CITY OF REDDING
Development Services Planning Division
777 Cypress Avenue, Redding, CA 96001
P.O. Box 496071, Redding, CA 96049-6071
Phone: 530-225-4022
cityofredding.gov

MITIGATED NEGATIVE DECLARATION

Permit No. S-2023-00802 & PD-2025-00905
State Clearinghouse No.

SUBJECT

Brentwood Village Subdivision and Planned Development

PROJECT DESCRIPTION

The Project applicant, Quartz Hill Land, LLC, is requesting approval of Tentative Subdivision Map Application S-2023-00802 and Planned Development Plan Application PD-2025-00905, to subdivide approximately 9.4 gross acres, spanning one parcel located in the northwest quadrant of the City, into 58 attached single-family residential lots, along with roadways and other supporting infrastructure, in an "RM-9-PD" Residential Multiple-Family District with Planned Development Overlay District.

Residential lot sizes would range from 2,720 square feet to 19,715 square feet. However, the majority of the lot sizes are within the 3,000 square feet to 7,000 square foot range. The Project site is zoned with a planned development overlay district which allows the flexibility necessary to have units on individual lots within the residential multiple-family zoning district. The planned development overlay also allows for flexibility in density: The Project proposes a density of 6.4 units per acre which is below the 9 units per acre normally required with the Zoning Code but above the minimum density required by the General Plan.

The Project proposes one detention pond which would also act as water quality treatment feature and private parklet.

Access to the subdivision would be taken off of Quartz Hill Road from two small street sections, Road B and Road C, that would intersect with Road A. Road A would act as the main road within the subdivision. It would also connect the existing Sunray Way which continues off-subdivision into unincorporated County property. The Conditions of Approval require construction of necessary improvements, including construction of road, curb, gutter, and sidewalk interior to the subdivision. All utility connections are available adjacent to the site. Street improvements would be required of the Project along Quartz Hill Road. These improvements include the installation of curb, gutter, and sidewalk along with landscaping and fencing.

ENVIRONMENTAL SETTING

The Project site is located in the northwest quadrant of the City. The River Ridge Park and River Ridge Terrace subdivisions exist to the south. The northern property line of the project site flanks

an unincorporated area of Shasta County. There are a couple of houses developed to the north but most of this land and the land to the west and east is undeveloped and in a natural state. While there is an area of steep slope along the site's northern boundary, the majority of the site is comparatively flat and undeveloped. An unnamed ephemeral drainage runs north to south and there are a few vernal pools present in the eastern portion of the site. The site is primarily composed of blue oak-foothill pine woodland.

FINDINGS AND DETERMINATION

The City of Redding conducted an Initial Study (attached), which determined that the proposed Project could have significant environmental effects. Subsequent revisions to the Project proposal create the specific mitigation measures identified below. The Project, as revised and as agreed to by the applicant, avoids or mitigates the potentially significant environmental effects identified, and the preparation of an environmental impact report will not be required. There is no substantial evidence, in light of the whole record before the City, that the Project as revised may have a significant effect on the environment. If there are substantial changes that alter the character or impacts of the proposed Project, another environmental impact determination will be necessary.

The Project includes measures to mitigate potentially significant impacts of development on biological resources.

Prior to approval of the project, the lead agency may conclude, at a public hearing, that certain mitigation measures identified in the Mitigated Negative Declaration are infeasible or undesirable. In accordance with CEQA Section 15074.1, the lead agency may delete those mitigation measures and substitute other measures which it determines are equivalent or more effective. The lead agency would adopt written findings that the new measure is equivalent or more effective in mitigating or avoiding potential significant effects and that it, in itself, would not cause any potentially significant effect on the environment.

1. **Based on the whole record (including the Initial Study and any supporting documentation) and the mitigation measures incorporated into the Project, the City of Redding has determined that a Mitigated Negative Declaration is appropriate. All potentially significant impacts would be reduced to less than significant.**

2. **The Mitigated Negative Declaration, with its supporting documentation, fully incorporated herein, reflects the independent judgment and analysis of the lead agency, which is the City of Redding.**

DOCUMENTATION

The attached Initial Study documents the reasons to support the above determination.

MITIGATION MEASURES

MM-Bio-1: The applicant shall have a pre-construction rare plant survey of the proposed disturbance area or other Project features that may impact special status species of the Project site conducted by a qualified botanist during the appropriate survey window (blooming period) for rare and endangered plants that have the potential to occur within the Project site if such a survey has not been provided to the City. Surveys shall be done in accordance with the most current version of California Native Plant Society *Botanical Survey Guidelines* (CNPS 2001), California

Department of Fish and Wildlife *Protocols for Surveying and Evaluating Impacts to Special Status Plant Species, Native Plant Populations and Natural Communities* and U.S. Fish and Wildlife's *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants*. If present, special status plant species plant populations will be flagged and, if possible, avoided during construction. If the population cannot be avoided during construction, a plan will be developed for approval by the California Department of Fish and Wildlife which may include transplanting the plant population, compensation, or other measures established by that agency.

MM-Bio-2: To avoid all impacts to special-status vernal pool species, construction activities cannot take place within 250 feet of occupied (or assumed occupied) vernal features. If avoidance cannot be achieved, then USFWS protocol-level sampling for vernal pool fairy shrimp shall be conducted to determine the presence of vernal pool fairy shrimp, or the applicant can assume presence of vernal pool shrimp and consult with the USFWS. The consultation process will require the preparation of a Biological Assessment and the development of a mitigation plan. At a minimum the removal of the vernal pool would require mitigation by purchasing vernal pool re-establishment credits at a 1:1 ratio and vernal pool preservation credits at a 2:1 replacement ratio.

MM-Bio-3: If vegetation removal and/or construction activities are to occur during the bat roosting season (March 1 through August 31), a Qualified Biologist shall conduct a preconstruction survey no more than seven days before vegetation removal or construction activities begin. If an active roost is found, a non-disturbance buffer shall be established for a distance of 500 feet around the nest unless a smaller buffer zone is approved by CDFW. Construction may resume once the young have left the nest or as approved by the Qualified Biologist. The survey shall be provided to the CDFW. If a lapse in construction activities of 14 days or more occurs during the roosting season, an additional roost survey is required to ensure no roosts were established in the area while construction was on hold. Minimum qualifications for a Qualified Biologist include a bachelor's degree in biological or environmental science, natural resources management, or related discipline; field experience in the habitat types that may occur at the Project site; familiarity with the Covered Species (or closely related species) that may occur at the Project site; and prior preconstruction survey, construction monitoring, or construction oversight experience (if and as relevant to the activity to be conducted).

MM-Bio-4: To avoid impacts to nesting birds and raptors, vegetation removal and/or construction shall be conducted between September 1 and January 31. If vegetation removal and/or construction activities are to occur during the nesting season (February 1 through August 31), a qualified biologist shall conduct a preconstruction survey no more than seven (7) days before vegetation removal or construction activities begin. If an active nest is found, a non-disturbance buffer shall be established by a qualified biologist in coordination with CDFW. Construction may resume once the young have left the nest or as approved by the qualified biologist. The survey shall be provided to the CDFW. If construction activities cease for a period greater than seven (7) days, additional preconstruction surveys will be required.

PUBLIC REVIEW DISTRIBUTION

Draft copies or notice of this Mitigated Negative Declaration were distributed to:

- State Clearinghouse
- Shasta County Clerk
- U.S. Army Corp of Engineers, Redding

- California Department of Fish and Wildlife, Redding
- Central Valley Regional Water Quality Control Board, Redding
- California Native Plant Society, Shasta County
- Shasta Environmental Alliance
- Redding Rancheria
- Wintu Tribe of Northern California
- Paskenta Band of Nomlaki Indians
- All property owners within 300 feet of the property boundary
- Applicant
- Property Owner, if not applicant
- Representative

PUBLIC REVIEW

(X) Draft document referred for comments July 3, 2025.

( ) No comments were received during the public review period.

( ) Comments were received but did not address the draft Mitigated Negative Declaration findings or the accuracy/completeness of the Initial Study. No response is necessary. The letters are attached.

( ) Comments addressing the findings of the draft Mitigated Negative Declaration and/or accuracy or completeness of the Initial Study were received during the public review period. The letters and responses follow (see Response to Comments, attached).

The draft Mitigated Negative Declaration, Initial Study, Mitigated Negative Declaration, and other information concerning the project are available for public review Monday through Friday from 8:00 a.m. to 3:00 p.m., at the Planning Division of the Development Services Department, City of Redding, 777 Cypress Avenue, Redding, CA 96001, and online on the Development Services' City Planning Projects page of the City's website at http://www.cityofredding.gov. If you have any questions or wish to submit comments, please contact Danny Castro, Associate Planner, at dcastro@cityofredding.org, or by telephone at (530) 225-4471.

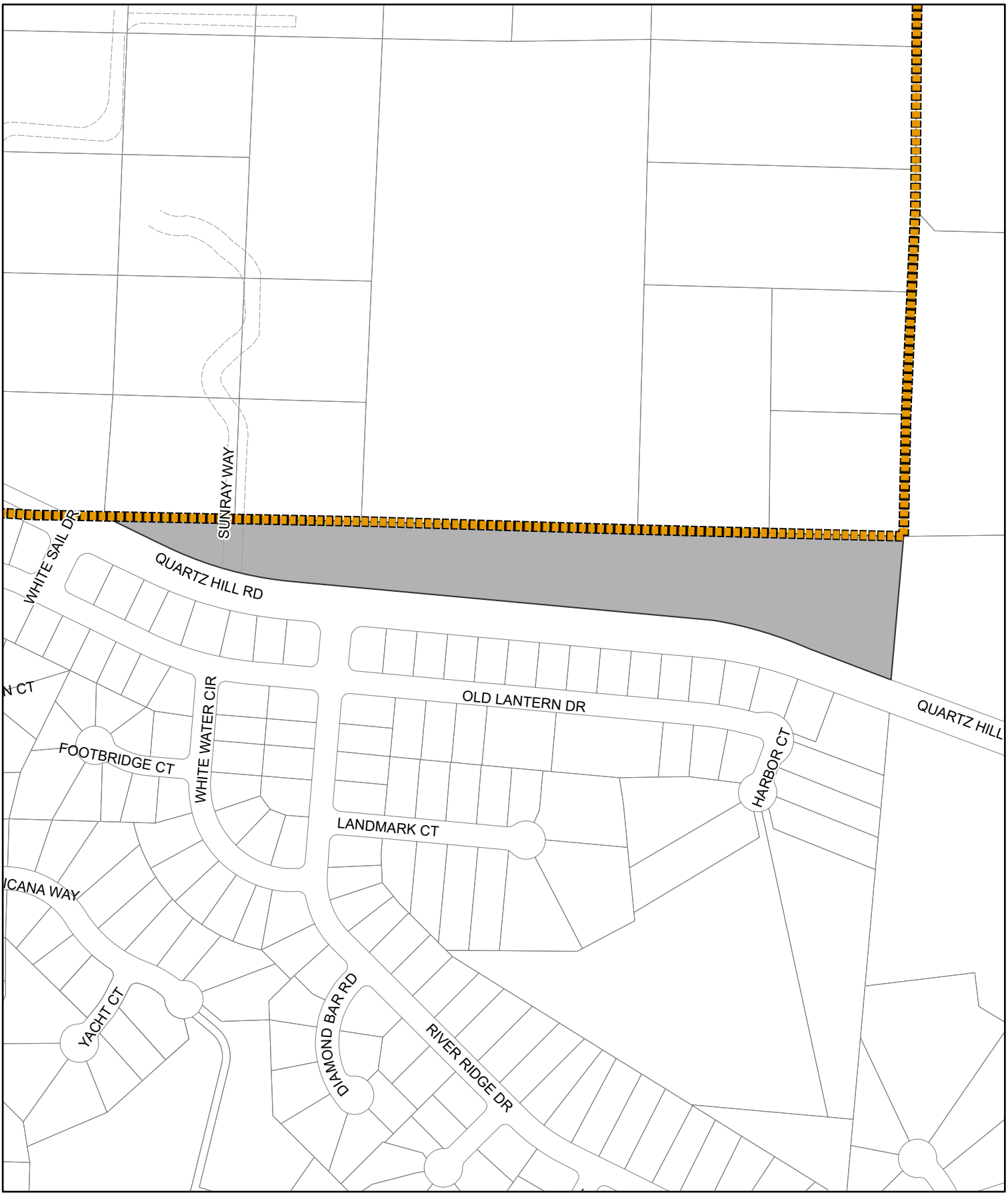


Lily Toy, Planning Manager

July 3, 2025
Date

Date of Final Report

Attachments:
A. Location map
B. Initial Study
C. Mitigation Monitoring Program



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GIS DIVISION
INFORMATION TECHNOLOGY DEPARTMENT

DATE PRODUCED:
JUNE 2, 2023

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LOCATION MAP

S-2023-00802
RAMAKRISHNA KANDULA
605 QUARTZ HILL RD
AP# 115-170-014

MTG. DATE:

ITEM:

ATTACHMENT:

ENVIRONMENTAL INITIAL STUDY

INITIAL STUDY CHECKLIST
References and Documentation

Brentwood Village
Tentative Subdivision Map S-2023-00802
and Planned Development Plan PD-2025-00905

Prepared by:
CITY OF REDDING
Development Services Department
Planning Division
777 Cypress Avenue
Redding, California 96001

July 2, 2025

CITY OF REDDING
ENVIRONMENTAL CHECKLIST FORM

1. Project Title: Brentwood Village Subdivision and Planned Development

2. Lead Agency Name and Address:

CITY OF REDDING
Development Services Department
Planning Division
777 Cypress Avenue
Redding, CA 96001

3. Contact Person and Phone Number: Danny Castro, 530.225.4471

4. Project Location:

605 Quartz Hill Road
Redding, CA 96003

5. Applicant's Name and Address:

Quartz Hill Land, LLC
2040 Trefoil Road
San Ramon, CA 94582

Representative's Name and Address:

Sharrah Dunlap Sawyer, Inc.
320 Hartnell Avenue
Redding, CA 96002

6. General Plan Designation: Residential 6 to 10 Units per Acre

7. Zoning: "RM-9-PD" Residential Multiple-Family Planned Development Overlay District

8. Description of Project:

Tentative Subdivision Map Application S-2023-00802 and Planned Development Plan Application PD-2025-00905 propose to subdivide approximately 9.4 gross acres, spanning one parcel located in the northwest quadrant of the City, into 58 attached single-family residential lots, along with roadways and other supporting infrastructure, in an "RM-9-PD" Residential Multiple-Family District with Planned Development Overlay District.

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The project proposes one detention pond which would also act as water quality treatment feature and private parklet.

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Sunray Way which continues off-subdivision into unincorporated County property. The Conditions of Approval require construction of necessary improvements, including construction of road, curb, gutter, and sidewalk interior to the subdivision. All utility connections are available adjacent to the site. Street improvements would be required of the project along Quartz Hill Road. These improvements include the installation of curb, gutter, and sidewalk along with landscaping and fencing.

9. Surrounding Land Uses and Setting:

The Project site is located in the northwest quadrant of the City. The River Ridge Park and River Ridge Terrace subdivisions exist to the south. The northern property line of the project site flanks an unincorporated area of Shasta County. There are a couple of houses developed to the north but most of this land and the land to the west and east is undeveloped and in a natural state. While there is an area of steep slope along the site's northern boundary, the majority of the site is comparatively flat and undeveloped. An unnamed ephemeral drainage runs north to south and there are a few vernal pools present in the eastern portion of the site. The site is primarily composed of blue oak-foothill pine woodland.

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement):

California Regional Water Quality Control Board
California Department of Fish and Wildlife
United States Army Corps of Engineers

11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, is there a plan for consultation that includes, for example, the determination of significance of impacts to tribal cultural resources, procedures regarding confidentiality, etc.?

The Redding Rancheria, the Paskenta Band of Nomlaki Indians, and the Wintu Tribe of Northern California were noticed about this project and the preparation of its associated initial study. While the Paskenta Band of Nomlaki Indians initially requested consultation, no other California Native American tribes requested consultation pursuant to Public Resources Code section 21080.3.1. Consultation with the Paskenta Band of Nomlaki Indians is ongoing although the City has not been made aware of any tribal cultural resources present on the project site.

Note: *Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code section 21080.3.2.) Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code section 21082.3(c) contains provisions specific to confidentiality.*

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact or Potentially Significant Unless Mitigation Incorporated" as indicated by the checklist on the following pages.

	Aesthetics		Agricultural and Forestry Resources		Air Quality
X	Biological Resources		Cultural Resources		Energy
	Geology / Soils		Greenhouse Gas Emissions		Hazards & Hazardous Materials
	Hydrology / Water Quality		Land Use / Planning		Mineral Resources
	Noise		Population / Housing		Public Services

	Recreation		Transportation		Tribal Cultural Resources
	Utilities / Service Systems		Wildfire		Mandatory Findings of Significance

DETERMINATION: (To be completed by the Lead Agency)

On the basis of the initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR of NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Copies of the Initial Study and related materials and documentation may be obtained at the Planning Division of the Development Services Department, 777 Cypress Avenue, Redding, CA 96001. Contact Danny Castro at (530) 225-4471.



Danny Castro
Development Services Department

July 2, 2025
Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

This section analyzes the potential environmental impacts associated with the proposed project. The issue areas evaluated in this Initial Study include:

- Aesthetics
- Agricultural and Forestry Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Energy
- Geology/Soils
- Greenhouse Gas Emissions
- Hazards & Hazardous Materials
- Hydrology/Water Quality
- Land Use/Planning
- Mineral Resources
- Noise
- Population/Housing
- Public Services
- Recreation
- Transportation
- Tribal Cultural Resources
- Utilities/Service Systems
- Wildfire
- Mandatory Findings of Significance

The environmental analysis in this section is patterned after the Initial Study Checklist recommended by the State *CEQA Guidelines* and used by the City of Redding in its environmental review process. For the preliminary environmental assessment undertaken as part of this Initial Study's preparation, a determination that there is a potential for significant effects indicates the need to more fully analyze the development's impacts and to identify mitigation.

For the evaluation of potential impacts, the questions in the Initial Study Checklist are stated and an answer is provided according to the analysis undertaken as part of the Initial Study. The analysis considers the long-term, direct, indirect, and cumulative impacts of the development. To each question, there are four possible responses:

- **No Impact.** The development will not have any measurable environmental impact on the environment.

- **Less Than Significant Impact.** The development will have the potential for impacting the environment, although this impact will be below established thresholds that are considered to be significant.

- **Potentially Significant Impact Unless Mitigation Incorporated.** The development will have the potential to generate impacts which may be considered as a significant effect on the environment, although mitigation measures or changes to the development's physical or operational characteristics can reduce these impacts to levels that are less than significant.

- **Potentially Significant Impact**. The development will have impacts which are considered significant, and additional analysis is required to identify mitigation measures that could reduce these impacts to less than significant levels.

Where potential impacts are anticipated to be significant, mitigation measures will be required, so that impacts may be avoided or reduced to insignificant levels.

Prior environmental evaluations applicable to all or part of the project site:

- *City of Redding General Plan* 2045
- *City of Redding General Plan Update Final Environmental Impact Report*, 2024, SCH #2022050300
- CEQA Findings of Fact and Statement of Overriding Considerations for the *City of Redding General Plan Update Final Environmental Impact Report*, as adopted by the Redding City Council on March 13, 2024, by Resolution 2024-027

List of attachments/references:

Attachment A – Figure 1 – Location Map
Figure 2 – Tentative Map Package (Cover Sheet, Tentative Map, Preliminary Grading, Preliminary Utilities, Tree Information Sheet)
Figure 3 – Planned Development Plan

Attachment B – *Biological Resources Assessment, Aquatic, Terrestrial, and Botanical Resources, Brentwood Village Development Project, City of Redding, Shasta County, California*, Gallaway Enterprises, September 2022

Attachment C – *Brentwood Village Entitlement Storm Drainage Analysis*, Sharrah Dunlap Sawyer, Inc., November 29, 2022

Attachment D – *Cultural Resources Inventory Survey, Brentwood Development Project, c. 9.5-acres, City of Redding, Shasta County, California*. Gallaway Enterprises, July 19, 2022
Attachment E – *Draft Delineation of Aquatic Resources, Brentwood Village Development Project, Redding, Shasta County, California*, Gallaway Enterprises, September 2022
Attachment F – *Re: Brentwood Timeline 22.0143.000*, Kevin Sevier, Gallaway Enterprises, June 4, 2025
Attachment G – *Re: Response to CDFW email dated December 4, 2023 titled Early Consultation for Tentative Subdivision Parcel Map S-2023-00802 (Brentwood Village)*, Gallaway Enterprises, February 26, 2024
Attachment H – *Re: Western Spadefoot Survey for the Brentwood Village Development on Quartz Hill Road (APN 115-170-014); Shasta County, California*, Gallaway Enterprises, February 2023
Attachment I – *Transportation Impact Study for the Brentwood Village Project, Prepared for the City of Redding*, W-Trans, March 21, 2024
Attachment J – *Tree Inventory for the Brentwood Village Development Project – Redding, California*, Gallaway Enterprises, September 2022

I. AESTHETICS: *Except as provided in Public Resources Code Section 21099, would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Have a substantial adverse effect on a scenic vista?			**X**	
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?			**X**	
c) In nonurbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? *(Public views are those that area experienced from publicly accessible vantage point).* If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?			**X**	
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?			**X**	

Discussion:

a) Scenic resources identified in the General Plan Environmental Impact Report include the Sacramento River and its tributaries; mountains and foothill; and open hillsides. Development of the Project would not obstruct a scenic vista identified in the *City of Redding General Plan 2045* and would be consistent with development pattern established on nearby properties. Although new development would alter the appearance of the existing conditions, it would not create a substantial adverse impact on scenic vistas or degrade the City's visual character or quality due to the existing urbanized character of the City. The Project will comply with the City's development ordinances, including the Zoning Ordinance and Subdivision Ordinance. The proposed Project would not represent a significant change to the overall scenic quality of the area.

b) The Project site is not located adjacent to a state-designated scenic highway. In addition, the Project would be consistent with the surrounding land uses and the project would not substantially obstruct, interrupt, or detract from identified scenic resources. There are not prominent rock outcroppings, visually-significant tree stands, or historic buildings in the vicinity of the Project.

c) The Project will be compatible with the existing developed visual character of the adjacent/nearby development. The Project is consistent with the General Plan density allowed on-site and the Project site is located adjacent to an area which is developed with similar uses. The location, size, and design of the proposed use would be compatible with uses in the immediate area.

d) The Project would generate light that is customary for development and comply with the Zoning Ordinance light standards. There would not be an adverse effect on day or nighttime views in the area.

Documentation:
City of Redding General Plan 2045, Community Development and Design Element 2045
City of Redding General Plan 2045, Natural Resources Element 2045

City of Redding Zoning Ordinance, Chapter 18.40.090

Mitigation:
None necessary.

II. AGRICULTURE RESOURCES: *In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural, Land Evaluation and Site Assessment Mode (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided bin Forest Protocols adopted by the California Air Resources Board. Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				**X**
b) Conflict with existing zoning for agricultural use, or a Williamson Act Contract?				**X**
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 5110(g))?				**X**
d Result in the loss of forest land or conversion of forest land to non-forest use?				**X**
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest land?				**X**

Discussion:
a-e) The Project site does not contain designated farmland, forest land, or timberlands. The Project site has not been historically used for agricultural purposes, nor does it possess soils that are prime for agricultural production. The site is not located within an area of Prime Farmland as identified by the California Department of Conservation's Important Farmland Series Mapping and Monitoring Program and is not under Williamson Act contract. The Project would not convert or rezone any farmland to non-agricultural use, or any forest land to non-forest use.

Documentation:
City of Redding General Plan 2045, Natural Resources Element 2045
California Department of Conservation's Farmland Mapping and Monitoring Program
United States Department of Agriculture, Soil Conservation Service and Forest Service, *Soil Survey of Shasta County Area*.

Mitigation:
None necessary.

III. AIR QUALITY: *Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Conflict with or obstruct implementation of the applicable air quality plan?			**X**	

III. AIR QUALITY: *Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable Federal or State ambient air quality standard			**X**	
c) Expose sensitive receptors to substantial pollutant concentrations?				**X**
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?				**X**

Discussion:

a) Shasta County, including the far northern Sacramento Valley, currently exceeds the state's ambient standards for ozone (smog) and particulates (fine, airborne particles). Consequently, these pollutants are the focus of local air quality policy, especially when related to land use and transportation planning. Even with application of measures to reduce emissions for individual projects, cumulative impacts are unavoidable when ozone and/or particulate emissions are involved. For example, the primary source of emissions contributing to ozone is from vehicles. Any project that generates vehicle trips has the potential of contributing incrementally to the problem.

The City of Redding General Plan (GP) Environmental Impact Report (EIR) concluded that cumulative impacts would be significant and unavoidable *on a City-wide basis* and those impacts are addressed in the adopted CEQA Findings of Fact and Statement of Overriding Considerations. The GP EIR estimated areawide and mobile source emissions under the General Plan 2045 and compared the estimates to the estimated area and mobile source emissions projected in the 2021 Air Quality Attainment Plan (AQAP) for year 2025, which is the time horizon of the AQAP. The analysis concluded that the *cumulative* ROG and NOX emissions that would be generated by activity under the GP in 2045 would exceed the projections in the AQAP for year 2025 resulting in a very conservative determination. The GP EIR mirrors GP policies by requiring Mitigation Measures AQ-1 and AQ-2. AQ-1 requires that "Standard Mitigation Measures" (SMMs) be applied to all discretionary projects. AQ-2 requires the use of Best Available Mitigation Measures (BAMMs) recommended by SCAQMD which have the ability to provide recommendations for each discretionary project. The requirement of SMMs are also required by the City's Standard Conditions of Approval (SCOA) for discretionary projects including subdivisions. Because the Project would generate the type of construction and traffic emissions projected for the land use types and density set forth for the Project site by the GP EIR, the Project would not conflict with the SCAQMD plans and impacts would be less than significant.

b) The GP EIR concluded that cumulative impacts would be significant and unavoidable on a City-wide basis and those impacts are addressed in the adopted CEQA Findings of Fact and Statement of Overriding Considerations. The GP EIR concluded that implementation of the GP would cumulatively generate construction-related emissions of criteria air pollutants and precursors, including ROG, NOX, PM10, and PM2.5 from site preparation (e.g., excavation, clearing), off-road equipment, material delivery, worker commute trips, and other activities (e.g., building construction, asphalt paving, application of architectural coatings). Implementation of the construction-related SMMs as required by the City's SCOA for discretionary projects would reduce construction-generated emissions of criteria air pollutants and precursors. However, due to Shasta County's nonattainment-transitional status for ozone, construction activities associated with the Project would add to the cumulative impacts, and the GP EIR acknowledges that implementation of the GP may result in adverse air quality impacts to surrounding land uses and may contribute to the existing air quality condition in the City. There are no components of the proposed Project that would result in increased construction-related air quality emissions beyond what was previously evaluated and disclosed by the GP EIR for the Project site. Nonetheless, and consistent with the findings of the GP EIR, Project-related air quality emissions during construction activities would contribute to the significant and unavoidable construction-related air quality impact identified by the GP EIR (Impact AQ-2), However, the Project would not result in increased impacts or increased cumulatively-considerable impacts due to construction-related emissions beyond what was evaluated and disclosed by the GP EIR and would not exceed the thresholds established by the GP.

The *City of Redding General Plan 2045*, Natural Resources Element 2045 establishes emission thresholds that have been adopted by regional agencies when determining air quality impacts of discretionary projects for the important regional/local pollutants, including: Reactive Organic Gases (ROG) and Oxides of Nitrogen (NOx), which are ozone precursors, and Inhalable Particulate

Matter, 10 Micron (PM_{10}) and 2.5 Micron ($PM_{2.5}$) as follows:

Level "A"	**Level "B"**
25 pounds per day of NOx	137 pounds per day of NOx
25 pounds per day of ROG	137 pounds per day of ROG
80 pounds per day of PM_{10}	137 pounds per day of PM_{10}
80 pounds per day of $PM_{2.5}$	

The process of applying SMM and BAMM is to apply appropriate SMM to all projects based on potential air quality impacts and to help contribute to reducing cumulative impacts. If the project exceeds Level "A" threshold, then BAMM will be applied based on the unique characteristics of the project selected from a list of measures provided by AQMD. If a project exceeds Level "B" thresholds, SMM, BAMM, and appropriate special BAMM would be applied and the City will seek recommendations of the AQMD regarding the efficiency of proposed emissions measures beyond BAMM. If a project's emission cannot be reduced to below Level "B" thresholds, emission offsets will be required. If, after applying emission offsets, the project still exceeds the Level "B" threshold, then an Environmental Impact Report is required.

The current Project has the potential to impact air quality primarily in two ways: (1) the Project would generate vehicle trip emissions (with NOx, ROG, and PM_{10}) that contribute cumulatively to local and regional air quality conditions; and (2) fugitive dust (particulate/$PM_{10 \text{ and }} PM_{2.5}$) emissions are possible during construction activities. As a residential development, the Project does not have the potential to generate significant emission concentrations of other pollutants subject to state and federal ambient air quality standards, and no recommendations for BAMM were made by the SCAQMD.

Application of the SMMs outlined below would reduce the Project's potential air quality impacts to a level less than significant.

1. Apply nontoxic soil stabilizers according to manufacturer's specification to all inactive construction areas (previously-graded areas inactive for ten (10) days or more).
2. Reestablish ground cover on the construction site through seeding and watering prior to final occupancy.
3. All grading operations shall be suspended by the City Engineer when winds (as instantaneous gusts) exceed 20 miles per hour as directed by the AQMD.
4. Provide temporary traffic control as appropriate during all phases of construction to improve traffic flow (e.g. flag person) as approved by the City Engineer.
5. Schedule construction activities that affect traffic flow to off-peak hours as determined by the City Engineer.
6. Water active construction sites at least twice daily or as directed by the Public Works Department.
7. All truck hauling dirt, sand, soil, or other loose materials shall be covered or maintain at least two feet (2') of freeboard (i.e., minimum vertical distance between top of the load and the trailer) in accordance with the requirements of CVC Section 23114. This provision is enforced by local law enforcement agencies.
8. Sweep streets at the end of the day if visible soil materials are carried onto adjacent public paved roads (recommend water sweeper with reclaimed water).
9. Install wheel washers where vehicles enter and exit unpaved roads onto paved roads, or wash off trucks and any equipment leaving the site each trip.

In addition to the requirements of the California Building Code, the following operational SMMs will be applied as appropriate to as recommended by the Shasta County Air Quality Management District:

1. Provide energy-efficient process systems, such as water heaters, furnaces, and boiler units.
2. All new wood burning devices shall be EPA Phase II certified.
3. Large residential, commercial, and industrial projects should include bus shelters at transit access points.
4. Contribute to traffic-flow improvements that reduce emissions and are not growth-inducing (e.g., right-of-way, capital improvements, etc.)
5. Install an electrical outlet at the front and back of all residential units for electrical yard equipment.
6. Streets should be designed to maximize pedestrian access to transit stops.

c-d) The GP EIR concluded that cumulative impacts would be significant and unavoidable on a City-wide basis and those are addressed in the adopted CEQA Findings of Fact and Statement of Overriding Considerations. However, the document notes that the

SCAQMD identified the following types of land use conflicts that could result in the exposure of sensitive receptors to excessive pollutant concentrations in their CEQA Land Use Protocol Guidelines:

- Development projects with sensitive receptors in close proximity to a congested intersection or roadway with high levels of emissions from motor vehicles. High concentrations of carbon monoxide, fine particulate matter, or toxic air contaminants are the most common concerns.
- Development projects with sensitive receptors close to an industrial source of toxic air contaminants.
- Development projects with sensitive receptors close to a source of odorous emissions. Although odors generally do not pose a health risk, they can be quite unpleasant and often lead to citizen complaints to the District and to local governments.

The Project does not meet any of these criteria. Further, the Project is not located in proximity to any of the land uses types noted.

Documentation:
City of Redding General Plan 2045, Natural Resources Element 2045
City of Redding General Plan Update Final Environmental Impact Report, 2024, SCH #2022050300
CEQA Findings of Fact and Statement of Overriding Considerations for the *City of Redding General Plan Update Final Environmental Impact Report*, as adopted by the Redding City Council on March 13, 2024, by Resolution 2024-027

Mitigation:
None necessary.

IV. BIOLOGICAL RESOURCES: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?		**X**		
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local of regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?				**X**
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?			**X**	
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?		**X**		
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?			**X**	
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community, Conservation Plan, or other approved local, regional, or State habitat conservation plan?				**X**

Discussion:

a) The information below is based on the survey results documented in the Biological Resources Assessment (BRA), response memo for Crotch's bumble bee, Western Spadefoot Survey, and Draft Delineation of Aquatic Resources, all prepared by Gallaway Enterprises for the project. The BRA included a late season protocol level survey for all plant species with blooming periods that overlapped the survey date.

Plants

The majority of the Project site is composed of blue oak-foothill pine woodland characterized by an overstory of primarily blue oaks and scattered foothill pines, and a sparse to moderately-dense understory dominated by white leaf manzanita and poison oak. Annual grassland occurs throughout the site, primarily as the herbaceous layer of blue oak-foothill pine woodland, but also in a few patches where the tree canopy opens.

No special-status plant species were observed onsite; however, potentially suitable habitat was identified for Henderson's bent grass and Red Bluff dwarf rush.

Henderson's bent grass: There is marginally suitable habitat present in and around a vernal pool and ephemeral ditch on the Project site; however, these habitats are disturbed and primarily man-made features and there are no recorded occurrences of Henderson's bent grass in close proximity to the site. Because of the possibility for Henderson's bent grass to occur onsite, the Project could impact the plant. Mitigation measure MM-Bio-1 would reduce Project impacts to Henderson's bent grass to less than significant.

Red Bluff dwarf rush: The site contains shallow vernal pools that could potentially provide suitable habitat for Red Bluff dwarf rush. However, the vernal habitat present is largely man-made and disturbed and there are no recorded California Natural Diversity Database (CNDDB) occurrences in close proximity to the Project site. Because of the possibility for Red Bluff dwarf rush to occur onsite, the Project could impact the plant. Mitigation measure MM-Bio-1 would reduce Project impacts to Red Bluff dwarf rush to less than significant.

Animals

Potentially suitable habitat was identified for vernal pool fairy shrimp, western spadefoot toad, pallid bat, western red bat, and migratory birds and raptors.

Vernal pool fairy shrimp: There are vernal pools present onsite that contain potentially suitable habitat for vernal pool fairy shrimp; however, they are shallow and vegetated with marginally hydrophytic species, indicating short ponding duration. Based on the presence of marginally suitable habitat within the Project site, there is a low potential for vernal pool fairy shrimp to occur. Because a protocol level survey has not been performed to rule out the presence of vernal pool fairy shrimp, mitigation measure MM-Bio-2 mitigates potential impacts to them to a level of less than significant.

Western spadefoot toad: The site features aquatic resources that could support breeding habitat for western spadefoot when water is ponded for 30 days or longer during the western spadefoot breeding season, and adjacent grasslands could provide suitable aestivation habitat. Due to the lack of nearby occurrences and marginally suitable habitat, there is low potential for western spadefoot to occur on site. Two nighttime pre-construction surveys were conducted by a qualified biologist on January 31 and February 6, 2023 following precipitation events and when ambient temperatures were above 49˚F and while ponded water was present. No western spadefoot toads were observed or acoustically detected onsite. In Gallaway Enterprise's professional opinion, additional nighttime surveys are not needed. No impacts to the western spadefoot toad are anticipated.

Bats: Mature trees onsite could potentially provide suitable roosting habitat for the pallid bat. Evidence of roosting was not observed during the biological habitat assessment but there is low potential for the species to occur within the Project site. Oak trees could potentially provide suitable roosting habitat for western red bats. Western red bats are closely associated with riparian habitat, which does not occur onsite. While the potential for the western red bat to occur within the project site is low, they cannot be ruled out. Mitigation measure MM-Bio-3 addresses potential impacts to the pallid and western red bats and brings those impacts to a level of less than significant.

Migratory birds and raptors: There are suitable nesting habitats for a variety of nesting avian species throughout the site. The bird species covered by the Migratory Birds Treaty Act (MBTA) includes nearly all of those that breed in North America, excluding introduced species. Activities that involve the removal of vegetation including trees, shrubs, grasses, and forbs or ground disturbance have the potential to affect bird species protected by the MBTA. Mitigation measure MM-Bio-4 addresses potential impacts to migratory birds and raptors and brings those impacts to a level of less than significant.

Crotch's bumble bee: The California Department of Fish and Wildlife (CDFW) was consulted early regarding the Biological Resources Survey and Wetlands Delineation Study and had concern that there may be potentially suitable habitat for Crotch's

bumble bee within the Project site. After analysis, Gallaway Enterprises concluded that there is no suitable essential habitat for Crotch's bumble bee within the Project area. Floral resources within the grassland habitat are insufficient to support Crotch's bumble bees year-round and no known Crotch's bumble bee food sources were observed during the botanical survey conducted on August 10, 2022. Additionally, the nearest Crotch's bumble bee CNDDB occurrence is approximately 31 miles southeast of the BSA in Red Bluff, and the nearest Bumble Bee Watch sighting is approximately 50 miles southeast of the BSA in Vina. Therefore, an on-site assessment for Crotch's bumble bee is not warranted due to the lack of suitable essential habitat or nearby recorded occurrences.

b) No CDFW-designated sensitive natural communities or critical habitat occurs within the Project site. No riparian habitat is present as there are no edges of rivers, streams, lakes, or other water bodies on or immediately adjacent to the site.

c) Three isolated vernal pools are present in the eastern portion of the Project site. One is a clearly defined closed depression and the other two are minutely shallow depressions located with the compacted soils of dirt roads. They have a combined total area of 0.05 acres. These features have no hydrologic connection to any jurisdictional feature and, thus, do not meet the definition of a jurisdictional Waters of the United States (WOTUS). To confirm the jurisdictional status of WOTUS within the project site, the report recommends that a significant nexus determination be conducted by the United States Army Corp of Engineers (USACE). By law, the filling of WOTUS requires a permit from the USACE. Gallaway suggests that it is more likely that all of the wetlands onsite would be considered waters of the State. Permits from the State Water Resources Control Board (SWRCB) may be applicable. The applicant would be required to do any mitigation required by one of the above agencies.

   Riverine habitat occurs onsite in the form of a manmade channel that is characterized by ephemeral flows which run south to north through the site. This drainage is heavily vegetated and likely only provides aquatic habitat when it is flowing immediately after precipitation events. The drainage is unlikely to provide functioning habitat for fishes and other aquatic species. Because this drainage channel lacks the criteria to be considered a wetland it is considered an "other waters of the United States" (OW) and would not fall under Federal jurisdiction. Although it would not count as a Federally-jurisdictional feature, permission for work in the onsite ephemeral drainage may be required from the California Department of Fish and Wildlife (CDFW).

   While mitigation measures are not necessary for the purposes of this environmental document, acquisition of the required permits, or an agency determination that such permits are not necessary, will be required prior to issuance of a grading permit and are conditioned with the Project's conditions of approval for the filling of the wetlands and the filling or alteration of the ephemeral drainage channel. Acquiring Federal and/or State permits to fill jurisdictional features is also the law.

d) The Project site is surrounded by existing development to the south. The site does not serve as a wildlife movement corridor as it does not link together areas of suitable habitat that are otherwise separated by rugged terrain, changes in vegetation, or human development. The site contains trees that could be used for nesting migratory birds and bats. Although no special status bird or bat species were observed on the Project site during the protocol level field survey, the potential for the Project to interfere with an established native resident, migratory wildlife, or native wildlife nursery site is considered a potentially significant impact. Mitigation measures MM-Bio-3 and MM-Bio-4 bring those impacts to less than significant.

e) The City has adopted a Tree Management Ordinance (Chapter 18.45 of the RMC) that promotes the conservation of mature, healthy trees in the design of new development. The ordinance also recognizes that the preservation of trees will sometimes conflict with necessary land-development requirements. The City's General Plan EIR further acknowledges that preservation of native trees will sometimes conflict with normal land development and that implementation of the General Plan will ultimately set aside over 7,000 acres of open space, much of which contains oak habitat. But efforts must still be made to retain existing trees if reasonably possible, and to sufficiently plant new trees in the context of the new development. A tree survey is required to identify natural trees and tree groups most suitable for preservation or "candidate trees/groups." Where all identified candidate trees/groups cannot be preserved, the set-aside of a natural area or areas within a project site that is particularly suitable for the planting, retention, and/or natural regeneration of trees is considered to be a desirable means of accomplishing the goals of the ordinance.

   A tree inventory for the Project site was conducted in August of 2022 by Gallaway Enterprises. The study identified a total of 303 blue oaks and 15 foothill pines that measured over six inches in diameter at breast height (DBH). Each inventoried tree was assigned a health rating of 1 to 5 with 1 being a tree with poor health and 5 being a tree in excellent health. The average health of the trees inventoried was 2, with many of the trees in declining health due to drought. Sixteen of the trees over six inches DBH are proposed to be preserved, with 302 to be removed. City staff have not identified any candidate trees with the potential to be preserved, and the removal of trees is permitted with an approved grading or building permit. While many trees are proposed for removal, the Project anticipates the installation of approximately 326 new trees. The lawful removal of trees is allowed under the Tree

Management Ordinance. Because the Project does not conflict with the Tree Management Ordinance or any other conservation plan, impacts would be considered to be ***less than significant*** in this regard.

f) No habitat conservation plans or other similar plans have been adopted for the area of the Project site proposed for development. No impact would occur in this regard.

