher elevations and redirect them to the ground level. This is often the main cause for wind accelerations around large buildings at the pedestrian level.



Corner Acceleration

W*inds approach at an oblique angle to a tall façade and are deflected down causing a localized increase in the wind activity or corner acceleration around the exposed building corner(s) at pedestrian level.*



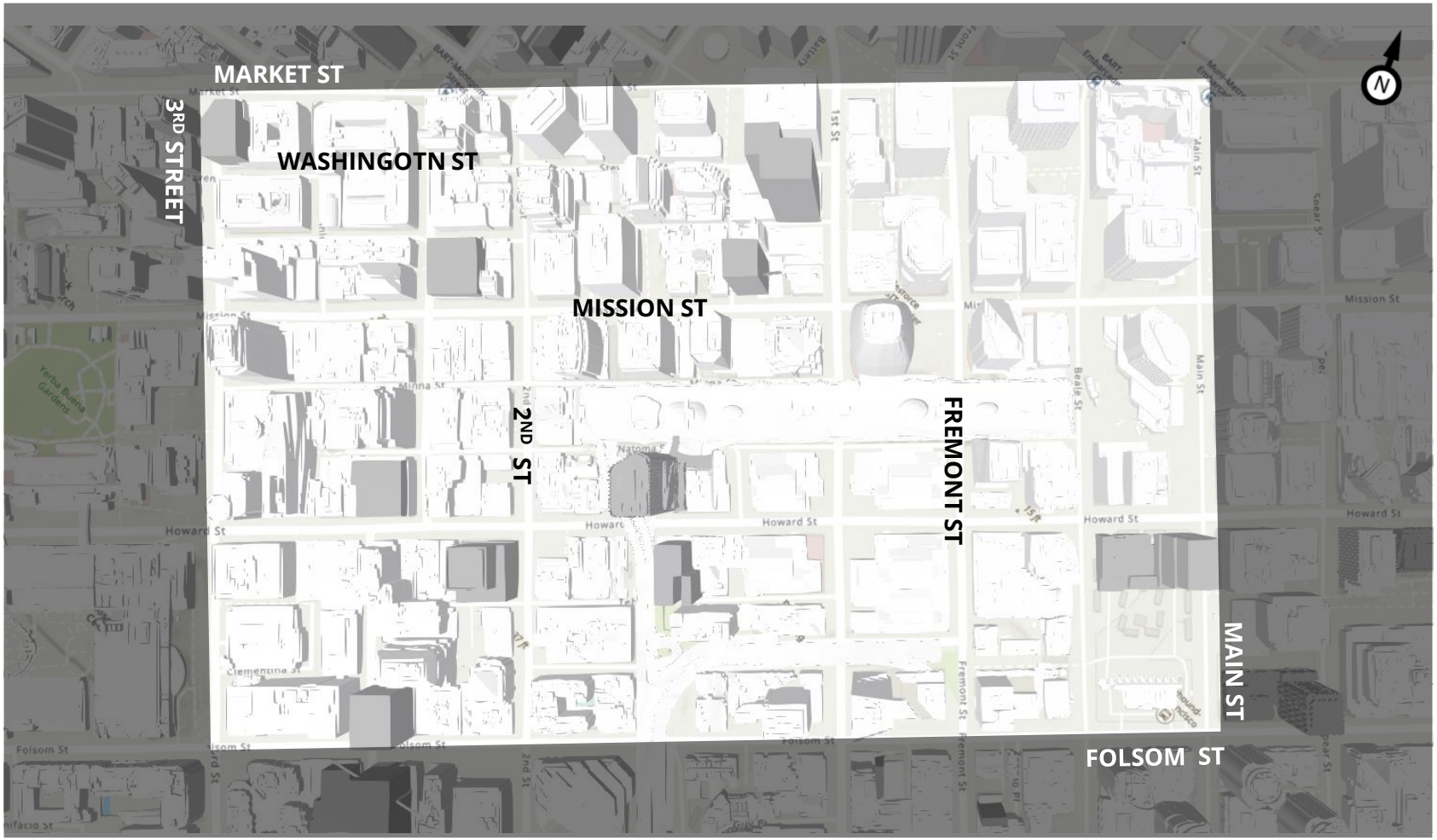
Channeling

When two buildings are situated side by side or an underpass is created, wind flow tends to accelerate through the space due to channeling effect caused by the narrow gap.

AREA 1

DOWNTOWN AREA SURROUNDING THE TRANSBAY CENTER BOUND BY MARKET STREET TO THE NORTH, MAIN STREET TO THE EAST, FOLSOM STREET TO THE SOUTH AND 3RD STREET TO THE WEST

Downtown Area Surrounding the Transbay Center Bound by Market Street to the North, Main Street to the East, Folsom Street to the South and 3rd Street to the West



IMAGES ARE NOT TO SCALE

Overview of Additional Development Density

Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under 2050 environmental baseline

Additional Development Assumed Under the Proposed Action

Additional Development Under Plan Bay Area 2050

Additional Development Under Eastside Alternative









IMAGES ARE NOT TO SCALE

AREA 1

The area is within the dense downtown core, surrounded by several high-rise and mid-rise buildings. As such the surroundings offer a substantial level of sheltering from the predominant winds. Additional development under 2050 environmental baseline and Future development consistent with the Housing Element Update, Plan Bay Area 2050 and Eastside Alternative include buildings of heights that are comparable to those in the 2019 and 2050 Existing development. Owing to the sheltering afforded by the surroundings, low wind speeds are generally expected in Area 1 and that is expected to continue to be the case under the 2050 environmental baseline, Housing Element Update, Plan Bay Area 2050 and Eastside Alternative developments.

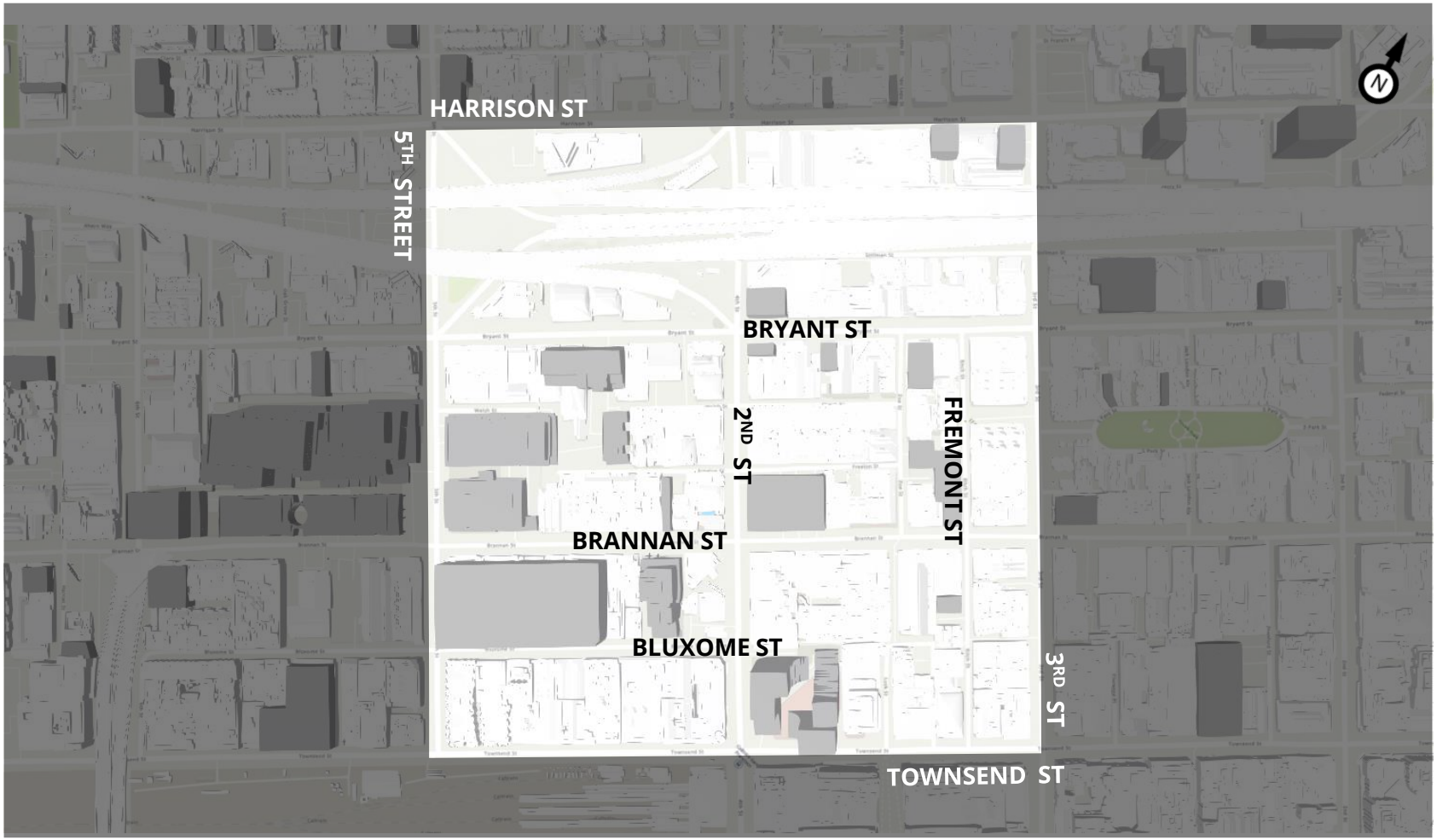
Significant wind impacts are not expected as a result of the additional development under 2050 environmental baseline or the future development consistent with the Housing Element Update, Plan Bay Area 2050 and Eastside Alternative.

Average wind speeds in the Housing Element Update, Plan Bay Area 2050 and Eastside Alternative are expected to be comparable to the 2050 environmental baseline.

AREA 2

CENTRAL SOMA AREA BOUND BY HARRISON STREET TO THE NORTH, 3RD STREET TO THE EAST, TOWNSEND STREET TO THE SOUTH AND 5TH STREET TO THE WEST

Central SoMA Area Bound by Harrison Street to the North, 3rd Street to the East, Townsend Street to the South and 5th Street to the West



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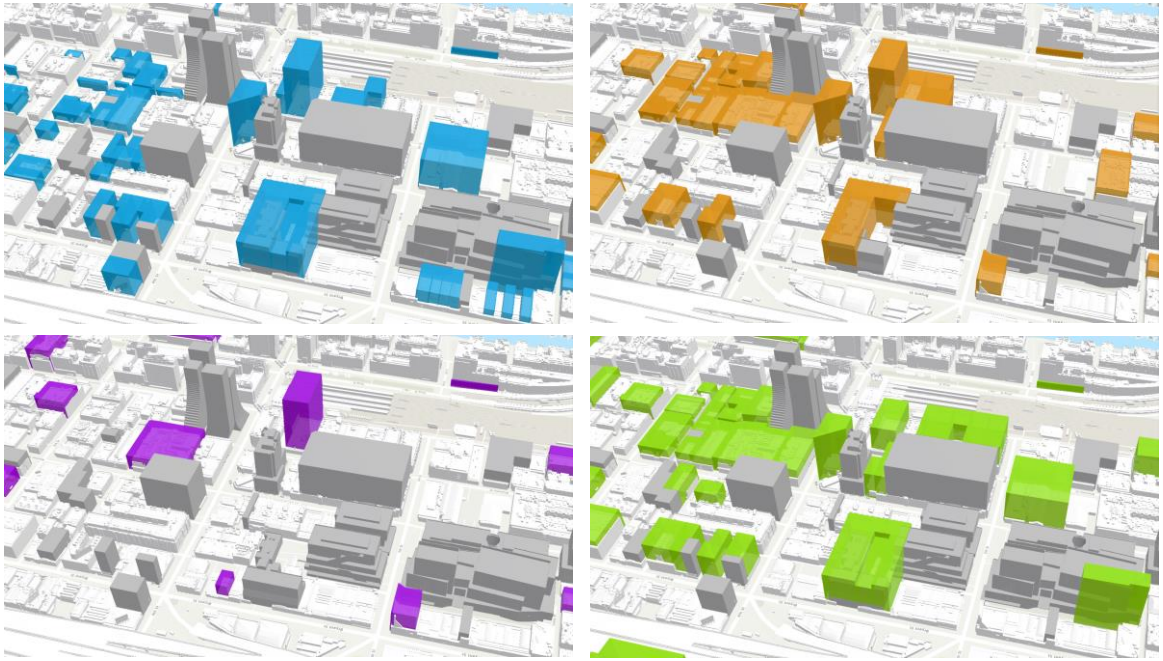
Overview of Additional Development Density

- Existing buildings in 2019
- Pipeline Projects Assumed to be built by 2050
- Additional Development Under 2050 environmental baseline
- Additional Development Assumed Under the Proposed Action
- Additional Development Under Plan Bay Area 2050
- Additional Development Under Eastside Alternative



All Views from Northwest

KEY POINTS:

Additional development under 2050 environmental baseline and Future development consistent with the Housing Element Update, Plan Bay Area 2050 and Eastside Alternative include buildings that are mid- to high-rise. The area is fairly exposed to the predominant westerly winds owing to the low surroundings upwind. The mid- to –high-rise buildings are expected to redirect winds in a manner that would create substantial gusts at ground level and the resulting wind activity is expected to exceed the hazard criterion at several areas as identified in the next page.

Significant wind impacts are expected as a result of the Additional development under 2050 environmental baseline and Future development consistent with the Housing Element Update, Plan Bay Area 2050 and Eastside Alternative.

Average wind speeds are predicted to be comparable in the 2050 environmental baseline, Housing Element Update. Plan Bay Area 2050 and Eastside Alternative.

AREA 2

Existing buildings in 2019

Additional Development Under 2050 environmental baseline

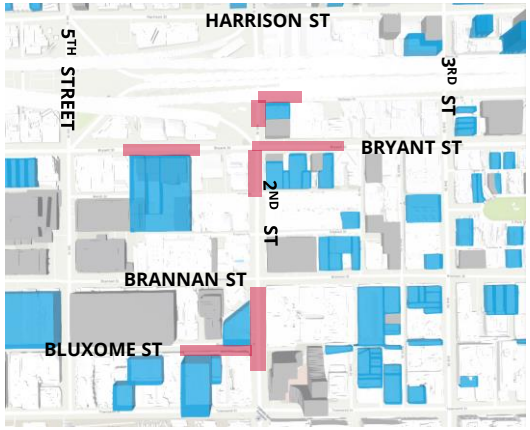
Additional Development Under Plan Bay Area 2050

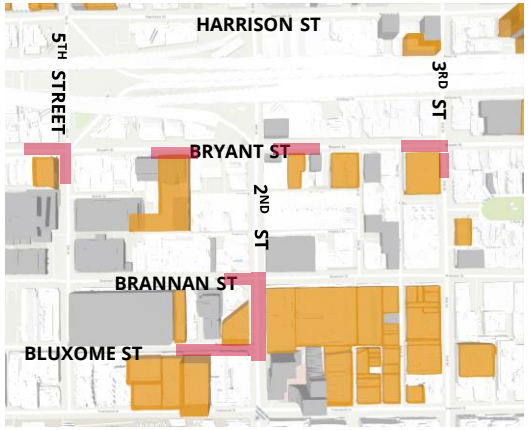
Pipeline Projects Assumed to be built by 2050

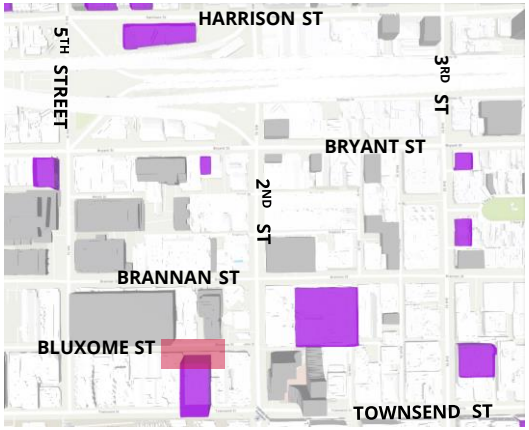
Additional Development Assumed Under the Proposed Action

Additional Development Under Eastside Alternative

Areas where the wind hazard criterion is predicted to be exceeded as a result of the additional development









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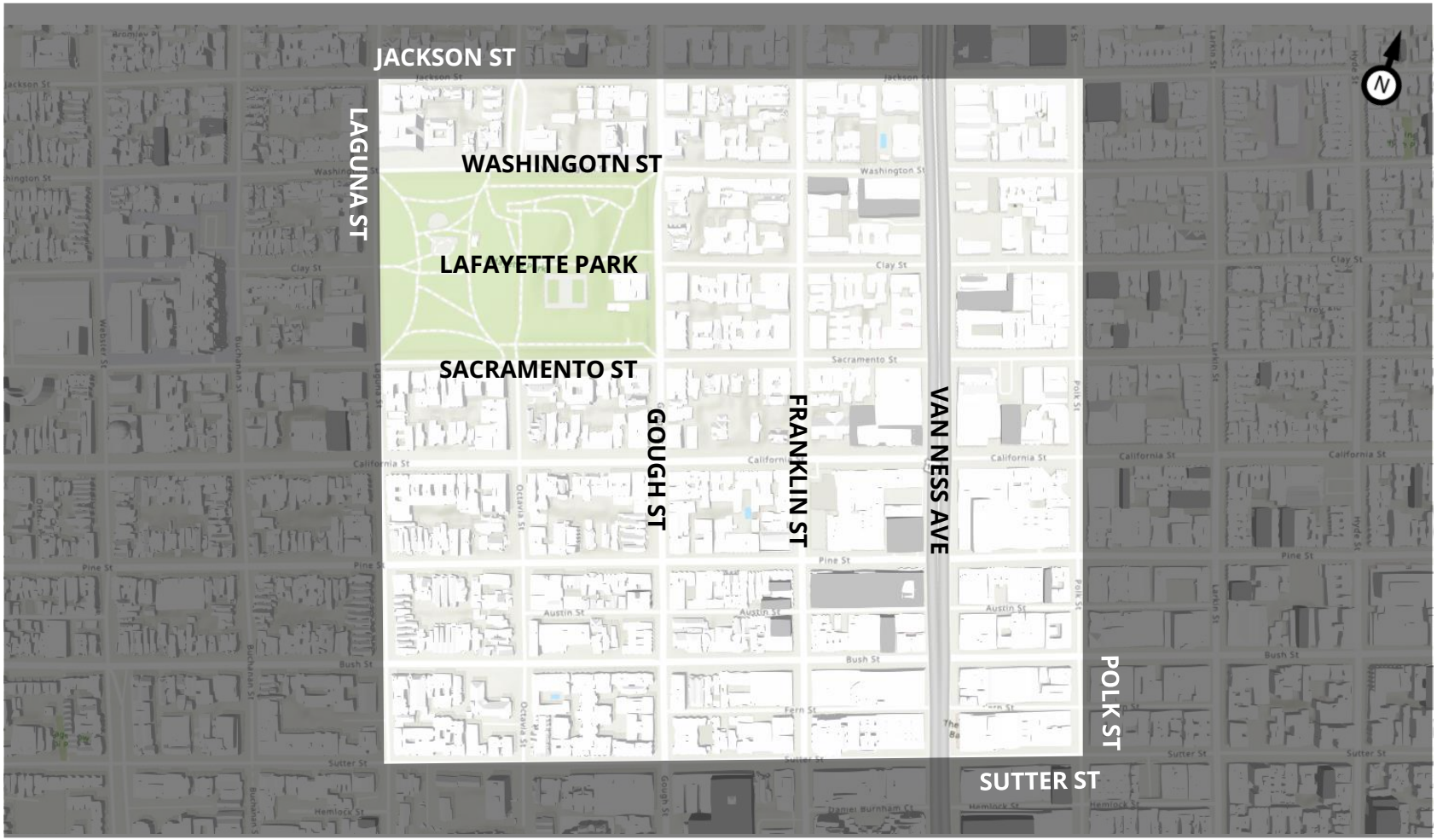
AREA 3

AREA NEAR LAFAYETTE PARK BOUND BY JACKSON STREET TO THE NORTH, POLK STREET TO THE EAST, SUTTER STREET TO THE SOUTH AND LAGUNA STREET TO THE WEST

Area near Lafayette Park Bound by Jackson Street to the North, Polk Street to the East, Sutter Street to the South and Laguna Street to the West



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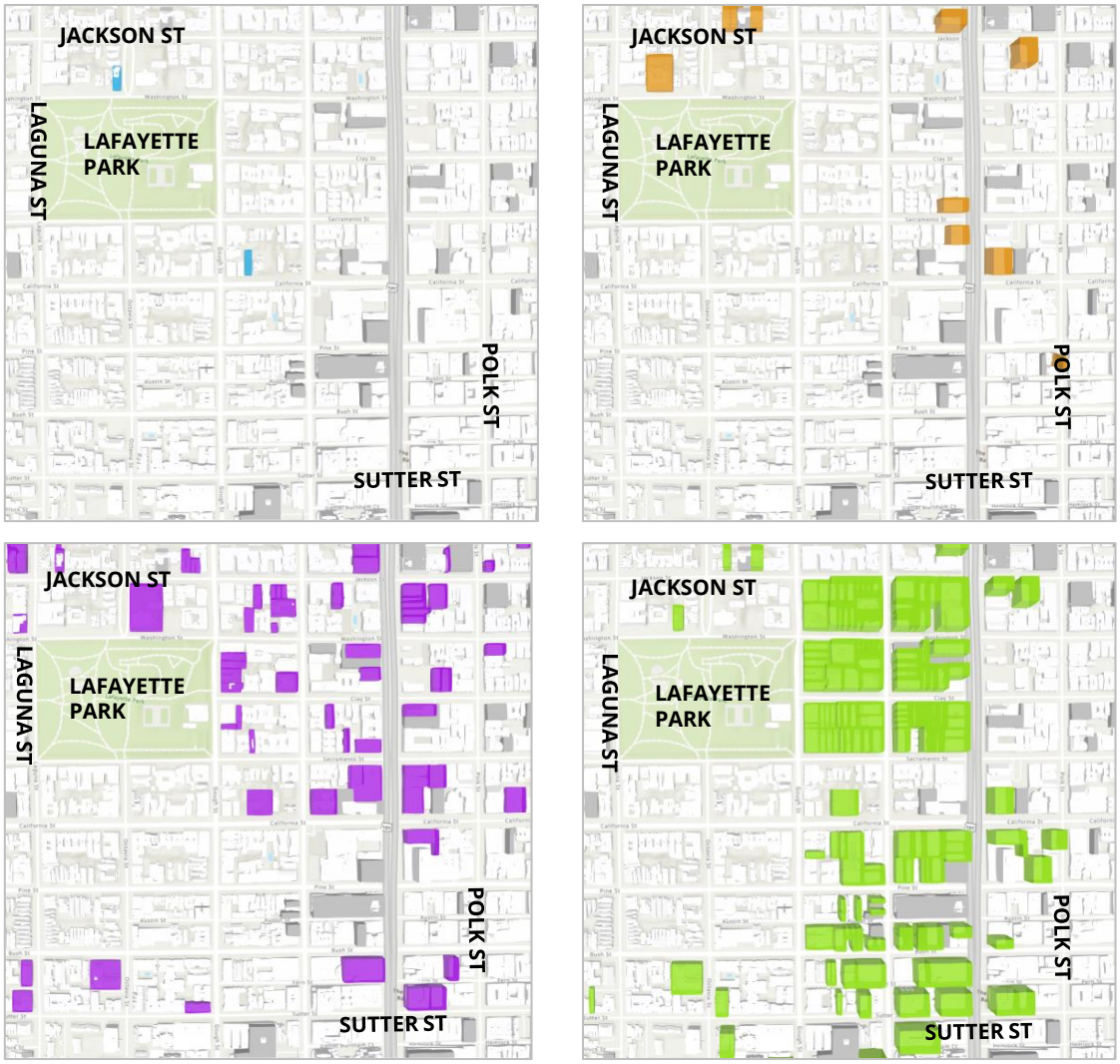
Overview of Additional Development Density



N

- Existing buildings in 2019
- Pipeline Projects Assumed to be built by 2050
- Additional Development Under 2050 environmental baseline
- Additional Development Assumed Under the Proposed Action
- Additional Development Under Plan Bay Area 2050
- Additional Development Under Eastside Alternative

IMAGES ARE NOT TO SCALE

AREA 3.1 2050 ENVIRONMENTAL BASELINE



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under 2050 environmental baseline

KEY POINTS:

Additional development under the Environmental Baseline are low in height and therefore will not create any notable wind impact.

The elevated Lafayette Park shelters the section of Gough Street adjacent to and to the south of it from winds approaching form the west and northwest.

Note that taller buildings in the 2019 Existing development and pipeline projects assumed to be built by 2050 that are of the order of 12 stories or taller are likely to redirect wind in a manner that would create substantial gusts at ground level comparable in height to those in the 2019 and 2050 Existing development.

Significant wind impacts are not expected as a result of the additional development under 2050 environmental baseline*

*This CEQA conclusion is required for the No Project Alternative

AREA 3.2 FUTURE DEVELOPMENT CONSISTENT WITH THE HOUSING ELEMENT UPDATE
AREA 3.3 PLAN BAY AREA 2050
AREA 3.4 EASTSIDE ALTERNATIVE



KEY POINTS:

Future development consistent with the Housing Element Update, Plan Bay Area 2050 and Eastside Alternative include buildings of the order of 15 stories or taller. The heights of these buildings are substantially higher than the surrounding buildings in the 2019 and 2050 Existing development. The general low height of the 2019 and 2050 existing development to the west of Area 3 and the open Lafayette Park increase the exposure of these tall buildings to the predominant west and northwest winds.

Downwashing, corner acceleration and channeling flows are expected around the base of all such buildings that are downwind (or east of) low developments. The resulting wind activity is expected to exceed the hazard criterion as identified in the figures that follow in the next pages.

Significant wind impacts are expected as a result of the future development consistent with the Housing Element Update, Plan Bay Area 2050 and Eastside Alternative.





IMAGES ARE NOT TO SCALE

AREA 3.2 FUTURE DEVELOPMENT CONSISTENT WITH THE HOUSING ELEMENT UPDATE
AREA 3.3 PLAN BAY AREA 2050
AREA 3.4 EASTSIDE ALTERNATIVE

Existing buildings in 2019

Additional Development Under 2050 environmental baseline

Additional Development Under Plan Bay Area 2050

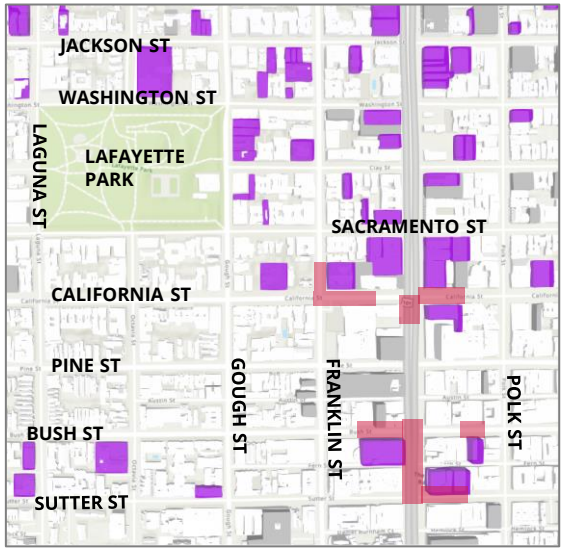
Pipeline Projects Assumed to be built by 2050

Additional Development Assumed Under the Proposed Action

Additional Development Under Eastside Alternative

Areas where the wind hazard criterion is predicted to be exceeded as a result of the additional development







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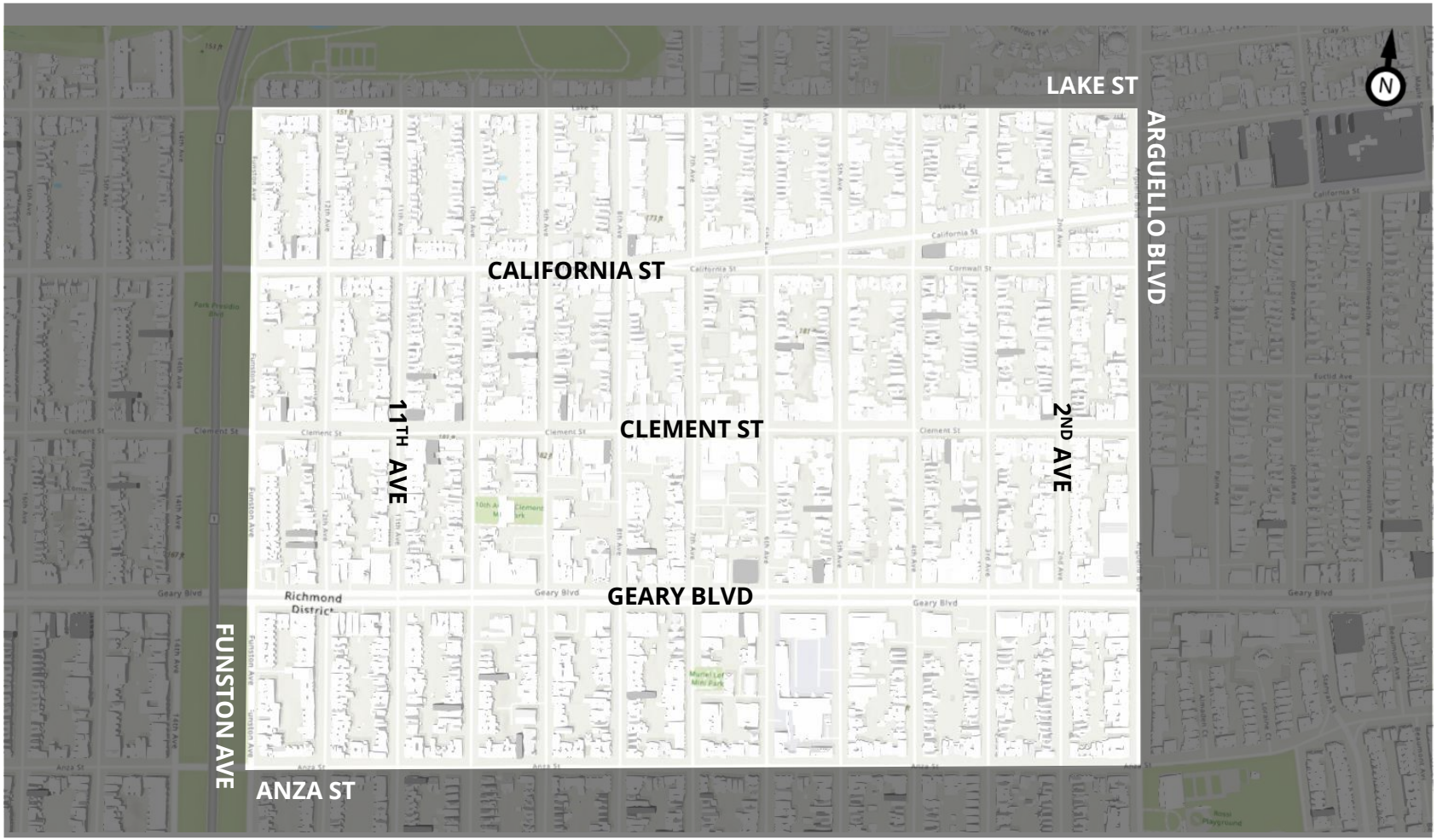
AREA 4

AREA BOUND BY LAKESTREET TO THE NORTH, ARGUELLO BOULEVARD TO THE EAST, ANZA STREET TO THE SOUTH AND FUNSTON AVENUE TO THE WEST

Area Bound by Lake Street to the North, Arguello Boulevard to the East, Anza Street to the South And Funston Avenue to the West



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Overview of Additional Development Density

Existing buildings in 2019

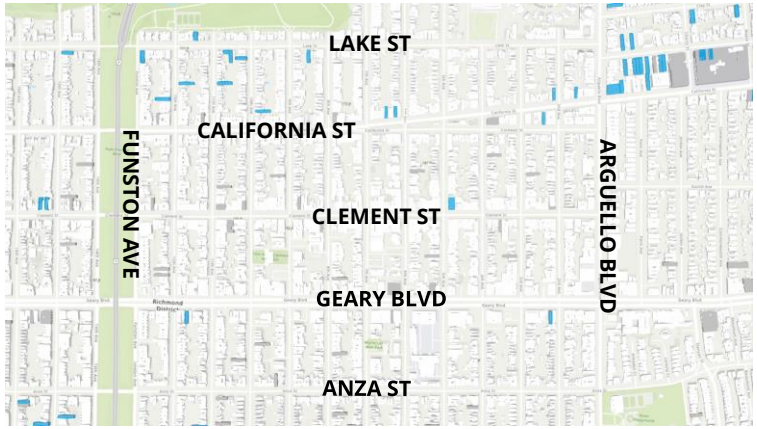
Pipeline Projects Assumed to be built by 2050

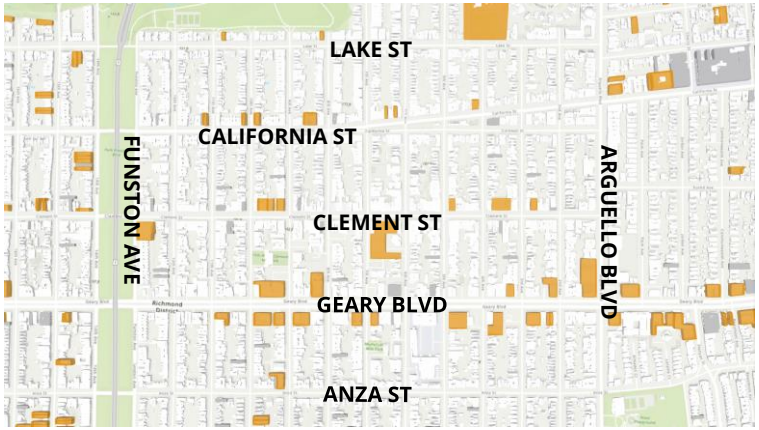
Additional Development Under 2050 environmental baseline

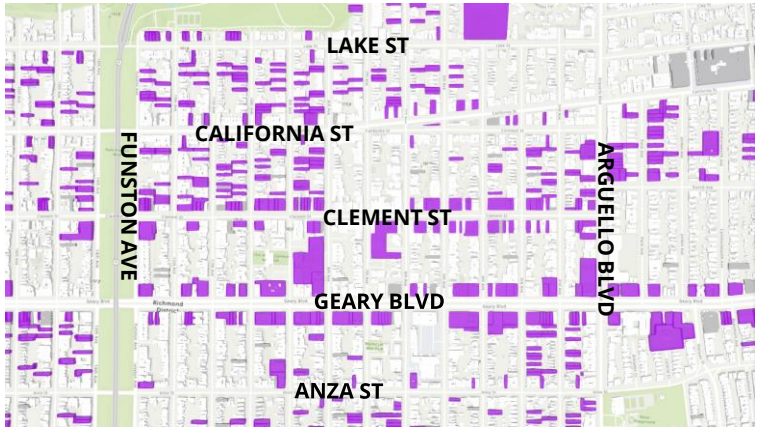
Additional Development Assumed Under the Proposed Action

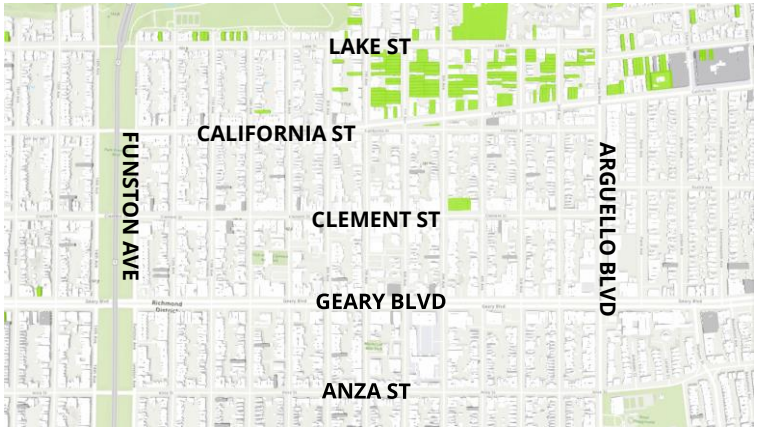
Additional Development Under Plan Bay Area 2050

Additional Development Under Eastside Alternative









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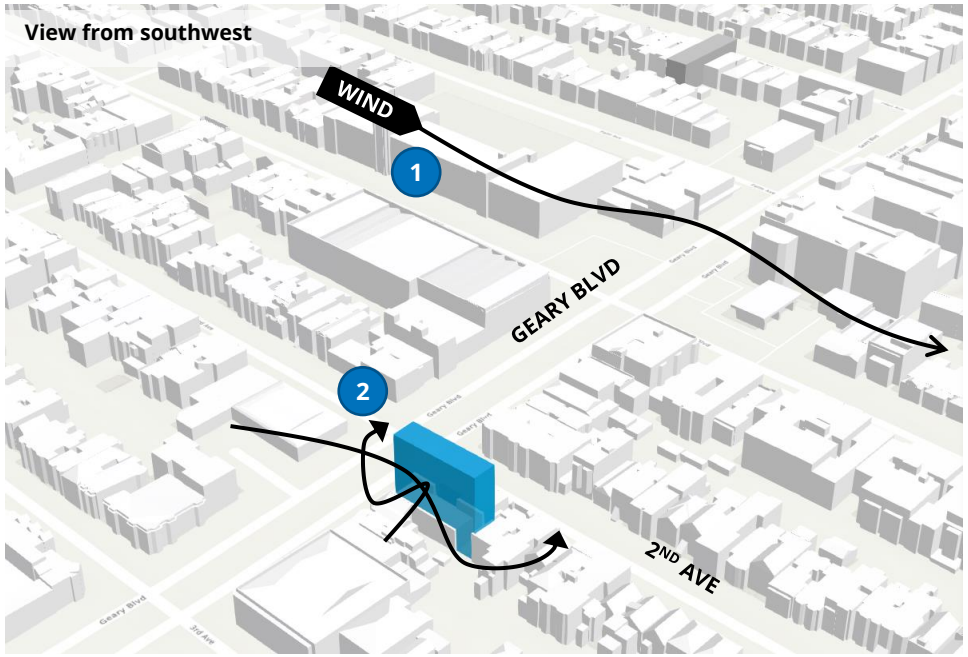
AREA 4.1 2050 ENVIRONMENTAL BASELINE



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under 2050 environmental baseline

KEY POINTS:

Most of the buildings in the additional development under the 2050 environmental baseline are comparable in height to those in the 2019 and 2050 Existing development.

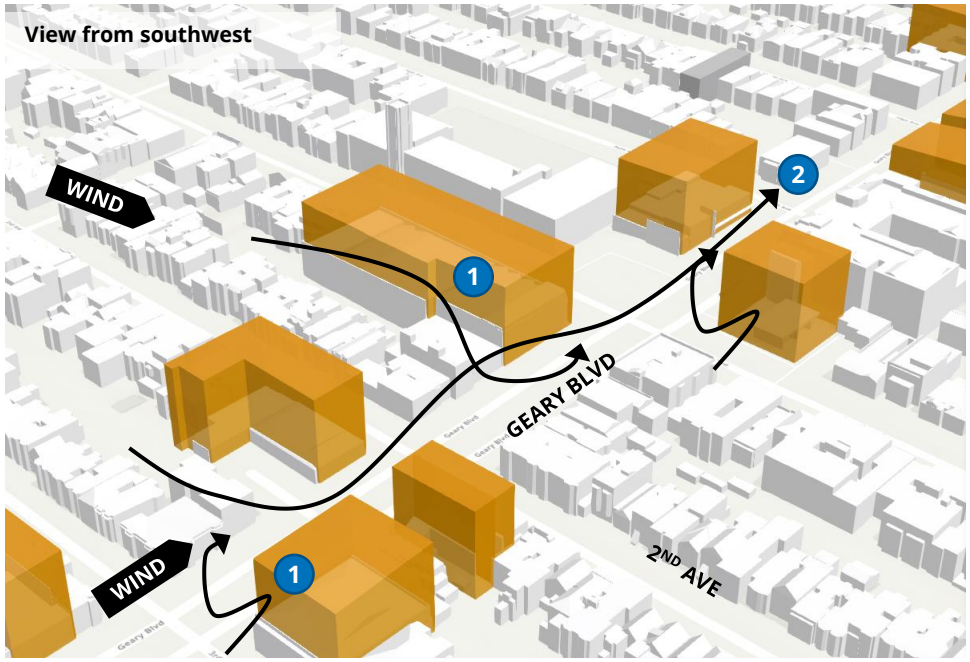
1. As such, wind will tend to flow over the fairly uniform terrain and will not be redirected to ground level in a manner than would create strong gusts on most streets.

2. The tallest additional building is on Geary Boulevard at 22nd Avenue. This building appears to be of the order of 7 stories tall and substantially taller than the surrounding buildings. As a result, the exposure of the building to the prevailing west and northwest winds and downwashing and corner acceleration flows resulting from that exposure are predicted to cause wind activity at ground level that would be higher than in the 2019 and 2050 Existing development, but not high enough to exceed the hazard criterion.

Significant wind impacts are not expected in the 2050 environmental baseline expected.*

*This CEQA conclusion is required for the No Project Alternative

AREA 4.2 FUTURE DEVELOPMENT CONSISTENT WITH THE HOUSING ELEMENT UPDATE



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Assumed Under the Proposed Action

KEY POINTS:

Future development consistent with the Housing Element Update includes buildings of varying heights. While most buildings are comparable in height to 2019 and 2050 Existing development, several buildings along Geary Boulevard are assumed to be substantially taller than the general surroundings.

1. The taller buildings on Geary Boulevard will intercept wind approaching over the low surroundings and cause downwashing and corner acceleration flows around their bases. The buildings are separated from each other enough to create space for winds to enter the Geary Boulevard following these mechanisms.

2. The flows are expected to then channel along Geary Boulevard.

The combination of flow mechanisms resulting from the interaction of these tall buildings with wind is expected to result in increased wind speeds on Geary Boulevard relative to the 2050 environmental baseline.

No significant wind impacts are expected with the Housing Element Update.

Average wind speeds are expected to be higher than in the development under the 2050 environmental baseline.

AREA 4.3 PLAN BAY AREA 2050



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under Plan Bay Area 2050

KEY POINTS:

Future development consistent with Plan Bay Area 2050 includes buildings that are comparable in height to the 2050 environmental baseline and shorter than the future development consistent with the Housing Element Update.

The height and number of additions under the Plan Bay Area 2050 development increases the development density substantially from a wind-impact perspective. The increased density is expected to protect all streets within Area 4 from wind exposure to a large extent and reduce wind speeds along the streets relative to the Housing Element Update and 2050 environmental baseline.

1. The taller buildings on Geary Boulevard will intercept wind approaching over the low surroundings and cause downwashing and corner acceleration flows around their bases.

2. The flows are expected to then channel along Geary Boulevard.

The combination of flow mechanisms resulting from the interaction of the tall buildings with wind is expected to result in increased wind speeds on Geary Boulevard. However, the positive impact of the increased built density is expected to balance the wind impact by reducing the potential for substantial gusts.

No significant wind impacts are expected with the Housing Element Update.

Average wind speeds are expected to be lower than in the development under the 2050 environmental baseline.

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

AREA 4.4 PLAN BAY AREA 2050



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under Eastside Alternative

KEY POINTS:

Future development consistent with Eastside Alternative includes new development at the northeast portion of Area 4 between Lake Street and California Street. The new buildings are of a similar height as the 2019 and 2050 Existing development. Therefore, the new buildings are not expected to alter wind flows in a manner than would create wind speeds that exceed the hazard criterion.

No significant wind impacts are expected.

Average wind speeds are expected to be lower than in the Housing Element Update.

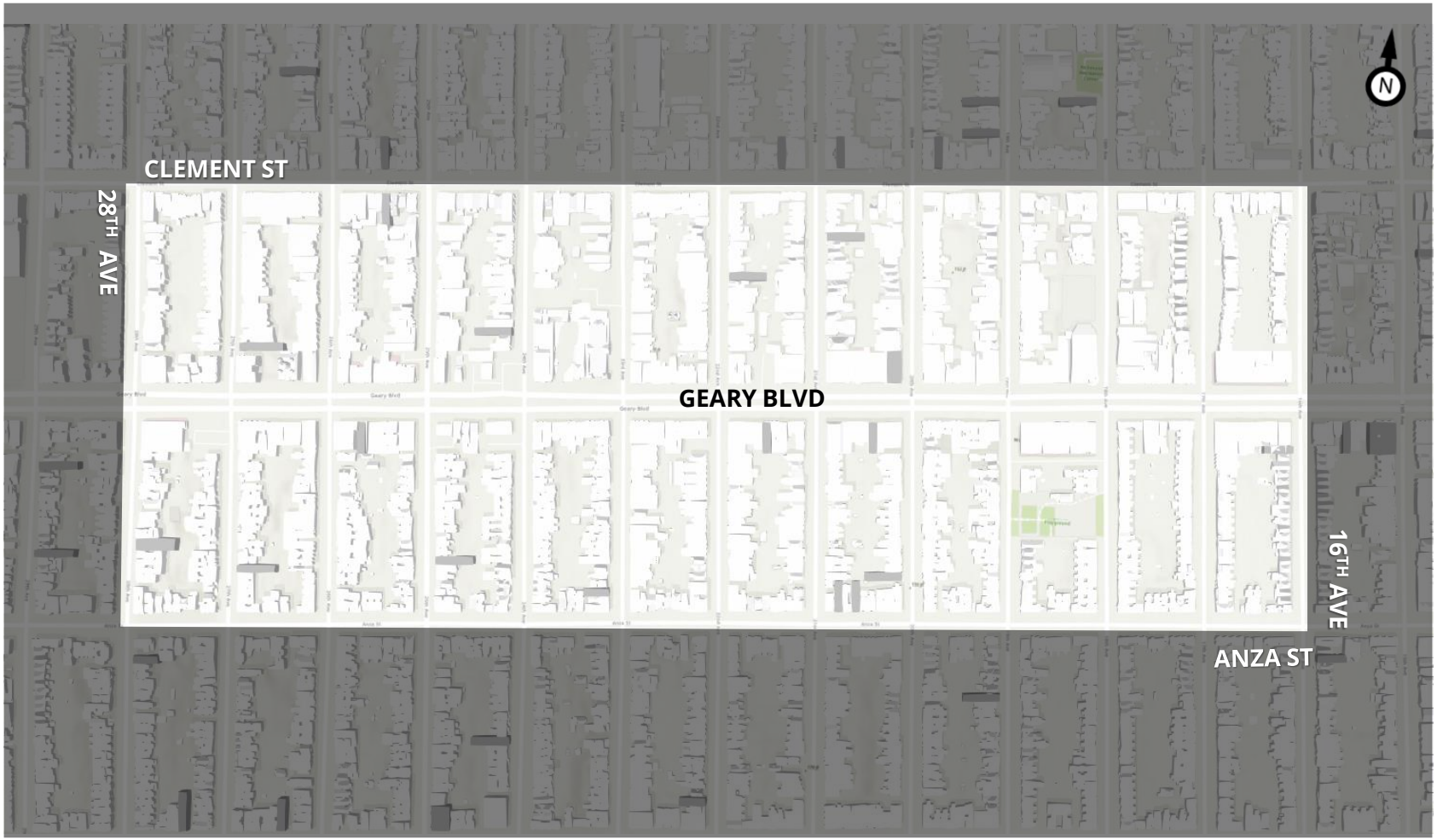
Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

AREA 5

GEARY BOULEVARD BETWEEN 16TH AVENUE TO THE EAST AND 28TH AVENUE TO THE WEST

Geary Boulevard between 16th Avenue and 28th Avenue



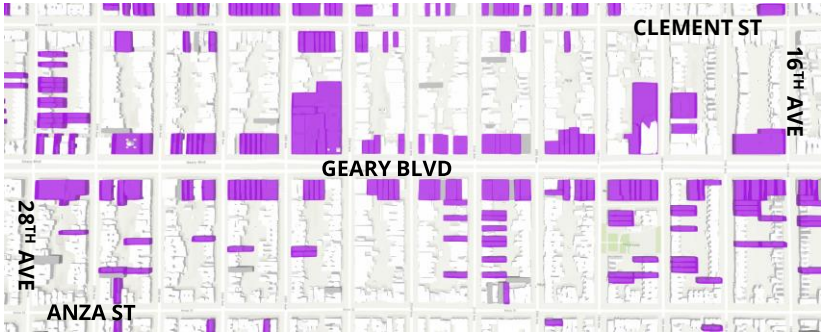
IMAGES ARE NOT TO SCALE

Overview of Additional Development Density

- Existing buildings in 2019
- Pipeline Projects Assumed to be built by 2050
- Additional Development Under 2050 environmental baseline
- Additional Development Assumed Under the Proposed Action
- Additional Development Under Plan Bay Area 2050
- Additional Development Under Eastside Alternative









IMAGES ARE NOT TO SCALE

AREA 5.1 2050 ENVIRONMENTAL BASELINE



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under 2050 environmental baseline

KEY POINTS:

Additional development under the 2050 environmental baseline are comparable in height to those in the 2019 and 2050 Existing development.

1 As such, wind will tend to flow over the fairly uniform terrain and will not be redirected to ground level in a manner than would create strong gusts.

No significant wind impacts are expected in the 2050 environmental baseline expected.*

*This CEQA conclusion is required for the No Project Alternative

AREA 5.2 FUTURE DEVELOPMENT CONSISTENT WITH THE HOUSING ELEMENT UPDATE





Existing buildings in 2019

Additional Development Assumed Under the Proposed Action

Pipeline Projects Assumed to be built by 2050

KEY POINTS:

Future development consistent with the Housing Element Update includes buildings of heights up to thrice the height of the buildings in the 2019 and 2050 Existing development.

1. The shorter buildings will encourage wind to continue flowing over the built area similar to the flow in the 2050 environmental baseline.
2. The massing of the taller buildings extending above the general surroundings will redirect wind and increase wind speeds at ground level relative to the 2050 environmental baseline.

The upwind terrain comprises a dense arrangement of low-rise buildings that will shelter the area to some extent and Soma limit the wind impact that could potentially arise from the flow patterns described above. As such, the increased wind speeds will continue to meet the hazard criterion.

No significant wind impacts are expected with the Housing Element Update.

Average wind speeds are expected to be higher than in the development under the 2050 environmental baseline.

AREA 5.3 AREA 5.4 PLAN BAY AREA 2050 EASTSIDE ALTERNATIVE



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under Plan Bay Area 2050

Additional Development Under Eastside Alternative

5.3 & 5.4 KEY POINTS:

Future development consistent with Plan Bay Area 2050 includes buildings that are comparable in height to the 2050 environmental baseline and shorter than the future development consistent with the Housing Element Update.

The height and number of additions under the Plan Bay Area 2050 development increases the development density substantially from a wind-impact perspective. The increased density is expected to protect Geary Blvd from wind exposure to a large extent and reduce wind speeds along the street.

Future development consistent with Eastside Alternative includes one new building that is of a similar height as the 2019 and 2050 Existing development. The building is not substantially taller or wider than buildings adjacent to it and therefore is not expected to alter wind flows in a manner than would create wind speeds that exceed the hazard criterion.

With both alternatives assuming low-rise buildings comparable to those in the 2019 and 2050 Existing development, and the 2050 environmental baseline, the wind impact is expected to be similar to those scenarios. Wind flow is expected to move over the built terrain without any notable impact on ground level.

No significant impacts expected.

Average wind speeds are expected to be lower under the Plan Bay Area 2050 and Eastside Alternative than those in the Housing Element Update.

IMAGES ARE NOT TO SCALE

AREA 6

IRVING STREET BETWEEN 19TH AVENUE TO THE EAST AND 27TH AVENUE TO THE WEST

Irving Street between 19th Avenue and 27th Avenue



IMAGES ARE NOT TO SCALE

Overview of Additional Development Density

Existing buildings in 2019

Additional Development Under 2050 environmental baseline

Additional Development Under Plan Bay Area 2050

Pipeline Projects Assumed to be built by 2050

Additional Development Assumed Under the Proposed Action

Additional Development Under Eastside Alternative



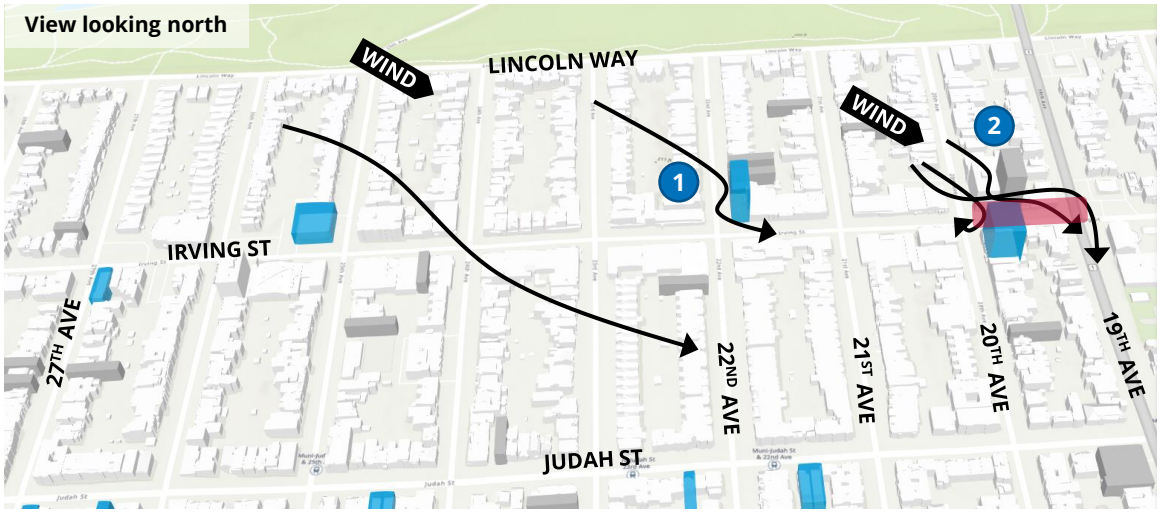






IMAGES ARE NOT TO SCALE

AREA 6.1 2050 ENVIRONMENTAL BASELINE





Existing buildings in 2019

Additional Development Under 2050 environmental baseline

Pipeline Projects Assumed to be built by 2050

Areas where the wind hazard criterion is predicted to be exceeded as a result of the additional development

KEY POINTS:

The area is located south of the Golden Gate Park. Predominant wind approaching the area from the northwest and west would be preconditioned by the dense trees in the park and the dense arrangement of low-rise buildings surrounding the area.

While low buildings would not redirect wind in a manner that would cause substantial gusts, buildings over 10 stories generally have a notable impact in this area.

One of the pipeline projects assumed to be built by 2050 and two additional buildings assumed under the 2050 environmental baseline are over 10 stories tall, and substantially taller than the buildings in the 2019 and 2050 Existing development.

1. Downwashing and corner acceleration flows are predicted at the intersection of Irving Street and 22nd Avenue.
2. A combination of downwashing, corner acceleration and channeling flows is expected around the taller buildings on Irving Street between 19th and 20th Avenues.

The resulting wind speeds in those areas are predicted to exceed the hazard criterion.

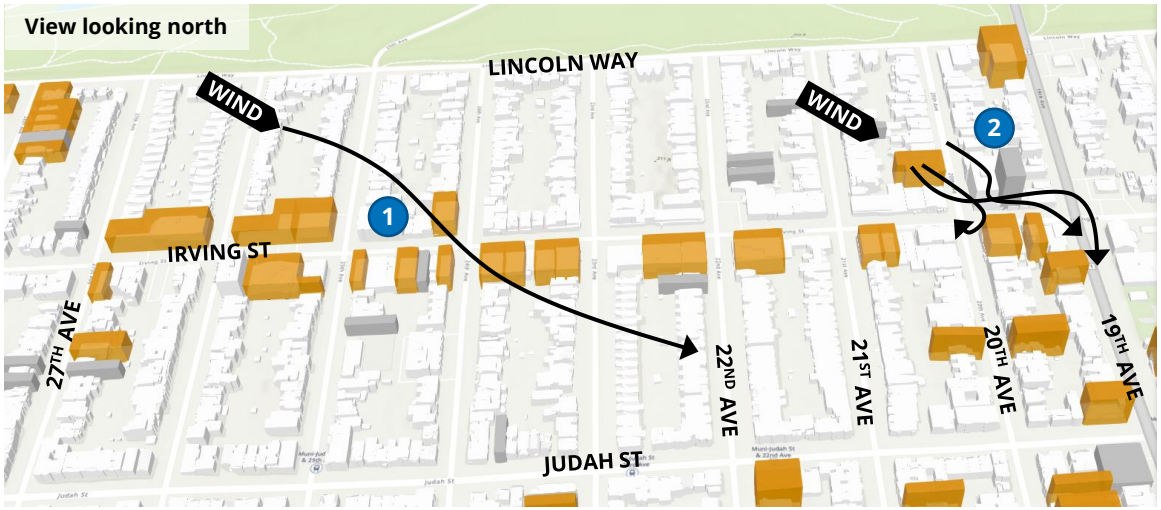
Significant wind impacts are expected on Irving Street between 19th and 20th Avenues and around the intersection at 22nd Avenue.*

*This CEQA conclusion is required for the No Project Alternative

IMAGES ARE NOT TO SCALE

Project #: 2002166
March 21, 2022

AREA 6.2 FUTURE DEVELOPMENT CONSISTENT WITH THE HOUSING ELEMENT UPDATE





Existing buildings in 2019

Additional Development Assumed Under the Proposed Action

Pipeline Projects Assumed to be built by 2050

Areas where the wind hazard criterion is predicted to be exceeded as a result of the additional development

KEY POINTS:

The area is located south of the Golden Gate Park. Predominant wind approaching the area from the northwest and west would be preconditioned by the dense trees in the park and the dense arrangement of low-rise buildings surrounding the area.

1. Most of the new additions on Irving Street would be of moderate height, like the taller buildings in the 2019 and 2050 Existing development. These additions would allow winds to flow over them as they form part of the built terrain.

2. The tallest additions within Area 6 are between 19th and 20th Avenues. One of the pipeline projects assumed to be built by 2050 is substantially taller than the 2019 and 2050 Existing development and would cause significant wind impacts that would be intensified by the future development consistent with the Housing Element Update on Irving Street between 19th and 20th Avenues. This can be attributed to a combination of downwashing, corner acceleration and channeling flows is expected in this area.

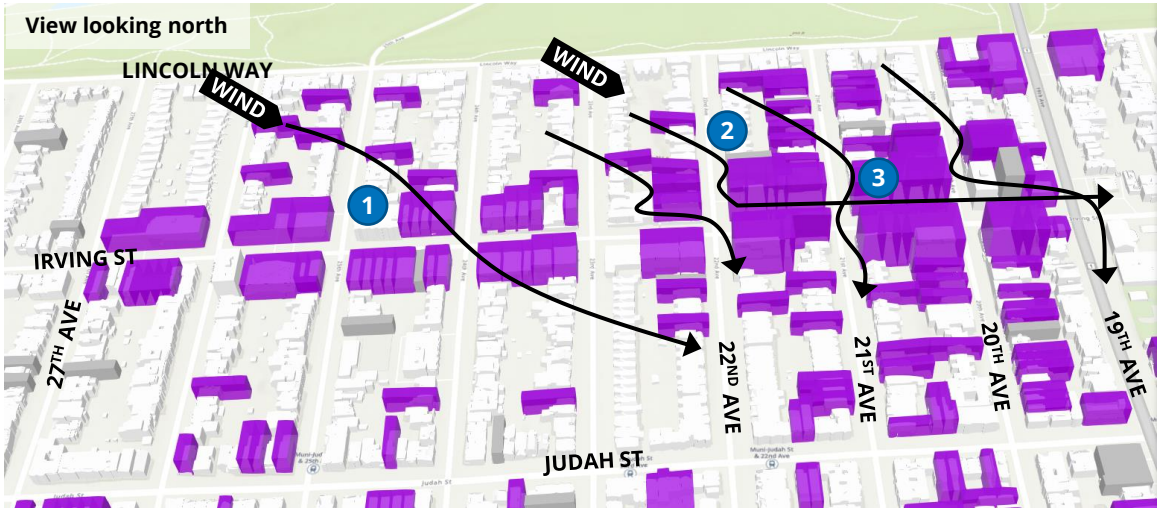
Significant wind impacts are expected on Irving Street between 19th and 20th Avenues and on 19th Avenue south of Irving Street.

Average wind speeds are expected to be higher than in the development under the 2050 environmental baseline.

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

AREA 6.3 PLAN BAY AREA 2050





Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under Plan Bay Area 2050

KEY POINTS:

The area is located south of the Golden Gate Park. Predominant wind approaching the area from the northwest and west would be preconditioned by the dense trees in the park and the dense arrangement of low-rise buildings surrounding the area.

1. Most new additions on Irving Street between 22nd and 27th Avenues would be of moderate height and comparable to the taller buildings in the 2019 and 2050 Existing development. These additions would allow wind to flow over them as they form part of the built terrain.
2. The tallest additions within Area 6 are between 19th and 22nd Avenues; they are of the order of 10 stories or taller. In San Francisco, buildings of this height located among shorter buildings typically create substantial gusts.
3. This can be attributed to a combination of downwashing, corner acceleration and channeling flows through Irving Street and the cross streets in the section.

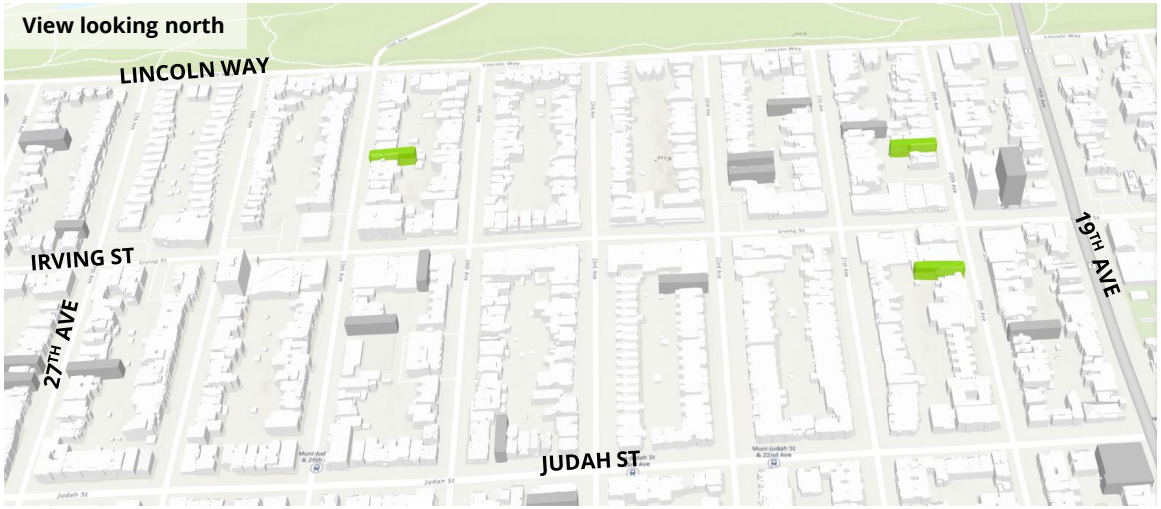
Significant wind impacts are expected on Irving Street between 19th and 22nd Avenues that may extend along 19th, 20th, 21st, and 22nd Avenues close to their intersections at Irving Street.