Documentation:

City of Redding General Plan 2045, Natural Resources Element 2045
City of Redding General Plan Update Final Environmental Impact Report, 2024, SCH #2022050300
City of Redding Municipal Code, Chapter 18.45, *Tree Management Ordinance*
California Department of Fish and Wildlife: Natural Diversity Database
Tree Inventory for the Brentwood Village Development Project – Redding, California, Gallaway Enterprises, September 2022
Biological Resources Assessment, Aquatic, Terrestrial, and Botanical Resources, Brentwood Village Development Project, City of Redding, Shasta County, California, Gallaway Enterprises, September 2022
Draft Delineation of Aquatic Resources, Brentwood Village Development Project, Redding, Shasta County, California, Gallaway Enterprises, September 2022
Re: Western Spadefoot Survey for the Brentwood Village Development on Quartz Hill Road (APN 115-170-014); Shasta County, California, Gallaway Enterprises, February 2023
Re: Response to CDFW email dated December 4, 2023 titled Early Consultation for Tentative Subdivision Parcel Map S-2023-00802 (Brentwood Village), Gallaway Enterprises, February 26, 2024
Re: Brentwood Timeline 22.0143.000, Kevin Sevier, Gallaway Enterprises, June 4, 2025

Mitigation:

MM-Bio-1: The applicant shall have a pre-construction rare plant survey of the proposed disturbance area or other Project features that may impact special status species of the Project site conducted by a qualified botanist during the appropriate survey window (blooming period) for rare and endangered plants that have the potential to occur within the Project site if such a survey has not been provided to the City. Surveys shall be done in accordance with the most current version of California Native Plant Society B*otanical Survey Guidelines* (CNPS 2001), California Department of Fish and Wildlife *Protocols for Surveying and Evaluating Impacts to Special Status Plant Species Native Plant Populations and Natural Communities* and U.S. Fish and Wildlife's G*uidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants*. If present, special status plant species plant populations will be flagged and, if possible, avoided during construction. If the population cannot be avoided during construction, a plan will be developed for approval by the California Department of Fish and Wildlife which may include transplanting the plant population, compensation, or other measures established by that agency.

MM-Bio-2: To avoid all impacts to special-status vernal pool species construction activities cannot take place within 250 feet of occupied (or assumed occupied) vernal features. If avoidance cannot be achieved, then U.S. Fish and Wildlife Service (USFWS) protocol-level sampling for vernal pool fairy shrimp shall be conducted to determine the presence of vernal pool fairy shrimp, or the applicant can assume presence of vernal pool shrimp and consult with the USFWS. The consultation process will require the preparation of a Biological Assessment and the development of a mitigation plan. At a minimum, the removal of the vernal pool would require mitigation by purchasing vernal pool re-establishment credits at a 1:1 ratio and vernal pool preservation credits at a 2:1 replacement ratio.

MM-Bio-3: If vegetation removal and/or construction activities are to occur during the bat roosting season (March 1 through August 31), a Qualified Biologist shall conduct a preconstruction survey no more than seven days before vegetation removal or construction activities begin. If an active roost is found, a non-disturbance buffer shall be established for a distance of 500 feet around the nest unless a smaller buffer zone is approved by CDFW. Construction may resume once the young have left the nest or as approved by the Qualified Biologist. The survey shall be provided to the CDFW. If a lapse in construction activities of 14 days or more occurs during the roosting season, an additional roost survey is required to ensure no roosts were established in the area while construction was on hold. Minimum qualifications for a Qualified Biologist include a bachelor's degree in biological or environmental science, natural resources management, or related discipline; field experience in the habitat types that may occur at the Project site; familiarity with the Covered Species (or closely related species) that may occur at the Project site; and prior preconstruction survey, construction monitoring, or construction oversight experience (if and as relevant to the activity to be conducted).

MM-Bio-4: To avoid impacts to nesting birds and raptors, vegetation removal and/or construction shall be conducted between

September 1 and January 31. If vegetation removal and/or construction activities are to occur during the nesting season (February 1 through August 31), a qualified biologist shall conduct a preconstruction survey no more than seven (7) days before vegetation removal or construction activities begin. If an active nest is found, a non-disturbance buffer shall be established by a qualified biologist in coordination with CDFW. Construction may resume once the young have left the nest or as approved by the qualified biologist. The survey shall be provided to the CDFW. If construction activities cease for a period greater than seven (7) days, additional preconstruction surveys will be required.

V. CULTURAL RESOURCES: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5?				**X**
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?			**X**	
c) Disturb any human remains, including those interred outsides of dedicated cemeteries?			**X**	

Discussion

a-c) A cultural resources inventory survey was conducted by Gallaway Enterprises for the Project site. This included a records search of the Northeast Center of the California Historical Resources Information System, consultation with the Native American Heritage Commission, and a pedestrian surface inspection. The report concluded that archaeological and cultural resources clearance is recommended for the Project site based on the absence of historic properties, significant historical resources, and archaeological resources within the Project site.

While archaeological and historic clearance of the Project site is recommended in the report, it is impossible to rule out the possibility of an unanticipated archeological find. The City's Standard Subdivision Conditions require that if, in the course of development, any archeological, historical, or paleontological resources are uncovered, all work in the immediate vicinity of the discovery shall be stopped immediately and the City of Redding shall be notified. A qualified archaeological professional must then be retained by the developer to investigate the discovered cultural object to determine its significance. If the cultural object is deemed potentially significant by the archaeologist, appropriate treatment and measures shall be followed in accordance with applicable laws, as reviewed and approved by the City, prior to the resumption of work in the affected area.

Documentation:
City of Redding General Plan 2045, Natural Resources Element 2045
Cultural Resources Inventory Survey, Brentwood Development Project, c. 9.5-acres, City of Redding, Shasta County, California. Gallaway Enterprises, July 19, 2022

Mitigation:
None necessary.

VI. Energy: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?			**X**	
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?				**X**

Discussion

a) The Project would not result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during Project construction or operation. Direct energy use would involve the short-term use of energy for construction activities. Project construction would primarily consume diesel and gasoline through operation of construction equipment, material deliveries, and debris hauling. Construction is estimated to result in a short-term consumption of energy, representing a small demand on local and regional fuel supplies that would be easily accommodated and would be temporary. Long-term use of electricity for operations within the subdivision such a lighting, cooking, heating, and cooling is expected to be less than significant due to the smaller scale residential nature of the Project.

b) The Project will not conflict with any State or local plans for renewable energy or energy efficiency.

Documentation:
City of Redding General Plan 2045, Natural Resources Element 2045

Mitigation:
None necessary.

VII. GEOLOGY AND SOILS: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: i) Rupture of a known earthquake, fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publications 42. ii) Strong seismic ground shaking? iii) Seismic-related ground failure, including liquefaction? iv) Landslides?			**X**	
b) Result in substantial soil erosion or the loss of topsoil?			**X**	
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?			**X**	
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?			**X**	
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of waste water?				**X**
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?			**X**	

Discussion:

a, c, d) There are no Alquist-Priolo earthquake faults designated in the Redding area of Shasta County. There are no other documented earthquake faults in the immediate vicinity that pose a significant risk, and the site is located in an area designated in the Health and Safety Element of the *General Plan* as having a low ground-shaking potential. The Project is not located on or near any documented

landslide hazard areas, and there is no evidence of ground slippage or subsidence occurring naturally on the site. The type of soil and underlying geology is expected to have a low potential for liquefaction as it is comprised of gravel and not clay. No portion of the site falls within the 100-year floodplain of the Sacramento River or any creek.

b) The Project site contains one primary soil classification. Redding gravelly loam, 3 to 8 percent slopes. This soil has very slow permeability. Runoff is slow to medium and the hazard of erosion is slight to moderate. The hardpan is at a depth of 10 to 30 inches. This soil is not prime farmland and is often used as range and dryland pasture.

The Project is subject to certain erosion-control requirements mandated by existing City and State regulations. These requirements include:

- *City of Redding Grading Ordinance.* This ordinance requires the application of "Best Management Practices" (BMPs) in accordance with the City Erosion and Sediment Control Standards Design Manual (Redding Municipal Code Section 16.12.060, Subsections C, D, E). In practice, specific erosion-control measures are determined upon review of the final project improvement plans and are tailored to project-specific grading impacts.

- *California Regional Water Quality Board "Construction Activity Storm Water Permit.*" This permit somewhat overlaps the City's Grading Ordinance provision by applying state standards for erosion-control measures during construction of the project.

- *California Regional Water Quality Control Board "Project Storm Water Pollution Prevention Plan (SWPPP).*" This plan emphasizes stormwater best management practices and is required as part of the Construction Activity Storm Water Permit. The objectives of the SWPPP are to identify the sources of sediment and other pollutants that affect the quality of stormwater discharges and to describe and ensure the implementation of practices to reduce sediment and other pollutants in stormwater discharges.

- *U.S. Army Corps of Engineers Permits.* Any appropriate permits required from the U.S. Army Corps of Engineers to address impacts to Waters of the United States.

- *State Water Resources Control Board Permits.* Any appropriate permits required from the State Water Resources Control Board to address impacts to Waters of the State.

Actions for compliance with these regulations are addressed under standard conditions of approval, which are uniformly applied to all land development projects. Since the Project is subject to uniformly applied ordinances and policies and the overall risk of erosion is low, potential impacts related to soil erosion and sedimentation are less than significant.

g) The proposed Project does not involve the use of septic tanks or alternative wastewater disposal. No impact has been identified.

h) No unique geologic features, fossil-bearing strata, or paleontological sites are known to exist on the Project site.

Documentation:
City of Redding General Plan 2045, Public Safety Element 2045, figures PS-1 (Ground Shaking Potential) and PS-2 (Liquefaction Potential)
City of Redding General Plan Update Final Environmental Impact Report, 2024, SCH #2022050300
City of Redding Grading Ordinance, RMC Chapter 16.12
City of Redding Standard Specifications, Grading Practices
City of Redding Standard Development Conditions for Discretionary Approvals
Soil Survey of Shasta County Area, United States Department of Agriculture, Soil Conservation Service and Forest Service, August 1974
Division of Mines and Geology Special Publication 42
State Regional Water Quality Control Board, Central Valley Region, *Regulations Related to Construction Activity Storm Water Permits and Storm Water Pollution Prevention Plans*

Mitigation:
None necessary.

VIII. GREENHOUSE GAS EMISSIONS: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			**X**	
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?			**X**	

Discussion:

a, b)The City of Redding General Plan (GP) and Environmental Impact Report (EIR) concluded this impact is cumulatively significant and unavoidable as pertains to buildout of the GP and is addressed in the GP EIR's CEQA Findings of Fact and Statement of Overriding Considerations. The EIR indicates that greenhouse gas (GHG) emissions are projected to result in a slight decrease in emissions from the CEQA baseline established by the GP EIR but not result in the 85 percent reduction from existing conditions necessary to ensure the City is on a trajectory to achieve the long-term reductions goals AB 1279 and substantial progress toward the State's carbon neutrality goals for year 2045.

The City has not adopted a numerical significance threshold for assessing impacts related to GHG emissions. Similarly, neither the SCAQMD, CARB, nor any other state or regional agency has yet adopted a numerical significance threshold for assessing GHG emissions that applies to the Project. Since there is no applicable adopted or accepted numerical threshold of significance for GHG emissions, the methodology for evaluating the Project's impacts related to GHG emissions focuses on its consistency with statewide, regional, and local plans adopted for the purpose of reducing and/or mitigating GHG emissions. This consistency with such plans is the sole basis for determining the significance of the Project's GHG-related impacts on the environment.

The Project is consistent with numerous policies of the GP that address lowering VMT through infill development, including but not limited to the following:

- Establishing the "Primary and Secondary Growth Areas" intended to focus future development and annexations in proximity to existing services and infrastructure.
- Increasing residential densities along transit corridors.
- Prioritizing infill development.
- Working to complete the City's "Complete Streets" system to provide multimodal transportation opportunities.

The Project is also consistent with the applicable Shasta Regional Transportation Agency's Regional Transportation Plan's goals, including:

- Encouraging transportation-efficient growth and development where it is supported by current or planned mobility options.

With regard to consistency with the California Air Resources Board's 2017 Scoping Plan, the Scoping Plan addresses a broad range of actions and strategies intended to reduce greenhouse gases such as increasing stringency of carbon fuel standards, adding additional zero-emission vehicles on the state's roadways, and similar broad-based programs which are not applicable to the Project.

As demonstrated by the above and the analysis provided in the GP EIR, the Project complies with or exceeds the plans, policies, regulations and GHG reduction actions/strategies outlined in the GP, the SRTA RTP, and CARB's 2017 Scoping Plan. Therefore, the Project would not conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing emissions of GHGs.

Documentation:
City of Redding General Plan 2045, Natural Resources Element 2045

Mitigation:
None necessary.

IX. **HAZARDS AND HAZARDOUS MATERIALS:** *Would the project:*	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?				**X**
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			**X**	
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?			**X**	
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				**X**
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?				**X**
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				**X**
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?			**X**	

Discussion:

a-d) The nature of the Project as a single-family residential subdivision does not present a significant risk related to hazardous materials or emissions. There are no documented hazardous material sites located on or near the Project.

e) The Project is not located within an airport land use plan or within two miles of a public airport or public use airport and would not result in a safety hazard for people residing or working in the Project area. There would be no impact on public safety.

f) The Project does not involve a use or activity that could interfere with emergency-response or emergency-evacuation plans for the area.

g) While the Project site is located within the Very High Fire Severity Zone, the nature of the Project will require extensive grading and removal of trees and other natural fire fuels throughout the site to accommodate potential housing development. California Residential Building Code requires dwellings to be constructed using flame-resistant materials and include fire sprinklers within the dwelling and under the roof. Impacts would be considered less than significant.

Documentation:
City of Redding General Plan 2045, Public Safety Element, 2045, *including figures PS-4 (Very High Fire Severity Zone) and PS-6 (Wildfire Evacuation Routes)*

Mitigation:
None necessary.

X. **HYDROLOGY AND WATER QUALITY**: *Would the project:*	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?			**X**	
b) Substantially decease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?			**X**	
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:			**X**	
i) Result in substantial erosion or siltation on- or off-site;				
ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;				
iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or				
iv) Impede or redirect flood flows?				
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?				**X**
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?				**X**

Discussion:

a) Since the Project would be served by City sanitary sewer service, the Project would not involve any permitted discharges of waste material into ground or surface waters. Construction and operation of the Project would not violate any water quality standards established by the Central Valley Regional Water Quality Control Board (RWQCB) in its Basin Plan for the Sacramento River and San Joaquin River Basins. Water pollution best management practices are required and will be incorporated into the improvement plans for the Project. The City's construction standards require that all projects prepare an erosion and sediment control plan (ESCP) prior to construction to address water pollution control. The ESCP will ensure that water quality standards are not substantially affected by the Project during construction.

b) The Project would utilize City water service for domestic uses and fire protection. The proposed Project would not impact groundwater supplies.

c) The Project is subject to standard requirements defined under Section VII, *Geology and Soils*, that minimize the potential for erosion or siltation on or off site. The final improvement plans for the Project must also incorporate specific design measures intended to limit pollutant discharges in stormwater from urban improvements as established under the State's National Pollutant Elimination System (NPDES) general permit, which the City is now obligated to follow in accordance with State Water Quality Control Order No. 2013-0001-DWQ. Feasible Best Management Practices (BMPs) would be incorporated in the final design of the Project's storm-drain system, as approved by the City Engineer, based on the BMPs listed in the latest edition of the California Storm Water Quality Association *Storm Water Best Management Practices Handbook*.

City of Redding Policy 1806 requires that all subdivision development include stormwater detention facilities designed to maintain existing predevelopment rates of runoff during a 10-, 25-, and 100-year storm event with a 6-hour duration. The Project application includes a stormwater hydrology analysis prepared by Sharrah Dunlap Sawyer dated November 29, 2022 which concludes that the

proposed detention facility design is sufficient to maintain or reduce existing flows from the site in accordance with City Council Policy 1806.

d) The Project site is not located in a flood hazard, tsunami or seiche zone.

e) The Project would not conflict with a water quality control plan or groundwater management plan

Documentation:
City of Redding General Plan 2045, Natural Resources and Public Safety Elements, 2045
Federal Emergency Management Agency Floodplain regulations, FIRM map 06089C1535G, dated March 17, 2011
City of Redding Storm Drain Master Plan, Montgomery-Watson Engineers 1993
Brentwood Village Entitlement Storm Drainage Analysis, Sharrah Dunlap Sawyer, Inc., November 29, 2022

Mitigation:
None necessary.

XI. LAND USE AND PLANNING: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Physically divide an established community?				**X**
b) Cause a significant environmental impact due to conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?				**X**

Discussion:

a) The Project does not have the potential to physically divide an established community. It lies at the edge of the City with its northern boundary adjacent to Shasta County land. There are five parcels to the north. Two are unoccupied Federally-owned parcels. The other three parcels use two separate segments of Sunray Way and a private driveway for access to Quartz Hill Road. These access points will be maintained with the subdivision. Because no established community exists between the Project site and the developed portion of the City of Redding, the Project would not physically divide an established community.

b) The Project is compatible with the applicable policies and regulations of the City General Plan and Zoning Ordinance and is not in conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

Documentation:
City of Redding General Plan 2045, Community Development and Design Element, 2045
City of Redding General Plan 2045, Natural Resources Element, 2045

Mitigation:
None necessary.

XII. MINERAL RESOURCES: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant With Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?				**X**
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local General Plan, specific plan or other land use plan?				**X**

Discussion:

a, b) The Project site is not identified in the General Plan as having any known mineral-resource value or as being located within any "Critical Mineral Resource Overlay" area.

Documentation:
City of Redding General Plan 2045, Natural Resources Element, 2045
City of Redding General Plan Land Use 2045 Diagram

Mitigation:
None necessary.

XIII. NOISE: *Would the project result in:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			**X**	
b) Generation of excessive ground-borne vibration or ground-borne noise levels?			**X**	
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				**X**

Discussion:

a, b)Due to the nature of the Project as a residential subdivision it would not result in a permanent increase in ambient noise levels and would not result in generation of excessive ground-borne vibration or ground-borne noise levels.

During the construction of the proposed Project, there will be a temporary increase in noise in the Project vicinity above existing ambient noise levels. The most noticeable construction noise will be related to grading, utility excavation, and land-clearing activity. The City's Grading Ordinance (RMC Chapter 16.12.120.H) limits grading-permit-authorized activities to between the hours of 7:00 a.m. and 7:00 p.m., Monday through Saturday. No operations are allowed on Sunday. Since heavy construction work associated with the Project is limited in scope and by existing regulation, the anticipated noise impact to neighboring residents is considered less than significant.

c) The Project is not located within two miles of a public airport and is not in an airport land use plan. There are no private airstrips in the vicinity of the Project site.

Documentation:
City of Redding General Plan 2045, Noise Element, 2045
City of Redding General Plan 2045, Transportation Element, 2045
City of Redding Zoning Ordinance Redding Municipal Code, Section 18.40.100
City of Redding Grading Ordinance Redding Municipal Code, Section 16.12.120
City of Redding Municipal Airport Area Plan

Mitigation:
None necessary.

XIV. POPULATION AND HOUSING: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Induce substantial unplanned population growth in an area, either directly *(for example, by proposing new homes and businesses)* or indirectly *(for example, through extension of roads or other infrastructure)*?				**X**
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?				**X**

Discussion:

a, b)The Project would create opportunity for the construction of new residential units as planned and anticipated by the Redding General Plan. The Project is similar in character to that in the surrounding area. The Project would not induce unplanned population growth and does not propose growth or development not anticipated by the General Plan. The Project does not displace any people or housing. The Project will provide housing.

Documentation:
City of Redding General Plan 2045, Housing Element, 2020-2028

Mitigation:
None necessary.

XV. PUBLIC SERVICES: *Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
Fire Protection?			**X**	
Police Protection?			**X**	
Schools?			**X**	
Parks?			**X**	
Other public facilities?			**X**	

Discussion:

Fire and Police Protection:

The City would provide police and fire protection to the Project from existing facilities and under existing service levels. The size of the Project would not mandate the need for additional police or fire facilities.

The Project is subject to Chapter 16.20 of the Redding Municipal Code, which requires new development to pay a citywide fire facilities-impact fee calculated to mitigate a project's fair share of cumulative impacts to the City's fire-protection infrastructure based upon improvements necessary to accommodate new development under the City's *General Plan*.

Schools:

The Project is located in the Gateway Unified School District and may contribute to the total student enrollment in these districts. However, a school-facility impact (in-lieu) fee exists, as provided under State law that is paid prior to the issuance of a building permit for each residential unit to address school-facility funding necessitated by the effects of growth citywide.

Parks:

The Project will not cause a physical deterioration of an existing park facility or cause an adverse physical impact associated with a new park facility. The Project is subject to Chapter 16.20 of the Redding Municipal Code, which requires new residential development to pay a citywide park and recreation-facilities impact fee calculated to mitigate a project's fair share of cumulative impacts to the City's parks and recreation infrastructure based upon improvements necessary to accommodate new development under the City's General Plan. See discussion under Item XVI (*Recreation*) below.

Other public facilities:

See discussion under Item XIX (*Utilities and Service Systems*) below.

Documentation:
City of Redding General Plan 2045, Public Facilities and Services Element 2045

Mitigation:
None necessary.

XVI. RECREATION:	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?			**X**	
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?			**X**	

Discussion:

a) The Project will not cause a physical deterioration of an existing recreation facility or cause an adverse physical impact associated with a new recreation facility. While a small recreational area is proposed with the subdivision, residents do have the potential to utilize other parks within the City outside the vicinity of the Project. Recreational development fees are collected by the City at the time of issuance of a building permit to offset any impacts to regional park facilities and to raise funds to provide for new recreational facilities. In addition, Chapter 17.54 of the City's Subdivision Ordinance, *Park and Recreational Land Dedications and In-Lieu Fees*, requires that as a condition of approval of a tentative map, a subdivider shall either dedicate land or pay a fee in lieu thereof for park or recreation purposes. There would not be any potentially significant impacts to recreational facilities associated with the Project.

b) The Project does not propose any substantial recreational facilities or require construction or expansion of facilities. There would not be any potentially significant impacts to recreation associated with the Project.

Documentation:
City of Redding General Plan 2045, Natural Resources Element, 2045
City of Redding General Plan, Parks, Trails, and Recreation Element, 2045
City of Redding General Plan 2045, Public Facilities and Services Element, 2045

Mitigation:
None necessary.

XVII. TRANSPORTATION: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?				**X**
b) Conflict or be inconsistent with CEQA Guidelines Section 15064.3, Subdivision (b)?			**X**	
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?			**X**	
d) Result in inadequate emergency access?				**X**

Discussion:

a) Given that the location of the site is in a historically rural part of the City, pedestrian trips are expected to be limited; however, the surrounding area is transitioning to a suburban setting. Sidewalks and street lighting will be installed along all Project streets and on the north side of Quartz Hill Road along the Project's frontage. Minimal demand for public transit is expected due to the location and context of the Project site, although as more of this area of the City develops, Redding Area Bus Authority (RABA) may expand service to the area. The Project will be required to provide sufficient road width on Quartz Hill Road to accommodate buffered bike lanes on both sides of the road as well as a two-way center turn lane. Nothing about the Project conflicts with any transit-oriented ordinances or plans.

b) Senate Bill (SB) 743 established VMT as the metric to be applied for determining transportation impacts associated with development projects. Like many other jurisdictions in California, the City of Redding has not yet adopted a policy or thresholds of significance regarding VMT so the Project-related VMT impacts were assessed based on guidance provided by the California Governor's Office of Planning and Research (QPR) in the publication Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory, 2018. Under this guidance, residential developments that have a VMT per capita that is 15 percent or more below the existing average countywide residential VMT per capita would have a less-than-significant transportation impact. The traffic impact analysis completed for the Project found that the Project is expected to have a daily VMT per capita below the 15 percent countywide average, making its effects on VMT less than significant.

c) No sharp curves, dangerous intersections, or other geometric design hazards are proposed with the Project and existing suboptimal features will not be increased. The Project entrance will be required to have adequate sight lines and turning radius for entering and exiting. The existing driveway serving 11165 Quartz Hill Road will have a standard City driveway approach installed, and Sunray Way, which takes access from Quartz Hill Road, will be repaved. The residential nature of the Project makes it compatible with the surrounding area.

d) The Project site would be accessed via two new street connections to Quartz Hill Road; the westerly street connection would be a new north leg at the Quartz Hill Road/River Ridge Drive intersection. All aspects of the site, including street and driveway widths and turning radii, would be designed in accordance with applicable standards. Therefore, access would be expected to function acceptably for emergency response vehicles. The Project site would have multiple access points, so should one be compromised during an emergency, responders would be able to use the other to access the subdivision.

Documentation:
City of Redding General Plan 2045, Transportation Element, 2045
City of Redding General Plan 2045, Parks, Trails, and Recreation Element 2045
City of Redding Parks, Trails, and Open Space Master Plan, Update
City of Redding Traffic Impact Fee Program
City of Redding Active Transportation Plan, 2018

Redding Area Bus Authority Short Range Transit Plan, January 2024
Transportation Impact Study for the Brentwood Village Project, Prepared for the City of Redding, W-Trans, March 21, 2024

Mitigation:
None necessary.

XVIII. TRIBAL CULTURAL RESOURCES: *Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, 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:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or			**X**	
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.			**X**	

Discussion:

a, b) Genesis Society undertook consultation with the Native American Heritage Commission (NAHC) regarding sacred land listings for the Project site. An information request letter was delivered to the NAHC on July 6, 2022. The NAHC response is still pending. The project was also referred to the Wintu Tribe of Northern California, the Redding Rancheria, and the Paskenta Band of Nomlaki Indians under California State Assembly Bill 52 (AB 52) by the City of Redding. The Paskenta Band of Nomlaki Indians were the only tribe to respond with a request for consultation. Formal consultation between the tribe and the City of Redding commenced in October of 2023 and is ongoing. To date, the City of Redding has not been made aware of any specific concerns having to do with any tribal cultural resource with the potential to exist onsite.

Documentation:
Letters sent to Redding Rancheria, the Wintu Tribe of Northern California, and the Paskenta Band of Nomlaki Indians, August 18, 2023
Cultural Resources Inventory Survey, Brentwood Development Project, c. 9.5-acres, City of Redding, Shasta County, California. Gallaway Enterprises, July 19, 2022

Mitigation:
None necessary.

XIX. UTILITIES AND SERVICE SYSTEMS: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Require or result in the relocation or construction of new or expanded water or wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?				**X**
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?				**X**

XIX. UTILITIES AND SERVICE SYSTEMS: *Would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				**X**
d) Generate solid waste in excess of State or local standards, or infrastructure, or otherwise impair the attainment of solid waste reduction goals?				**X**
e) Comply with Federal, State, and local management and reduction statutes and regulations related to solid waste?				**X**

Discussion:

a) The proposed development does not generate the need for relocation or construction of new or expanded water or wastewater treatment or stormwater drainage, electric power, natural gas, or telecommunications facilities.

b) Potable water is available from the City to serve the Project with adequate pressure and flows for fire suppression. The demands of the Project can be accommodated within the City's existing water resources. Sufficient water supplies are available to serve the Project and reasonably foreseeable future development during normal, dry, and multiple dry years.

c) The Project will utilize the City's sanitary sewer system to dispose of wastewater. Adequate sewer capacity and wastewater treatment are available in the City's existing system.

d) The Project would not generate solid waste in excess of State or local standards, or infrastructure, or otherwise impair the attainment of solid waste reduction goals. The City provides solid waste disposal (curbside pick-up) service, which homes in the subdivision would utilize. Adequate capacity is available to serve the needs of the Project without need of special accommodation.

e) The Project will comply with Federal, State, and local management and reduction statutes and regulations related to solid waste. The City regulates and operates programs that promote the proper disposal of toxic and hazardous materials from households, including those created by the Project.

Documentation:
City of Redding General Plan 2045, Public Facilities and Services Element, 2045
City of Redding Water and Sewer Atlas

Mitigation:
None necessary.

XX. WILDFIRE: *If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Substantially impair an adopted emergency response plan or emergency evacuation Plan?			**X**	

XX. **WILDFIRE:** *If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:*	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose projects occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of wildfire?			**X**	
c) Require installation or maintenance of associated infrastructure (such as roads, fuel sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?				**X**
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result, post-fire slope instability, or drainage changes?			**X**	

Discussion:

a) While the Project is located within a mapped very high fire severity zone, it would not impair an emergency response plan or emergency evacuation plan.

b) The Project will be graded to facilitate the construction of the subdivision and will be cleared of most fire fuel onsite. Maintenance of the vegetation surrounding the Project site is and would continue to be the responsibility of the neighboring property owners. The development of the subdivision, along with its associated improvements, will make the existing neighborhood less susceptible to fire risk by removing fire fuel and adding non-combustible surfaces such as pavement. There is no identified factor that would exacerbate wildfire risks or expose Project occupants to pollutant concentrations from a wildfire.

c) All utilities associated with the Project would be placed underground where they do not pose a fire risk. No generators or outdoor fuel tanks are proposed with the Project as the development would be required to connect to City utilities. The Project would not require the installation or maintenance of associated infrastructure that could exacerbate wildfire risks.

d) The Project would be designed and developed to all City, State, and Federal standards and is not expected to expose people or structures to downstream flooding or landslides as a result of post-fire slope instability or drainage changes.

Documentation:
City of Redding General Plan 2045, Public Safety Element 2045

Mitigation:
None necessary.

XXI. **MANDATORY FINDINGS OF SIGNIFICANCE:**	**Potentially Significant Impact**	**Less-Than-Significant with Mitigation Incorporated**	**Less-Than-Significant Impact**	**No Impact**
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below the self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?			**X**	

XXI. MANDATORY FINDINGS OF SIGNIFICANCE:	Potentially Significant Impact	Less-Than-Significant with Mitigation Incorporated	Less-Than-Significant Impact	No Impact
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?			**X**	
c) Does the project have potential environmental effects which may cause substantial adverse effects on human beings, either directly or indirectly?				**X**

Discussion:

Based on the analysis undertaken as part of this Initial Study, the following findings can be made:

a) If unmitigated, the Project has the potential to impact special-status species (Henderson's bent grass, Red Bluff dwarf rush, vernal pool fairy shrimp, pallid and western red bats) as well as species of migratory birds and raptors. Mitigation Measures MM-Bio-1, MM-Bio-2, MM-Bio-3, and MM-Bio-4 are established to reduce potential impacts to less than significant. The Project has the potential to degrade wildlife habitat in general due to erosion and sedimentation resulting from grading and construction of Project infrastructure. However, the Project conditions as identified under *Hydrology/Water Quality* have been established to reduce potential impacts to a level less than significant.

b) As discussed in Item III, the Project will contribute to regionwide cumulative air quality impacts. However, under policy of the *General Plan*, application of Standard Mitigation Measures (SMMs) and Best Available Mitigation Measures (BAMMS) will reduce potential impacts from this Project to a level less than significant.

c) As discussed herein, the Project does not have characteristics which could cause substantial adverse effects on human beings, either directly or indirectly.

Mitigation:

MM-Bio-1: The applicant shall have a pre-construction rare plant survey of the proposed disturbance area or other Project features that may impact special status species of the Project site conducted by a qualified botanist during the appropriate survey window (blooming period) for rare and endangered plants that have the potential to occur within the Project site if such a survey has not been provided to the City. Surveys shall be done in accordance with the most current version of California Native Plant Society B*otanical Survey Guidelines* (CNPS 2001), California Department of Fish and Wildlife *Protocols for Surveying and Evaluating Impacts to Special Status Plant Species Native Plant Populations and Natural Communities* and U.S. Fish and Wildlife's G*uidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants*. If present, special status plant species plant populations will be flagged and, if possible, avoided during construction. If the population cannot be avoided during construction, a plan will be developed for approval by the California Department of Fish and Wildlife which may include transplanting the plant population, compensation, or other measures established by that agency.

MM-Bio-2: To avoid all impacts to special-status vernal pool species, construction activities cannot take place within 250 feet of occupied (or assumed occupied) vernal features. If avoidance cannot be achieved, then USFWS protocol-level sampling for vernal pool fairy shrimp shall be conducted to determine the presence of vernal pool fairy shrimp, or the applicant can assume presence of vernal pool shrimp and consult with the USFWS. The consultation process will require the preparation of a Biological Assessment and the development of a mitigation plan. At a minimum the removal of the vernal pool would require mitigation by purchasing vernal pool re-establishment credits at a 1:1 ratio and vernal pool preservation credits at a 2:1 replacement ratio.

MM-Bio-3: If vegetation removal and/or construction activities are to occur during the bat roosting season (March 1 through August 31), a Qualified Biologist shall conduct a preconstruction survey no more than seven days before vegetation removal or construction

activities begin. If an active roost is found, a non-disturbance buffer shall be established for a distance of 500 feet around the nest unless a smaller buffer zone is approved by CDFW. Construction may resume once the young have left the nest or as approved by the Qualified Biologist. The survey shall be provided to the CDFW. If a lapse in construction activities of 14 days or more occurs during the roosting season, an additional roost survey is required to ensure no roosts were established in the area while construction was on hold. Minimum qualifications for a Qualified Biologist include a bachelor's degree in biological or environmental science, natural resources management, or related discipline; field experience in the habitat types that may occur at the Project site; familiarity with the Covered Species (or closely related species) that may occur at the Project site; and prior preconstruction survey, construction monitoring, or construction oversight experience (if and as relevant to the activity to be conducted).

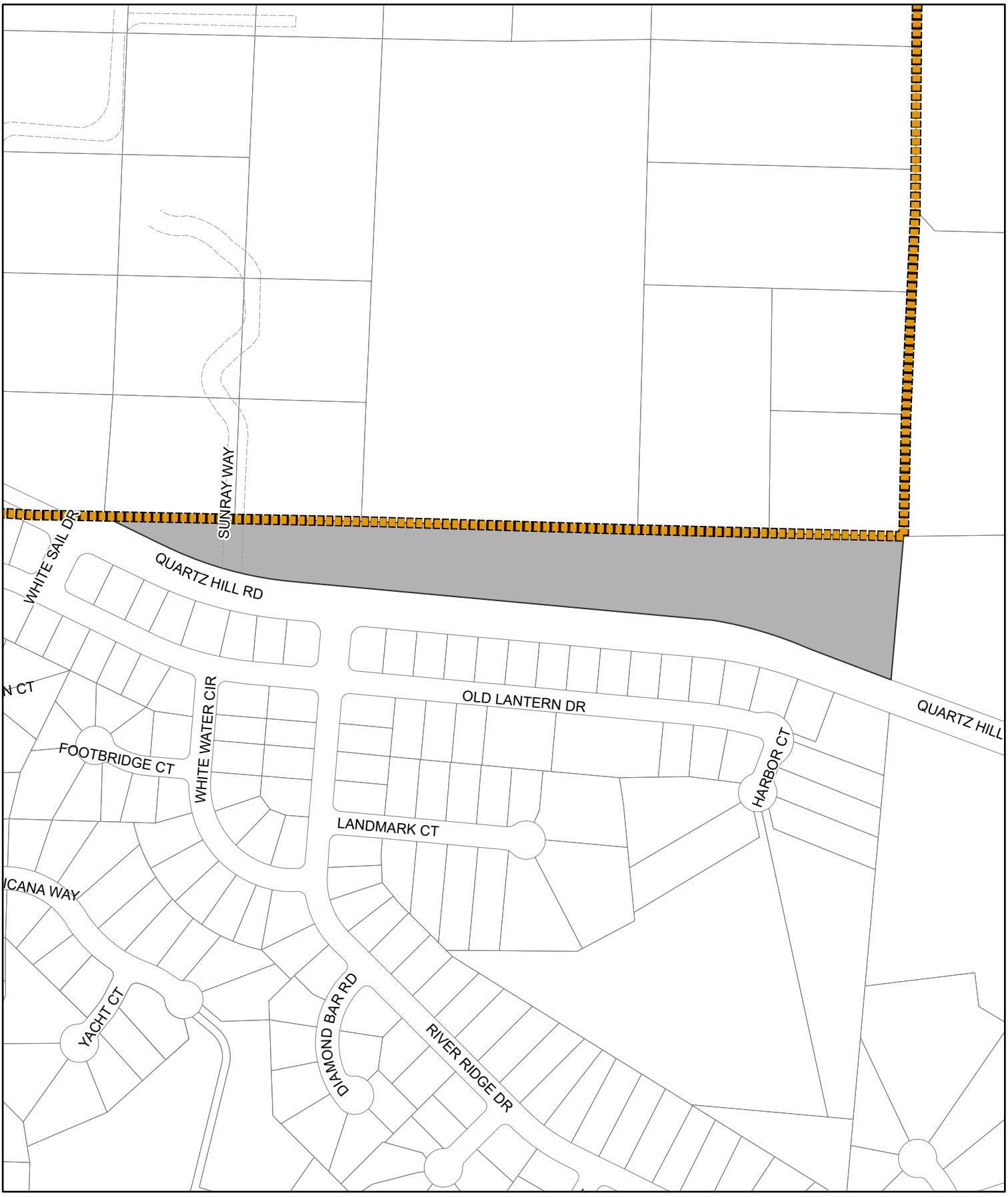
MM-Bio-4: To avoid impacts to nesting birds and raptors, vegetation removal and/or construction shall be conducted between September 1 and January 31. If vegetation removal and/or construction activities are to occur during the nesting season (February 1 through August 31), a qualified biologist shall conduct a preconstruction survey no more than seven (7) days before vegetation removal or construction activities begin. If an active nest is found, a non-disturbance buffer shall be established by a qualified biologist in coordination with CDFW. Construction may resume once the young have left the nest or as approved by the qualified biologist. The survey shall be provided to the CDFW. If construction activities cease for a period greater than seven (7) days, additional preconstruction surveys will be required.