Average wind speeds are expected to be higher than in the Housing Element Update.

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

AREA 6.4 EASTSIDE ALTERNATIVE



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under Eastside Alternative

KEY POINTS:

Future development consistent with Eastside Alternative includes three new buildings that are of a similar height as the 2019 and 2050 Existing development.

The building is not substantially taller or wider than buildings adjacent to it and therefore is not expected to alter wind flows in a manner than would create wind speeds that exceed the hazard criterion.

No significant impacts expected.

Average wind speeds are expected to be lower than those in the Housing Element Update.

AREA 7

19TH AVENUE BETWEEN ORTEGA STREET TO THE NORTH AND SANTIAGO STREET TO THE SOUTH

19th Avenue between Ortega Street and Santiago Street



IMAGES ARE NOT TO SCALE

AREA 7

Overview of Additional Development Density

Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under 2050 environmental baseline

Additional Development Assumed Under the Proposed Action

Additional Development Under Plan Bay Area 2050

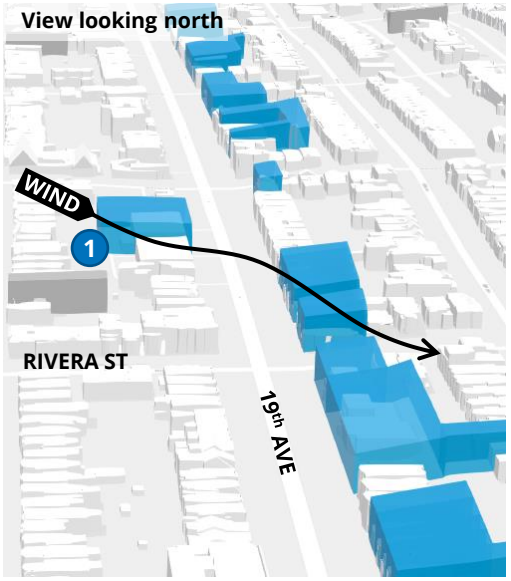
Additional Development Under Eastside Alternative

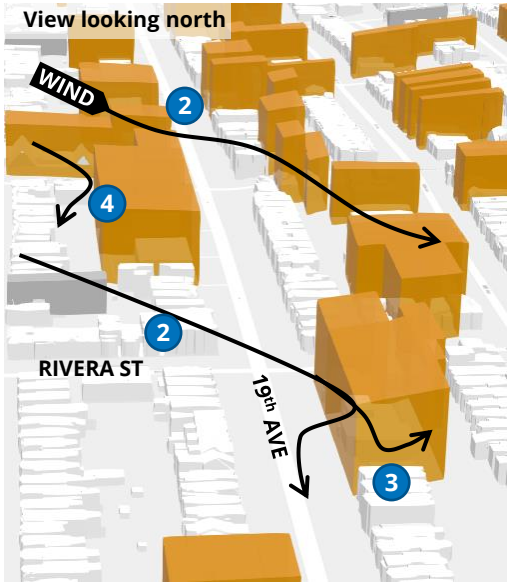


IMAGES ARE NOT TO SCALE

AREA 7.1
AREA 7.2

2050 ENVIRONMENTAL BASELINE FUTURE DEVELOPMENT CONSISTENT WITH THE HOUSING ELEMENT UPDATE





Existing buildings in 2019

Additional Development Under 2050 environmental baseline

Pipeline Projects Assumed to be built by 2050

Additional Development Assumed Under the Proposed Action

7.1 KEY POINTS:

Additional development under the 2050 environmental baseline are comparable in height to those in the 2019 and 2050 Existing development.

1. As such, wind will tend to flow over the fairly uniform terrain and will not be redirected to ground level in a manner than would create strong gusts.

No significant wind impacts are expected in the 2050 environmental baseline expected.*

*This CEQA conclusion is required for the No Project Alternative

7.2 KEY POINTS:

Future development consistent with the Housing Element Update includes buildings of heights up to thrice the height of the buildings in the 2019 and 2050 Existing development.

2. The shorter buildings will encourage wind to continue flowing over the built area similar to the flow in the 2050 environmental baseline. A similar elevated flow may be expected in sections of the street densely lined by taller (new) buildings as well.
3. The massing of the taller buildings extending above the general surroundings will redirect wind and increase wind speeds at ground level relative to the 2050 environmental baseline.
4. Some of the taller buildings on the west side of 19th Avenue will also shelter the street from the predominant westerly winds. Additionally, The upwind terrain that comprises a dense arrangement of low-rise buildings that will precondition wind approaching the area and limit the wind impact that could potentially arise from the flow patterns described above.

As such, the increased wind speeds will continue to meet the hazard criterion.

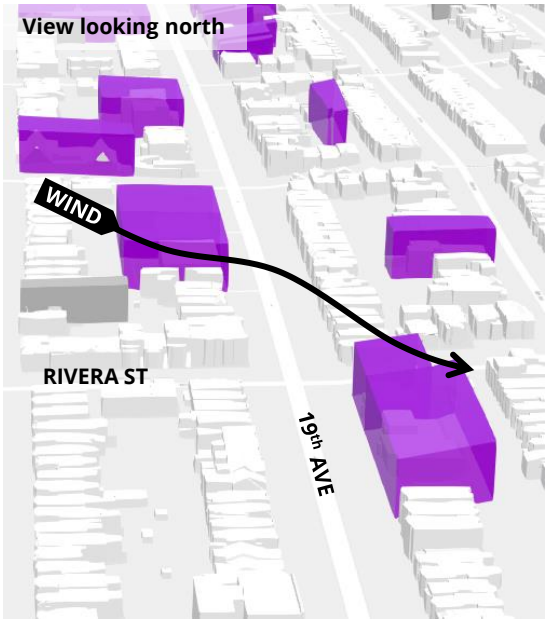
No significant wind impacts are expected with the Housing Element Update.

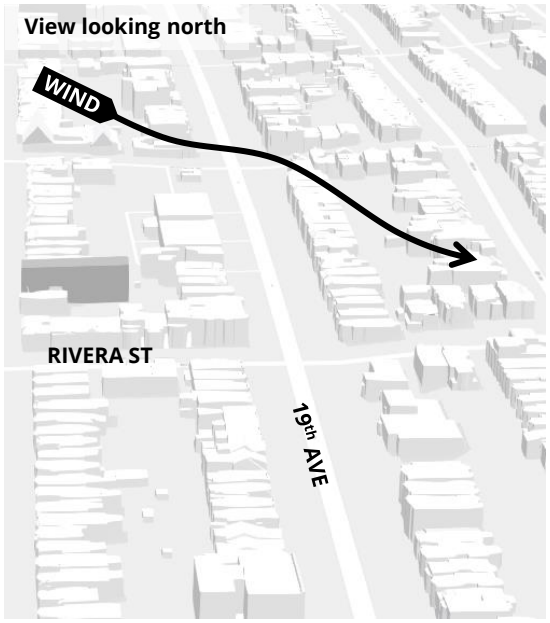
Average wind speeds are expected to be higher than in the development under the 2050 environmental baseline.

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

AREA 7.3 AREA 7.4 PLAN BAY AREA 2050 EASTSIDE ALTERNATIVE





Existing buildings in 2019

Additional Development Under Plan Bay Area 2050

Pipeline Projects Assumed to be built by 2050

Additional Development Under Eastside Alternative

7.3 & 7.4 KEY POINTS:

Future development consistent with Plan Bay Area 2050 include buildings that are comparable in height to the 2050 environmental baseline and shorter than the future development consistent with the Housing Element Update.

Future development consistent with the Eastside Alternative includes no additional development in Area 7.

With both alternatives assuming low-rise buildings comparable to those in the 2019 and 2050 Existing development, and the 2050 environmental baseline, the wind impact is expected to be similar to those scenarios.

No significant impacts expected.

Average wind speeds are expected to be lower than those in the Housing Element Update.

AREA 8

TARAVAL STREET BETWEEN 40TH AVENUE TO THE EAST AND 48TH AVENUE TO THE WEST

Taraval Street between 40th Avenue and 48th Avenue



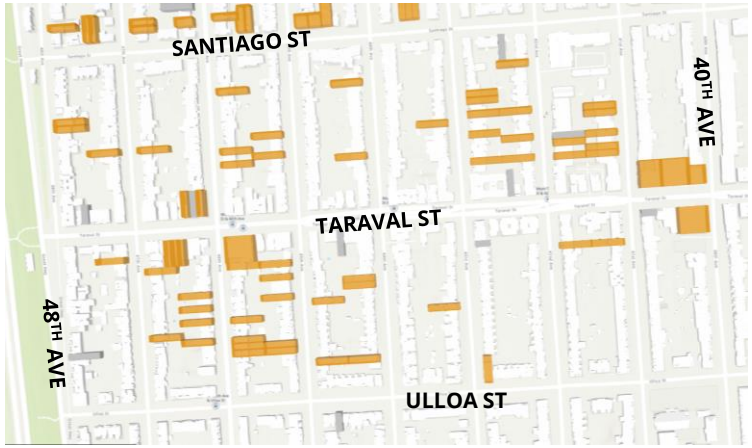
IMAGES ARE NOT TO SCALE

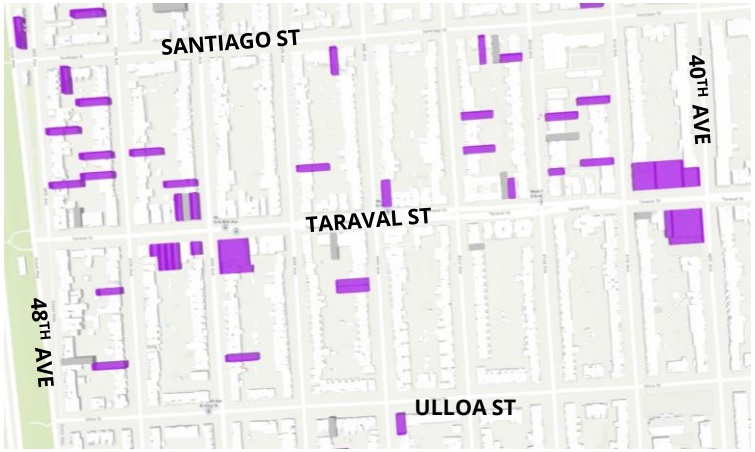
Project #: 2002166
March 21, 2022

Overview of Additional Development Density

- Existing buildings in 2019
- Pipeline Projects Assumed to be built by 2050
- Additional Development Under 2050 environmental baseline
- Additional Development Assumed Under the Proposed Action
- Additional Development Under Plan Bay Area 2050
- Additional Development Under Eastside Alternative



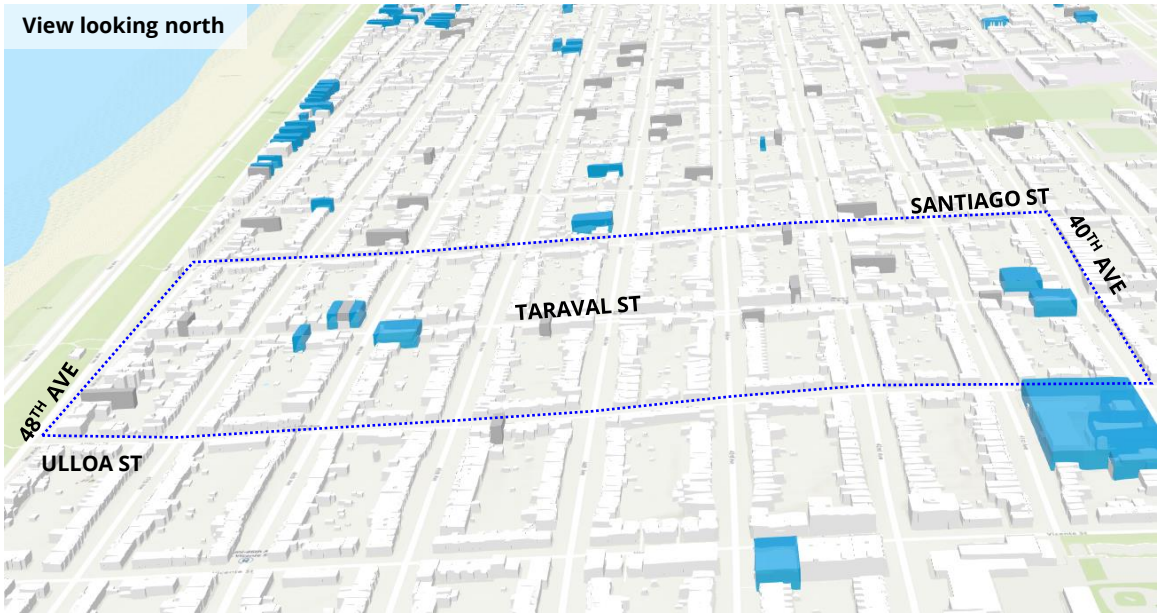


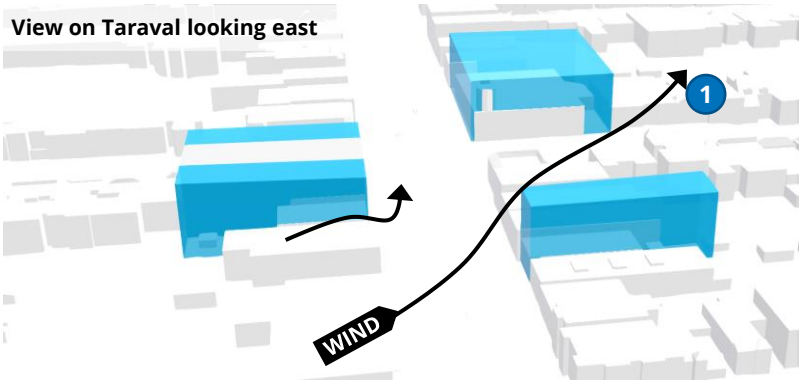




IMAGES ARE NOT TO SCALE

AREA 8.1 2050 ENVIRONMENTAL BASELINE





Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under 2050 environmental baseline

KEY POINTS:

The area is close to the waterfront, hence exposed to predominant westerly winds.

Additional development under the 2050 environmental baseline are comparable in height to those in the 2019 and 2050 Existing development. The height is considered to be low from a wind impact perspective.

1 Wind generally flows over terrains consisting of buildings of similar height – this is expected with flow over the 2050 environmental baseline development.

Additionally, low-rise buildings, as in the 2050 environmental baseline, do not redirect wind significantly to cause severe wind impacts.

Wind speeds will increase locally around the new and taller buildings but not to a level that will exceed the hazard criterion.

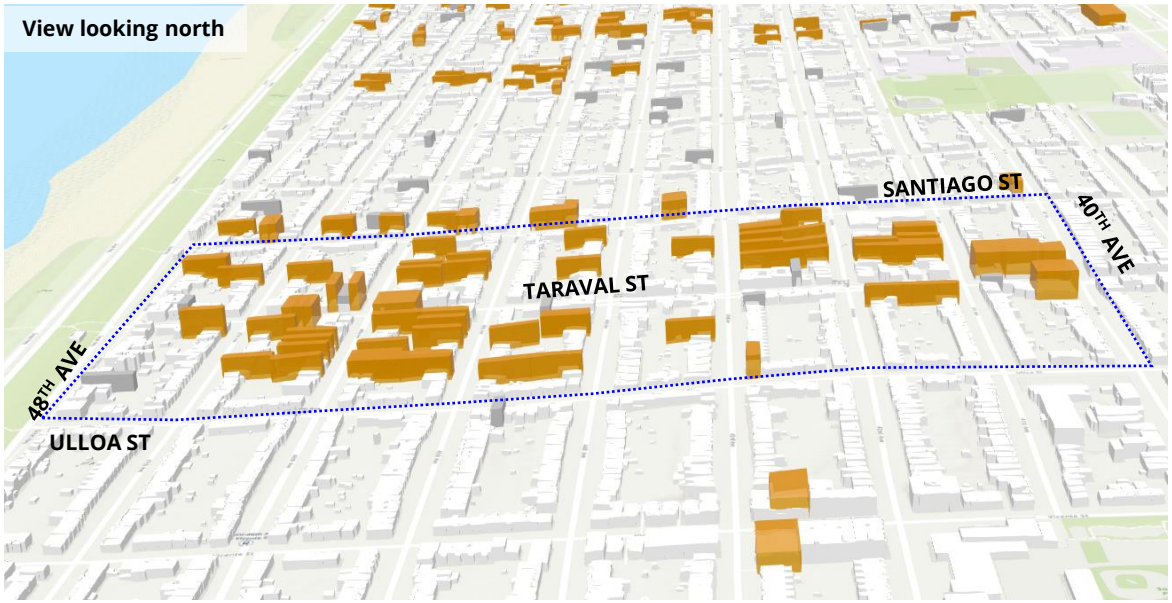
No significant wind impacts expected.*

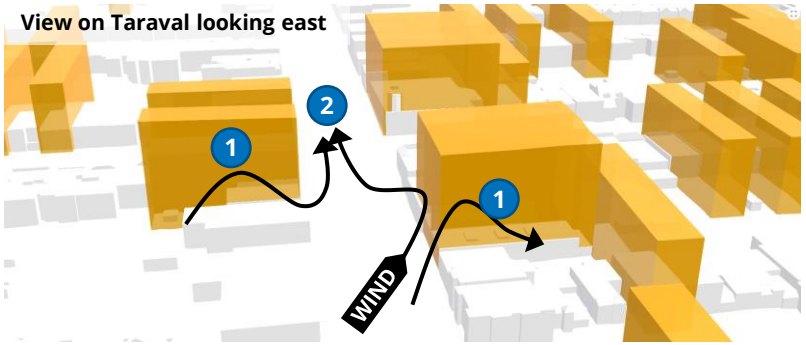
*This CEQA conclusion is required for the No Project Alternative

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

AREA 8.2 FUTURE DEVELOPMENT CONSISTENT WITH THE HOUSING ELEMENT UPDATE





Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Assumed Under the Proposed Action

KEY POINTS:

Future development consistent with the Housing Element Update includes building of about twice to thrice the height of the buildings in the 2019 and 2050 Existing scenarios.

The height is considered to be moderate from a wind impact perspective and the shorter existing buildings reduce the full-height exposure of the new buildings to the predominant winds.

1. Even so, the massing of the new buildings extending above the general surroundings will redirect winds toward ground level.
2. Relative to the 2050 environmental baseline scenario, increased wind speeds are expected around the base of the buildings fronting on Taraval Street.

The increased wind speeds will continue to meet the hazard criterion.

No significant wind impacts expected.

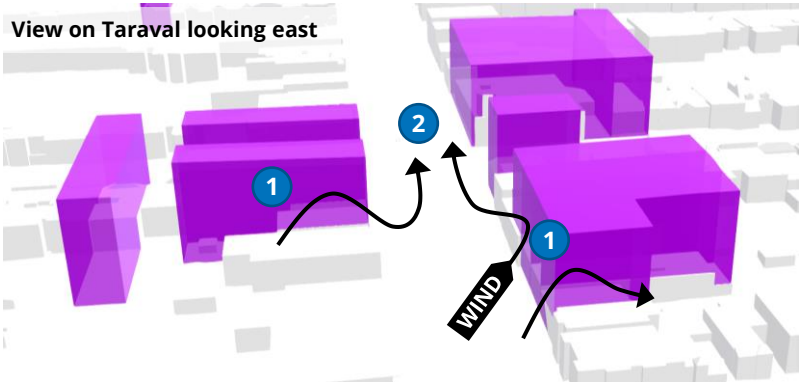
Average wind speeds are expected to be higher than in the development under the 2050 environmental baseline.

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

AREA 8.3 PLAN BAY AREA 2050





Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under Plan Bay Area 2050

KEY POINTS:

Future development consistent with Plan Bay Area 2050 includes building of about twice to thrice the height of the buildings in the 2019 and 2050 Existing scenarios.

The development height and distribution, as it relates to wind impacts are comparable to that in the Housing Element Update.

The height is considered to be moderate from a wind impact perspective and the shorter existing buildings reduce the full-height exposure of the new buildings to the predominant winds.

1. Even so, the massing of the new buildings extending above the general surroundings will redirect winds toward ground level.
2. Relative to the 2050 environmental baseline scenario, increased wind speeds are expected around the base of the buildings fronting on Taraval Street.

The increased wind speeds will meet the hazard criterion.

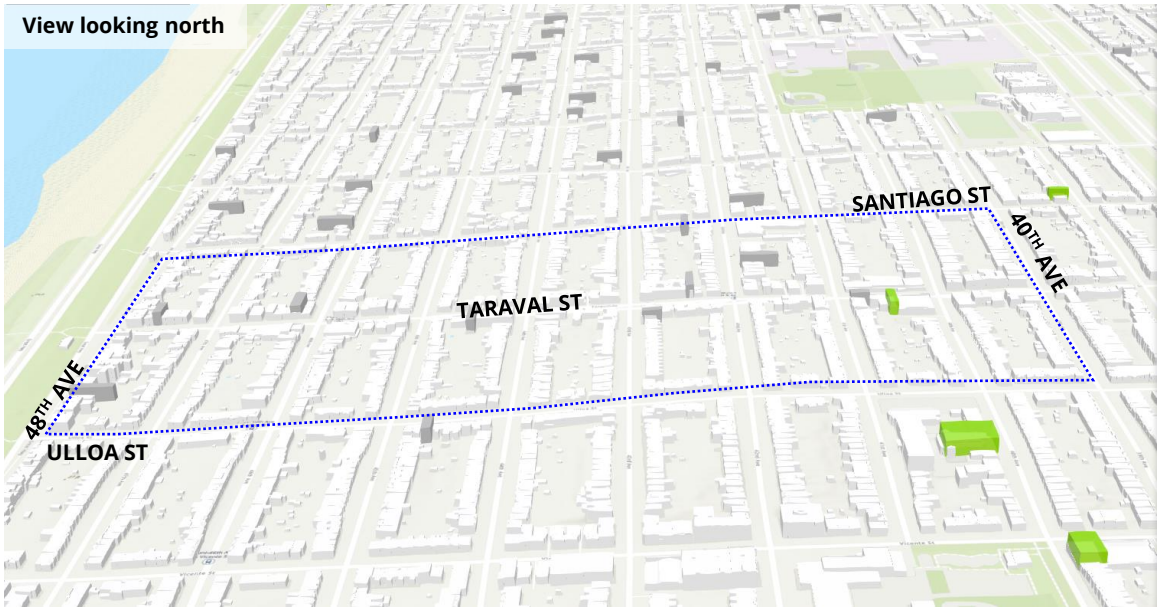
No significant impacts expected.

Average wind speeds are expected to be similar to those expected in the Housing Element Update.

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

AREA 8.4 EASTSIDE ALTERNATIVE



Existing buildings in 2019

Pipeline Projects Assumed to be built by 2050

Additional Development Under Eastside Alternative

KEY POINTS:

Future development consistent with Eastside Alternative includes one additional building at the east end of Taraval Street in the selected Area 8.

The building is not substantially taller or wider than buildings adjacent to it and therefore is not expected to alter wind flows in a manner than would create wind speeds that exceed the hazard criterion.

No significant impacts expected.

Average wind speeds are expected to be lower than those in the Housing Element Update.

Project #: 2002166
March 21, 2022

IMAGES ARE NOT TO SCALE

SIGNIFICANT IMPACTS

KEY AREAS	2050 ENV. BASELINE	HOUSING ELEMENT UPDATE	PLAN BAY AREA 2050	EASTSIDE ALTERNATIVE
AREA 1	NO	NO	NO	NO
AREA 2	YES	YES	YES	YES
AREA 3	NO	YES	YES	YES
AREA 4	NO	NO	NO	NO
AREA 5	NO	NO	NO	NO
AREA 6	YES	YES	YES	NO
AREA 7	NO	NO	NO	NO
AREA 8	NO	NO	NO	NO

The darker the shade of orange, the greater the average wind speeds expected as evaluated under the San Francisco Hazard Criterion. The higher the speeds, the more difficult it is typically to manage or mitigate the significant wind impact. However, a comprehensive evaluation would also involve weighing the contributions from not only building height and exposure, but also the grouping of tall buildings of similar height, the positions of each massing relative to the shape and massing in other scenarios etc. Details to this effect will be elaborated in the EIR through RWDI's collaboration with ICF.

APPENDIX K

Shadow Supporting Information

If you require assistance to access all the features of this PDF, please contact Elizabeth White at 628.652.7557 or *CPC.HousingElementUpdateEIR@sfgov.org*.

CONTENTS

Appendix K.1: Shadow Site Selection Methodology

Appendix K.2: Shadow Heat Maps

APPENDIX K.1. SHADOW SITE SELECTION METHODOLOGY

Shadow Site Selection Methodology

The heatmaps for each of the thirty individual open spaces included within this appendix were generated using projected geographical distributions for the new housing units that would be 1) developed consistent with current zoning under the 2050 environmental baseline or 2) developed under the housing element update with parcel boundaries extruded to their full allowable zoning heights (plus parapet allowances) to generate building massing volumes representative of the conceptual patterns of growth under both the 2050 environmental baseline and future development consistent with the housing element update. To understand the potential overall shadow impacts of future development consistent with the housing element update compared to the 2050 environmental baseline, an assessment of the maximum possible reach of shadows cast between one hour after sunrise and one hour before sunset year-round generated by developments under both the 2050 environmental baseline and the proposed action was prepared within this appendix. This appendix includes detailed heatmaps of each of the thirty individually selected open spaces, which indicate the range of shadow impacts that could occur across the city with implementation of the housing element update. The heat maps provide an overview of the shadow that would result from likely development consistent with the housing element update on the selected parks and open spaces during representative times of the year, as follows: December 21, the winter solstice, when the midday sun is lowest and shadows are longest; June 21, the summer solstice, when the midday sun is highest and shadows are lowest; and March 21 and September 21, the spring and fall equinoxes, when the sun angle and shadows are midway between the solstices.[1]

As indicated above, thirty sites were selected for more detailed discussion and analysis in the EIR. These open spaces were selected through a review of the city-wide shadow extents maps which identified parks, schoolyards, or other open spaces would be potentially affected[2] by shadow under the 2050 environmental baseline, development consistent with the housing element update, and/or the plan bay area 2050 land use concept. From this list of potentially affected parks, schoolyards, or other open spaces, thirty sites were selected because they are located in areas where greater variance in development patterns between land use concepts is predicted and to represent a wide geographic distribution to best illustrate representative shadow impacts across public open spaces city-wide.

[1] For purposes of this shadow analysis, the spring and fall equinoxes are considered equivalent and are both represented by a single set of graphics.

[2] These extents maps depict the maximum theoretical areas of new shadow effects without taking into account shadow cast by existing buildings.

APPENDIX K.2. SHADOW HEAT MAPS

1 | LAFAYETTE PARK

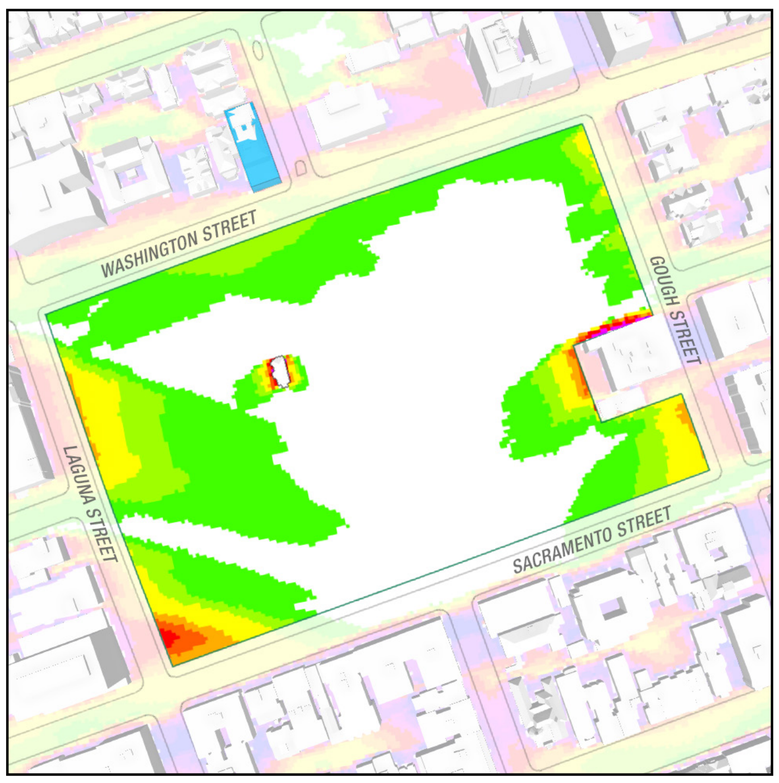
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

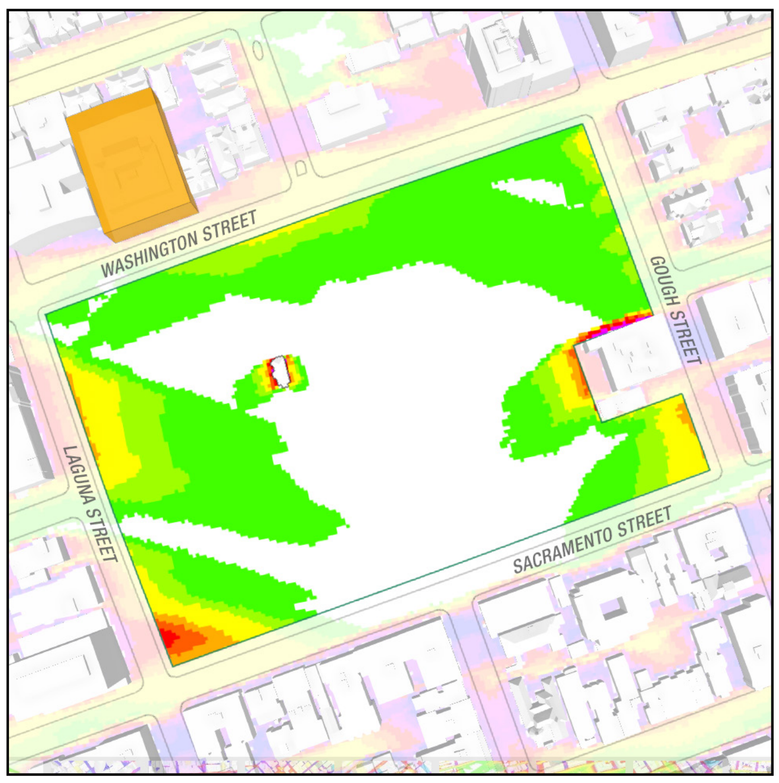
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

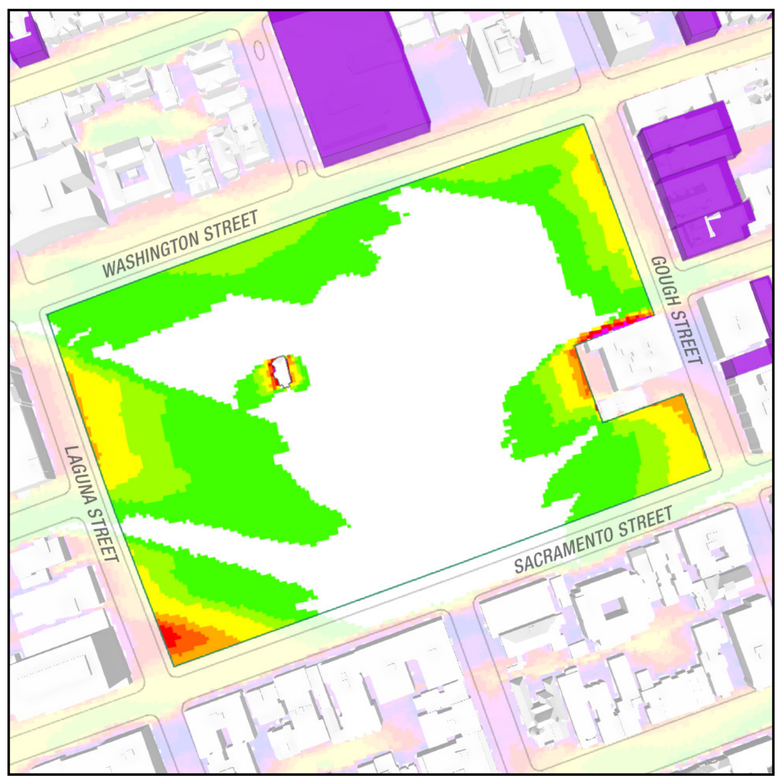
2050 ENVIRONMENTAL BASELINE



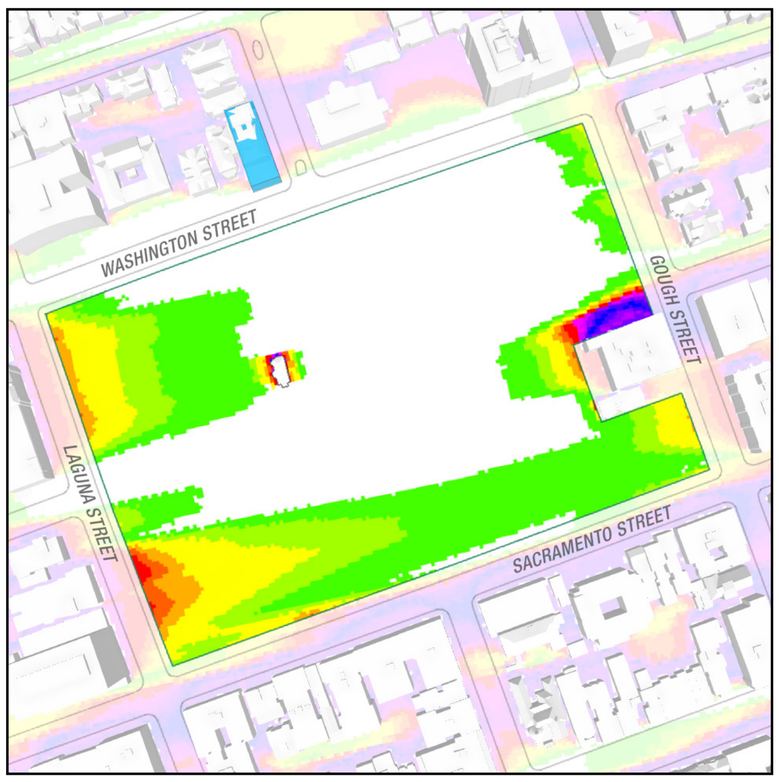
PROPOSED ACTION

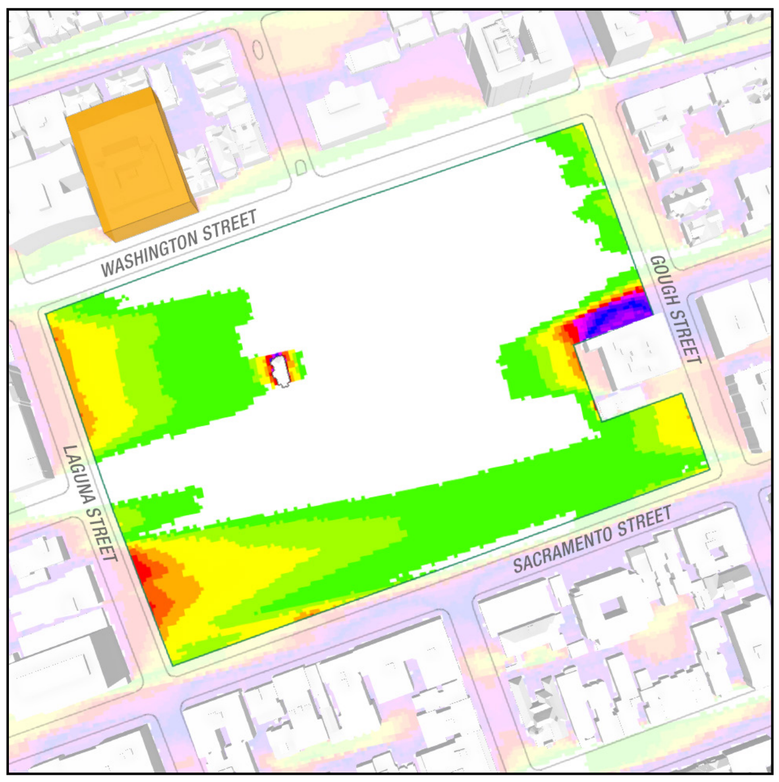


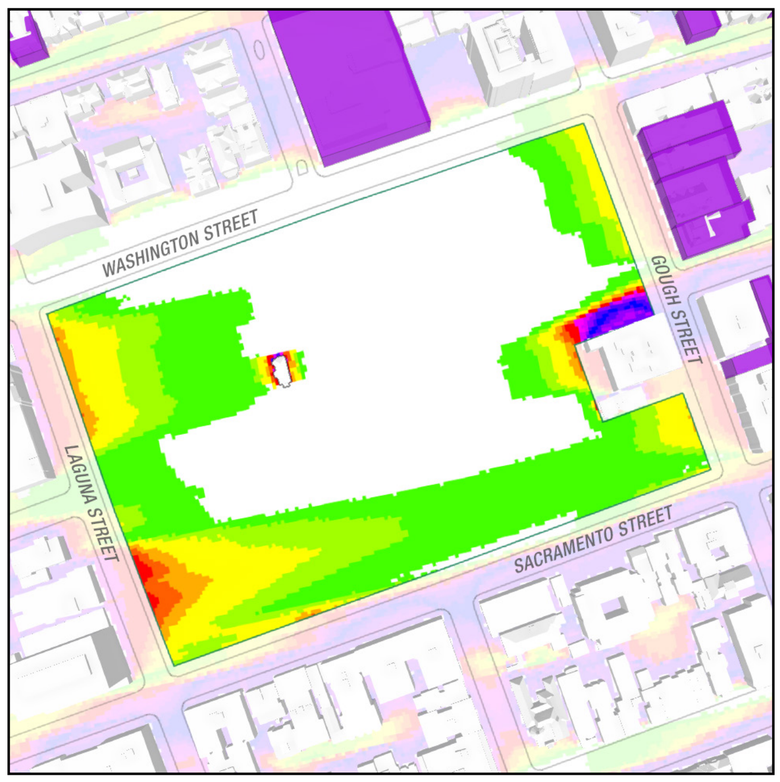
PLAN BAY AREA 2050



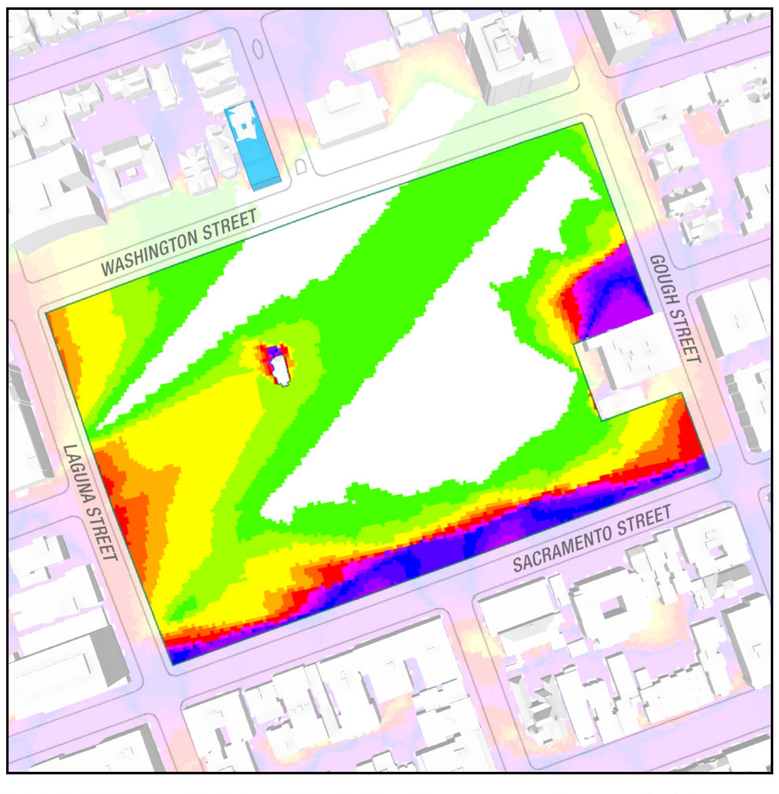
SUMMER SOLSTICE (June 21)

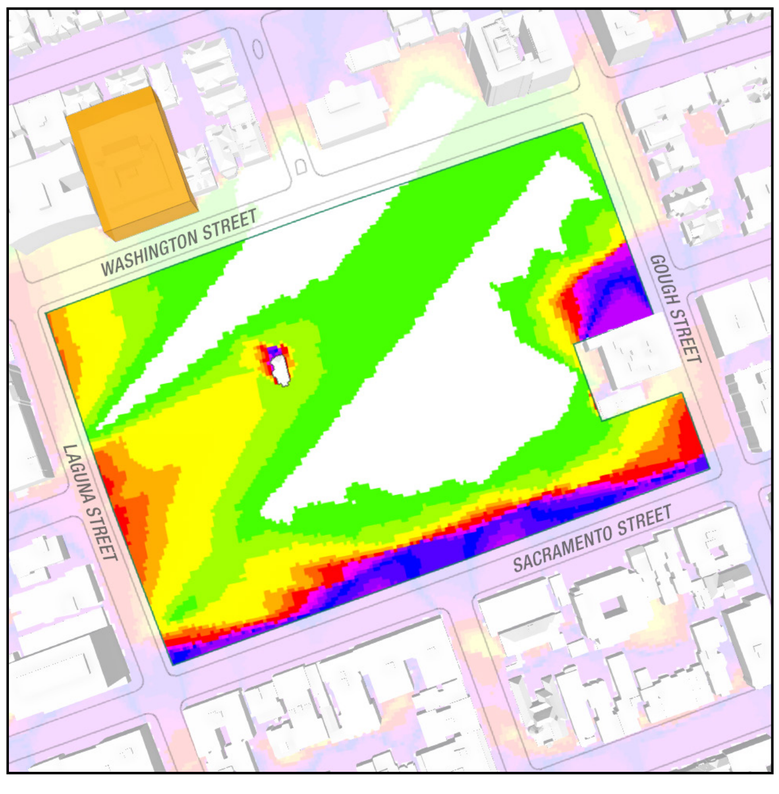


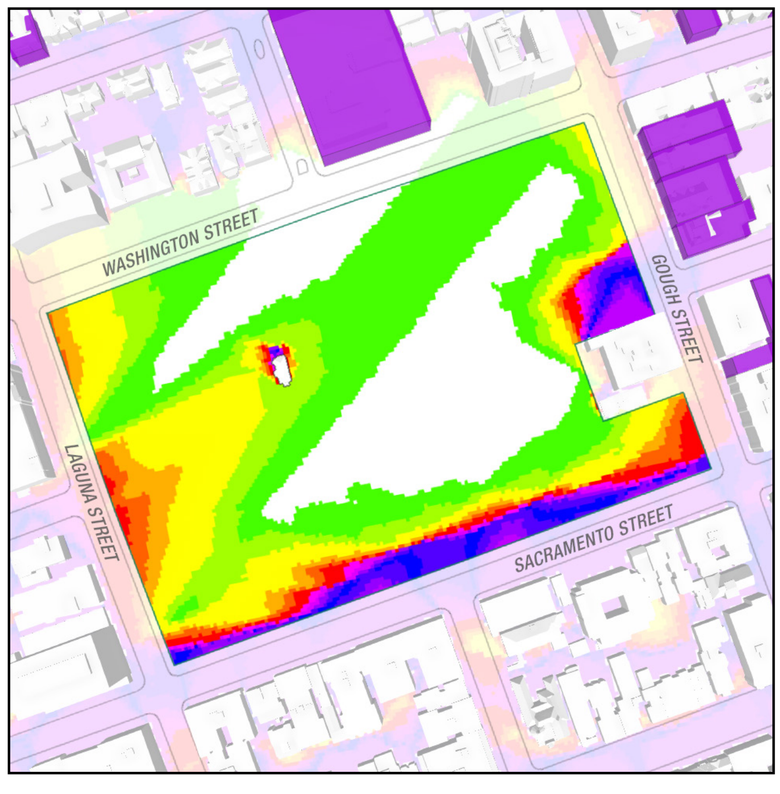




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

2 | HELEN WILLS PARK

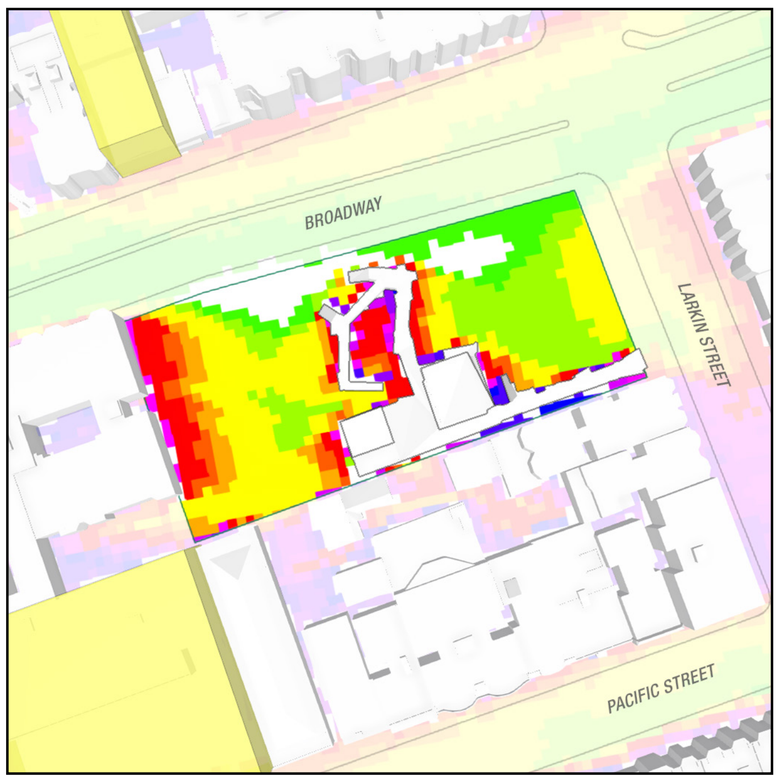
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

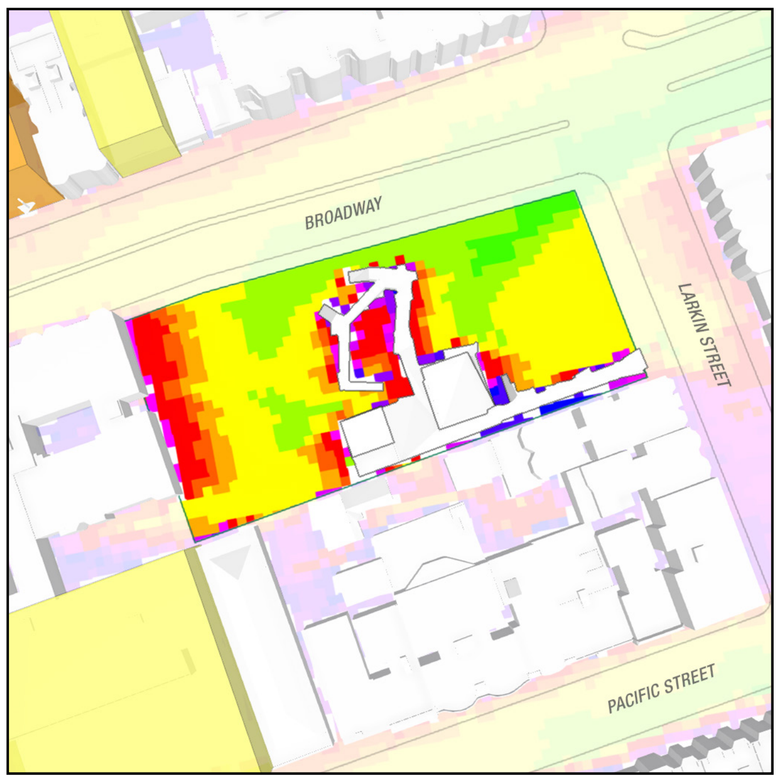
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

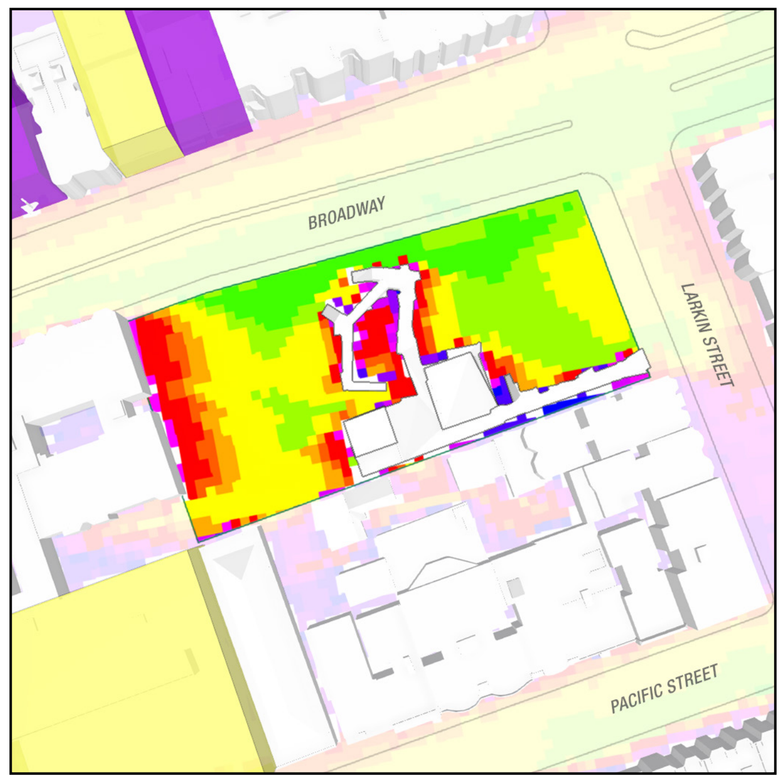
2050 ENVIRONMENTAL BASELINE



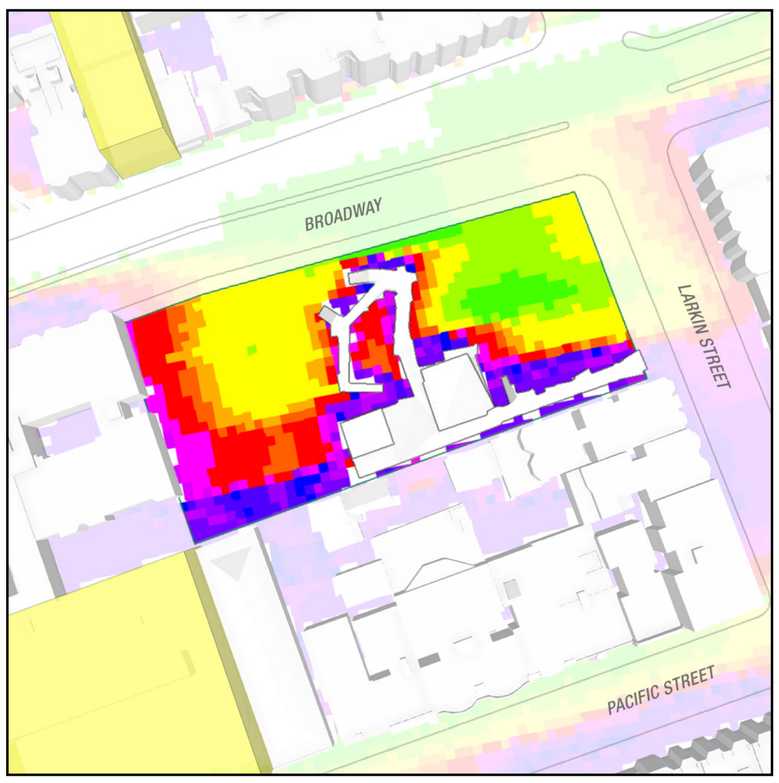
PROPOSED ACTION

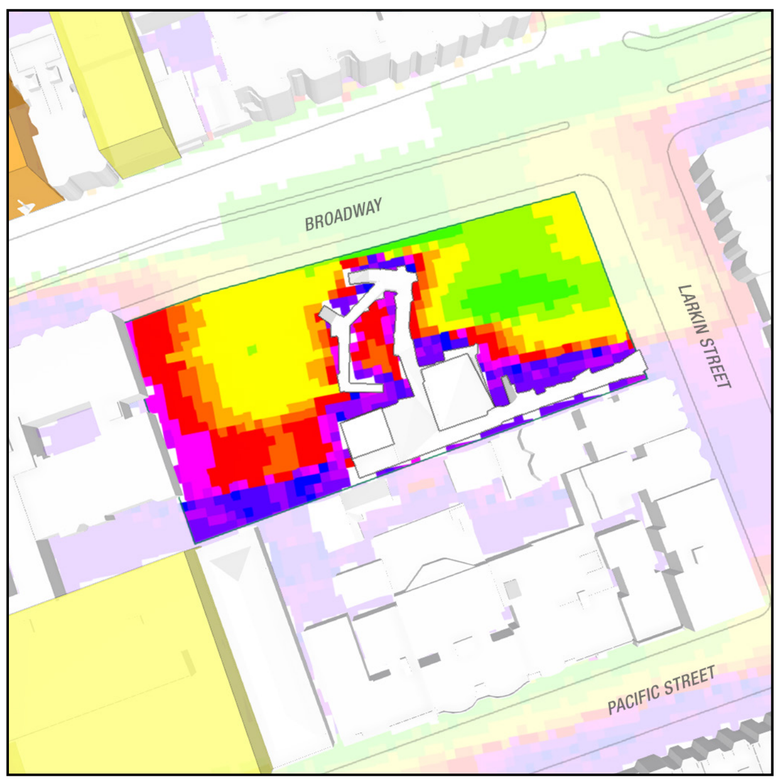


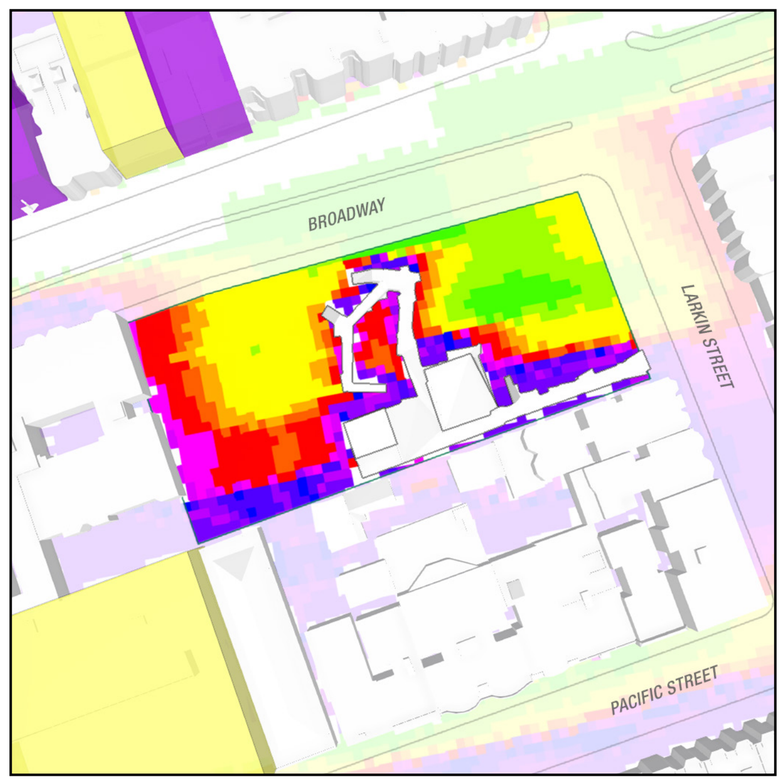
PLAN BAY AREA 2050



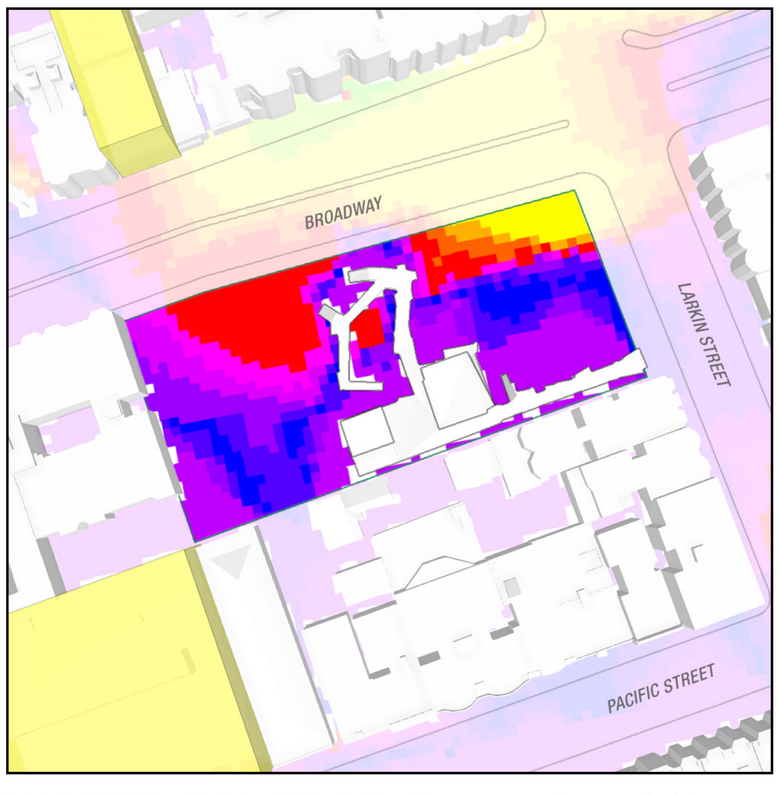
SUMMER SOLSTICE (June 21)

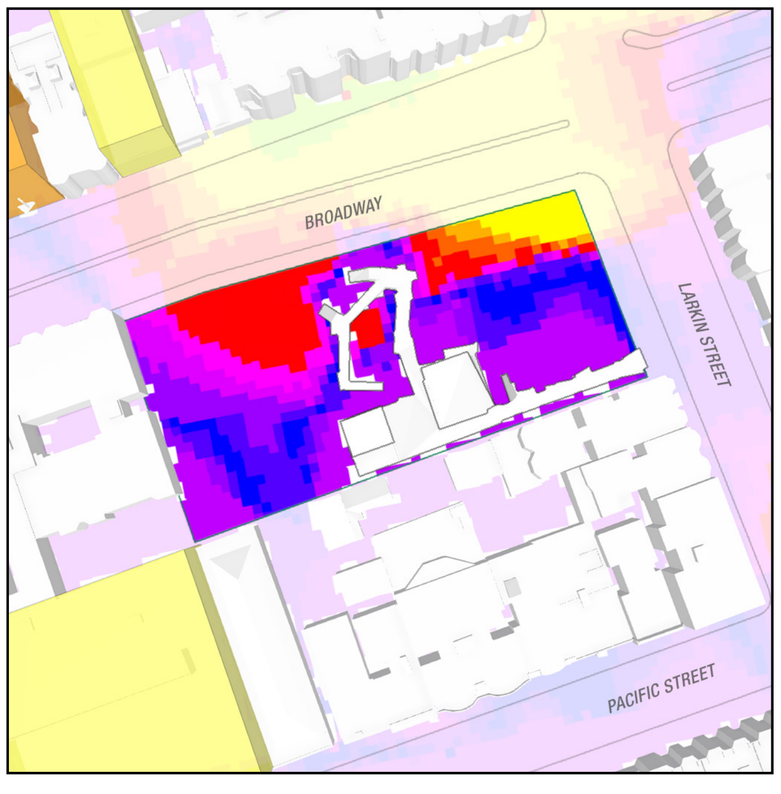


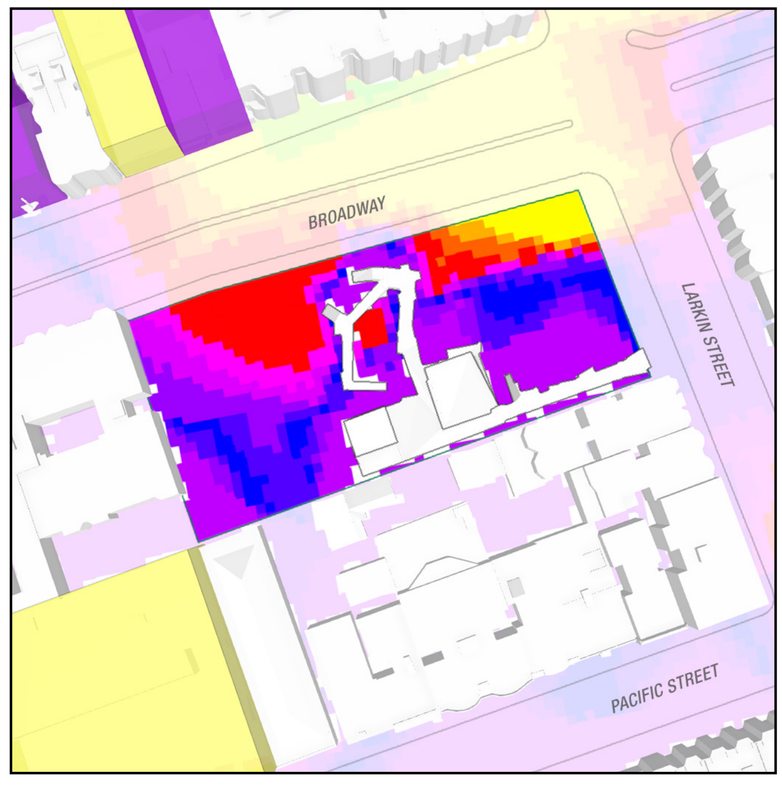




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

3 | PORTSMOUTH SQUARE

DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

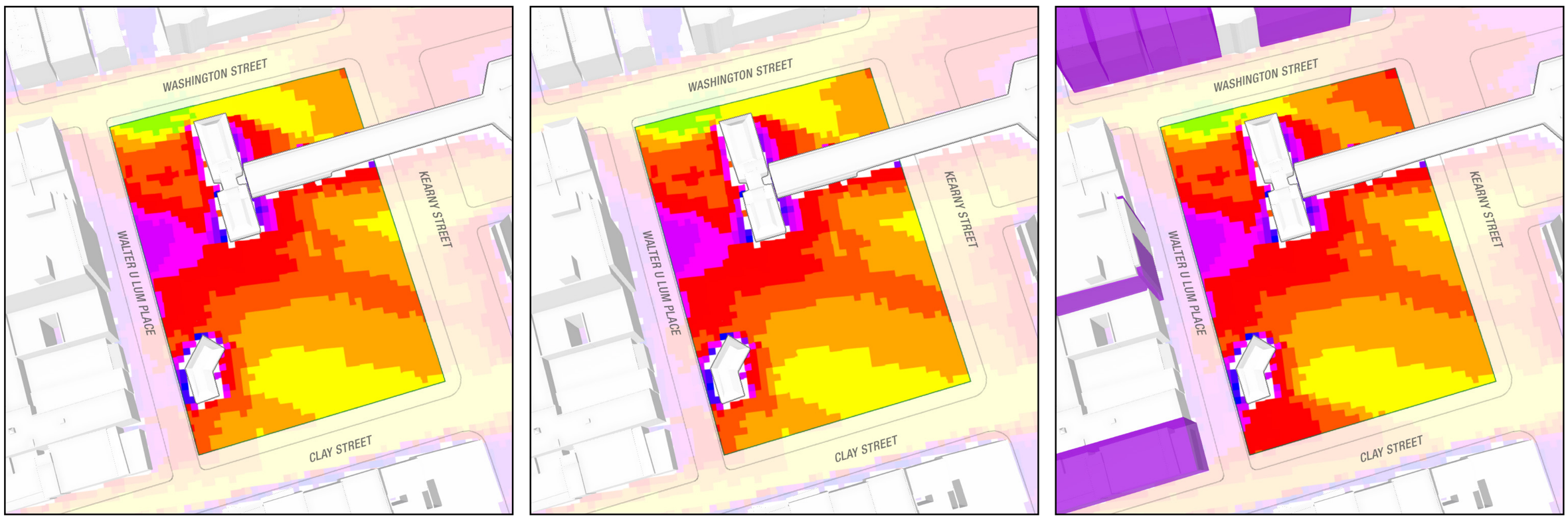
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