Attachment A

Figure 1 – Location Map

Figure 2 – Tentative Map Package
Cover Sheet
Tentative Map
Preliminary Grading
Preliminary Utilities
Tree Information Sheet

Figure 3 – Planned Development Plan



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GIS DIVISION
INFORMATION TECHNOLOGY DEPARTMENT

DATE PRODUCED:
JUNE 2, 2023

0 200 400 Feet

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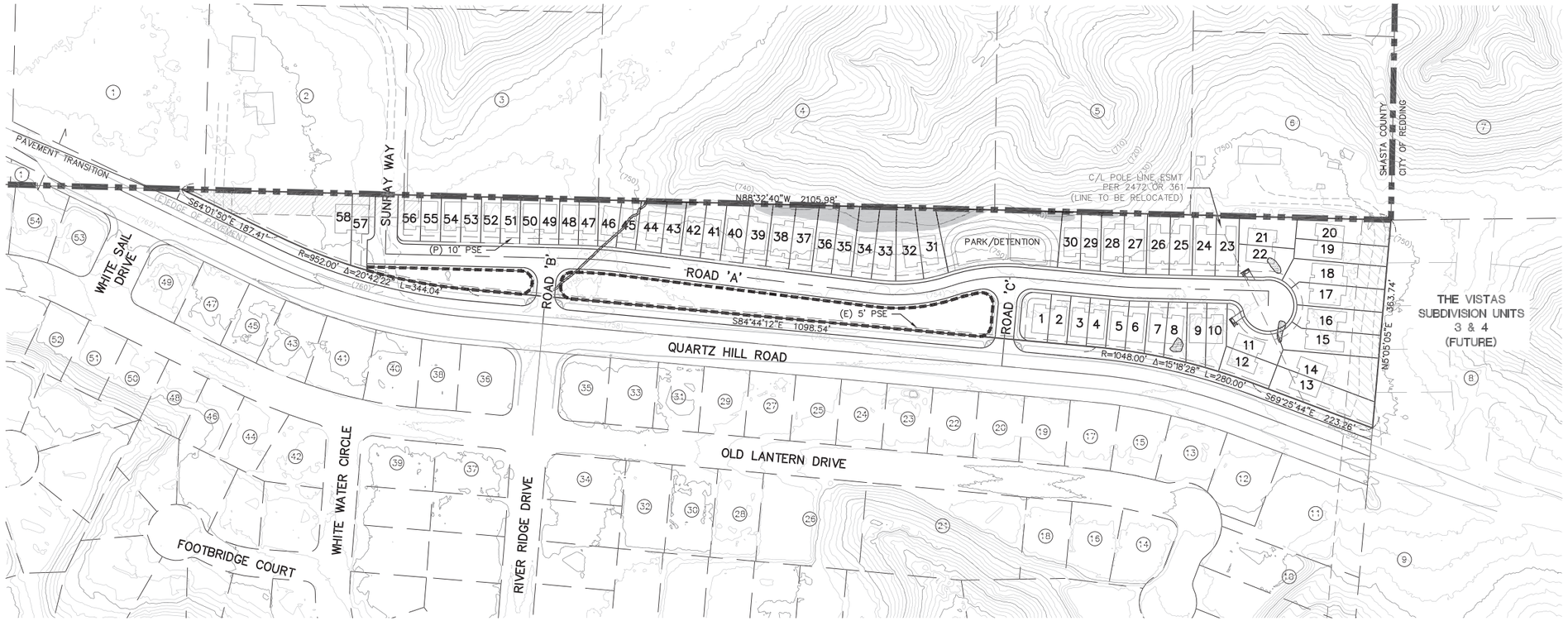
LOCATION MAP

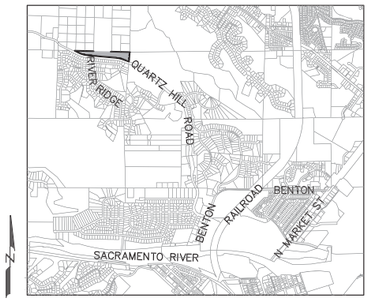
S-2023-00802
RAMAKRISHNA KANDULA
605 QUARTZ HILL RD
AP# 115-170-014

MTG. DATE:

ITEM:

ATTACHMENT:





SITE MAP
SCALE: NTS

CLIENT:
QUARTZ HILL LAND, LLC
2040 TREFOIL ROAD
SAN RAMON, CA 94582

OWNER:
QUARTZ HILL LAND LLC
2040 TREFOIL RD
SAN RAMON, CA 94582

ENGINEER:
SHARRAH DUNLAP SAWYER, INC.
320 HARTNELL AVE.
REDDING, CA 96002

SITE DATA
A.P.#: 115-170-014
GENERAL PLAN: RES 6-10
ZONING: RM-9-PD
EXISTING USE: VACANT
PROPOSED USE: 58 UNIT SUBDIVISION WITH SINGLE-STORY DUPLEXES & 2-STORY TOWNHOMES
SITE AREA: 9.4 AC
AREA IN STEEP SLOPE: 0.4 AC
NET PROJECT AREA: 9.0 AC
TOTAL PROJECT UNITS: 58
PROJECT DENSITY: 6.4 D.U./AC
ELECTRICITY: REDDING ELECTRIC UTILITY
WATER: CITY OF REDDING
SEWER: CITY OF REDDING
TELEPHONE: AT&T

ADJACENT PARCEL OWNERS

1. 115-140-014 SINGH 19937 MEADOW VIEW DRIVE, REDDING, CA 96002
2. 115-140-013 LAWSON 2011 TRUST 1498 RIVER RIDGE DRIVE REDDING, CA 96002
3. 115-140-012 TROTTA 2014 TRUST 1825 SCOTT ROAD #G BURBANK, CA 91504
4. 115-140-016 UNITED STATES OF AMERICA
5. 115-140-019 UNITED STATES OF AMERICA
6. 115-140-021 MARTIN 325 QUARTZ HILL ROAD REDDING, CA 96003
7. 113-010-003 MCCONNELL FOUNDATION 800 SHASTA VIEW DRIVE REDDING, CA 96003
8. 113-190-014 WALKER REVOCABLE TRUST 2017 555 QUARTZ HILL ROAD REDDING, CA 96003
9. 113-190-019 COTTAGES AT BEL AIR LLC 2040 TREFOIL RD SAN RAMON, CA 94582
10. 115-400-028 RUFFCORN 1481 HARBOR COURT REDDING, CA 96003
11. 115-400-027 KELLY 1499 HARBOR COURT REDDING, CA 96003
12. 115-400-026 HAMILTON 3312 OLD LANTERN DRIVE REDDING, CA 96003
13. 115-400-025 LOPEZ LIVING REVOCABLE TRUST 3318 OLD LANTERN DRIVE REDDING, CA 96003
14. 115-400-030 PETRIE REVOCABLE TRUST 3321 OLD LANTERN DRIVE REDDING, CA 96003
15. 115-400-024 IVICEVICH 2010 TRUST 19533 SAN VINCENTE DRIVE REDDING, CA 96003
16. 115-400-031 EMERSON 2008 TRUST 13372 ALICIA PARKWAY REDDING, CA 96003
17. 115-400-023 SAETEURN MUANG CHING 3330 OLD LANTERN DRIVE REDDING, CA 96003
18. 115-400-032 BOWERS 3337 OLD LANTERN DRIVE REDDING, CA 96003
19. 115-400-022 CONNER 3336 OLD LANTERN DRIVE REDDING, CA 96003
20. 115-400-021 THOMPSON 3342 OLD LANTERN DRIVE REDDING, CA 96003
21. 115-400-039 GOAD LIVING TRUST 3351 OLD LANTERN DRIVE REDDING, CA 96003
22. 115-400-020 SHELLY TRUST 3348 OLD LANTERN DRIVE REDDING, CA 96003
23. 115-400-019 KIKUTA FAMILY TRUST 3354 OLD LANTERN DRIVE REDDING, CA 96003
24. 115-400-018 CRAWFORD FAMILY TRUST 3360 OLD LANTERN DRIVE REDDING, CA 96003
25. 115-400-017 ROBERT D. TAYLOR ET. AL 3366 OLD LANTERN DRIVE REDDING, CA 96003
26. 115-400-041 HAGGARD 3363 OLD LANTERN DRIVE REDDING, CA 96003
27. 115-400-016 AQUINO 3372 OLD LANTERN DRIVE REDDING, CA 96003
28. 115-400-035 TAKACH LIVING TRUST 3371 OLD LANTERN DRIVE REDDING, CA 96003
29. 115-400-015 KNIGHT 3378 OLD LANTERN DRIVE REDDING, CA 96003
30. 115-400-036 BURTON 3379 OLD LANTERN DRIVE REDDING, CA 96003
31. 115-400-014 FONG 3384 OLD LANTERN DRIVE REDDING, CA 96003
32. 115-400-037 LEE KYUNG WOON 3387 OLD LANTERN DRIVE REDDING, CA 96003
33. 115-400-013 DEAN TRUST 3390 OLD LANTERN DRIVE REDDING, CA 96003
34. 115-350-012 NEILSEN REVOCABLE TRUST 1493 RIVER RIDGE DRIVE REDDING, CA 96003
35. 115-350-019 KIBIZOFF 3396 OLD LANTERN DRIVE REDDING, CA 96003
36. 115-350-020 PHILLIPS 3404 OLD LANTERN DRIVE REDDING, CA 96003
37. 115-350-013 LAWSON 2011 TRUST 1498 RIVER RIDGE DRIVE REDDING, CA 96003
38. 115-350-021 KENYON 3416 OLD LANTERN DRIVE REDDING, CA 96003
39. 115-350-018 BARTLEY TRUST 1495 WHITE WATER CIRCLE REDDING, CA 96003
40. 115-350-022 SPANO TRUST OF 1999 3428 OLD LANTERN DRIVE REDDING, CA 96003
41. 115-350-059 BALDO FAMILY TRUST 3440 OLD LANTERN CIRCLE REDDING, CA 96003
42. 115-350-068 SANTIAGO 3449 OLD LANTERN DRIVE REDDING, CA 96003
43. 115-350-061 ROMERO 3452 OLD LANTERN DRIVE REDDING, CA 96003
44. 115-350-053 HAWORTH 3457 OLD LANTERN DRIVE REDDING, CA 96003
45. 115-350-025 DIETRICH 3143 SUNNY LANE REDDING, CA 96001
46. 115-350-002 GROBSTEIN 3469 OLD LANTERN DRIVE REDDING, CA 96003
47. 115-350-026 SCHMIDT REVOCABLE TRUST 3476 OLD LANTERN DRIVE REDDING, CA 96003
48. 115-350-001 COSTA 3477 OLD LANTERN DRIVE REDDING, CA 96003
49. 115-350-052 SCHULTZ ETAL 3490 OLD LANTERN DRIVE REDDING, CA 96003
50. 115-350-027 OREAN REV LIVING TRUST 3485 OLD LANTERN DRIVE REDDING, CA 96003
51. 115-350-063 BENTE 2611 PACIFIC AVENUE REDDING, CA 96002
52. 115-350-066 PURKEY 3509 OLD LANTERN DRIVE REDDING, CA 96003
53. 115-350-051 PHILLIPS FAMILY TRUST 4755 BRINCARD WAY REDDING, CA 96003
54. 115-350-050 SCARBOROUGH LIVING TRUST 3546 OLD LANTERN DRIVE REDDING, CA 93003

LEGEND:

- AQUATIC FEATURES PER GALLAWAY REPORT DATED SEPTEMBER 2022
- AREA WITH 20% AND GREATER SLOPES (0.4 ACRES)
- PORTION OF 40' NON-EXCLUSIVE ROAD & UTILITY EASEMENT PER 1624 OR 285 TO BE RELINQUISHED
- ACCESS TO REMAIN FOR EXISTING RESIDENCE AT 11165 QUARTZ HILL ROAD (EASEMENT TO BE GRANTED AS NECESSARY)
- 50' RIGHT OF WAY PER 731 OR 341 (SHASTA DAM P.U.D.)
- ENHANCED LANDSCAPE AREA (1.0 AC)
- CITY OF REDDING/SHASTA COUNTY BOUNDARY

N

100 0 50 100
1 INCH = 100 FEET

S-2023-00802
BRENTWOOD VILLAGE SUBDIVISION TENTATIVE MAP & PLANNED DEVELOPMENT COVER SHEET

PARCEL 5 AS SHOWN ON 19 MAPS 69 LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 22, TOWNSHIP 32 NORTH, RANGE 5 WEST, MOUNT DIABLO BASE AND MERIDIAN, COUNTY OF SHASTA, STATE OF CALIFORNIA

FOR

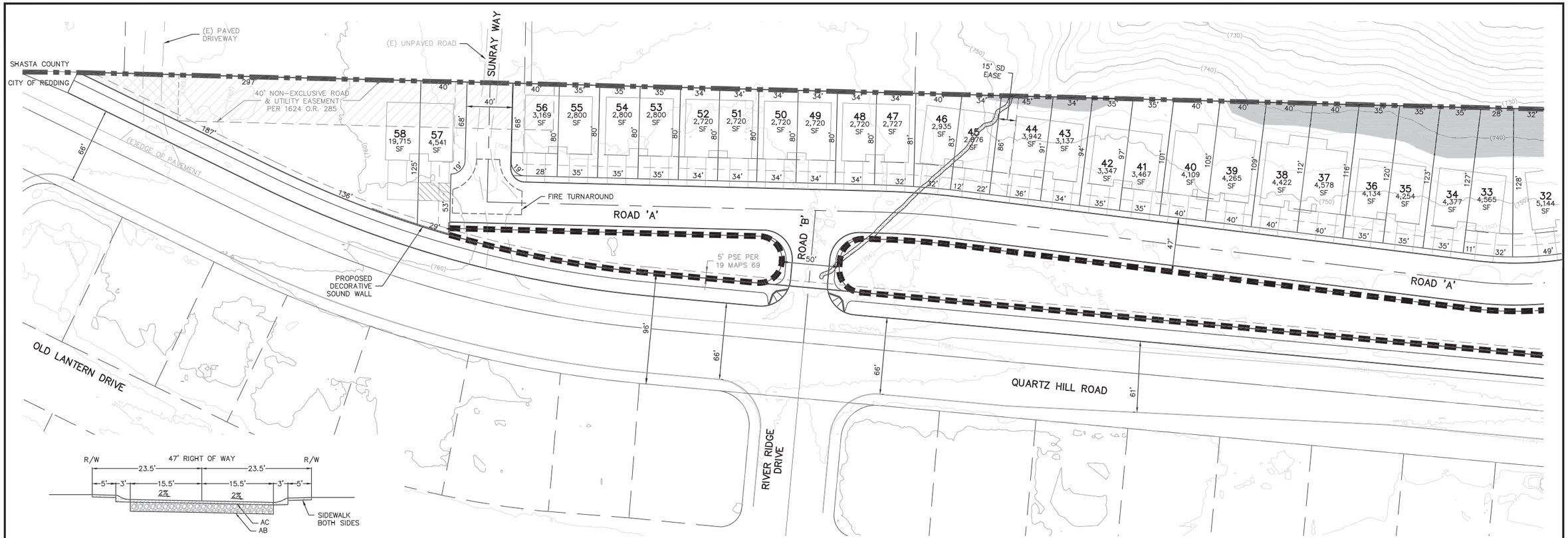
QUARTZ HILL LAND, L.L.C.

BY

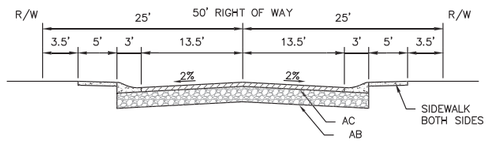
SHARRAH DUNLAP SAWYER, INC.
Civil Engineering • Land Planning • Surveying & Mapping
Landscape Architecture • Presentation Graphics
320 Hartnell Avenue, Redding, CA 96002
530.221.1792 voice • info@sdsengineering.com

DATE: JANUARY 16, 2025 SCALE: 1"=100' SHEET 1 OF 8

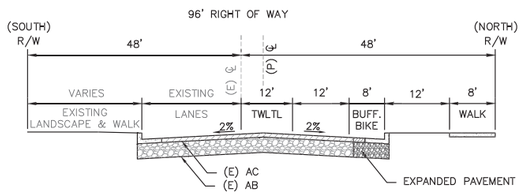
TLM/NLB/MLH P:\proj\p\22143\dwg\22143tm.dwg 22143



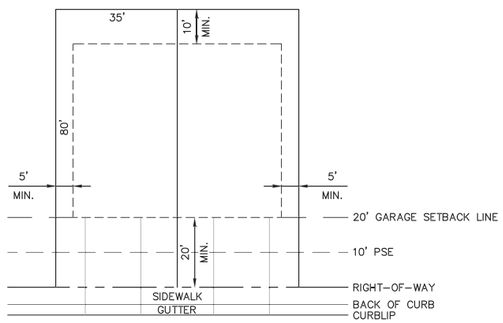
TYPICAL 47' STREET SECTION
ROAD 'A'
N.T.S.
PARKING LIMITED TO ONE SIDE OF STREET
NO PARKING ALLOWED ON EITHER SIDE OF STREET (TRASH PICKUP DAYS)
(SIGNS TO BE INSTALLED)



TYPICAL 50' STREET SECTION
ROADS 'B' & 'C'
N.T.S.
NO PARKING PERMITTED
(SIGNS TO BE INSTALLED)



QUARTZ HILL ROAD TYPICAL SECTION
INTERIM ARTERIAL PER 112.80
WITH BUFFERED BIKE LANES PER CITY OF REDDING
ACTIVE TRANSPORTATION PLAN
N.T.S.



TYPICAL LOT DIAGRAM
N.T.S.

BUILDING SETBACK MINIMUMS

FRONT:	20' (TO GARAGE)
SIDE:	5'
REAR:	10' (15' ALONG QUARTZ HILL RD)
CORNER SIDE:	12'

GROSS/NET PARCEL AREAS:

(THIS SHEET)

LOT 57

GROSS AREA:	4,541 S.F.
ACCESS ESMT:	434 S.F.
NET AREA:	4,107 S.F.

LOT 58

GROSS AREA:	19,715 S.F.
ACCESS ESMT:	1,754 S.F.
NET AREA:	17,961 S.F.

NOTE: AREAS SHOWN ON PLAN ARE GROSS PARCEL AREAS

N

40 0 20 40
1 INCH = 40 FEET

LEGEND:

- AQUATIC FEATURES PER GALLAWAY REPORT DATED SEPTEMBER 2022
- AREAS WITH 20% AND GREATER SLOPES
- PROPOSED ACCESS EASEMENT
- PORTION OF EXISTING NON-EXCLUSIVE ROAD & UTILITY EASEMENT PER 1624 O.R. 285 TO BE RELINQUISHED
- ACCESS TO REMAIN FOR 11165 QUARTZ HILL ROAD (EASEMENT TO BE GRANTED AS NECESSARY)
- ENHANCED LANDSCAPE AREA
- CITY OF REDDING/SHASTA COUNTY BOUNDARY

S-2023-00802
BRENTWOOD VILLAGE SUBDIVISION TENTATIVE MAP & PLANNED DEVELOPMENT

PARCEL 5 AS SHOWN ON 19 MAPS 69 LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 22, TOWNSHIP 32 NORTH, RANGE 5 WEST, MOUNT DIABLO BASE AND MERIDIAN, COUNTY OF SHASTA, STATE OF CALIFORNIA

FOR

QUARTZ HILL LAND, L.L.C.

BY

SHARRAH DUNLAP SAWYER, INC.
Civil Engineering • Land Planning • Surveying & Mapping
Landscape Architecture • Presentation Graphics
320 Hartnell Avenue, Redding, CA 96002
530.221.1792 voice • info@sdsengineering.com

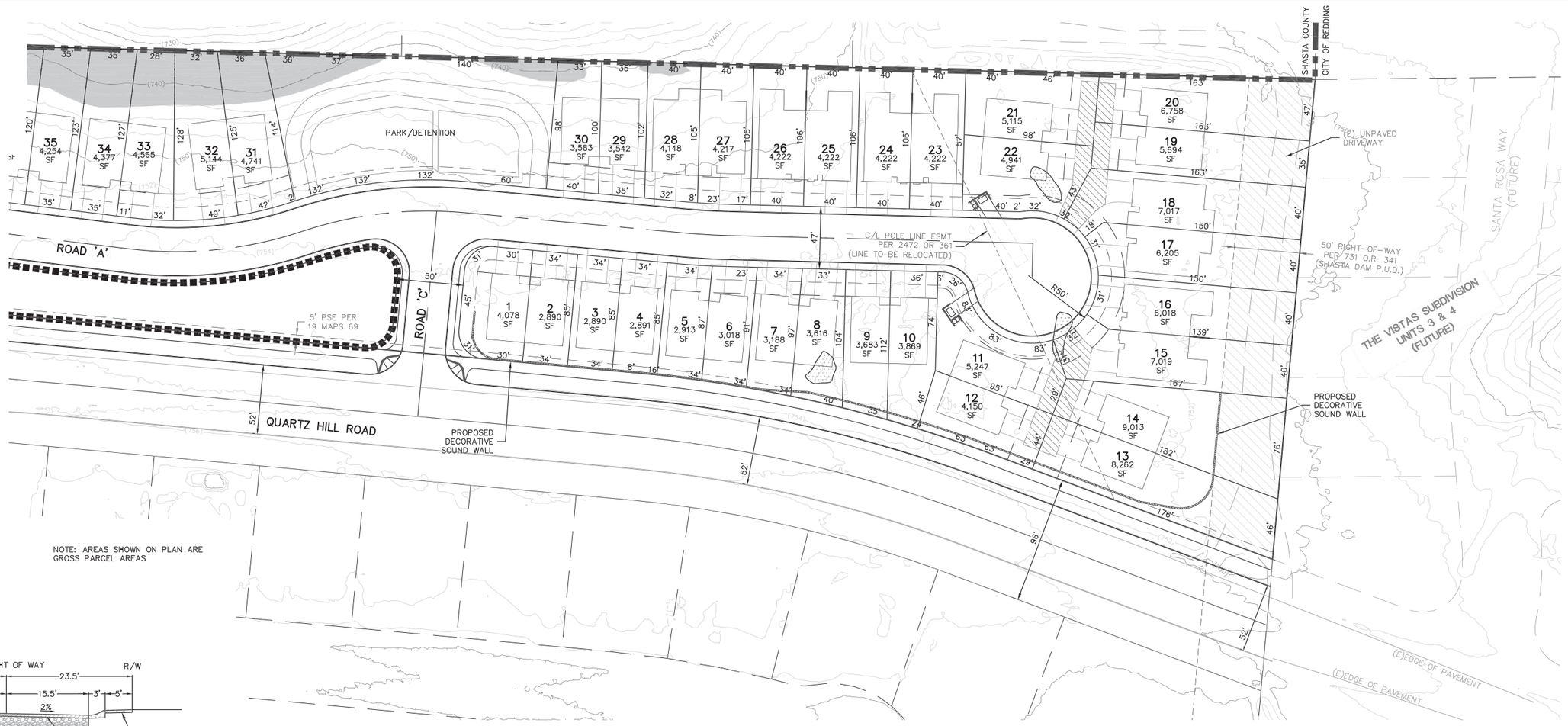
DATE: JANUARY 16, 2025 SCALE: 1"=40' SHEET 2 OF 8

TLM/NLD/MLH P:/proj/p/22143/dwg/22143tm.dwg 22143

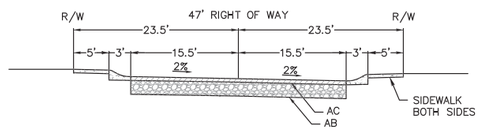
GROSS/NET PARCEL AREAS:

(THIS SHEET)

LOT 11		
	GROSS AREA:	5,247 S.F.
	ACCESS ESMT:	434 S.F.
	NET AREA:	4,813 S.F.
LOT 12		
	GROSS AREA:	4,150 S.F.
	ACCESS ESMT:	374 S.F.
	NET AREA:	3,776 S.F.
LOT 13		
	GROSS AREA:	8,262 S.F.
	P.U.D. & ACCESS ESMTS:	2,651 S.F.
	NET AREA:	5,611 S.F.
LOT 14		
	GROSS AREA:	9,013 S.F.
	P.U.D. & ACCESS ESMTS:	3,853 S.F.
	NET AREA:	5,160 S.F.
LOT 15		
	GROSS AREA:	7,019 S.F.
	P.U.D. & ACCESS ESMTS:	2,729 S.F.
	NET AREA:	4,290 S.F.
LOT 16		
	GROSS AREA:	6,018 S.F.
	P.U.D. & ACCESS ESMTS:	1,987 S.F.
	NET AREA:	4,031 S.F.
LOT 17		
	GROSS AREA:	6,205 S.F.
	P.U.D. & ACCESS ESMTS:	1,987 S.F.
	NET AREA:	4,218 S.F.
LOT 18		
	GROSS AREA:	7,017 S.F.
	P.U.D. & ACCESS ESMTS:	2,805 S.F.
	NET AREA:	4,212 S.F.
LOT 19		
	GROSS AREA:	5,694 S.F.
	P.U.D. & ACCESS ESMTS:	2,194 S.F.
	NET AREA:	3,500 S.F.
LOT 20		
	GROSS AREA:	6,758 S.F.
	P.U.D. & ACCESS ESMTS:	2,632 S.F.
	NET AREA:	4,126 S.F.
LOT 21		
	GROSS AREA:	5,115 S.F.
	ACCESS ESMT:	628 S.F.
	NET AREA:	4,487 S.F.
LOT 22		
	GROSS AREA:	4,941 S.F.
	ACCESS ESMT:	510 S.F.
	NET AREA:	4,431 S.F.

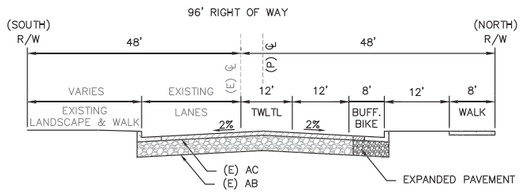


NOTE: AREAS SHOWN ON PLAN ARE GROSS PARCEL AREAS



TYPICAL 47' STREET SECTION

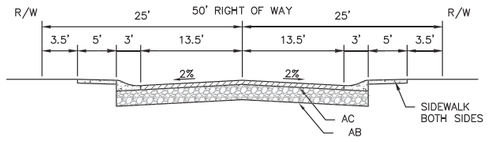
ROAD 'A'
N.T.S.
PARKING LIMITED TO ONE SIDE OF STREET
NO PARKING ALLOWED ON EITHER SIDE OF STREET (TRASH PICKUP DAYS)
(SIGNS TO BE INSTALLED)



QUARTZ HILL ROAD TYPICAL SECTION

INTERIM ARTERIAL PER 112.80
WITH BUFFERED BIKE LANES PER CITY OF REDDING
ACTIVE TRANSPORTATION PLAN

N.T.S.

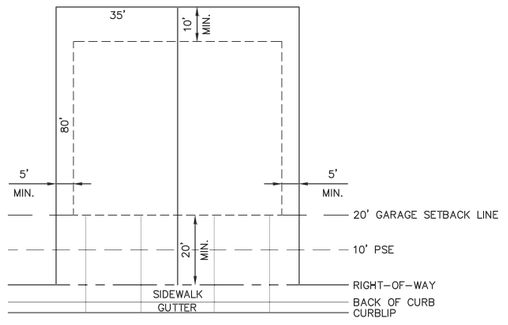


TYPICAL 50' STREET SECTION

ROADS 'B' & 'C'
N.T.S.
NO PARKING PERMITTED
(SIGNS TO BE INSTALLED)

LEGEND:

- AQUATIC FEATURES PER GALLAWAY REPORT DATED SEPTEMBER 2022
- AREAS WITH 20% AND GREATER SLOPES
- PROPOSED ACCESS EASEMENT
- 50' RIGHT-OF-WAY PER 731 O.R. 341 (SHASTA DAM P.U.D.)
- ENHANCED LANDSCAPE AREA
- CITY OF REDDING/SHASTA COUNTY BOUNDARY

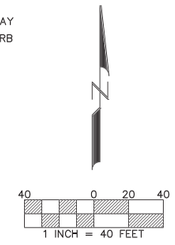


TYPICAL LOT DIAGRAM

N.T.S.

BUILDING SETBACK MINIMUMS

FRONT:	20' (TO GARAGE)
SIDE:	5'
REAR:	10' (15' ALONG QUARTZ HILL RD)
CORNER SIDE:	12'



S-2023-00802
BRENTWOOD VILLAGE SUBDIVISION TENTATIVE MAP & PLANNED DEVELOPMENT

PARCEL 5 AS SHOWN ON 19 MAPS 69 LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 22, TOWNSHIP 32 NORTH, RANGE 5 WEST, MOUNT DIABLO BASE AND MERIDIAN, COUNTY OF SHASTA, STATE OF CALIFORNIA

FOR

QUARTZ HILL LAND, L.L.C.

BY

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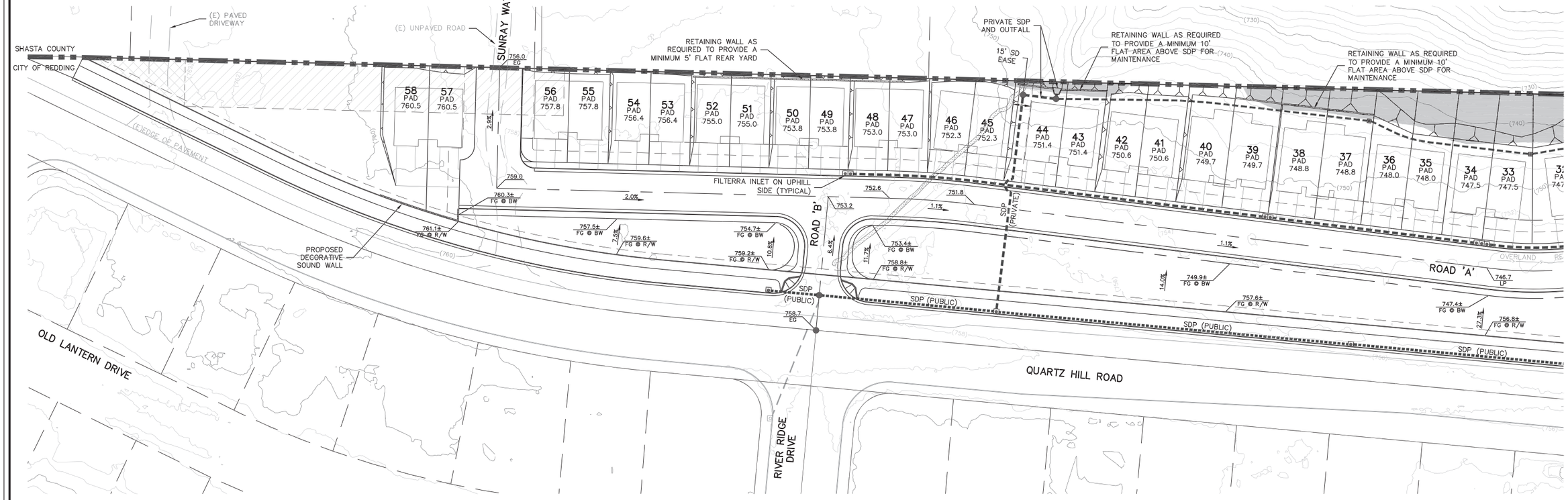

LEGEND:

- AQUATIC FEATURES PER GALLAWAY REPORT DATED SEPTEMBER 2022
- AREAS WITH 20% AND GREATER SLOPES
- PORTION OF EXISTING NON-EXCLUSIVE ROAD & UTILITY EASEMENT PER 1624 O.R. 285 TO BE RELINQUISHED
- ACCESS TO REMAIN FOR 11165 QUARTZ HILL ROAD (EASEMENT TO BE GRANTED AS NECESSARY)
- CITY OF REDDING/SHASTA COUNTY BOUNDARY
- SDP — PROPOSED STORM DRAIN PIPE (PRIVATE)
- SDP — PROPOSED STORM DRAIN PIPE (PUBLIC)
- EXISTING STORM DRAIN PIPE
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN CATCH BASIN WITH FILTERRA INLET ON UPHILL SIDE (TO BE PRIVATELY MAINTAINED)
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN HEADWALL
- PROPOSED STORM DRAIN MANHOLE
- 2.0% — ROAD GRADE
- 751.9 — FINISHED GRADE SURFACE ELEVATION

NOTE: ALL STORM DRAIN PIPES AND INFRASTRUCTURE ARE TO BE PRIVATELY MAINTAINED UNLESS OTHERWISE LABELED.

N

40 0 20 40
1 INCH = 40 FEET

S-2023-00802
BRENTWOOD VILLAGE SUBDIVISION TENTATIVE MAP PRELIMINARY GRADING

PARCEL 5 AS SHOWN ON 19 MAPS 69 LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 22, TOWNSHIP 32 NORTH, RANGE 5 WEST, MOUNT DIABLO BASE AND MERIDIAN, COUNTY OF SHASTA, STATE OF CALIFORNIA

FOR

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DATE: JANUARY 16, 2025 SCALE: 1"=40' SHEET 4 OF 8

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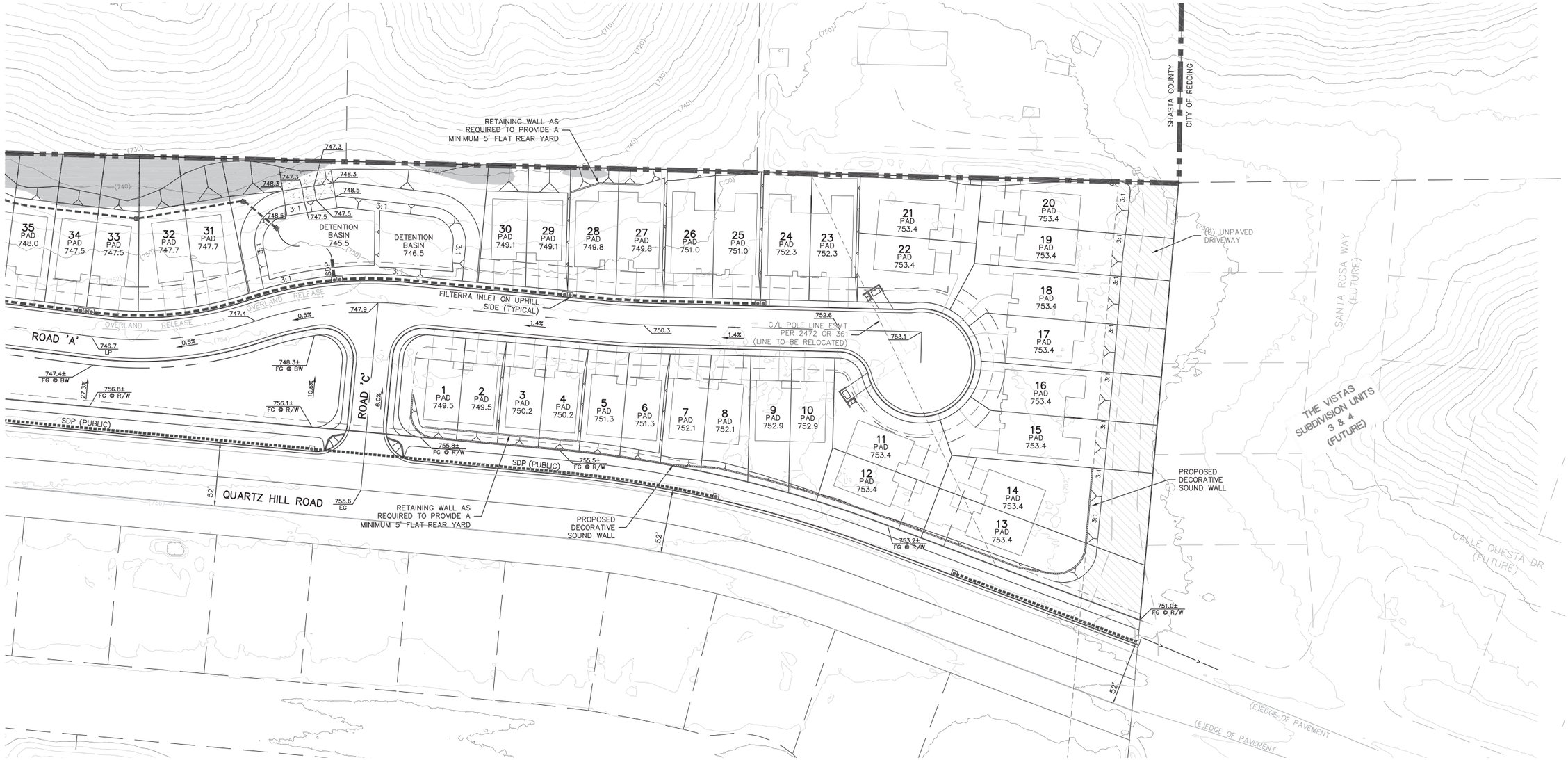

LEGEND:

- AQUATIC FEATURES PER GALLAWAY REPORT DATED SEPTEMBER 2022
- AREAS WITH 20% AND GREATER SLOPES
- 50' RIGHT-OF-WAY PER 731 O.R. 341 (SHASTA DAM P.U.D.)
- 2.0% — ROAD GRADE
- 751.9 — FINISHED GRADE SURFACE ELEVATION
- CITY OF REDDING/SHASTA COUNTY BOUNDARY
- SDP — PROPOSED STORM DRAIN PIPE (PRIVATE)
- SDP — PROPOSED STORM DRAIN PIPE (PUBLIC)
- EXISTING STORM DRAIN PIPE
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN CATCH BASIN WITH FILTERRA INLET ON UPHILL SIDE (TO BE PRIVATELY MAINTAINED)
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED AREA DRAIN
- PROPOSED STORM DRAIN MANHOLE
- 2.0% — ROAD GRADE
- 751.9 — FINISHED GRADE SURFACE ELEVATION

NOTE: DETENTION BASIN TO BE PRIVATELY MAINTAINED. ALL STORM DRAIN PIPES AND INFRASTRUCTURE ARE TO BE PRIVATELY MAINTAINED UNLESS OTHERWISE LABELED.

N

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1 INCH = 40 FEET

S-2023-00802
BRENTWOOD VILLAGE SUBDIVISION TENTATIVE MAP PRELIMINARY GRADING

PARCEL 5 AS SHOWN ON 19 MAPS 69 LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 22, TOWNSHIP 32 NORTH, RANGE 5 WEST, MOUNT DIABLO BASE AND MERIDIAN, COUNTY OF SHASTA, STATE OF CALIFORNIA

FOR

QUARTZ HILL LAND, L.L.C.

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DATE: JANUARY 16, 2025 SCALE: 1"=40' SHEET 5 OF 8

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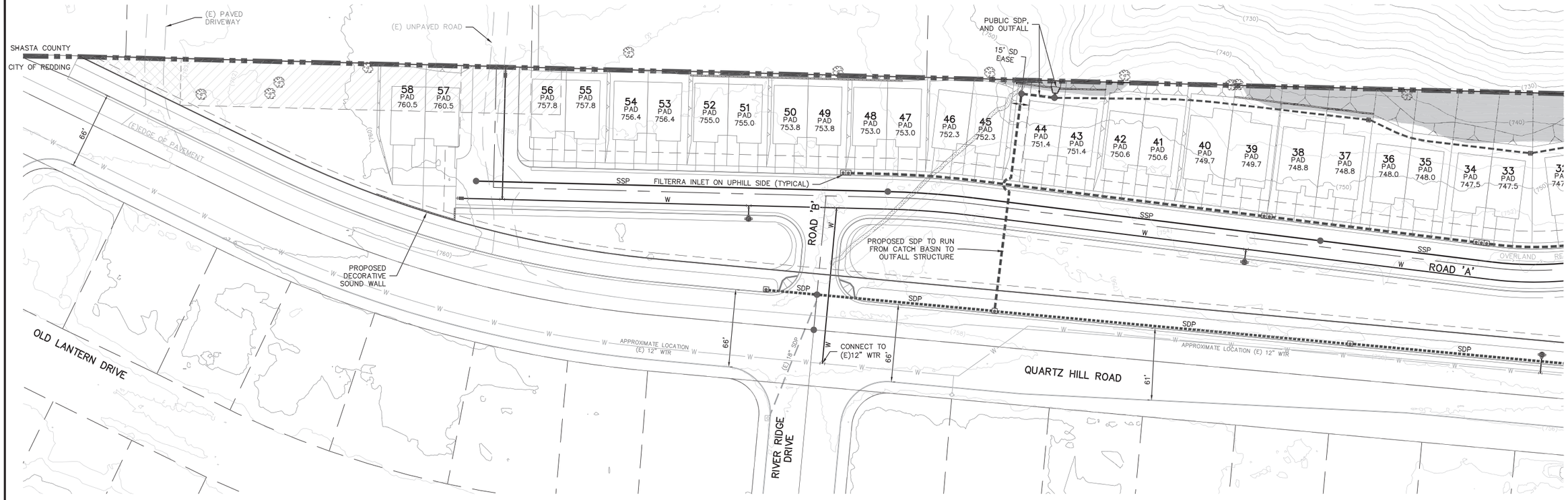

LEGEND:

- AQUATIC FEATURES PER GALLAWAY REPORT DATED SEPTEMBER 2022
- AREAS WITH 20% AND GREATER SLOPES
- PORTION OF EXISTING NON-EXCLUSIVE ROAD & UTILITY EASEMENT PER 1624 O.R. 285 TO BE RELINQUISHED
- PORTION OF 40' NON-EXCLUSIVE ROAD & UTILITY EASEMENT PER 1624 OR 285 TO BE RETAINED
- SDP — PROPOSED STORM DRAIN PIPE (PRIVATE)
- SDP — PROPOSED STORM DRAIN PIPE (PUBLIC)
- EXISTING STORM DRAIN PIPE
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN CATCH BASIN WITH FILTERRA INLET ON UPHILL SIDE (TO BE PRIVATELY MAINTAINED)
- PROPOSED STORM DRAIN HEADWALL
- SSP — PROPOSED SANITARY SEWER LINE
- PROPOSED MANHOLE
- EXISTING SANITARY SEWER MANHOLE
- PROPOSED FIRE HYDRANT
- W — PROPOSED WATER LINE
- PROPOSED WATER LINE BLOWOFF
- W — APPROXIMATE EXISTING WATER LINE
- TREES WITH POTENTIAL TO REMAIN SEE GALLAWAY TREE SURVEY LETTER DATED SEPTEMBER 14, 2022
- CITY OF REDDING/SHASTA COUNTY BOUNDARY

NOTE: DETENTION BASIN TO BE PRIVATELY MAINTAINED. ALL STORM DRAIN PIPES AND INFRASTRUCTURE ARE TO BE PRIVATELY MAINTAINED UNLESS OTHERWISE LABELED.

N

40 0 20 40
1 INCH = 40 FEET

S-2023-00802
BRENTWOOD VILLAGE SUBDIVISION
TENTATIVE MAP
PRELMINARY UTILITIES

PARCEL 5 AS SHOWN ON 19 MAPS 69 LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 22, TOWNSHIP 32 NORTH, RANGE 5 WEST, MOUNT DIABLO BASE AND MERIDIAN, COUNTY OF SHASTA, STATE OF CALIFORNIA

FOR

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BY

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DATE: JANUARY 16, 2025 SCALE: 1"=40' SHEET 6 OF 8

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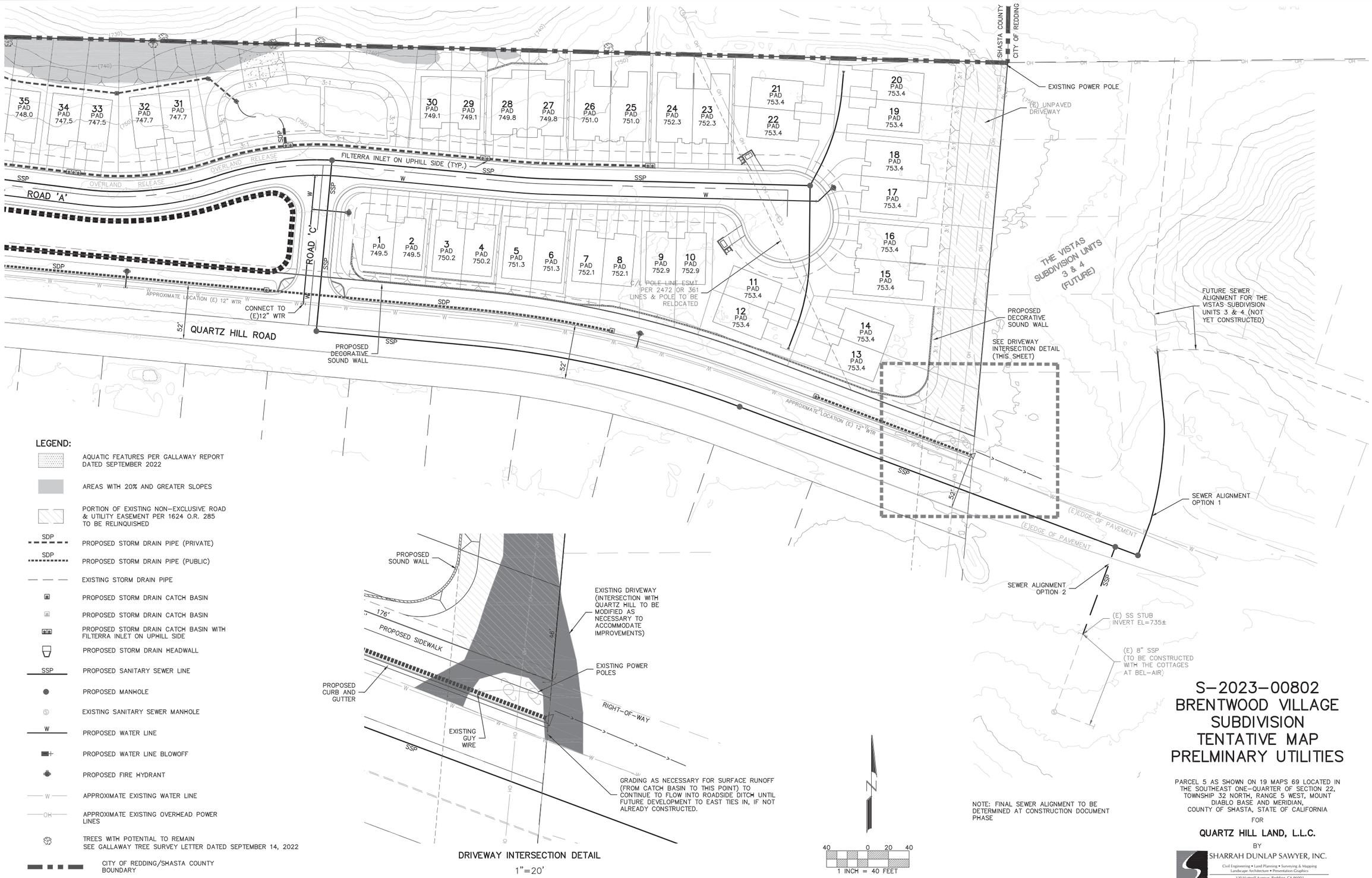


LEGEND:

- AQUATIC FEATURES PER GALLAWAY REPORT DATED SEPTEMBER 2022
- AREAS WITH 20% AND GREATER SLOPES
- PORTION OF EXISTING NON-EXCLUSIVE ROAD & UTILITY EASEMENT PER 1624 O.R. 285 TO BE RELINQUISHED
- SDP — PROPOSED STORM DRAIN PIPE (PRIVATE)
- SDP — PROPOSED STORM DRAIN PIPE (PUBLIC)
- EXISTING STORM DRAIN PIPE
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN CATCH BASIN
- PROPOSED STORM DRAIN CATCH BASIN WITH FILTERRA INLET ON UPHILL SIDE
- PROPOSED STORM DRAIN HEADWALL
- SSP — PROPOSED SANITARY SEWER LINE
- PROPOSED MANHOLE
- EXISTING SANITARY SEWER MANHOLE
- W — PROPOSED WATER LINE
- PROPOSED WATER LINE BLOWOFF
- PROPOSED FIRE HYDRANT
- W — APPROXIMATE EXISTING WATER LINE
- OH — APPROXIMATE EXISTING OVERHEAD POWER LINES
- TREES WITH POTENTIAL TO REMAIN SEE GALLAWAY TREE SURVEY LETTER DATED SEPTEMBER 14, 2022
- CITY OF REDDING/SHASTA COUNTY BOUNDARY

DRIVEWAY INTERSECTION DETAIL
1"=20'

NOTE: FINAL SEWER ALIGNMENT TO BE DETERMINED AT CONSTRUCTION DOCUMENT PHASE

S-2023-00802
BRENTWOOD VILLAGE SUBDIVISION TENTATIVE MAP PRELMINARY UTILITIES

PARCEL 5 AS SHOWN ON 19 MAPS 69 LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 22, TOWNSHIP 32 NORTH, RANGE 5 WEST, MOUNT DIABLO BASE AND MERIDIAN, COUNTY OF SHASTA, STATE OF CALIFORNIA

FOR

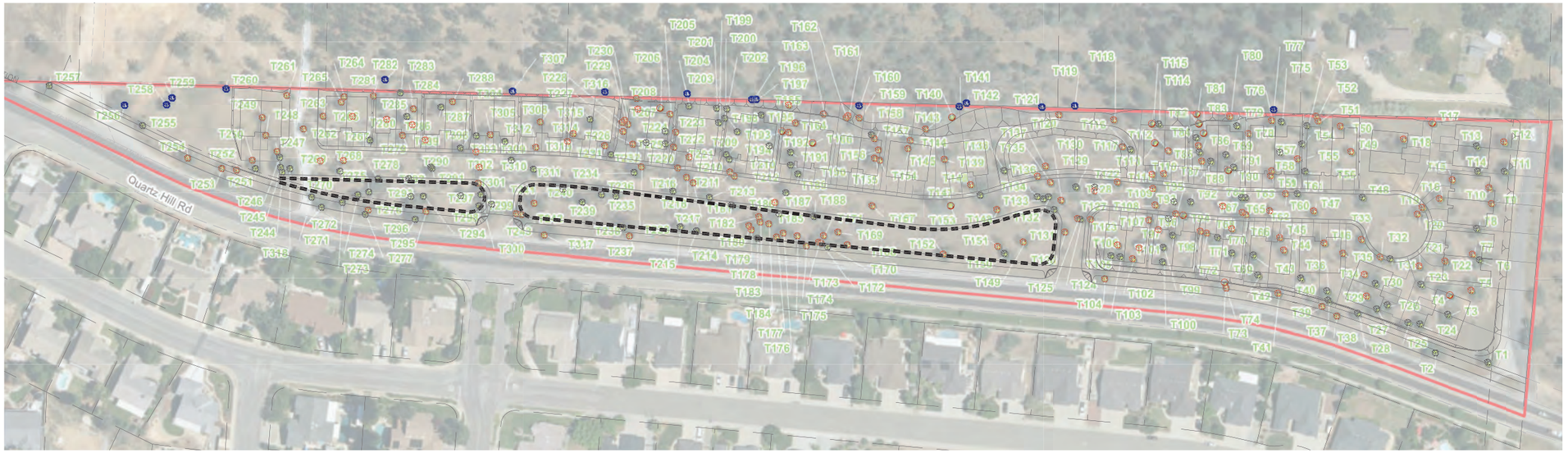
QUARTZ HILL LAND, L.L.C.