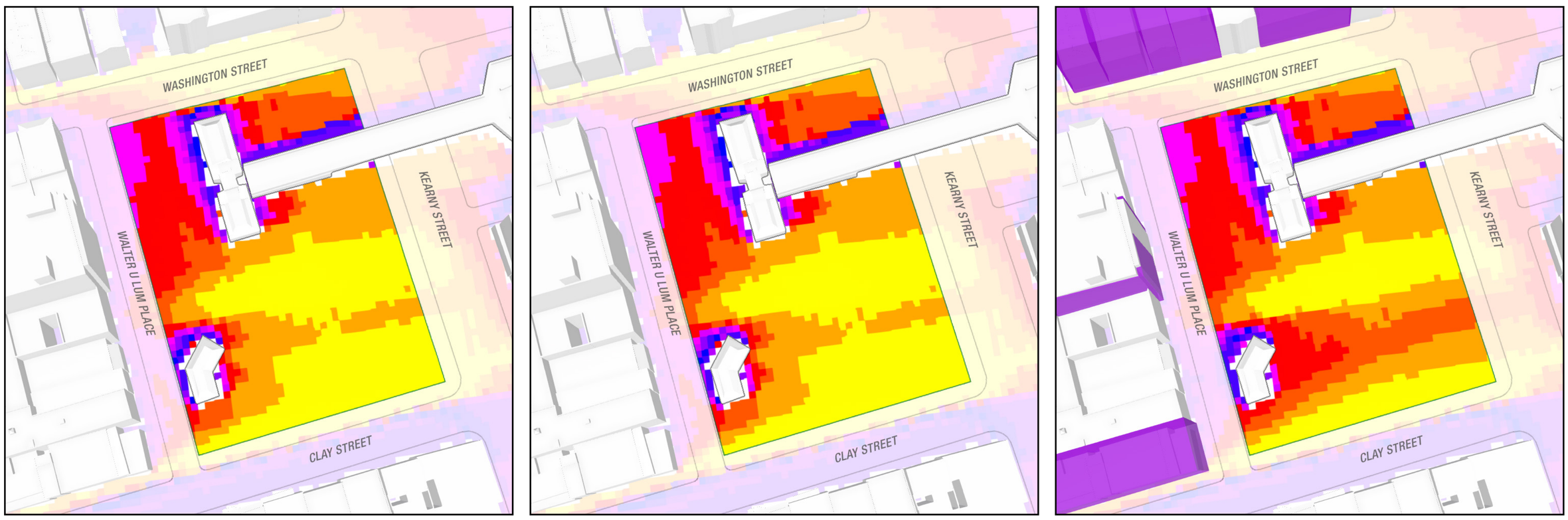
2050 ENVIRONMENTAL BASELINE

PROPOSED ACTION

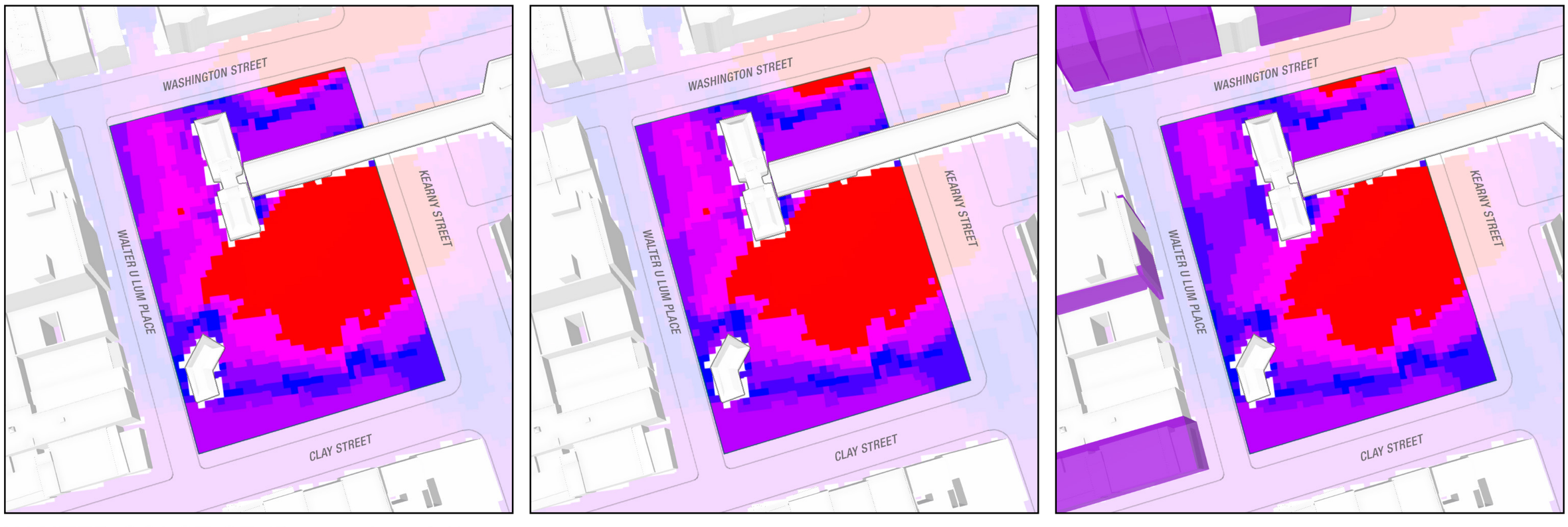
PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)



SPRING & FALL EQUINOXES (March 21 & September 21)



WINTER SOLSTICE (December 21)

4 | RINCON PARK/BAY TRAIL

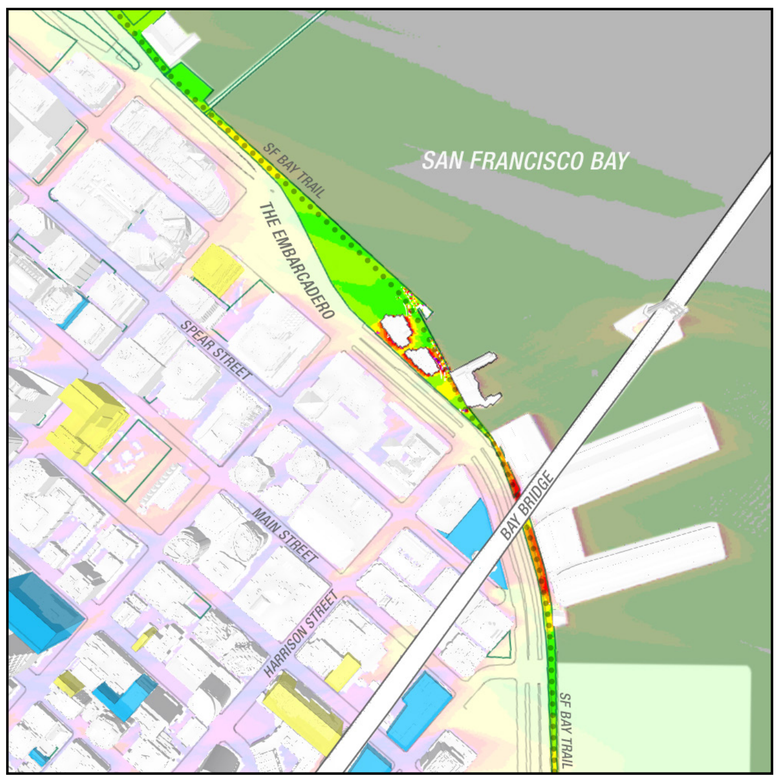
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

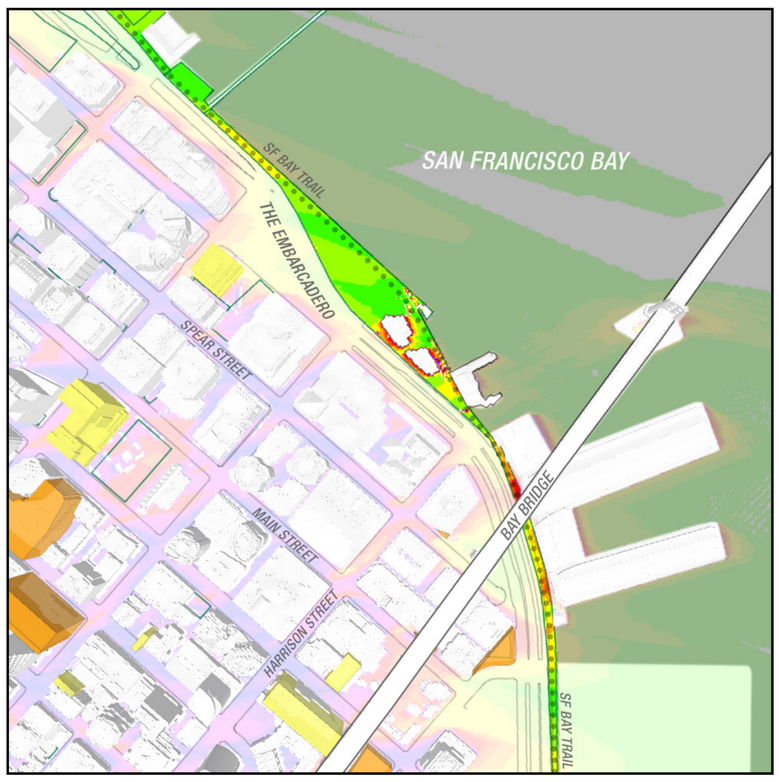
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

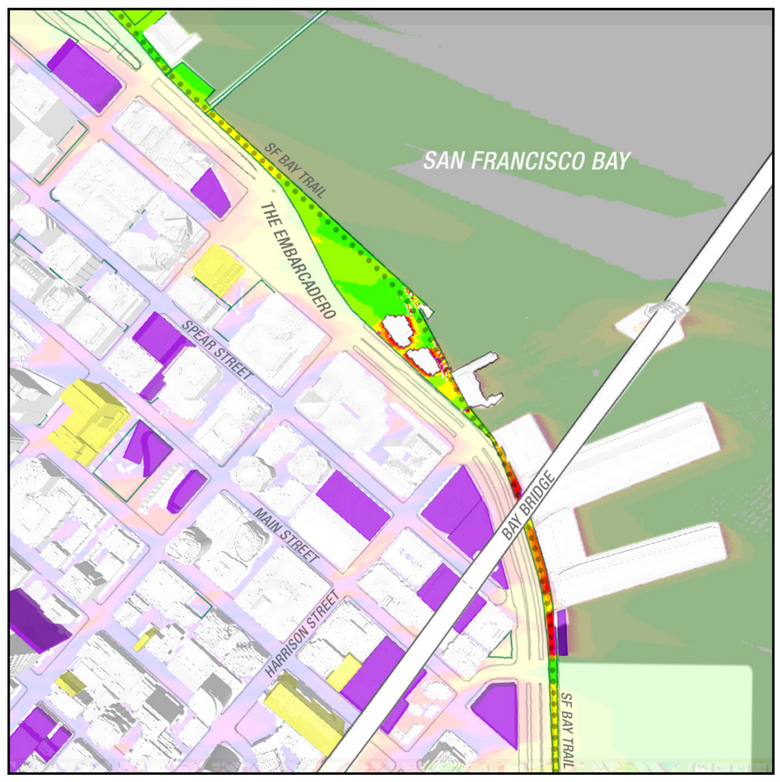
2050 ENVIRONMENTAL BASELINE



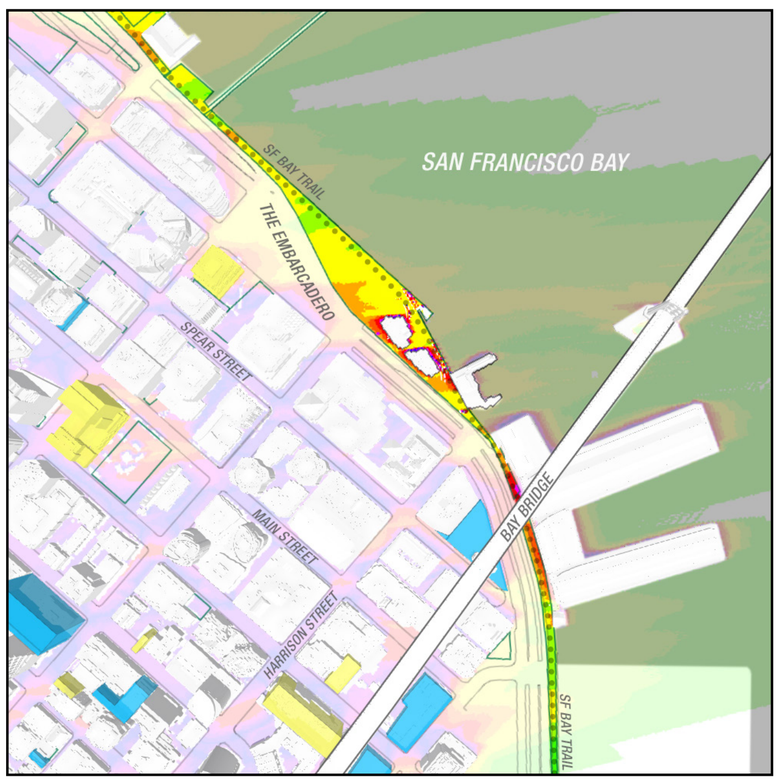
PROPOSED ACTION

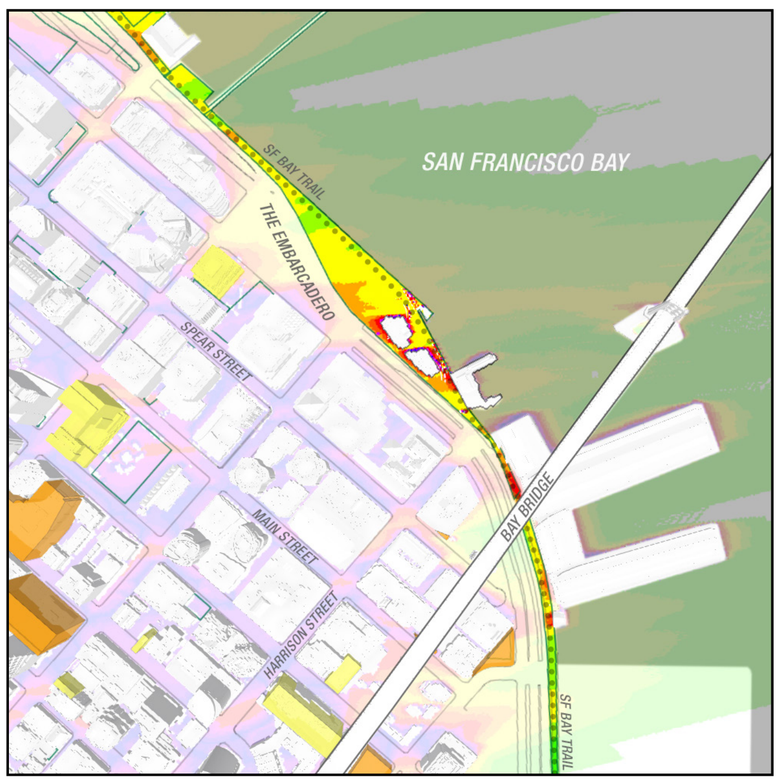


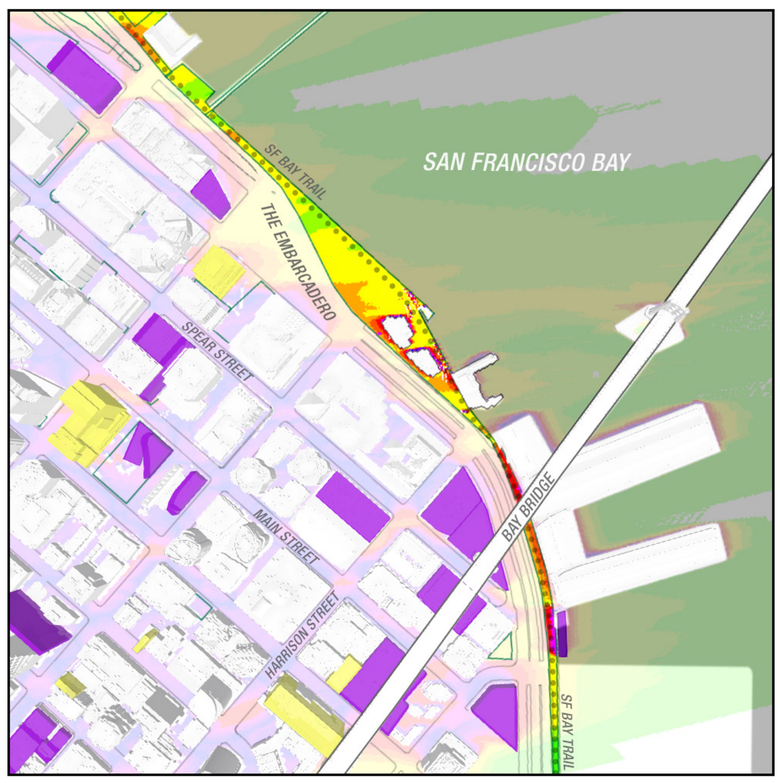
PLAN BAY AREA 2050



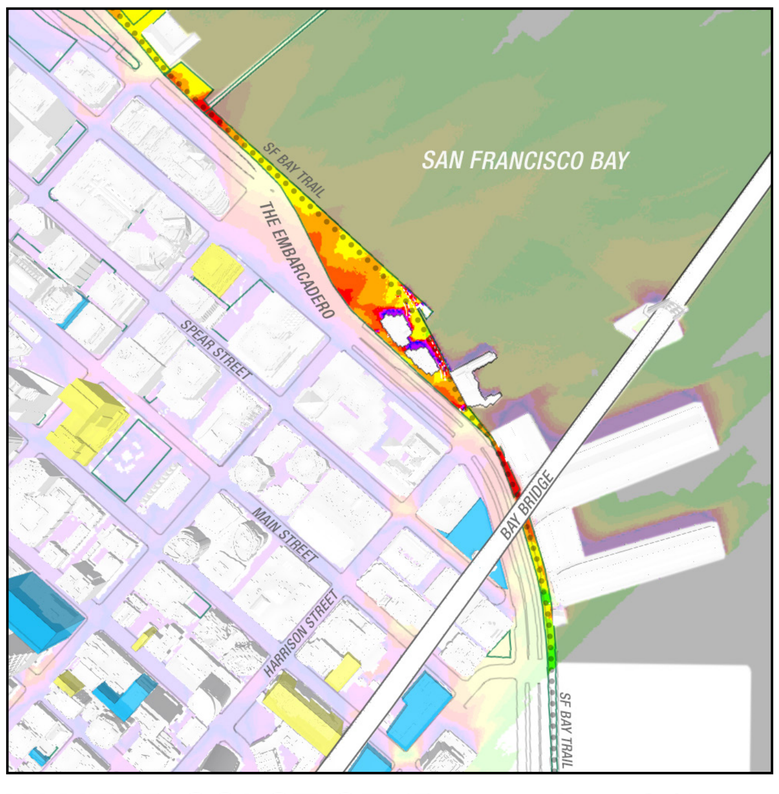
SUMMER SOLSTICE (June 21)

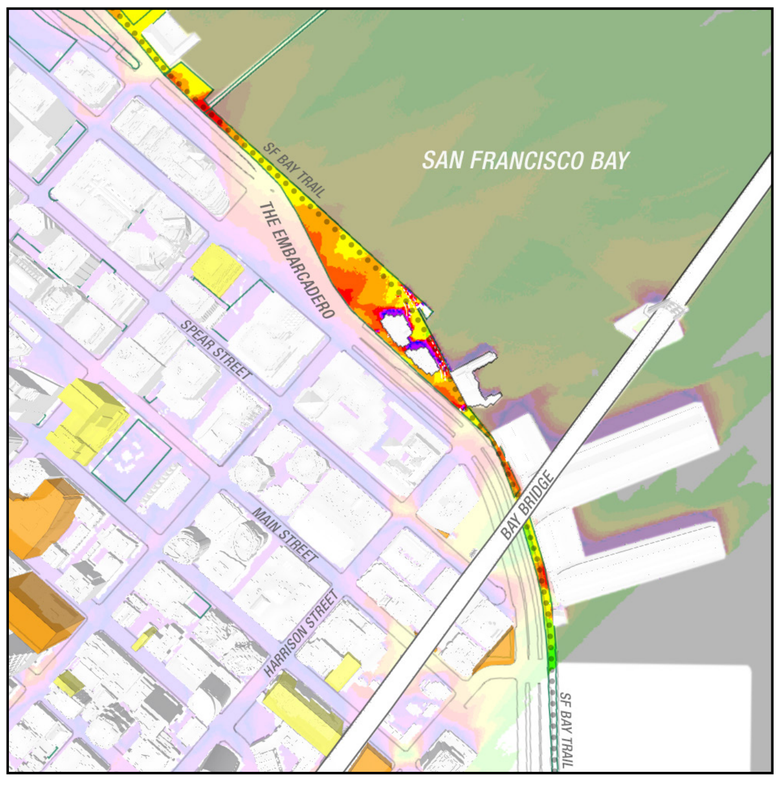






SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

5 | SALESFORCE PARK

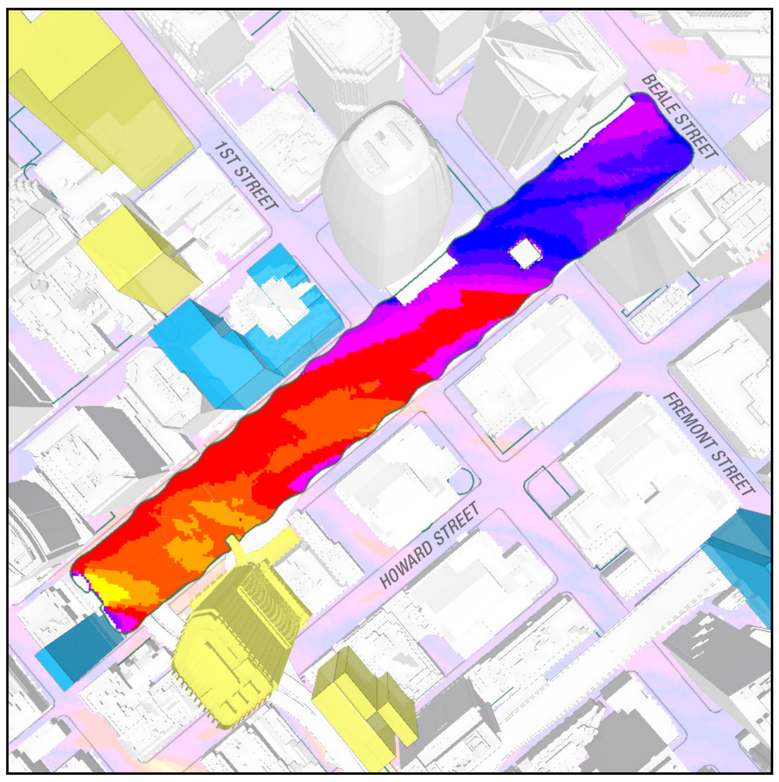
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

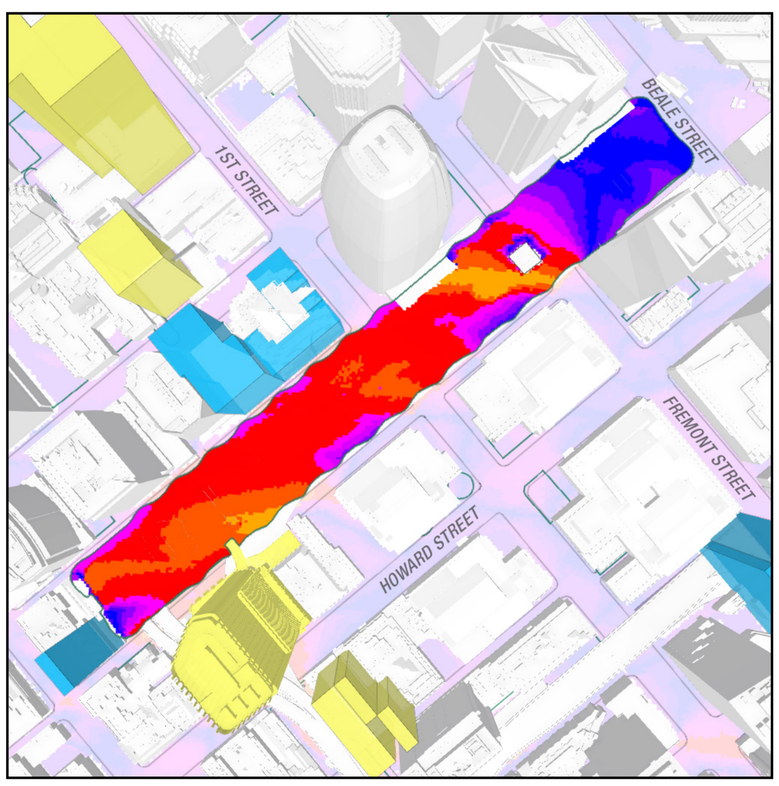
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

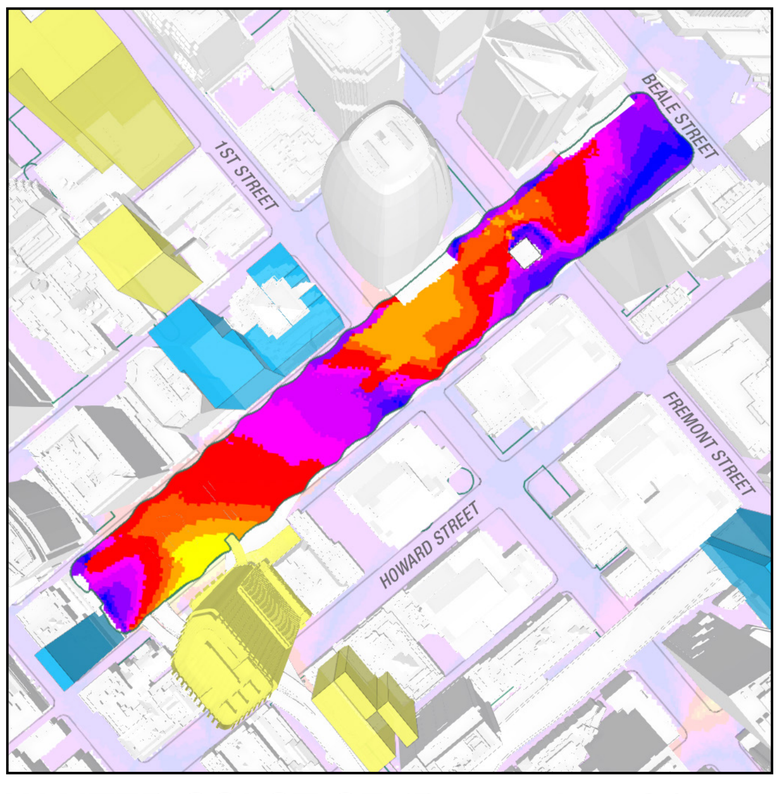
2050 ENVIRONMENTAL BASELINE



SUMMER SOLSTICE (June 21)

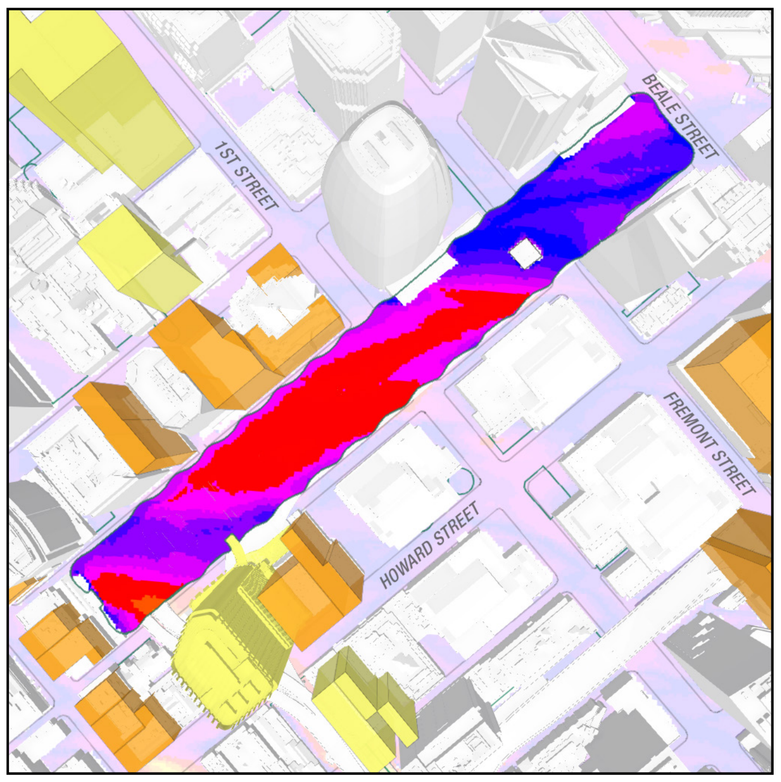


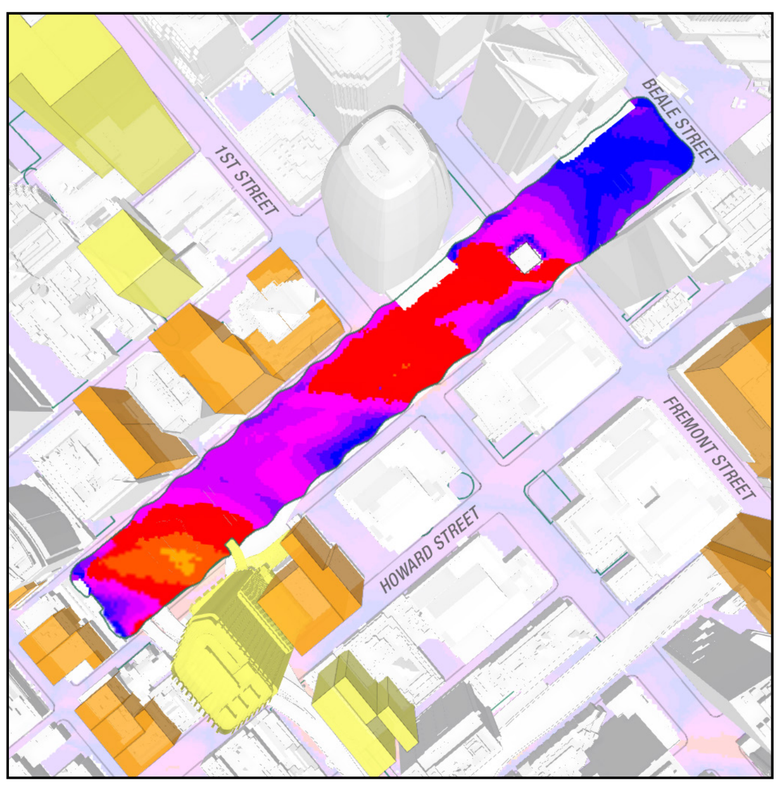
SPRING & FALL EQUINOXES (March 21 & September 21)

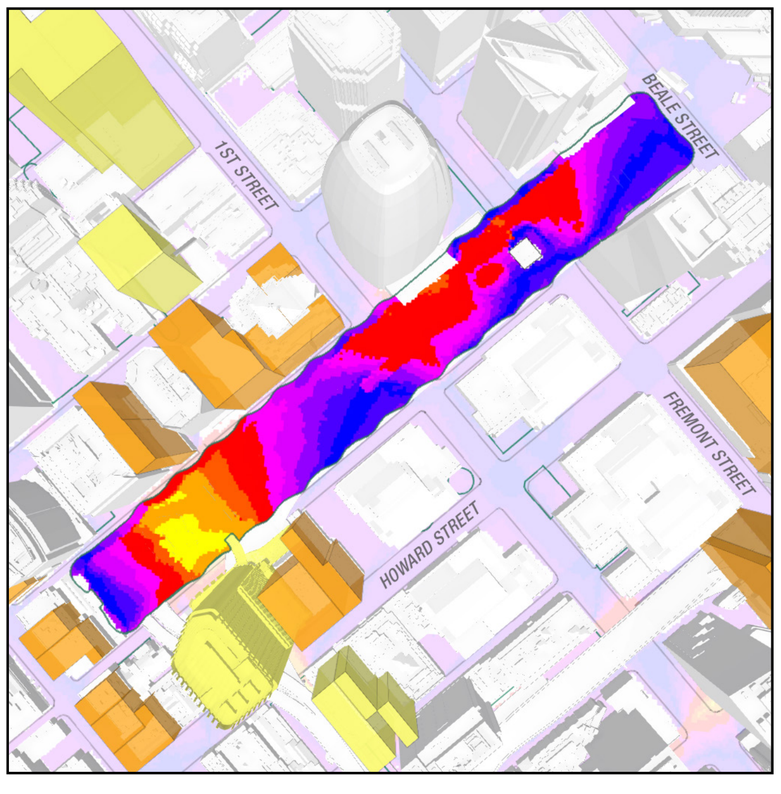


WINTER SOLSTICE (December 21)

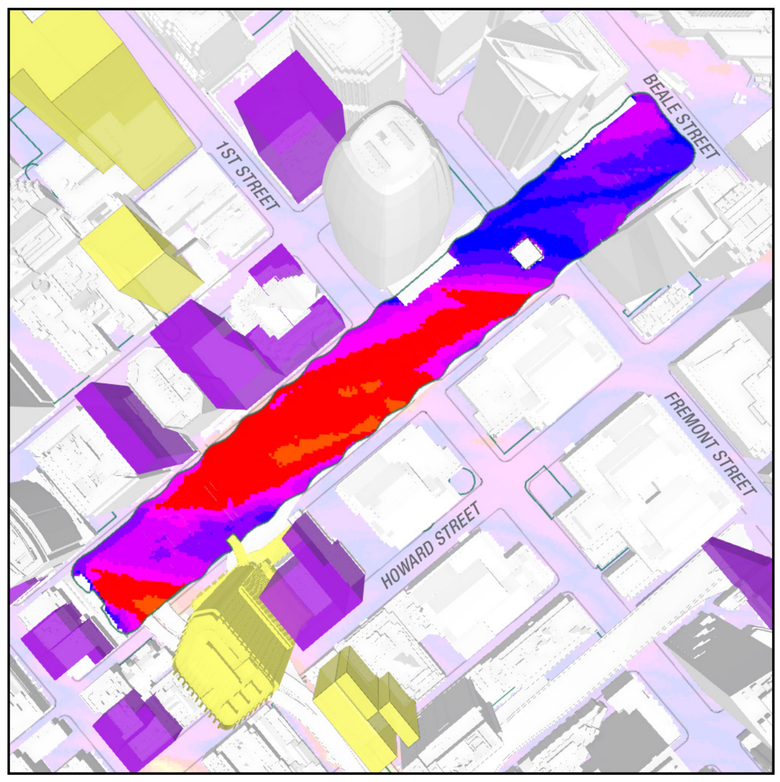
PROPOSED ACTION

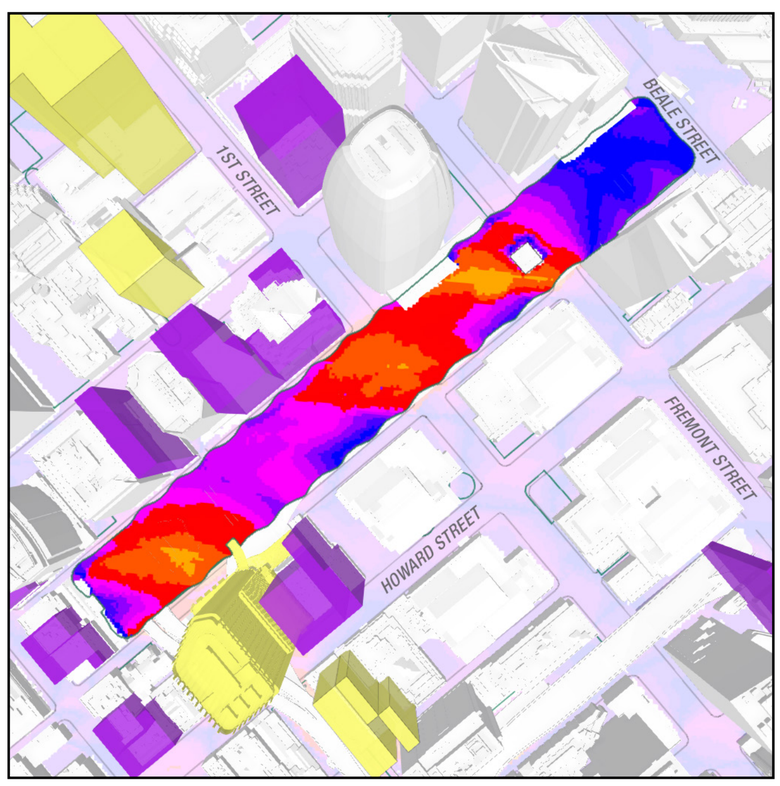


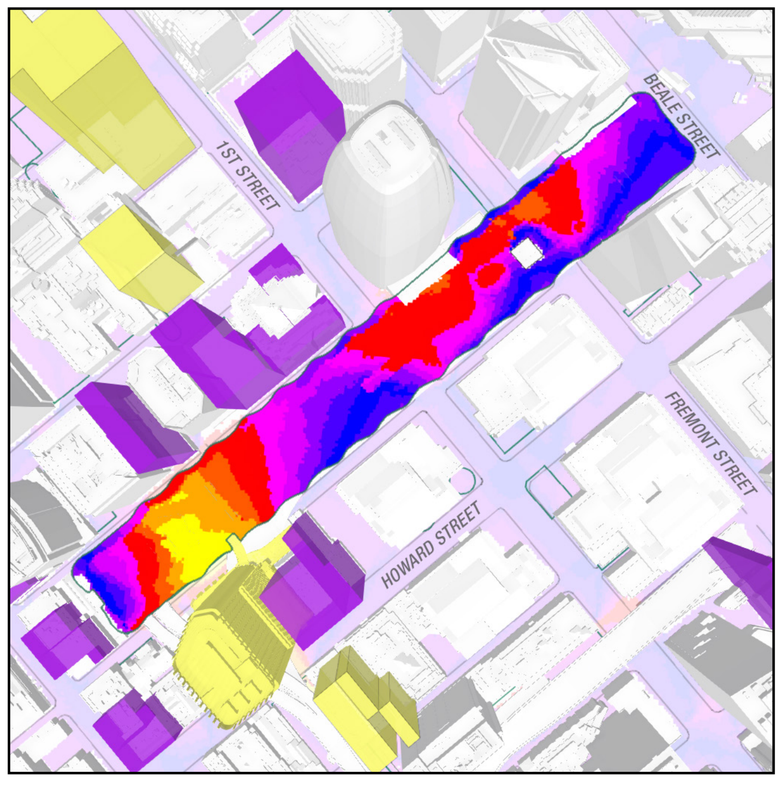




PLAN BAY AREA 2050







6 | UNION SQUARE

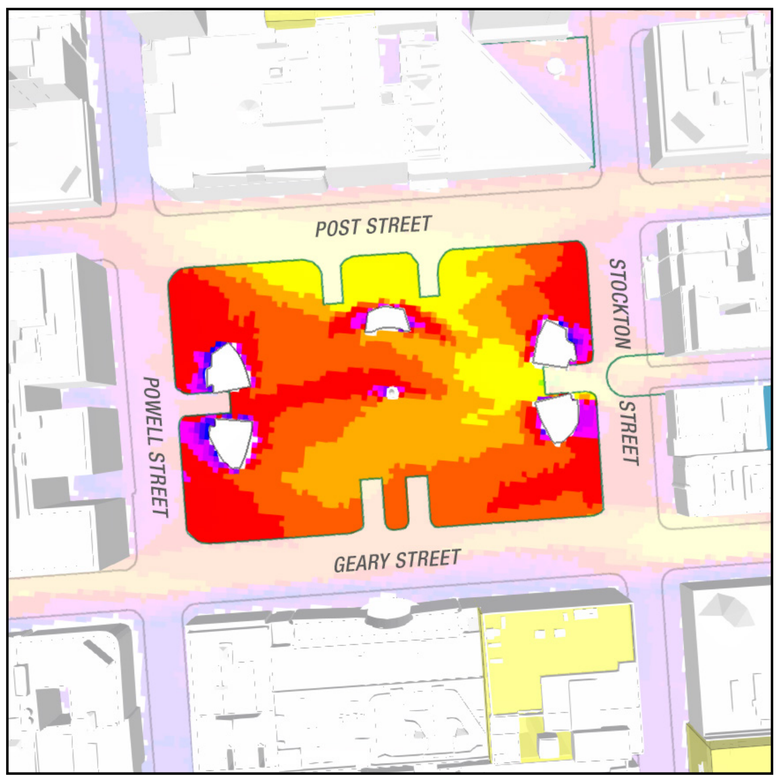
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

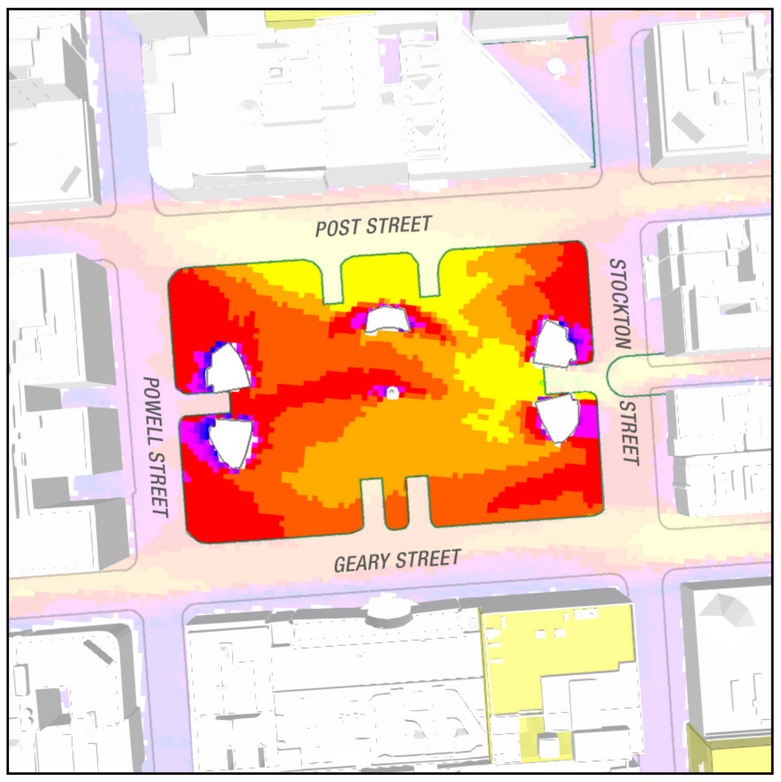
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

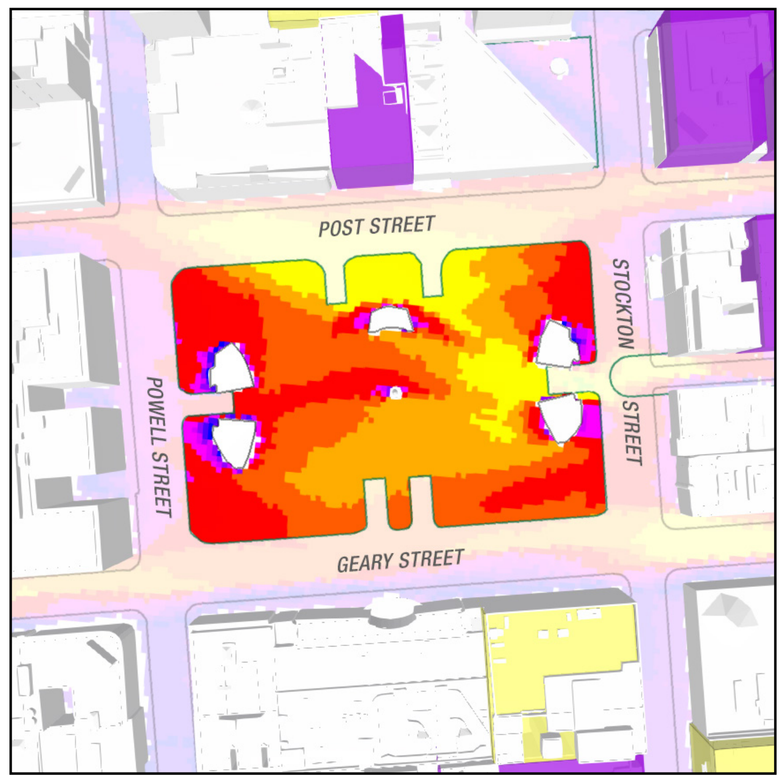
2050 ENVIRONMENTAL BASELINE



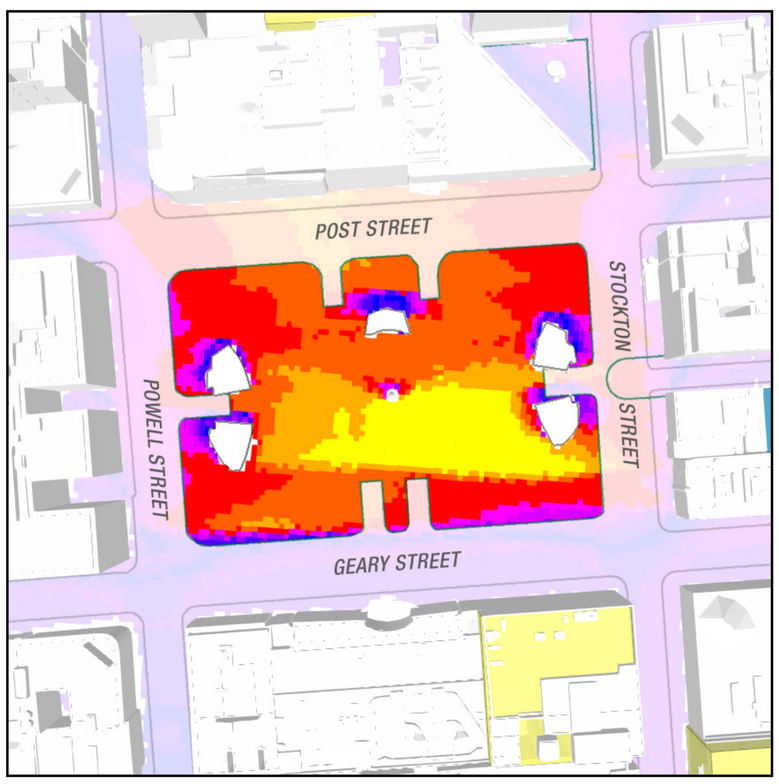
PROPOSED ACTION

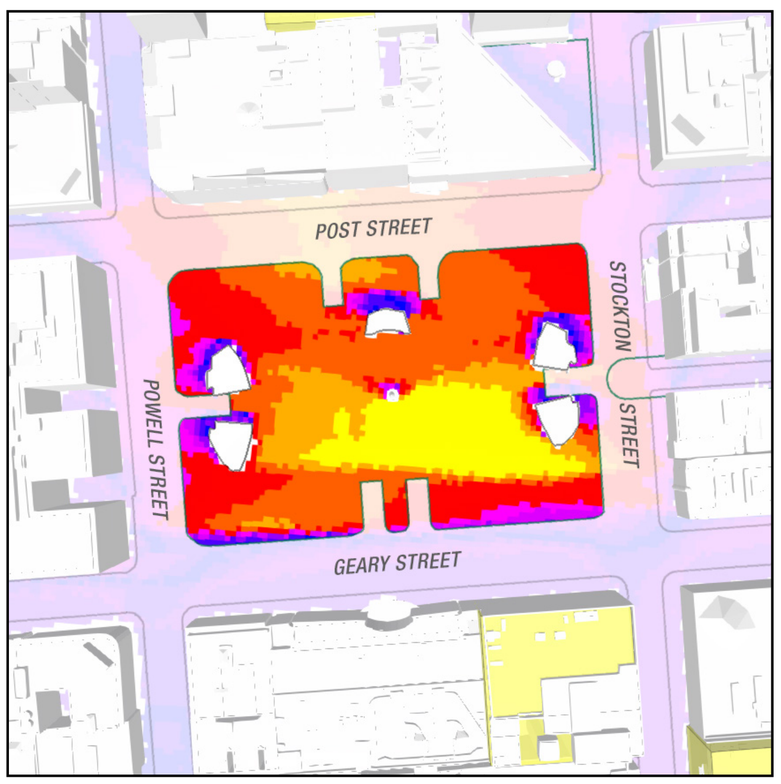


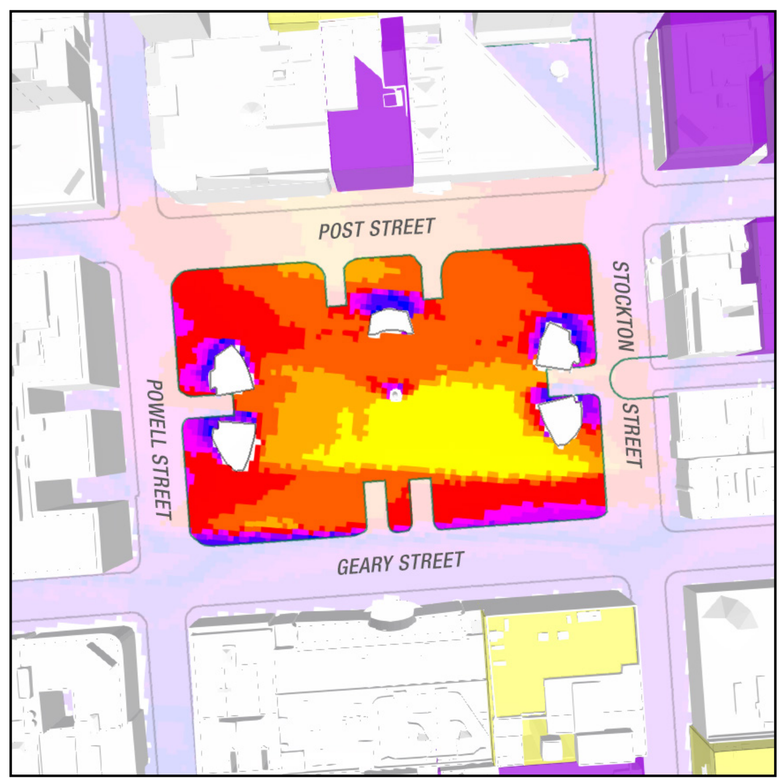
PLAN BAY AREA 2050



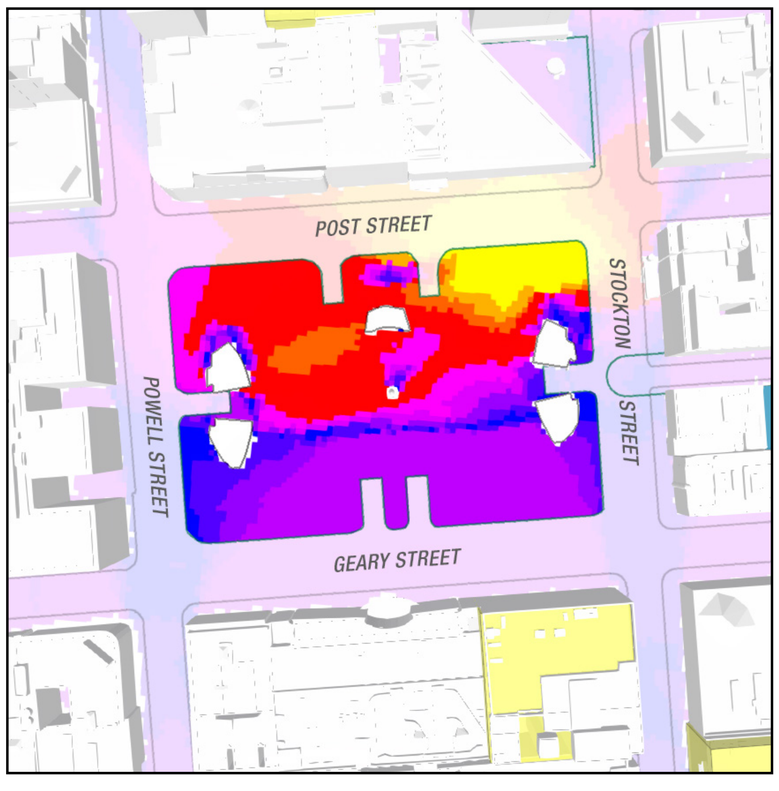
SUMMER SOLSTICE (June 21)

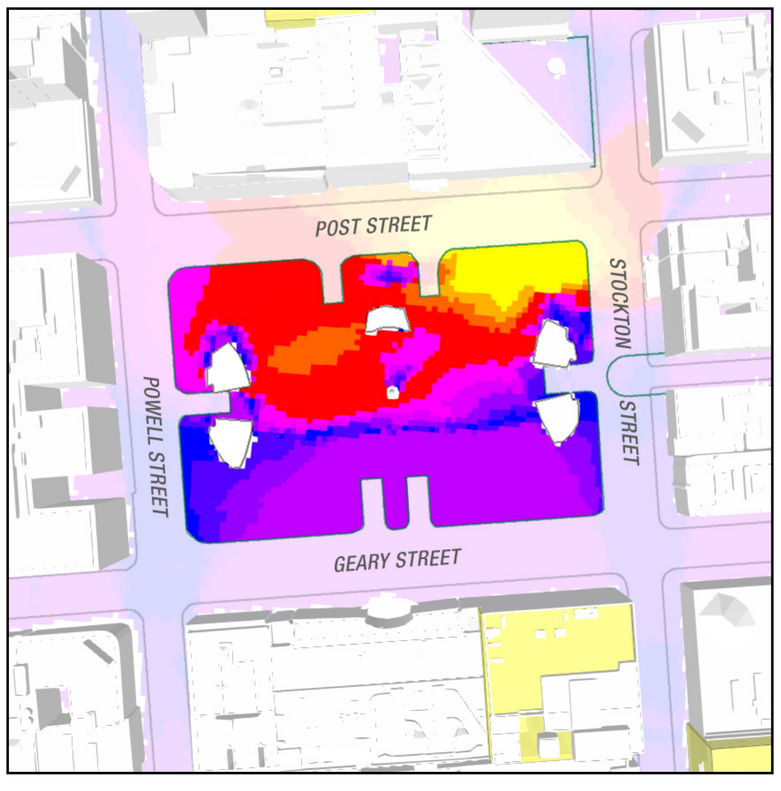


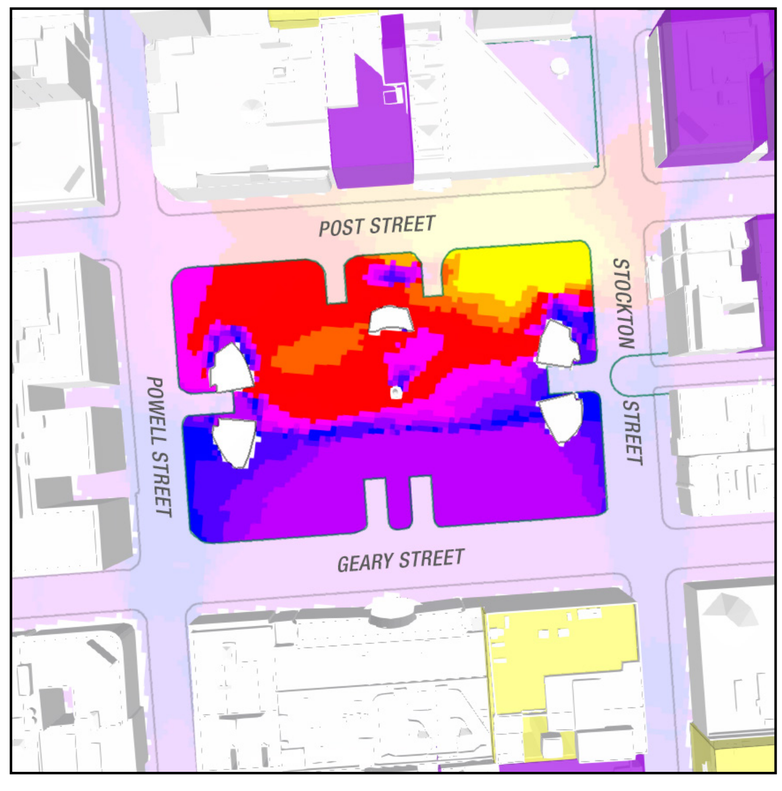




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

7 | YERBA BUENA GARDENS

DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

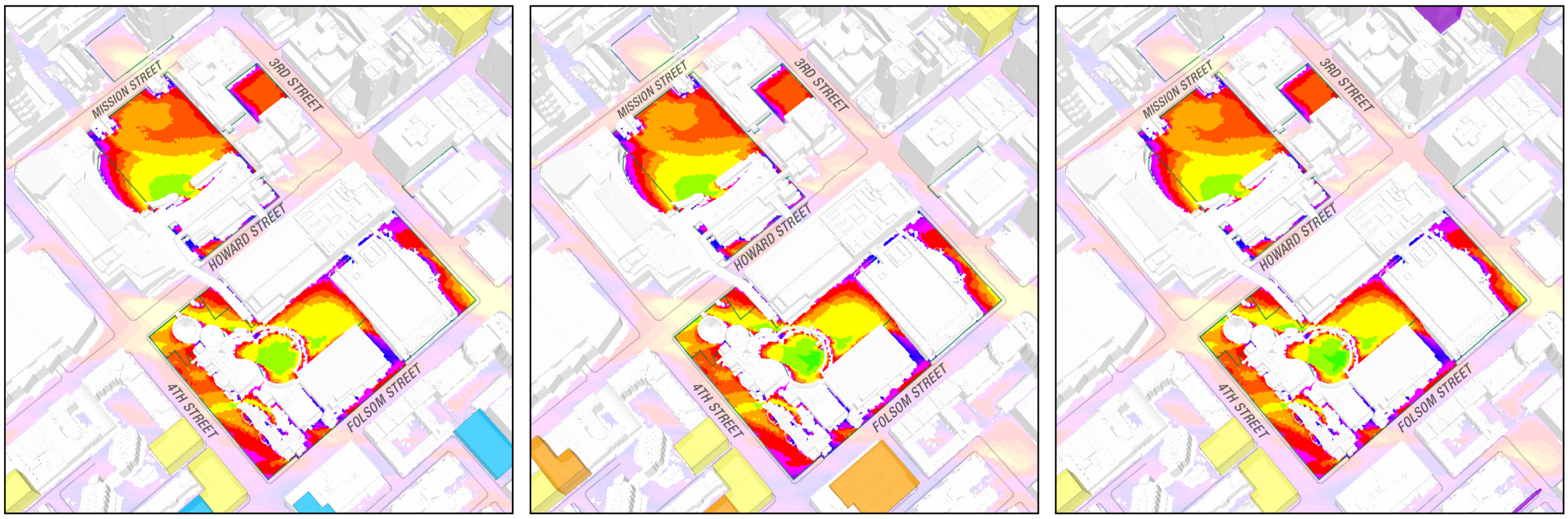
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

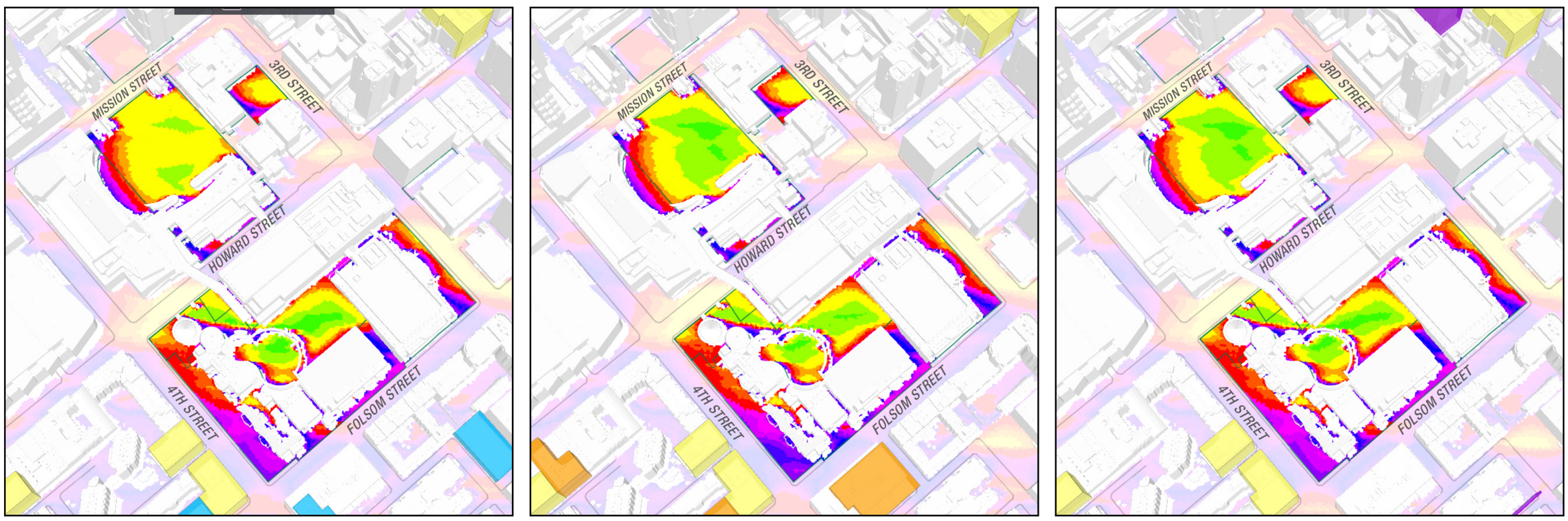
2050 ENVIRONMENTAL BASELINE

PROPOSED ACTION

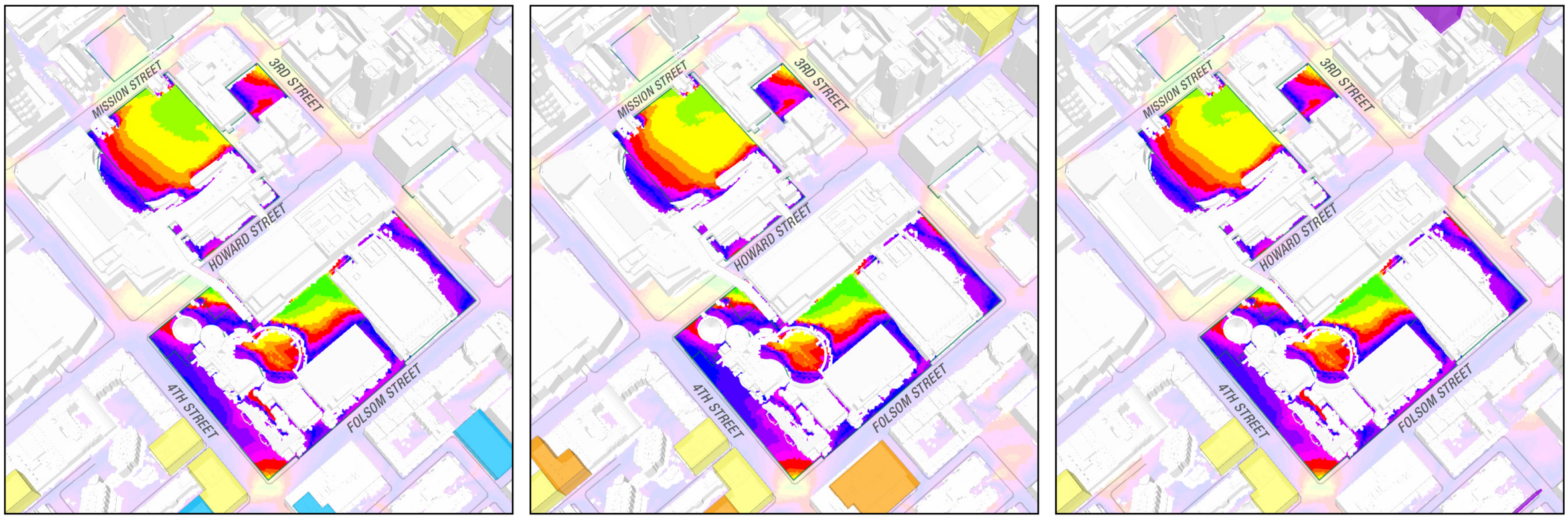
PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)