BY

SHARRAH DUNLAP SAWYER, INC.
Civil Engineering • Land Planning • Surveying & Mapping
Landscape Architecture • Presentation Graphics
320 Hartnell Avenue, Redding, CA 96002
530.221.1792 voice • info@sdsengineering.com

DATE: JANUARY 16, 2025 SCALE: 1"=40' SHEET 7 OF 8

TLM/NLD/MLH P:\proj\p\22143\dwg\221431m.dwg 22143



LEGEND:

- ENHANCED LANDSCAPE AREA (1.0 AC = 10.6% OF SITE)
- OAK TREES ABLE TO REMAIN (NO. 77, 119, 121, 141, 142, 160, 196, 197, 203, 256, 258, 259, 260, 282, 307, AND 316)
- OAK TREES TO BE REMOVED WITH HEALTH RATING OF 1 OR 2
- OAK TREES TO BE REMOVED WITH HEALTH RATING OF 3 OR HIGHER
- PINE TREES TO BE REMOVED

OAK TREES IN STUDY		303
PINE TREES IN STUDY		15
	TOTAL	318
TREES ABLE TO REMAIN		16
TREES TO BE REMOVED		302
HEALTH RATING OF 1 OR 2 (OAKS)		160
AVERAGE HEALTH (OAKS)		128
FOOTHILL PINES		14
NUMBER OF TREES TO BE PLANTED		
WITHIN ENHANCED LANDSCAPE AREAS		34
ON LOTS		232
ALONG QUARTZ HILL ROAD		60
	TOTAL	326

NOTES:
1. NO CANDIDATE TREES WERE IDENTIFIED ON THE SITE.
2. THE AVERAGE DBH OF SURVEYED TREES IS 10", AND THE AVERAGE HEALTH OF SURVEYED TREES IS 2 (PER GALLAWAY LETTER DATED SEPTEMBER 14, 2022)
3. ALL PROPOSED TREE NUMBERS ARE APPROXIMATE. FINAL LOCATIONS AND NUMBER TO BE DETERMINED WITH CONSTRUCTION DOCUMENTS.
4. NO. OF TREES TO BE PLANTED IN ENHANCED LANDSCAPE AREAS IS BASED ON EXISTING SITE-WIDE RATIO OF 34 TREES/ACRE.
5. NO. OF TREES TO BE PLANTED ON LOTS IS BASED ON 1 TREE PER 500 S.F. OF PROPOSED LIVING SPACE.
6. NO. OF TREES ALONG QUARTZ HILL ROAD IS BASED ON TREES AT 30' ON CENTER.
7. TREE DIAGRAM UNDERLAY IS FROM THE TREE INVENTORY LETTER.

#	SPECIES	SIZE	HEALTH	SAVE/REMOVE
1	OAK	13	3	REMOVE
2	OAK	18	3	REMOVE
3	OAK	13	3	REMOVE
4	PINE	19	3	REMOVE
5	OAK	11	2	REMOVE
6	OAK	13	3	REMOVE
7	OAK	8	2	REMOVE
8	OAK	16	3	REMOVE
9	OAK	12	2	REMOVE
10	OAK	14	2	REMOVE
11	OAK	14	3	REMOVE
12	OAK	15	2	REMOVE
13	OAK	23	4	REMOVE
14	OAK	10	3	REMOVE
15	OAK	16	2	REMOVE
16	OAK	15	2	REMOVE
17	PINE	9	3	REMOVE
18	OAK	20	1	REMOVE
19	OAK	12	2	REMOVE
20	OAK	13	2	REMOVE
21	OAK	17	3	REMOVE
22	OAK	7	2	REMOVE
23	OAK	15	3	REMOVE
24	OAK	11	3	REMOVE
25	OAK	11	3	REMOVE
26	OAK	12	3	REMOVE
27	OAK	11	3	REMOVE
28	OAK	7	3	REMOVE
29	OAK	8	2	REMOVE
30	OAK	7	3	REMOVE
31	OAK	9	2	REMOVE
32	OAK	9	2	REMOVE
33	OAK	14	2	REMOVE
34	OAK	8	2	REMOVE
35	OAK	8	2	REMOVE
36	OAK	11	3	REMOVE
37	OAK	6	3	REMOVE
38	OAK	15	1	REMOVE
39	OAK	14	1	REMOVE
40	OAK	8	3	REMOVE
41	OAK	12	4	REMOVE
42	OAK	14	2	REMOVE
43	OAK	15	3	REMOVE
44	OAK	7	2	REMOVE
45	OAK	14	2	REMOVE
46	OAK	10	2	REMOVE
47	OAK	10	2	REMOVE
48	OAK	16	3	REMOVE
49	OAK	9	2	REMOVE
50	OAK	10	2	REMOVE
51	OAK	8	3	REMOVE
52	OAK	11	2	REMOVE
53	OAK	8	2	REMOVE
54	OAK	7	3	REMOVE
55	OAK	8	2	REMOVE
56	OAK	8	3	REMOVE
57	OAK	9	3	REMOVE
58	OAK	7	2	REMOVE
59	OAK	6	2	REMOVE
60	OAK	9	2	REMOVE

#	SPECIES	SIZE	HEALTH	SAVE/REMOVE
61	OAK	9	3	REMOVE
62	OAK	11	2	REMOVE
63	OAK	7	3	REMOVE
64	OAK	11	3	REMOVE
65	OAK	10	1	REMOVE
66	OAK	8	2	REMOVE
67	OAK	10	2	REMOVE
68	OAK	10	1	REMOVE
69	OAK	8	3	REMOVE
70	OAK	7	3	REMOVE
71	OAK	7	1	REMOVE
72	OAK	8	2	REMOVE
73	PINE	20	1	REMOVE
74	OAK	12	1	REMOVE
75	OAK	11	3	REMOVE
76	OAK	8	2	REMOVE
77	OAK	7	2	SAVE
78	OAK	7	2	REMOVE
79	OAK	11	3	REMOVE
80	OAK	12	2	REMOVE
81	PINE	19	3	REMOVE
82	PINE	18	2	REMOVE
83	PINE	20	3	REMOVE
84	OAK	7	3	REMOVE
85	OAK	7	2	REMOVE
86	OAK	11	3	REMOVE
87	OAK	6	2	REMOVE
88	OAK	8	3	REMOVE
89	OAK	7	3	REMOVE
90	OAK	8	3	REMOVE
91	PINE	20	2	REMOVE
92	OAK	13	3	REMOVE
93	OAK	7	3	REMOVE
94	PINE	12	3	REMOVE
95	OAK	12	1	REMOVE
96	OAK	7	3	REMOVE
97	OAK	6	1	REMOVE
98	OAK	11	3	REMOVE
99	OAK	9	3	REMOVE
100	OAK	6	3	REMOVE
101	OAK	9	2	REMOVE
102	OAK	12	2	REMOVE
103	OAK	8	3	REMOVE
104	OAK	14	1	REMOVE
105	OAK	9	3	REMOVE
106	OAK	8	1	REMOVE
107	OAK	6	2	REMOVE
108	OAK	7	2	REMOVE
109	OAK	8	2	REMOVE
110	OAK	9	2	REMOVE
111	OAK	8	2	REMOVE
112	OAK	8	1	REMOVE
113	PINE	16	3	REMOVE
114	OAK	8	3	REMOVE
115	PINE	20	3	REMOVE
116	OAK	6	3	REMOVE
117	OAK	10	1	REMOVE
118	OAK	9	1	REMOVE
119	OAK	10	3	SAVE
120	OAK	7	1	REMOVE

#	SPECIES	SIZE	HEALTH	SAVE/REMOVE
121	OAK	7	2	SAVE
122	OAK	11	2	REMOVE
123	OAK	8	2	REMOVE
124	OAK	8	3	REMOVE
125	OAK	8	1	REMOVE
126	OAK	9	2	REMOVE
127	OAK	10	2	REMOVE
128	OAK	7	3	REMOVE
129	OAK	11	3	REMOVE
130	OAK	6	2	REMOVE
131	OAK	13	3	REMOVE
132	OAK	6	3	REMOVE
133	OAK	10	3	REMOVE
134	OAK	10	3	REMOVE
135	OAK	8	2	REMOVE
136	OAK	8	2	REMOVE
137	OAK	7	2	REMOVE
138	OAK	10	3	REMOVE
139	OAK	10	1	REMOVE
140	PINE	24	2	REMOVE
141	OAK	11	1	REMOVE
142	OAK	11	1	SAVE
143	OAK	11	2	REMOVE
144	OAK	14	2	REMOVE
145	OAK	11	1	REMOVE
146	OAK	8	2	REMOVE
147	OAK	10	3	REMOVE
148	OAK	10	2	REMOVE
149	OAK	10	1	REMOVE
150	OAK	10	3	REMOVE
151	OAK	9	1	REMOVE
152	OAK	9	2	REMOVE
153	PINE	20	2	REMOVE
154	OAK	8	1	REMOVE
155	OAK	19	1	REMOVE
156	OAK	10	1	REMOVE
157	OAK	7	1	REMOVE
158	OAK	7	3	REMOVE
159	OAK	8	1	REMOVE
160	OAK	15	1	REMOVE
161	OAK	6	1	REMOVE
162	OAK	7	1	REMOVE
163	OAK	7	2	REMOVE
164	OAK	9	1	REMOVE
165	OAK	9	2	REMOVE
166	PINE	8	3	REMOVE
167	OAK	7	1	REMOVE
168	OAK	6	1	REMOVE
169	OAK	8	1	REMOVE
170	OAK	7	3	REMOVE
171	OAK	6	2	REMOVE
172	OAK	8	2	REMOVE
173	OAK	8	2	REMOVE
174	OAK	12	2	REMOVE
175	OAK	7	2	REMOVE
176	OAK	7	2	REMOVE
177	OAK	7	1	REMOVE
178	OAK	10	3	REMOVE
179	OAK	10	2	REMOVE
180	OAK	7	2	REMOVE

#	SPECIES	SIZE	HEALTH	SAVE/REMOVE
181	OAK	10	3	REMOVE
182	OAK	6	2	REMOVE
183	OAK	7	2	REMOVE
184	OAK	6	2	REMOVE
185	OAK	12	3	REMOVE
186	OAK	8	2	REMOVE
187	OAK	10	3	REMOVE
188	OAK	9	3	REMOVE
189	OAK	8	3	REMOVE
190	OAK	7	3	REMOVE
191	OAK	11	3	REMOVE
192	OAK	7	2	REMOVE
193	PINE	22	2	REMOVE
194	OAK	9	3	REMOVE
195	OAK	10	3	REMOVE
196	OAK	8	2	REMOVE
197	OAK	6	3	REMOVE
198	OAK	8	3	REMOVE
199	OAK	7	3	REMOVE
200	OAK	6	3	REMOVE
201	OAK	8	3	REMOVE
202	OAK	12	3	REMOVE
203	OAK	9	3	SAVE
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205	OAK	9	1	REMOVE
206	PINE	13	3	REMOVE
207	OAK	7	2	REMOVE
208	OAK	11	1	REMOVE
209	OAK	11	3	REMOVE
210	OAK	6	3	REMOVE
211	OAK	7	1	REMOVE
212	OAK	11	1	REMOVE
213	OAK	12	3	REMOVE
214	OAK	6	3	REMOVE
215	OAK	8	3	REMOVE
216	OAK	10	3	REMOVE
217	OAK	8	1	REMOVE
218	OAK	10	2	REMOVE
219	OAK	9	2	REMOVE
220	OAK	9	2	REMOVE
221	OAK	6	2	REMOVE
222	OAK	7	3	REMOVE
223	OAK	10	2	REMOVE
224	OAK	6	3	REMOVE
225	OAK	11	3	REMOVE
226	OAK	11	2	REMOVE
227	OAK	6	1	REMOVE
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229	OAK	7	1	REMOVE
230	OAK	9	1	REMOVE
231	OAK	6	1	REMOVE
232	OAK	15	3	REMOVE
233	OAK	8	2	REMOVE
234	OAK	12	3	REMOVE
235	OAK	12	3	REMOVE
236	OAK	11	3	REMOVE
237	OAK	10	2	REMOVE
238	OAK	12	3	REMOVE
239	OAK	10	3	REMOVE
240	OAK	17	3	REMOVE

#	SPECIES	SIZE	HEALTH	SAVE/REMOVE
241	OAK	11	2	REMOVE
242	OAK	13	2	REMOVE
243	OAK	13	2	REMOVE
244	OAK	12	3	REMOVE
245	OAK	10	3	REMOVE
246	OAK	9	3	REMOVE
247	OAK	8	2	REMOVE
248	OAK	11	1	REMOVE
249	OAK	6	1	REMOVE
250	OAK	7	1	REMOVE
251	OAK	10	3	REMOVE
252	OAK	7	1	REMOVE
253	OAK	8	1	REMOVE
254	OAK	13	2	REMOVE
255	OAK	6	3	REMOVE
256	OAK	20	4	SAVE
257	OAK	15	3	REMOVE
258	OAK	9	1	SAVE
259	OAK	9	1	SAVE
260	OAK	8	1	SAVE
261	OAK	11	1	REMOVE
262	OAK	10	2	REMOVE
263	OAK	8	2	REMOVE
264	OAK	9	2	REMOVE
265	OAK	9	2	REMOVE
266	OAK	6	2	REMOVE
267	OAK	9	3	REMOVE
268	OAK	7	1	REMOVE
269	OAK	8	1	REMOVE
270	OAK	10	3	REMOVE
271	OAK	10	3	REMOVE
272	OAK	13	3	REMOVE
273	OAK	9	3	REMOVE
274	OAK	9	3	REMOVE
275	OAK	6	3	REMOVE
276	OAK	8	2	REMOVE
277	OAK	7	3	REMOVE
278	OAK	11	4	REMOVE
279	OAK	8	2	REMOVE
280	OAK	12	2	REMOVE
281	OAK	8	2	REMOVE
282	OAK	7	3	SAVE
283	OAK	7	3	REMOVE
284	OAK	9	2	REMOVE
285	OAK	12	3	REMOVE
286	OAK	7	2	REMOVE
287	OAK	6	3	REMOVE
288	OAK	9	2	REMOVE
289	OAK	6	2	REMOVE
290	OAK	7	3	REMOVE
291	OAK	10	3	REMOVE
292	OAK	11	3	REMOVE
293	OAK	13	3	REMOVE
294	OAK	7	3	REMOVE
295	OAK	11	2	REMOVE
296	OAK	16	4	REMOVE
297	OAK	9	3	REMOVE
298	OAK	16	4	REMOVE
299	OAK	6	3	REMOVE
300	OAK	10	3	REMOVE

#	SPECIES	SIZE	HEALTH	SAVE/REMOVE
301	OAK	6	2	REMOVE
302	OAK	9	2	REMOVE
303	OAK	11	2	REMOVE
304	OAK	10	3	REMOVE
305	OAK	12	1	REMOVE
306	OAK	9	3	REMOVE
307	OAK	8	3	SAVE
308	OAK	9	2	REMOVE
309	OAK	9	3	REMOVE
310	OAK	10	3	REMOVE
311	OAK	13	3	REMOVE
312	OAK	6	2	REMOVE
313	OAK	9	1	REMOVE
314	OAK	10	2	REMOVE
315	OAK	10	3	REMOVE
316	OAK	8	3	SAVE
317	OAK	6	1	REMOVE
318	OAK	9	3	REMOVE

N

100 0 50 100

1 INCH = 100 FEET

BRENTWOOD VILLAGE SUBDIVISION TENTATIVE MAP & PLANNED DEVELOPMENT TREE INFORMATION SHEET

PARCEL 5 AS SHOWN ON 19 MAPS 69 LOCATED IN THE SOUTHEAST ONE-QUARTER OF SECTION 22, TOWNSHIP 32 NORTH, RANGE 5 WEST, MOUNT DIABLO BASE AND MERIDIAN, COUNTY OF SHASTA, STATE OF CALIFORNIA

FOR

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Brentwood Village

Planned Development

January 2025

Prepared for:

Quartz Hill Land, L.L.C.

Prepared by:

SHARRAH DUNLAP SAWYER

Site Plan



1" = 200'

Site Data:

APN:	115-170-014
Existing use:	Vacant
General plan:	Res. 6-10
Zoning:	RM-9-PD
Proposed use:	58 Unit subdivision with single-story duplexes & 2-story townhomes
Site Area:	9.4 AC
Area in steep slope:	0.4 AC
Net Project Area:	9.0 AC
Total Units:	58 (29 Buildings)
Project Density:	6.4 D.U./AC

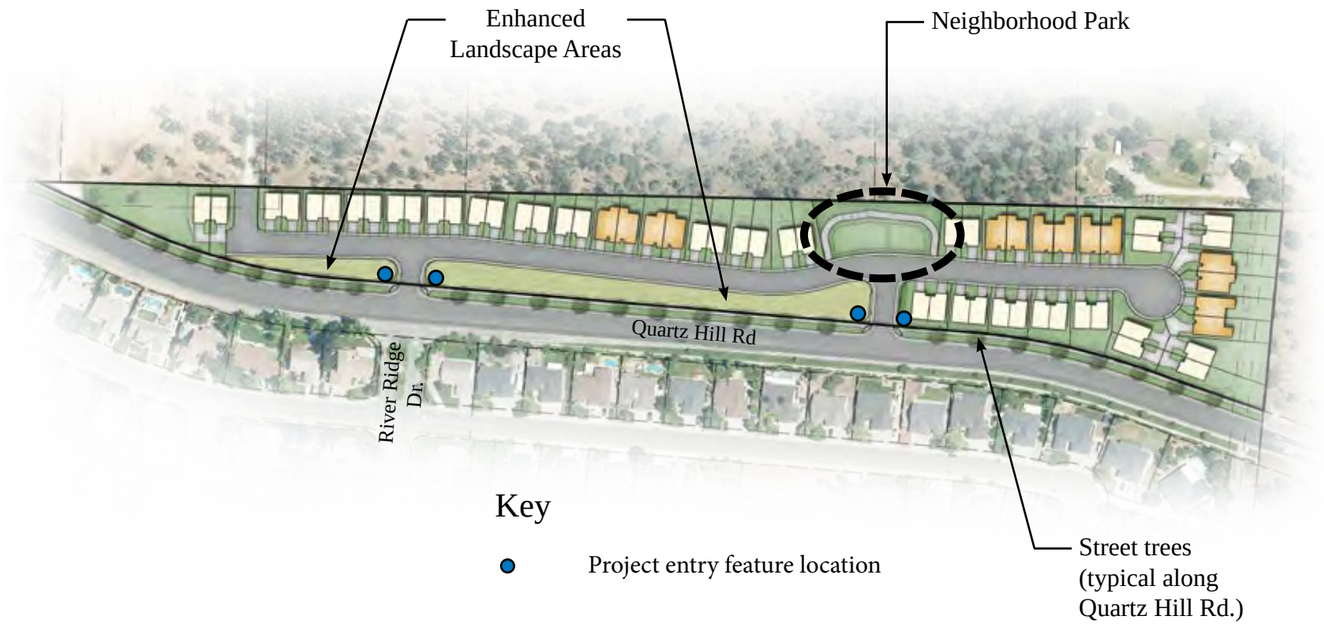
Legend:

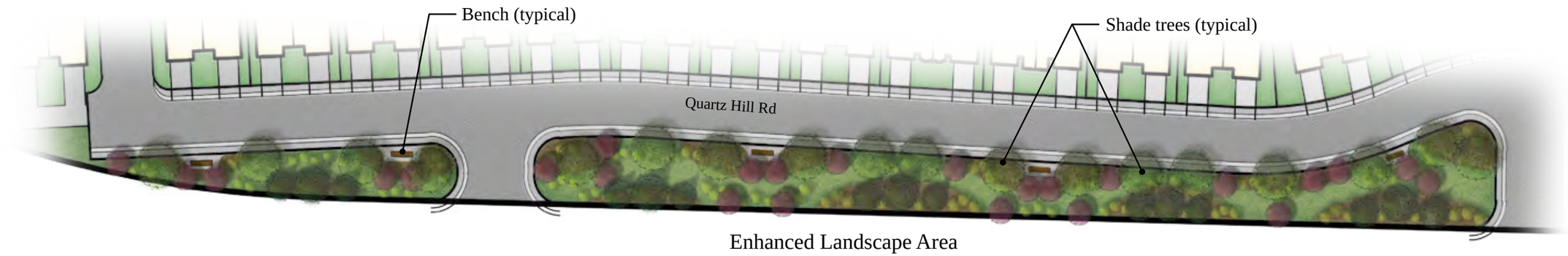
	Project Boundary	
	Single-Story Townhome Units	14
	Two-Story Duplex Units	44
	Total:	***58***

Amenities



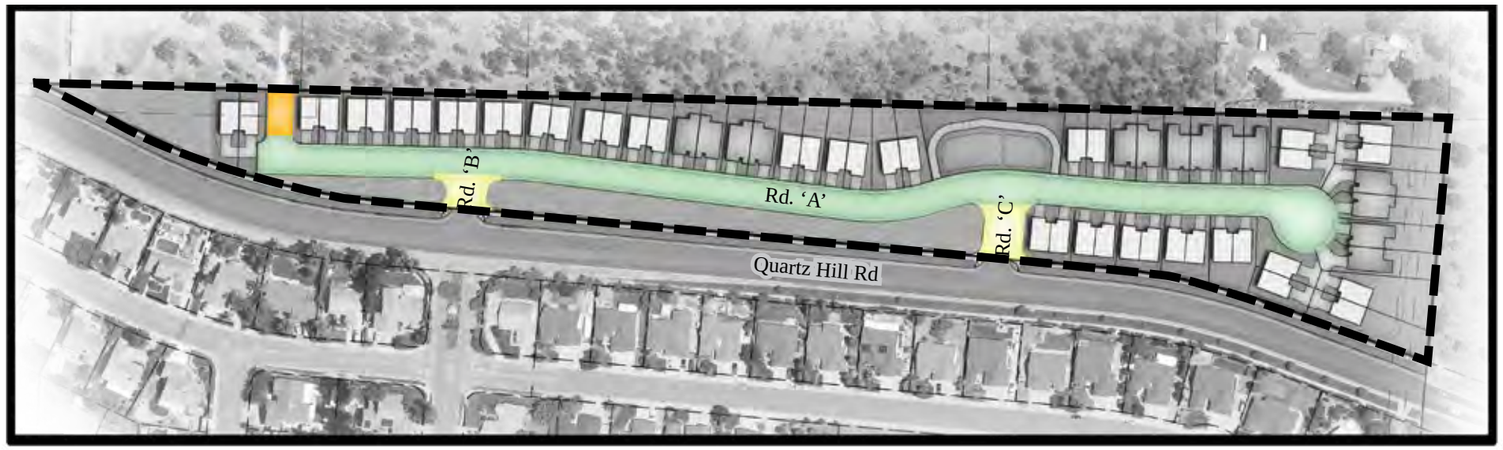
Neighborhood Park
Not to Scale





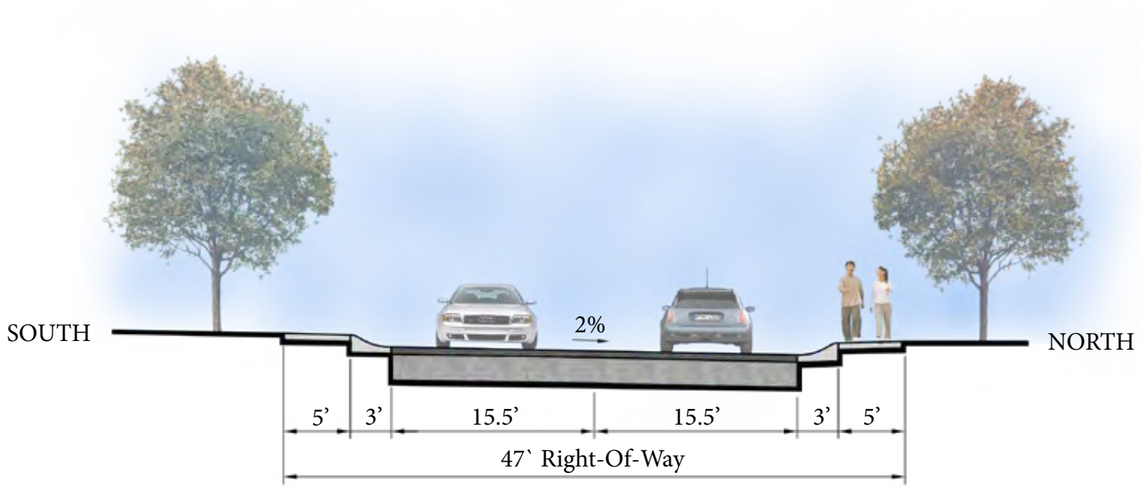
Enhanced Landscape Area
Not to Scale

Street Sections

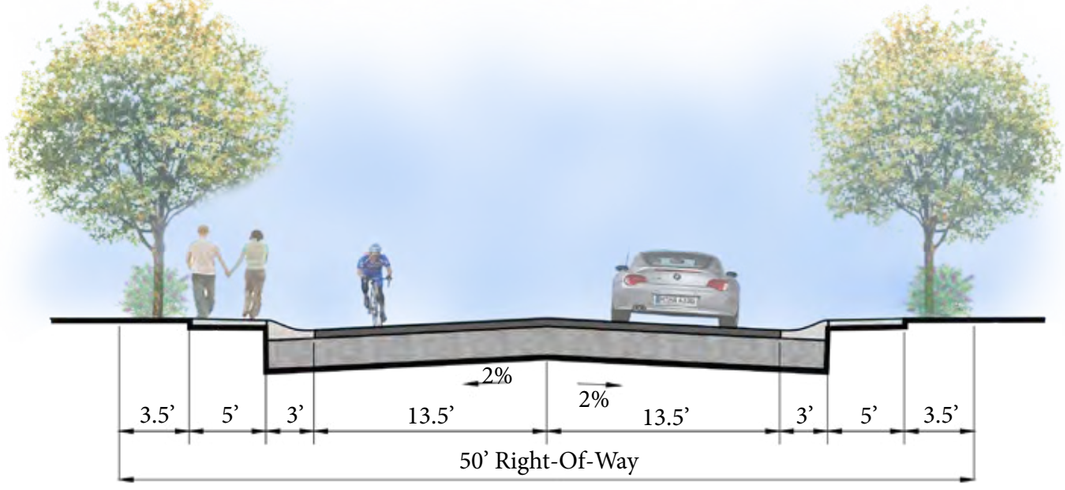


Key

- 47' Street section (Road 'A')
- 50' Street section (Roads 'B' & 'C')
- Improved driveway access to exisiting residence



47' Street Section
Road 'A'
N.T.S.



50' Street Section
Roads 'B' & 'C'
N.T.S.

Typical Lot



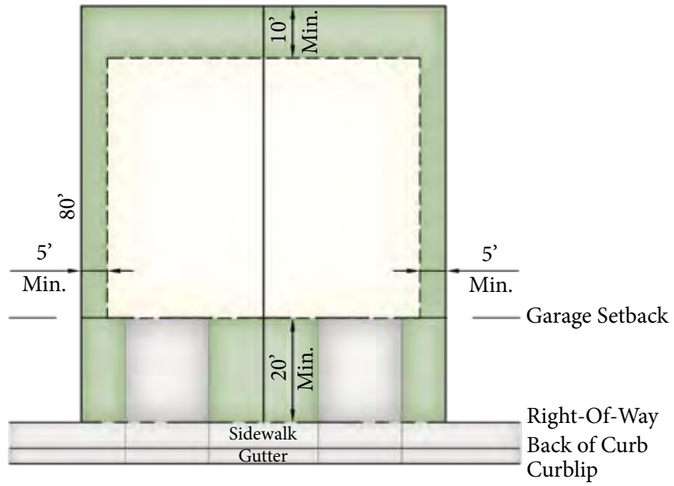
Key

Single-story duplex buildings

Two-story duplex buildings

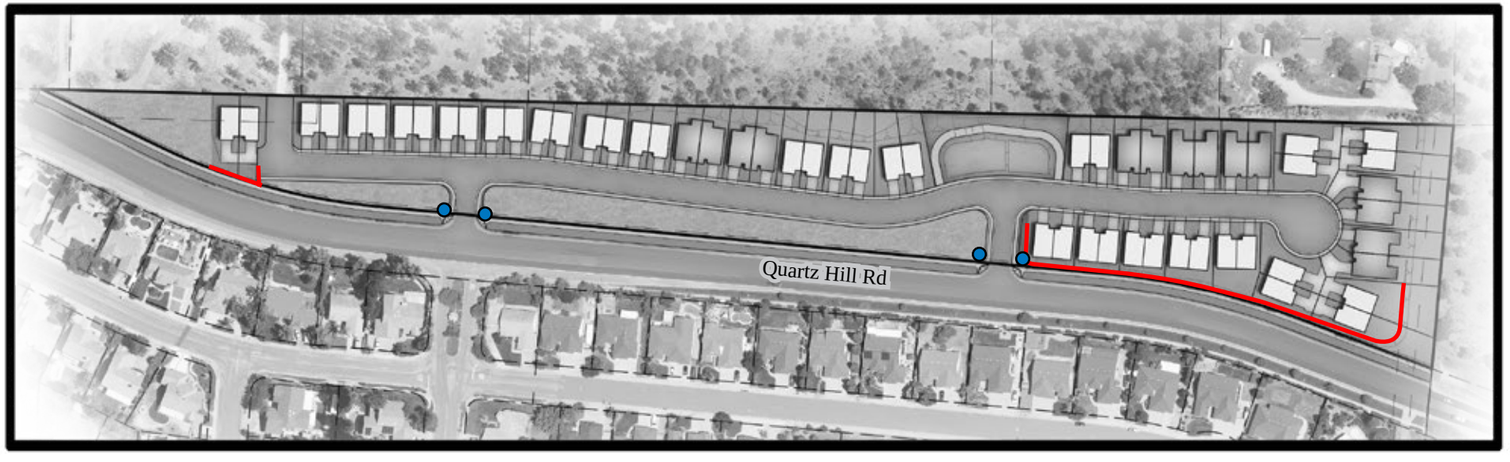
Building Setback Minimums

Front:	12’ (to house)
	20’ (to garage)
Side:	5’
Rear:	10’ (15’ along Quartz Hill Rd.)
Corner Side:	12’



Typical Lot Diagram
N.T.S.

Walls & Entry



Key

Decorative sound wall

Project entry feature location

Wall and entry feature design are intended to be similar in character to other subdivisions along Quartz Hill Road for aesthetic continuity.



Wall Example
The Vistas



Entry Feature Example
Bel Air Estates



Wall Example
River Ridge Park

Front Elevations
(Single Story)

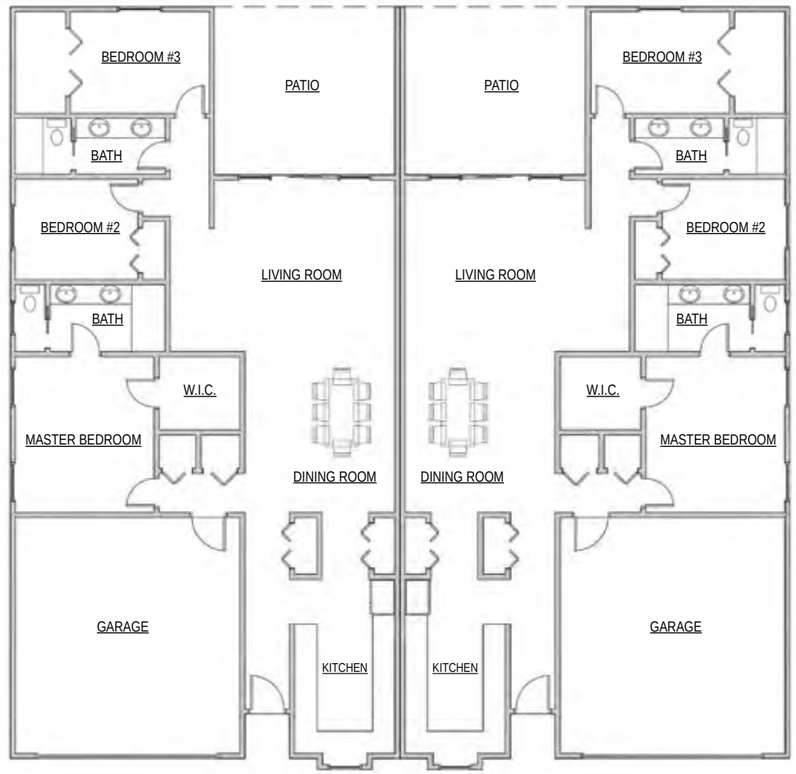








**This is a sample of garage door, roofline, and building finish combinations. More options are possible.*



One-Story Floor Plan A

2,099 Square Feet

(1,650 s.f. conditioned, 449 s.f. garage)

This one-story home features three bedrooms, two bathrooms, a two-car garage, and private backyard and patio. A variety of finishes, paint colors, and architectural features offer diverse options for the homes in the neighborhood.

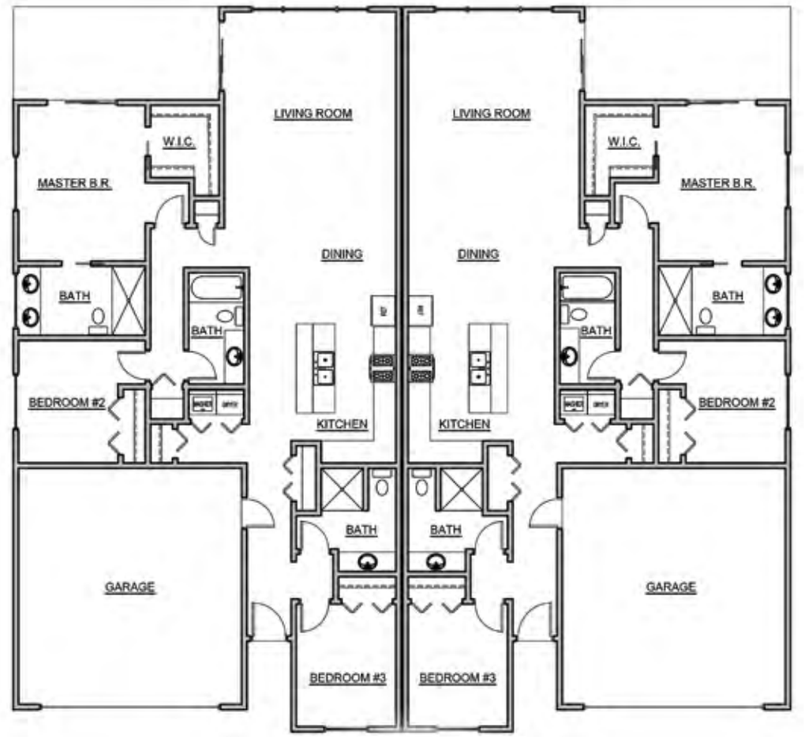
**Architectural plans are preliminary - final plans may vary.*



Side Elevation



Rear Elevation



One-Story Floor Plan B

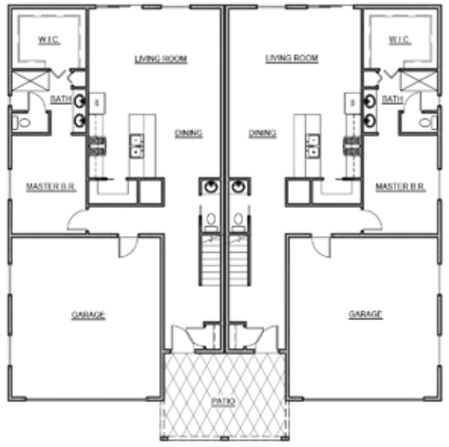
2,045 Square Feet

(1,596 s.f. conditioned, 449 s.f. garage)

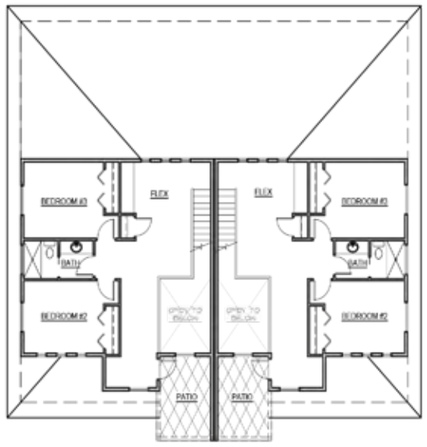
This one-story home features three bedrooms, 2-3/4 bathrooms, a two-car garage, patio, and private backyard. A variety of finishes, paint colors, and architectural features offer diverse options for the homes in the neighborhood.

Note: Only one roofline shown on this sheet.

**Architectural plans are preliminary - final plans may vary.*



First Floor

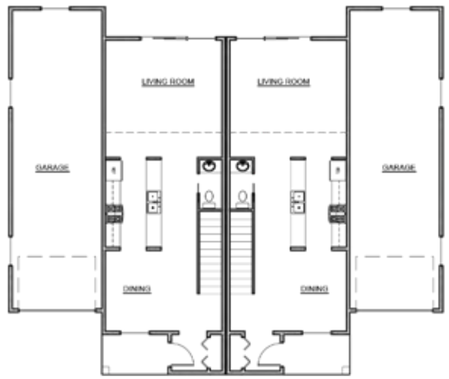


Second Floor

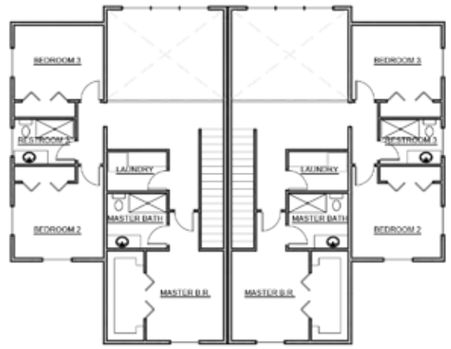
Two-Story Floor Plan A

2,260 Square Feet

The 2,260 sf floor plan features a two-car garage, an upstairs patio, downstairs master bedroom, two upstairs bedrooms, two full bathrooms, and a private backyard.



First Floor



Second Floor

Two-Story Floor Plan B

2,361 Square Feet

The 2,361 sf floor plan features a one-car tandem garage, three upstairs bedrooms, two and a half bathrooms, a mezzanine, and private backyard.



**Architectural plans are preliminary - final plans may vary.*

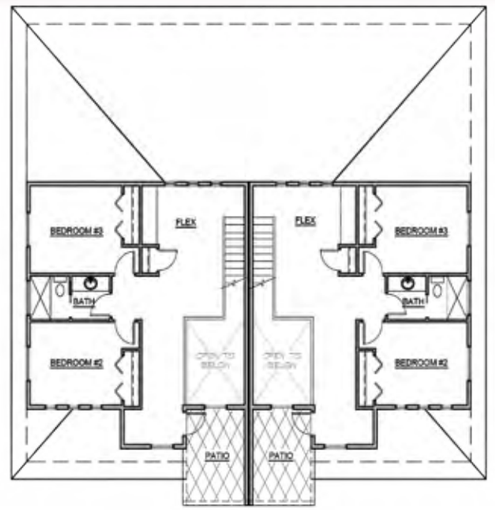


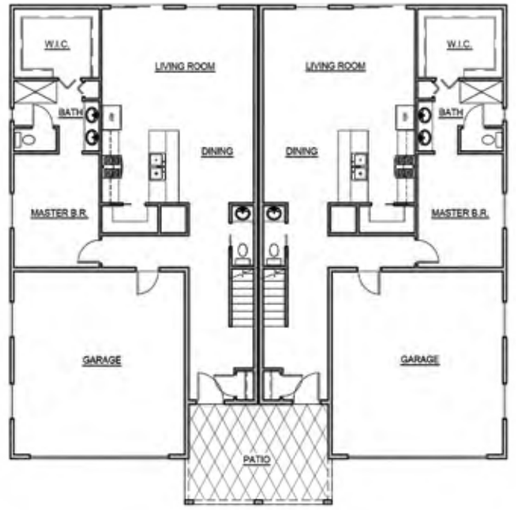
Side Elevation



Rear Elevation

**Architectural plans are preliminary - final plans may vary.*





Two-Story Floor Plan A

2,260 Square Feet

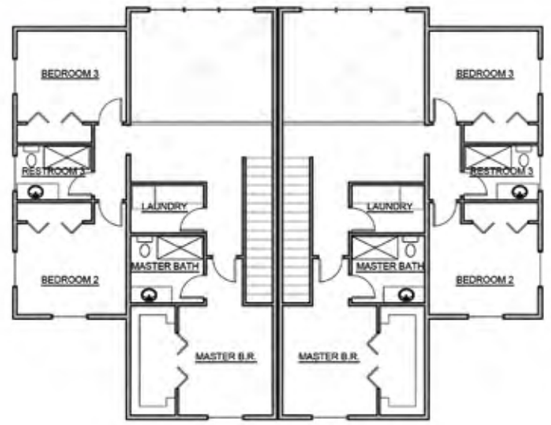


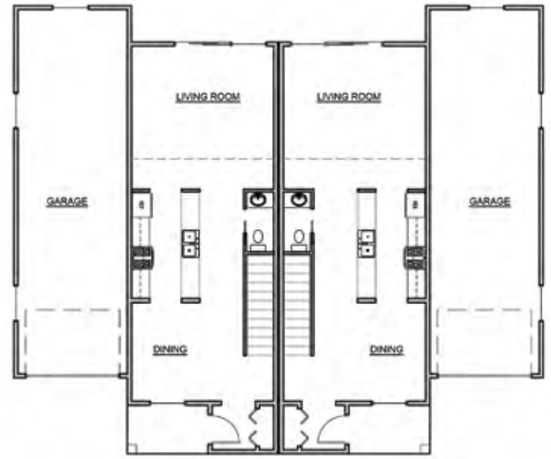
Side Elevation



Rear Elevation

**Architectural plans are preliminary - final plans may vary.*





Two-Story Floor Plan B

2,361 Square Feet

Attachment B

Biological Resources Assessment, Aquatic, Terrestrial, and Botanical Resources, Brentwood Village Development Project, City of Redding, Shasta County, California
Gallaway Enterprises, September 2022

gallaway
ENTERPRISES

BIOLOGICAL RESOURCES ASSESSMENT

Aquatic, Terrestrial, and Botanical Resources

Brentwood Village Development Project

City of Redding, Shasta County, California

September 2022



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BIOLOGICAL RESOURCES ASSESSMENT

Brentwood Village Development Project

City of Redding, California
Section 22, Township 32N, Range 05W

INTRODUCTION

Purpose and Overview

The purpose of this biological resources assessment (BRA) is to document the endangered, threatened, sensitive, and rare species and their habitats that occur or may occur in the biological survey area (BSA) of the Brentwood Village Development Project (Project), located immediately north of Quartz Hill Road at River Ridge Drive in Redding, Shasta County, California (**Figure 1**)**.** The BSA is approximately 12 acres. The proposed Project involves the construction of a residential development.

The BSA is the area where biological assessments are conducted and includes all areas to be affected directly or indirectly by proposed Project activities (**Figure 2**). Gallaway Enterprises conducted habitat assessments and botanical surveys within the BSA to evaluate site conditions and potential for special-status biological and botanical species to occur. Other primary references consulted included species lists and information gathered using the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC), the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) portals, California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB), the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants of California, and literature review. The results of the BRA are the findings of habitat assessments and field surveys, and the recommendations for avoidance and minimization measures.

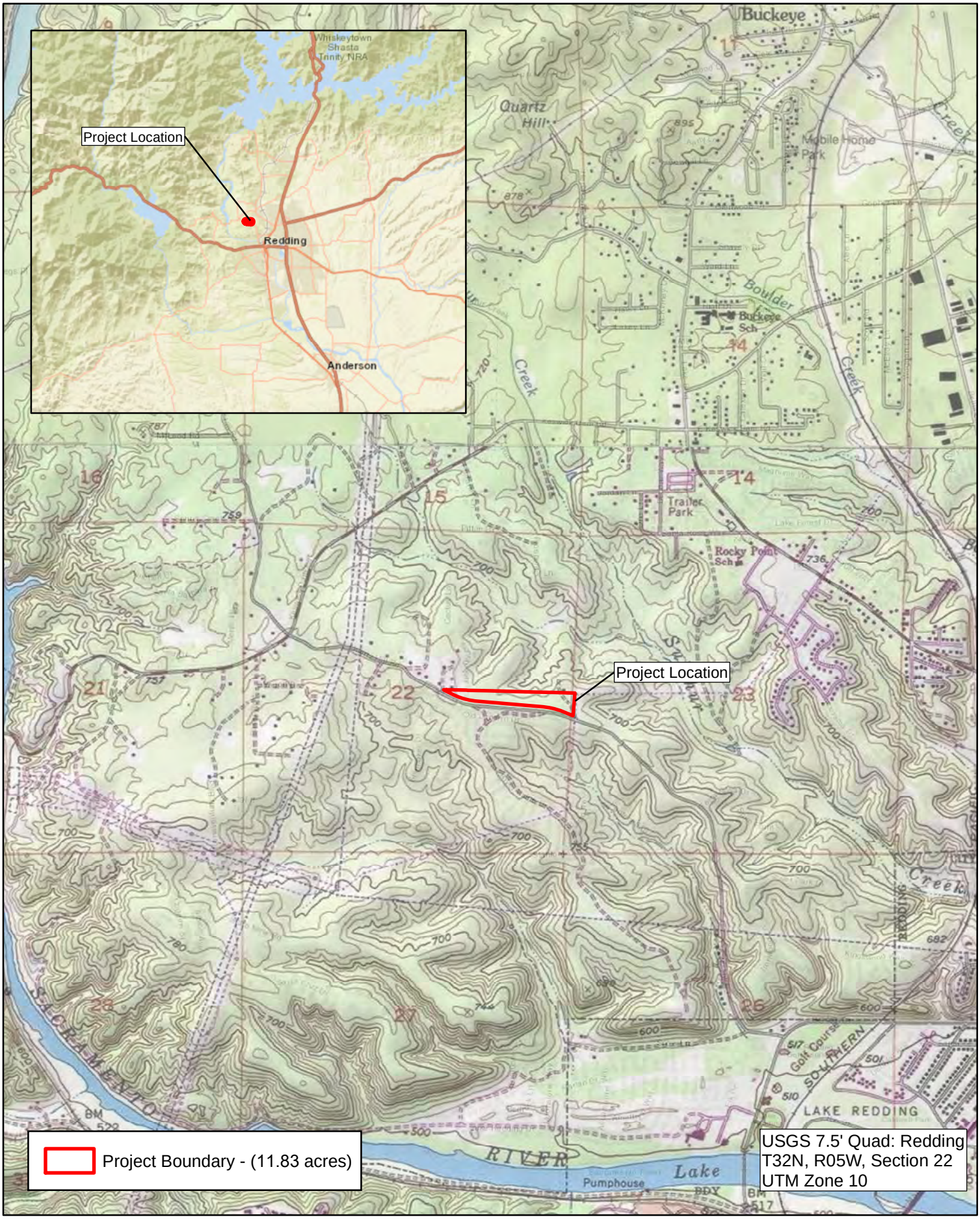
Project Location and Environmental Setting

The BSA is located within the foothills of the Klamath Mountain Range in the City of Redding. The BSA is located within the "Redding" United States Geological Survey (USGS) quadrangle, Section 22, Township 32N, Range 05W. The BSA is adjacent to a few existing rural residences and a residential subdivision to the south. An unnamed, manmade ephemeral drainage runs north to south and there are a few disturbed vernal pools present in the eastern portion of the BSA. The BSA is primarily composed of blue oak-foothill pine woodland.

The average annual precipitation is 33.68 inches and the average annual temperature is 62.45°F in the region where the Project site is located (WRCC 2022). The Project site occurs at an elevation of approximately 750 feet above sea level. The site is sloped between 0 and 15 percent. Soils within the site were gravelly loams.

Project Description

The proposed Project will involve the development of a residential subdivision and appurtenant infrastructure (**Appendix A: Proposed Site Development Plan**).



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NORTH

Data Sources: ESRI, USGS
Shasta County

Brentwood Village Development Project
Regional Location
Figure 1

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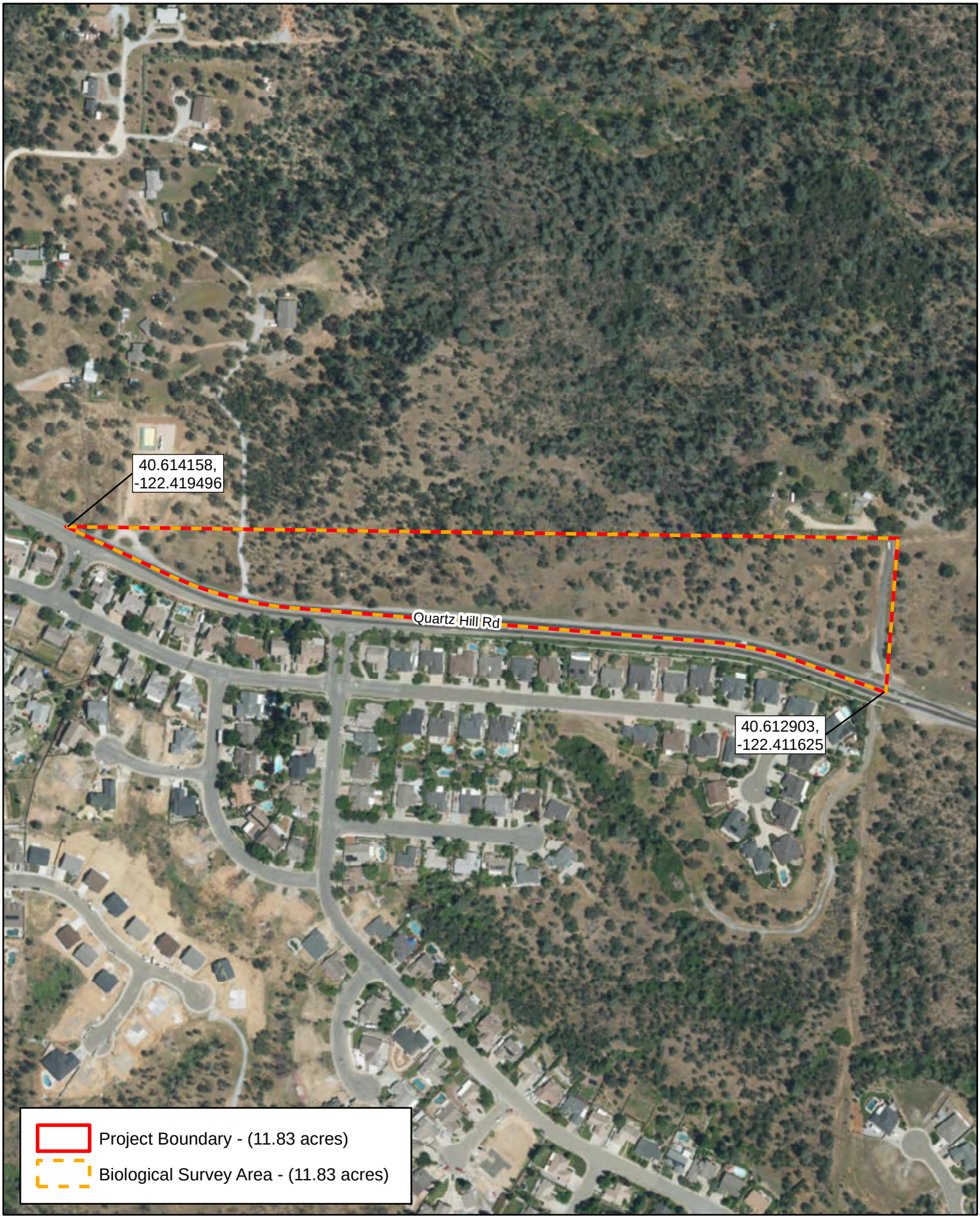
GE: #22-105 Map Date: 09/02/2022



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NORTH

Data Sources: ESRI, City of Redding 05/27/2020

Brentwood Village Development Project
Biological Survey Area
Figure 2

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GE: #22-105 Map Date: 09/02/2022

METHODS

References Consulted

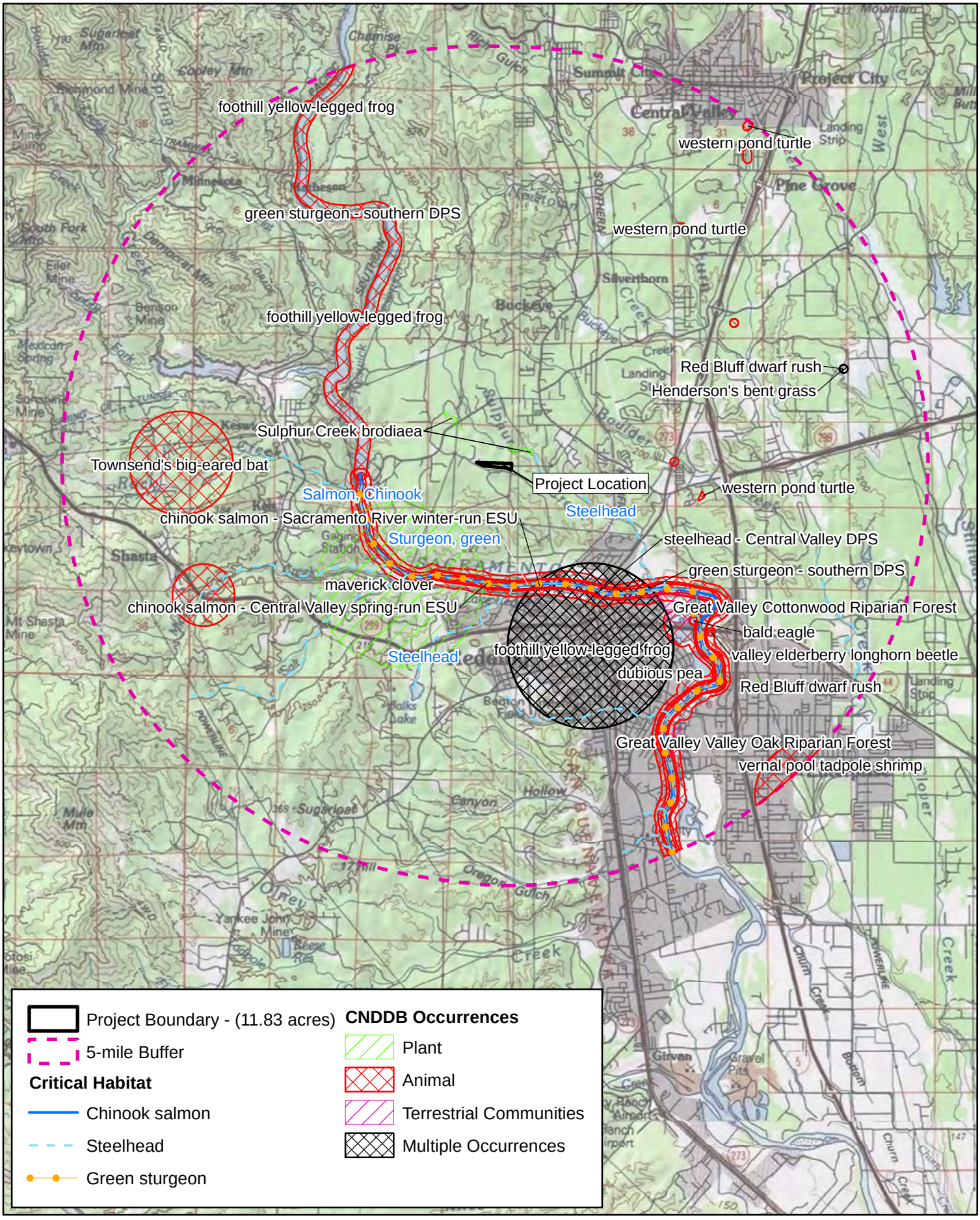
Gallaway Enterprises obtained lists of special-status species that occur in the vicinity of the BSA. The CNDDB Geographic Information System (GIS) was also consulted and showed special-status species within a 5-mile radius of the BSA (**Figure 3**). Other primary sources of information regarding the occurrence of federally listed threatened, endangered, proposed, and candidate species and their habitats within the BSA used in the preparation of this BRA are:

- The USFWS IPaC Official Species List for the Project area, August 10, 2022, Project Code: 2022-0073136 (**Appendix B: Official Species Lists**);
- The results of a species record search of the CDFW CNDDB, RareFind 5, for the 7.5-minute USGS Whiskeytown (4012265), Shasta Dam (4012264), Project City (4012263), Igo (4012255), Redding (4012254), and Enterprise (4012253) quadrangles (**Appendix B: Official Species Lists**);
- The CNPS Inventory of Rare and Endangered Vascular Plants of California for the 7.5-minute USGS Whiskeytown (4012265), Shasta Dam (4012264), Project City (4012263), Igo (4012255), Redding (4012254), and Enterprise (4012253) quadrangles (**Appendix B: Official Species Lists**);
- USFWS Critical Habitat Portal, August 10, 2022;
- Results from the protocol-level botanical surveys and habitat assessments conducted by Gallaway Enterprises on August 10, 2022 (**Appendix C: Observed Species Lists; Appendix D: Project Site Photos**); and
- Results from the Delineation of Aquatic Resources conducted by Gallaway Enterprises on August 10, 2022 (**Appendix E: Draft Delineation of Aquatic Resources**).

Special-Status Species

Special-status species that are considered in this BRA are those that fall into one of the following categories:

- Listed as threatened or endangered, or are proposed or candidates for listing under the California Endangered Species Act (CESA, 14 California Code of Regulations 670.5) or the Federal Endangered Species Act (ESA, 50 Code of Federal Regulations 17.12);
- Listed as a State Species of Special Concern (SSC) by CDFW or protected under the California Fish and Game Code (CFGC) (i.e., Fully Protected species);
- Ranked by the CNPS as 1A, 1B, or 2;
- Protected under the Migratory Bird Treaty Act (MBTA);
- Protected under the Bald and Golden Eagle Protection Act; or
- Species that are otherwise protected under policies or ordinances at the local or regional level as required by the California Environmental Quality Act (CEQA, §15380).



NORTH

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Data Sources: ESRI, USGS, Shasta County, CNDDB, CDFW, USFWS, NMFS

Brentwood Village Development Project
CNDDB Occurrences and Critical Habitat
Figure 3

gallaway ENTERPRISES

GE: #22-105 Map Date: 09/02/2022

Critical Habitat

The ESA requires that critical habitat be designated for all federally listed species. Critical habitat is designated for areas that provide essential habitat elements that enable a species' survival, and which are occupied by the species during the species listing under the ESA. For the purposes of designating critical habitat only, habitat is the abiotic and biotic setting that currently or periodically contains the resources and conditions necessary to support one or more life processes of a species.

The USFWS Critical Habitat Portal was accessed on August 10, 2022 to determine whether critical habitat occurs within the BSA. Appropriate Federal Registers were also used to confirm the presence or absence of critical habitat.

Sensitive Natural Communities

Sensitive Natural Communities (SNCs) are monitored by CDFW with the goal of preserving these areas of habitat that are rare or ecologically important. Many SNCs are designated as such because they represent a historical landscape and are typically preserved as valued components of California's diverse habitat assemblage. The CNDDB was accessed on August 10, 2022 to determine whether the BSA occurs within a mapped SNC.

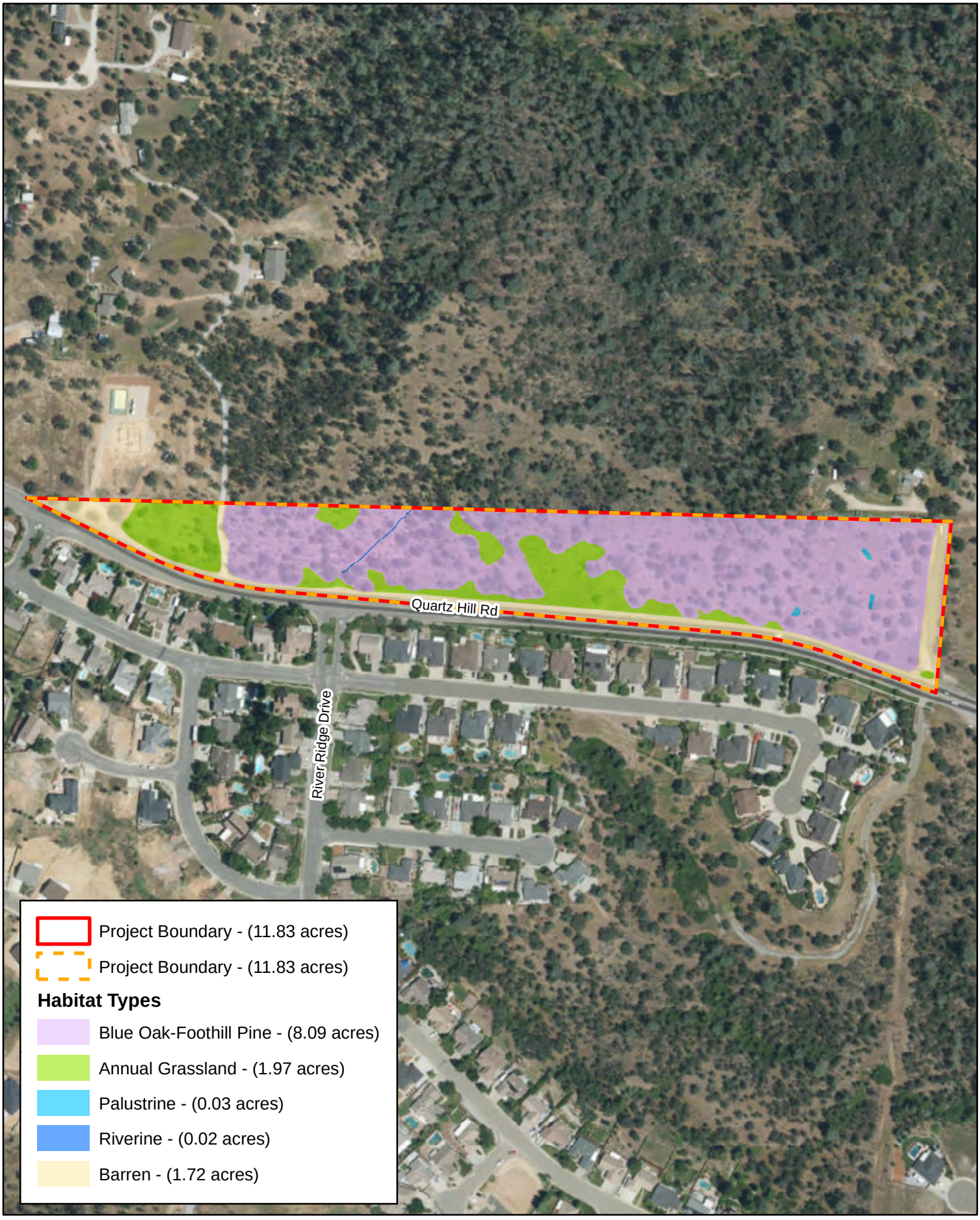
Aquatic Resources

A formal delineation of aquatic resources was conducted by Gallaway Enterprises on August 10, 2022 (**Appendix E: Draft Delineation of Aquatic Resources Map).**

Habitat Assessments and Protocol-level Rare Plant Survey

Habitat assessments were conducted by Gallaway Enterprises staff (**Figure 4**). The wildlife habitat assessment was conducted by Associate Biologist Brittany Reaves and the botanical habitat assessment was conducted by Senior Botanist Elena Gregg on August 10, 2022. Additionally, Mrs. Gregg conducted a late-season protocol-level botanical survey for all plant species with blooming periods that overlapped the survey date. Lists of all species observed within the BSA are included as **Appendix C**.

Habitat assessments for botanical and wildlife species were conducted to determine if suitable habitat elements for special-status species occur within the BSA. The habitat assessments and protocol-level survey were conducted by walking the entire BSA and recording observed species and specific habitat types and elements. If habitat was observed for special-status species, it was then evaluated for quality based on vegetation composition and structure, physical features (e.g., soils, elevation), microclimate, surrounding area, presence of predatory species and available resources (e.g., prey items, nesting substrates), and land use patterns.



NORTH

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Data Sources: ESRI, Shasta County, City of Redding GIS 05/27/2020

Brentwood Village Development Project
Habitat Types
Figure 4

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GE: #22-105 Map Date: 09/02/2022

RESULTS

Terrestrial Habitat

Blue Oak-Foothill Pine

The majority of the BSA is composed of blue oak-foothill pine woodland (**Figure 4**). Blue oak-foothill pine woodland within the BSA is characterized by an overstory of primarily blue oaks (*Quercus douglasii*) and scattered foothill pines (*Pinus sabiniana*) and a sparse to moderately dense understory dominated by whiteleaf manzanita (*Arctostaphylos viscida* ssp. *viscida*) and poison oak (*Toxicodendron diversilobum*). This habitat type is typically diverse in structure, consisting of a mix of hardwoods, conifers, and shrubs. This habitat type provides valuable breeding, nesting, and foraging opportunities for migratory birds. Common wildlife species that utilize in blue oak-foothill pine woodlands include California scrub-jay (*Aphelocoma californica*), acorn woodpecker (*Melanerpes formicivorus*), and western gray squirrel (*Sciurus griseus*).

Annual Grassland

Annual grassland occurs throughout the site, primarily as the herbaceous layer of blue oak-foothill pine woodland, but also in a few patches where the tree canopy opens (**Figure 4**). Annual grassland habitats and species composition depend largely on annual precipitation, fire regimes, and grazing practices (Mayer and Laudenslayer 1988). Species observed in the annual grassland in the BSA include greater rattlesnake grass (*Briza maxima*), wild oat (*Avena barbata*), sweet vernal grass (*Anthoxanthum aristatum*), meduashead (*Elymus caput-medusae*), smooth cat's ear (*Hypochaeris glabra*), rattlesnake weed (*Daucus pusillus*), and soft chess (*Bromus hordeaceus*). Most wildlife species use grassland habitat for foraging, but generally require some other habitat characteristic such as rocky outcrops, cliffs, caves, or ponds in order to find shelter and cover for escapement. Some rodents, such as ground squirrel (*Otospermophilus beecheyi*), utilize annual grasslands for burrowing.

Barren

Barren habitat within the BSA is comprised of the unpaved gravel and dirt roads. Barren habitat is typified by non-vegetated soil, rock, paved roads, and gravel areas void of vegetation. It is typically considered low-quality habitat for most wildlife species, although some ground nesting avian species such as killdeer (*Charadrius vociferous*) and small reptiles such as western fence lizard (*Sceloporus occidentalis*) can be found breeding in barren habitat.

Aquatic Habitat

Palustrine

According to the Cowardin classification system, palustrine habitats are inland, nontidal depressions containing standing water that vary in size from small ponds to large areas that cover many acres. Typical palustrine habitats include floodplains, inland marshes, and wetlands including vernal and seasonal wetlands. Within the BSA, palustrine habitat occurs in the form of three (3) disturbed vernal pools located within or abutting dirt roads in the eastern portion of the BSA. The vernal pools typically dry during the

spring months and the pools within the BSA were dry during the site visit. The vernal features were sparsely vegetated with hyssop loosestrife (*Lythrum hyssopifolium*), perennial ryegrass (*Festuca perennis*), popcorn flower (*Plagiobothrys stipitatus*), annual hairgrass (*Deschampsia danthonioides*), and prairie plantain (*Plantago elongata*). The typically calm waters of palustrine habitats offer environmental conditions that contrast sharply with those of running water and may provide breeding and foraging habitat for a number of amphibians, reptiles, and birds.

Riverine

Riverine habitat is typically characterized by intermittent or continually running water. However, the riverine habitat within the BSA is a manmade unnamed ditch that is characterized by ephemeral flows which runs south to north through the BSA. This drainage is heavily vegetated and likely only provides aquatic habitat when it is flowing immediately after precipitation events. The drainage was dry at the time of the site visit and is unlikely to provide functioning habitat for fishes and other aquatic species. Riverine habitat provides food for many species of insectivorous birds, hawks, and their prey.

Critical Habitat

There is no critical habitat present within the BSA.

Sensitive Natural Communities

No CDFW-designated SNCs occur within the BSA.

Special-Status Species

A summary of special-status species assessed for potential occurrence within the BSA based on the USFWS IPaC species list, NMFS species list, CNDDB species list, and the CNPS inventory of rare and endangered plants within the Whiskeytown (4012265), Shasta Dam (4012264), Project City (4012263), Igo (4012255), Redding (4012254), and Enterprise (4012253) USGS 7.5-minute quadrangles and their potential to occur within the BSA are described in **Table 1**. Potential for occurrence was determined by reviewing database queries from federal and state agencies and performing field surveys to evaluate habitat characteristics.

Table 1. Special-status species and Sensitive Natural Communities and their potential to occur in the BSA of the Brentwood Village Development Project

Common Name *(Scientific Name)*	**Status** Fed/State/CNPS	**Associated Habitats**	**Potential for Occurrence**
SENSITIVE NATURAL COMMUNITIES			
Great Valley Cottonwood Riparian Forest	_/SNC/_	Riparian forest.	None. There is no designated Great Valley Cottonwood Riparian Forest within the BSA.
Great Valley Valley Oak Riparian Forest	_/SNC/_	Riparian forest.	None. There is no designated Great Valley Oak Riparian Forest within the BSA.

Common Name *(Scientific Name)*	**Status** Fed/State/CNPS	**Associated Habitats**	**Potential for Occurrence**
Great Valley Willow Scrub	_/SNC/_	Riparian scrub.	None. There is no designated Great Valley Willow Scrub within the BSA.
PLANTS			
Canyon Creek stonecrop (*Sedum obtusatum* ssp. *paradisum*)	_/_/1B.3	Rock faces and in crevices of exposed granite. (Blooming Period [BP]: May – Jun)	None. No suitable rock habitat present and not observed during protocol-level surveys.
Dubious pea (*Lathyrus sulphureus* var. *argillaceus*)	_/_/3	Cismontane woodland. (BP: Apr – May)	None. No species of *Lathyrus* observed during protocol-level surveys.
Henderson's bent grass (*Agrostis hendersonii*)	_/_/3.2	Moist places in grassland or vernal pool habitat. (BP: Apr – Jun)	**Low**. There is marginal habitat present within the vernal pool habitat and ephemeral drainage. Additional surveys recommended.
Legenere (*Legenere limosa*)	_/_/1B.1	Vernal pools. (BP: Apr – Jun)	None. The vernal pool habitat present is not suitably deep for this species.
Maverick clover (*Trifolium piorkowskii*)	_/_/1B.2	Shallow vernal depressions on volcanic flats or the open banks of intermittent or perennial streams in the foothills of Shasta County. (BP: Apr – May)	None. There is no suitable soils or stream habitat present within the BSA.
Nuttall's ribbon-leaved pondweed (*Potamogeton epihydrus*)	_/_/2B.2	Assorted shallow freshwater marshes and swamps. (BP: [Jun]Jul – Sep)	None. No suitably wet habitat present and not observed during protocol-level surveys.
Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*)	_/_/1B.1	Vernal pools and vernally mesic sites. (BP: Mar – Jun)	**Low**. There is marginal habitat present within the vernal pool habitat. Additional surveys recommended.
Sanford's arrowhead (*Sagittaria sanfordii*)	_/_/1B.2	In standing or slow-moving freshwater ponds, marshes, and ditches. (BP: May – Oct [Nov])	None. No suitably wet habitat present and not observed during protocol-level surveys.

Common Name *(Scientific Name)*	**Status** Fed/State/CNPS	**Associated Habitats**	**Potential for Occurrence**
PLANTS			
Shasta huckleberry (*Vaccinium shastense* ssp. *shastense*)	_/_/1B.3	Microhabitat is acidic, mesic; often streambanks; sometimes seeps, rocky outcrops, roadsides, and disturbed areas. (BP: Dec – May [Sep])	None. There is no suitable habitat present within the BSA and no species of *Vaccinium* was observed during protocol-level surveys.
Shasta snow-wreath (*Neviusia cliftonii*)	_/SC/1B.2	In the mountains around Lake Shasta on shaded, north facing, or sheltered canyons. Often found by stream sides, sometimes on limestone or volcanic soils. (BP: Apr – Jun)	None. There is no suitable habitat present within the BSA.
Silky cryptantha (*Cryptantha crinita*)	_/_/1B.2	Gravelly streambeds and wetland swales. (BP: Apr – May)	None. There is no suitable habitat within the drainage present.
Slender Orcutt grass (*Orcuttia tenuis*)	FT/SE/1B.1	Deep vernal pools. (BP: May – Sep [Oct])	None. The species was not observed during the protocol-level rare plant survey.
Sulphur Creek brodiaea (*Brodiaea matsonii*)	_/_/1B.1	Streambanks. In cracks and crevices of metamorphic amphibolite schist. (BP: May – Jun)	None. There are no suitable substrates or streambank habitat present within the drainage in the BSA.
INVERTEBRATES			
Monarch butterfly *(Danaus plexippus)*	FC/_/_	Egg and larval stage dependent upon milkweed. Adults migrate seasonally, amassing in in dense tree canopies; e.g., eucalyptus.	None. The is no suitable habitat within the BSA. No milkweed plants were observed within the BSA.
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	FT/_/_	Blue elderberry shrubs; usually associated with riparian areas.	None. No elderberry shrubs were observed within the BSA.

Common Name *(Scientific Name)*	**Status** Fed/State/CNPS	**Associated Habitats**	**Potential for Occurrence**
INVERTEBRATES			
Vernal pool fairy shrimp *(Branchinecta lynchi)*	FT/_/_	Vernal pools and seasonally ponded areas.	**Low**. There are shallow vernal pools that contain marginal habitat.
Vernal pool tadpole shrimp *(Lepidurus packardi)*	FE/_/_	Deep vernal pools.	None. None of the wetlands within the BSA provide suitable hydrology to support the complete lifecycle of this species.
FISH			
Chinook salmon Central Valley spring-run Evolutionarily Significant Unit (ESU) *(Oncorhynchus tshawytscha)*	FT/ST/_	Sacramento River and its tributaries.	None. The drainage within the BSA is too ephemeral to support this species.
Chinook salmon Sacramento River winter-run ESU *(Oncorhynchus tshawytscha)*	FE/SE/_	Sacramento River and its tributaries.	None. The drainage within the BSA is too ephemeral to support this species.
Green sturgeon Southern Distinct Population Segment (DPS) *(Acipenser medirostris)*	FT/_/_	Spawns in the Sacramento, Feather and Yuba Rivers, site fidelity. Non spawning adults occupy marine/estuarine waters. Delta Estuary is important for rearing juveniles.	None. The drainage within the BSA is too ephemeral to support this species.
Steelhead Central Valley DPS *(Oncorhynchus mykiss irideus)*	FT/_/_	Sacramento and San Joaquin rivers and their tributaries.	None. The drainage within the BSA is too ephemeral to support this species.
Delta smelt *(Hypomesus transpacificus)*	FT/SE/_	Found only from the San Pablo Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo Counties.	None. The drainage within the BSA is too ephemeral to support this species.
HERPTILES			
Foothill yellow-legged frog Northwest/North Coast Clade (*Rana boylii)*	_/SSC/_	Perennial, shallow streams and riffles with rocky substrates and partial shade; commonly found in canyons and narrow streams.	None. The drainage within the BSA is too ephemeral to support this species (USFWS 2021).

Common Name *(Scientific Name)*	**Status** Fed/State/CNPS	**Associated Habitats**	**Potential for Occurrence**
HERPTILES			
Pacific tailed frog (*Ascaphus truei*)	_/SSC/_	Perennial montane streams. Tadpoles require water below 15 degrees Celsius.	None. The drainage within the BSA is too ephemeral to support this species.
Shasta salamander (*Hydromantes shastae*)	_/ST/_	Occurs in rocky, limestone talus near Lake Shasta.	None**.** No suitable habitat occurs within the BSA and the BSA is located outside of the known range of this species (Gogol-Prokurat 2016).
Western pond turtle (*Emys marmorata*)	_/SSC/_	Bodies of water with deep pools, emergent vegetation for foraging and cover, and locations for basking and nesting.	None. There is no suitable habitat present within the BSA.
Western spadefoot (*Spea hammondii)*	_/SSC/_	Occurs primarily in grassland habitats. Vernal pools and seasonal drainages are typically used for breeding and egg-laying.	**Low**. Aquatic features present could potentially provide suitable breeding habitat when ponded water is present for 30 days or longer, and suitable aestivation habitat is present in the surrounding areas of annual grassland.
BIRDS			
Bald eagle *(Haliaeetus leucocephalus)*	_/SE, FP/_	Coasts, large lakes, and river systems with open forests with large trees and snags.	None. There is no suitable habitat present within the BSA.
Bank swallow (*Riparia riparia*)	_/ST/_	Requires vertical banks or cliffs with fine-textured sandy soils near streams, rivers, lakes, ocean to dig nesting burrow.	None. There is no suitable habitat present within the BSA.
Northern spotted owl (*Strix occidentalis caurina*)	FT/ST/_	Forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags, and live trees with broken tops.	None. There is no suitable habitat present within the BSA.

Common Name *(Scientific Name)*	**Status** Fed/State/CNPS	**Associated Habitats**	**Potential for Occurrence**
BIRDS			
Tricolored blackbird *(Agelaius tricolor)*	_/ST/_	Colonial nester in large freshwater marshes. Requires open, accessible water source and does most of its foraging in open habitats such as farm fields, pastures, cattle pens, large lawns.	None. There is no suitable nesting habitat within or adjacent to the BSA.
MAMMALS			
Fisher West Coast DPS *(Pekania pennanti)*	_/SSC/_	Intermediate to large-tree stages of coniferous forests and deciduous-riparian areas with high percent canopy closure. Uses cavities, snags, logs and rocky areas for cover and denning. Needs large areas of mature, dense forest.	None. There is no suitable habitat present within the BSA.
Pallid bat *(Antrozous pallidus)*	_/SSC/_	Rocky outcroppings to open, sparsely vegetated grasslands with nearby water source. Day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, trees (e.g., cavities and exfoliating bark), and various human structures (i.e., bridges).	**Low**. Mature trees with exfoliating bark and large cavities within the BSA could potentially provide day-roosting habitat within the BSA. There are no CNDDB occurrences of this species within 5 miles of the BSA.
Townsend's big-eared bat *(Corynorhinus townsendii)*	_/SSC/_	Roost in caves and cave-like cavities, occasionally in bridges.	None. There is no suitable habitat present within the BSA.
Western red bat *(Lasiurus blossevillii)*	_/SSC/_	Riparian areas dominated by walnuts, oaks, willows, cottonwoods, and sycamores where they roost in these broad-leafed trees.	**Low**. The BSA contains mature trees that could potentially provide roosting habitat; however, there is no riparian habitat present.

CODE DESIGNATIONS	
FE or FT = Federally listed as Endangered or Threatened **FC** = Federal Candidate Species **SE or ST=** State Listed as Endangered or Threatened **SC** = State Candidate Species **SSC** = State Species of Special Concern **FP** = State Fully Protected Species **SNC** = CDFW Sensitive Natural Community	**CNPS California Rare Plant Rank (CRPR):** **CRPR 1B** = Rare or Endangered in California or elsewhere **CRPR 2** = Rare or Endangered in California, more common elsewhere **CRPR 3** = More information is needed **CRPR 4** = Plants with limited distribution **0.1** = Seriously Threatened **0.2** = Fairly Threatened **0.3** = Not very Threatened
Potential for Occurrence: for plants it is considered the potential to occur during the survey period; for birds and bats it is considered the potential to breed, forage, roost, or over-winter in the BSA during migration. Any bird or bat species could fly over the BSA, but this is not considered a potential occurrence. The categories for the potential for occurrence include: **None:** The species or natural community is known not to occur and has no potential to occur in the BSA based on sufficient surveys, the lack suitable habitat, and/or the BSA is well outside of the known distribution of the species. **Low:** Potential habitat in the BSA is sub-marginal and/or the species is known to occur in the vicinity of the BSA. **Moderate:** Suitable habitat is present in the BSA and/or the species is known to occur in the vicinity of the BSA. Pre-construction surveys may be required. **High:** Habitat in the BSA is highly suitable for the species and there are reliable records close to the BSA, but the species was not observed. Pre-construction surveys required, with the exception of indicators for foraging habitat. **Known:** Species was detected in the BSA, or a recent reliable record exists for the BSA.	

Endangered, Threatened, and Rare Plants

A botanical habitat assessment and late-season protocol-level botanical survey was conducted within the BSA on August 10, 2022 by Gallaway Enterprises Senior Botanist Elena Gregg. No special-status plant species were observed within the BSA; however, potentially suitable habitat was identified for Henderson's bent grass and Red Bluff dwarf rush. As their blooming periods did not occur at the time of the site visit, these species were unable to be identified within the BSA. A list of all plant species observed during the survey is provided in **Appendix C**.

Henderson's bent grass

Henderson's bent grass is a CNPS Rank 3.2 plant. It is an annual grass native to northern California and Oregon. It usually occurs in vernal pool and swale habitats; however, it can also be found in moist areas in annual grasslands. It is associated with valley grasslands, vernal and seasonal wetlands, and swale and streambank plant communities. Current threats facing Henderson's bent grass is loss of habitat, changes in hydrology, and invasive species.

CNDDB Occurrences

There is one (1) CNDDB occurrence of this species within 5 miles of the BSA (#21). It is located 4 miles to the northeast of the BSA and was found in a quarter-acre vernal pool.

Status of Henderson's bent grass occurring in the BSA

There is marginally suitable habitat present in and around the vernal pool and ephemeral ditch within the BSA; however, these habitats within the BSA are disturbed and primarily man-made features and there are no recorded occurrences of Henderson's bent grass in close proximity to the BSA. There is low potential for Henderson's bent grass to occur within the BSA.

Red Bluff Dwarf Rush

Red Bluff dwarf rush is ranked by the CNPS as a 1B.1 plant species. It is an annual monocot that is endemic to California and blooms from March through May. Red Bluff dwarf rush is found in mesic annual grasslands and the edges of vernal pools.