SPRING & FALL EQUINOXES (March 21 & September 21)



WINTER SOLSTICE (December 21)

8 | SOUTH PARK

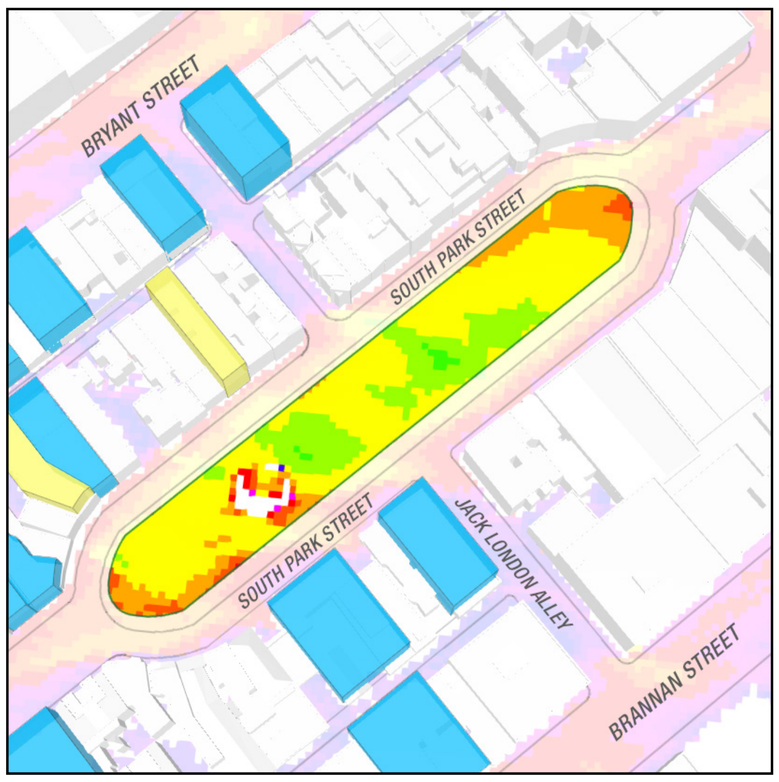
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

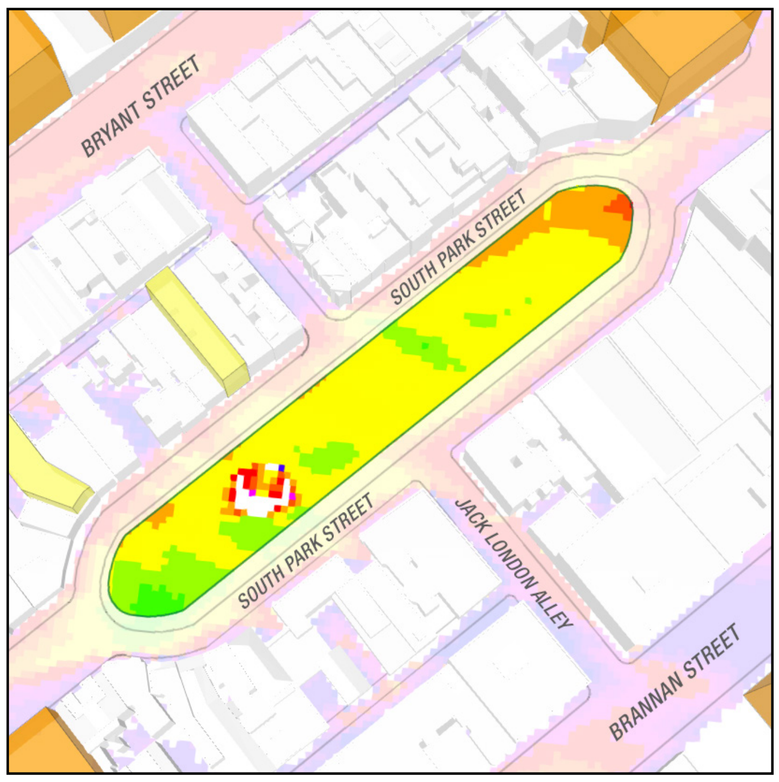
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

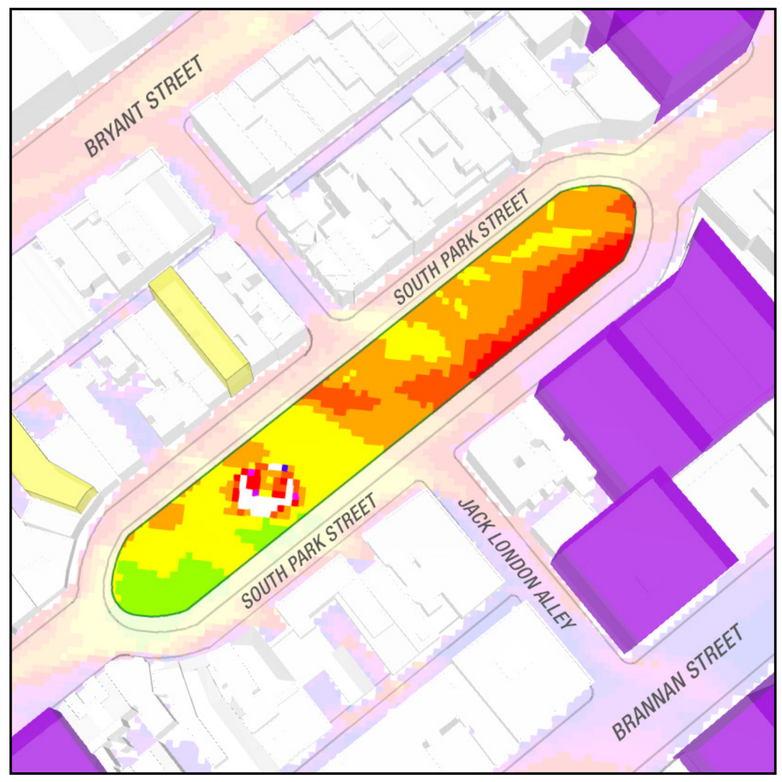
2050 ENVIRONMENTAL BASELINE



PROPOSED ACTION

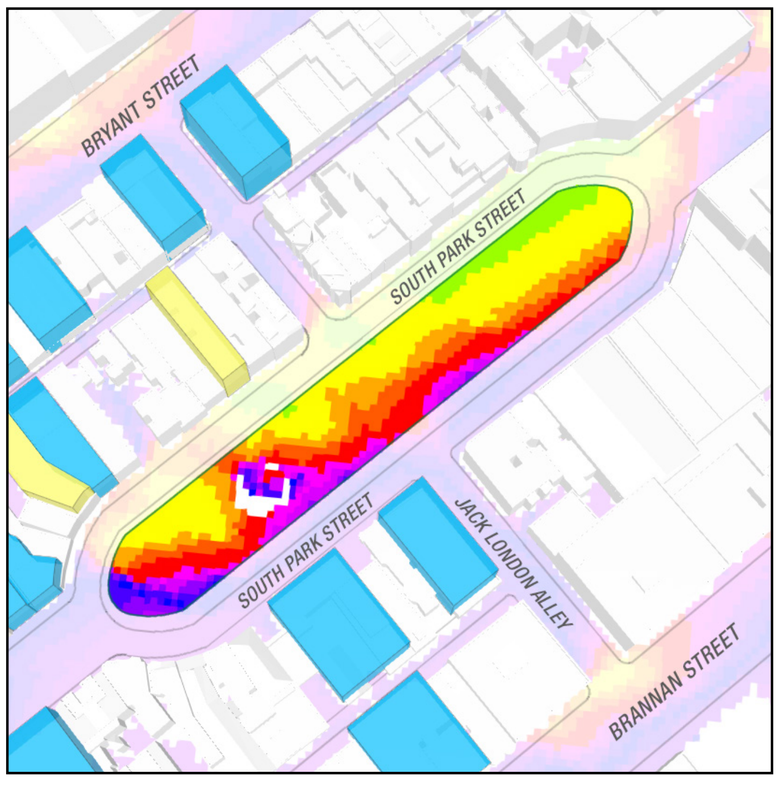


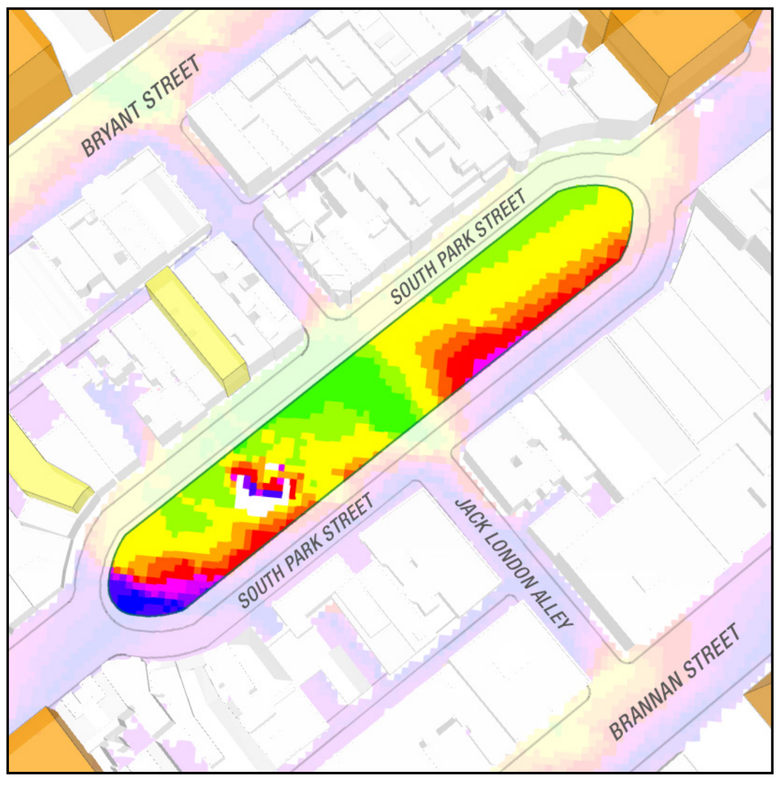
PLAN BAY AREA 2050

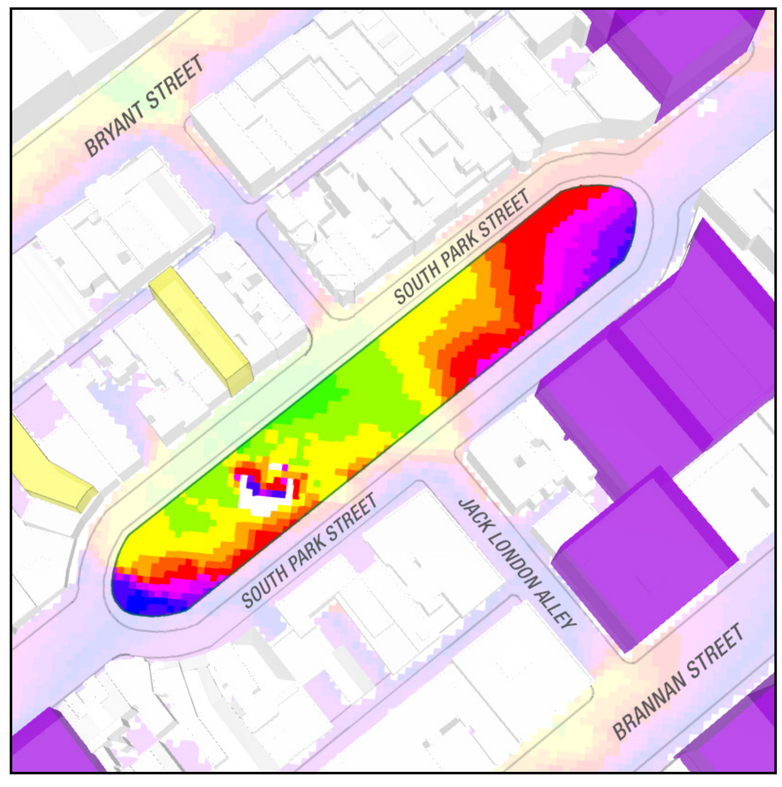


SUMMER SOLSTICE (June 21)

SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

9 | MARGARET HAYWARD PLAYGROUND

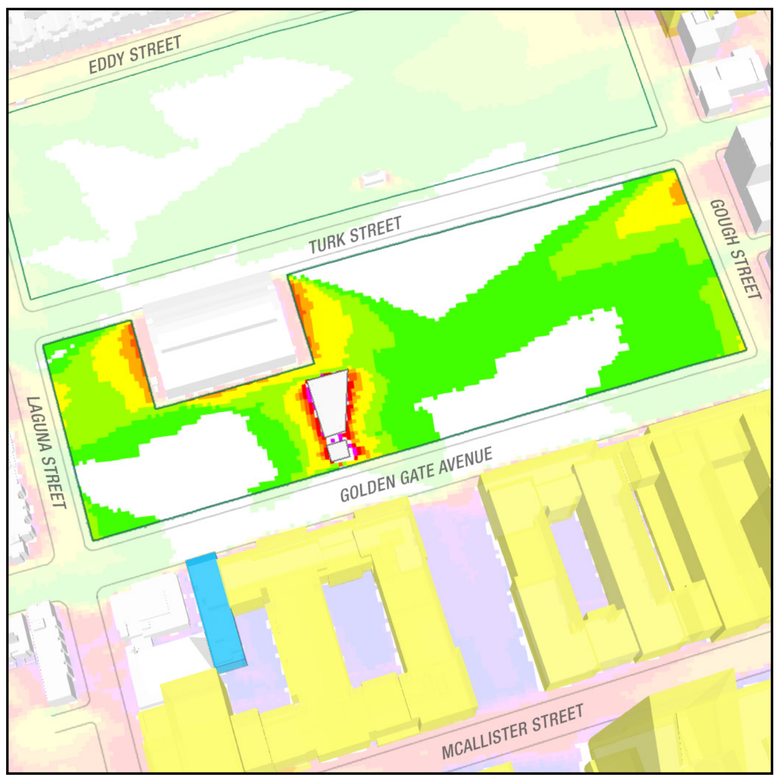
N

DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

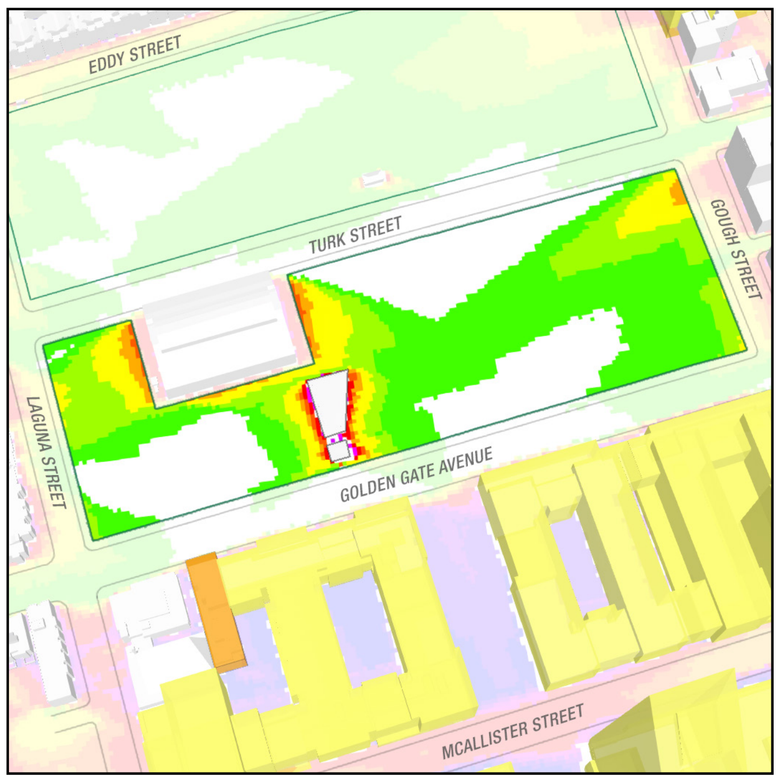
0 15 30 45 60 75 90 105 120 135 150 165 180+

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

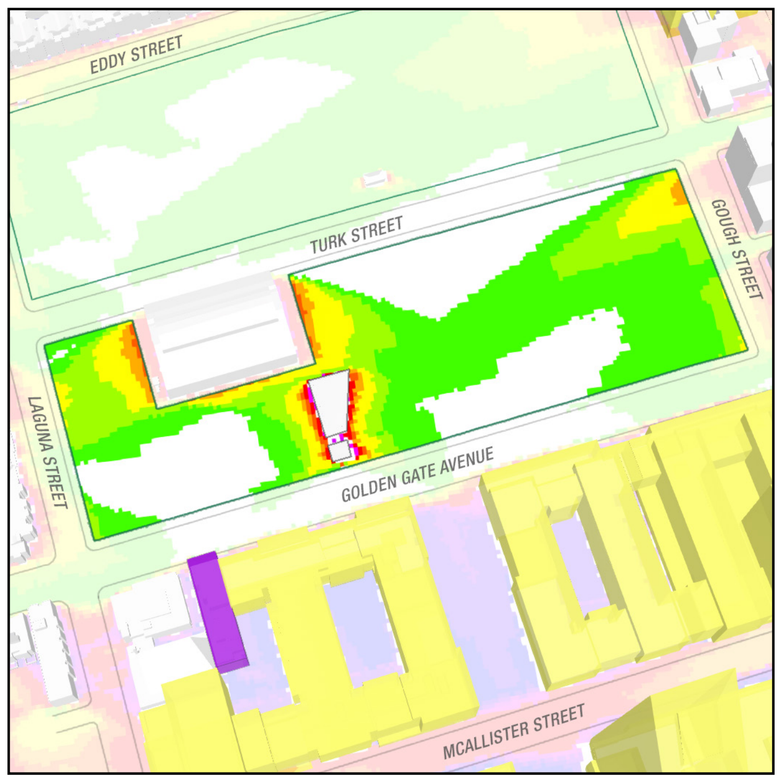
2050 ENVIRONMENTAL BASELINE



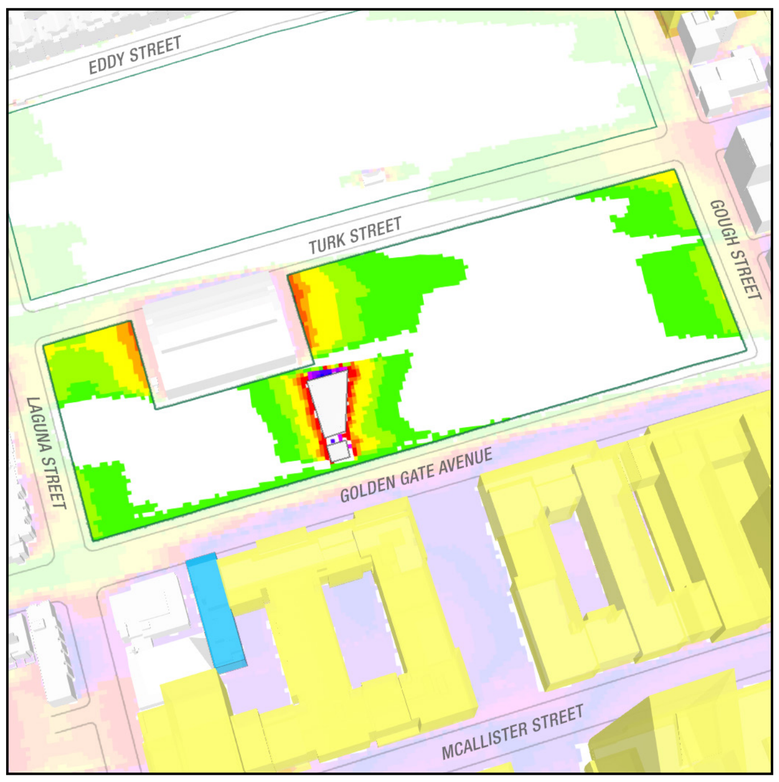
PROPOSED ACTION

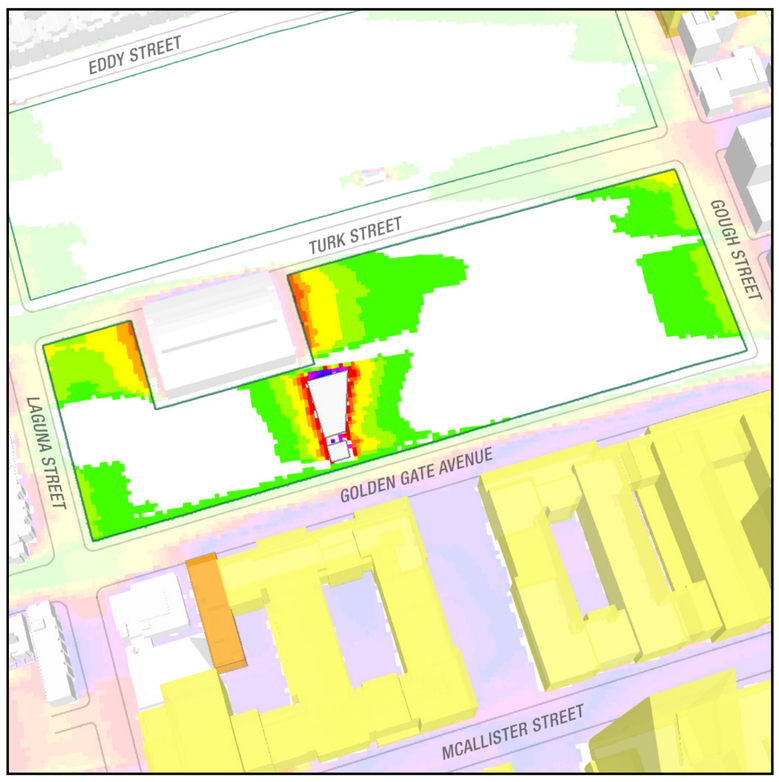


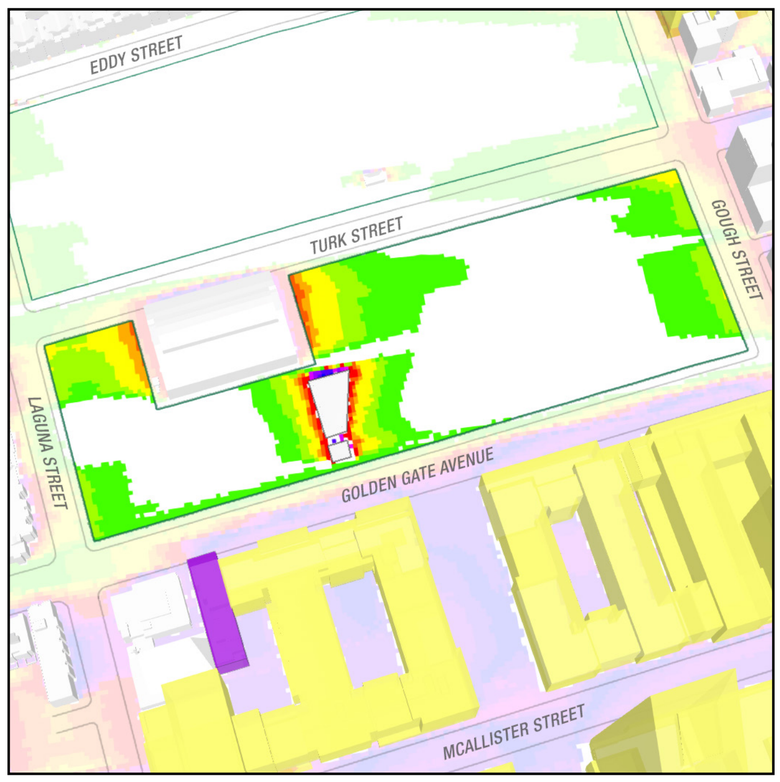
PLAN BAY AREA 2050



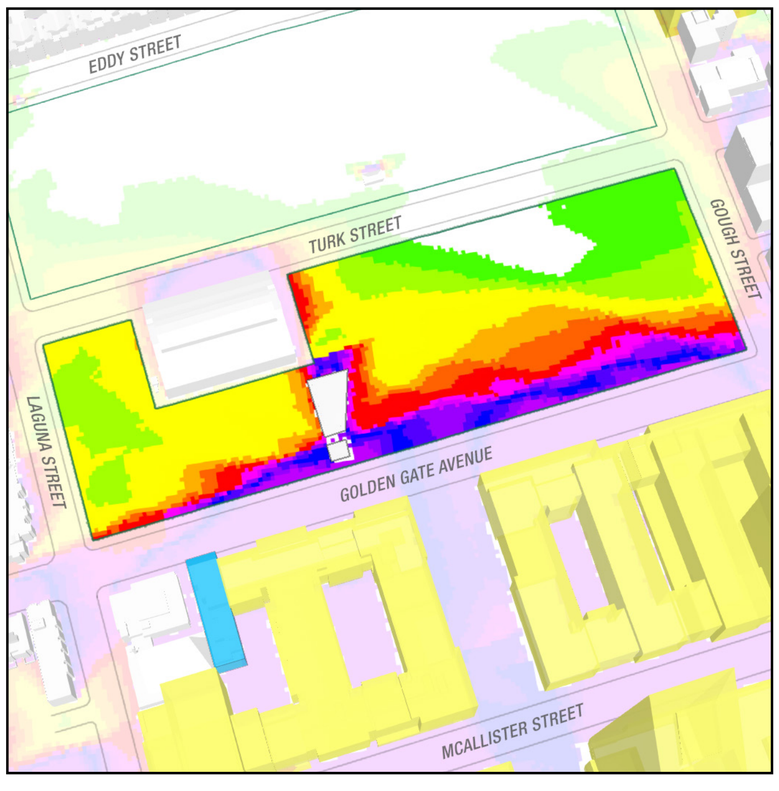
SUMMER SOLSTICE (June 21)

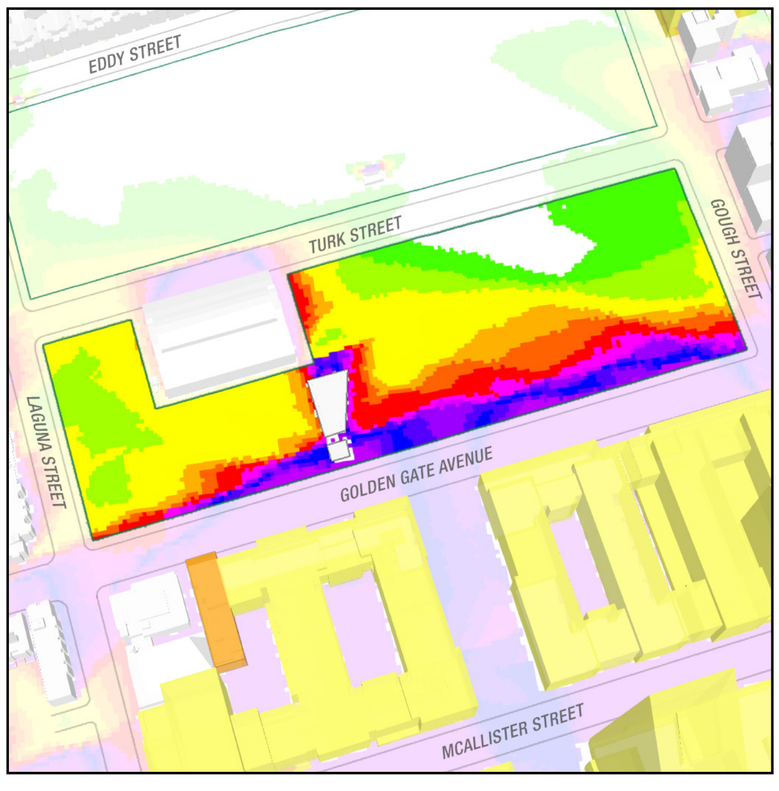


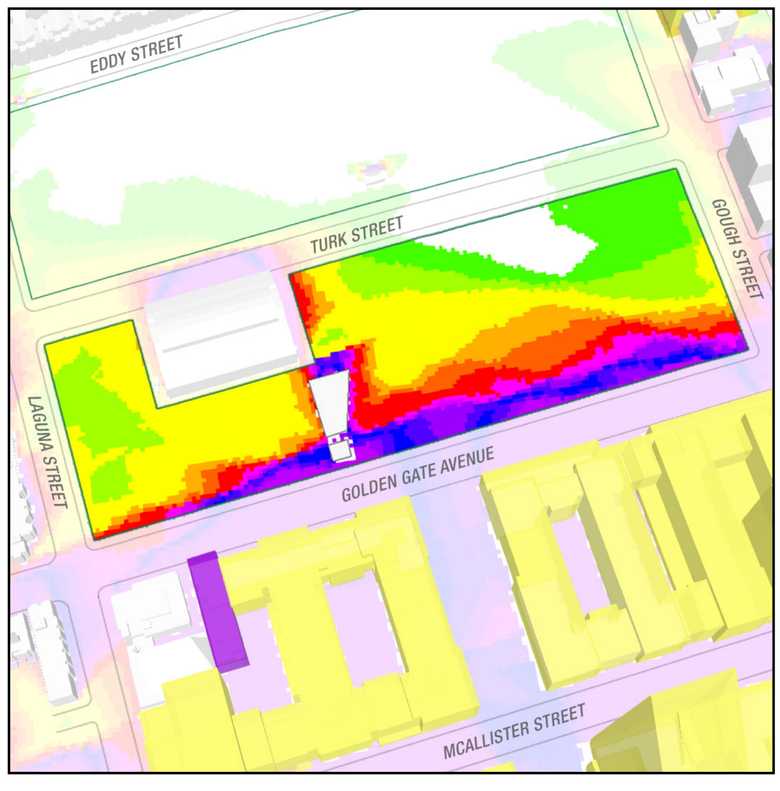




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

10 | CIVIC CENTER PLAZA

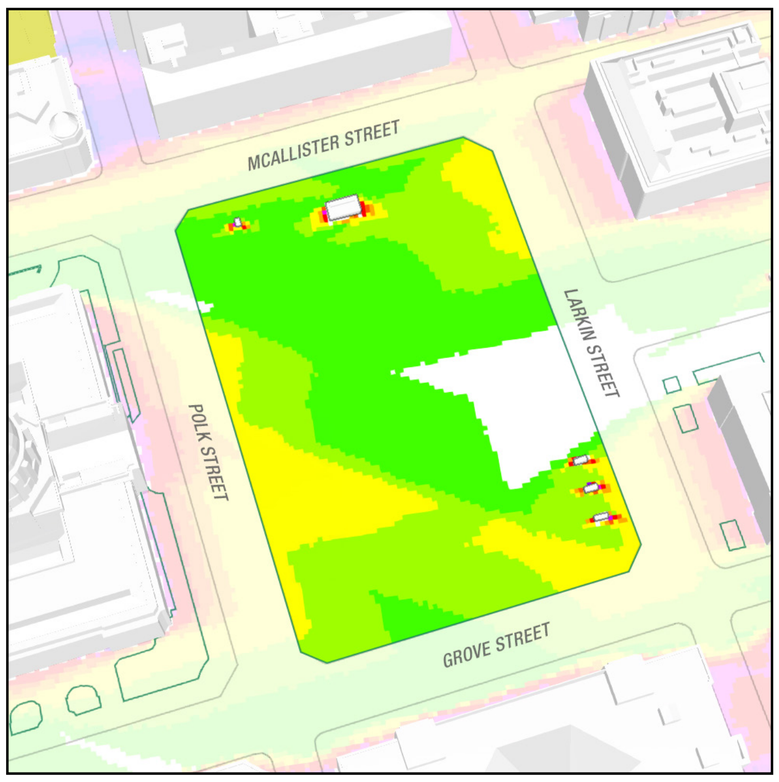
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

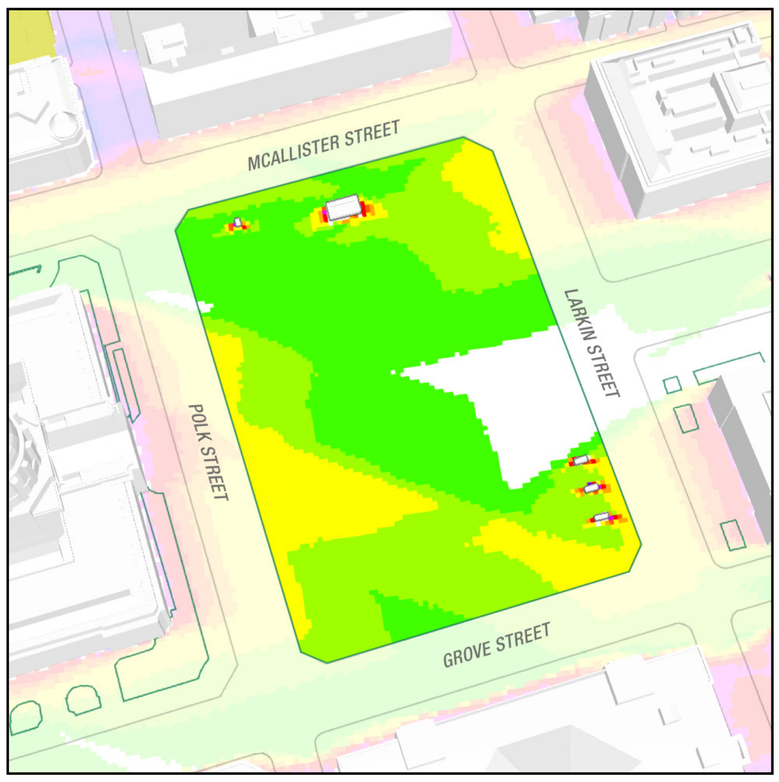
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

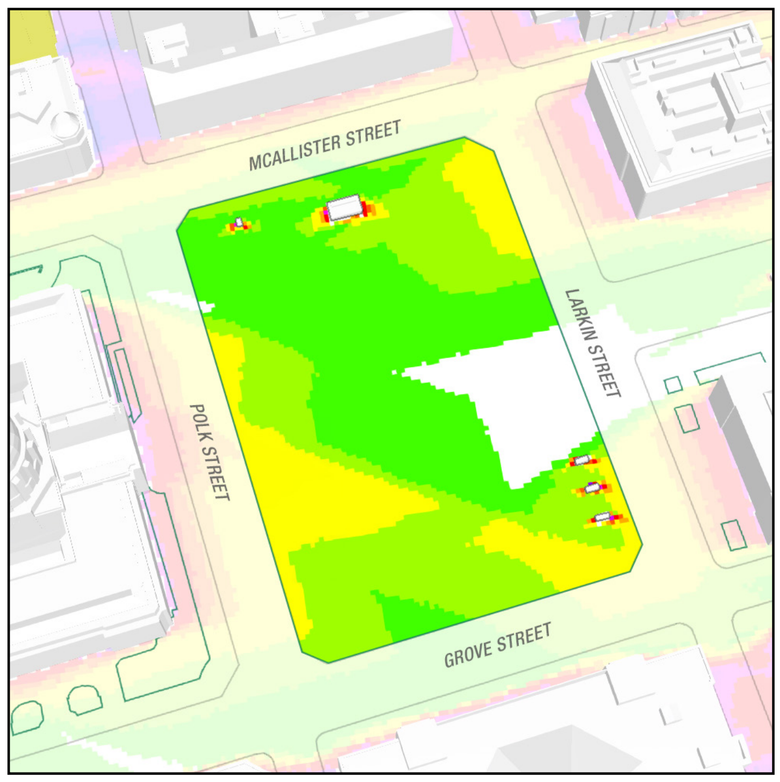
2050 ENVIRONMENTAL BASELINE



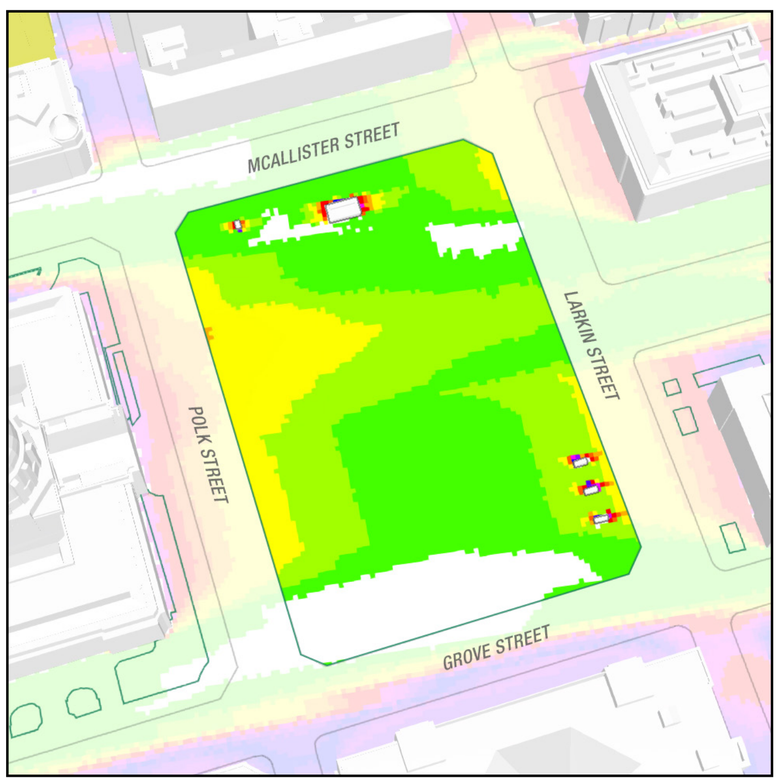
PROPOSED ACTION

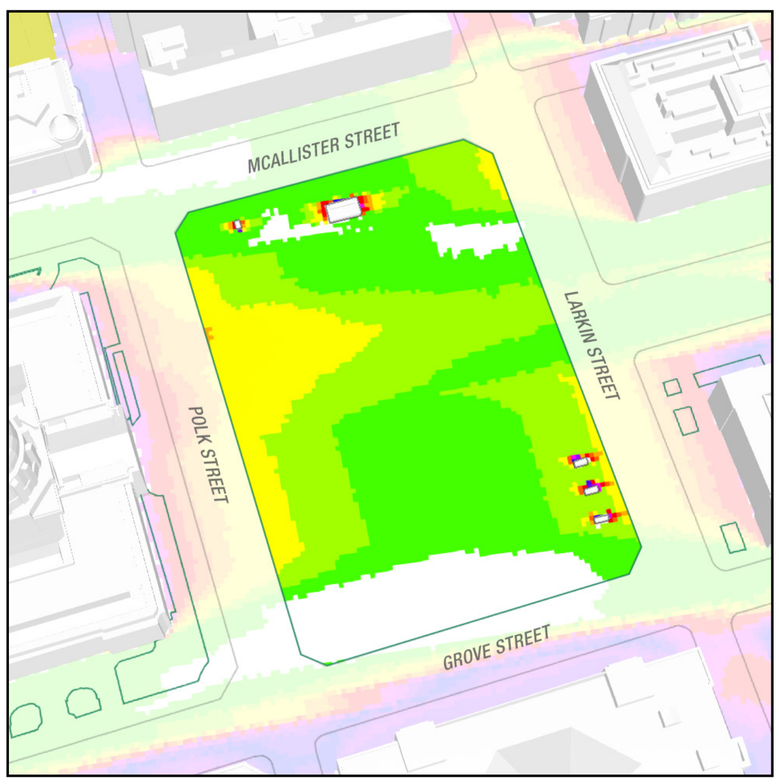


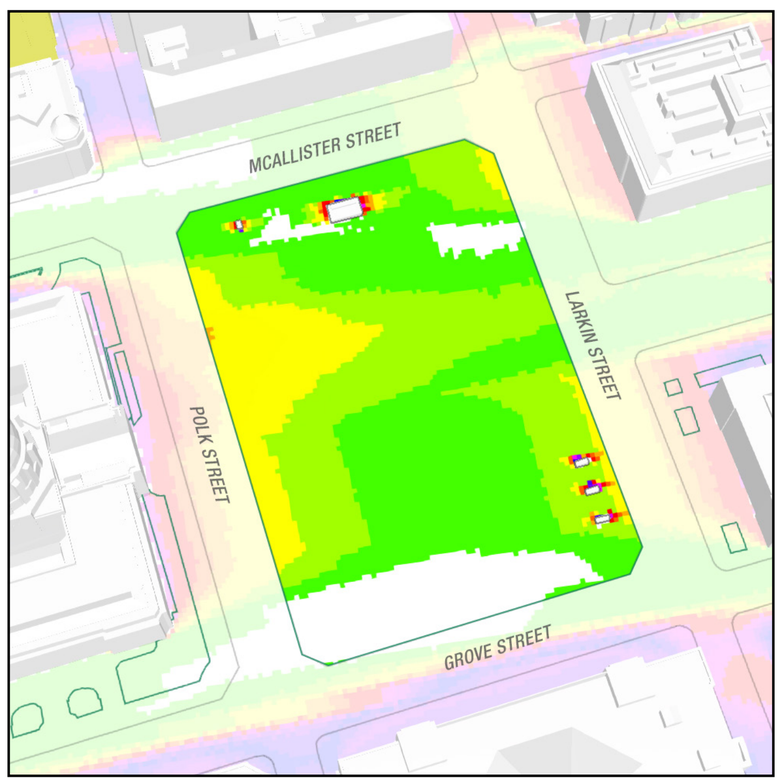
PLAN BAY AREA 2050



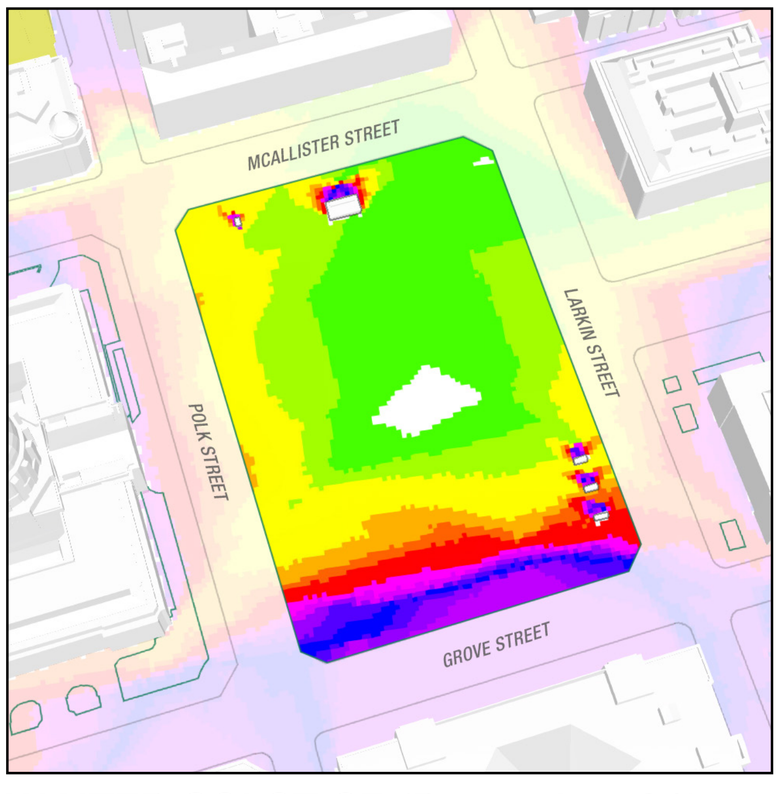
SUMMER SOLSTICE (June 21)

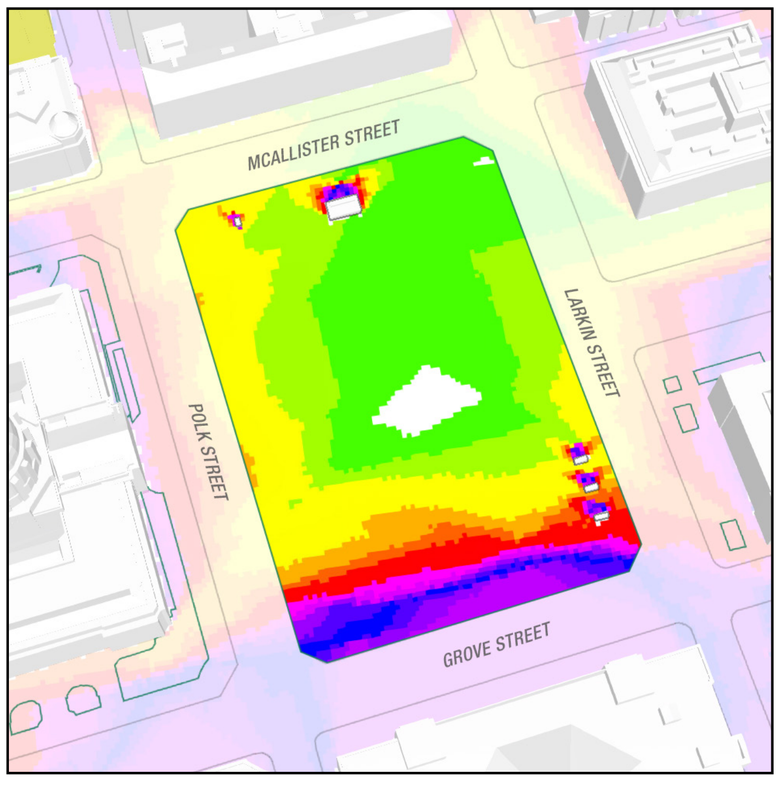


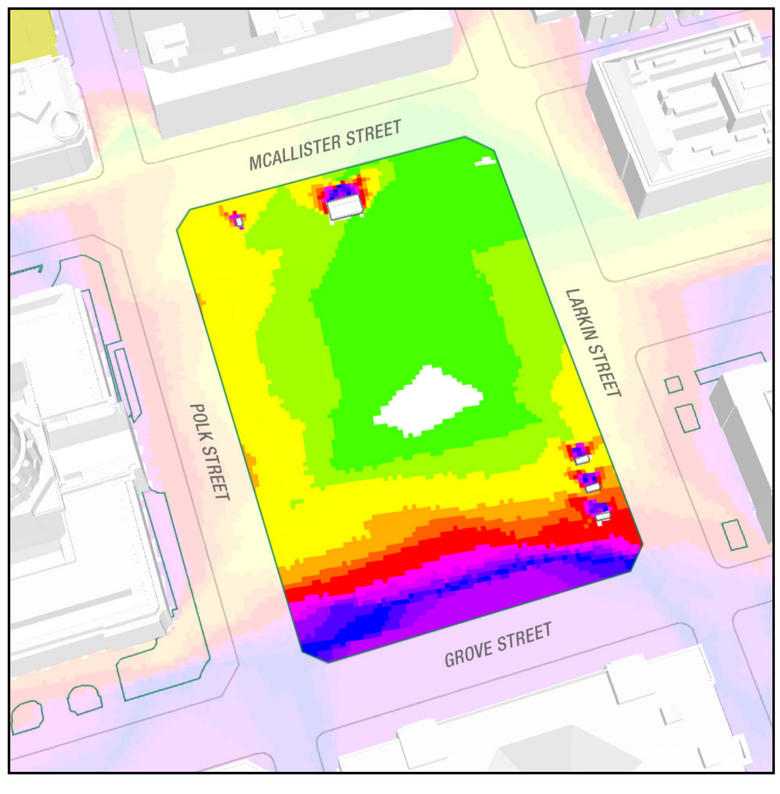




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

11 | VICTORIA MANOLO DRAVES PARK

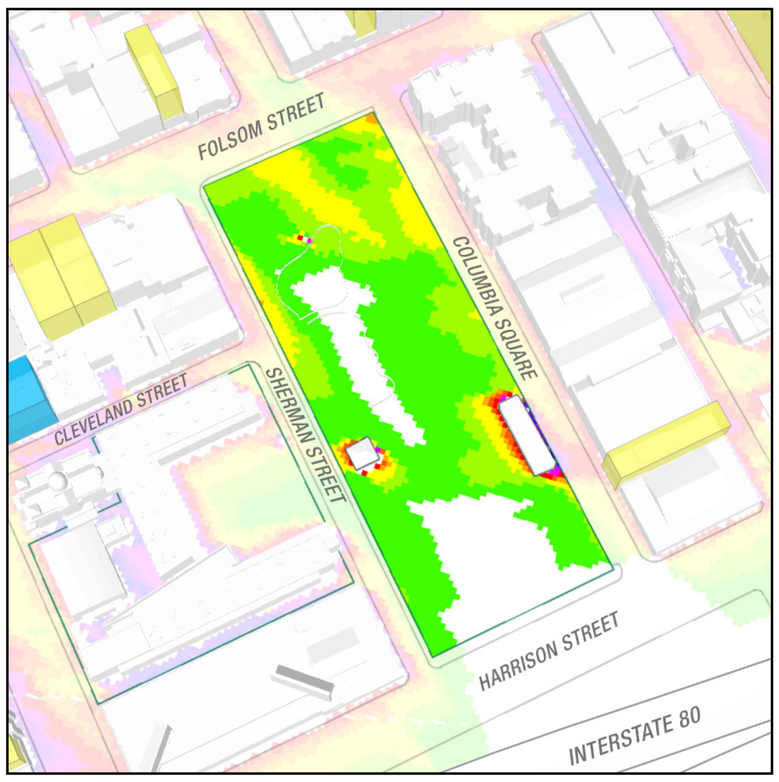
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

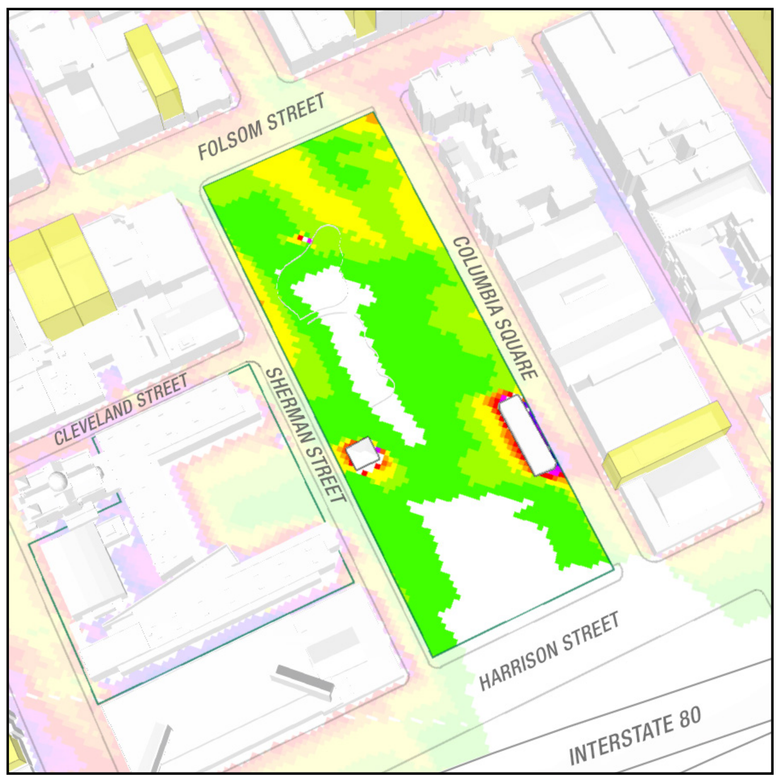
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

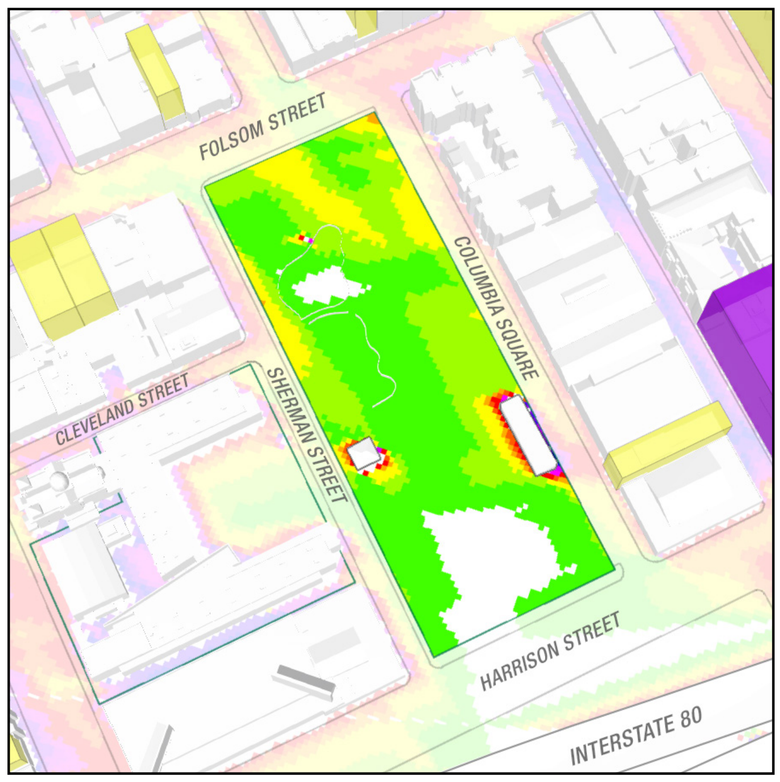
2050 ENVIRONMENTAL BASELINE



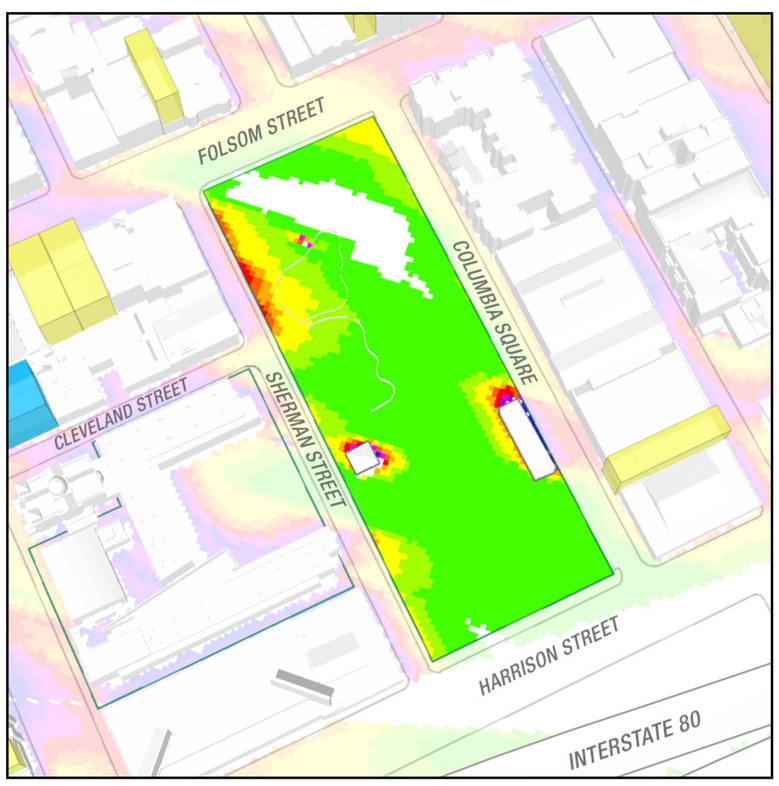
PROPOSED ACTION

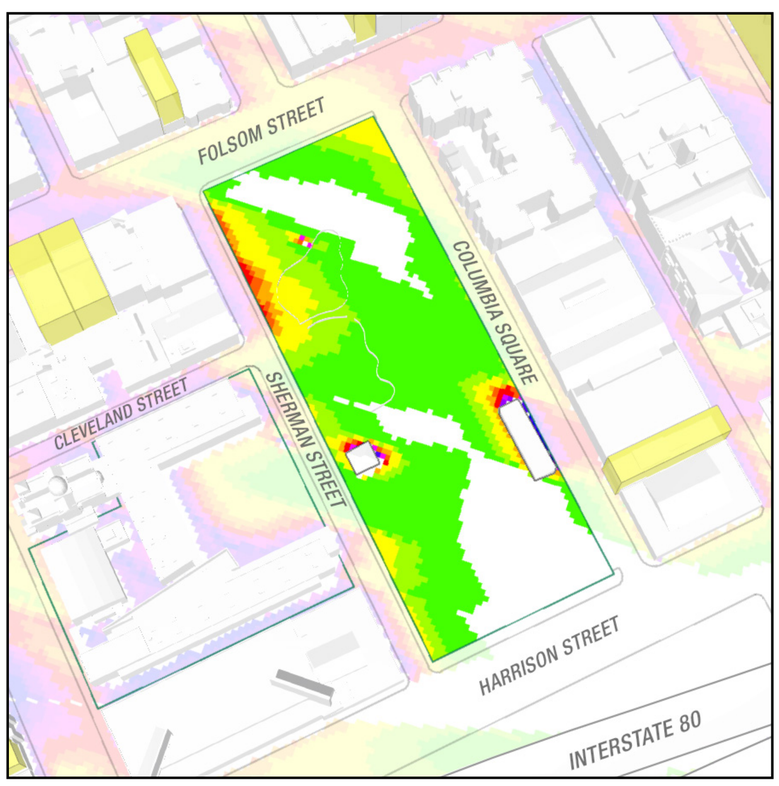


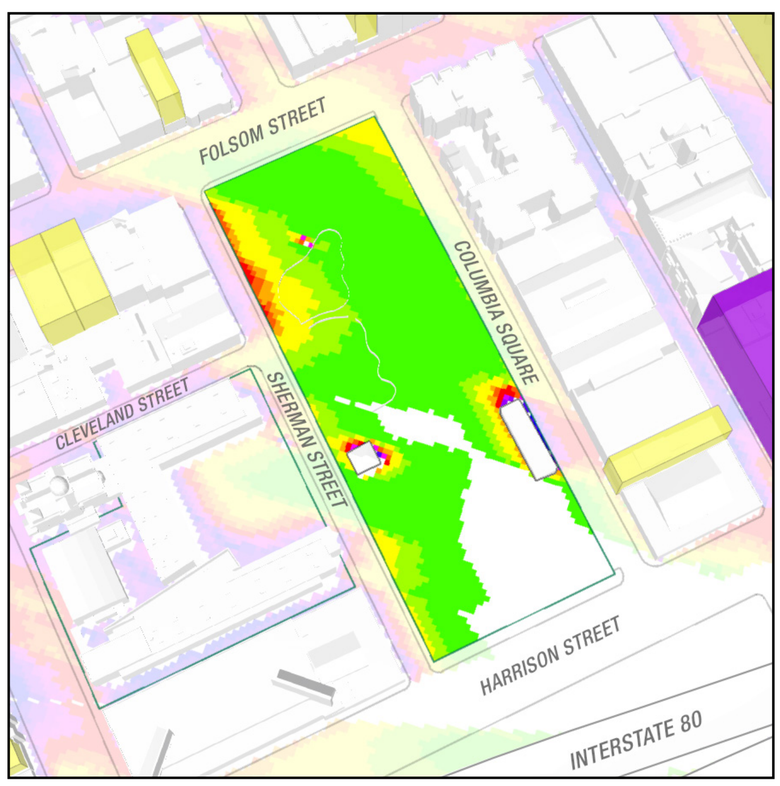
PLAN BAY AREA 2050



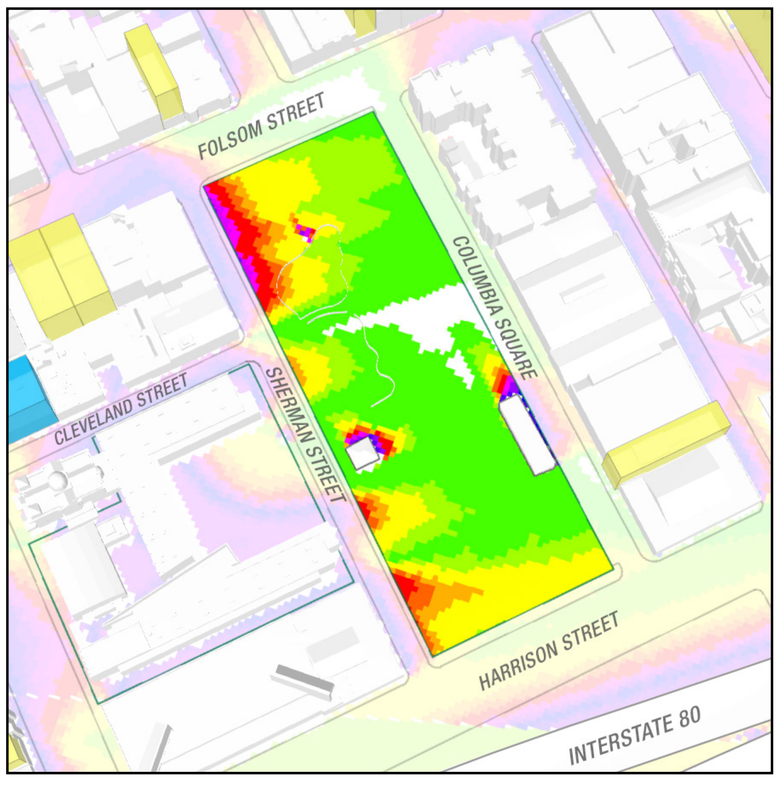
SUMMER SOLSTICE (June 21)

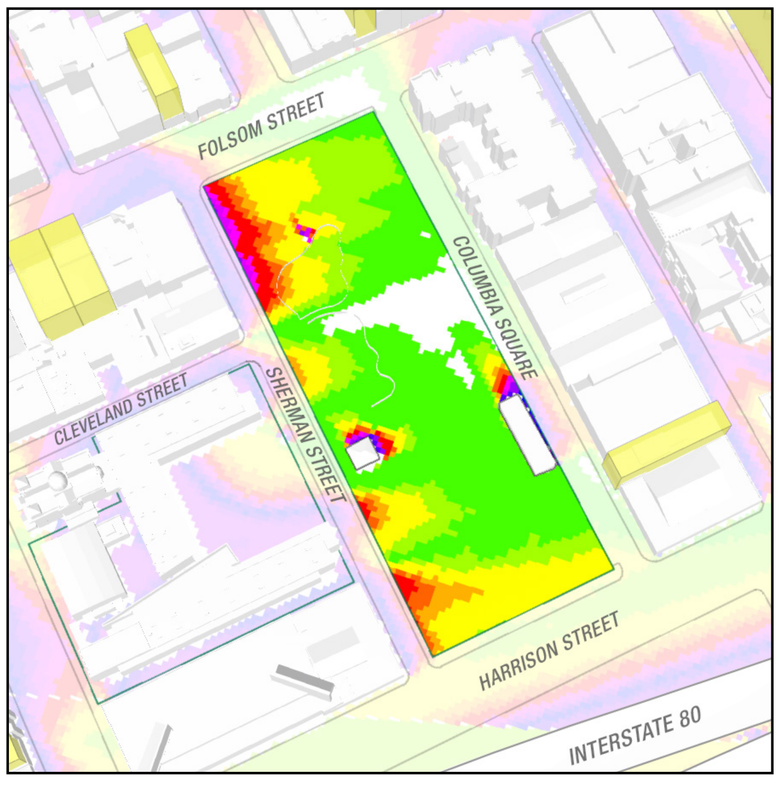


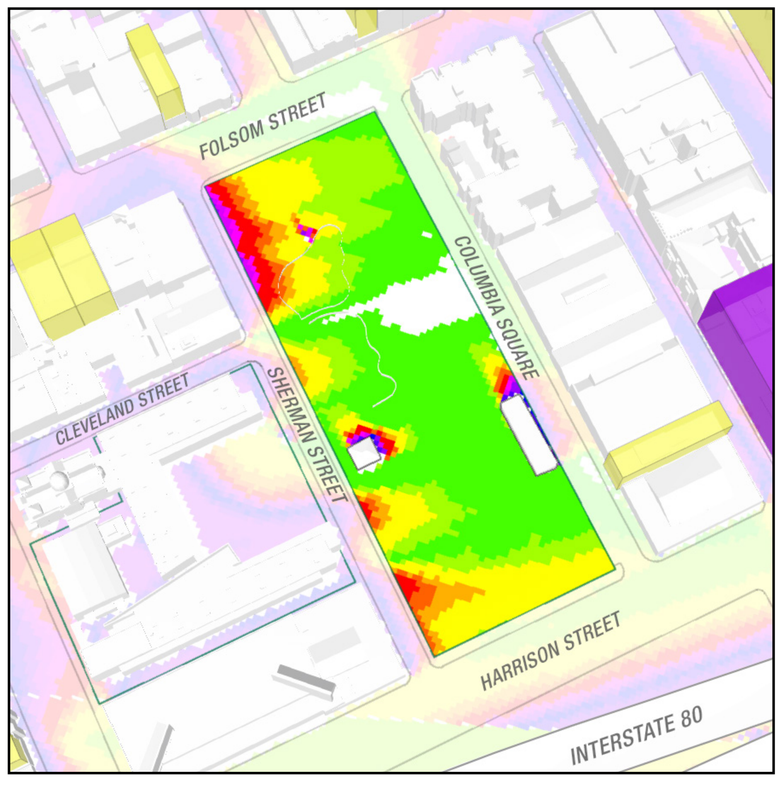




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

12 | DUBOCE PARK

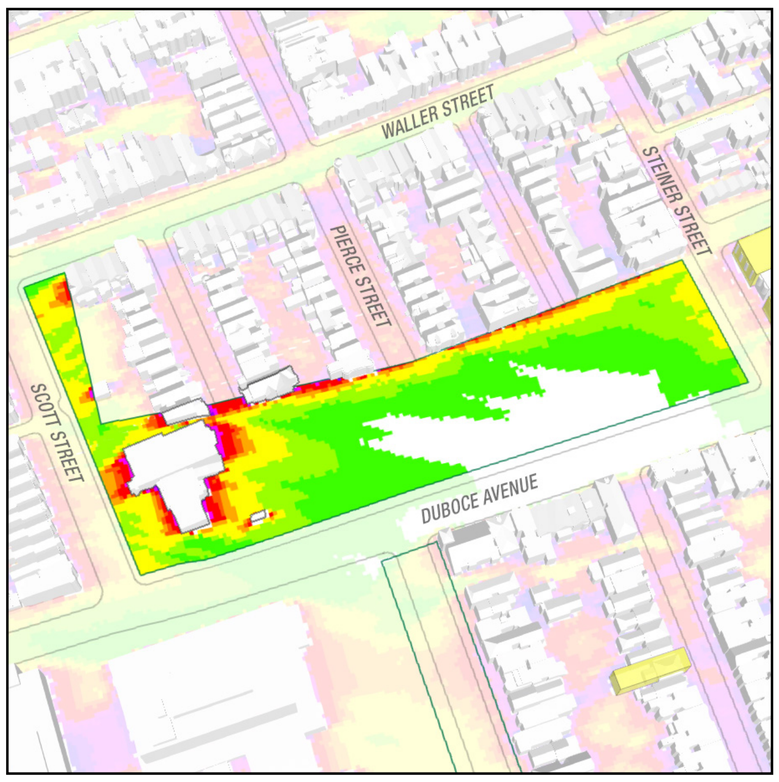
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

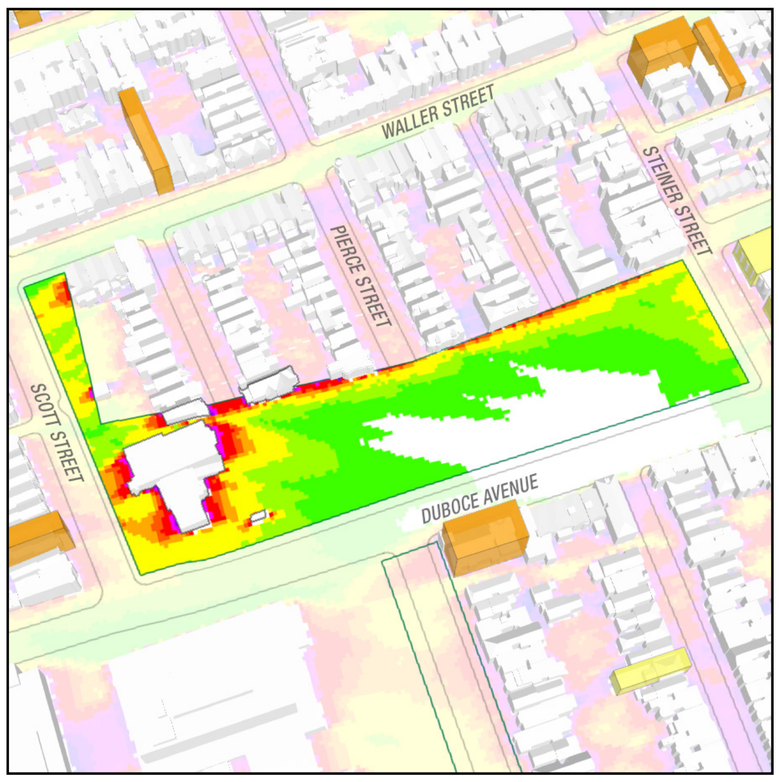
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

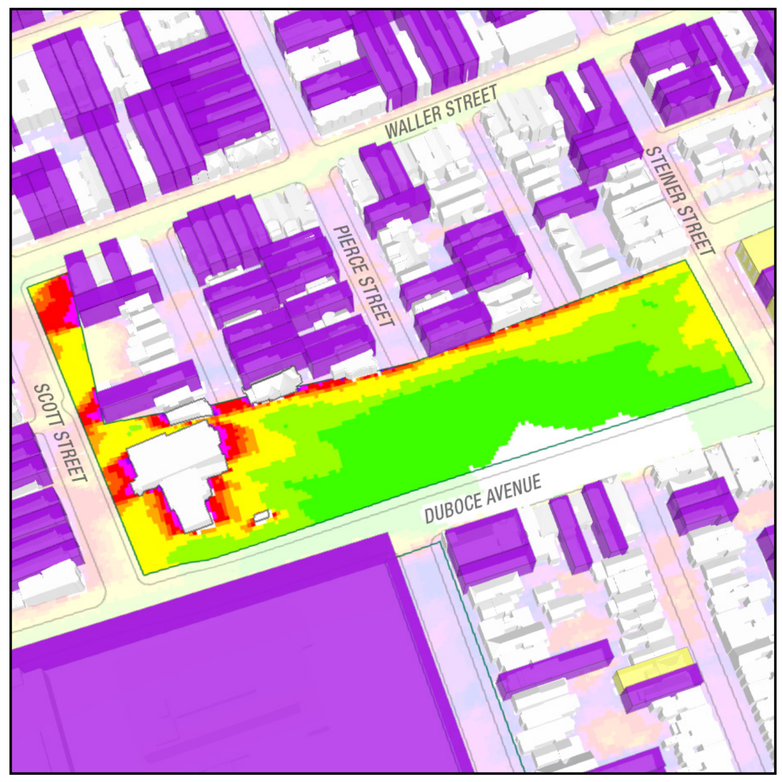
2050 ENVIRONMENTAL BASELINE



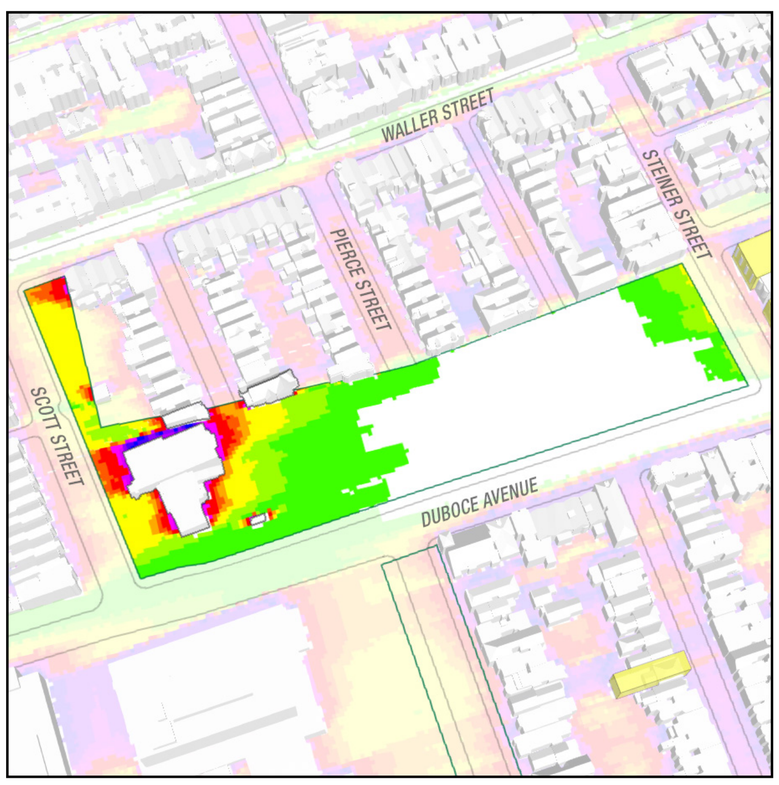
PROPOSED ACTION

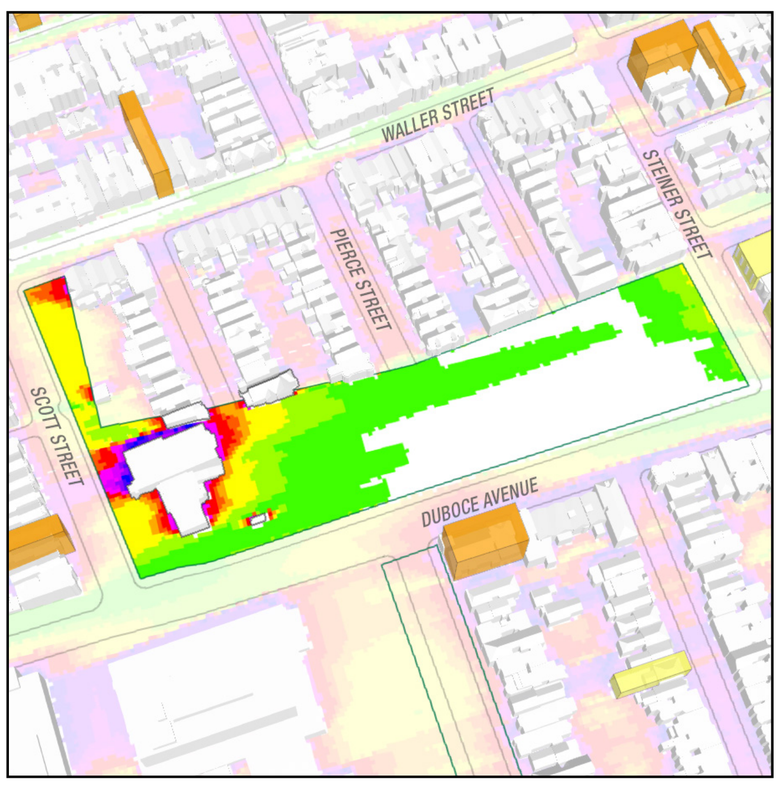


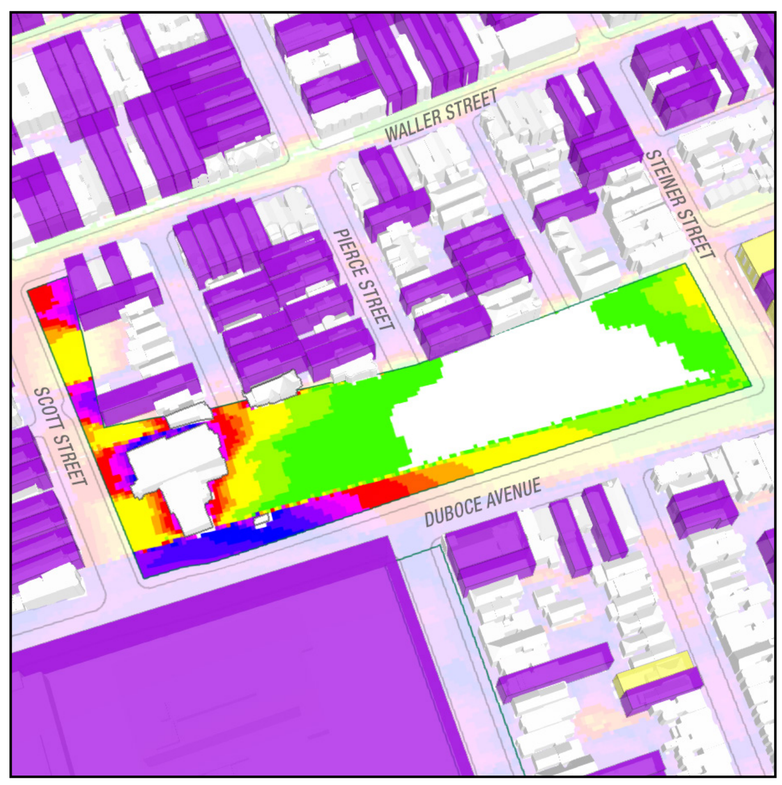
PLAN BAY AREA 2050



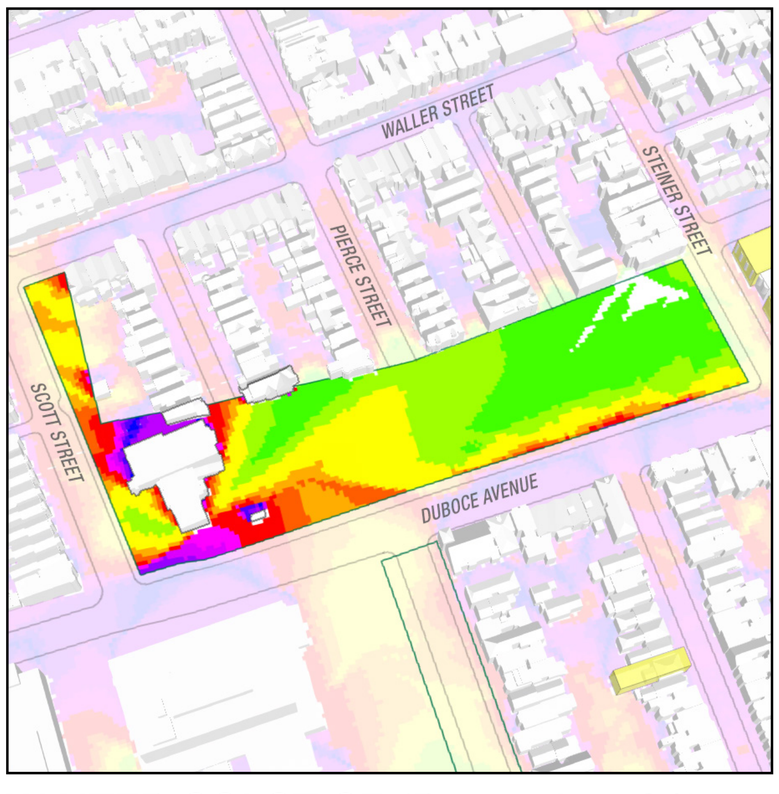
SUMMER SOLSTICE (June 21)

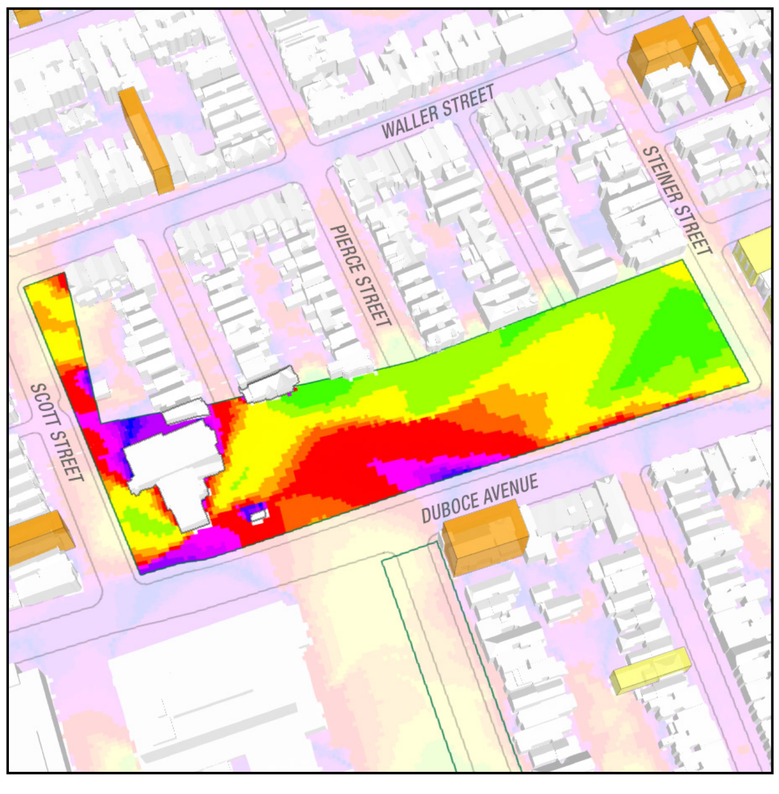


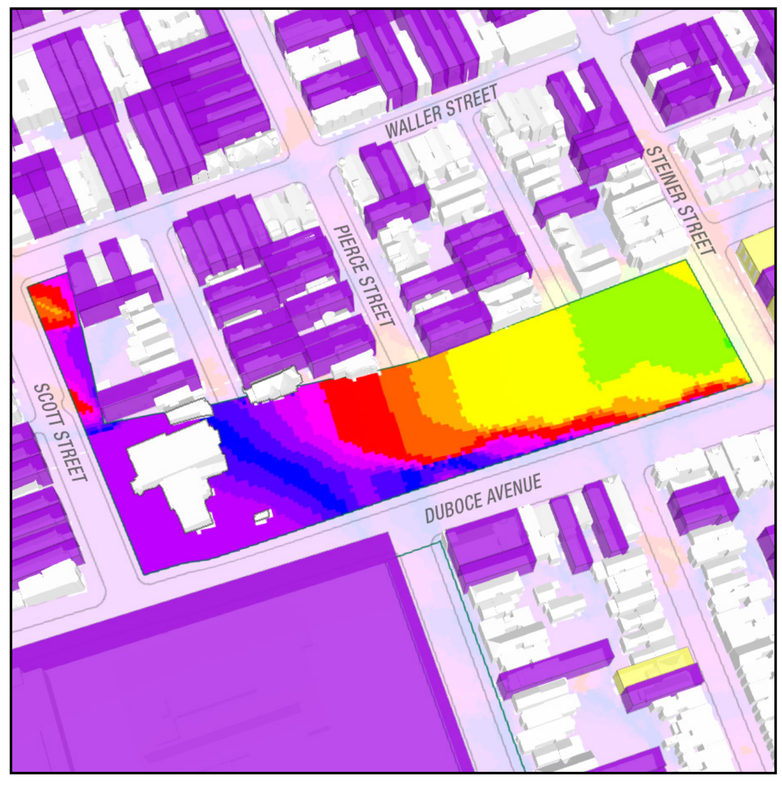




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

13 | GRATTAN PLAYGROUND

N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

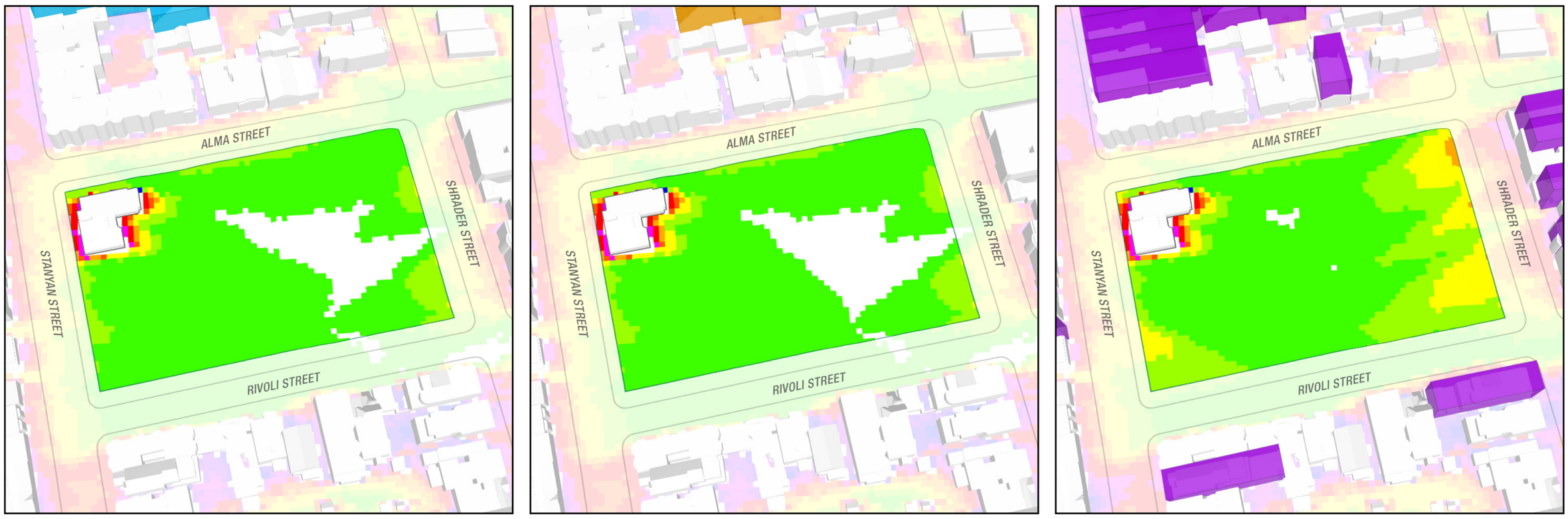
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

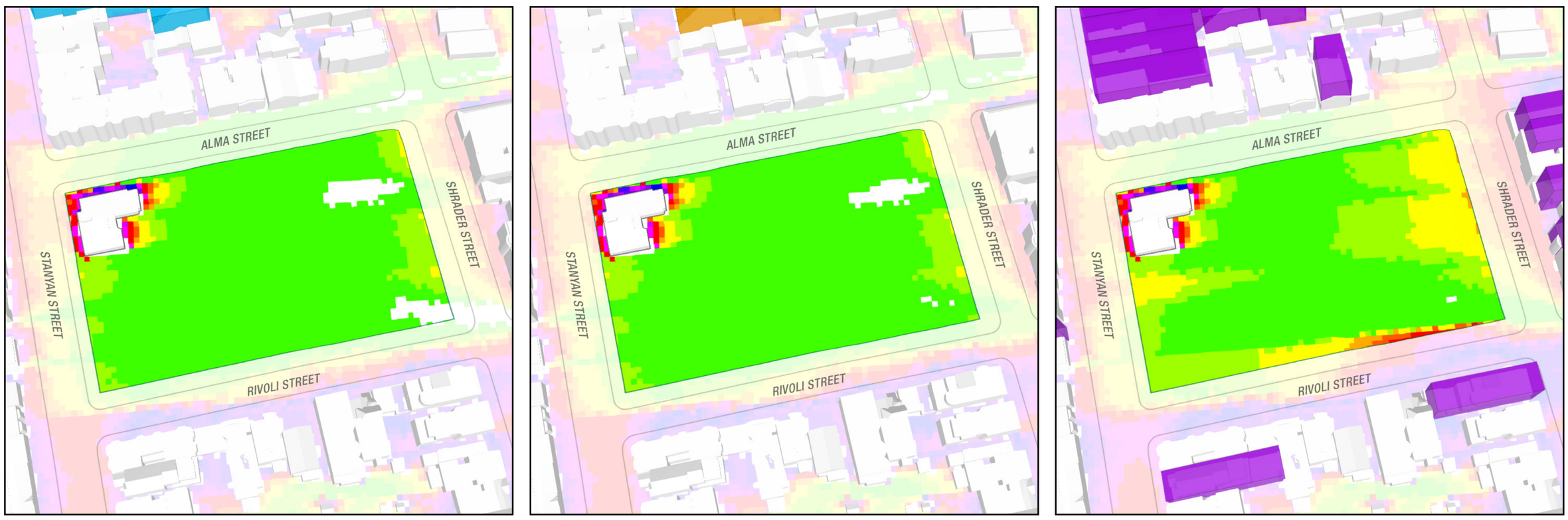
2050 ENVIRONMENTAL BASELINE

PROPOSED ACTION

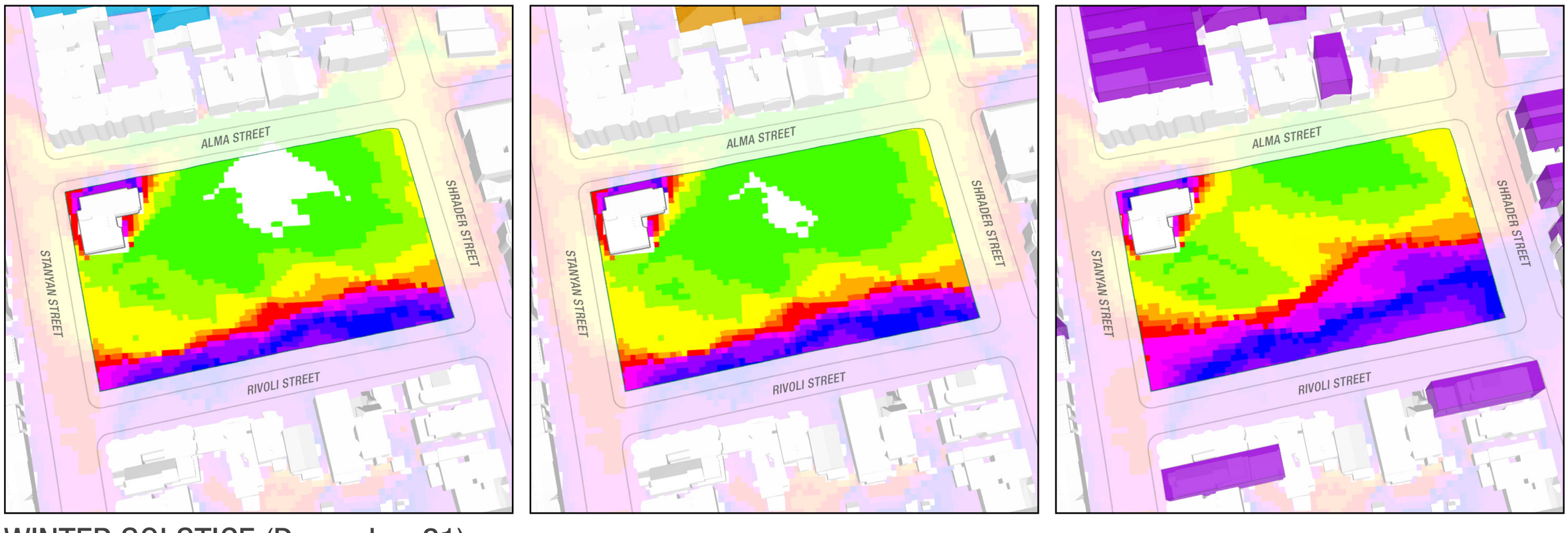
PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)



SPRING & FALL EQUINOXES (March 21 & September 21)



WINTER SOLSTICE (December 21)

14 | MISSION PLAYGROUND

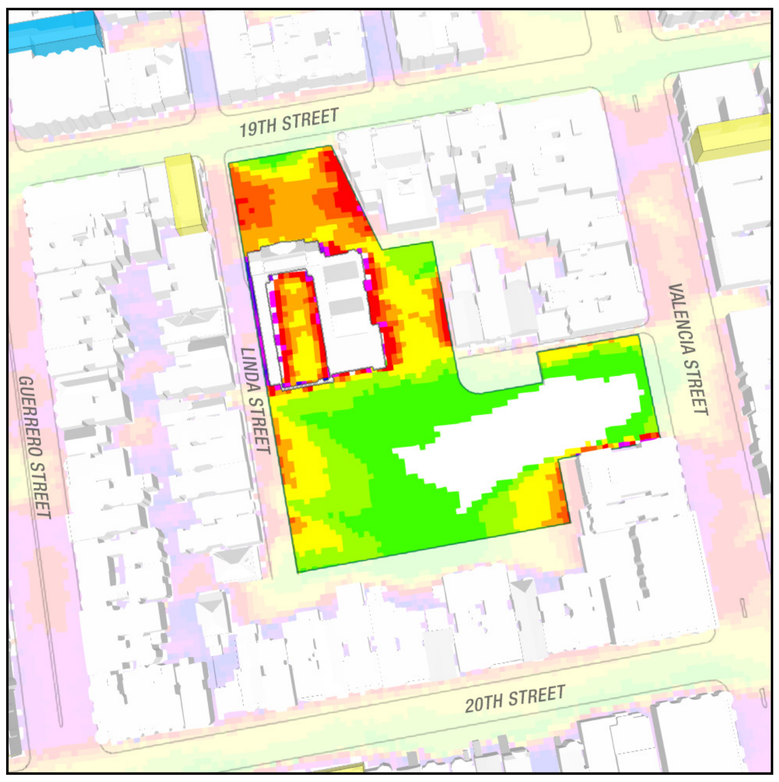
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

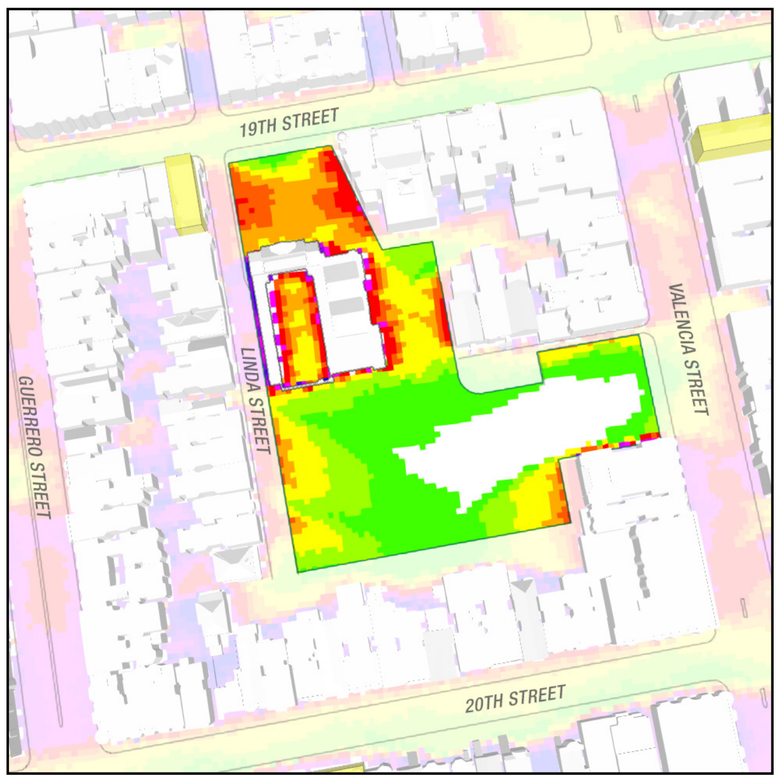
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

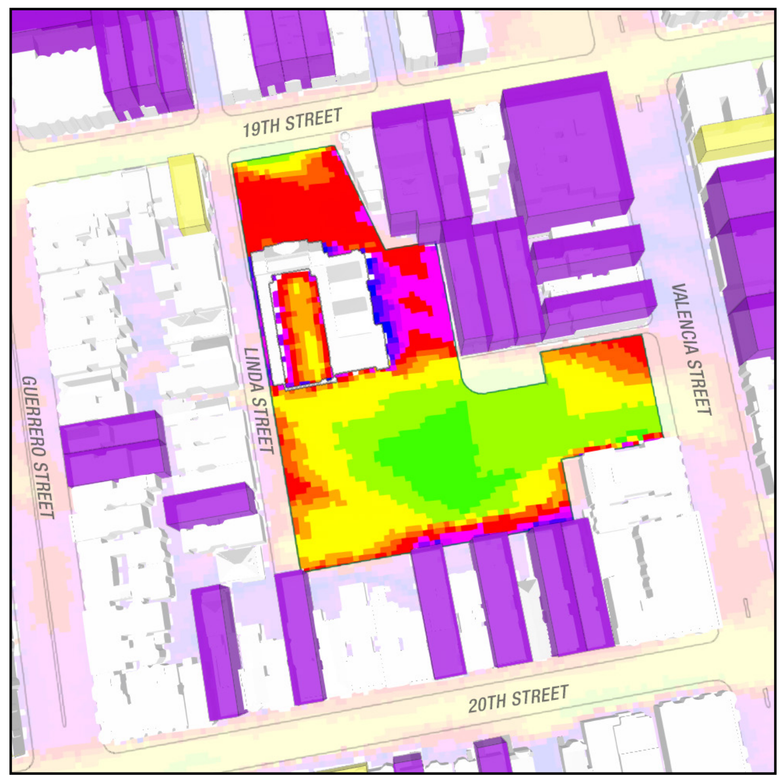
2050 ENVIRONMENTAL BASELINE



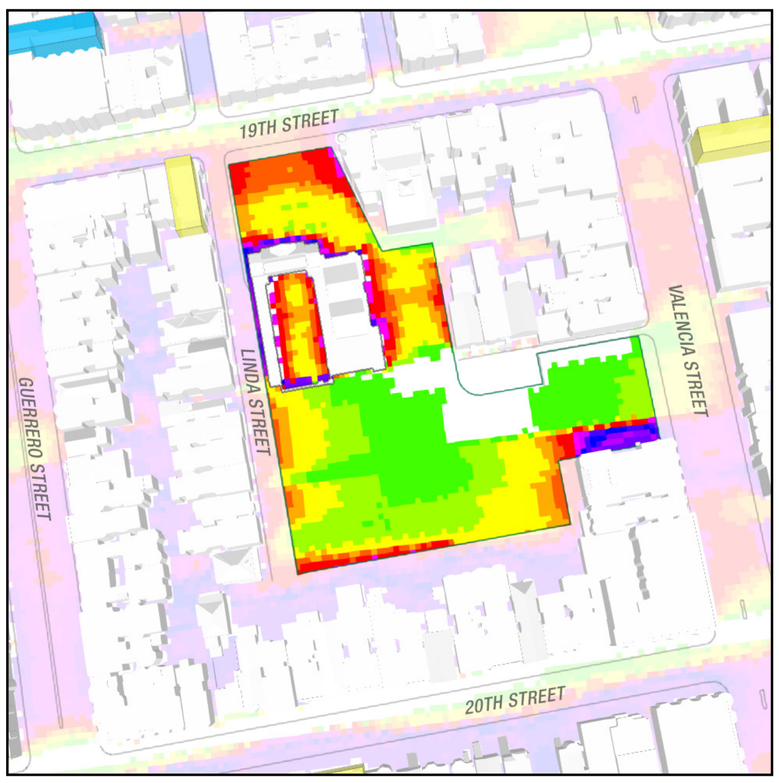
PROPOSED ACTION

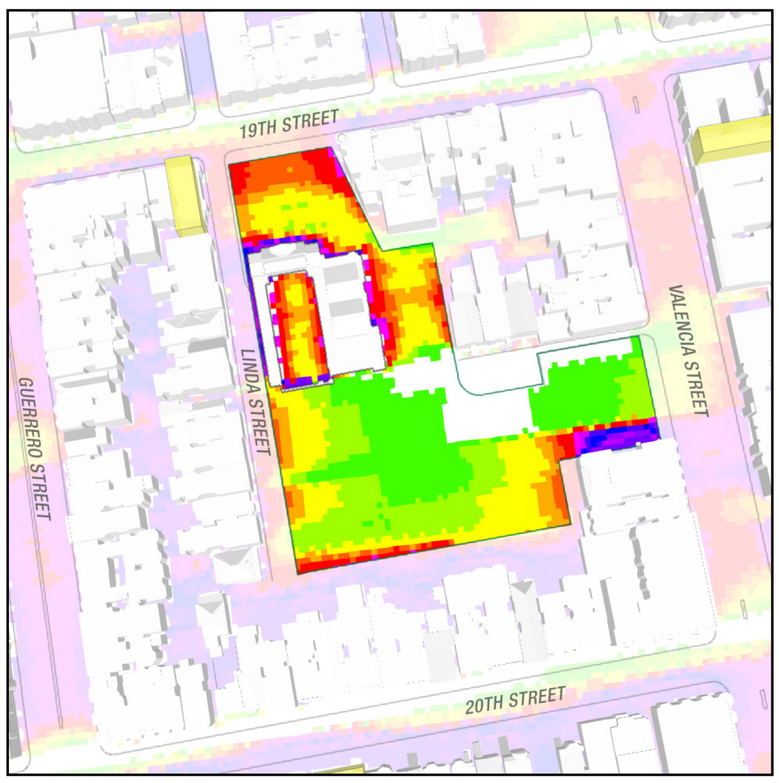


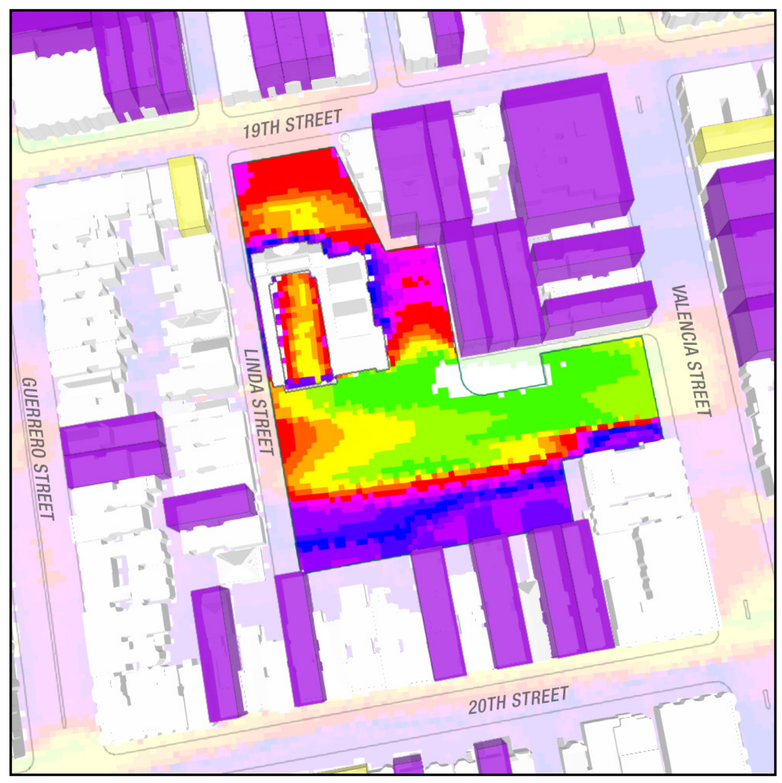
PLAN BAY AREA 2050



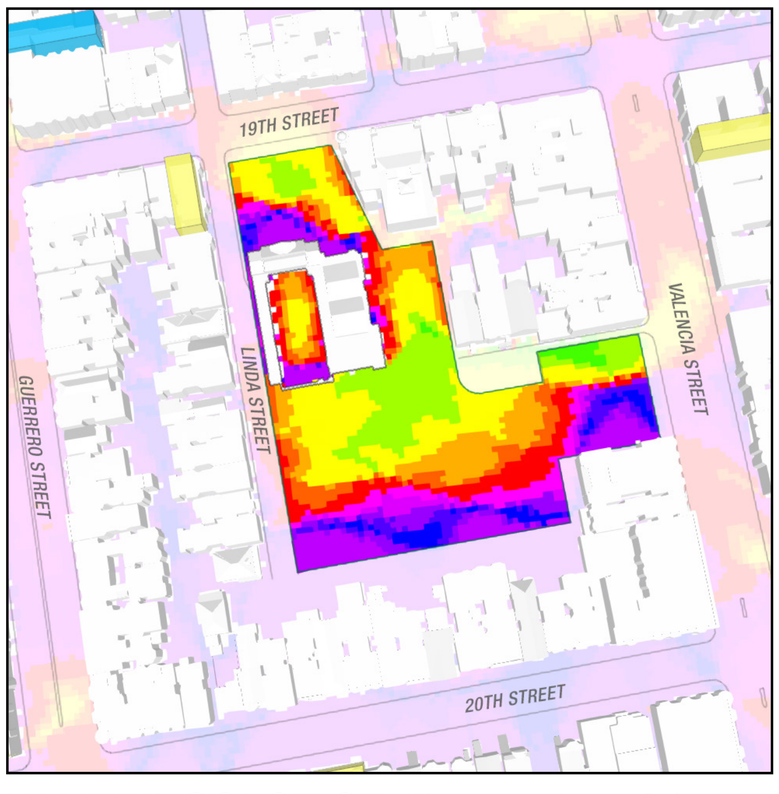
SUMMER SOLSTICE (June 21)

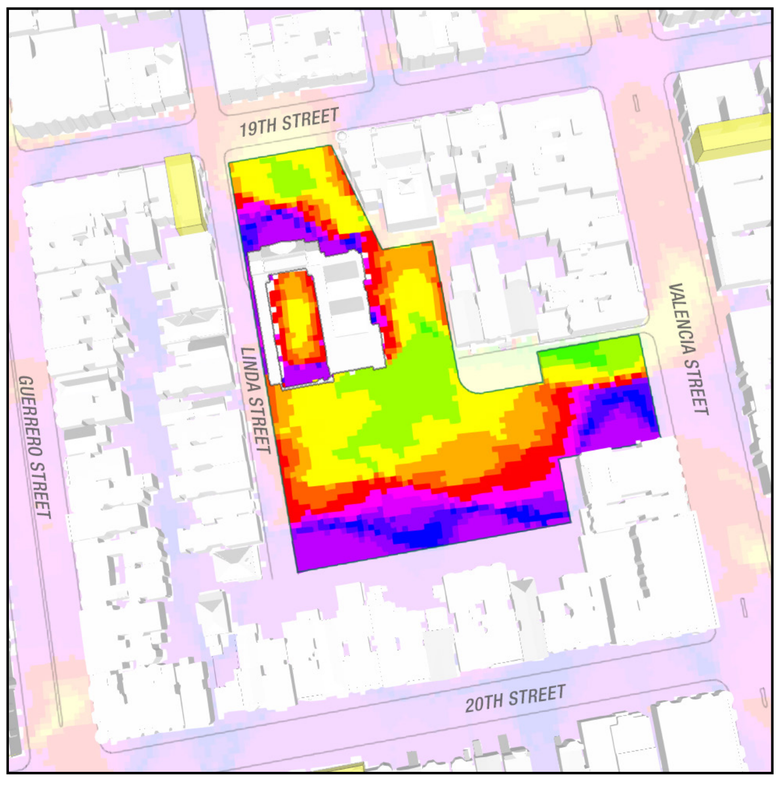


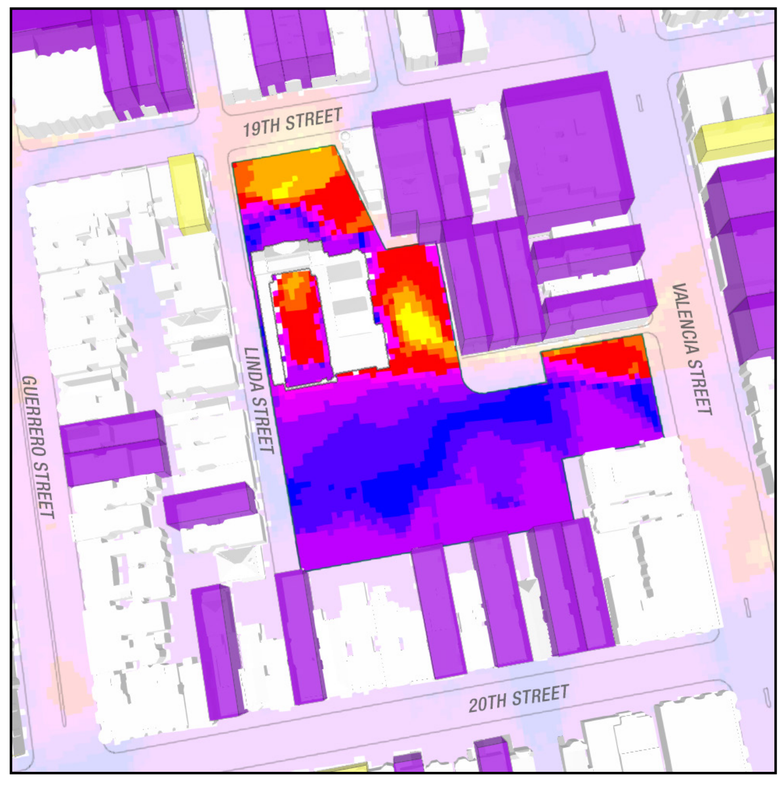




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

15 | MISSION DOLORES PARK

DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

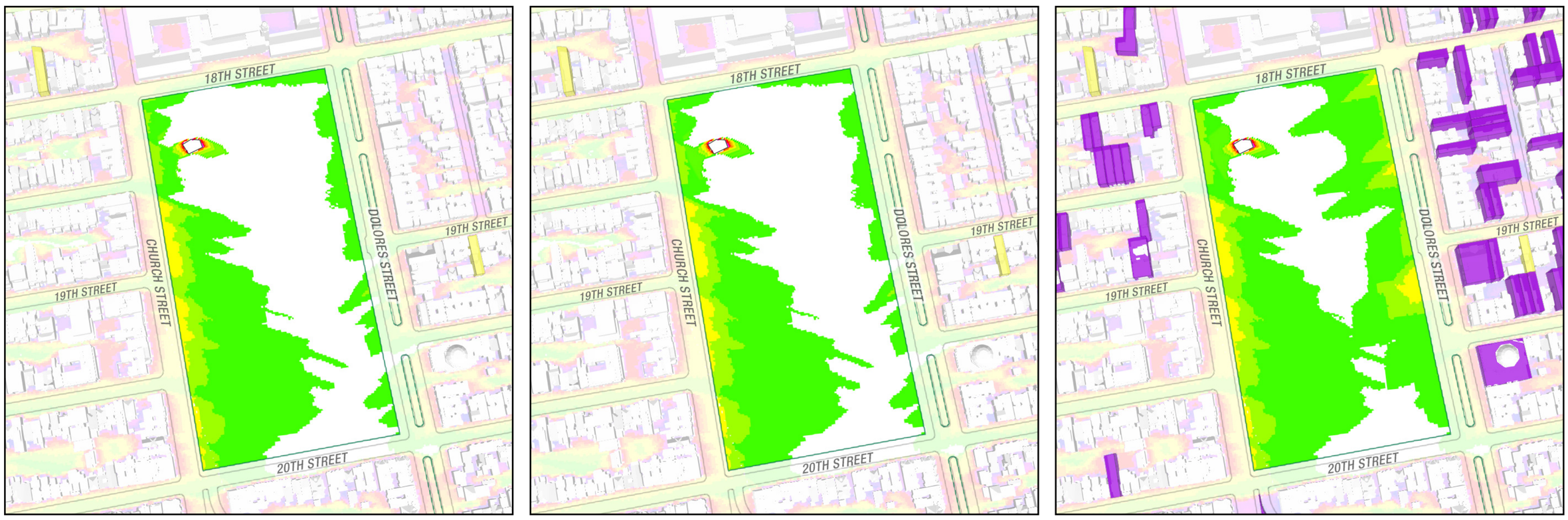
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

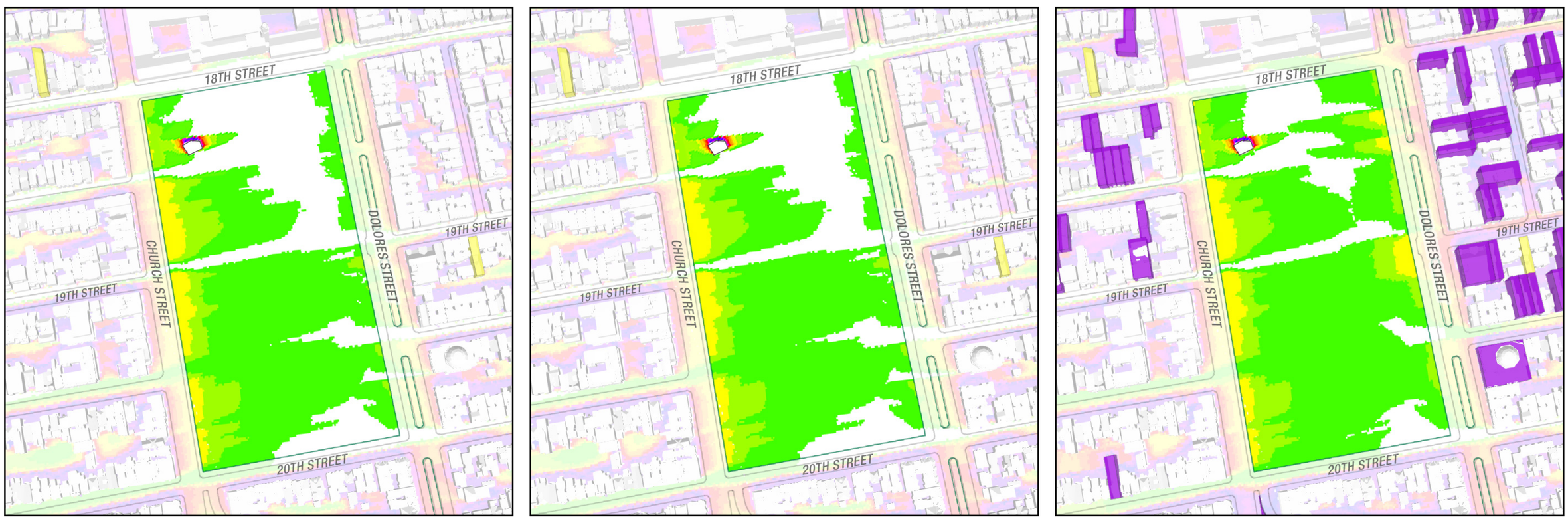
2050 ENVIRONMENTAL BASELINE

PROPOSED ACTION

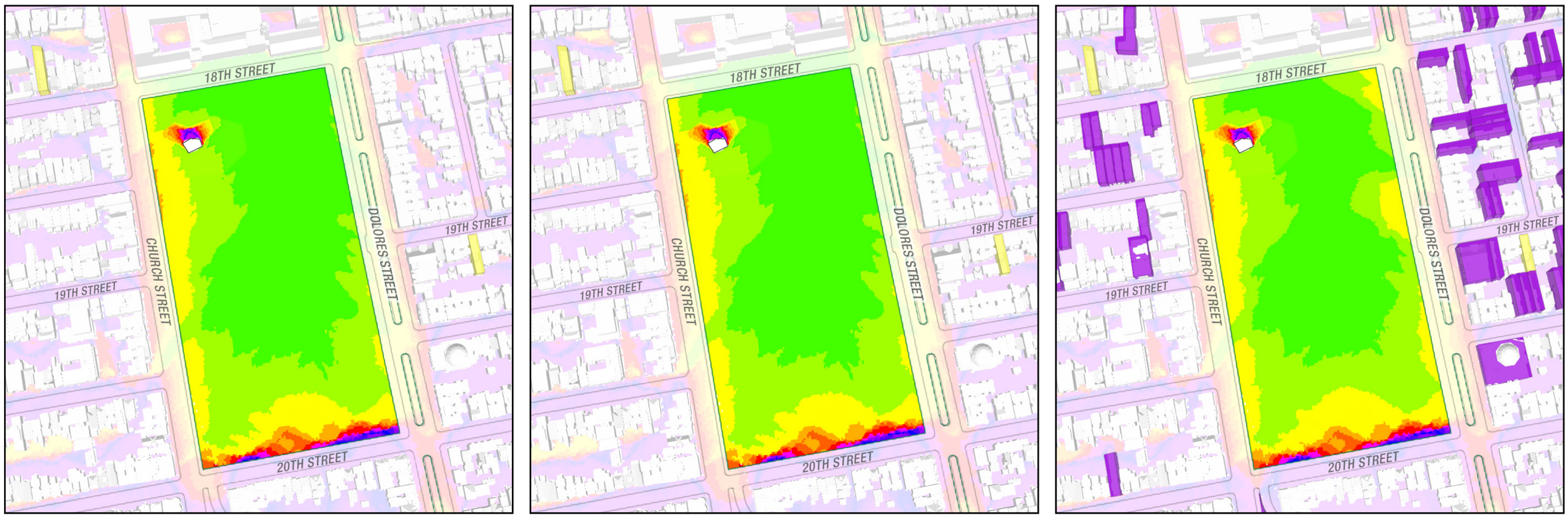
PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)



SPRING & FALL EQUINOXES (March 21 & September 21)



WINTER SOLSTICE (December 21)

16 | DANIEL WEBSTER ELEMENTARY

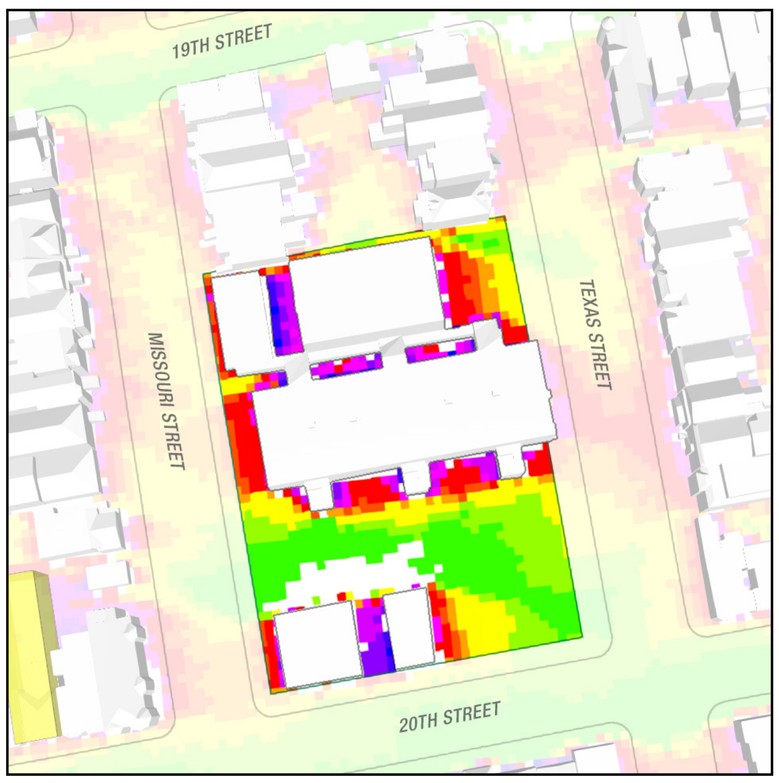
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

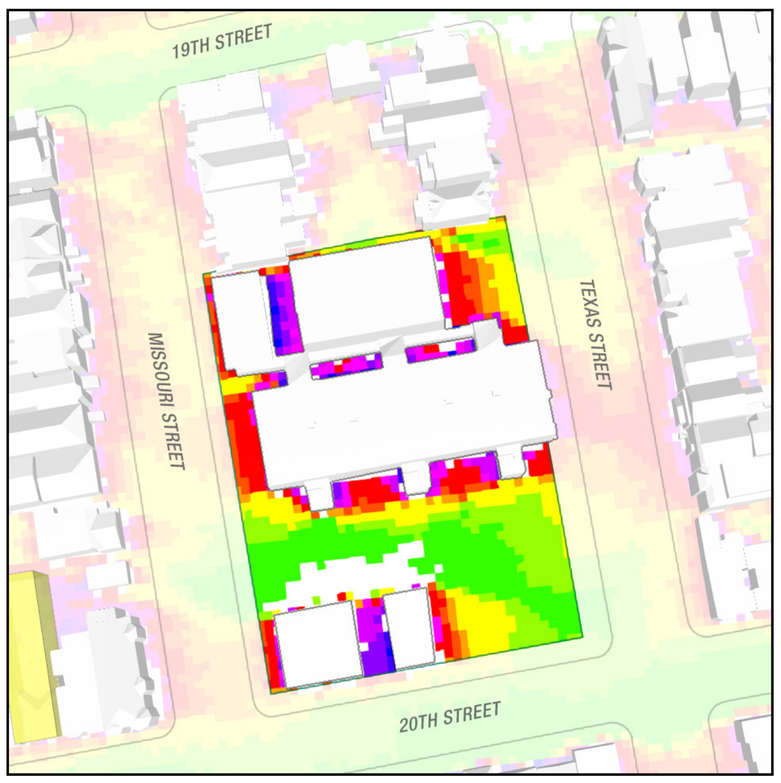
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

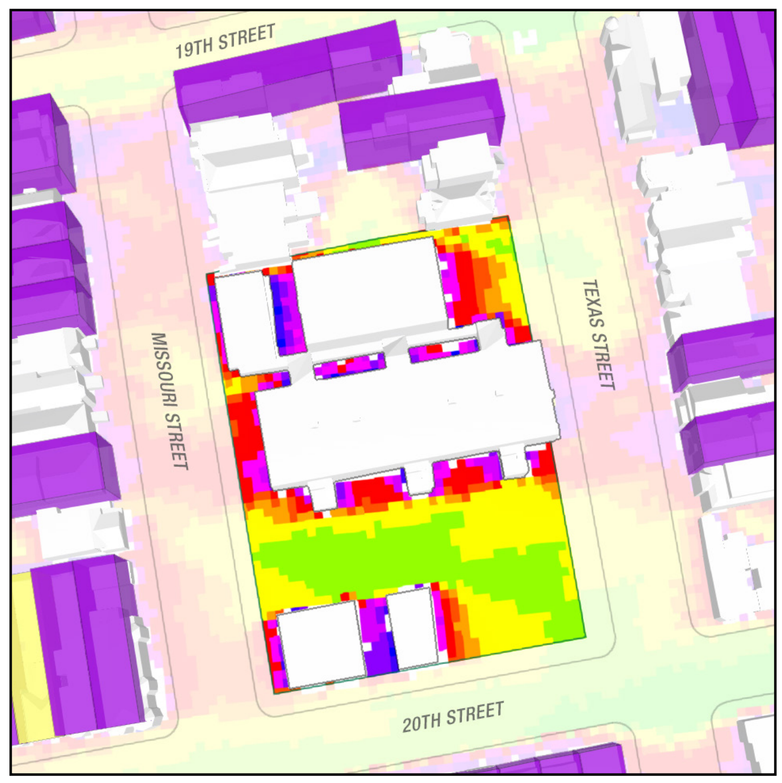
2050 ENVIRONMENTAL BASELINE



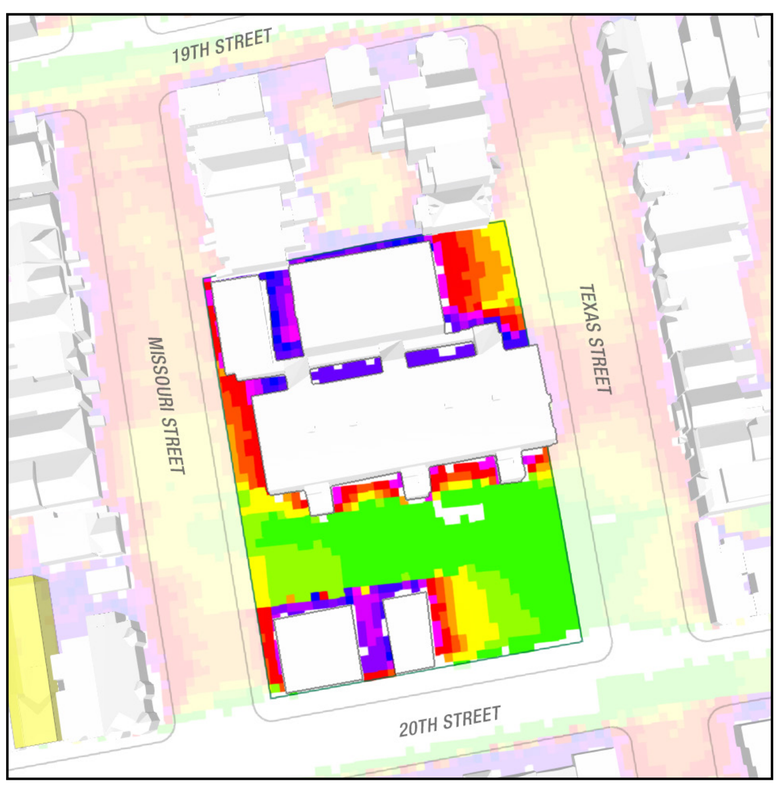
PROPOSED ACTION

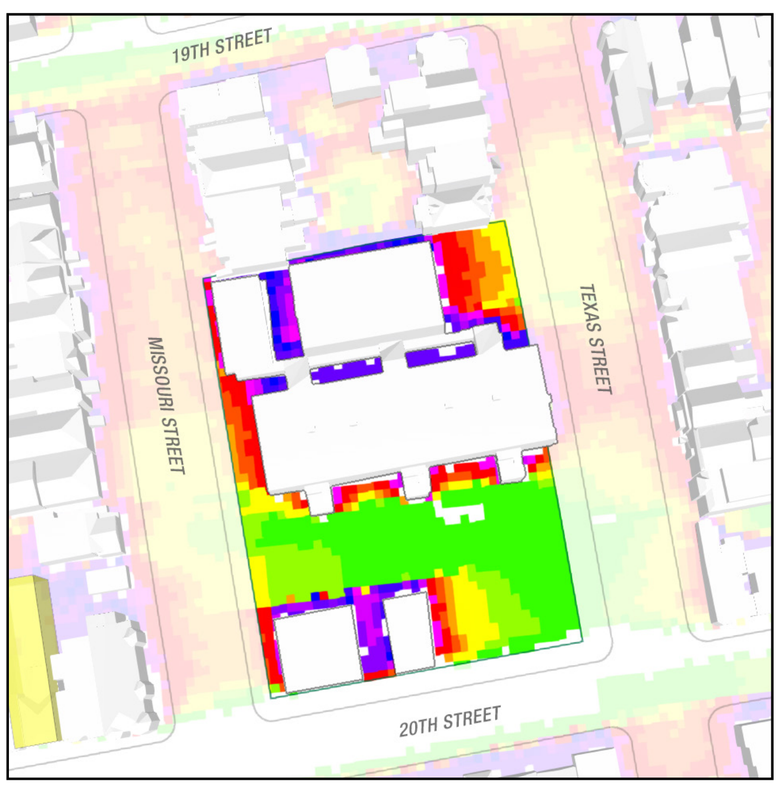


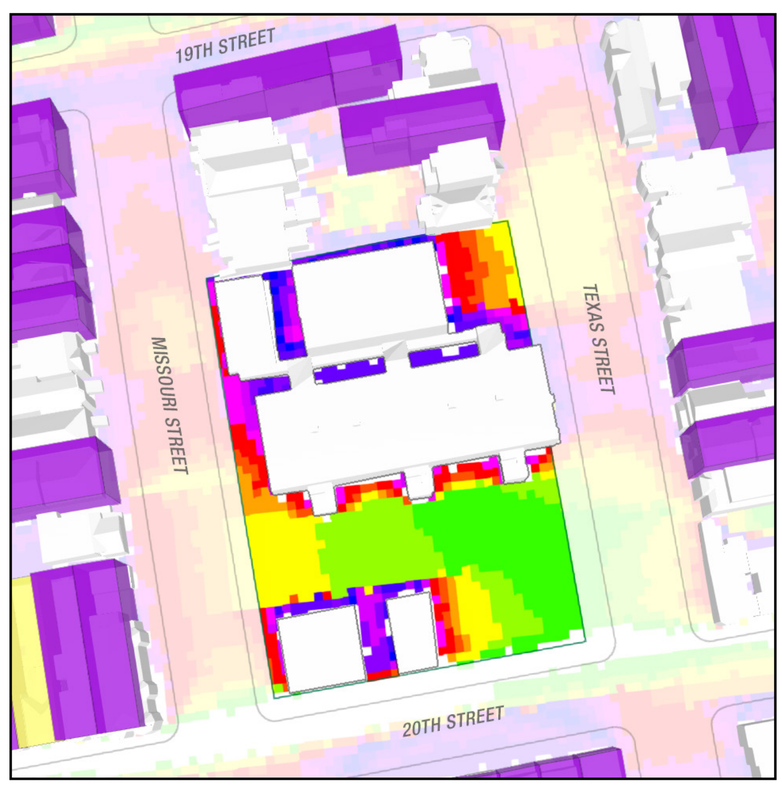
PLAN BAY AREA 2050



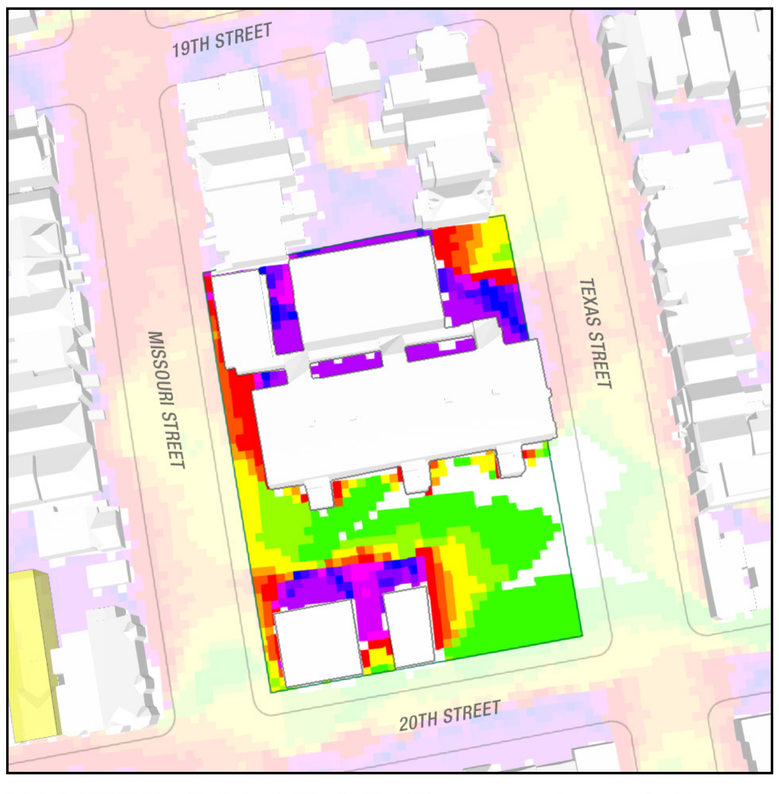
SUMMER SOLSTICE (June 21)