CNDDB occurrences

There are two (2) CNDDB occurrences of Red Bluff dwarf rush within 5 miles of the BSA (#20, 51), both located approximately 4 miles east of the BSA.

Status of Red Bluff dwarf rush occurring in the BSA

The BSA contains shallow vernal pools that could potentially provide suitable habitat for Red Bluff dwarf rush. However, the vernal habitat present within the BSA is largely man-made and disturbed and there are no recorded CNDDB occurrences in close proximity to the BSA. As such, there is **low** potential for Red Bluff dwarf rush to occur within the BSA.

Endangered, Threatened, and Special-Status Wildlife

A wildlife habitat assessment was conducted within the BSA on August 10, 2022 by Gallaway Enterprises Associate Biologist Brittany Reaves. Potentially suitable habitat was identified for vernal pool fairy shrimp, western spadefoot, western red bat, pallid bat, and avian species protected under the MBTA and CFGC. A complete list of wildlife species observed within the BSA can be found in **Appendix C.**

Vernal pool fairy shrimp

Vernal pool fairy shrimp are federally listed as threatened and are widespread but not abundant. Known populations occur in California to southern Oregon. The geographic range of this species encompasses most of the Central Valley from Shasta County to Tulare County and the central coast range from northern Solano County to Santa Barbra County, California. Additional disjunctive occurrences have been identified in western Riverside County, California, and in Jackson County, Oregon, near the city of Medford. The vernal pool fairy shrimp occupies a variety of different vernal pool habitats, from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools. Occupied habitats range in size from rock outcrops pools as small as one square meter to large vernal pools up to 12 acres. Smaller vernal pools are the most commonly occupied and are found more frequently in grass or mud bottomed swales, or basalt flow depression pools in unplowed grasslands. They rely on the topography and interconnecting vernal features to disperse to different areas. Vernal pool fairy shrimp have been collected from early December to early May (USFWS 2005).

CNDDB Occurrences

There are no CNDDB occurrences of vernal pool fairy shrimp within 5 miles of the BSA. The nearest

occurrence (#311) is located 6.5 miles southeast of the BSA. This is also the northernmost occurrence of this species.

Status of vernal pool fairy shrimp occurring in the BSA

There are vernal pools present within the BSA that contain potentially suitable habitat for vernal pool fairy shrimp; however, they are shallow and vegetated with marginally hydrophytic species, indicating short ponding duration. Based on the presence of marginally suitable habitat within the, there is a **low** potential for vernal pool fairy shrimp to occur within the BSA.

Western spadefoot

The western spadefoot is a SSC in California. It is an endemic species in California. The western spadefoot toad ranges from the northern point of the Central Valley south to the western corner of California. They are a stocky, small toad that varies in colors from gray, green and brown and typically have four irregular spots or stripes on their back. Their eyes are described as being golden with vertical pupils. The most distinguishing feature of the toad is a hardened, black spade on the hind foot. The spade is used for burrowing into moist soils. Suitable habitat consists of open grasslands with intermittent streams and vernal pools. Vernal pools and water sources that are ponded for a minimum of 30 days are essential for breeding and depositing eggs. Current threats facing the western spadefoot toad are loss of habitat, changes in hydrological regimes, and human disturbances.

CNDDB occurrences

There are no occurrences of this species within 5 miles of the BSA. The nearest occurrence (#462) of western spadefoot was recorded in 2006, approximately 10 miles southeast of the BSA. This occurrence was recorded within the aquatic habitat of the Stillwater Plains Conservation Bank located directly east of the Redding Municipal Airport.

Status of western spadefoot toad occurring in the BSA

The BSA features aquatic resources that could support breeding habitat for western spadefoot when water is ponded for 30 days or longer during the western spadefoot breeding season, and adjacent grasslands could provide suitable aestivation habitat. Western spadefoot has never been found north of occurrences #462 and #1404, which are located 10 miles southeast of the BSA. Additionally, it cannot be confirmed whether or not the aquatic resources onsite pond for the required duration to support this species. Due to the lack of nearby occurrences and marginally suitable habitat, there is **low** potential for western spadefoot to occur within the BSA.

Pallid bat

Pallid bats are designated as a CDFW SSC. Pallid bats roost alone, in small groups (2 to 20 bats), or gregariously (hundreds of individuals). Day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, trees (e.g., basal hollows of coast redwoods and giant sequoias, bole cavities of oaks, exfoliating Ponderosa pine [*Pinus ponderosa*] and valley oak [*Quercus lobata*] bark, deciduous trees in riparian areas, and fruit trees in orchards), and various human structures such as bridges (especially wooden and concrete girder designs), barns, porches, bat boxes, and human-occupied as well as vacant buildings. Roosts generally have unobstructed entrances/exits, are high above the ground, warm, and

inaccessible to terrestrial predators. However, this species has also been found roosting on or near the ground under burlap sacks, stone piles, rags, and baseboards. Lewis 1996 found that pallid bats have low roost fidelity and both pregnant and lactating pallid bats changed roosts an average of once every 1.4 days throughout the summer. Overwintering roosts have relatively cool, stable temperatures and are located in protected structures beneath the forest canopy or on the ground, out of direct sunlight. In other parts of the species' range, males and females have been found hibernating alone or in small groups, wedged deeply into narrow fissures in mines, caves, and buildings. At low latitudes, outdoor winter activity has been reported at temperatures between –5 and 10 °C (WBWG 2022).

CNDDB Occurrences

The nearest occurrence of pallid bat is located approximately 7 miles west of the BSA (#111). This occurrence states that pallid bats were observed in riparian woodland habitat under Brady Creek Bridge on Kennedy Memorial Drive in 2002.

Status of pallid bat occurring in the BSA

Mature trees within the BSA could potentially provide suitable roosting habitat for pallid bat. Evidence of roosting (i.e., urine stains and guano) was not observed during the biological habitat assessment. There is low potential for pallid bat to occur within the BSA.

Western red bat

Western red bat is designated as a CDFW SSC. Western red bats are typically solitary, roosting primarily in the foliage of trees or shrubs. Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas. There may be an association with intact riparian habitat (particularly willows, cottonwoods, and sycamores). Roost sites are generally hidden from view from all directions except below; lack obstruction beneath, allowing the bat to drop downward for flight; lack lower perches that would allow visibility by predators; have dark ground cover to minimize solar reflection; have nearby vegetation to reduce wind and dust; and are generally located on the south or southwest side of a tree. Red bats generally begin to forage one to two hours after sunset. Although some may forage all night, most typically have an initial foraging period corresponding to the early period of nocturnal insect activity, and a minor secondary activity period corresponding to insects that become active several hours before sunrise. Red bats mate in late summer or early fall. Females become pregnant in spring and have a pregnancy that lasts 80 to 90 days. Females may have litters of up to five (5) pups per year. This species is considered to be highly migratory. Although generally solitary, red bats appear to migrate in groups and forage in close association with one another in summer. The timing of migration and the summer ranges of males and females seem to be different. Winter behavior of this species is poorly understood (WBWG 2021).

CNDDB Occurrences

The closest CNDDB occurrence of western red bat is located approximately 6 miles west (#4) of the BSA, where an adult western red bat was captured at the Whiskeytown National Recreation Area in 2002.

Status of western red bats occurring within the BSA

Oak trees occur within the BSA and could potentially provide suitable roosting habitat for western red bats. Western red bats are closely associated with riparian habitat, which does not occur within the BSA;

therefore, there is **low** potential for western red bat to occur within the BSA.

Migratory birds and raptors

Nesting birds are protected under the MBTA (16 USC 703) and the CFGC (§3503). The MBTA (16 USC §703) prohibits the killing of migratory birds or the destruction of their occupied nests and eggs except in accordance with regulations prescribed by the USFWS. The bird species covered by the MBTA includes nearly all of those that breed in North America, excluding introduced (i.e., exotic) species (50 Code of Federal Regulations §10.13). Activities that involve the removal of vegetation including trees, shrubs, grasses, and forbs or ground disturbance has the potential to affect bird species protected by the MBTA. The CFGC (§3503.5) states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes (hawks, eagles, and falcons) or Strigiformes (owls) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Take includes the disturbance of an active nest resulting in the abandonment or loss of young. The CFGC (§3503) also states that "it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto."

CNDDB occurrences

The majority of migratory birds and raptors protected under the MBTA and CFGC are not recorded on the CNDDB because they are abundant and widespread.

Status of migratory birds and raptors occurring in the BSA

There is suitable nesting habitat for a variety of nesting avian species throughout the BSA.

REGULATORY FRAMEWORK

The following describes federal, state, and local environmental laws and policies that may be relevant if the BSA were to be developed or modified.

Federal

Waters of the United States, Clean Water Act, Section 404

The Corps and the U.S. Environmental Protection Agency (EPA) regulate the discharge of dredged or fill material into jurisdictional waters of the United States, under the Clean Water Act (§404). The term "waters of the United States" is an encompassing term that includes "wetlands" and "other waters." Wetlands have been defined for regulatory purposes as follows: "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3, 40 CFR 230.3). Wetlands generally include swamps, marshes, bogs, and similar areas." Other waters of the United States are intermittent or perennial tributaries and impoundments including lakes, ponds, and other surface water features, that exhibit an ordinary high-water mark but lack positive indicators for one or more of the three wetland parameters (i.e., hydrophytic vegetation, hydric soil, and wetland hydrology) (33 CFR 328.4).

The Corps may issue either individual permits on a case-by-case basis or general permits on a program level. General permits are pre-authorized and are issued to cover similar activities that are expected to cause only minimal adverse environmental effects. Nationwide permits are general permits issued to cover particular fill activities. All nationwide permits have general conditions that must be met for the permits to apply to a particular Project, as well as specific conditions that apply to each nationwide permit.

Clean Water Act, Section 401

The Clean Water Act (§401) requires water quality certification and authorization for placement of dredged or fill material in WOTUS. In accordance with the Clean Water Act (§401), criteria for allowable discharges into surface waters have been developed by the State Water Resources Control Board, Division of Water Quality. The resulting requirements are used as criteria in granting National Pollutant Discharge Elimination System (NPDES) permits or waivers, which are obtained through the Regional Water Quality Control Board (RWQCB) per the Clean Water Act (§402). Any activity or facility that will discharge waste (such as soils from construction) into surface waters, or from which waste may be discharged, must obtain an NPDES permit or waiver from the RWQCB. The RWQCB evaluates an NPDES permit application to determine whether the proposed discharge is consistent with the adopted water quality objectives of the basin plan.

Migratory Bird Treaty Act

The MBTA (16 USC §703) prohibits the killing of migratory birds or the destruction of their occupied nests and eggs except in accordance with regulations prescribed by the USFWS. The bird species covered by the MBTA includes nearly all of those that breed in North America, excluding introduced (i.e., exotic) species (50 Code of Federal Regulations §10.13).

Federal Endangered Species Act

The United States Congress passed the ESA in 1973 to protect species that are endangered or threatened with extinction. The ESA is intended to operate in conjunction with the National Environmental Policy Act (NEPA) to help protect the ecosystems upon which endangered and threatened species depend.

Under the ESA, species may be listed as either “endangered” or “threatened.” Endangered means a species is in danger of extinction throughout all or a significant portion of its range. Threatened means a species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. All species of plants and animals, except non-native species and pest insects, are eligible for listing as endangered or threatened. The USFWS also maintains a list of “candidate” species. Candidate species are species for which there is enough information to warrant proposing them for listing, but that have not yet been proposed. “Proposed” species are those that have been proposed for listing but have not yet been listed.

The ESA makes it unlawful to “take” a listed animal without a permit. Take is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct.” Through regulations, the term “harm” is defined as “an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.”

State of California

California Endangered Species Act

The California Endangered Species Act (CESA) is similar to the ESA, yet it pertains to state-listed endangered and threatened species. The CESA requires state agencies to consult with the CDFW when preparing documents to comply with the CEQA. The purpose is to ensure that the actions of the lead agency do not jeopardize the continued existence of a listed species or result in the destruction, or adverse modification of habitat essential to the continued existence of those species. In addition to formal listing under the federal and state endangered species acts, "species of special concern" receive consideration by CDFW. Species of special concern are those whose numbers, reproductive success, or habitat may be threatened.

California Fish and Game Code (§3503.5)

The CFGC (§3503.5) states that it is "unlawful to take, possess, or destroy any birds in the order Falconiformes (hawks, eagles, and falcons) or Strigiformes (all owls except barn owls) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto." Take includes the disturbance of an active nest resulting in the abandonment or loss of young. The CFGC (§3503) also states that "it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto."

California Migratory Bird Protection Act

The CMBPA amends the CFGC (§3513) to mirror the provisions of the MBTA and allow the State of California to enforce the prohibition of take or possession of any migratory nongame bird as designated in the federal MBTA, including incidental take.

Activities that involve the removal of vegetation including trees, shrubs, grasses, and forbs or ground disturbance have the potential to affect bird species protected by the MBTA and CFGC. Thus, vegetation removal and ground disturbance in areas with breeding birds should be conducted outside of the breeding season (approximately March 1 through August 31). If vegetation removal or ground-disturbing activities are conducted during the breeding season, then a qualified biologist must determine if there are any nests of bird species protected under the MBTA and CFGC present in the Project area prior to commencement of vegetation removal or ground-disturbing activities. If active nests are located or presumed present, then appropriate avoidance measures (e.g., spatial or temporal buffers) must be implemented.

California Environmental Quality Act Guidelines §15380

Although threatened and endangered species are protected by specific federal and state statutes, CEQA Guidelines §15380(d) provides that a species not listed on the federal or state list of protected species may be considered rare or endangered if the species can be shown to meet certain specified criteria. These criteria have been modeled based on the definition in the ESA and the section of the CFGC dealing with rare, threatened, and endangered plants and animals. The CEQA Guidelines (§15380) allows a public agency to undertake a review to determine if a significant effect on species that have not yet been listed

by either the USFWS or CDFW (e.g., candidate species, species of concern) would occur. Thus, CEQA provides an agency with the ability to protect a species from a project's potential impacts until the respective government agencies have an opportunity to designate the species as protected, if warranted.

Lake and Streambed Alteration Agreement, CFGC (§1602)

The CDFW is a trustee agency that has jurisdiction under the CFGC (§1600 et seq.). The CFGC (§1602), requires that a state or local government agency, public utility, or private entity must notify CDFW if a proposed Project will "substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated by the department, or use any material from the streambeds… except when the department has been notified pursuant to Section 1601." If an existing fish or wildlife resource may be substantially adversely affected by the activity, CDFW may propose reasonable measures that will allow protection of those resources. If these measures are agreeable to the parties involved, they may enter into an agreement with CDFW identifying the approved activities and associated mitigation measures.

Rare and Endangered Plants

The CNPS maintains a list of plant species native to California with low population numbers, limited distribution, or otherwise threatened with extinction. This information is published in the Inventory of Rare and Endangered Vascular Plants of California. Potential impacts to populations of CNPS California Rare Plant Rank (CRPR) plants receive consideration under CEQA review. The CNPS CRPR categorizes plants as follows:

- Rank 1A: Plants presumed extinct in California;
- Rank 1B: Plants rare, threatened, or endangered in California or elsewhere;
- Rank 2A: Plants presumed extirpated or extinct in California, but not elsewhere;
- Rank 2B: Plants rare, threatened, or endangered in California, but more numerous elsewhere;
- Rank 3: Plants about which we need more information; and
- Rank 4: Plants of limited distribution.

The California Native Plant Protection Act (CFGC §1900-1913) prohibits the taking, possessing, or sale within the state of any plants with a state designation of rare, threatened, or endangered as defined by CDFW. An exception to this prohibition allows landowners, under specific circumstances, to take listed plant species, provided that the owners first notify CDFW and give the agency at least 10 days to retrieve (and presumably replant) the plants before they are destroyed. Fish and game Code §1913 exempts from the 'take' prohibition "the removal of endangered or rare native plants from a canal, lateral channel, building site, or road, or other right of way."

CONCLUSIONS AND RECOMMENDATIONS

Endangered, Threatened, and Rare Plants

Henderson's bent grass and Red Bluff dwarf rush

If impacts to the vernal pool and/or drainages present within the BSA are proposed, it is recommended that pre-construction CDFW protocol-level surveys be conducted during the appropriate survey windows (i.e., blooming periods) for Henderson's bent grass and Red Bluff dwarf rush by a qualified botanist to determine presence or absence within the BSA.

If special-status botanical species are observed within the BSA, then mitigation measures that are recognized by CDFW will be implemented based on the level of potential impacts. Mitigation options recognized include:

1. The applicant shall design the Project to avoid or minimize impacts to areas where special-status botanical species occur and maintain protective elements such as, fencing, open space or conservation easements, and/or buffer zones around suitable habitat where special-status botanical species occur prior to construction activities and throughout construction activities and/or;
2. If the applicant cannot completely avoid impacts to special-status botanical species then consultation with the CDFW must be conducted and on-site or off-site compensation (such as through a mitigation bank) may be required to mitigate for impacts. Mitigation measures could include collecting seed and/or transplanting the impacted plants.

Endangered, Threatened, and Special-status Wildlife

The following minimization and mitigation measures further reduce or eliminate Project-associated impacts to special-status wildlife species.

Vernal pool fairy shrimp

Direct and indirect impacts to federally listed vernal pool species require mandatory federal mitigation at a USFWS approved mitigation bank. Direct effects occur at, or very close to, the time of the action itself. Examples include loss of habitat or sedimentation resulting from construction activities. Indirect effects are caused by, or result from a proposed action, occur later in time, and are reasonably certain to occur. Typically, all ground disturbance activities within a 250-foot radius of a vernal feature are considered to have indirect impacts to vernal pool species. **To avoid all impacts to special-status vernal pool species construction activities cannot take place within 250 feet of occupied (or assumed occupied) vernal features.** If avoidance cannot be achieved, then USFWS protocol-level sampling for vernal pool fairy shrimp can be conducted to determine the presence of vernal pool fairy shrimp or the applicant can assume presence of vernal pool shrimp and consult with the USFWS. The consultation process will require the preparation of a Biological Assessment and the development of a mitigation plan. At a minimum the removal of the vernal pool would require mitigation by purchasing vernal pool re-establishment credits at a 1:1 ratio and vernal pool preservation credits at a 2:1 replacement ratio.

Western spadefoot

- Two (2) nighttime pre-construction surveys shall be conducted by a qualified biologist during and/or immediately following separate precipitation events that occur between October and May when ponded water is present.
- Should any life stages of western spadefoot be found within the Project boundary, CDFW shall be consulted prior to the initiation of Project activities.

Pallid bat and western red bat

- If mature trees are proposed for removal, they should be removed and/or fallen between September 16 – March 15 outside of the bat maternity season. Trees should be removed at dusk to minimize impacts to roosting bats.

Migratory birds and raptors

- Project activities including site grubbing and vegetation removal shall be initiated outside of the bird nesting season (February 1 – August 31).
- If Project activities cannot be initiated outside of the nesting season, the following will occur:
    - A qualified biologist will conduct a pre-construction survey within 250 feet of the BSA, where accessible, within 7 days prior to the start of Project activities.
    - If an active nest (i.e., containing egg[s] or young) is observed within the BSA or in an area adjacent to the BSA where impacts could occur, a species protection buffer will be established. The species protection buffer will be defined by the qualified biologist based on the species, nest type and tolerance to disturbance. Construction activity shall be prohibited within the buffer zones until the young have fledged or the nest fails as determined by a qualified biologist. Nests shall be monitored by a qualified biologist to determine the status of nest activity.

Other Natural Resources

Waters of the United States

If activities occur within the ordinary high-water mark and/or result in fill or discharge to any waters of the U.S which include but are not limited to, intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, "wetlands," sloughs, prairie potholes, wet meadows, playa lakes, vernal pools, or natural ponds, then the following will need to be obtained:

- Prior to any discharge or fill material into Waters of the U.S, authorization under a Nationwide Permit or Individual Permit shall be obtained from the Corps. For fill requiring a Corps permit, a water quality certification from the Regional Water Quality Board (Clean Water Act §401) shall also be obtained prior to discharge of dredged or fill material.
- Prior to any activities that would obstruct the flow of or alter the bed, channel, or bank of any perennial, intermittent or ephemeral creeks, notification of streambed alteration shall be submitted to the CDFW, and, if required, a Lake and Streambed Alteration Agreement (§1602) shall be obtained.

Oak Woodlands and Tree Removal

Impacts to oaks within the BSA must be mitigated as required by the City of Redding. The City of Redding enacted a Tree Preservation Ordinance (Chapter 18.45 of the Municipal Code) and oak tree preservation guide.[1] Prior to Project entitlement a Tree Protection Plan, which includes a tree delineation, impacts assessment, tree health survey, and tree protection requirements will be required. The Tree Protection Plan will identify the type, location, and number of trees that will be preserved onsite.

[1] City of Redding. Trees & Construction, A Guide to Preservation. Document retrieved from: http://www.cityofredding.org/home/showdocument?id=3720

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LIST OF PREPARERS

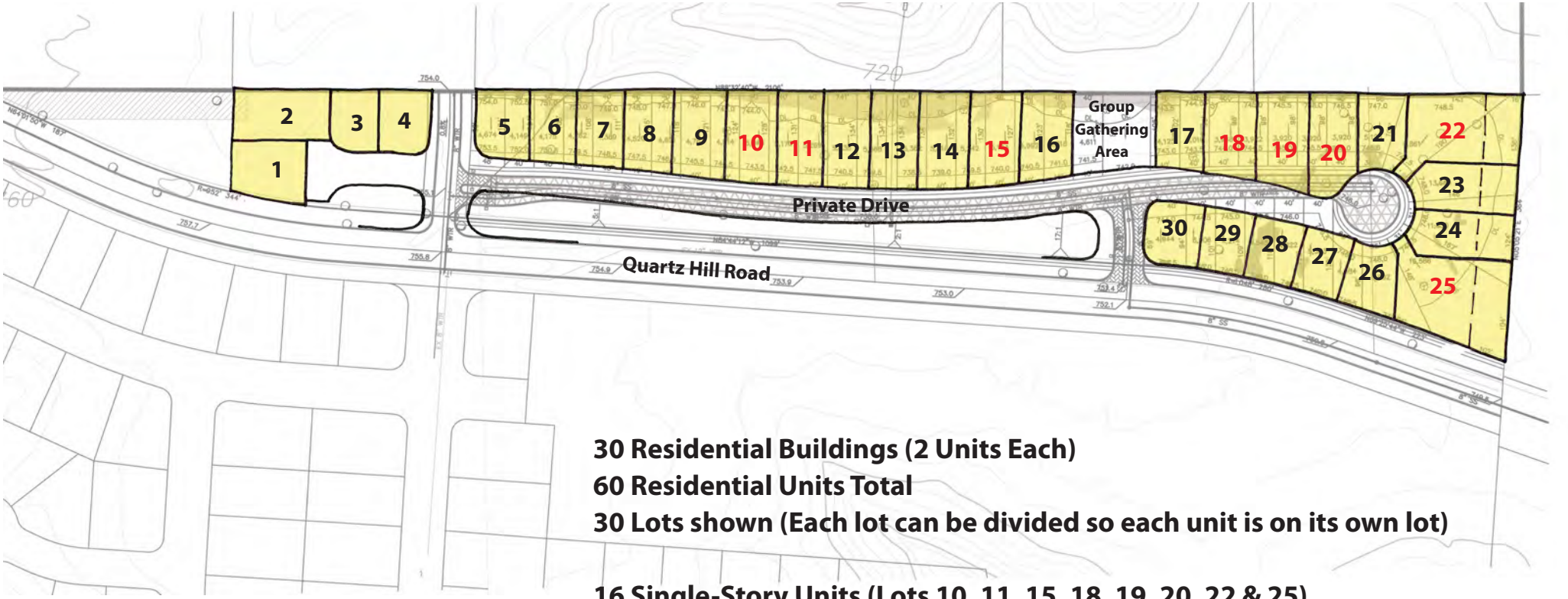
Brittany Reaves. Associate Biologist and GIS Analyst I. B.S. in Parks and Natural Resources Management, California State University, Chico. Mrs. Reaves has more than 5 years of experience conducting protocol-level wildlife surveys and biological habitat assessments, collecting field data, and preparing technical documents, maps, and reports.

Elena Gregg. Senior Botanist. B.S. in Environmental Biology and Management, University of California, Davis. Mrs. Gregg has over 16 years of experience conducting protocol-level botanical surveys, botanical habitat assessments, arborist surveys, and wetland delineations.

Anthony McLaughlin. GIS Analyst and Environmental Planning. B.A. in Human Geography with certificates in Geographical Information Systems and Environmental and Land Use Planning, California State University, Chico. Anthony has more than 5 years of experience conducting spatial analysis, drafting technical reports, and producing high quality cartographic outputs.

Appendix A

Proposed Site Development Plan



30 Residential Buildings (2 Units Each)
60 Residential Units Total
30 Lots shown (Each lot can be divided so each unit is on its own lot)

16 Single-Story Units (Lots 10, 11, 15, 18, 19, 20, 22 & 25)
44 2-Story Units

CONCEPT SKETCH

Quartz Hill Road - Redding, CA

April 2022
Job # 22.0143

SHARRAH DUNLAP SAWYER
INCORPORATED

Appendix B

Official Species Lists

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Whiskeytown (4012265) OR Shasta Dam (4012264) OR Project City (4012263) OR Igo (4012255) OR Redding (4012254) OR Enterprise (4012253))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Antioch Dunes anthicid beetle *Anthicus antiochensis*	IICOL49020	None	None	G1	S3	
bald eagle *Haliaeetus leucocephalus*	ABNKC10010	Delisted	Endangered	G5	S3	FP
bank swallow *Riparia riparia*	ABPAU08010	None	Threatened	G5	S2	
California linderiella *Linderiella occidentalis*	ICBRA06010	None	None	G2G3	S2S3	
Canyon Creek stonecrop *Sedum paradisum ssp. paradisum*	PDCRA0A0U3	None	None	G3G4T3	S3	1B.3
chinook salmon - Central Valley spring-run ESU *Oncorhynchus tshawytscha pop. 11*	AFCHA0205L	Threatened	Threatened	G5T2Q	S2	
chinook salmon - Sacramento River winter-run ESU *Oncorhynchus tshawytscha pop. 7*	AFCHA0205B	Endangered	Endangered	G5T1Q	S1	
dubious pea *Lathyrus sulphureus var. argillaceus*	PDFAB25101	None	None	G5T1T2Q	S1S2	3
Fisher *Pekania pennanti*	AMAJF01020	None	None	G5	S2S3	SSC
foothill yellow-legged frog *Rana boylii*	AAABH01050	None	Endangered	G3	S3	SSC
great egret *Ardea alba*	ABNGA04040	None	None	G5	S4	
Great Valley Cottonwood Riparian Forest *Great Valley Cottonwood Riparian Forest*	CTT61410CA	None	None	G2	S2.1	
Great Valley Valley Oak Riparian Forest *Great Valley Valley Oak Riparian Forest*	CTT61430CA	None	None	G1	S1.1	
Great Valley Willow Scrub *Great Valley Willow Scrub*	CTT63410CA	None	None	G3	S3.2	
green sturgeon - southern DPS *Acipenser medirostris pop. 1*	AFCAA01031	Threatened	None	G2T1	S1	
Henderson's bent grass *Agrostis hendersonii*	PMPOA040K0	None	None	G2Q	S2	3.2
kneecap lanx *Lanx patelloides*	IMGASL7030	None	None	G2?	S2	
legenere *Legenere limosa*	PDCAM0C010	None	None	G2	S2	1B.1
long-eared myotis *Myotis evotis*	AMACC01070	None	None	G5	S3	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
maverick clover *Trifolium piorkowskii*	PDFAB40410	None	None	G2	S2	1B.2
northern clarkia *Clarkia borealis ssp. borealis*	PDONA05062	None	None	G4T4	S4	4.3
Nuttall's ribbon-leaved pondweed *Potamogeton epihydrus*	PMPOT03080	None	None	G5	S2S3	2B.2
Oregon shoulderband *Helminthoglypta hertleini*	IMGASC2280	None	None	G3Q	S1S2	
Pacific tailed frog *Ascaphus truei*	AAABA01010	None	None	G4	S3S4	SSC
pallid bat *Antrozous pallidus*	AMACC10010	None	None	G4	S3	SSC
Red Bluff dwarf rush *Juncus leiospermus var. leiospermus*	PMJUN011L2	None	None	G2T2	S2	1B.1
Sacramento anthicid beetle *Anthicus sacramento*	IICOL49010	None	None	G1	S4	
Sanford's arrowhead *Sagittaria sanfordii*	PMALI040Q0	None	None	G3	S3	1B.2
Shasta chaparral *Trilobopsis roperi*	IMGASA2030	None	None	G2	S1	
Shasta hesperian *Vespericola shasta*	IMGASA4070	None	None	G3	S3	
Shasta huckleberry *Vaccinium shastense ssp. shastense*	PDERI181Z1	None	None	G4T3	S3	1B.3
Shasta salamander *Hydromantes shastae*	AAAAD09030	None	Threatened	G3	S3	
Shasta snow-wreath *Neviusia cliftonii*	PDROS14020	None	Candidate Endangered	G2	S2	1B.2
silky cryptantha *Cryptantha crinita*	PDBOR0A0Q0	None	None	G2	S2	1B.2
silver-haired bat *Lasionycteris noctivagans*	AMACC02010	None	None	G3G4	S3S4	
slender Orcutt grass *Orcuttia tenuis*	PMPOA4G050	Threatened	Endangered	G2	S2	1B.1
slender silver moss *Anomobryum julaceum*	NBMUS80010	None	None	G5?	S2	4.2
steelhead - Central Valley DPS *Oncorhynchus mykiss irideus pop. 11*	AFCHA0209K	Threatened	None	G5T2Q	S2	
Sulphur Creek brodiaea *Brodiaea matsonii*	PMLIL0C0H0	None	None	G1	S1	1B.1
Townsend's big-eared bat *Corynorhinus townsendii*	AMACC08010	None	None	G4	S2	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
tricolored blackbird *Agelaius tricolor*	ABPBXB0020	None	Threatened	G1G2	S1S2	SSC
valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	IICOL48011	Threatened	None	G3T2T3	S3	
vernal pool fairy shrimp *Branchinecta lynchi*	ICBRA03030	Threatened	None	G3	S3	
vernal pool tadpole shrimp *Lepidurus packardi*	ICBRA10010	Endangered	None	G4	S3S4	
Wawona riffle beetle *Atractelmis wawona*	IICOL58010	None	None	G3	S1S2	
western pearlshell *Margaritifera falcata*	IMBIV27020	None	None	G4G5	S1S2	
western pond turtle *Emys marmorata*	ARAAD02030	None	None	G3G4	S3	SSC
western red bat *Lasiurus blossevillii*	AMACC05060	None	None	G4	S3	SSC
western spadefoot *Spea hammondii*	AAABF02020	None	None	G2G3	S3	SSC
Wintu sideband *Monadenia troglodytes wintu*	IMGASC7092	None	None	G1G2T1T2	S1S2	
Yuma myotis *Myotis yumanensis*	AMACC01020	None	None	G5	S4	

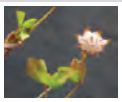
Record Count: 51

California Native Plant Society

Search Results

11 matches found. Click on scientific name for details

Search Criteria: CRPR is one of [**1A:1B:2A:2B**] , Quad is one of [**4012265:4012264:4012263:4012255:4012254:4012253**]

SCIENTIFIC NAME	▲ COMMON NAME	BLOOMING PERIOD	FED LIST	STATE LIST	CA RARE PLANT RANK	PHOTO
Sedum paradisum ssp. *paradisum*	Canyon Creek stonecrop	May-Jun	None	None	1B.3	 ©2018 Julie Kierstead Nelson
Legenere limosa	legenere	Apr-Jun	None	None	1B.1	 ©2000 John Game
Trifolium piorkowskii	maverick clover	Apr-May	None	None	1B.2	 ©2018 Al Keuter
Potamogeton epihydrus	Nuttall's ribbon-leaved pondweed	(Jun)Jul-Sep	None	None	2B.2	 Louis-M. Landry, 2010
Juncus leiospermus var. *leiospermus*	Red Bluff dwarf rush	Mar-Jun	None	None	1B.1	 ©2016 Dylan Neubauer
Sagittaria sanfordii	Sanford's arrowhead	May-Oct(Nov)	None	None	1B.2	 ©2013 Debra L. Cook
Vaccinium shastense ssp. *shastense*	Shasta huckleberry	(Jun-Sep)Dec-May	None	None	1B.3	 © 2016 Steve

						Matson
Neviusia cliftonii	Shasta snow-wreath	Apr-Jun	None	CC	1B.2	 ©2008 Steve Matson
Cryptantha crinita	silky cryptantha	Apr-May	None	None	1B.2	 ©2009 Sierra Pacific Industries
Orcuttia tenuis	slender Orcutt grass	May-Sep(Oct)	FT	CE	1B.1	 © 2013 Justy Leppert
Brodiaea matsonii	Sulphur Creek brodiaea	May-Jun	None	None	1B.1	 ©2016 Len Lindstrand III

Showing 1 to 11 of 11 entries

Suggested Citation:

California Native Plant Society, Rare Plant Program. 2022. Rare Plant Inventory (online edition, v9-01 1.5). Website https://www.rareplants.cnps.org [accessed 17 August 2022].

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: August 10, 2022
Project Code: 2022-0073136
Project Name: Brentwood Village on Quartz Hill Road

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

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

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 Code 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

Project Summary

Project Code: 2022-0073136
Project Name: Brentwood Village on Quartz Hill Road
Project Type: New Constr - Above Ground
Project Description: development
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@40.61359615,-122.41385625173464,14z



Counties: Shasta County, California

Endangered Species Act Species

There is a total of 6 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.

---

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.

Birds

NAME	STATUS
Northern Spotted Owl *Strix occidentalis caurina* 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/1123	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

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* 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/7850	Threatened

Crustaceans

NAME	STATUS
Vernal Pool Fairy Shrimp *Branchinecta lynchi*	Threatened
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/498	
Vernal Pool Tadpole Shrimp *Lepidurus packardi*	Endangered
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/2246	

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

IPaC User Contact Information

Agency: Gallaway Enterprises
Name: Brittany Reaves
Address: 117 Meyers Street, Suite 120
City: Chico
State: CA
Zip: 95928
Email brittany@gallawayenterprises.com
Phone: 5303329909

Appendix C

Observed Species Lists

Plant Species Observed within the Brentwood Village Development BSA on August 10, 2022	
Scientific Name	**Common Name**
Acmispon sp.	Lotus
Aegilops triuncialis	Barbed goatgrass
Aira caryophyllea	Silver hairgrass
Allium amplectens	Clasping onion
Anthoxanthum odoratum	Sweet vernal grass
Arctostaphylos viscida ssp. *viscida*	White-leaved manzanita
Avena barbata	Wild oats
Briza maxima	Greater quaking-grass
Bromus sitchensis var. *carinatus*	California brome
Bromus diandrus	Rip-gut brome
Bromus hordeaceus	Soft chess
Bromus rubens	Red brome
Carduus pycnocephalus	Italian thistle
Centromadia fitchii	Fitch's spikeweed
Croton setiger	Turkey-mullein
Crucianella angustifolia	Crosswort
Cyperus eragrostis	Tall nutsedge
Daucus pusillus	Rattlesnake weed
Deschampsia danthonoides	Annual hairgrass
Elymus caput-medusae	Medusahead
Elymus multisetus	Big squirreltail grass
Epilobium sp.	Willowherb
Erodium botrys	Long-beaked stork's-bill
Festuca bromoides	Six-weeks fescue
Festuca perennis	Rye-grass
Galium parisiense	Wall bedstraw
Gastridium phleoides	Nitgrass
Grindelia hirsutula var. *davyi*	Foothill gumplant
Heliotropium europaeum	European heliotrope
Heteromeles arbutifolia	Toyon
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley
Hypericum perforatum	Klamathweed
Hypochaeris glabra	Smooth cat's ear
Juncus bufonius	Toadrush
Leontodon saxatilis	Hawkbit
Logfia gallica	Narrowleaf cottonrose
Lonicera interrupta	Chaparral honeysuckle
Lythrum hyssopifolia	Hyssop loosestrife
Madia exigua	Little tarweed
Navarretia spp.	Pincushion plant
Nerium oleander	Oleander
Odontostomum hartwegii	Hartweg's odontostomum
Petrorhgia dubia	Grass-pink
Pinus sabiniana	Gray pine

Scientific Name	Common Name
Plagiobothrys stipitatus	Small-flowered popcornflower
Plantago elongata	Prairie plantain
Plantago erecta	Erect plantain
Polypogon monspeliensis	Rabbitsfoot grass
Quercus douglasii	Blue oak
Rumex crispus	Curly dock
Scribneria bolanderi	Scribner's grass
Spartium junceum	Spanish broom
Toxicodendron diversilobum	Poison oak
Trifolium hirtum	Rose clover
Vicia sp.	Vetch

Wildlife Species Observed within the Brentwood Village Development BSA on August 10, 2022	
Scientific Name	**Common Name**
Aphelocoma californica	California scrub-jay
Baeolophus inornatus	Oak titmouse
Cathartes aura	Turkey vulture
Colaptes auratus	Northern flicker
Melanerpes formicivorus	Acorn woodpecker
Odocoileus hemionus columbianus	Columbian black-tailed deer
Sceloporus occidentalis	Western Fence Lizard

Appendix D

Project Site Photos

Project Site Photos

Taken August 10, 2022



Looking northeast toward heavily vegetated ephemeral drainage.



Looking west toward annual grassland.



Looking west toward blue oak-foothill pine habitat.

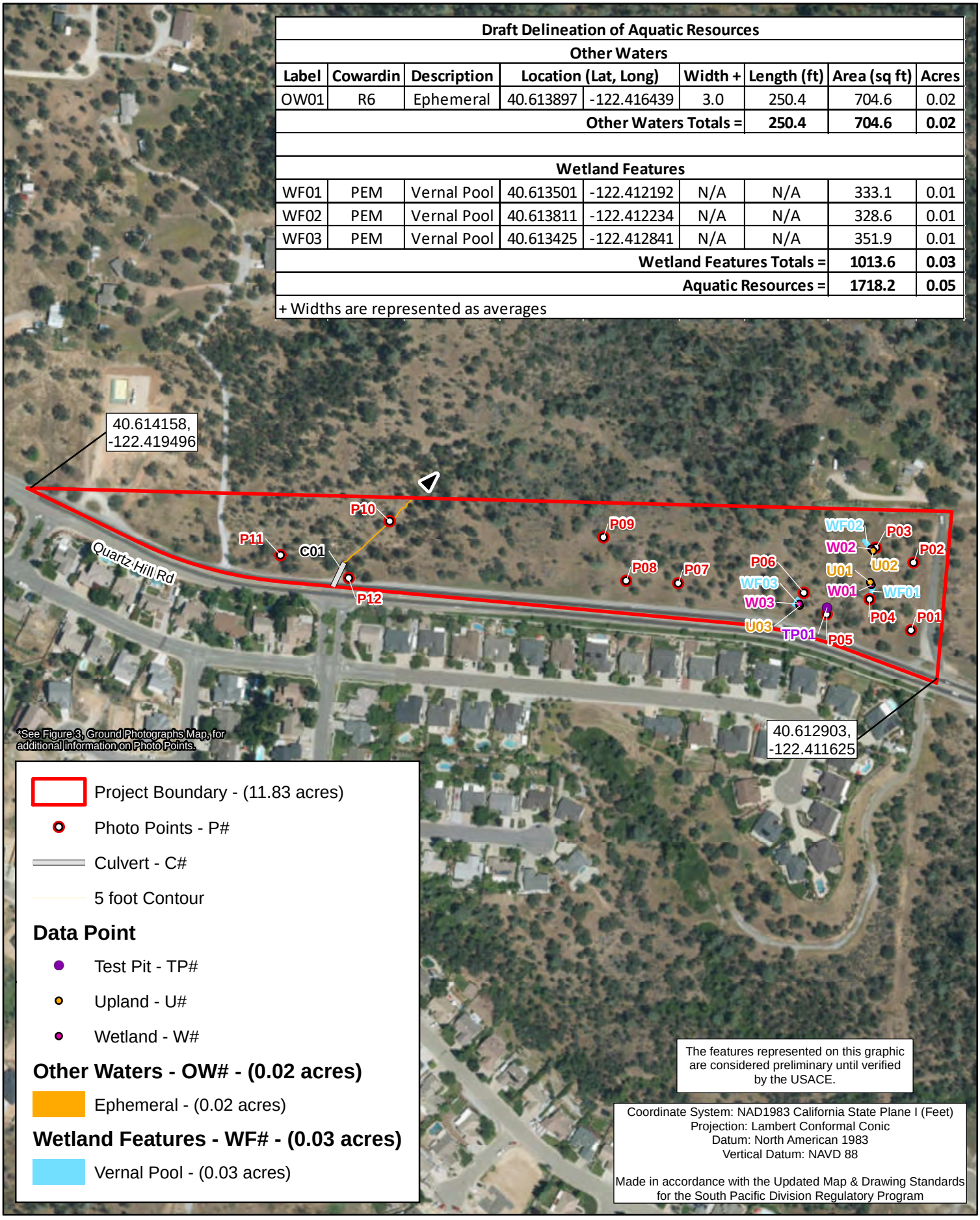


Barren roadway, looking south.

Appendix E

Draft Delineation of Aquatic Resources Map

Draft Delineation of Aquatic Resources								
Other Waters								
Label	**Cowardin**	**Description**	**Location (Lat, Long)**		**Width +**	**Length (ft)**	**Area (sq ft)**	**Acres**
OW01	R6	Ephemeral	40.613897	-122.416439	3.0	250.4	704.6	0.02
						Other Waters Totals =	**250.4**	**704.6**	**0.02**
Wetland Features								
WF01	PEM	Vernal Pool	40.613501	-122.412192	N/A	N/A	333.1	0.01
WF02	PEM	Vernal Pool	40.613811	-122.412234	N/A	N/A	328.6	0.01
WF03	PEM	Vernal Pool	40.613425	-122.412841	N/A	N/A	351.9	0.01
						Wetland Features Totals =	**1013.6**	**0.03**
						Aquatic Resources =	**1718.2**	**0.05**
+ Widths are represented as averages								



Project Boundary - (11.83 acres)

Photo Points - P#

Culvert - C#

5 foot Contour

Data Point

Test Pit - TP#

Upland - U#

Wetland - W#

Other Waters - OW# - (0.02 acres)

Ephemeral - (0.02 acres)

Wetland Features - WF# - (0.03 acres)

Vernal Pool - (0.03 acres)

The features represented on this graphic are considered preliminary until verified by the USACE.