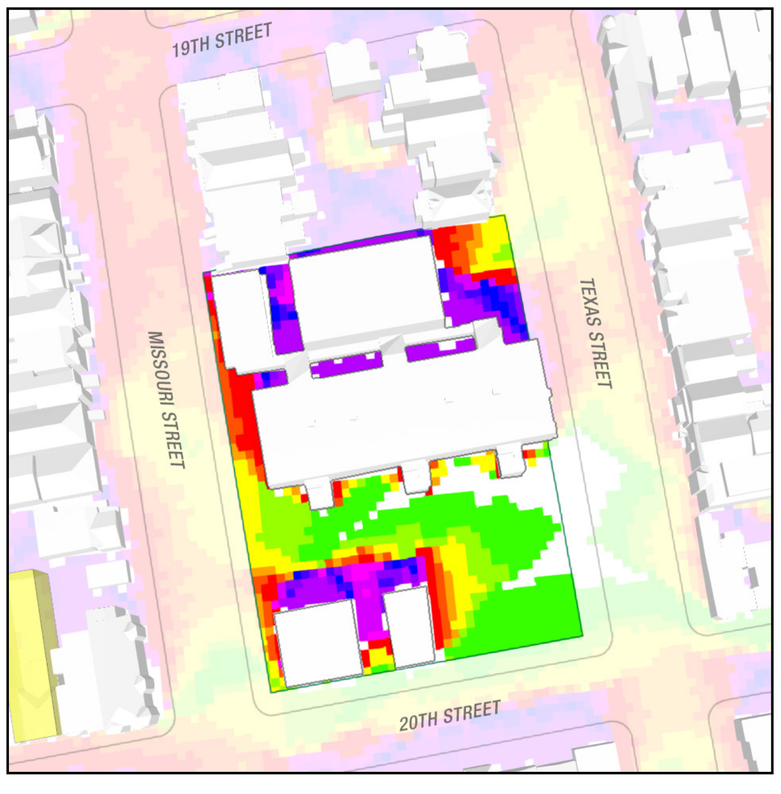


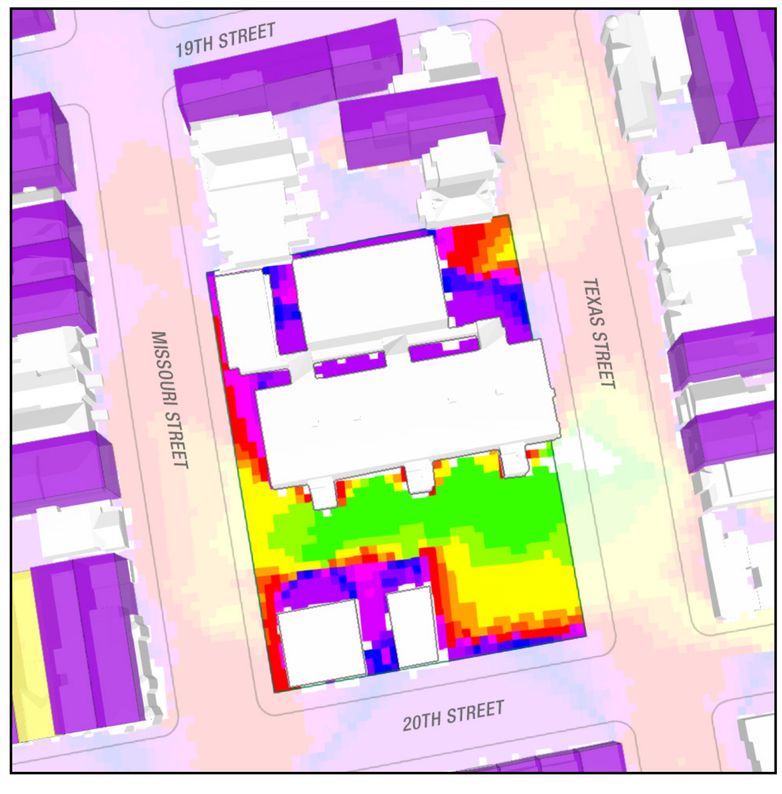




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

17 | POTRERO HILL RECREATION CENTER

N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

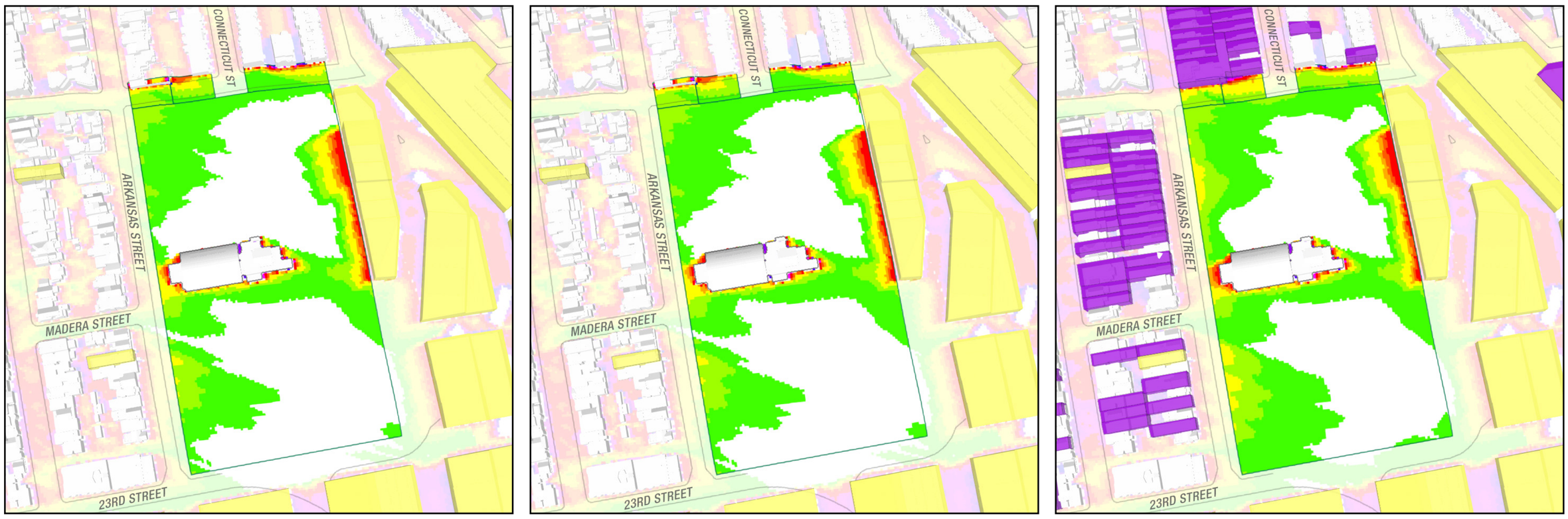
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

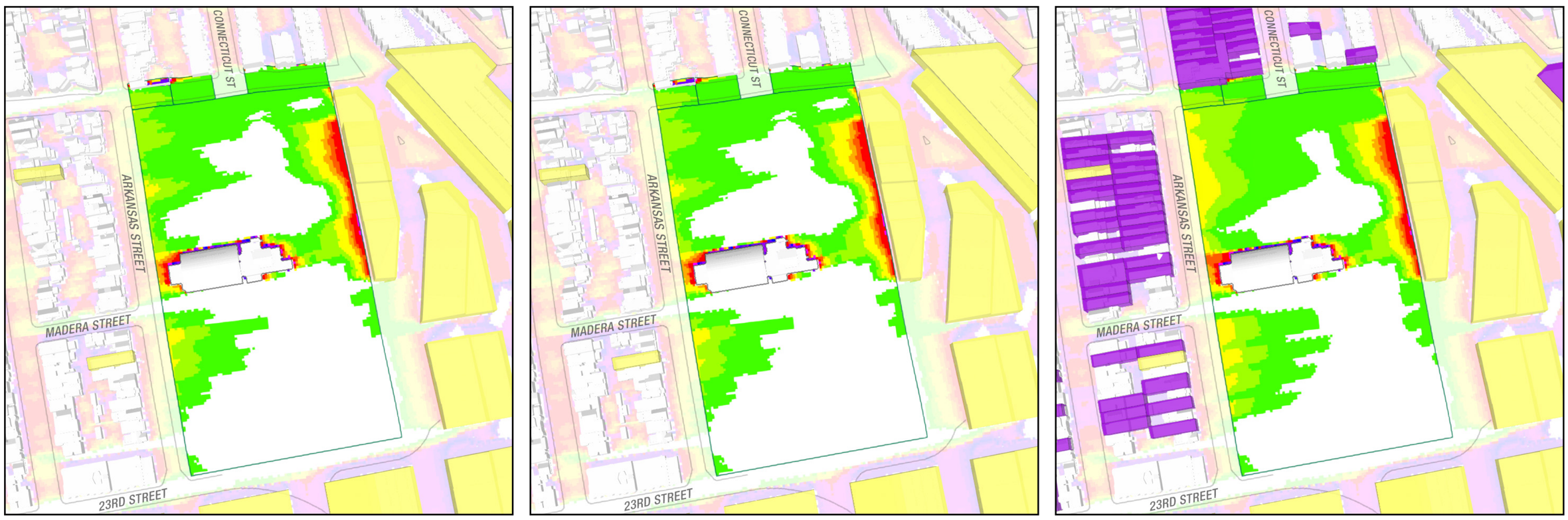
2050 ENVIRONMENTAL BASELINE

PROPOSED ACTION

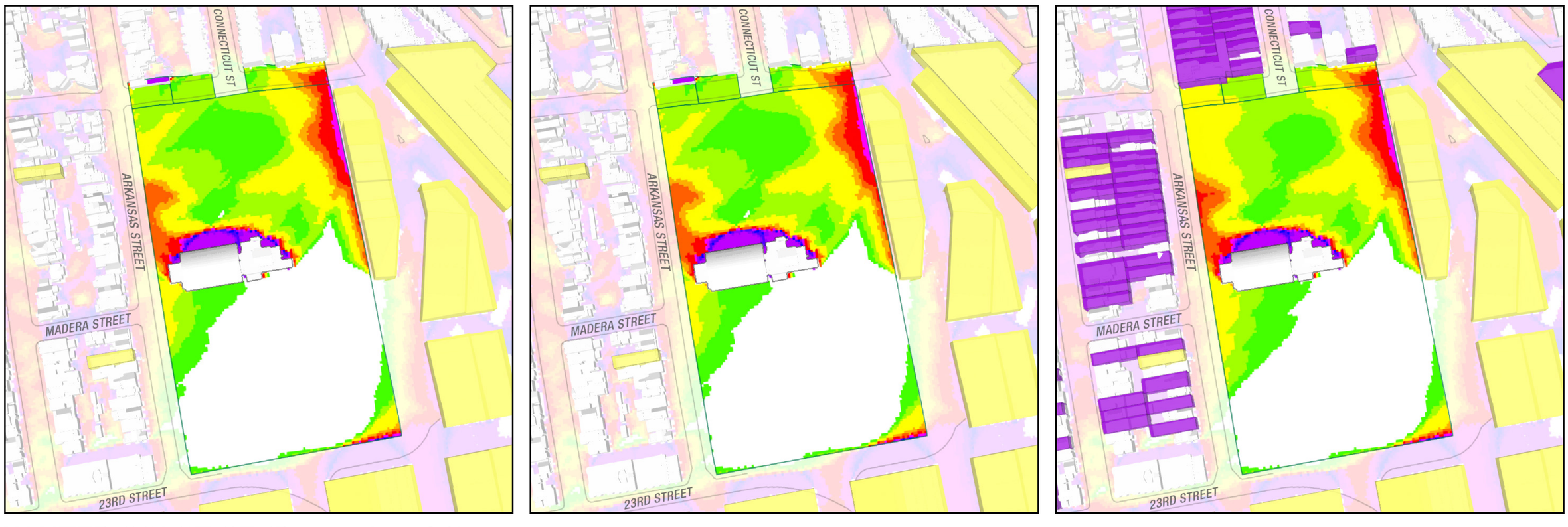
PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)



SPRING & FALL EQUINOXES (March 21 & September 21)



WINTER SOLSTICE (December 21)

18 | GARFIELD SQUARE

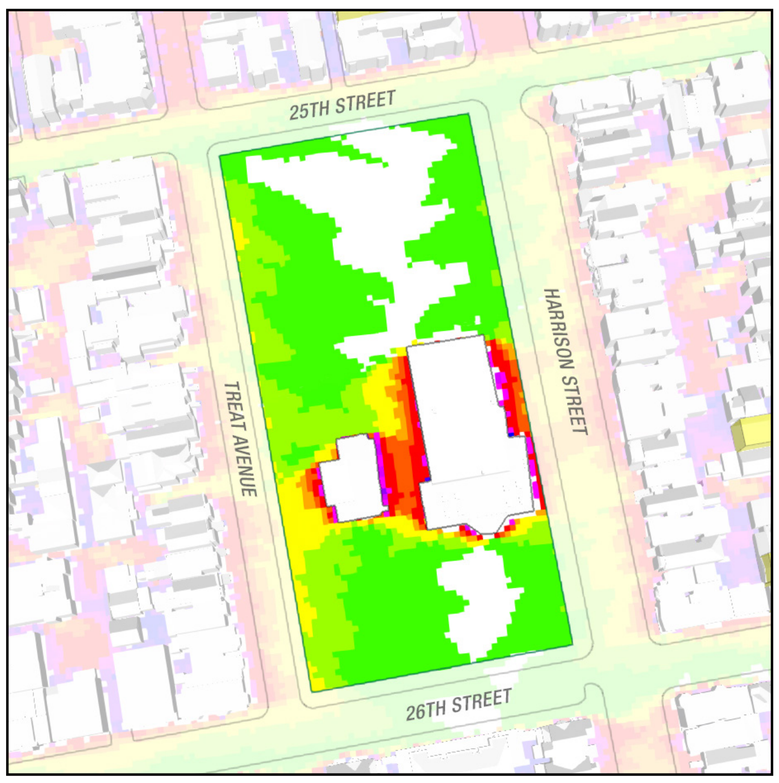
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

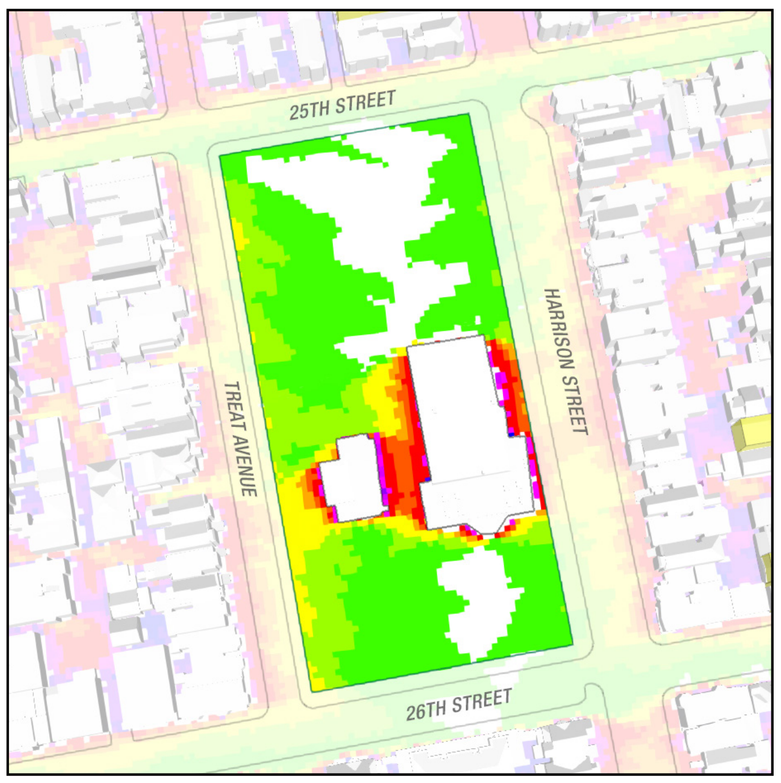
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

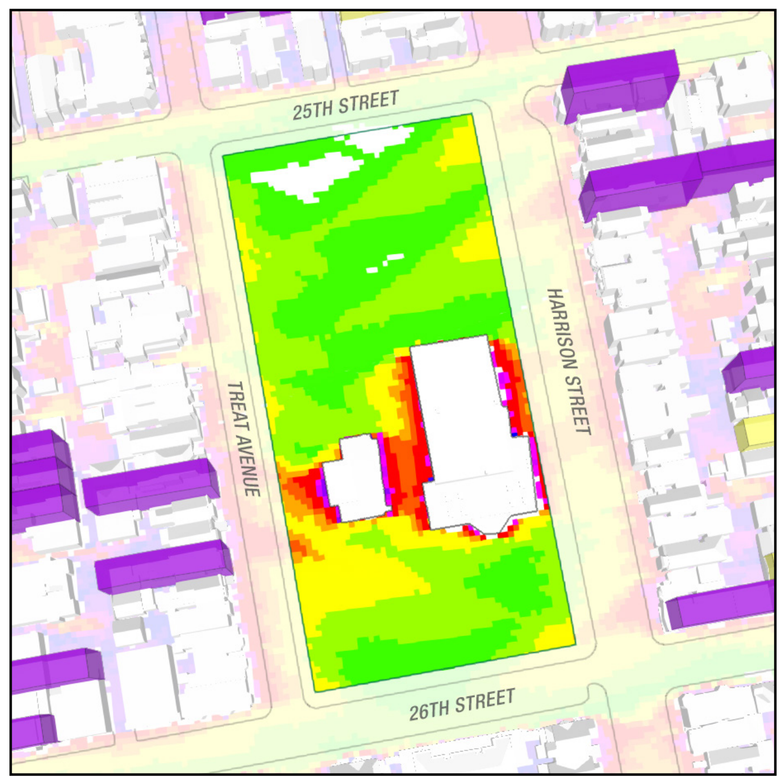
2050 ENVIRONMENTAL BASELINE



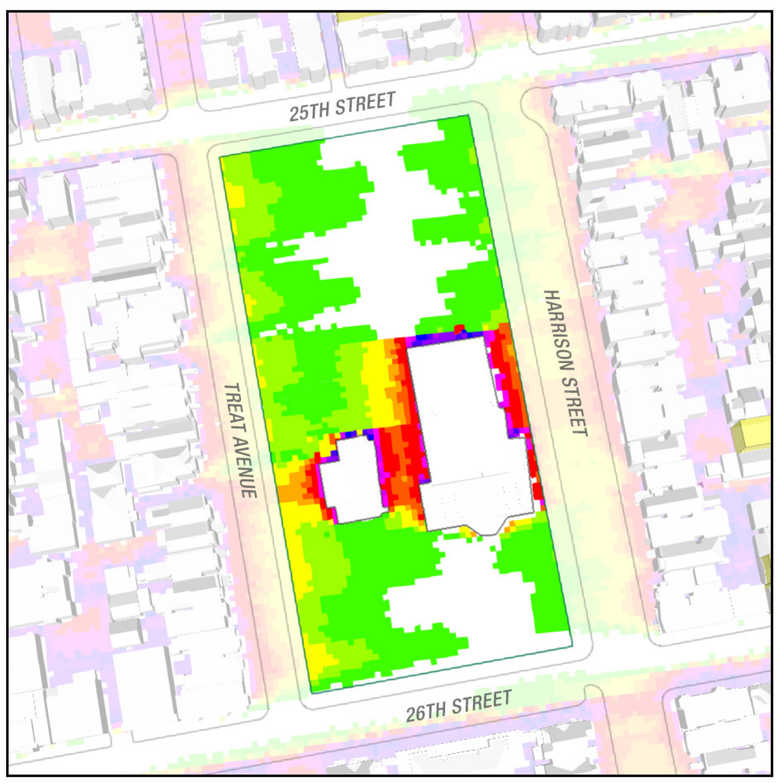
PROPOSED ACTION

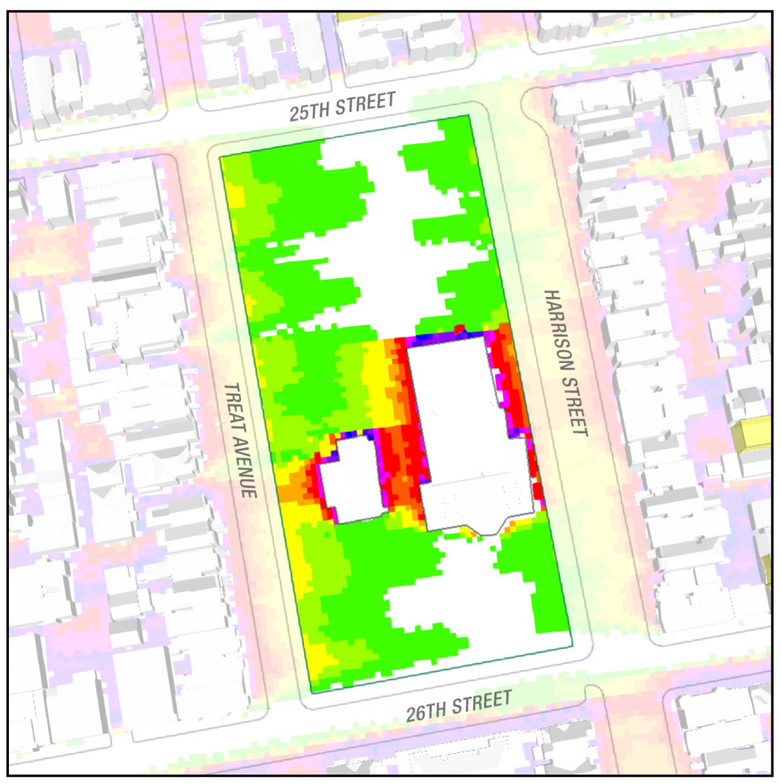


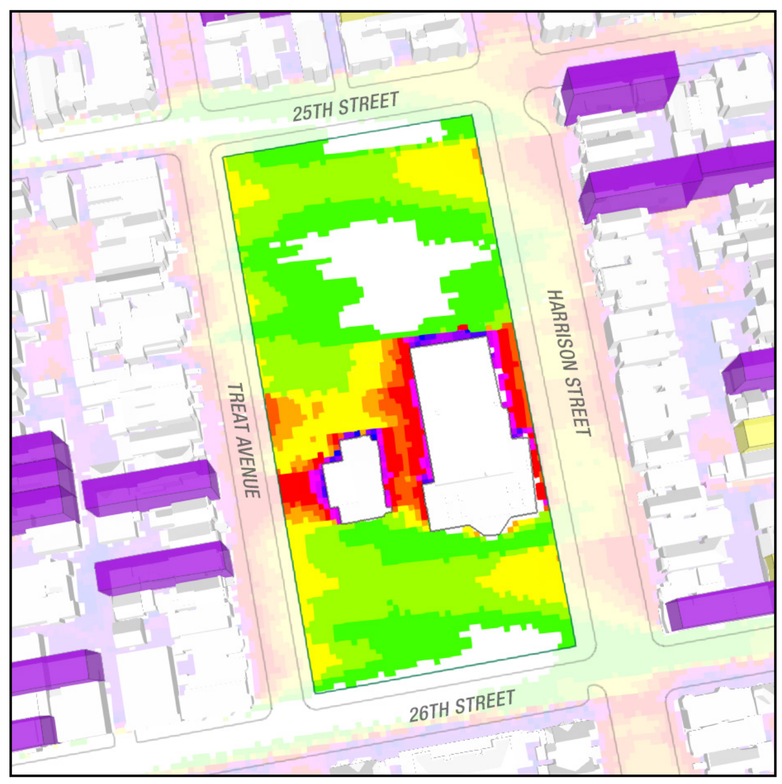
PLAN BAY AREA 2050



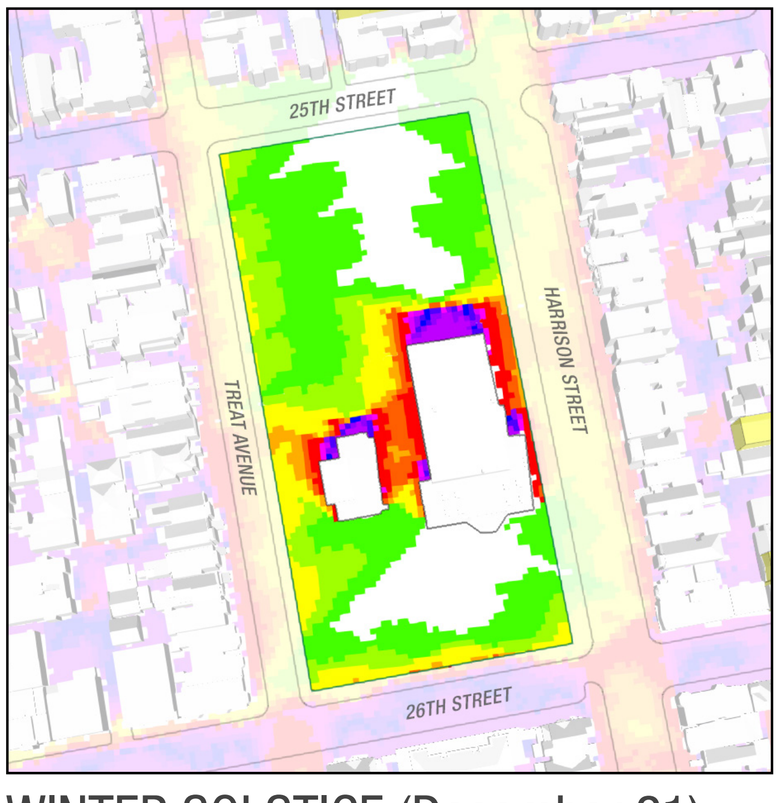
SUMMER SOLSTICE (June 21)

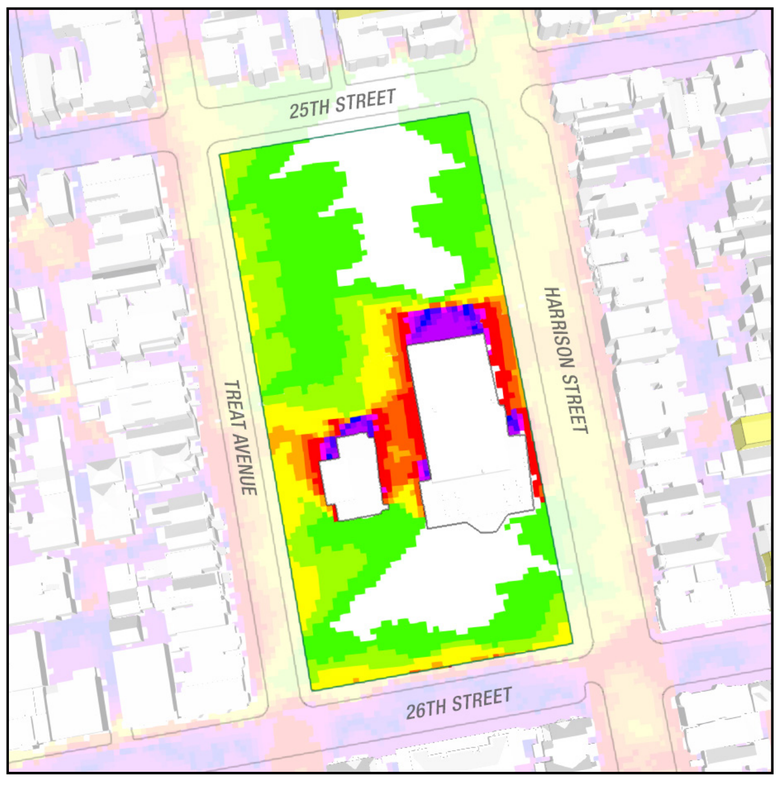


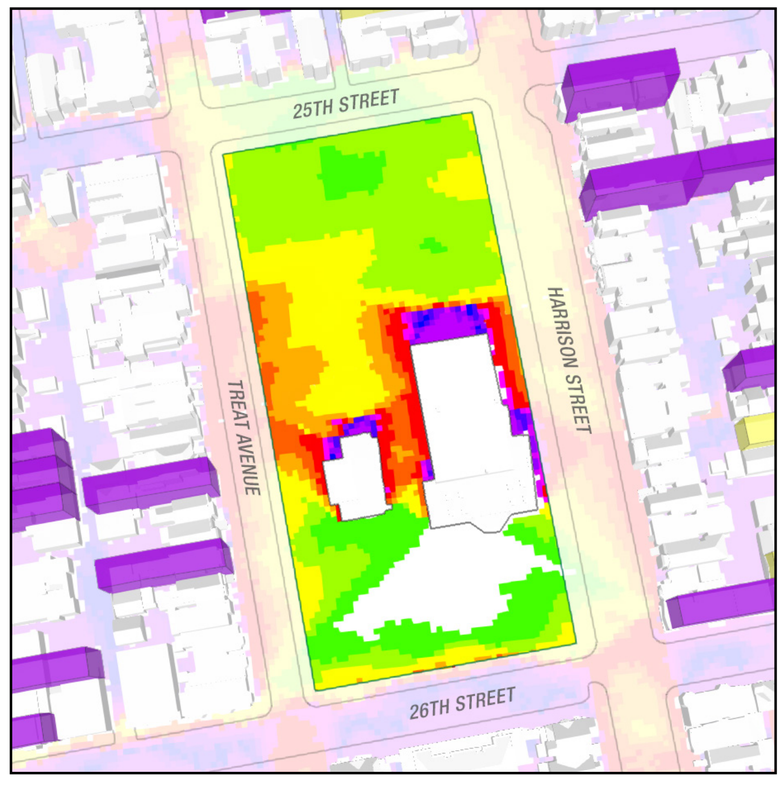




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

19 | BAY VIEW PARK KC JONES PLAYGROUND

N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

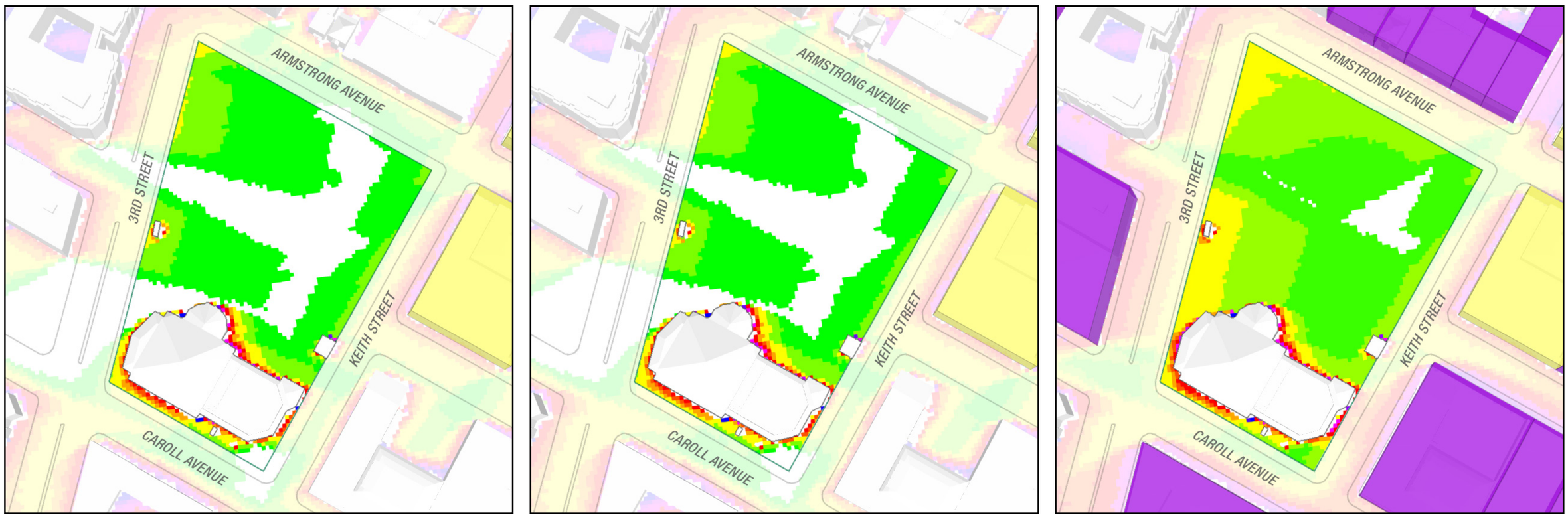
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

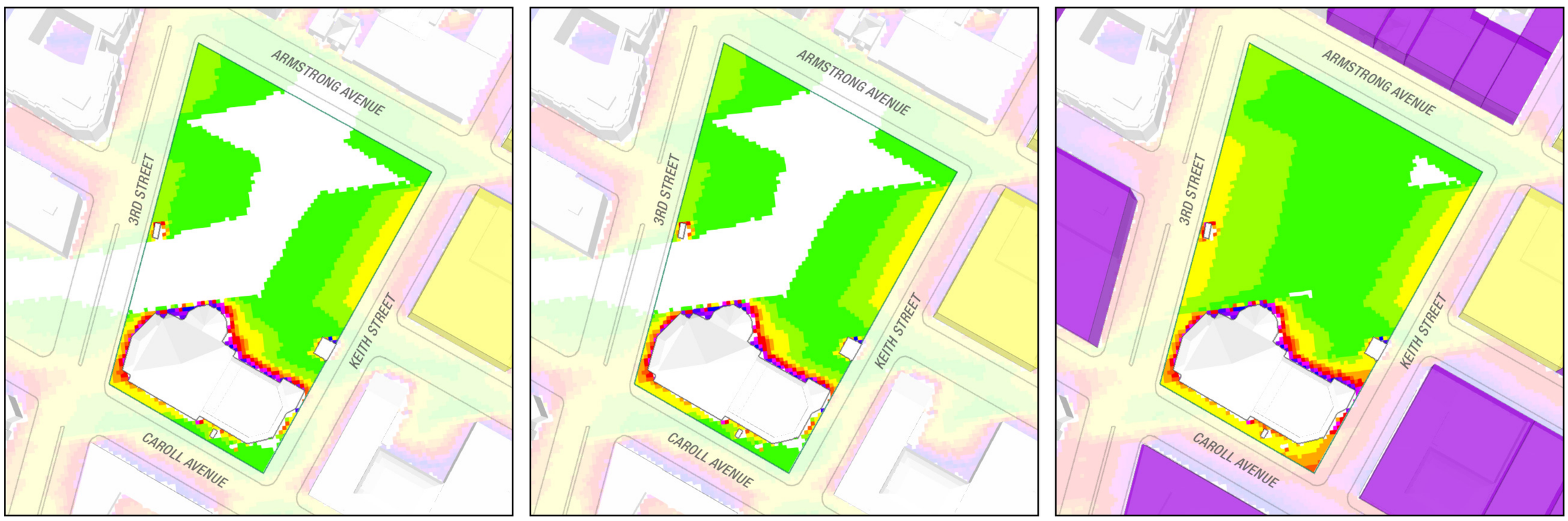
2050 ENVIRONMENTAL BASELINE

PROPOSED ACTION

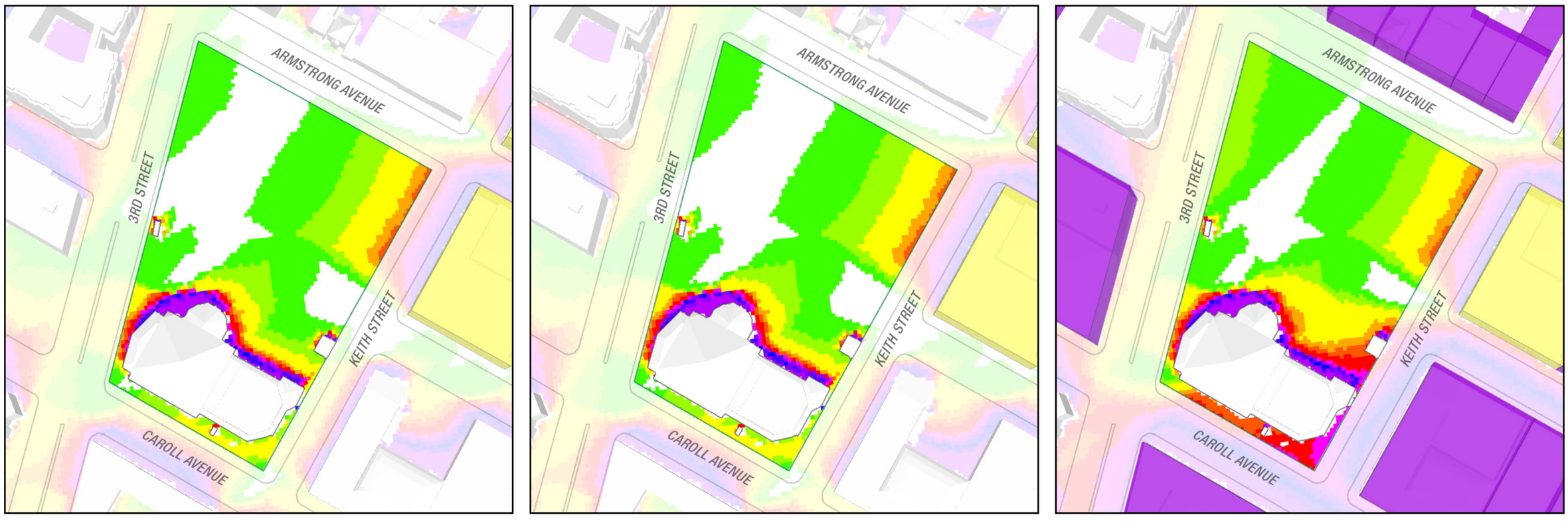
PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)



SPRING & FALL EQUINOXES (March 21 & September 21)



WINTER SOLSTICE (December 21)

20 | OCEANVIEW PLAYGROUND

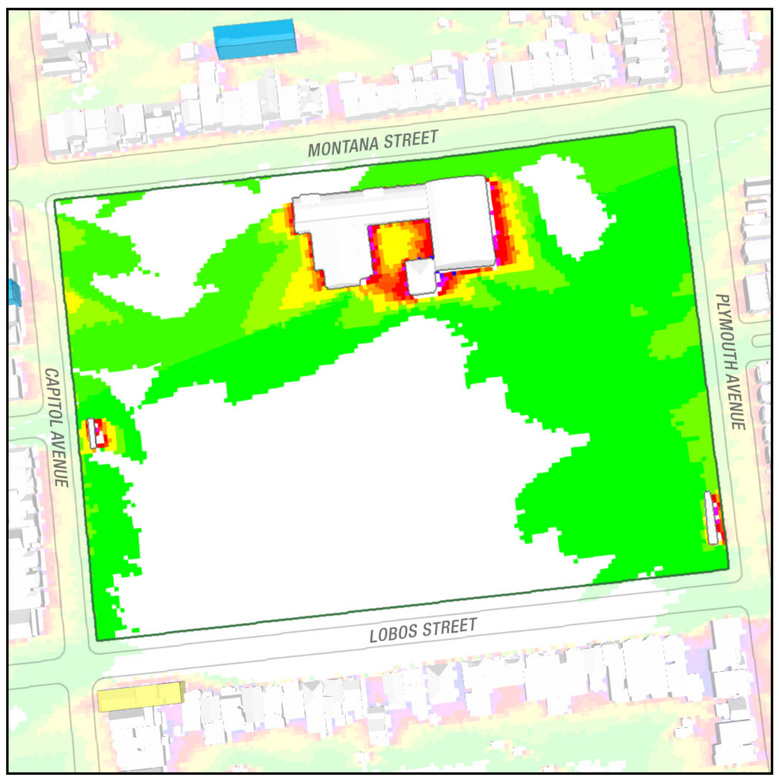
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

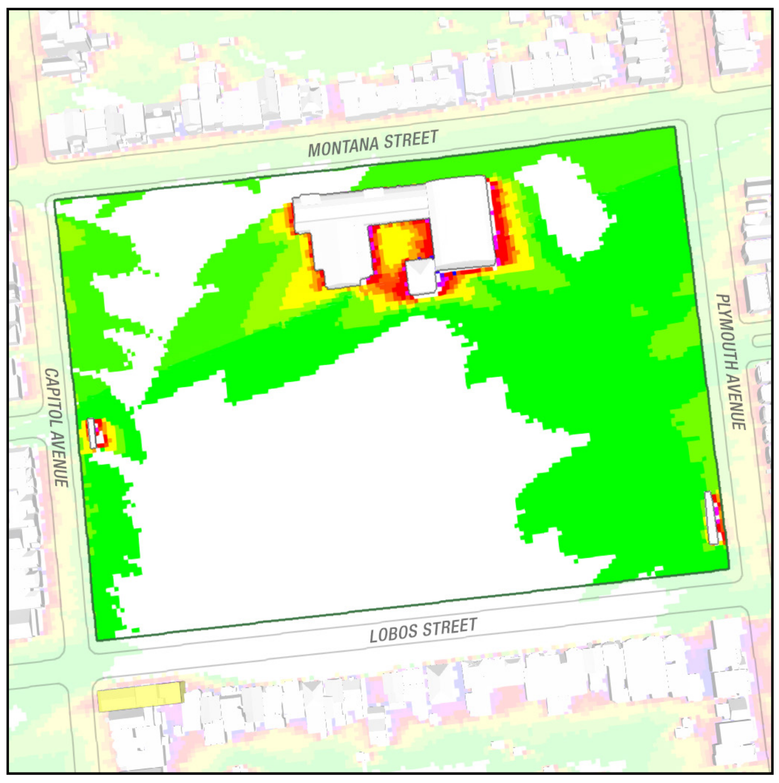
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

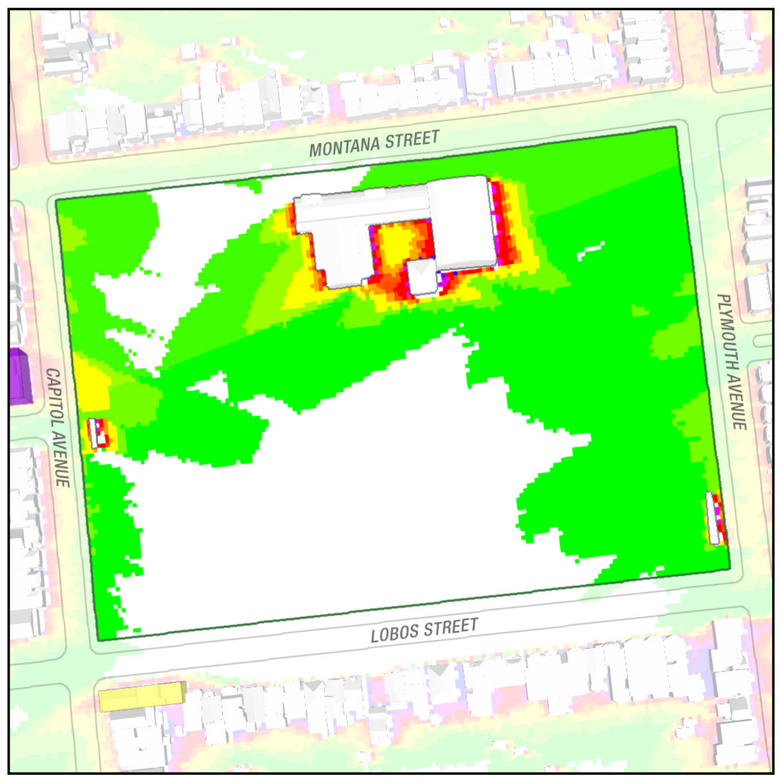
2050 ENVIRONMENTAL BASELINE



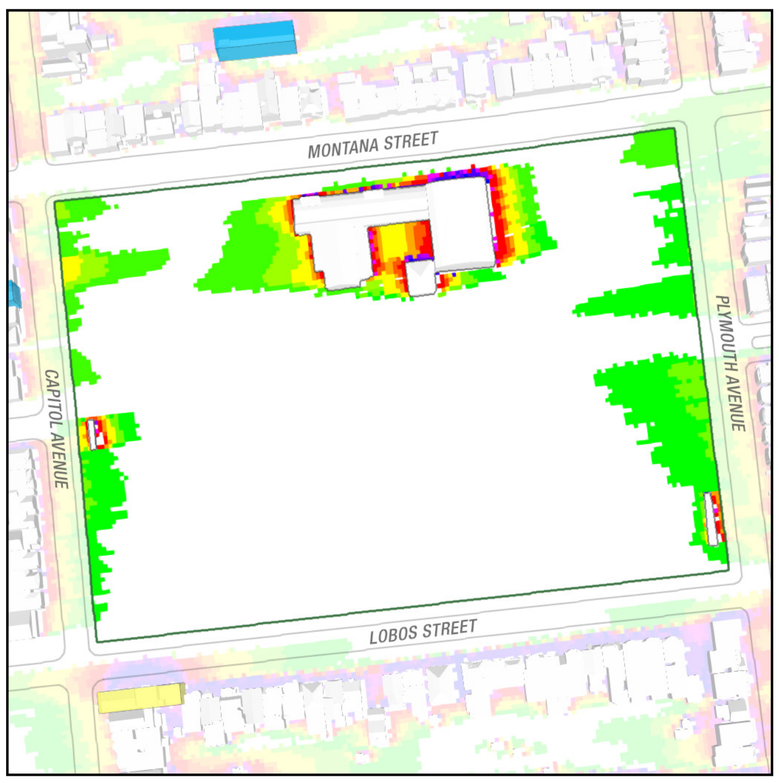
PROPOSED ACTION

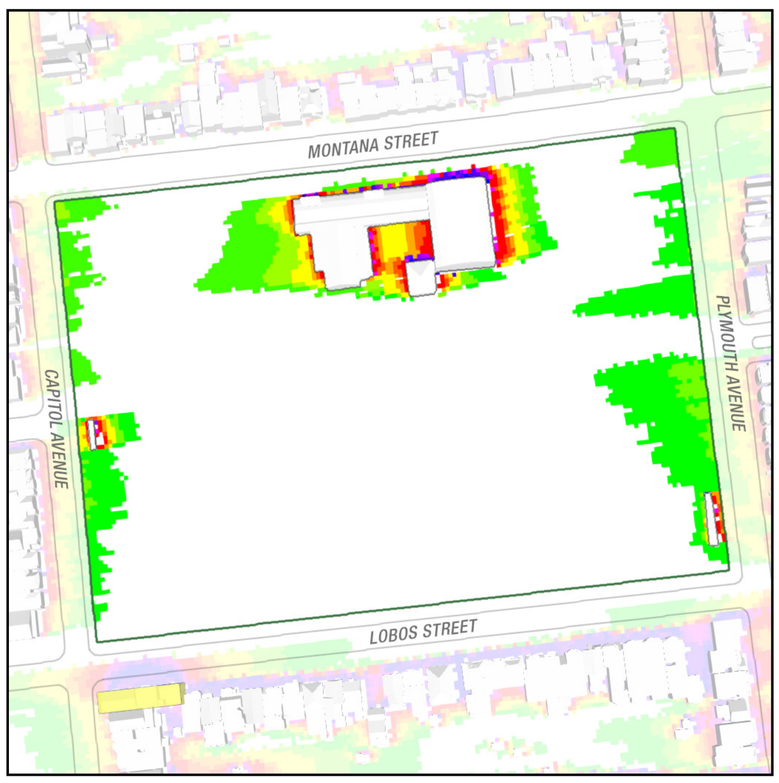


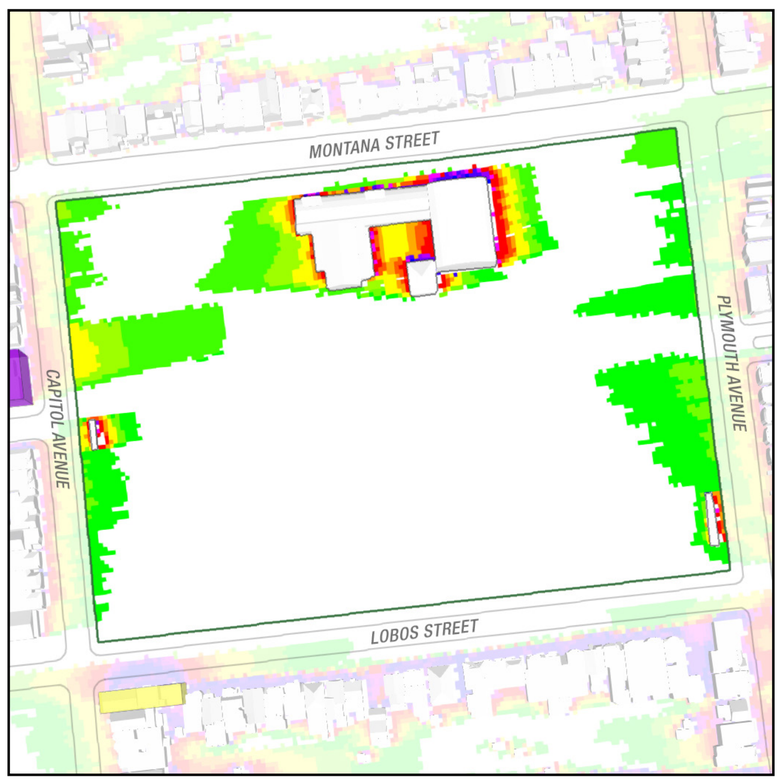
PLAN BAY AREA 2050



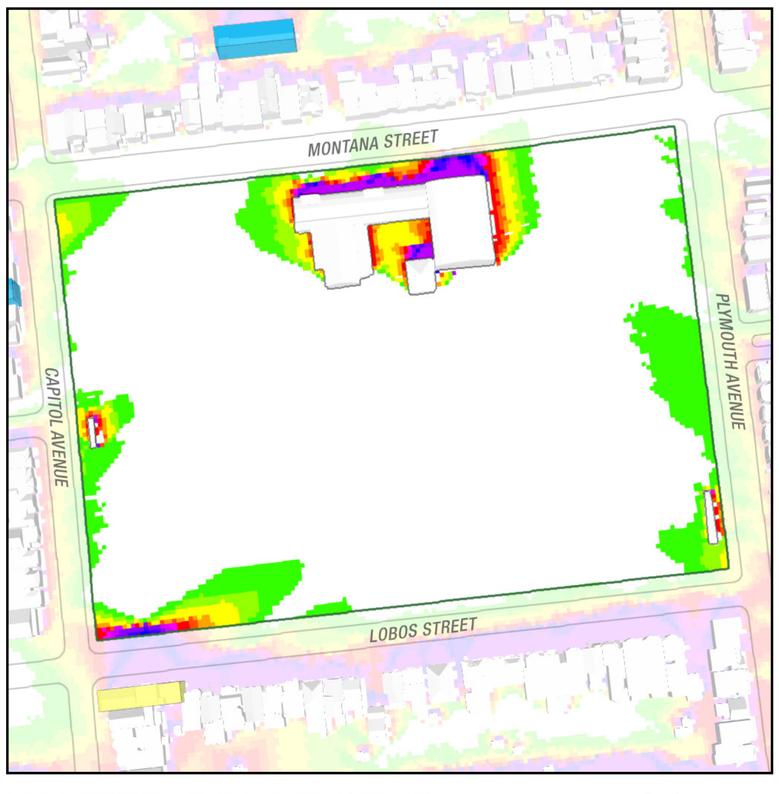
SUMMER SOLSTICE (June 21)

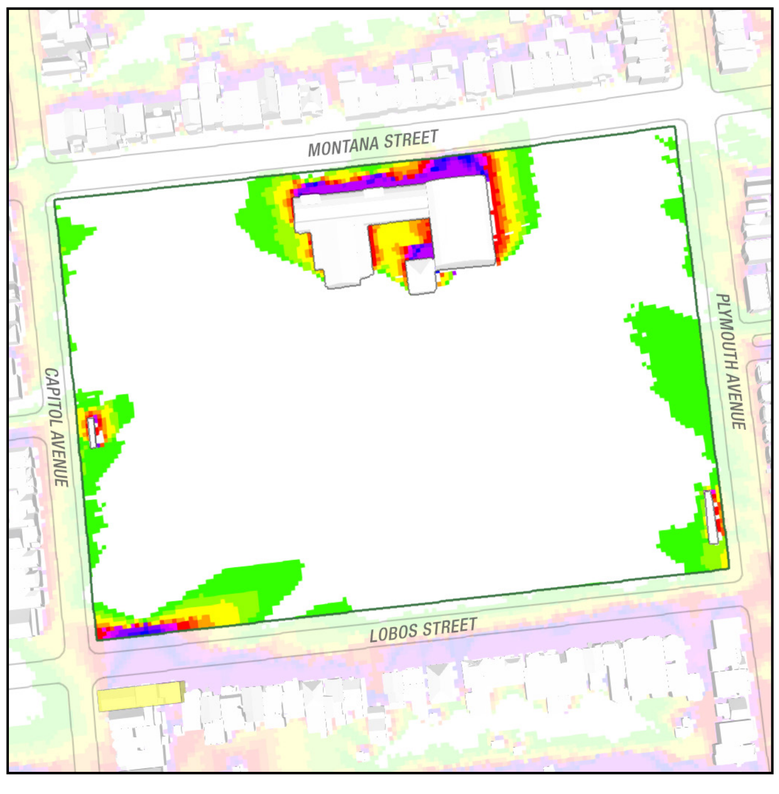


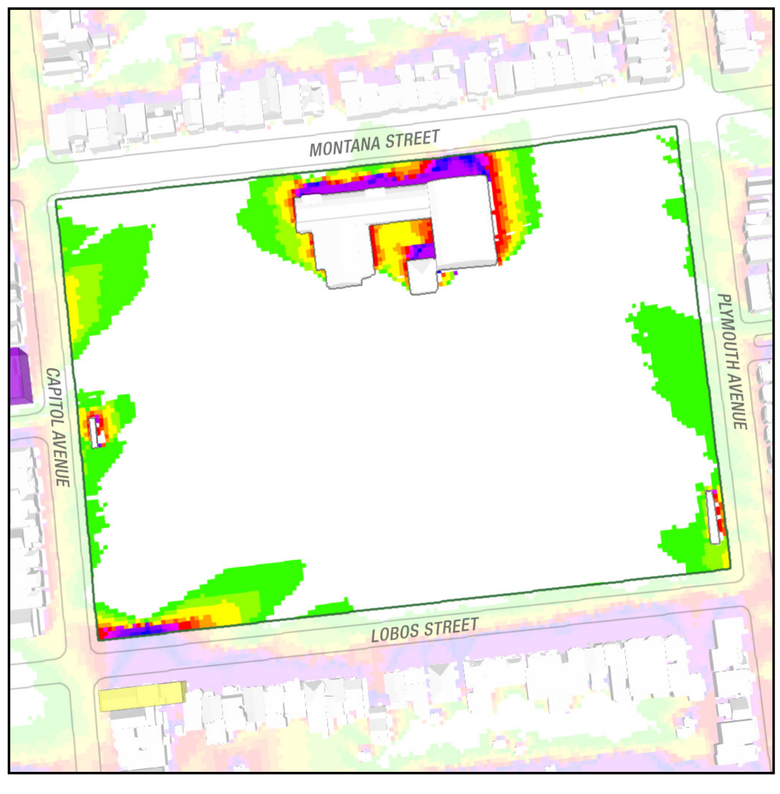




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

21 | BALBOA PARK

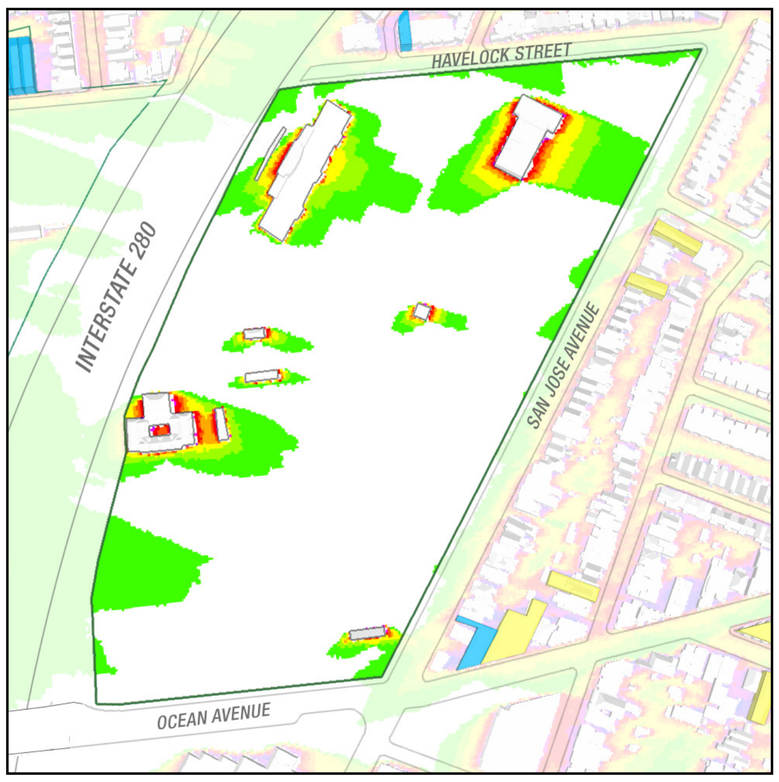
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

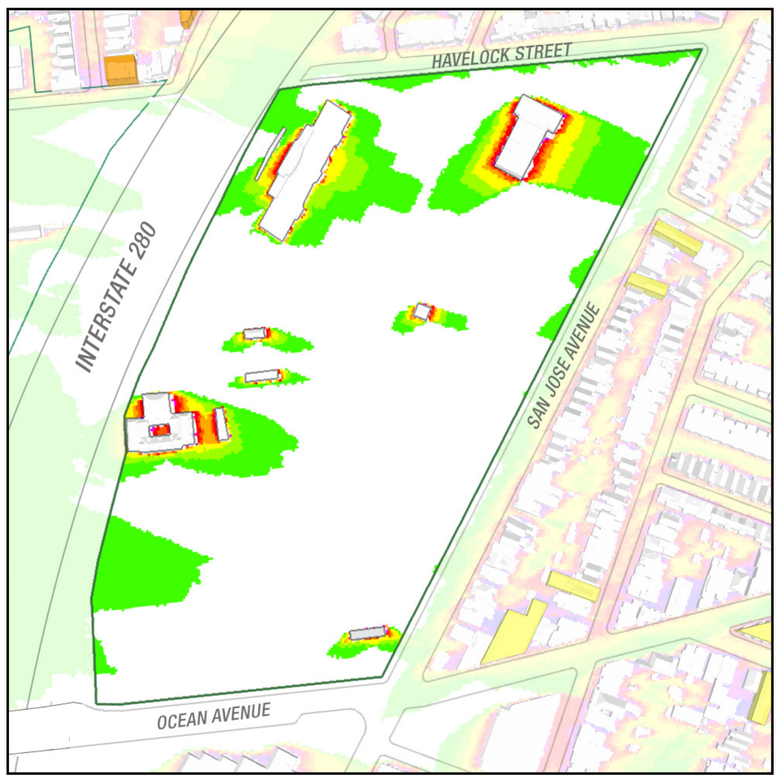
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