Coordinate System: NAD1983 California State Plane I (Feet)
Projection: Lambert Conformal Conic
Datum: North American 1983
Vertical Datum: NAVD 88

Made in accordance with the Updated Map & Drawing Standards for the South Pacific Division Regulatory Program

NORTH

1:3,600 1 inch = 300 feet

0 200 400 Feet

Data Sources: ESRI, City of Redding 05/27/2020

Brentwood Village Development Project
Draft Delineation of Aquatic Resources
Figure 4

gallaway ENTERPRISES

GE: #22-105 Map Date: 09/06/2022

Attachment C

Brentwood Village Entitlement Storm Drainage Analysis
Sharrah Dunlap Sawyer, Inc., November 29, 2022

BRENTWOOD VILLAGE

APN 115-170-014
REDDING, CA

ENTITLEMENT STORM DRAINAGE ANALYSIS

Prepared by

SHARRAH DUNLAP SAWYER, INC.
320 HARTNELL AVE.
REDDING CA, 96002
PHONE: 530-221-1792
FAX: 530-221-8369
WWW.SDSENGINEERING.COM

This report was written by or under the direct supervision of:

Gregory A. Dunbar, P.E.
Civil Engineer

11/29/22
Date

REGISTERED PROFESSIONAL ENGINEER
GREGORY A. DUNBAR
No. 56522
EXP. 6/30/23
CIVIL
STATE OF CALIFORNIA

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Detention Basin 3
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Rainfall Data

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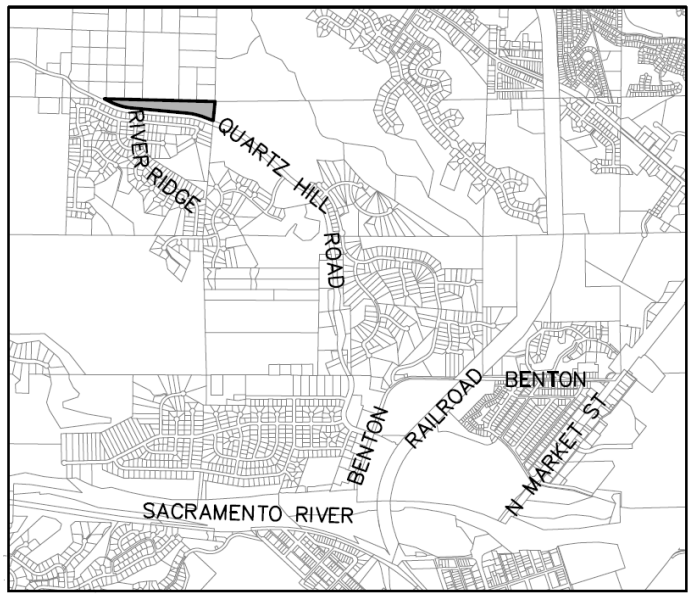
Pre-Developed Basin Runoff Calculations
Post-development Basin Map
Post-Developed Basin Runoff Calculations

Appendix C **Detention Calculations**
Stage-Storage Discharge Calculations
Stage-Discharge Calculations
18X18 Grate Dimension Calculations

Appendix D **Reference Materials**
Friction Coefficient Tables
Table 819.2A *Highway Design Manual*
Table 819.2B *Highway Design Manual*
Table 816.6B *Highway Design Manual*

EXECUTIVE SUMMARY

This report provides a preliminary analysis to show that the Brentwood Village project can detain the post-developed runoff to pre-developed flows, tributary to Sulphur Creek. The site is located north of the intersection of Quartz Hill Road and River Ridge Drive on Shasta County Parcel APN 115-170-014. The proposed development is a multifamily subdivision with 30 Duplex Units developed on a vacant lot.



VICINITY MAP

DESIGN CRITERIA

To meet City Council Policy 1806, and City of Redding Engineering Division requirements for protection of floodplains and downstream drainage concerns, the design is required to maintain or reduce pre-development peak flows for the 2-, 10-, 25-, and 100-year design storm events. This report compares the pre-development condition, when the lot was undeveloped, against the post-development condition when construction is complete. In order to meet requirements, the post-development flows must be equal to, or less than, the pre-development flows. The total site area is less than 10 acres.

Per CORCS 200.00, the rational method is used to calculate, route, and compare the runoff from the site. A 100-year design storm is used to size the detention basin to ensure there are no adverse impacts downstream. The Intensity-Depth-Frequency curve for this location was calculated using the data in the City of Redding HEC-1 Processor Documentation (January 16, 2006). The hydrologic soil groups used in this report were taken from the *USDA NRCS Web Soil Survey of the Shasta County Area.* See Appendix 'A' for the rainfall intensity equations, intensity graph, and soils data

PRE-DEVELOPMENT CONDITION

The site is located north of the intersection of Quartz Hill Road and River Ridge Drive in Redding, California. The site is currently a vacant lot with natural grass and brush covering the ground. The undeveloped land has a rational 'C' value of 0.42 in the 10-year event. This 'C' value is derived from Table 819.2A from the Caltrans Highway Design Manual (HDM). The site has some areas of very low relief (less than 1%) and some areas of high relief (up to 25%). The average fall across the entire site is approximately 5%. Per the NRCS Web Soil Survey data, the soil is a hydrologic type 'D' loamy soil that provides minimal infiltration. The site has fair grass and brush cover, as well as a few steep drainage ways. Since the project is located on top of a hill, storm water discharges in four directions in the predeveloped condition. All channel calculations are located behind each respective basin calculation sheet. See Appendix 'A' for the pre-developed basin map and calculations.

Basin PRE1

Basin PRE1 is 1.3 acres in size and discharges into the northwestern gully before combining with Sulphur creek (see the basin map for details). It is 100% undeveloped area.

Basin PRE2

Basin PRE2 is 1.2 acres in size and includes most of the northern portion of Quartz Hill Road. Stormwater runs off the road and enters a roadside ditch. This area includes road (58.3%) and undeveloped area (41.7%).

Basin PRE3

Basin PRE3 is 8.1 aces in size and includes the western portion of Quartz Hill Road as well as the majority of the site. Stormwater runs through a roadside ditch in Quartz Hill Road, discharges into a defined channel and enters the northern gully before combining with Sulphur Creek. The southern portion of Quartz Hill Road discharges into a catch basin located on the northwestern side of River Ridge Drive. This flow enters a concrete pipe before discharging into the defined channel. This area includes road (13.6%), landscaped area (2.5%) and undeveloped area (86.4%)

Basin PRE4

Basin PRE4 is 1.7 acres in size and includes flow travelling to the eastern gully. It is 100% undeveloped area.

POST-DEVELOPMENT CONDITION

The Brentwood Village project proposes to develop a residential subdivision with 30 duplex buildings. The site (POST1) will drain to the center of the parcel before entering the detention basin. If the lowest catch basin on site is overwhelmed, then the stormwater will spill into the detention basin before it leaves the site or reaches any pad elevations. The rational 'C' value range for detached multifamily residential subdivisions is 0.40-0.60 in Table 819.2B in the Caltrans HDM. A 'C' value of 0.55 was chosen for this project. Basin POST2 will enter a storm drain system and leave the site undetained. POST3 will discharge undetained after it discharges into the existing roadside ditch. See Appendix 'A' for the post-developed basin map and calculations.

POST1
Basin POST1 is 9.0 acres in size includes all the area tributary to the proposed detention basin. It is 100% multifamily subdivision.

POST2
Basin POST2 is 1.9 acres in size and includes the western portion of Quartz Hill Road. The storm drain inlets and pipe will need to be sized to convey the 100-year flow to allow this basin to flow undetained. The storm drain system will also intercept an existing concrete pipe (located on the northwest end of River Ridge Drive) and convey its existing flow along with the flow from Quartz Hill Road. The basin is 68.4% road and 31.6% landscaping.

POST3
Basin POST3 is 1.5 acres in size and includes the eastern portion of Quartz Hill Road. The storm drain inlets and pipe will need to be sized to convey the 100-year flow to allow this basin to flow undetained. The basin is 60% road and 40% landscaping.

DETENTION BASIN
The above ground detention basin is located north of the intersection of Road 'A' and Road 'C'. Water will enter the basin via storm drain pipe and flow through a short swale before discharging into the northern gully. The detention basin is integrated with the park. The water will stay below the main pad elevation (740.5') in events that are smaller than the 10-year event. During the 10-, 24-, and 100- year event, the main pad will become inundated, but the second pad elevation (743.0') will remain above the max water surface elevation.

The discharge structure will be a cook 18"x18" area drain with two orifices and a top grate. The bottom orifice is a 13" diameter circle with an invert elevation of 738.00'. The second orifice is labeled as a 13" x 36" weir at an invert elevation of 740.75'. This weir will be two 18" slots cut on opposite sides of the structure. The final opening is the 18" x 18" area drain grate. The top spillway grate will be at an elevation of 742.00'. See Appendix B for the detention basin calculations.

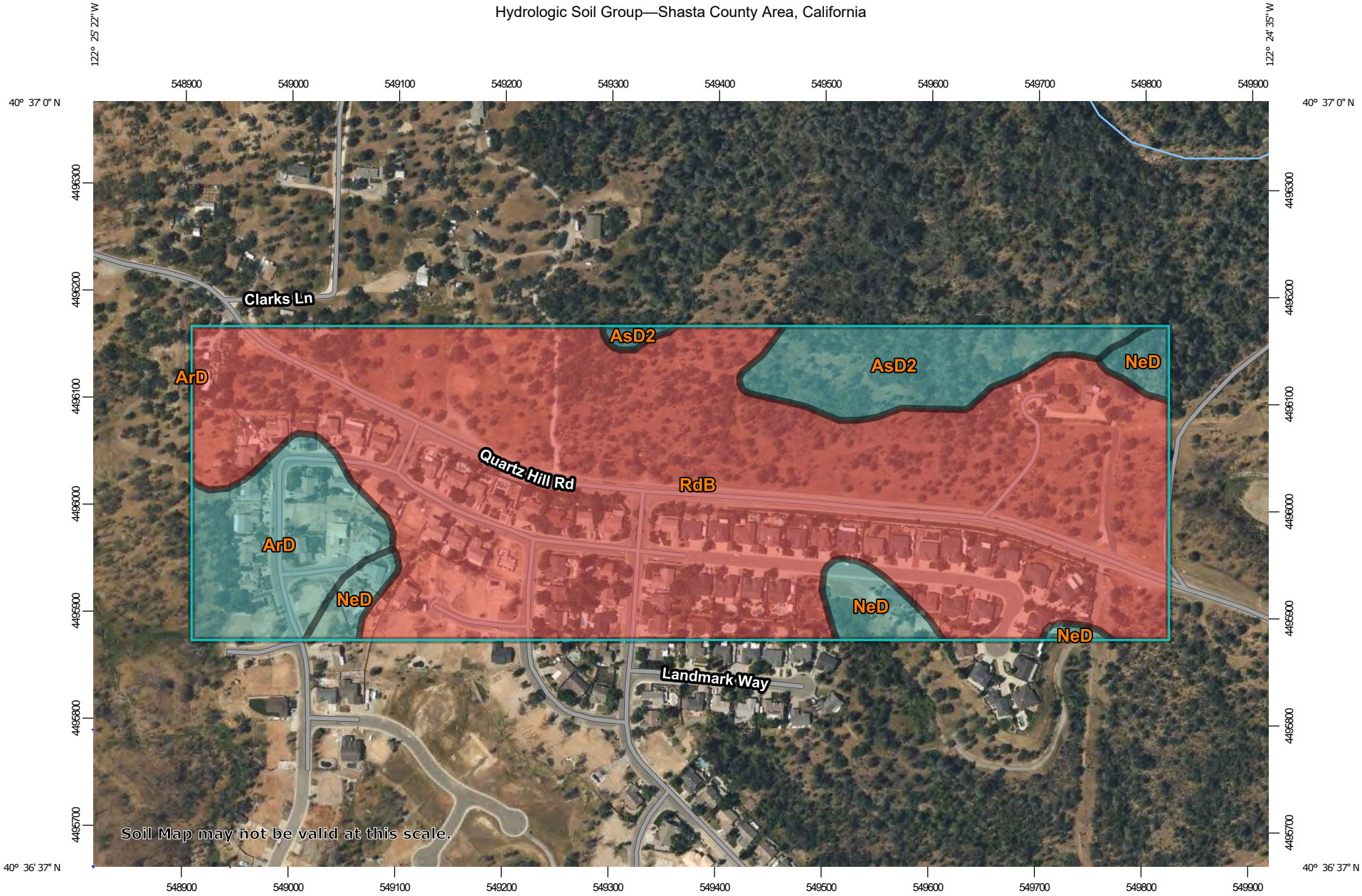
Per MS4 requirements, the 2-year peak flow rate must not exceed pre-development flow rates in the post-development condition. The Drainage Summary Table (below) shows that the peak flow rate in the 2-year storm has not increased.

Brentwood Detention Basin: DRAINAGE SUMMARY					
Top elevation: 743.00 Bottom elevation: 738.00		100-year WSE: 741.80		Orifice size: 13" Diameter Circle Orifice invert: 738.00	
	Pre-development (Q_{PRE2})	Storm Drain Flow (Q_{IN})	Future-Undetained	Post-Detained (Q_{OUT})	Post-Development ($Q_{OUT} + Q_{UNDET}$)
2-year	13.90	9.30	6.60	7.00	13.60
10-year	18.70	12.80	8.60	9.30	17.90
25-year	23.70	17.00	11.00	12.40	23.40
100-year	35.70	25.50	15.90	18.70	34.60

CONCLUSION

The discharge from the detention facility is shown not to exceed the pre-development flows within Sulphur Creek in the 2-, 10-, 25-, and 100-year events. The proposed design is sufficient to maintain or reduce existing flows from the site in accordance with City Council Policy 1806, and City of Redding Engineering Division requirements for protection of floodplains and downstream drainage concerns.

APPENDIX A
SITE DATA



Map Scale: 1:5,040 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Shasta County Area, California
Survey Area Data: Version 18, Sep 2, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 8, 2019—Jun 21, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ArD	Auburn very stony loam, 8 to 30 percent slopes	C	6.3	9.4%
AsD2	Auburn clay loam, 8 to 30 percent slopes, eroded	C	5.6	8.4%
NeD	Newtown gravelly loam, 15 to 30 percent slopes	C	3.2	4.7%
RdB	Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17	D	51.7	77.5%
Totals for Area of Interest			**66.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Rainfall Intensity Equations For the Redding Area

Depth-Duration-Frequency Data (in inches)
Per The City of Redding HEC-1 Processor Documentation (January 16, 2006)

Duration Days	Duration Minutes	Duration Hours	Table 1a Redding 5 SSE 510 ft 2 YR	5 YR	10 YR	25 YR	100 YR	Table 1b Shasta Dam 1075 ft 2 YR	5 YR	10 YR	25 YR	100 YR
-	5	0.08	0.31	0.36	0.40	0.46	0.58	0.46	0.54	0.60	0.70	0.89
-	10	0.17	0.41	0.48	0.54	0.61	0.76	0.63	0.74	0.82	0.96	1.21
-	15	0.25	0.49	0.56	0.63	0.72	0.90	0.76	0.89	0.98	1.15	1.46
-	30	0.5	0.64	0.74	0.84	0.95	1.19	1.03	1.21	1.34	1.58	1.99
-	60	1	0.85	0.98	1.11	1.26	1.57	1.41	1.66	1.84	2.15	2.73
-	120	2	1.13	1.3	1.47	1.67	2.09	1.93	2.27	2.51	2.95	3.73
-	180	3	1.33	1.53	1.73	1.97	2.46	2.32	2.73	3.02	3.54	4.47
-	360	6	1.76	2.03	2.29	2.60	3.25	3.17	3.73	4.12	4.83	6.11
-	720	12	2.33	2.69	3.03	3.45	4.31	4.33	5.09	5.64	6.61	8.36
1	1440	24	3.08	3.56	4.01	4.56	5.71	5.93	6.96	7.71	9.03	11.43

Calculated Intensity-Duration-Frequency Data

Elev	750 ft						
Duration Days	Duration Minutes	Duration Hours	2 YR in/hr	5 YR in/hr	10 YR in/hr	25 YR in/hr	100 YR in/hr
-	5	0.08	4.48	5.24	5.82	6.74	8.54
-	10	0.17	3.02	3.54	3.95	4.55	5.71
-	15	0.25	2.42	2.80	3.11	3.61	4.55
-	30	0.5	1.61	1.88	2.10	2.44	3.06
-	60	1	1.09	1.27	1.42	1.64	2.06
-	120	2	0.73	0.86	0.96	1.11	1.39
-	180	3	0.58	0.68	0.76	0.88	1.10
0.25	360	6	0.39	0.46	0.51	0.59	0.74
0.5	720	12	0.26	0.31	0.34	0.40	0.50
1	1440	24	0.18	0.21	0.23	0.27	0.34

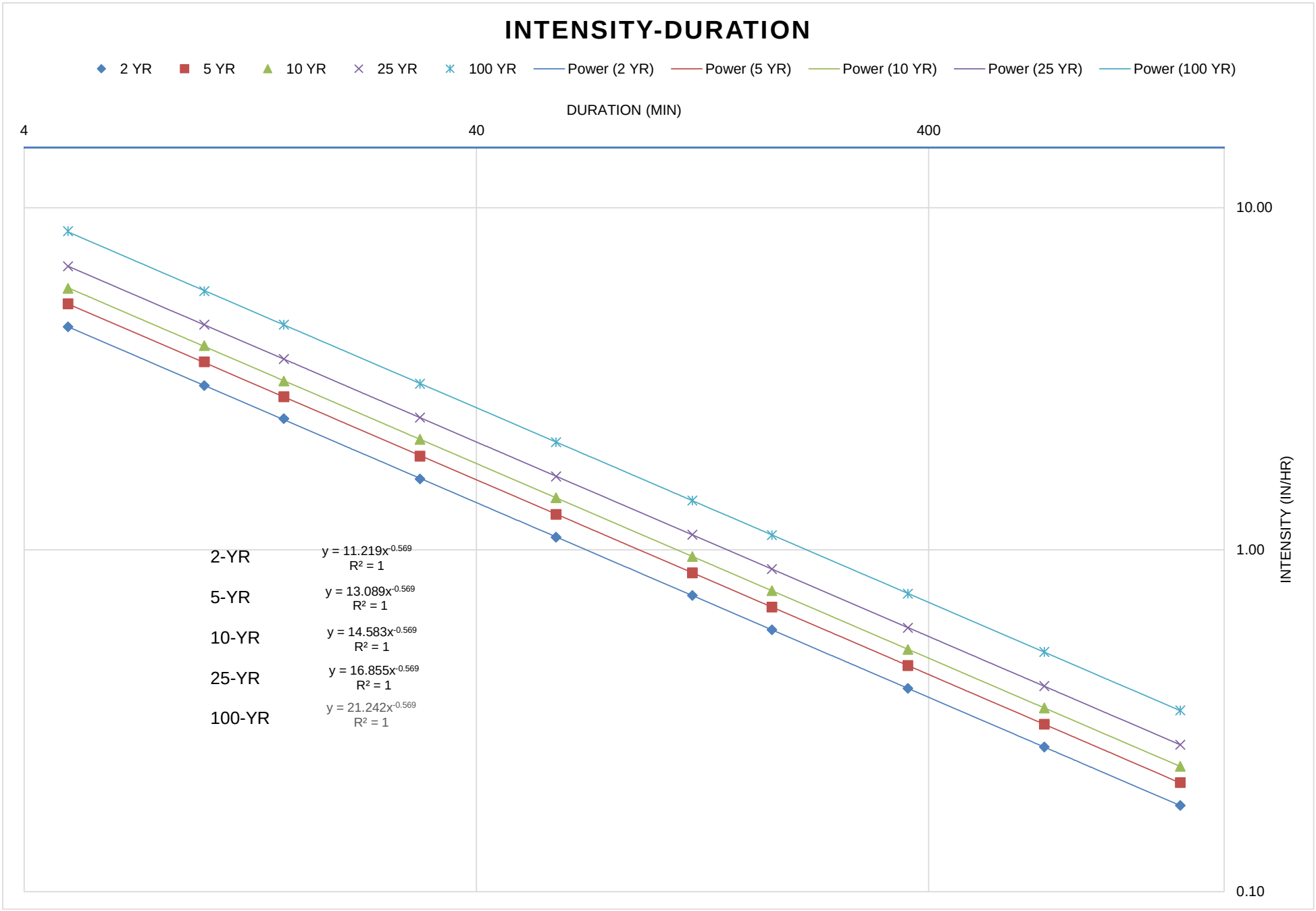
Intensity (in/hr)=IF(C26<=1075,IF(C26>=425,((C26-425)/(1075-425))*((G8/C8)-(D8/C8))+(D8/C8),"ERROR"),"ERROR")			
C26=Input Elevation	C8=Duration in Hours	D8=Inches at Redding 5 SSE	G8=inches at Shasta Dam

Intensity Equations

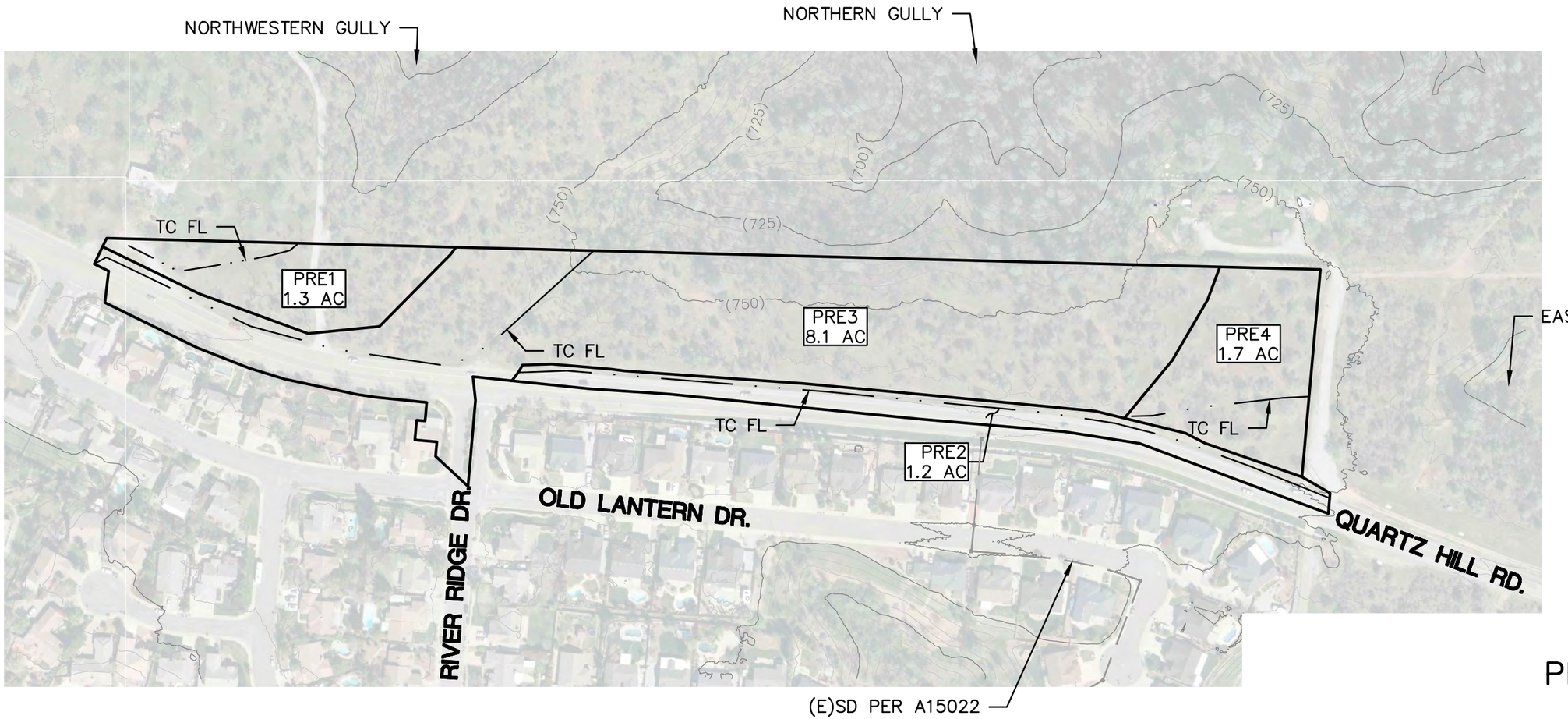
Intensity Equation: $i=FCT*t^{PWR}$
t=Time in **Minutes**

	FCT Value	PWR Value
2 YR	11.22	-0.57
5 YR	13.09	-0.57
10 YR	14.58	-0.57
25 YR	16.85	-0.57
100 YR	21.24	-0.57

FCT=ROUND(EXP(INDEX(LINEST(LN(<Intensity (y) Values>),LN(<Duration (x) Values>)),1,2)),2)
PWR=ROUND(INDEX(LINEST(LN(<Intensity (y) Values>),LN(<IDuration (x) Values>)),1),2)


INTENSITY-DURATION
2 YR
5 YR
10 YR
25 YR
100 YR
Power (2 YR)
Power (5 YR)
Power (10 YR)
Power (25 YR)
Power (100 YR)
DURATION (MIN)
4
40
400
10.00
1.00
0.10
INTENSITY (IN/HR)
2-YR
y = 11.219x-0.569
R² = 1
5-YR
y = 13.089x-0.569
R² = 1
10-YR
y = 14.583x-0.569
R² = 1
25-YR
y = 16.855x-0.569
R² = 1
100-YR
y = 21.242x-0.569
R² = 1

APPENDIX B
BASIN CALCULATIONS



PRE-DEVELOPMENT BASIN MAP

BRENTWOOD VILLAGE
SULPHUR CREEK WATERSHED
BY

SHARRAH DUNLAP SAWYER, INC.
Civil Engineering • Land Planning • Surveying & Mapping
Landscape Architecture • Presentation Graphics
320 Hartnell Avenue, Redding, CA 96002
530.221.1792 voice • 530.221.8369 fax • info@sdsengineering.com

TO BE USED AS A VISUAL AID ONLY. LINEWORK DOES NOT REPRESENT, NOR IS IT INTENDED TO REPLACE SURVEY OR RECORDED PROPERTY INFORMATION.

DATE: NOVEMBER, 2022 SCALE: 1"=200' SHEET 1 OF 1

RTT P:\proj\p\22143\DWG\22143det-ent.dwg JOB#:22.0143.000

Sharrah Dunlap Sawyer
November 2022
Calc'd by: RTT

Stormwater Runoff for Undeveloped Areas

Calculate composite post-development runoff coefficient using formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained from Table 819.2A (Caltrans Highway Design Manual)		"C" values		
Surface Type		10-yr	25-yr	100-yr
Relief	~5% relief across the site	0.14		
Soil Infiltration	Type 'D' loamy soil	0.12		
Vegetal Cover	Fair woodland cover	0.08		
Surface Storage	Small/steep drainage ways	0.08	10-yr x 1.1	10-yr x 1.25
		0.42	0.46	0.53

Stormwater Runoff for Developed Areas

Basin: PRE1

Calculate composite post-development runoff coefficient using formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)

Surface Type	Areas	%	"C" values 10-yr	25-yr	100-yr
Road	0.0 ac	0.0%	0.90	0.99	1.00
Undeveloped Area	1.3 ac	100.0%	0.42	0.46	0.53
Total Basin Area =	1.3 ac		0.42	0.46	0.53

Time of Concentration (Overland) $i = FCT * (Tc)^{PWR}$ $Tco = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14

	Estimated	Calculated		
Tco_2 = 22.2 min	i_2 = 1.92 in/hr	1.92 in/hr	L = 300 ft	Length of Flowpath
Tco_{10} = 19.5 min	i_{10} = 2.68 in/hr	2.68 in/hr	S = 0.017 ft/ft	Average Slope of Flowpath
Tco_{25} = 18.2 min	i_{25} = 3.22 in/hr	3.22 in/hr	n = 0.50	Few trees/natural grass, Table C-9
Tco_{100} = 16.3 min	i_{100} = 4.33 in/hr	4.33 in/hr	Elev = 750 ft	Site Elevation
			Tco_{min} = 5.0 min	

Total Rainfall Intensity $i = FCT * (Tc)^{PWR}$

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 22.2 min		ΣTc_{10} = 19.5 min	ΣTc_{25} = 18.2 min	ΣTc_{100} = 16.3 min
FCT = 11.22		FCT = 14.58	FCT = 16.85	FCT = 21.24
PWR = -0.57		PWR = -0.57	PWR = -0.57	PWR = -0.57
i_2 = 1.92 in/hr		i_{10} = 2.68 in/hr	i_{25} = 3.22 in/hr	i_{100} = 4.33 in/hr

Basin Runoff Flow $Q = C * i * A$

2-year	C_2= 0.42	i_2= 1.92 in/hr	A_2= 1.3 ac	**Q_2 = 1.0 cfs**
10-year	C_{10}= 0.42	i_{10}= 2.68 in/hr	A_{10}= 1.3 ac	**Q_{10} = 1.5 cfs**
25-year	C_{25}= 0.46	i_{25}= 3.22 in/hr	A_{25}= 1.3 ac	**Q_{25} = 1.9 cfs**
100-year	C_{100}= 0.53	i_{100}= 4.33 in/hr	A_{100}= 1.3 ac	**Q_{100} = 3.0 cfs**

Stormwater Runoff for Developed Areas

Basin: PRE2

Calculate composite post-development runoff coefficient using formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)

Surface Type	Areas	%	"C" values 10-yr	25-yr	100-yr
Road	0.7 ac	58.3%	0.90	0.99	1.00
Undeveloped Area	0.5 ac	41.7%	0.42	0.46	0.53
Total Basin Area =	1.2 ac		0.70	0.77	0.88

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR Tco = (0.66 $L^{0.5}$ $n^{0.52}$) / ($S^{0.31}$ $i^{0.38}$)

COR Hydro Manual pg. C-14

	Estimated	Calculated		
Tco_2 = 11.6 min	i_2 = 2.77 in/hr	2.77 in/hr	L = 100 ft	Length of Flowpath
Tco_{10} = 10.2 min	i_{10} = 3.88 in/hr	3.88 in/hr	S = 0.010 ft/ft	Average Slope of Flowpath
Tco_{25} = 9.5 min	i_{25} = 4.67 in/hr	4.67 in/hr	n = 0.40	natural grassland, Table C-9
Tco_{100} = 8.5 min	i_{100} = 6.27 in/hr	6.27 in/hr	Elev = 750 ft	Site Elevation
			Tco_{min} = 5.0 min	

Time of Concentration (Channel) Tcs = (L / V)

COR Hydro Manual pg. C-15

	L = 1300 ft	Length of Flowpath
V_{mann} = (1.49/n) $R^{0.67}$ $S^{0.5}$	S_{ave} = 0.006 ft/ft	Average Longitudinal Slope
R= A / P = 0.21 ft	n = 0.035	traight stream w/ stones or weeds
V_{mann} = 1.2 ft/s	A = 1.7 sf	Area of Flow
Tc_{mann} = L / (60 V)= 18.1 min	P = 8 ft	Wetted Perimeter

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor

ΣTc_2 = 29.7 min		ΣTc_{10} = 28.3 min	ΣTc_{25} = 27.6 min	ΣTc_{100} = 26.6 min
FCT = 11.22		FCT = 14.58	FCT = 16.85	FCT = 21.24
PWR = -0.57		PWR = -0.57	PWR = -0.57	PWR = -0.57
i_2 = 1.62 in/hr		i_{10} = 2.17 in/hr	i_{25} = 2.54 in/hr	i_{100} = 3.27 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.70	i_2= 1.62 in/hr	A_2= 1.2 ac	**Q_2 = 1.4 cfs**
10-year	C_{10}= 0.70	i_{10}= 2.17 in/hr	A_{10}= 1.2 ac	**Q_{10} = 1.8 cfs**
25-year	C_{25}= 0.77	i_{25}= 2.54 in/hr	A_{25}= 1.2 ac	**Q_{25} = 2.3 cfs**
100-year	C_{100}= 0.88	i_{100}= 3.27 in/hr	A_{100}= 1.2 ac	**Q_{100} = 3.5 cfs**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Nov 21 2022

PRE2 CHANNEL

Triangular

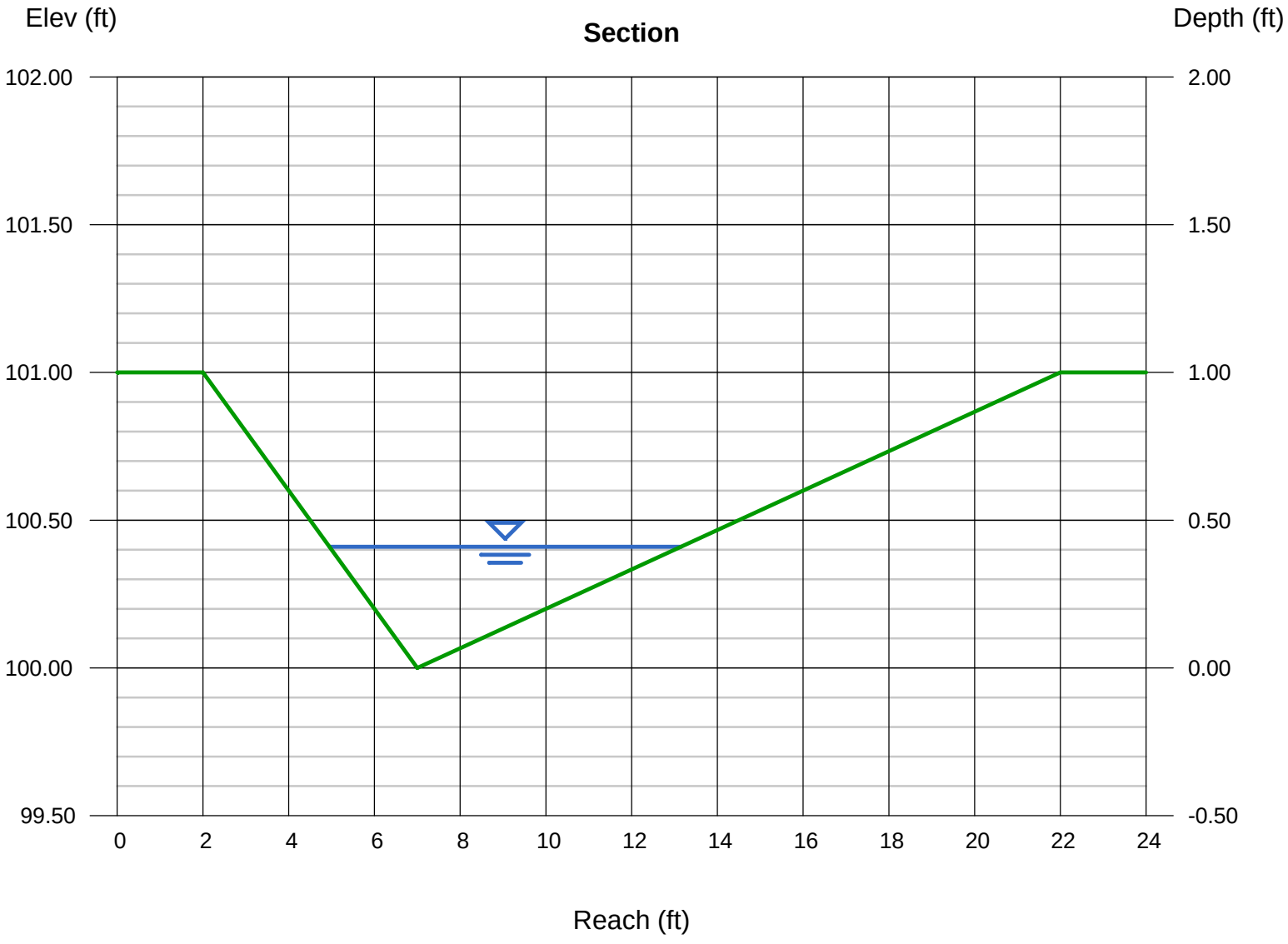
Side Slopes (z:1)	= 5.00, 15.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.60
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.80

Highlighted

Depth (ft)	= 0.41
Q (cfs)	= 1.800
Area (sqft)	= 1.68
Velocity (ft/s)	= 1.07
Wetted Perim (ft)	= 8.25
Crit Depth, Yc (ft)	= 0.29
Top Width (ft)	= 8.20
EGL (ft)	= 0.43



Stormwater Runoff for Developed Areas

Basin: PRE3

Calculate composite post-development runoff coefficient using formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)

Surface Type	Areas	%	"C" values 10-yr	25-yr	100-yr
Landscaped / Lawn Area	0.2 ac	2.5%	0.17	0.19	0.21
Road	1.1 ac	13.6%	0.90	0.99	1.00
Undeveloped Area	7.0 ac	86.4%	0.42	0.46	0.53
Total Basin Area =	8.1 ac		0.49	0.53	0.61

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR $T_{co} = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14

Tco_2 = 5.6 min	i_2 = 4.20 in/hr	4.20 in/hr	L = 100 ft		Length of Flowpath
Tco_{10} = 4.9 min	i_{10} = 5.89 in/hr	5.89 in/hr	S = 0.012 ft/ft		Average Slope of Flowpath
Tco_{25} = 4.6 min	i_{25} = 7.06 in/hr	7.06 in/hr	n = 0.15		Range - heavily grazed, Table C-9
Tco_{100} = 4.1 min	i_{100} = 9.50 in/hr	9.50 in/hr	Elev = 750 ft		Site Elevation
			Tco_{min} = 5.0 min		

Time of Concentration (Shallow Concentrated Flow) Tcg = (L / V)

Hydraulic Design Series No. 2 pg. 2-24

$V_{shallow} = \alpha\kappa S^{0.5}$	L = 600 ft	Length of Flowpath
$V_{shallow}$ = 1.4 ft/s	S_{ave} = 0.007 ft/ft	Average Longitudinal Slope
$Tc_{Shallow}$ = L / (60 V) = 7.1 min	κ = 0.491	Unpaved
	α = 33	Unit Conversion (33)

Time of Concentration (Channel) Tcs = (L / V)

COR Hydro Manual pg. C-15

V_{mann} = (1.49/n) $R^{0.67}$ $S^{0.5}$	L = 230 ft	Length of Flowpath
R= A / P = 0.37 ft	S_{ave} = 0.046 ft/ft	Average Longitudinal Slope
V_{mann} = 5.5 ft/s	n = 0.030	Vegetal lining
Tc_{mann} = L / (60 V)= 0.7 min	A = 2.6 sf	Area of Flow
	P = 7 ft	Wetted Perimeter

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 13.4 min		ΣTc_{10} = 12.7 min	ΣTc_{25} = 12.4 min	ΣTc_{100} = 11.9 min
FCT = 11.22		FCT = 14.58	FCT = 16.85	FCT = 21.24
PWR = -0.57		PWR = -0.57	PWR = -0.57	PWR = -0.57
i_2 = 2.56 in/hr		i_{10} = 3.42 in/hr	i_{25} = 4.01 in/hr	i_{100} = 5.18 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.49	i_2= 2.56 in/hr	A_2= 8.1 ac	**Q_2 = 10.2 cfs**
10-year	C_{10}= 0.49	i_{10}= 3.42 in/hr	A_{10}= 8.1 ac	**Q_{10} = 13.6 cfs**
25-year	C_{25}= 0.53	i_{25}= 4.01 in/hr	A_{25}= 8.1 ac	**Q_{25} = 17.2 cfs**
100-year	C_{100}= 0.61	i_{100}= 5.18 in/hr	A_{100}= 8.1 ac	**Q_{100} = 25.6 cfs**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Nov 28 2022

PRE3 CHANNEL

Triangular

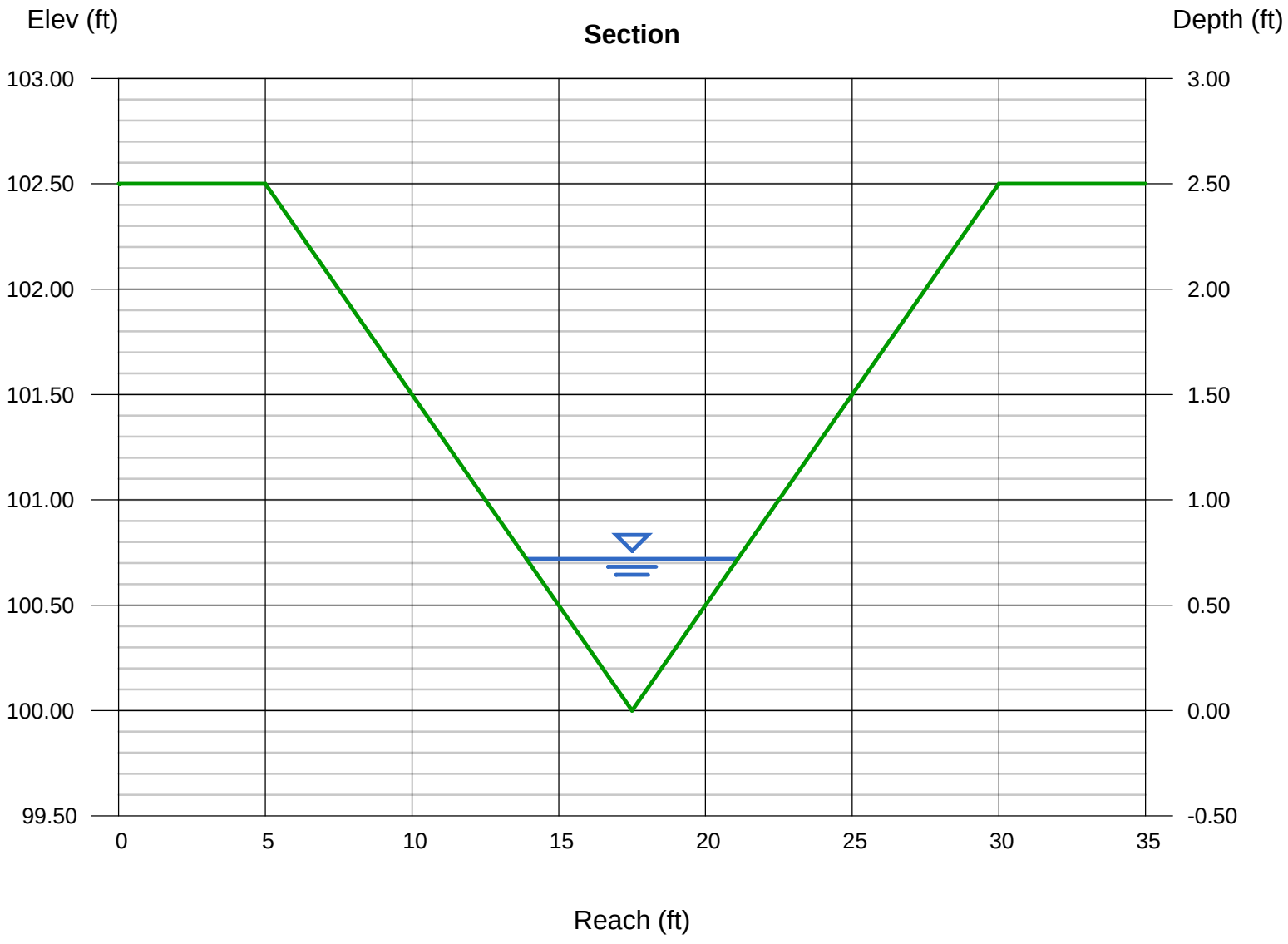
Side Slopes (z:1)	= 5.00, 5.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 100.00
Slope (%)	= 4.60
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.60