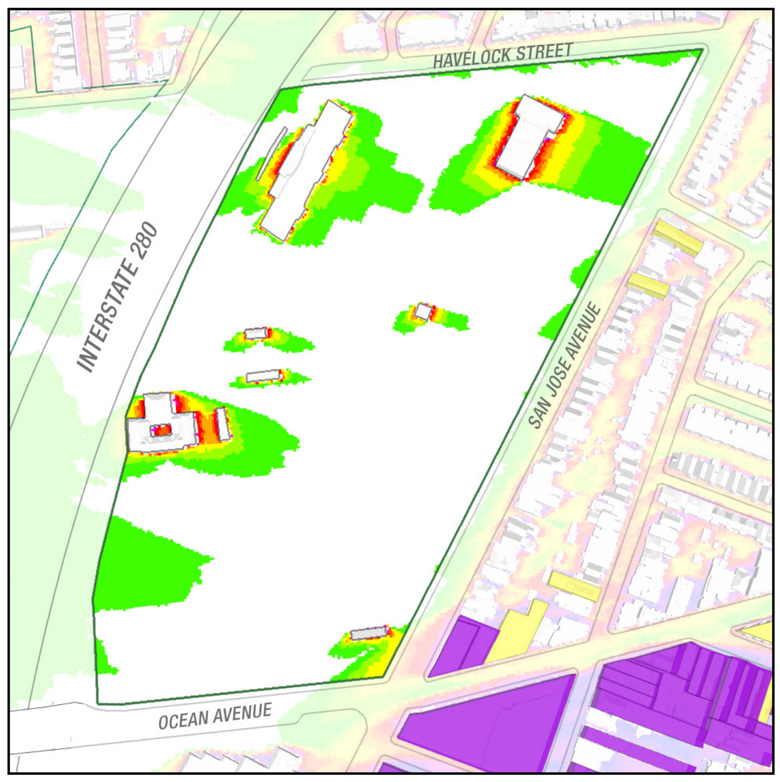
2050 ENVIRONMENTAL BASELINE



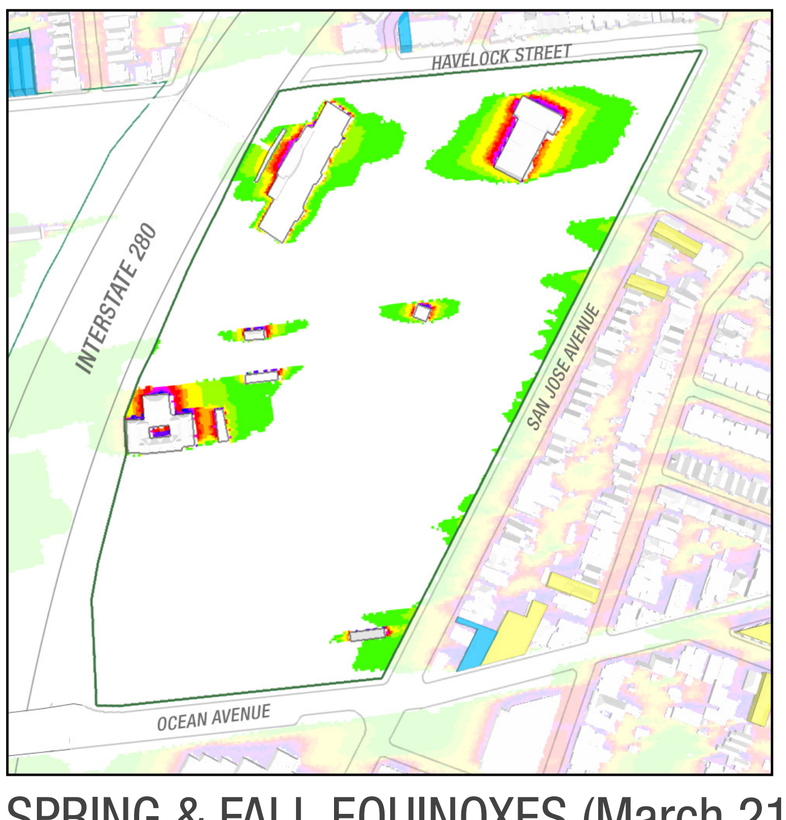
PROPOSED ACTION

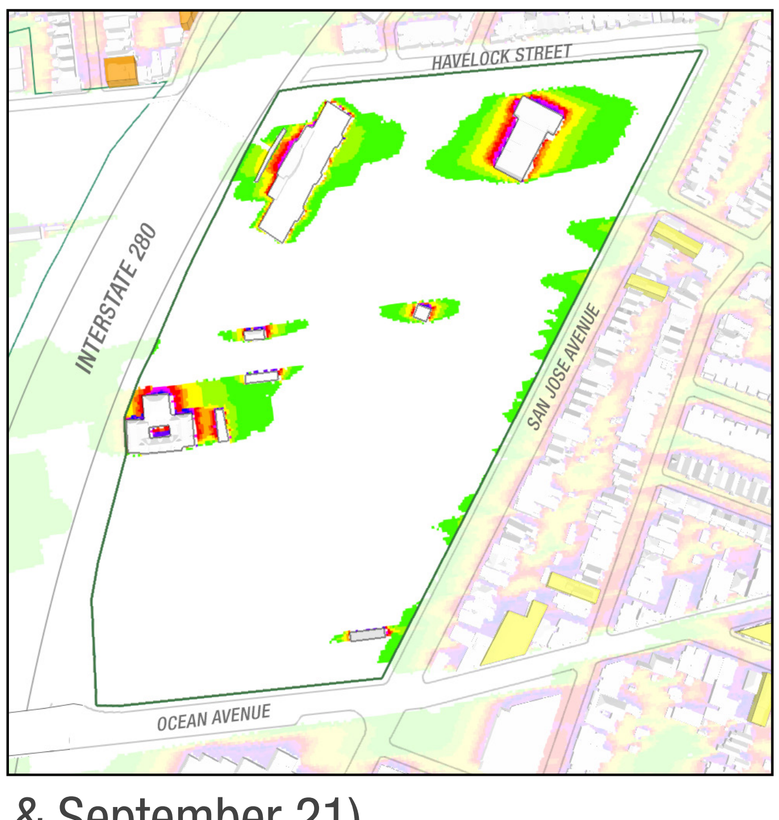


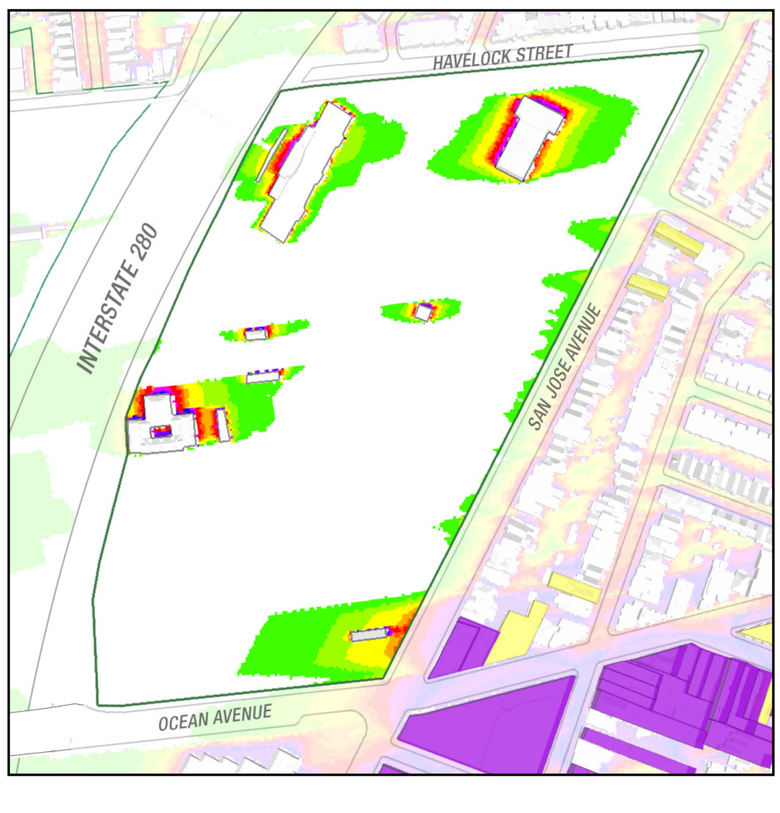
PLAN BAY AREA 2050



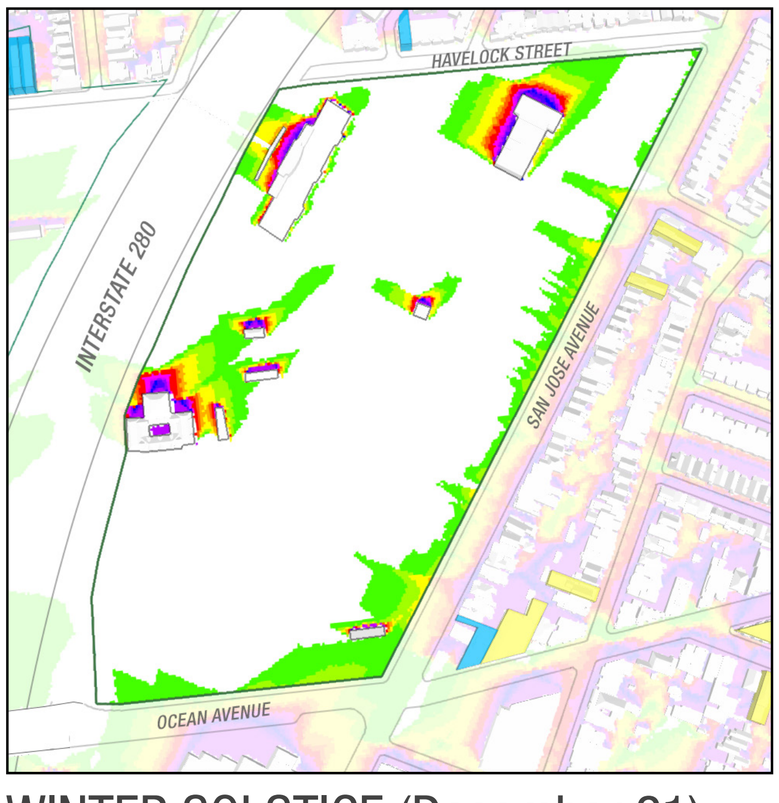
SUMMER SOLSTICE (June 21)

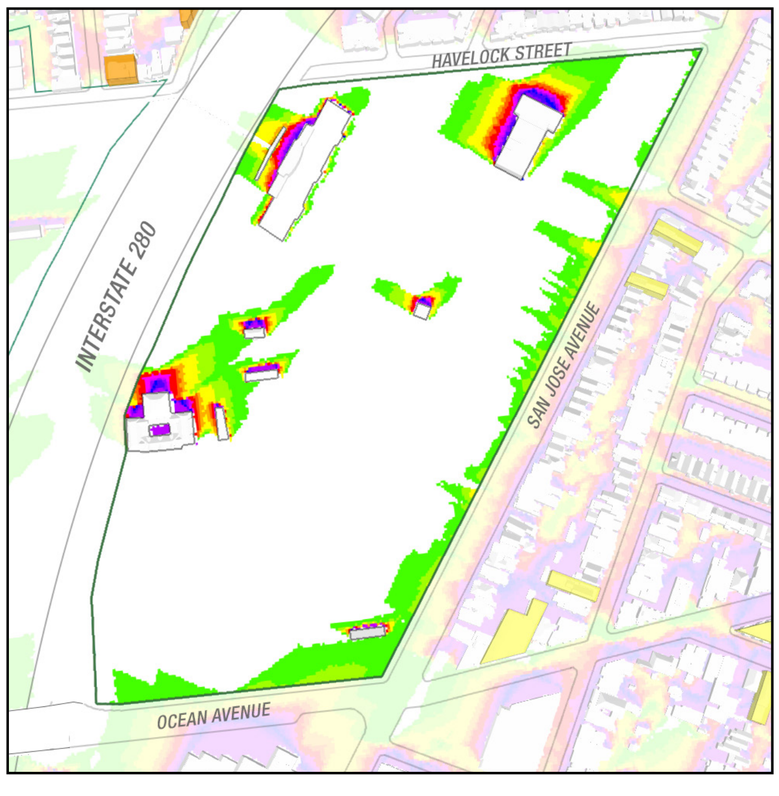


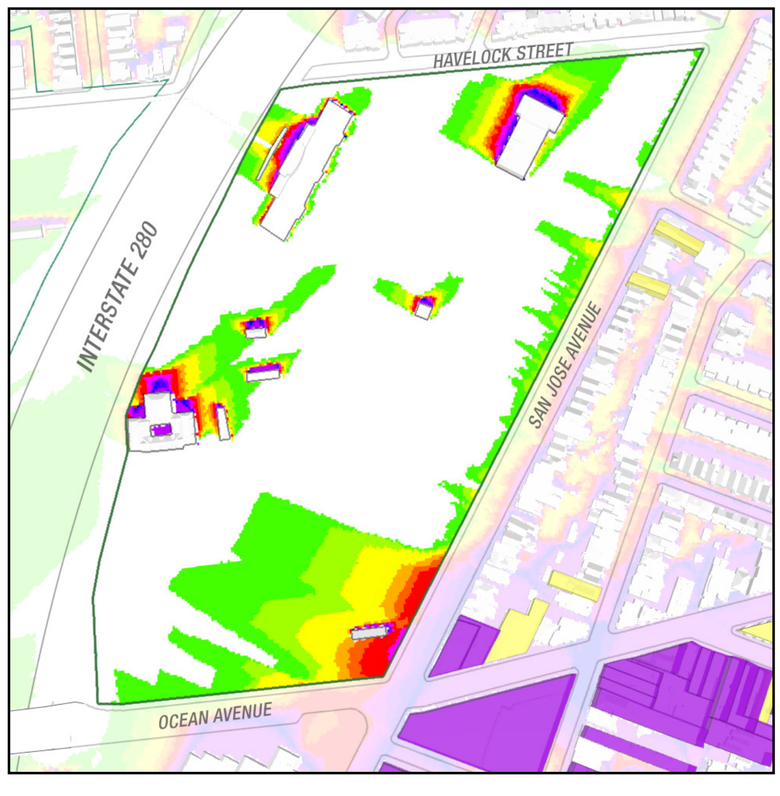




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

22 | APTOS PLAYGROUND

DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

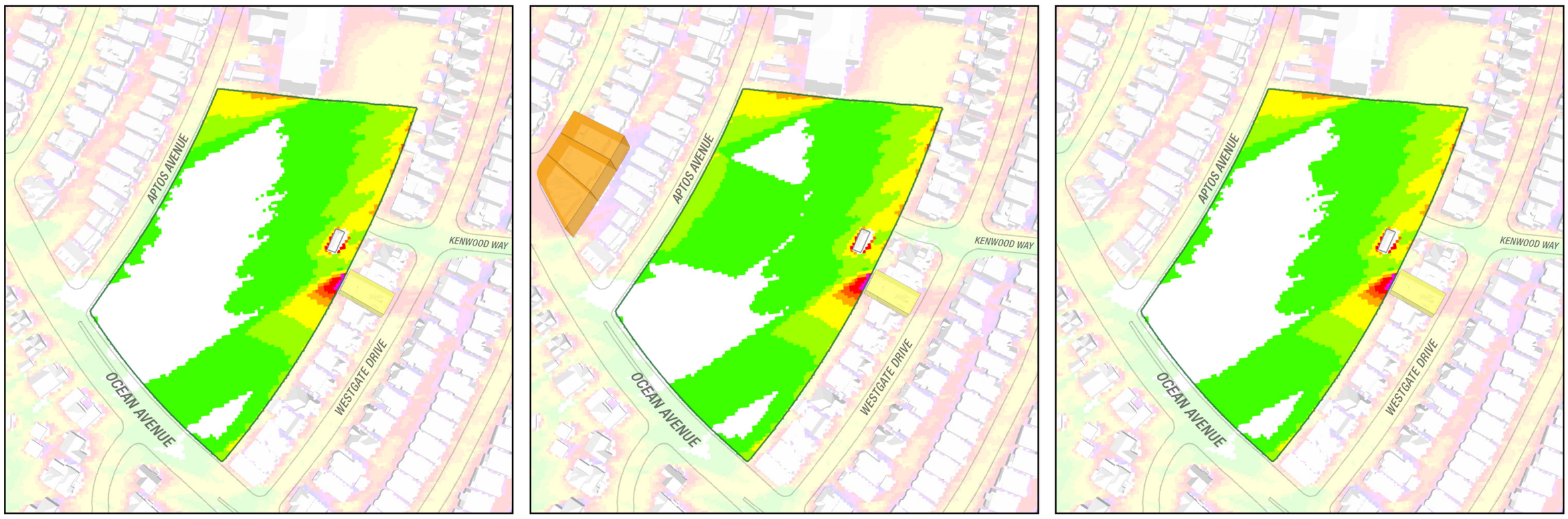
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

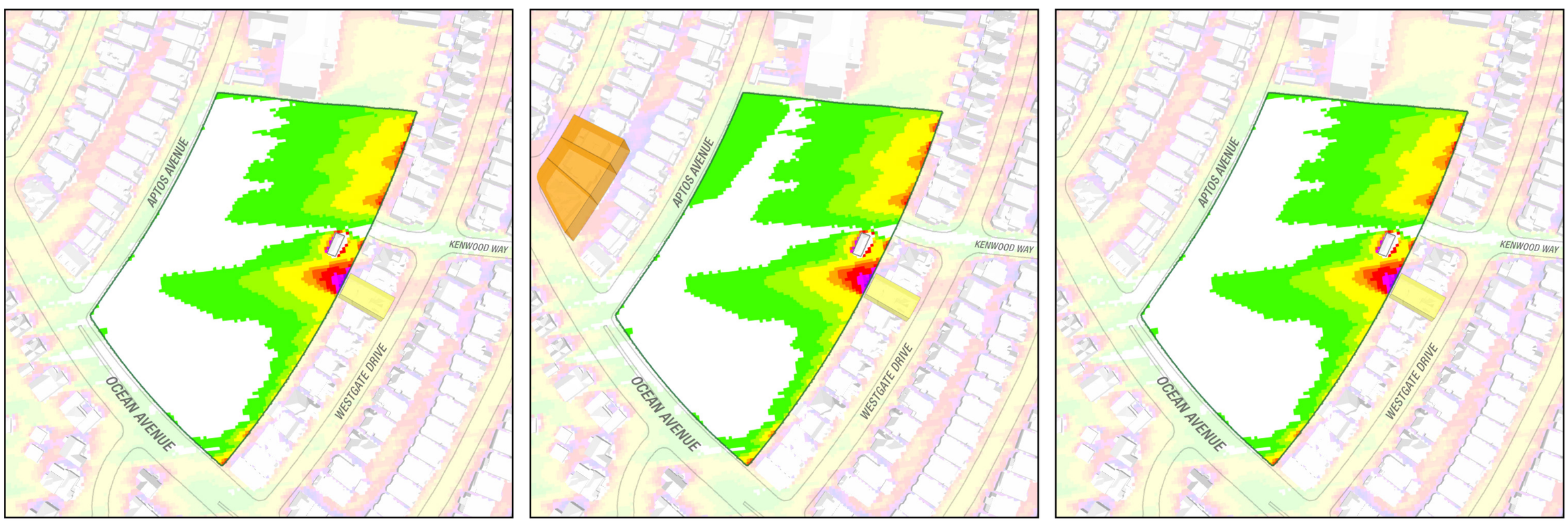
2050 ENVIRONMENTAL BASELINE

PROPOSED ACTION

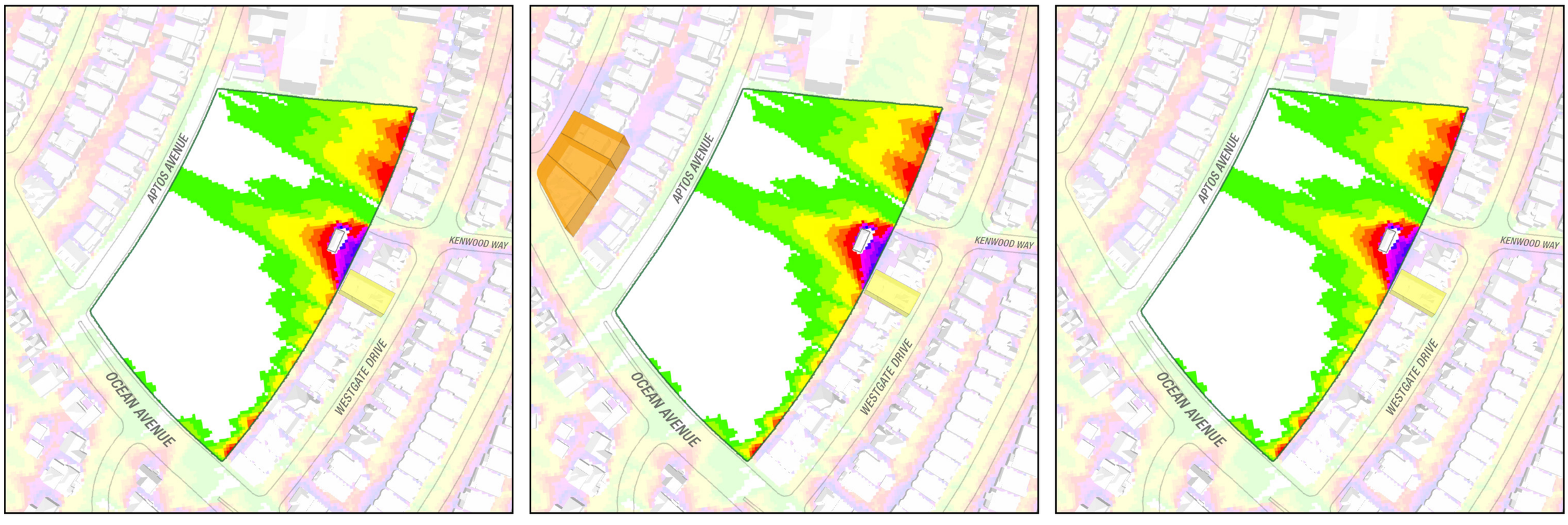
PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)



SPRING & FALL EQUINOXES (March 21 & September 21)



WINTER SOLSTICE (December 21)

23 | SUNSET BOULEVARD

DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

2050 ENVIRONMENTAL BASELINE



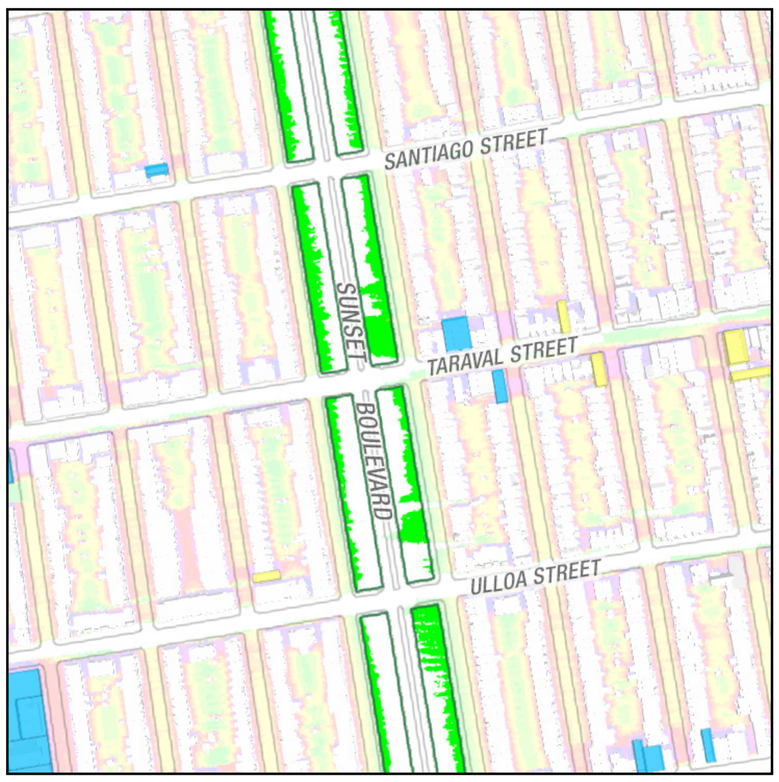
PROPOSED ACTION



PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)







SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

24 | LARSEN PLAYGROUND

DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

2050 ENVIRONMENTAL BASELINE



PROPOSED ACTION

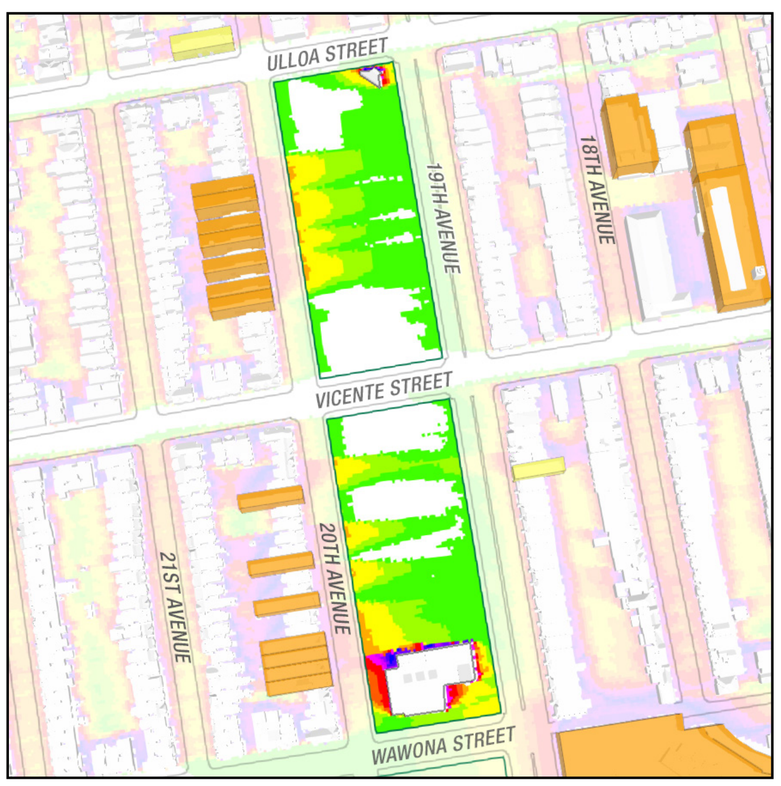


PLAN BAY AREA 2050



SUMMER SOLSTICE (June 21)

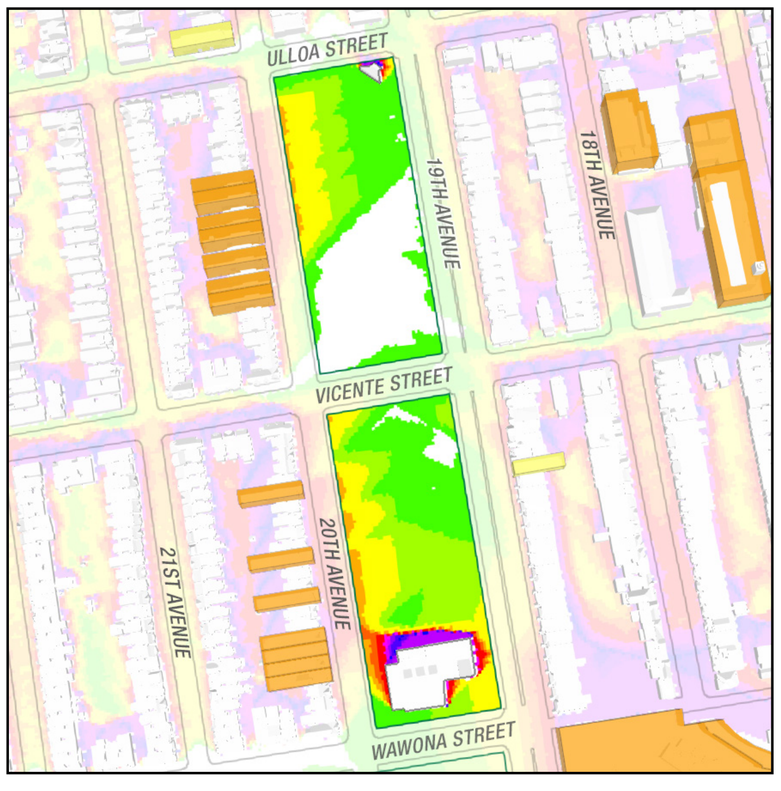


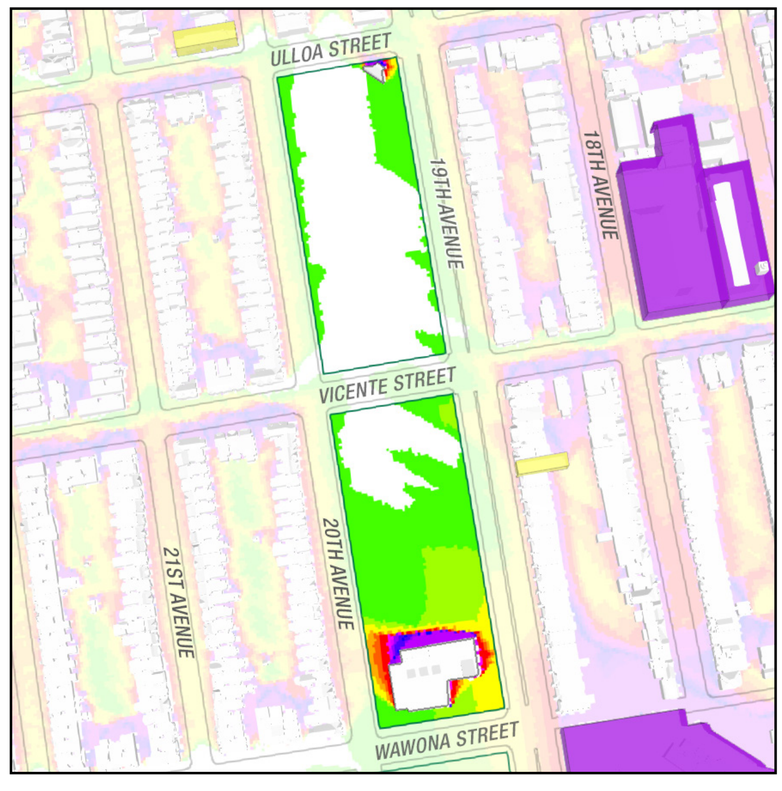




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

25 | MCCOPPIN SQUARE

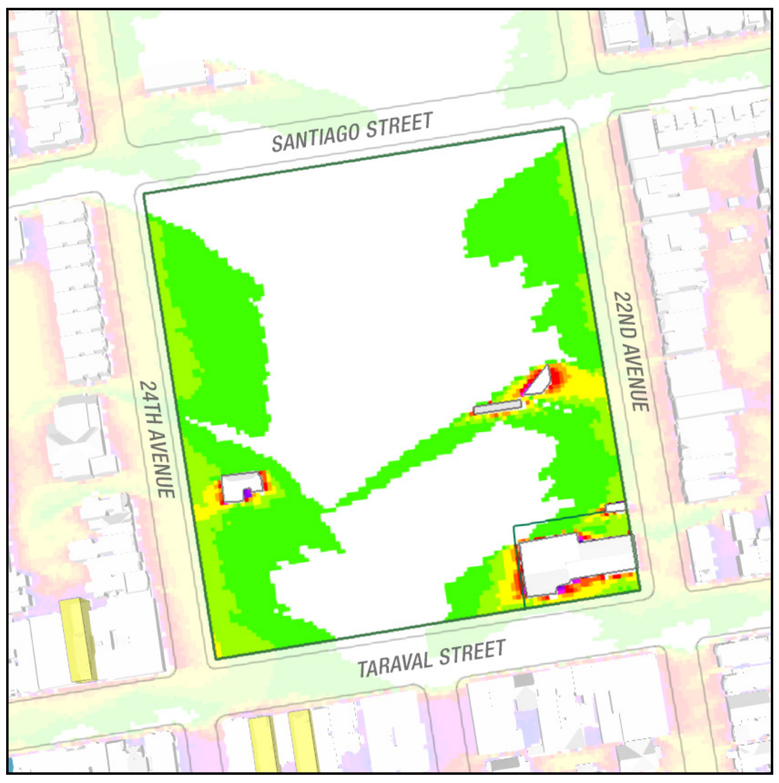
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

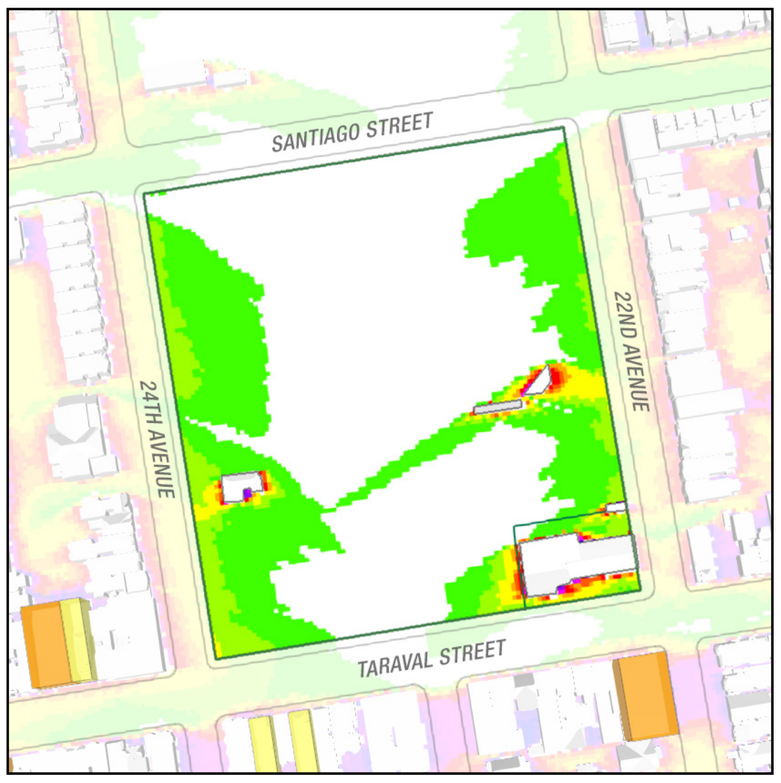
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

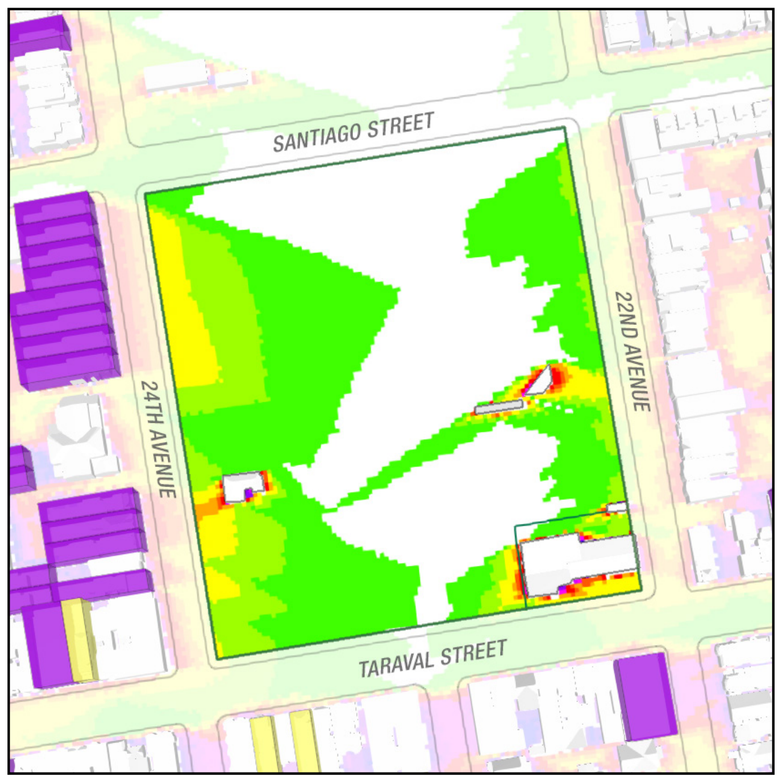
2050 ENVIRONMENTAL BASELINE



PROPOSED ACTION

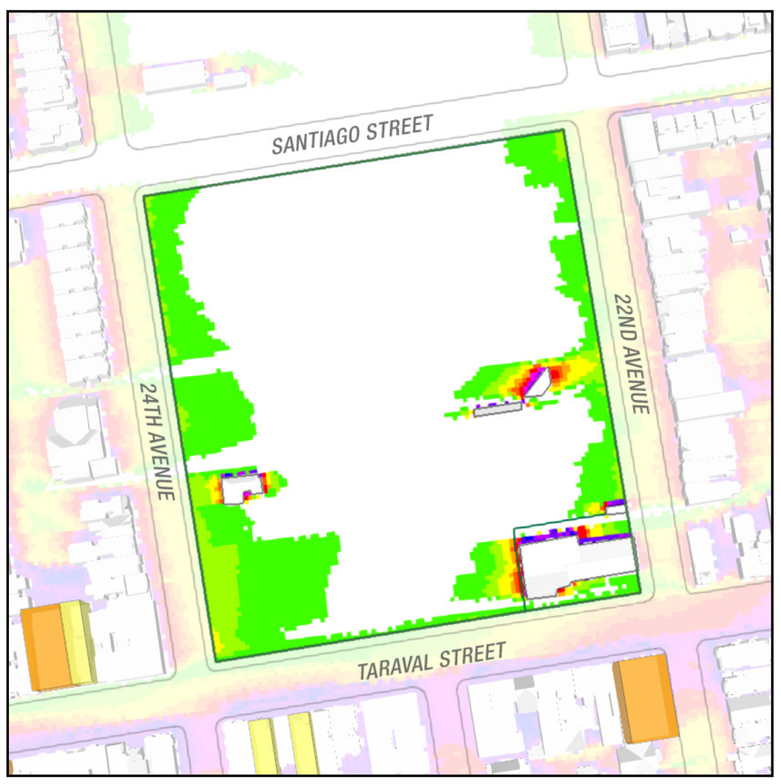


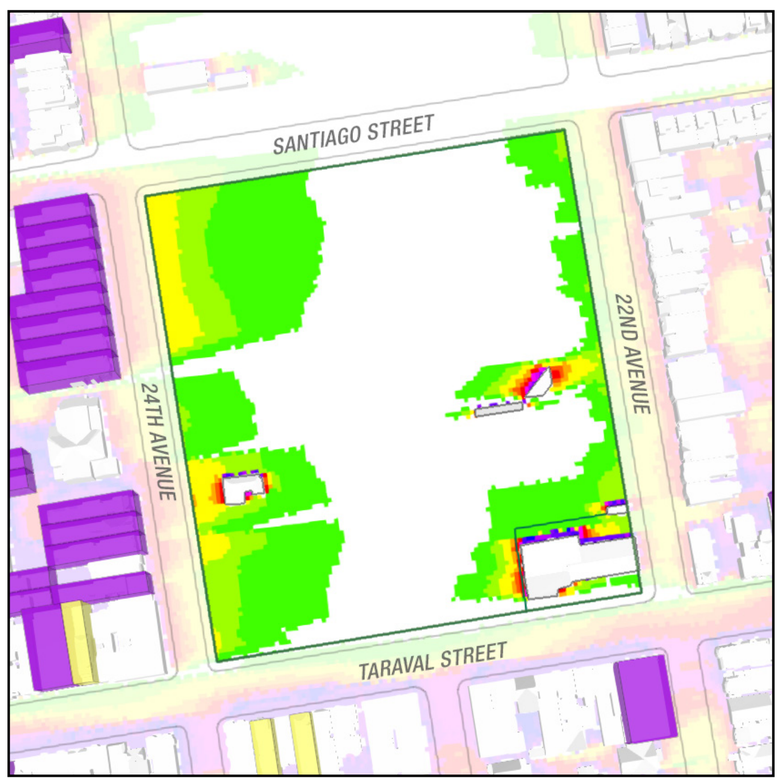
PLAN BAY AREA 2050



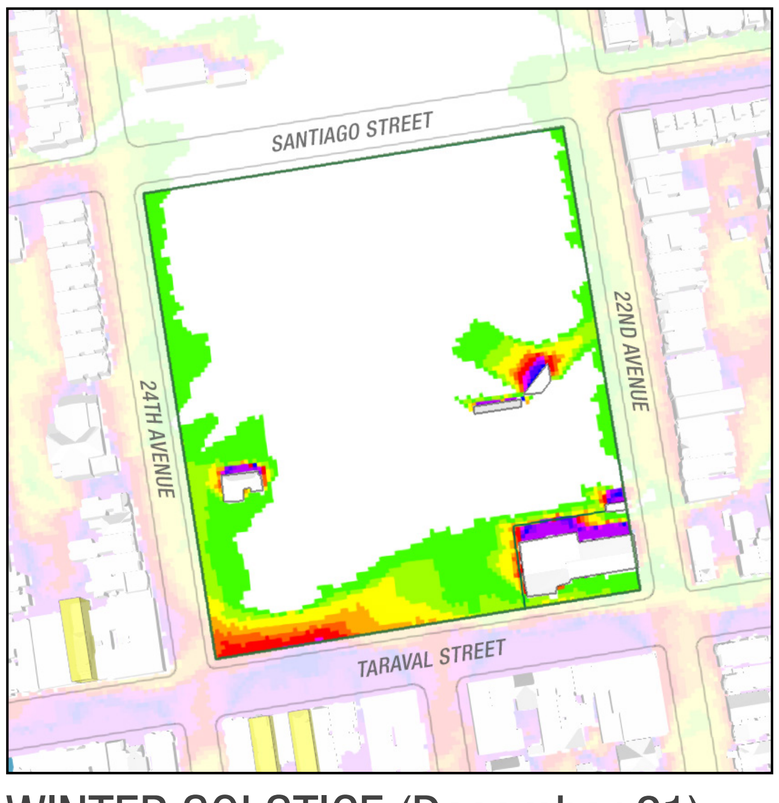
SUMMER SOLSTICE (June 21)



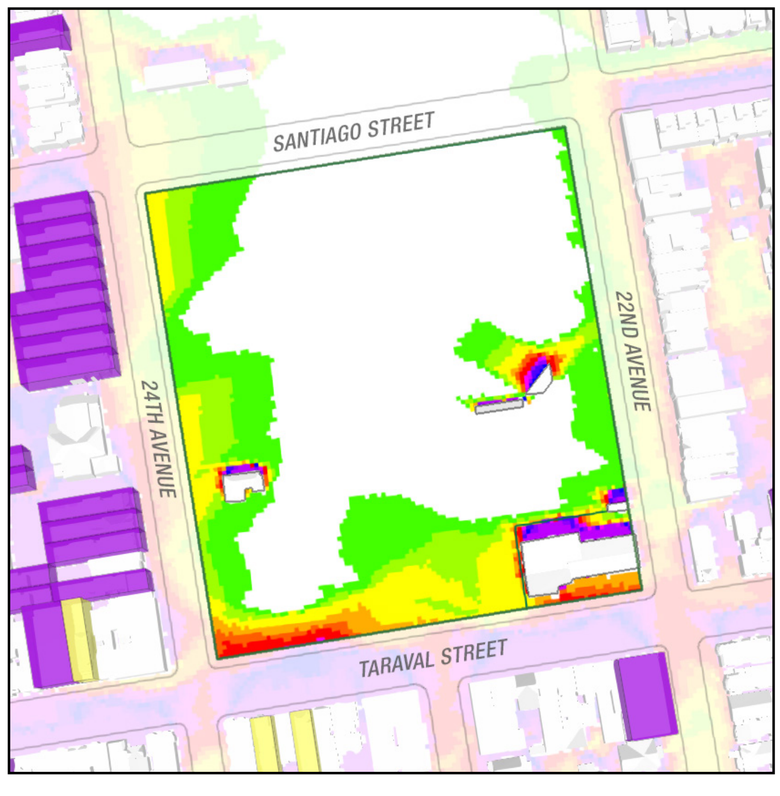




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

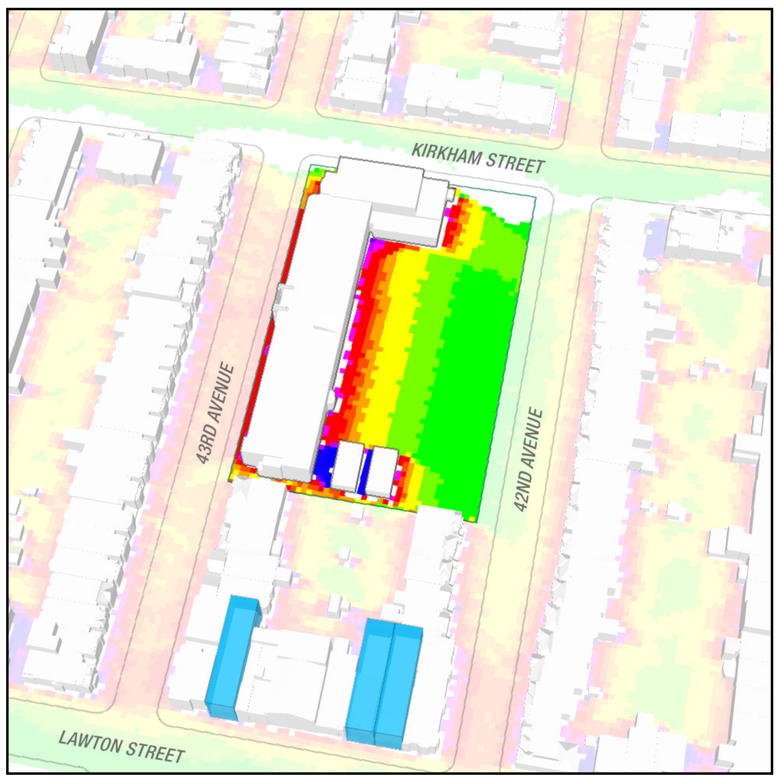
26 | FRANCIS SCOTT KEY ELEMENTARY

DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

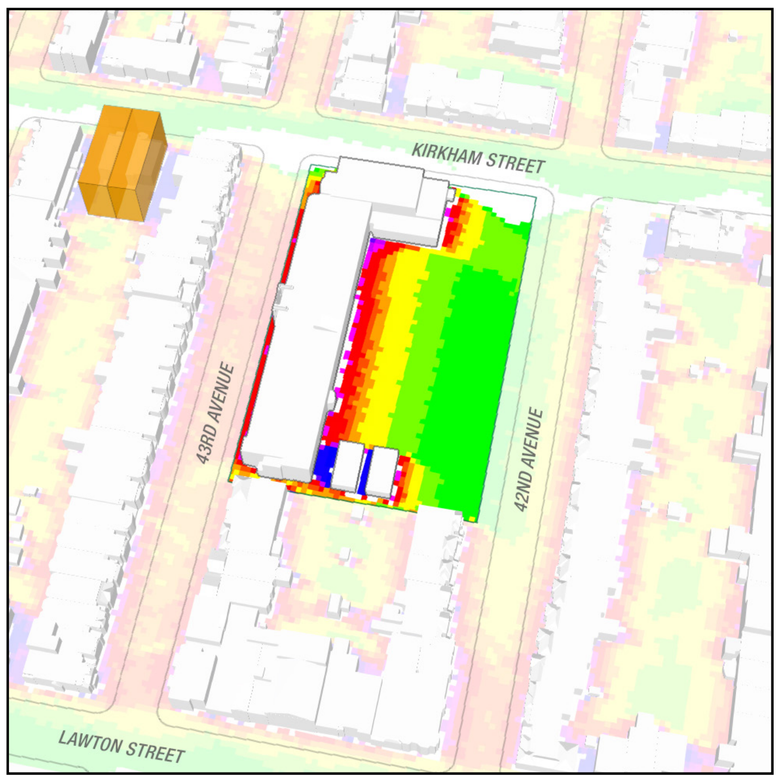
0 15 30 45 60 75 90 105 120 135 150 165 180+

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

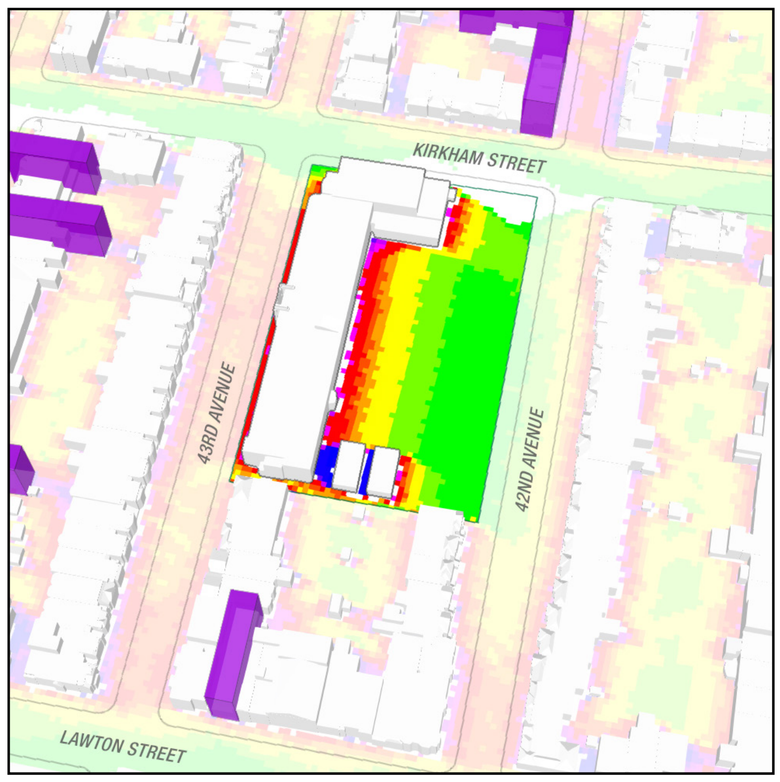
2050 ENVIRONMENTAL BASELINE



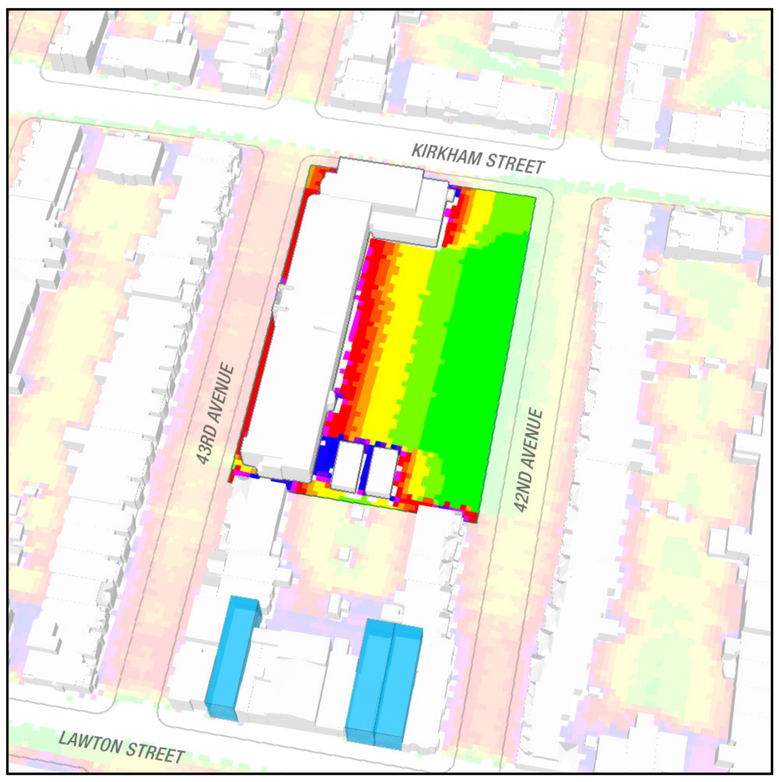
PROPOSED ACTION

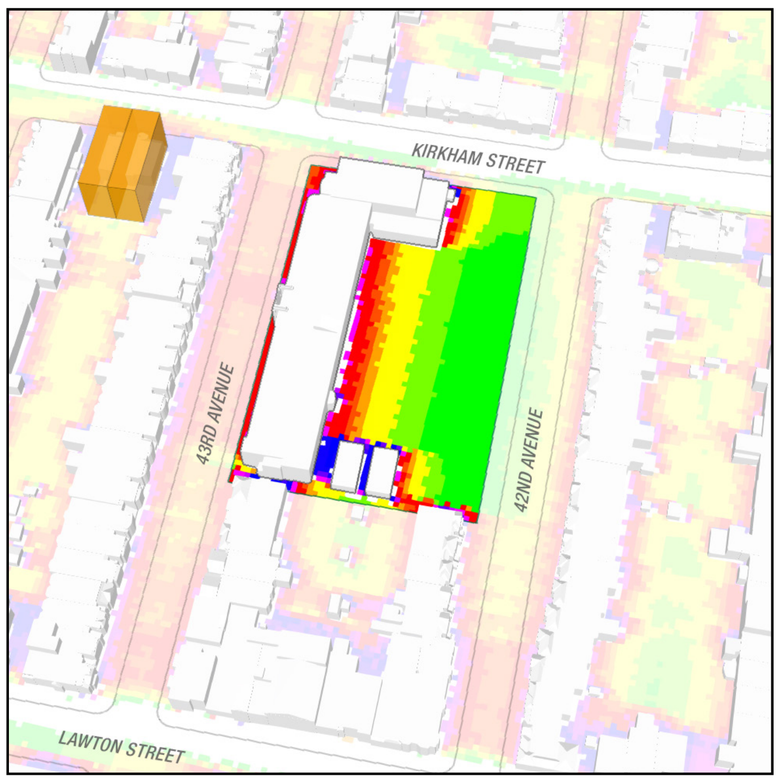


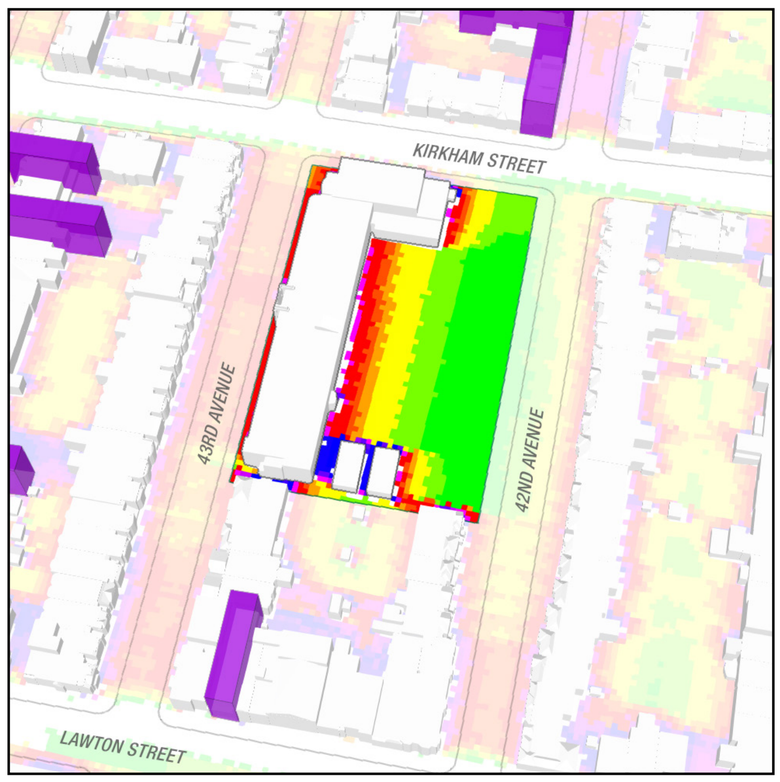
PLAN BAY AREA 2050



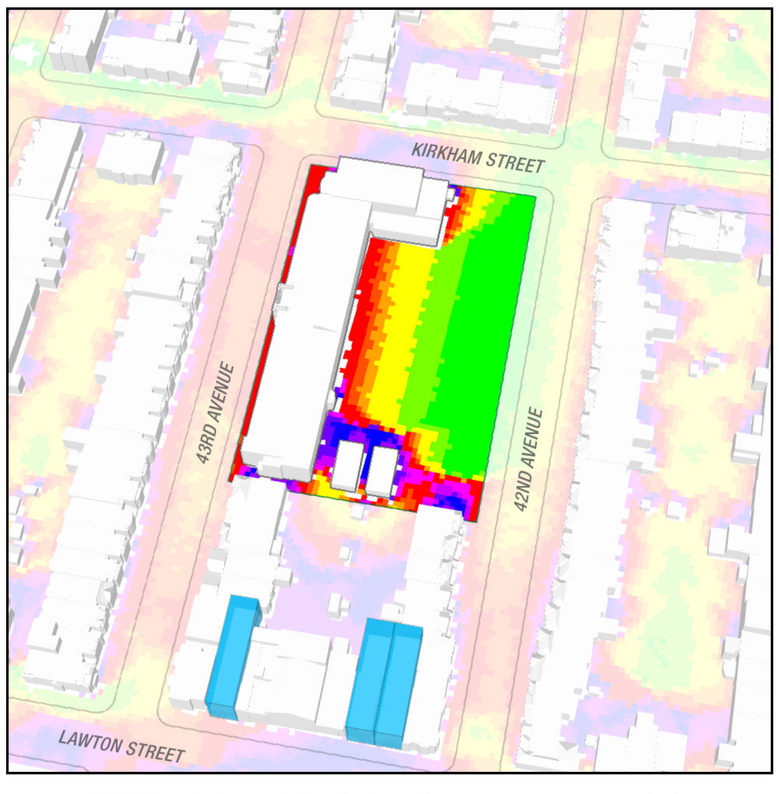
SUMMER SOLSTICE (June 21)

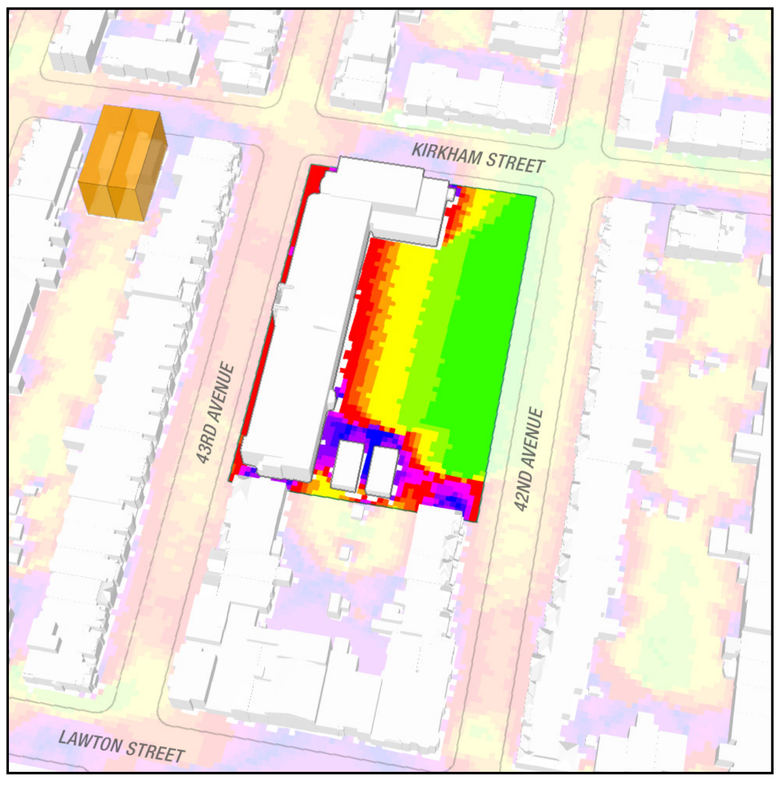


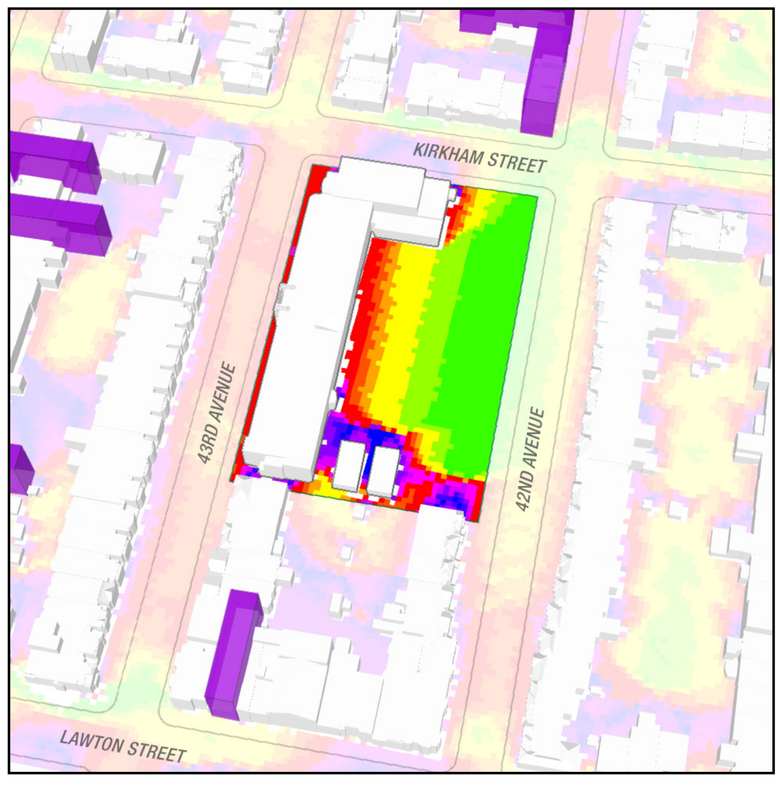




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

27 | SUTRO HEIGHTS PARK

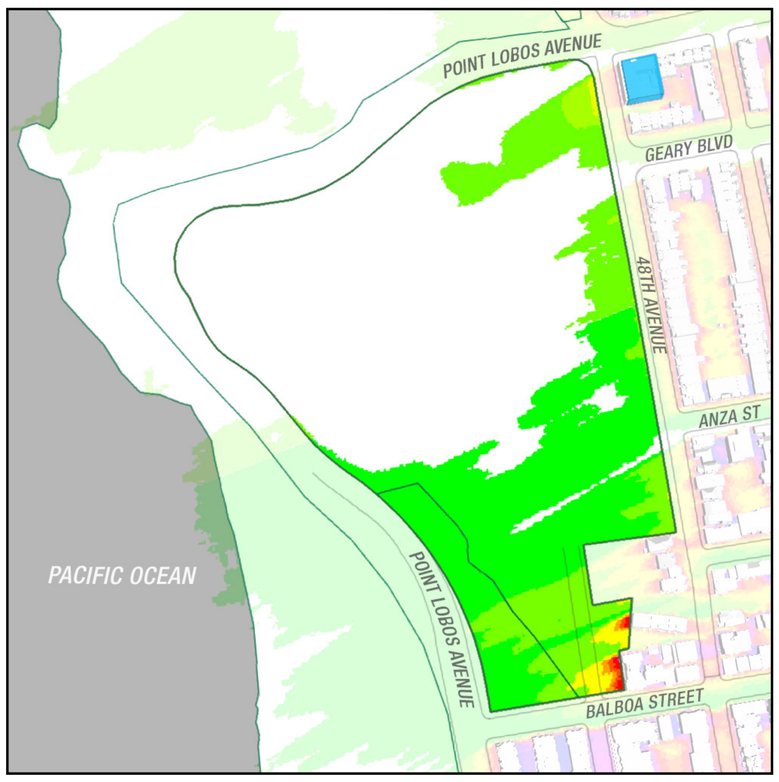
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

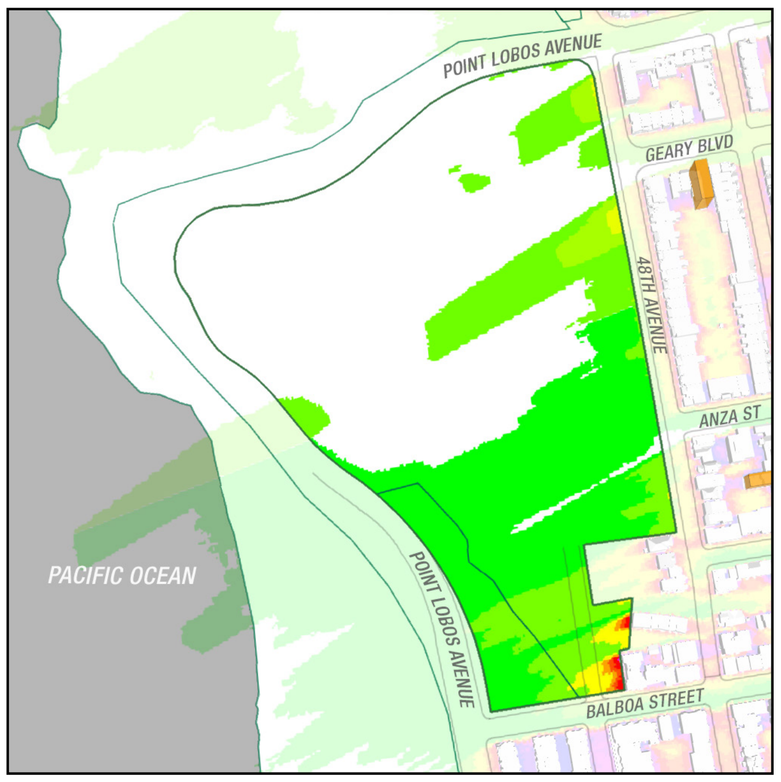
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

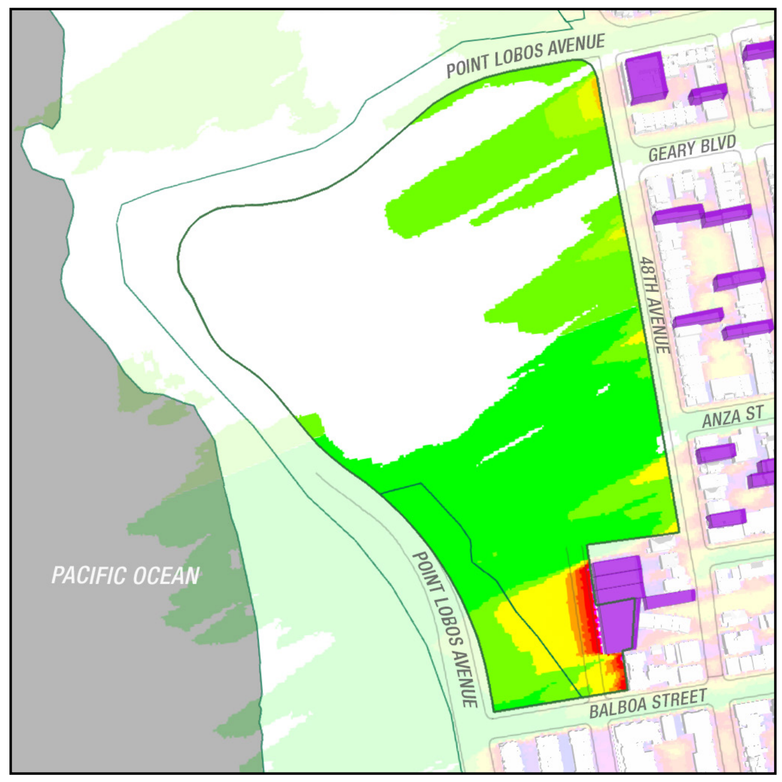
2050 ENVIRONMENTAL BASELINE



PROPOSED ACTION



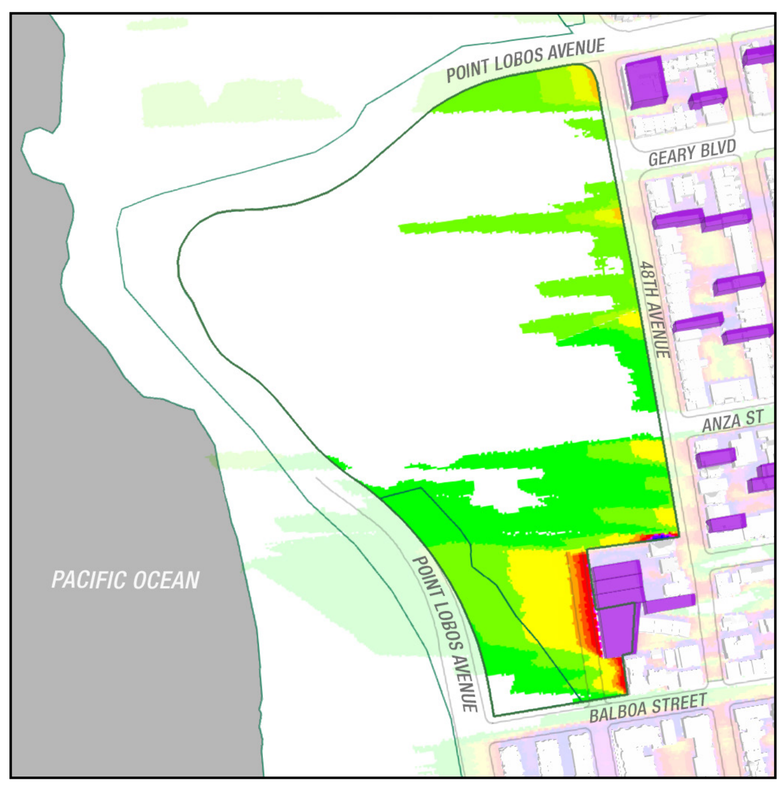
PLAN BAY AREA 2050



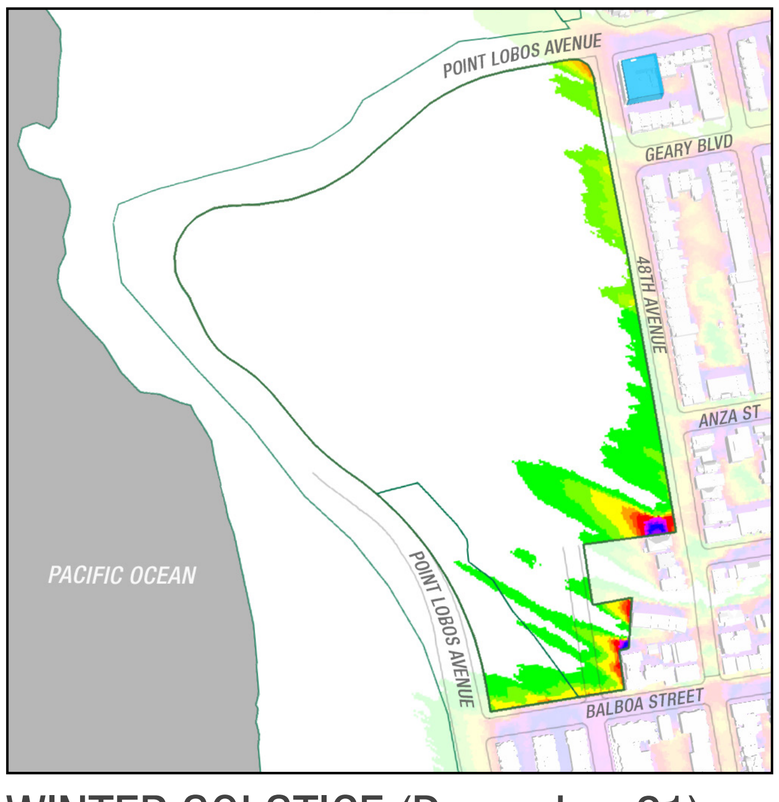
SUMMER SOLSTICE (June 21)



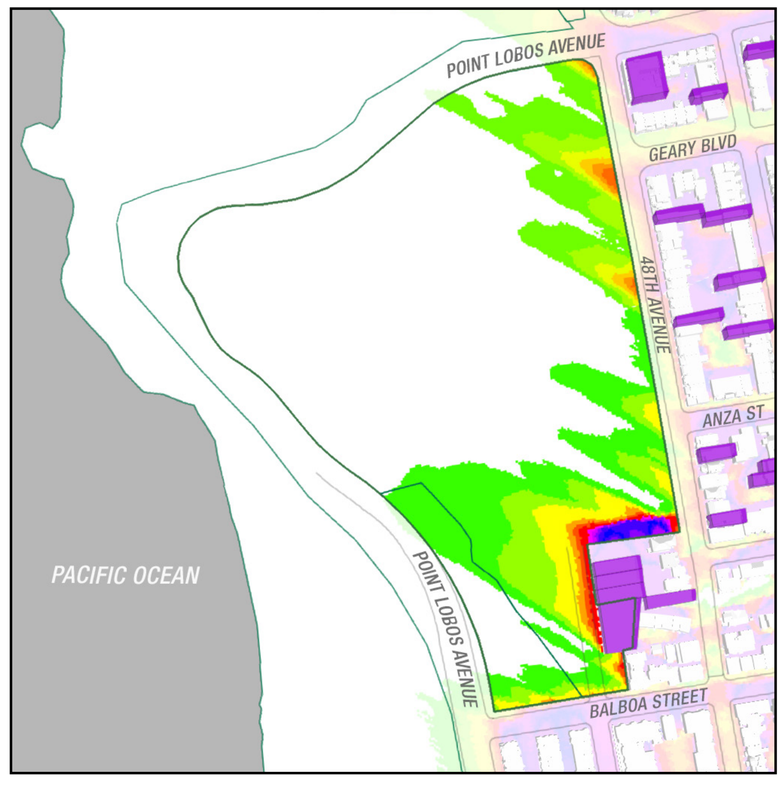




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

28 | FULTON PLAYGROUND

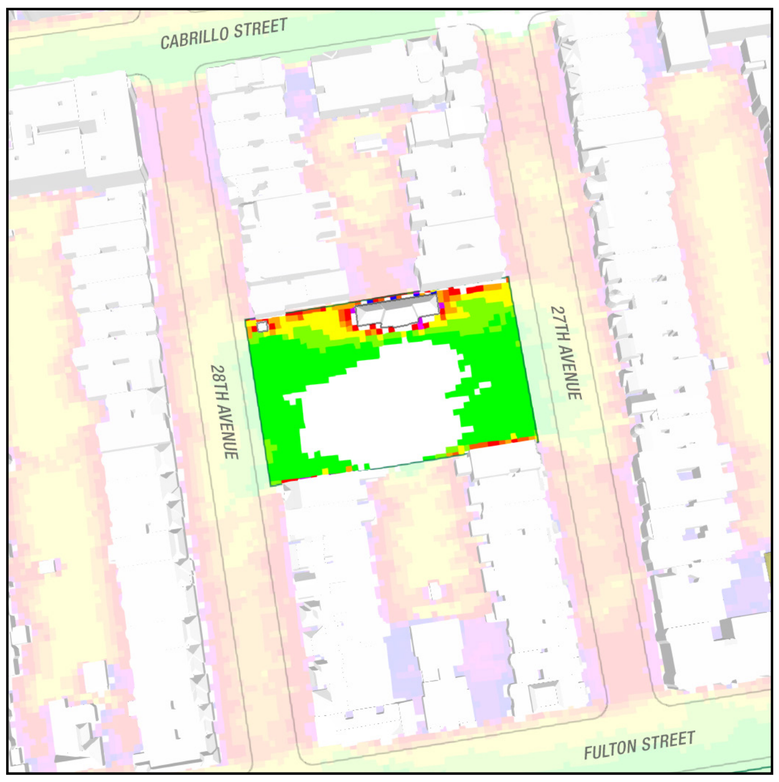
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

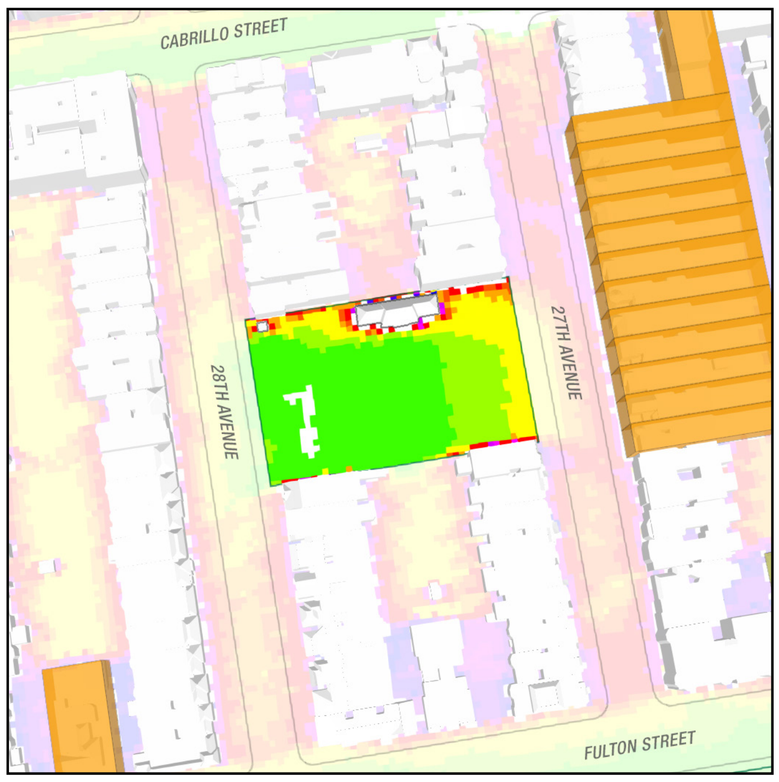
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

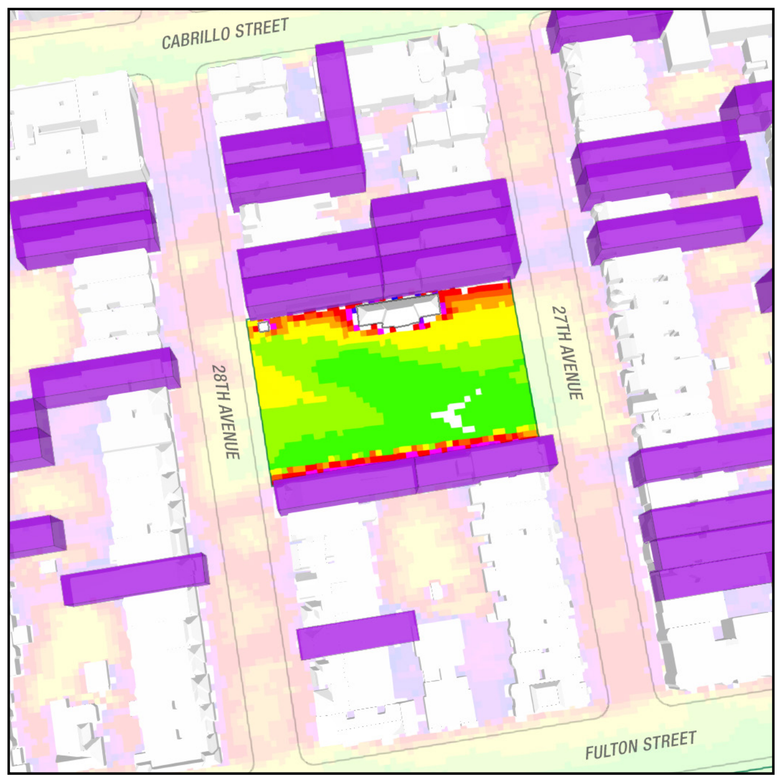
2050 ENVIRONMENTAL BASELINE



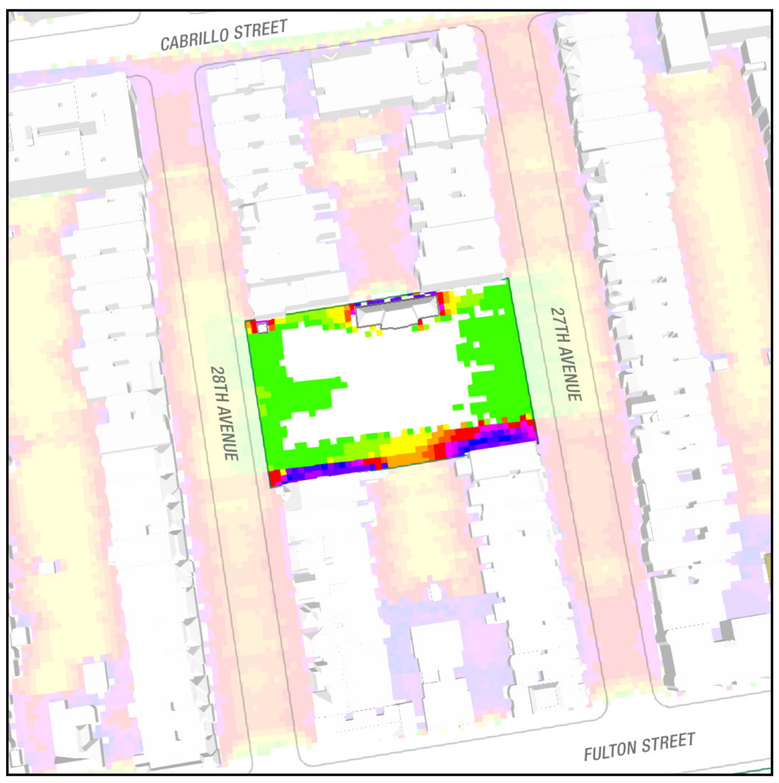
PROPOSED ACTION

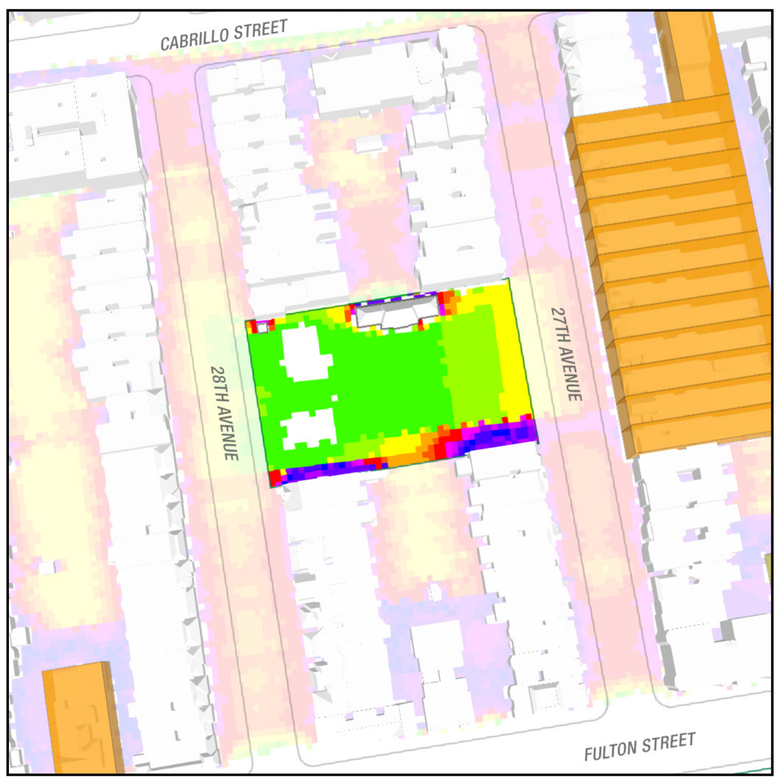


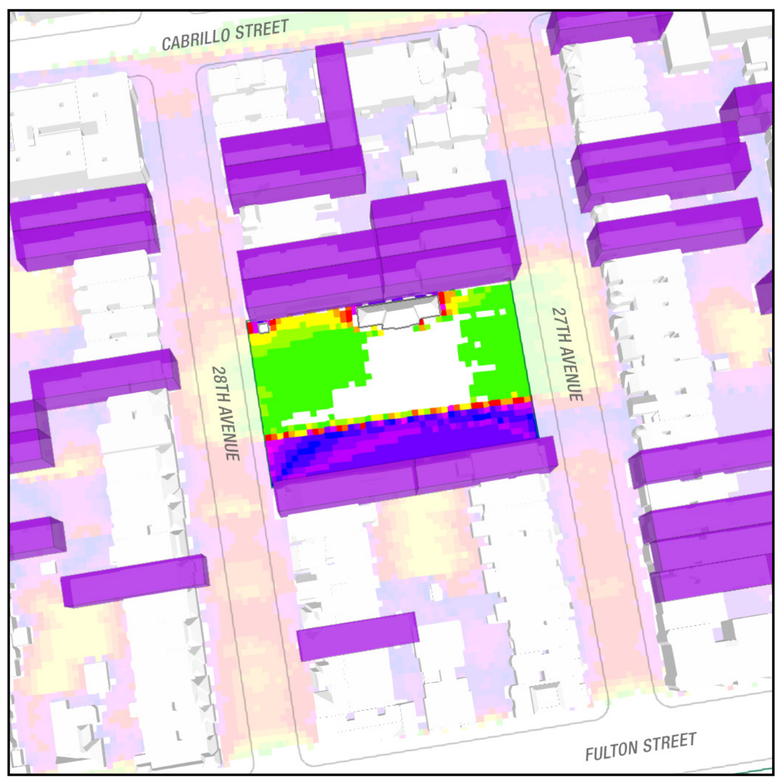
PLAN BAY AREA 2050



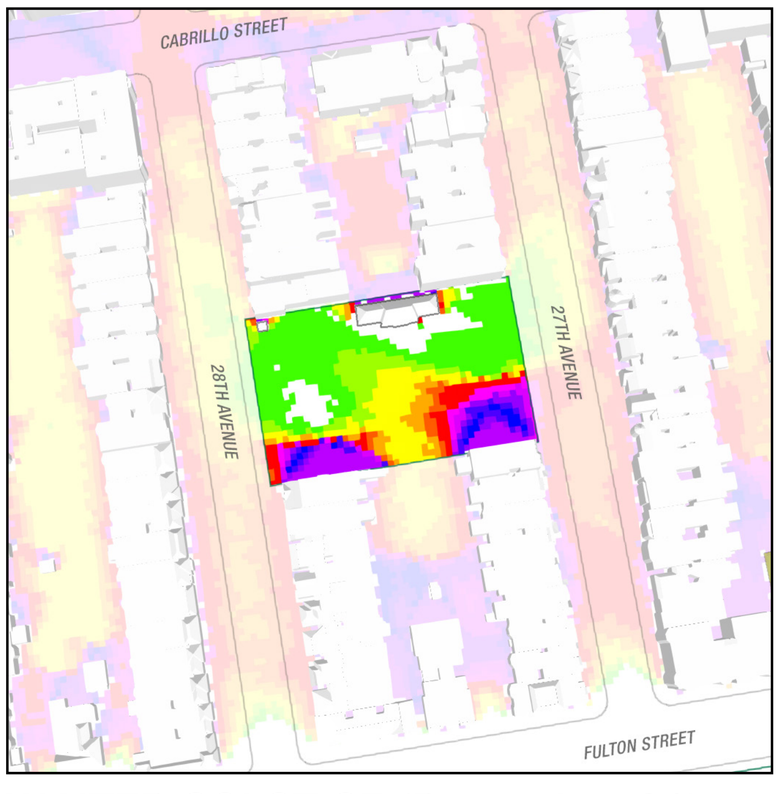
SUMMER SOLSTICE (June 21)

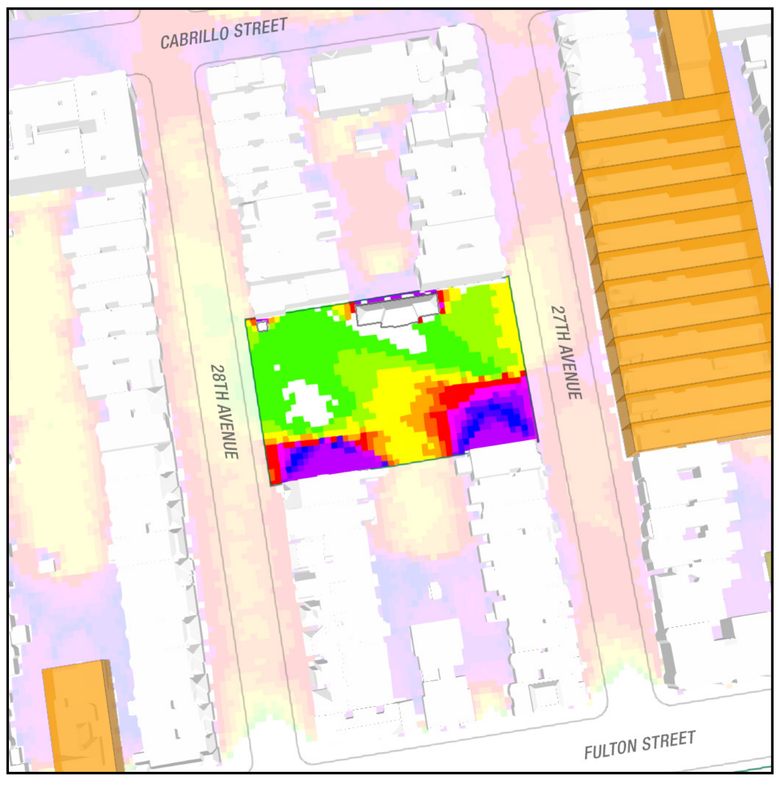


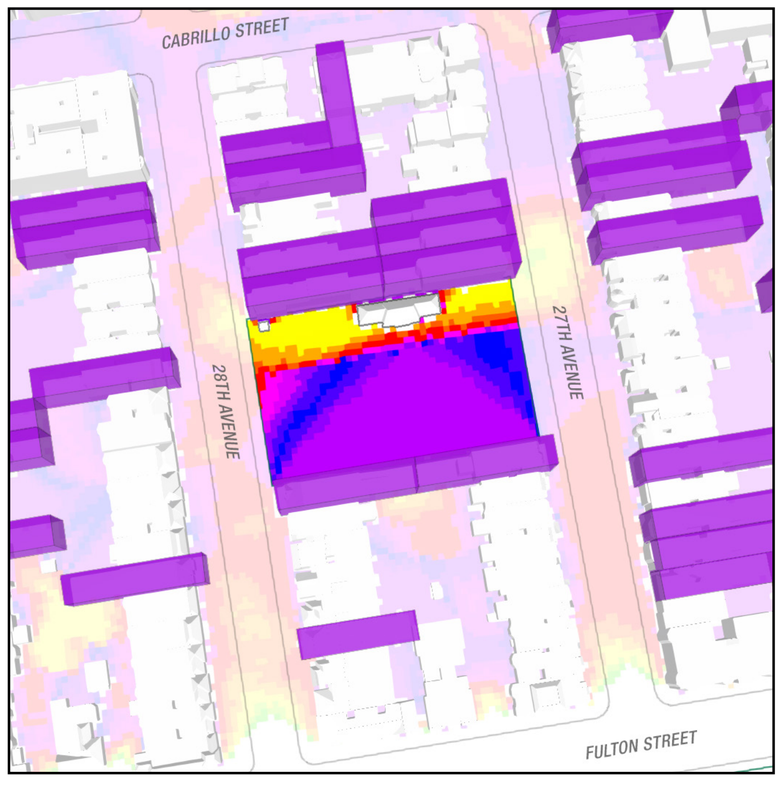




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

29 | ROOSEVELT MIDDLE SCHOOL

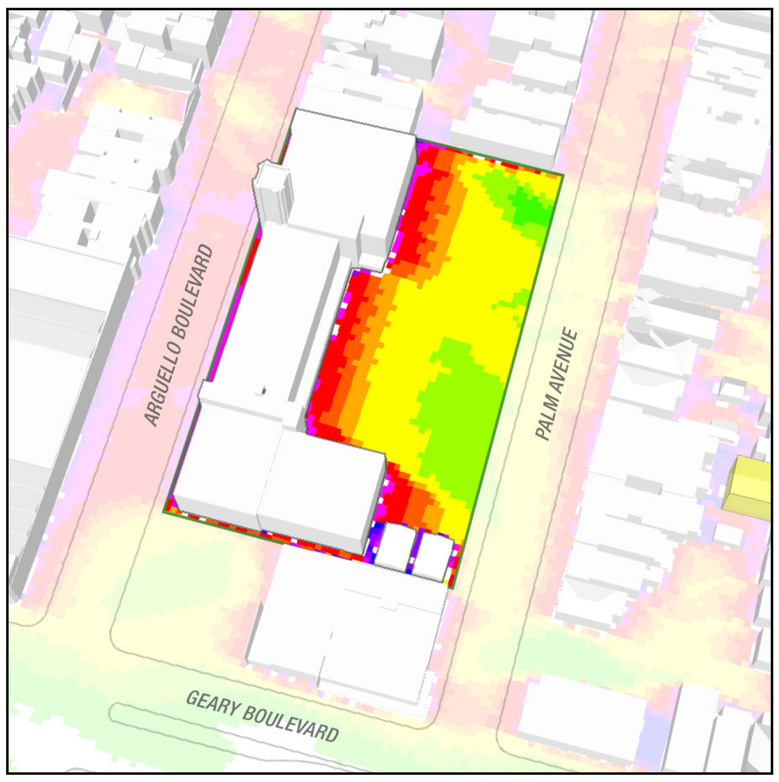
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

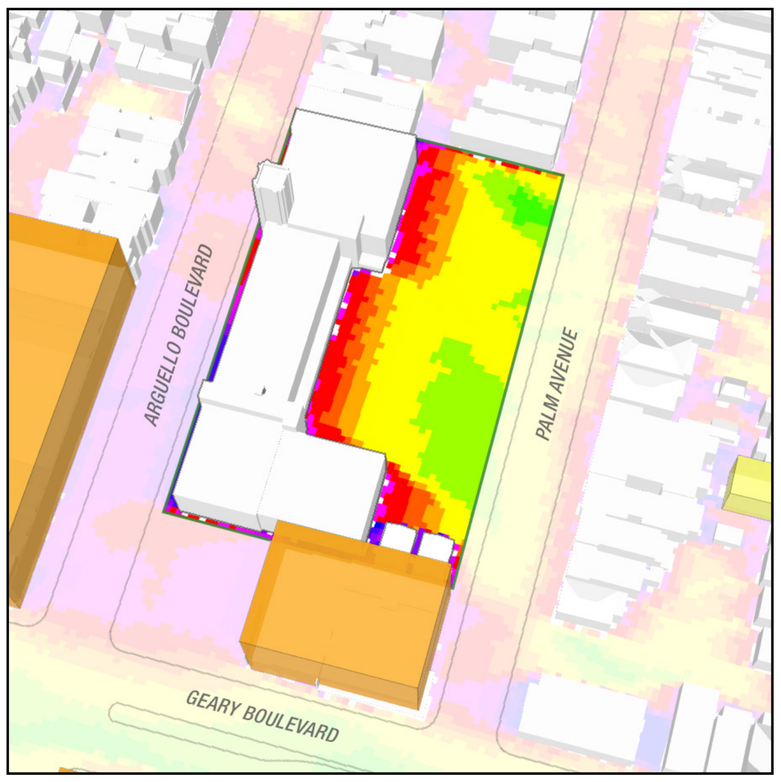
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

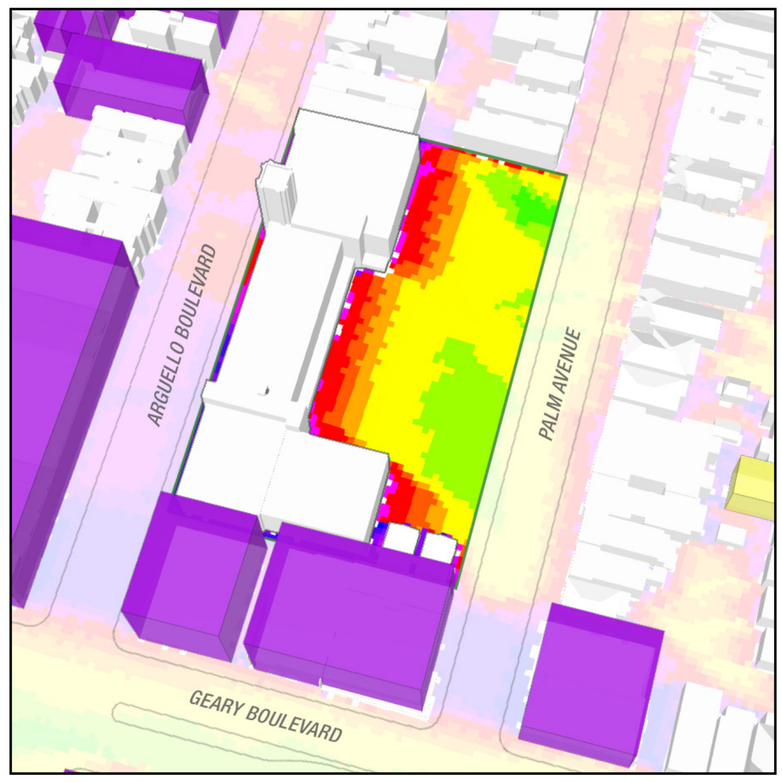
2050 ENVIRONMENTAL BASELINE



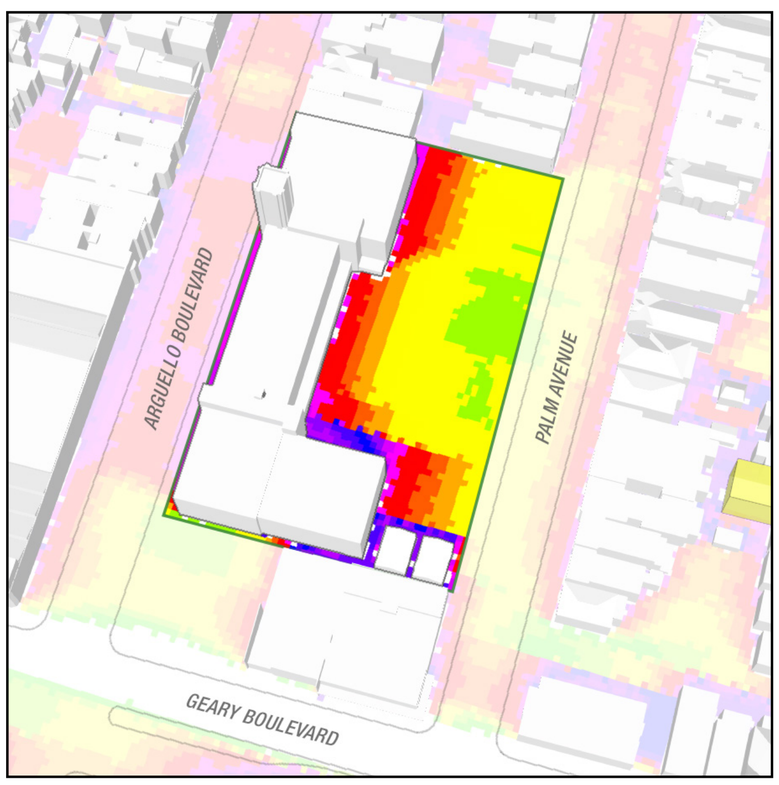
PROPOSED ACTION

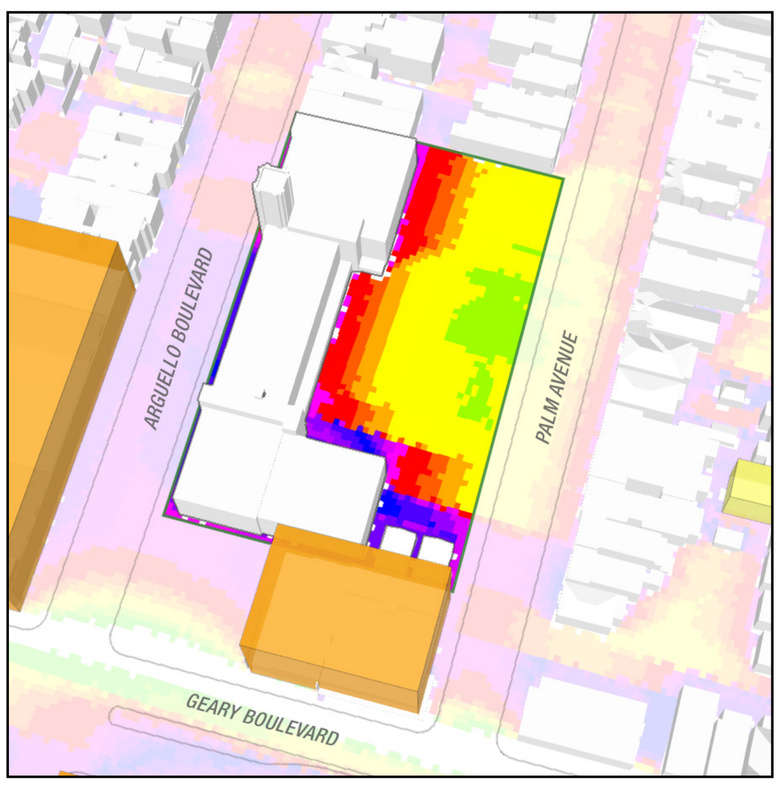


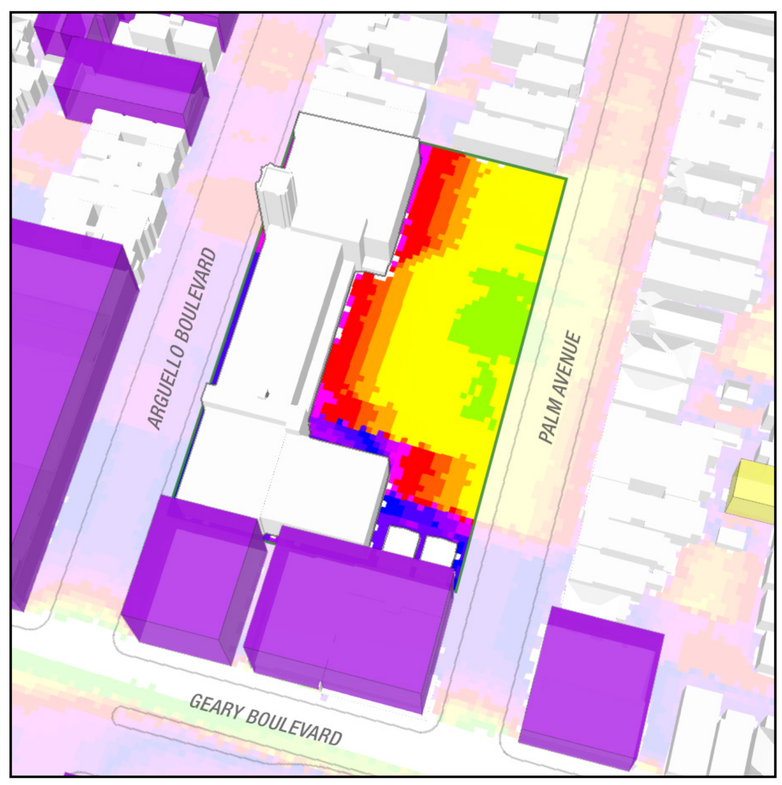
PLAN BAY AREA 2050



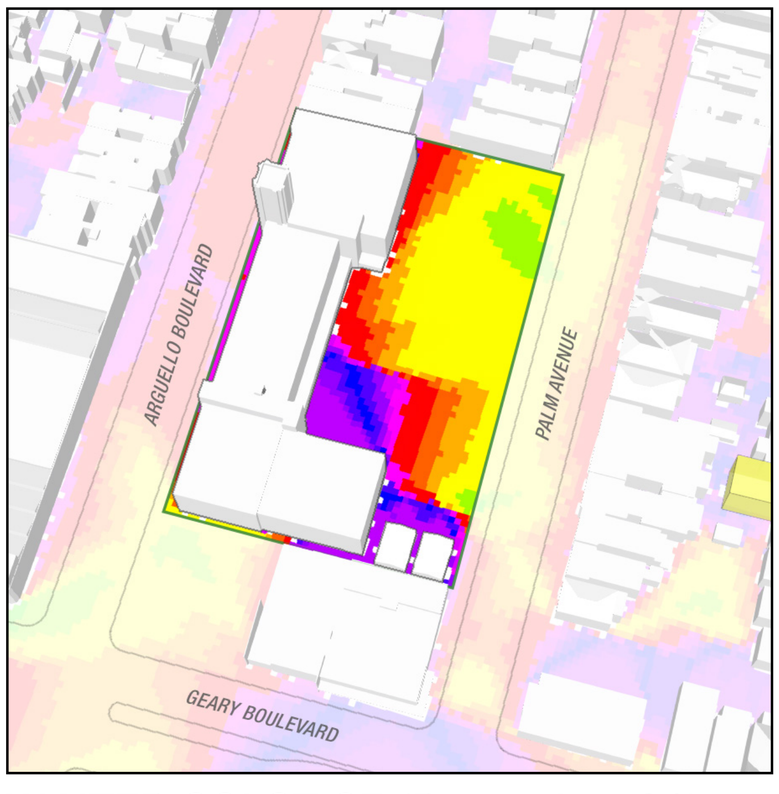
SUMMER SOLSTICE (June 21)

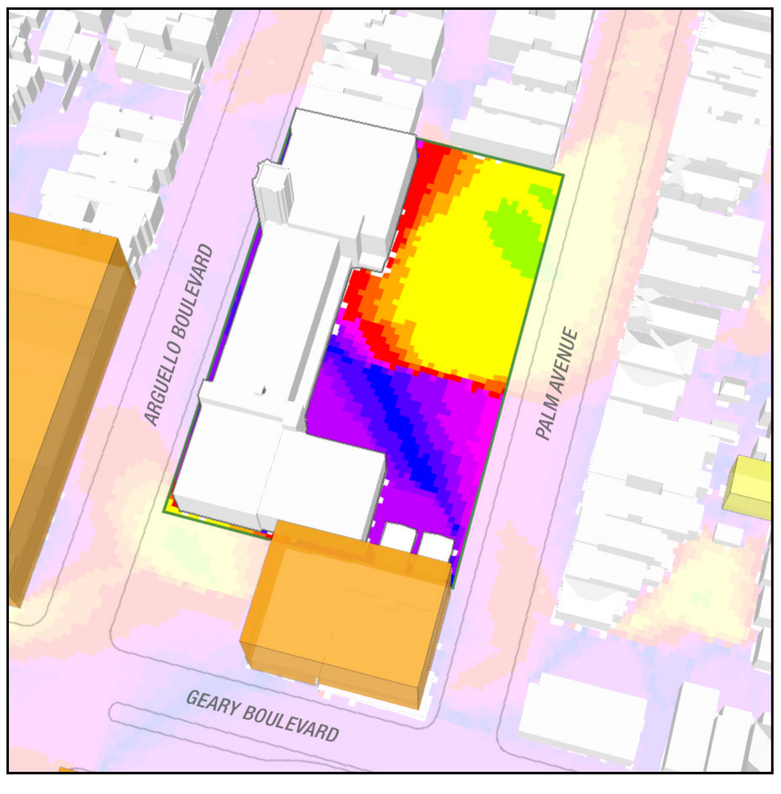


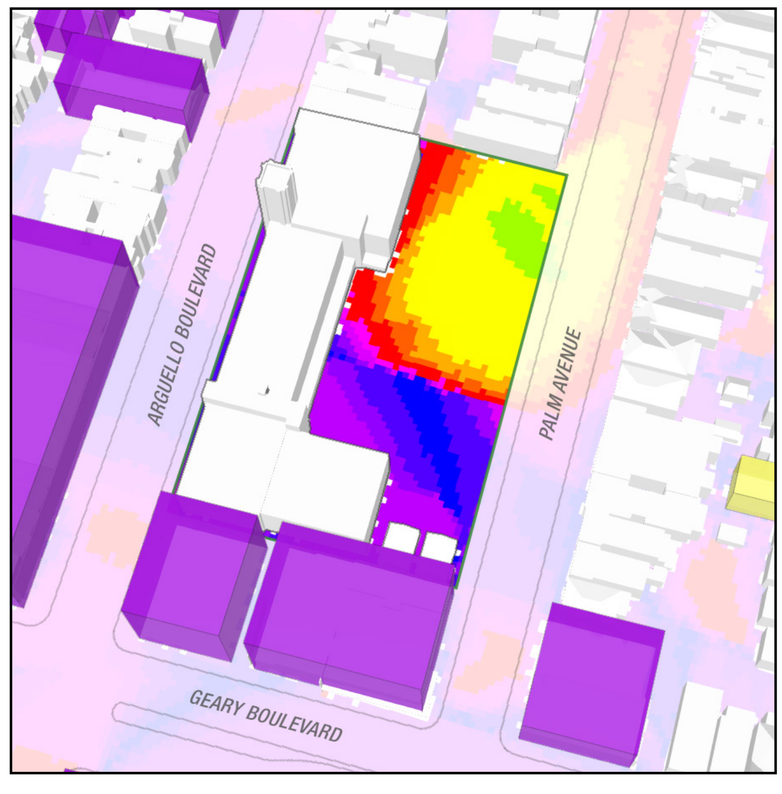




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)

30 | LAUREL HILL PLAYGROUND

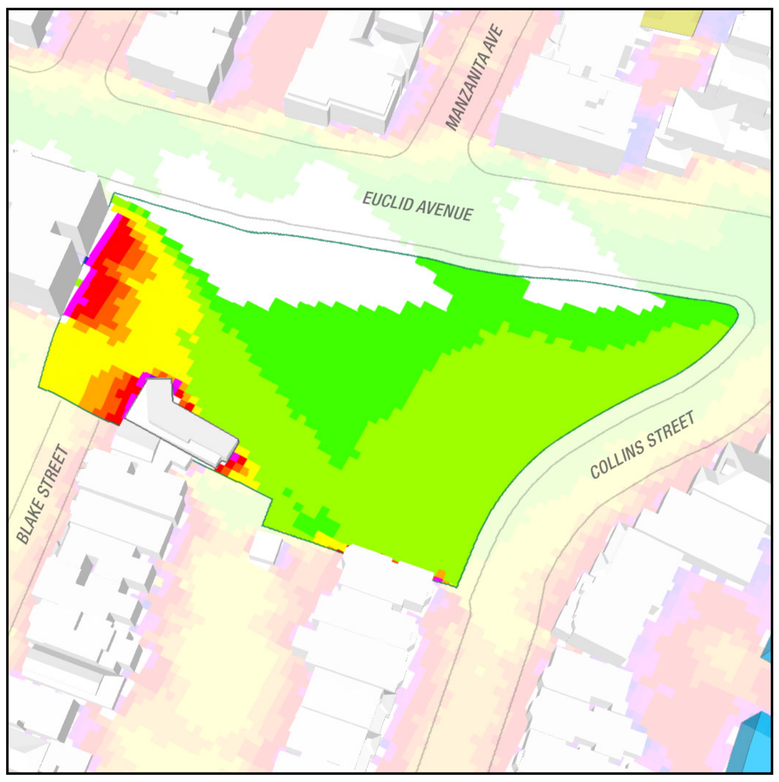
DURATION OF DAILY SHADOW BY AREA IN MINUTES (white areas are not shaded at any time)

0 15 30 45 60 75 90 105 120 135 150 165 180+

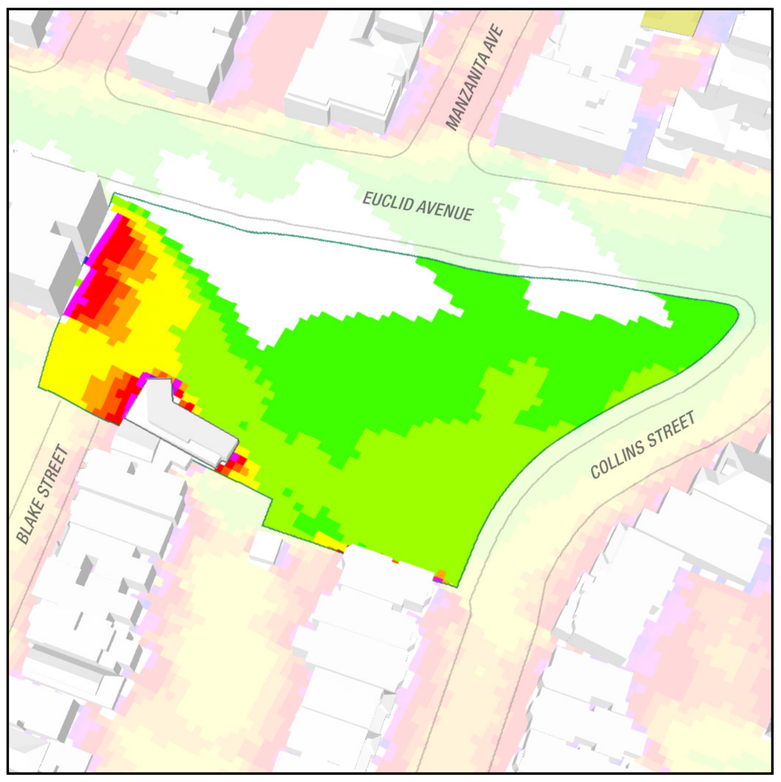
N

Existing Buildings
2050 Environmental Baseline
Proposed Action
Plan Bay Area 2050
Pipeline assumed built by 2050
Open Space Boundary

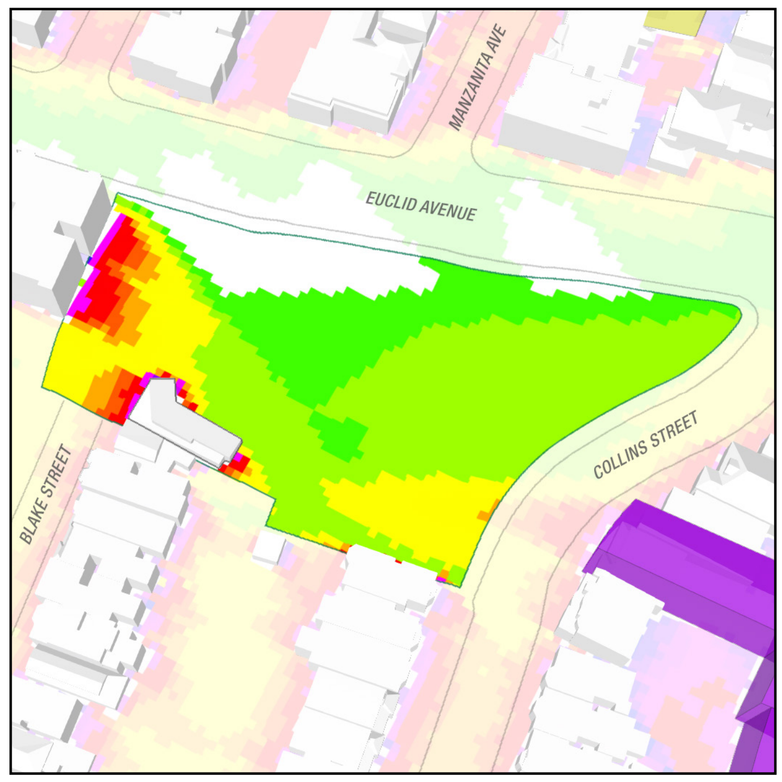
2050 ENVIRONMENTAL BASELINE



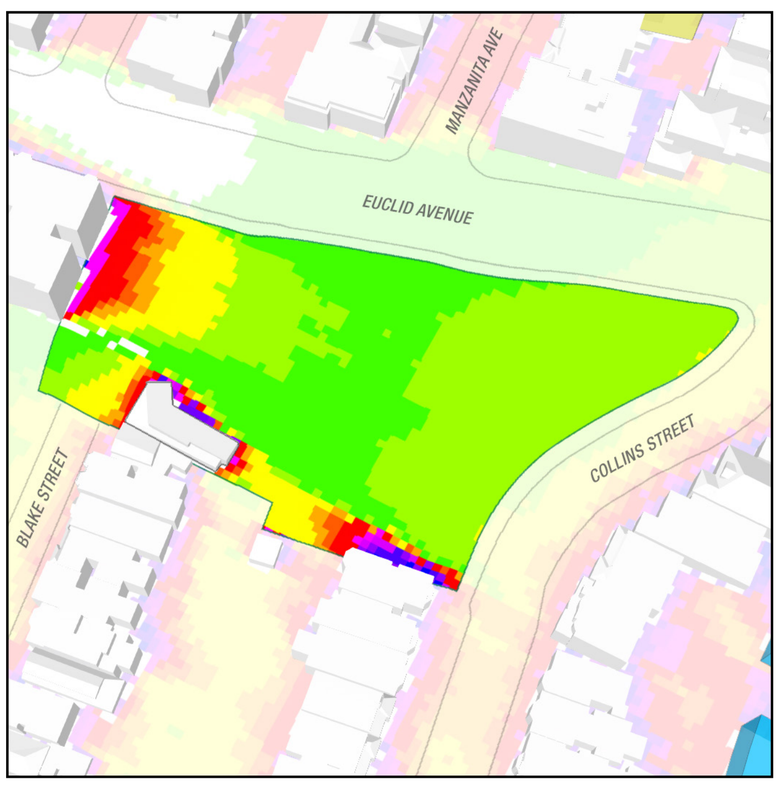
PROPOSED ACTION

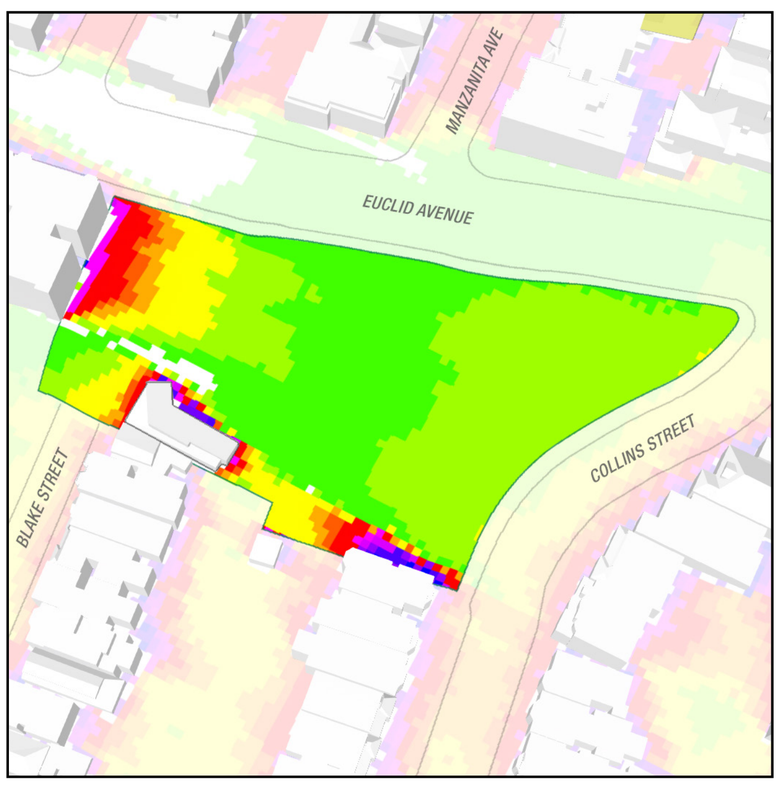


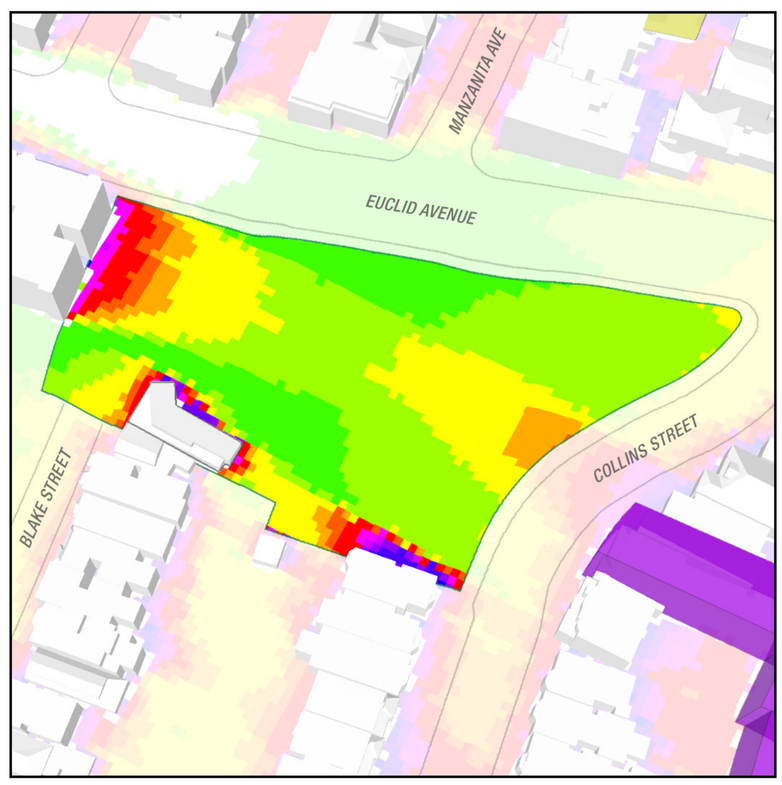
PLAN BAY AREA 2050



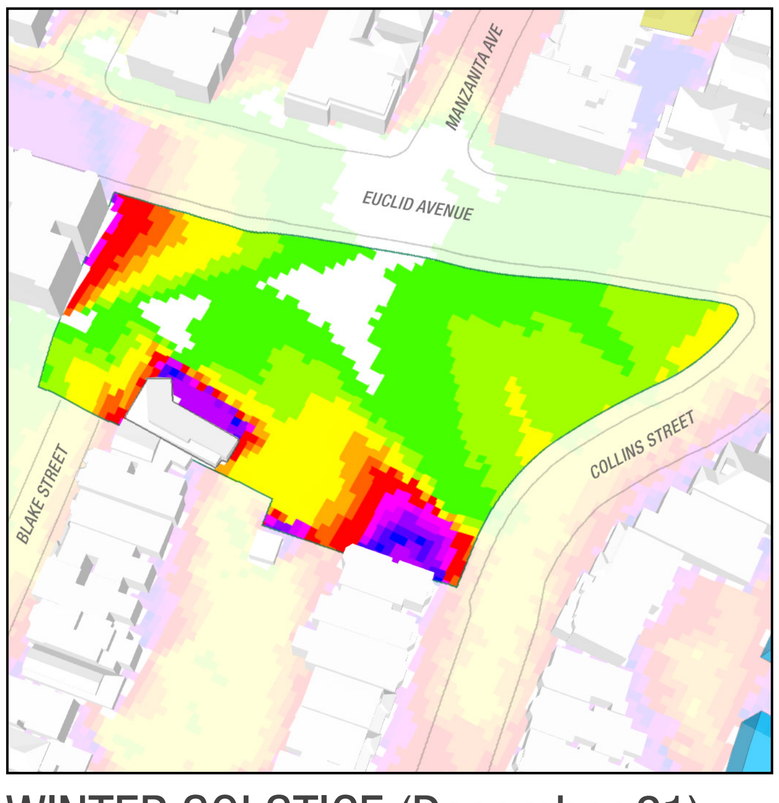
SUMMER SOLSTICE (June 21)

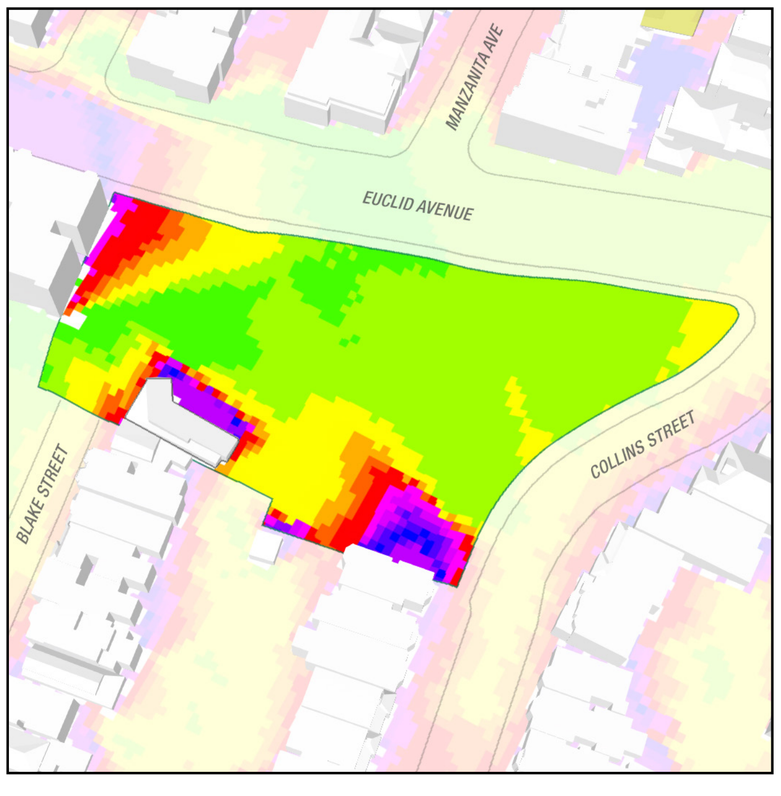


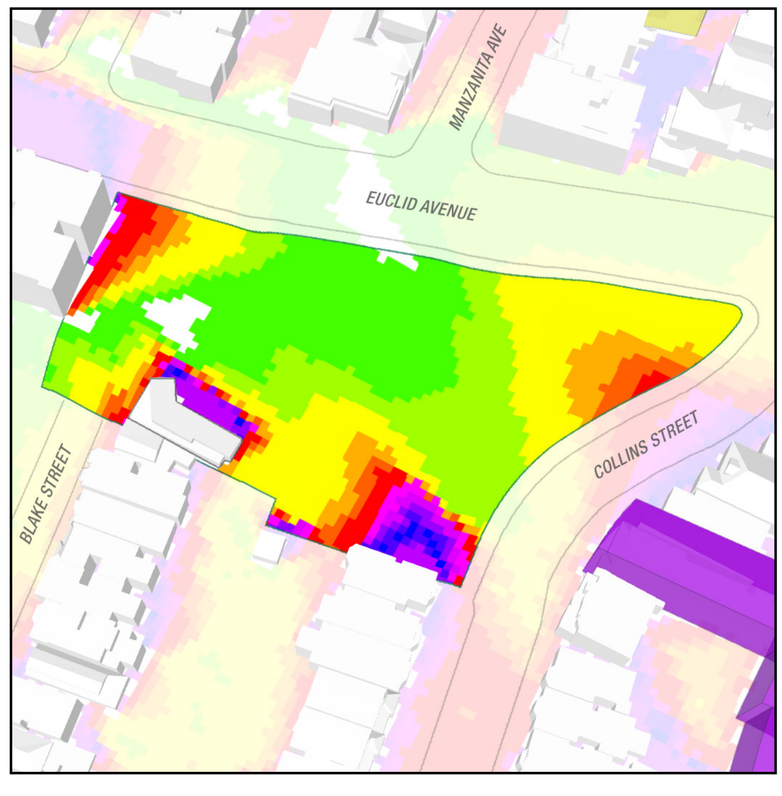




SPRING & FALL EQUINOXES (March 21 & September 21)







WINTER SOLSTICE (December 21)