Highlighted

Depth (ft)	= 0.72
Q (cfs)	= 13.60
Area (sqft)	= 2.59
Velocity (ft/s)	= 5.25
Wetted Perim (ft)	= 7.34
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 7.20
EGL (ft)	= 1.15



Stormwater Runoff for Developed Areas

Basin: PRE4

Calculate composite post-development runoff coefficient using formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)

Surface Type	Areas	%	"C" values 10-yr	25-yr	100-yr
Road	0.0 ac	0.0%	0.90	0.99	1.00
Undeveloped Area	1.7 ac	100.0%	0.42	0.46	0.53
Total Basin Area =	1.7 ac		0.42	0.46	0.53

Time of Concentration (Overland) $i = FCT * (Tc)^{PWR}$ $Tco = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14	Estimated	Calculated		
Tco_2 = 25.2 min	i_2 = 1.78 in/hr	1.78 in/hr	L = 300 ft	Length of Flowpath
Tco_{10} = 22.2 min	i_{10} = 2.49 in/hr	2.49 in/hr	S = 0.012 ft/ft	Average Slope of Flowpath
Tco_{25} = 20.7 min	i_{25} = 3.00 in/hr	3.00 in/hr	n = 0.50	Few trees/natural grass, Table C-9
Tco_{100} = 18.5 min	i_{100} = 4.03 in/hr	4.03 in/hr	Elev = 750 ft	Site Elevation
			Tco_{min} = 5.0 min	

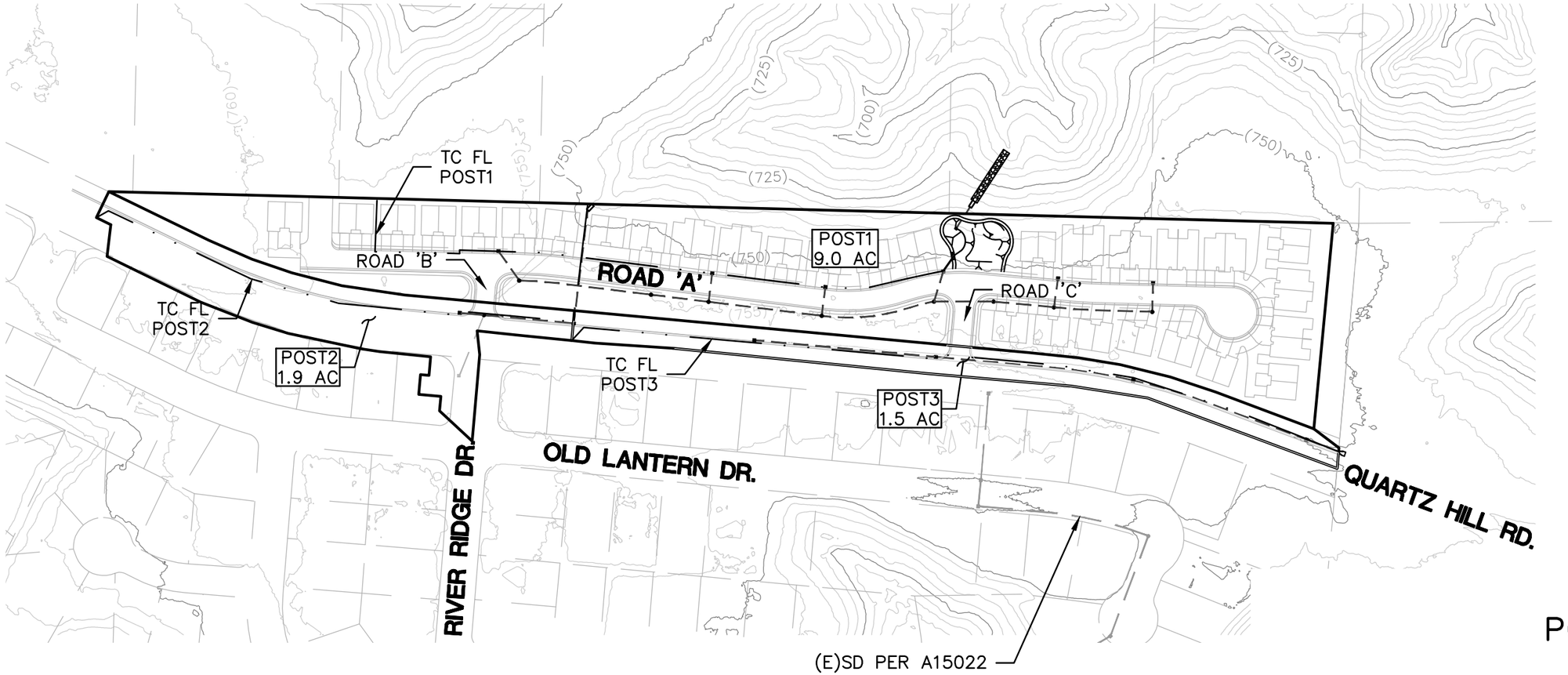
Total Rainfall Intensity $i = FCT * (Tc)^{PWR}$

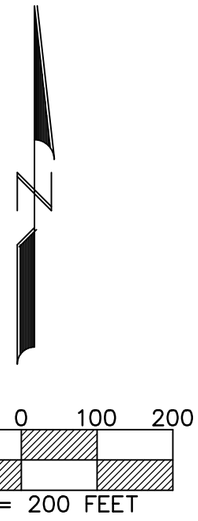
Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 25.2 min		ΣTc_{10} = 22.2 min	ΣTc_{25} = 20.7 min	ΣTc_{100} = 18.5 min
FCT = 11.22		FCT = 14.58	FCT = 16.85	FCT = 21.24
PWR = -0.57		PWR = -0.57	PWR = -0.57	PWR = -0.57
i_2 = 1.78 in/hr		i_{10} = 2.49 in/hr	i_{25} = 3.00 in/hr	i_{100} = 4.03 in/hr

Basin Runoff Flow $Q = C * i * A$

2-year	C_2= 0.42	i_2= 1.78 in/hr	A_2= 1.7 ac	**Q_2 = 1.3 cfs**
10-year	C_{10}= 0.42	i_{10}= 2.49 in/hr	A_{10}= 1.7 ac	**Q_{10} = 1.8 cfs**
25-year	C_{25}= 0.46	i_{25}= 3.00 in/hr	A_{25}= 1.7 ac	**Q_{25} = 2.3 cfs**
100-year	C_{100}= 0.53	i_{100}= 4.03 in/hr	A_{100}= 1.7 ac	**Q_{100} = 3.6 cfs**





POST–DEVELOPMENT BASIN MAP

BRENTWOOD VILLAGE
SULPHUR CREEK WATERSHED
BY

SHARRAH DUNLAP SAWYER, INC.
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DATE: NOVEMBER, 2022 SCALE: 1"=200' SHEET 1 OF 1

RTT P:\proj\p\22143\DWG\22143det-ent.dwg JOB#:22.0143.000

Stormwater Runoff for Developed Areas

Basin: POST1

Calculate composite post-development runoff coefficient using formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)

Surface Type	Areas	%	"C" values 10-yr	25-yr	100-yr
Multifamily Residential	9.0 ac	100.0%	0.55	0.61	0.69
Total Basin Area =	9.0 ac		0.55	0.61	0.69

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR $Tco = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14

	Estimated	Calculated		
Tco_2 =	19.0 min	i_2 = 2.09 in/hr	2.09 in/hr	L = 80 ft — Length of Flowpath
Tco_{10} =	16.7 min	i_{10} = 2.93 in/hr	2.93 in/hr	S = 0.002 ft/ft — Average Slope of Flowpath
Tco_{25} =	15.6 min	i_{25} = 3.52 in/hr	3.52 in/hr	n = 0.40 — Residential landscaping, Table C-9
Tco_{100} =	13.9 min	i_{100} = 4.74 in/hr	4.74 in/hr	Elev = 750 ft — Site Elevation
				Tco_{min} = 5.0 min

Time of Concentration (Gutter Flow) Tcg = (L / V)

COR Hydro Manual pg. C-15

$V_{gutter} = (1.12/n)\ S_x^{0.67}\ S^{0.5}\ T^{0.67}$

V_{gutter} = 1.5 ft/s

Tc_{gutter} = L / (60 V) = 1.4 min

L = 130 ft — Length of Flowpath
S_{ave} = 0.005 ft/ft — Average Longitudinal Slope
Sx = 0.02 ft/ft — Cross Slope
T = 12 ft — Spread of Flow
n = 0.020 — Concrete Gutter

Time of Concentration (SDP Pipe) Tcs = (L / V)

COR Hydro Manual pg. C-15

$V_{mann} = (1.49/n)\ R^{0.67}\ S^{0.5}$

R= A / P = 0.58 ft

V_{mann} = 5.6 ft/s

Tc_{mann} = L / (60 V)= 2.6 min

L = 880 ft — Length of Flowpath
S_{ave} = 0.005 ft/ft — Average Longitudinal Slope
n = 0.013 — HDPE
A = 2.3 sf — Area of Flow
P = 4 ft — Wetted Perimeter

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 23.0 min		ΣTc_{10} = 20.7 min	ΣTc_{25} = 19.6 min	ΣTc_{100} = 17.9 min
FCT = 11.22		FCT = 14.58	FCT = 16.85	FCT = 21.24
PWR = -0.57		PWR = -0.57	PWR = -0.57	PWR = -0.57
i_2 = 1.88 in/hr		i_{10} = 2.59 in/hr	i_{25} = 3.09 in/hr	i_{100} = 4.10 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.55	i_2= 1.88 in/hr	A_2= 9.0 ac	**Q_2 = 9.3 cfs**
10-year	C_{10}= 0.55	i_{10}= 2.59 in/hr	A_{10}= 9.0 ac	**Q_{10} = 12.8 cfs**
25-year	C_{25}= 0.61	i_{25}= 3.09 in/hr	A_{25}= 9.0 ac	**Q_{25} = 17.0 cfs**
100-year	C_{100}= 0.69	i_{100}= 4.10 in/hr	A_{100}= 9.0 ac	**Q_{100} = 25.5 cfs**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Nov 21 2022

POST1 PIPE

Circular

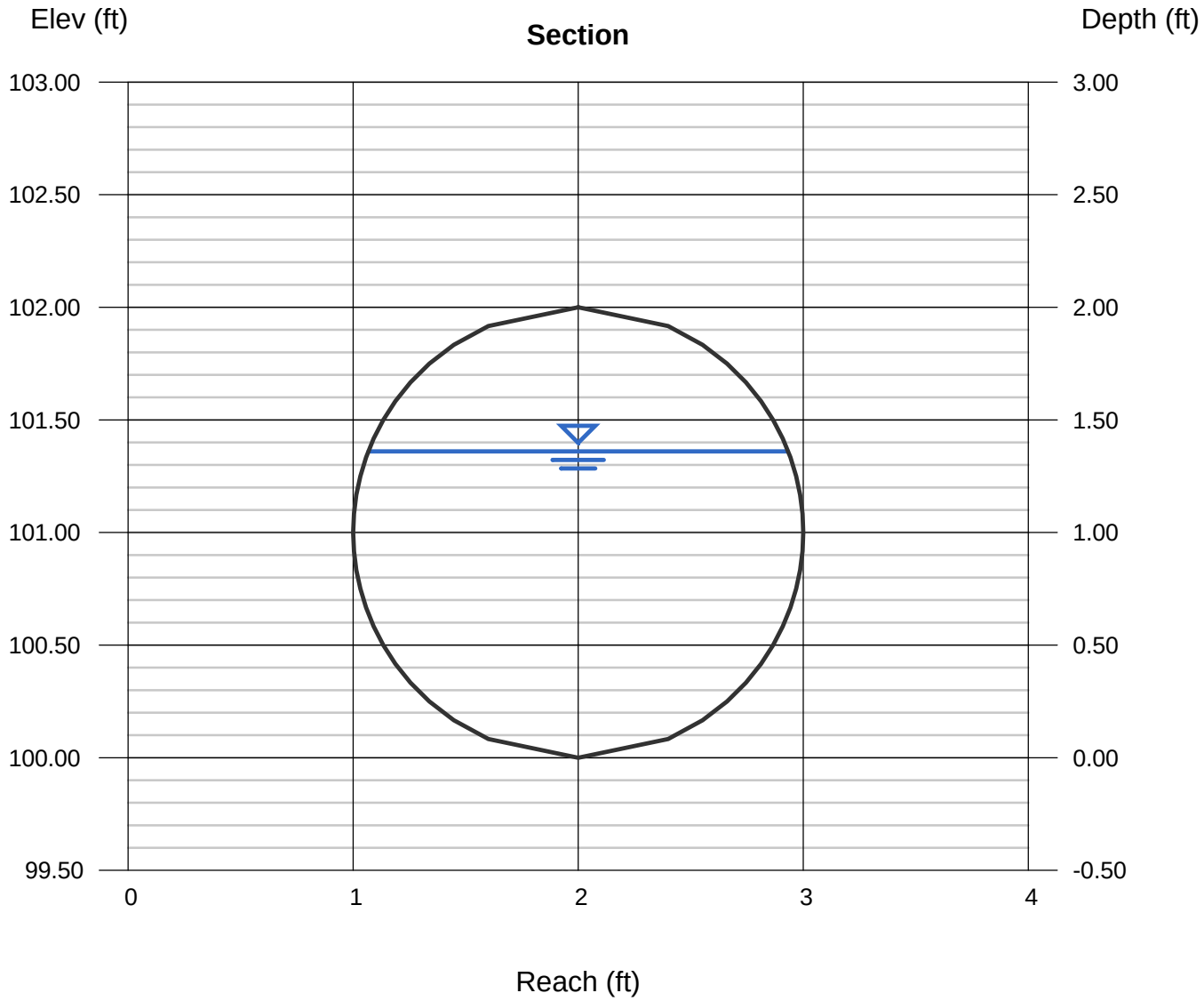
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 12.80

Highlighted

Depth (ft)	= 1.36
Q (cfs)	= 12.80
Area (sqft)	= 2.28
Velocity (ft/s)	= 5.62
Wetted Perim (ft)	= 3.88
Crit Depth, Yc (ft)	= 1.29
Top Width (ft)	= 1.87
EGL (ft)	= 1.85



Storm Drainage Report
Brentwood Village
Job #: 22.0143.000

Sharrah Dunlap Sawyer
November 2022
Calc'd by: RTT

Stormwater Runoff for Developed Areas

Basin: POST2

Calculate composite post-development runoff coefficient using formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)

Surface Type	Areas	%	"C" values 10-yr	25-yr	100-yr
Landscaped / Lawn Area	0.6 ac	31.6%	0.17	0.19	0.21
Road/Impervious	1.3 ac	68.4%	0.90	0.99	1.00
Total Basin Area =	1.9 ac		0.67	0.74	0.84

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR $T_{co} = (0.66\ L^{0.5}\ n^{0.52}) / (S^{0.31}\ i^{0.38})$

COR Hydro Manual pg. C-14

	Estimated	Calculated		
Tco_2 = 1.4 min	i_2 = 9.26 in/hr	9.26 in/hr	L = 30 ft	Length of Flowpath
Tco_{10} = 1.2 min	i_{10} = 13.14 in/hr	13.14 in/hr	S = 0.002 ft/ft	Average Slope of Flowpath
Tco_{25} = 1.1 min	i_{25} = 15.96 in/hr	15.96 in/hr	n = 0.02	Pavement - smooth, Table C-9
Tco_{100} = 1.0 min	i_{100} = 21.24 in/hr	21.24 in/hr	Elev = 750 ft	Site Elevation
			Tco_{min} = 5.0 min	

Time of Concentration (Gutter Flow) Tcg = (L / V)

COR Hydro Manual pg. C-15

$V_{gutter} = (1.12/n)\ S_x^{0.67}\ S^{0.5}\ T^{0.67}$

V_{gutter} = 1.5 ft/s

Tc_{gutter} = L / (60 V) = 6.9 min

L = 620 ft	Length of Flowpath
S_{ave} = 0.005 ft/ft	Average Longitudinal Slope
Sx = 0.02 ft/ft	Cross Slope
T = 12 ft	Spread of Flow
n = 0.020	Concrete Gutter

Time of Concentration (SDP Pipe) Tcs = (L / V)

COR Hydro Manual pg. C-15

$V_{mann} = (1.49/n)\ R^{0.67}\ S^{0.5}$

R= A / P = 0.60 ft

V_{mann} = 5.8 ft/s

Tc_{mann} = L / (60 V)= 1.1 min

L = 400 ft	Length of Flowpath
S_{ave} = 0.005 ft/ft	Average Longitudinal Slope
n = 0.013	HDPE
A = 1.8 sf	Area of Flow
P = 3 ft	Wetted Perimeter

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 9.4 min		ΣTc_{10} = 9.2 min	ΣTc_{25} = 9.1 min	ΣTc_{100} = 9.0 min
FCT = 11.22		FCT = 14.58	FCT = 16.85	FCT = 21.24
PWR = -0.57		PWR = -0.57	PWR = -0.57	PWR = -0.57
i_2 = 3.13 in/hr		i_{10} = 4.12 in/hr	i_{25} = 4.79 in/hr	i_{100} = 6.07 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.67	i_2= 3.13 in/hr	A_2= 1.9 ac	**Q_2 = 4.0 cfs**
10-year	C_{10}= 0.67	i_{10}= 4.12 in/hr	A_{10}= 1.9 ac	**Q_{10} = 5.2 cfs**
25-year	C_{25}= 0.74	i_{25}= 4.79 in/hr	A_{25}= 1.9 ac	**Q_{25} = 6.7 cfs**
100-year	C_{100}= 0.84	i_{100}= 6.07 in/hr	A_{100}= 1.9 ac	**Q_{100} = 9.7 cfs**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Nov 28 2022

POST2 PIPE

Circular

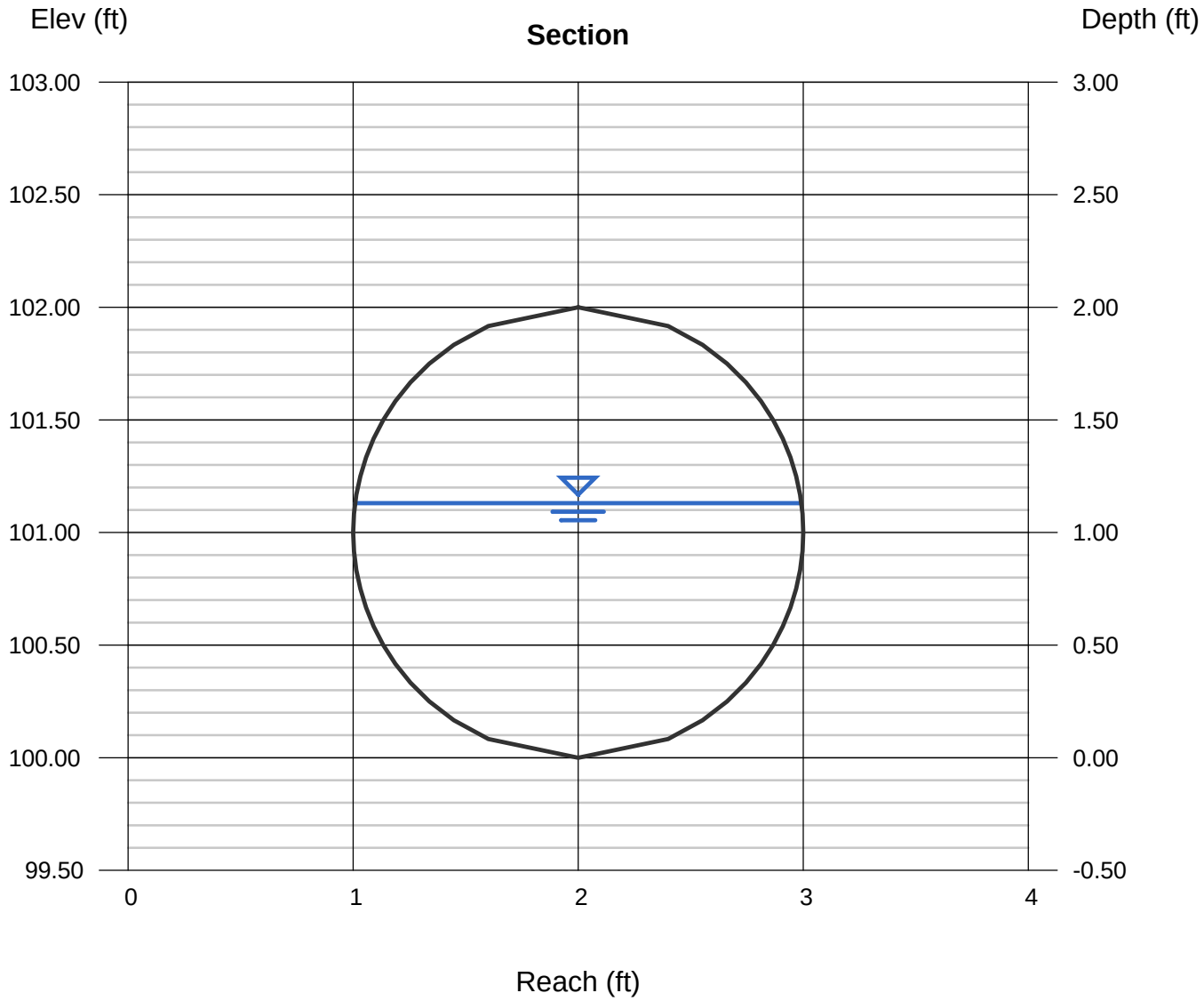
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.70

Highlighted

Depth (ft)	= 1.13
Q (cfs)	= 9.700
Area (sqft)	= 1.84
Velocity (ft/s)	= 5.28
Wetted Perim (ft)	= 3.41
Crit Depth, Yc (ft)	= 1.11
Top Width (ft)	= 1.98
EGL (ft)	= 1.56



Storm Drainage Report
Brentwood Village
Job #: 22.0143.000

Sharrah Dunlap Sawyer
November 2022
Calc'd by: RTT

Stormwater Runoff for Developed Areas

Basin: POST3

Calculate composite post-development runoff coefficient using formula:

$$C_{ave} = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 + A_4*C_4 + A_5*C_5}{A_T}$$

C-values obtained using Table 819.2B (Caltrans Highway Design Manual)

Surface Type	Areas	%	"C" values 10-yr	25-yr	100-yr
Landscaped / Lawn Area	0.6 ac	40.0%	0.17	0.19	0.21
Road/Impervious	0.9 ac	60.0%	0.90	0.99	1.00
Total Basin Area =	1.5 ac		0.61	0.67	0.76

Time of Concentration (Overland) i = FCT * (Tc) ^ PWR Tco = (0.66 $L^{0.5}$ $n^{0.52}$) / ($S^{0.31}$ $i^{0.38}$)

COR Hydro Manual pg. C-14

Tco_2 = 2.3 min	i_2 = 2.39 in/hr	6.98 in/hr	L = 30 ft	Length of Flowpath
Tco_{10} = 2.1 min	i_{10} = 3.23 in/hr	9.55 in/hr	S = 0.002 ft/ft	Average Slope of Flowpath
Tco_{25} = 2.0 min	i_{25} = 3.82 in/hr	11.35 in/hr	n = 0.02	Pavement - smooth, Table C-9
Tco_{100} = 1.8 min	i_{100} = 5.04 in/hr	15.19 in/hr	Elev = 750 ft	Site Elevation
			Tco_{min} = 5.0 min	

(Estimated / Calculated)

Time of Concentration (Gutter Flow) Tcg = (L / V)

COR Hydro Manual pg. C-15

V_{gutter} = (1.12/n) $S_x^{0.67}$ $S^{0.5}$ $T^{0.67}$

V_{gutter} = 1.5 ft/s

Tc_{gutter} = L / (60 V) = 6.6 min

L = 590 ft	Length of Flowpath
S_{ave} = 0.005 ft/ft	Average Longitudinal Slope
Sx = 0.02 ft/ft	Cross Slope
T = 12 ft	Spread of Flow
n = 0.020	Concrete Gutter

Time of Concentration (SDP Pipe) Tcs = (L / V)

COR Hydro Manual pg. C-15

V_{mann} = (1.49/n) $R^{0.67}$ $S^{0.5}$

R= A / P = 0.46 ft

V_{mann} = 4.8 ft/s

Tc_{mann} = L / (60 V)= 2.4 min

L = 700 ft	Length of Flowpath
S_{ave} = 0.005 ft/ft	Average Longitudinal Slope
n = 0.013	HDPE
A = 1.3 sf	Area of Flow
P = 3 ft	Wetted Perimeter

Total Rainfall Intensity i = FCT * (Tc) ^ PWR

Rainfall intensity equation compiled from data obtained from The City of Redding HEC-1 Processor Documentation (January 16, 2006).

ΣTc_2 = 11.3 min		ΣTc_{10} = 11.1 min	ΣTc_{25} = 11.0 min	ΣTc_{100} = 10.8 min
FCT = 11.22		FCT = 14.58	FCT = 16.85	FCT = 21.24
PWR = -0.57		PWR = -0.57	PWR = -0.57	PWR = -0.57
i_2 = 2.82 in/hr		i_{10} = 3.70 in/hr	i_{25} = 4.30 in/hr	i_{100} = 5.47 in/hr

Basin Runoff Flow Q = C * i * A

2-year	C_2= 0.61	i_2= 2.82 in/hr	A_2= 1.5 ac	**Q_2 = 2.6 cfs**
10-year	C_{10}= 0.61	i_{10}= 3.70 in/hr	A_{10}= 1.5 ac	**Q_{10} = 3.4 cfs**
25-year	C_{25}= 0.67	i_{25}= 4.30 in/hr	A_{25}= 1.5 ac	**Q_{25} = 4.3 cfs**
100-year	C_{100}= 0.76	i_{100}= 5.47 in/hr	A_{100}= 1.5 ac	**Q_{100} = 6.2 cfs**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Nov 21 2022

POST3 PIPE

Circular

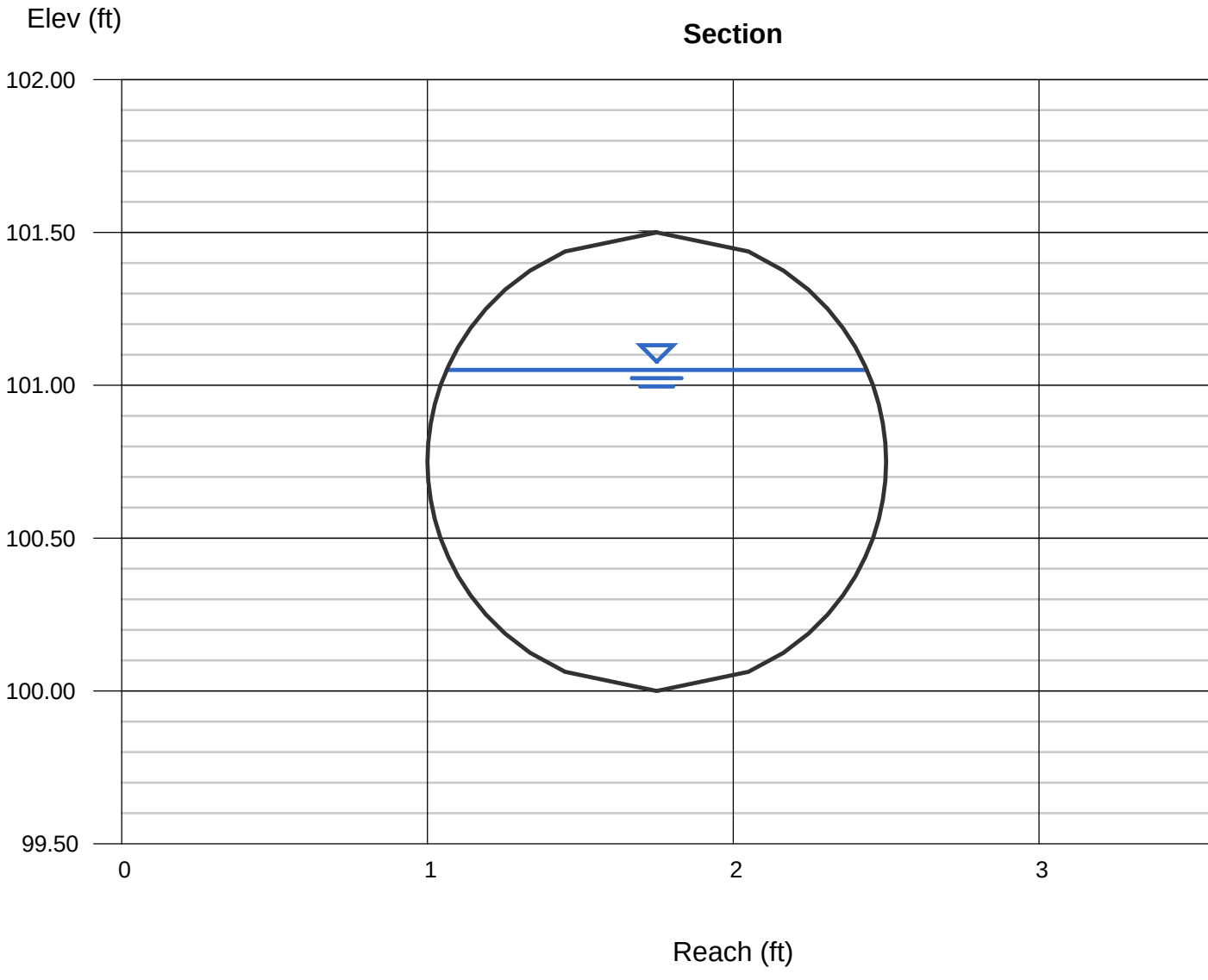
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.20

Highlighted

Depth (ft)	= 1.05
Q (cfs)	= 6.200
Area (sqft)	= 1.32
Velocity (ft/s)	= 4.68
Wetted Perim (ft)	= 2.98
Crit Depth, Yc (ft)	= 0.97
Top Width (ft)	= 1.37
EGL (ft)	= 1.39



APPENDIX C
DETENTION CALCULATIONS

Storm Drainage Analysis
Brentwood Village
Job #: 22.0143.000

Sharrah Dunlap Sawyer
November 2022
Calc'd by: RTT

Stage-Storage Required

Brentwood Detention Basin

The following calculations are performed per the U.S. Department of Transportation Federal Highway Administration *Hydraulic Design Series No. 2, Second Edition.*

Required Volume of Storage — $Vs = 60 (Q_{IN} - Q_{DET}) Tc$

2-year	10-year	25-year	100-year	
$Q_{PRE} = Q_{PRE1-4}$ = 13.9 cfs	Q_{PRE} = 18.7 cfs	Q_{PRE} = 23.7 cfs	Q_{PRE} = 35.7 cfs	Pre-development Flow
$q_{in} = Q_{IN} = Q_{POST1}$ = 9.3 cfs	Q_{IN} = 12.8 cfs	Q_{IN} = 17.0 cfs	Q_{IN} = 25.5 cfs	Post-development Flow
$Q_{UNDET} = {}_{POST2-3}$ = 6.6 cfs	Q_{UNDET} = 8.6 cfs	Q_{UNDET} = 11.0 cfs	Q_{UNDET} = 15.9 cfs	Undetained post-development flow
$Q_{ALL} = Q_{PRE1} - Q_{UNDET}$ = 7.3 cfs	Q_{ALL} = 10.1 cfs	Q_{ALL} = 12.7 cfs	Q_{ALL} = 19.8 cfs	Allowable peak flow discharge
$q_{out} = Q_{OUT}$ = 7.0 cfs	Q_{OUT} = 9.3 cfs	Q_{OUT} = 12.4 cfs	Q_{OUT} = 18.7 cfs	Detention basin peak discharge
Tc = 23.0 min	Tc = 20.7 min	Tc = 19.6 min	Tc = 17.9 min	Post-dev time of concentration
Vs = 3174 ft³	Vs = 4347 ft³	Vs = 5410 ft³	Vs = 7303 ft³	Required Volume of Storage

Stage-Storage Detention Basin

Assuming no infiltration and ground is saturated at start of storm, bottom of detention volume starts at outflow invert

	Brentwood Detention Basin: STAGE-STORAGE-DISCHARGE						
	Elev (ft)	Incremental Depth (ft)	Area (ft^2)	Incremental Volume (ft^3)	Cumulative Volume (ft^3)	Storage Volume (AC-FT)	Detention Discharge (cfs)
	738.00	0.00	310	0	0	0.00	0.0
	739.00	1.00	725	518	518	0.01	3.2
	740.00	1.00	1205	965	1483	0.03	5.6
2-YR	740.77	0.77	3272	1724	3206	0.07	7.0
	741.00	0.23	3890	824	4030	0.09	8.5
10-YR	741.09	0.09	3959	353	4383	0.10	9.3
25-YR	741.36	0.27	3938	1066	5449	0.13	12.4
100-YR	741.80	0.44	4506	1858	7307	0.17	18.7
	742.00	0.20	4660	917	8224	0.19	22.1
	743.00	1.00	5510	5085	13309	0.31	41.3

Brentwood Detention Basin: DRAINAGE SUMMARY					
Top elevation: 743.00 Bottom elevation: 738.00		100-year WSE: 741.80		Orifice size: 13" Diameter Circle Orifice invert: 738.00	
	Pre-development (Q_{PRE2})	Storm Drain Flow (Q_{IN})	Future-Undetained	Post-Detained (Q_{OUT})	Post-Development ($Q_{OUT} + Q_{UNDET}$)
2-year	13.90	9.30	6.60	7.00	13.60
10-year	18.70	12.80	8.60	9.30	17.90
25-year	23.70	17.00	11.00	12.40	23.40
100-year	35.70	25.50	15.90	18.70	34.60

Storm Drainage Analysis
Brentwood Village
Job #: 22.0143.000

Sharrah Dunlap Sawyer
November 2022
Calc'd by: RTT

Detention Stage-Storage-Discharge Calculation

BASIN S1876C

3nd Opening				
Cook 18"X18" Area Drain Grate				A = 1.97 sf
	cl elev =	742.00 ft	inv elev = 742.00 ft	L = 5.66 ft

2nd Opening				
36in. x 13in. Weir	w =	36.0 in	h = 13.0 in	A = 3.250 sf
	cl elev =	741.29 ft	inv elev = 740.75 ft	L = 3.00 ft

Bottom Opening				
13" Diameter Circle			d = 13.00 in	A = 0.922 sf
	cl elev =	738.54 ft	inv elev = 738.00 ft	

Orifice equation =	C*A*(2g*deltaH)^0.5	Weir equation =	C*L*H^1.5
	C = 0.63		C = 3.2
	2g = 64.4		

	1st Opening		2nd Opening				3rd Opening					
	cl depth	orifice outflow	wier depth	wier outflow	cl depth	orifice outflow	weir depth	weir outflow	cl depth	orifice outflow	Detention Discharge	Storage Volume
Elev	ft	cfs	ft	cfs	ft	cfs	ft	cfs	ft	cfs	cfs	Ac-ft
738.00												
739.00	0.46	3.2									3.2	0.01
740.00	1.46	5.6									5.6	0.03
740.77	2.23	7.0	0.02								7.0	0.07
741.00	2.46	7.3	0.25	1.2							8.5	0.09
741.09	2.55	7.4	0.34	1.9							9.3	0.10
741.36	2.82	7.8	0.61	4.6							12.4	0.13
741.80	3.26	8.4	1.05	10.3							18.7	0.17
742.00	3.46	8.7	1.25	13.4	0.71	13.8					22.1	0.19
743.00	4.46	9.8	2.25	32.4	1.71	21.5	1.0	18.10	1.00	10.00	41.3	0.31

** Note: Per Urban Drainage Design Manual Publication No. FHWA-NHI-01-021 August 2001 "*The Flow Condition, orifice or weir, producing the lowest discharge for a given stage defines the controlling relationship."*

Sharrah Dunlap Sawyer

Area Drain Length & Area Calc's

Cook 18" x 18" Area Drain Grate

Length of Box (Length of Bars) (L)=	20.875 inch
Width of Box (Length of Rods) (W)=	17.750 inch
Number of Rods (including end bars) (R)=	5
Number of Bearing Bars (B)=	15
Rod and End Bar Width (R_W)=	0.375 inch
Bar Width (B_W)=	0.188 inch

Length=[2L+2W]-[2(B_W*B)+2(R_W*R)]

Total Perimeter Length= 67.875 inch

5.66 ft

Area=[L*W]-[(R_W*R*W)+(B_W*B*L)-(B_W*B*R_W*R)]

Total Area= 283.81 sq in

1.97 sq ft

APPENDIX D
REFERENCE MATERIALS

Shallow Concentrated Overland Flow

U DOT: Hydraulic Design Series No. 2, Second Edition pg. 2-24

2.6.2.2 Shallow Concentrated Flow

After short distances, sheet flow tends to concentrate in rills and then gullies of increasing proportions. Such flow is usually referred to as shallow concentrated flow. The velocity of such flow can be estimated using an empirical relationship between the velocity and the slope:

$$V = \alpha \kappa S^{0.5}$$

Where,
V=Velocity (ft/s)
S=slope (ft/ft)
κ=dimensionless function of land cover
α=unit conversion (33)

Table 2.2. Intercept Coefficients for Velocity vs. Slope Relationship (McCuen, 1989)

k	Land Cover/Flow Regime
0.076	Forest with heavy ground litter; hay meadow (overland flow)
0.152	Trash fallow or minimum tillage cultivation; contour or strip cropped; woodland (overland flow)
0.213	Short grass pasture (overland flow)
0.274	Cultivated straight row (overland flow)
0.305	Nearly bare and untilled (overland flow); alluvial fans in western mountain regions
0.457	Grassed waterway (shallow concentrated flow)
0.491	Unpaved (shallow concentrated flow)
0.619	Paved area (shallow concentrated flow); small upland gullies

Manning's n Values	
Ven Te Chow, Ph.D, *Open Channel Hydraulics* , McGraw-Hill Publishing Company. Table 5-6 Values of The Roughness Coefficient	
Surface Description	n
A. Closed Conduits	-
Cast Iron	0.013
HDPE	0.013
Cement	0.013
B. Lined Channels	-
Gravel bottom with rip-rap sides	0.033
Concrete with float finish	0.015
Concrete with gravel bottom	0.017
Asphalt - smooth	0.013
Asphalt - rough	0.016
Vegetal lining	0.030
D. Natural Streams	-
Clean, straight natural stream	0.030
Straight stream w/ stones or weeds	0.035
Clean, winding natural stream	0.040
Winding stream w/ stones or weeds	0.045
Sluggish stream, weedy with pools	0.070
Very weedy with deep pools	0.100
Gravel, cobbles & few boulders	0.040
Cobbles with large boulders	0.050
D-2. Flood plains	-
Pasture, no brush	0.030
Scattered Brush, heavy weeds	0.050
Light brush and trees	0.050
Dense brush	0.070

City of Redding - Hydrology Manual		
Table C-9 Parameters for Overland Flow		
Surface Description	n	dist
Pavement - smooth, Table C-9	0.02	50-200
Pavement - rough, Table C-9	0.05	50-200
Bare soil/newly graded, Table C-9	0.1	100-300
Range - heavily grazed, Table C-9	0.15	100-300
lawns/golf course, Table C-9	0.2	100-300
parks/medians/pasture, Table C-9	0.3	200-500
natural grassland, Table C-9	0.4	200-500
Residential landscaping, Table C-9	0.4	100-300
Few trees/natural grass, Table C-9	0.5	300-600
Scattered trees/shrubs, Table C-9	0.6	300-600
Numerous trees/dense, Table C-9	0.8	300-600

Figure 819.2A

Runoff Coefficients for Undeveloped Areas

Watershed Types

	Extreme	High	Normal	Low
Relief	.28 -.35 Steep, rugged terrain with average slopes above 30%	.20 -.28 Hilly, with average slopes of 10 to 30%	.14 -.20 Rolling, with average slopes of 5 to 10%	.08 -.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	.12 -.16 No effective soil cover, either rock or thin soil mantle of negligible infiltration capacity	.08 -.12 Slow to take up water, clay or shallow loam soils of low infiltration capacity, imperfectly or poorly drained	.06 -.08 Normal; well drained light or medium textured soils, sandy loams, silt and silt loams	.04 -.06 High; deep sand or other soil that takes up water readily, very light well drained soils
Vegetal Cover	.12 -.16 No effective plant cover, bare or very sparse cover	.08 -.12 Poor to fair; clean cultivation crops, or poor natural cover, less than 20% of drainage area over good cover	.06 -.08 Fair to good; about 50% of area in good grassland or woodland, not more than 50% of area in cultivated crops	.04 -.06 Good to excellent; about 90% of drainage area in good grassland, woodland or equivalent cover
Surface Storage	.10 -.12 Negligible surface depression few and shallow; drainageways steep and small, no marshes	.08 -.10 Low; well defined system of small drainageways; no ponds or marshes	.06 -.08 Normal; considerable surface depression storage; lakes and pond marshes	.04 -.06 High; surface storage, high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes
Given	An undeveloped watershed consisting of; 1) rolling terrain with average slopes of 5%, 2) clay type soils, 3) good grassland area, and 4) normal surface depressions.		Solution: Relief 0.14 Soil Infiltration 0.08 Vegetal Cover 0.04 Surface Storage 0.06 C = 0.32	
Find	The runoff coefficient, C, for the above watershed.			

Table 819.2B

Runoff Coefficients for Developed Areas (1)

Type of Drainage Area	Runoff Coefficient
Business:	
Downtown areas	0.70 - 0.95
Neighborhood areas	0.50 - 0.70
Residential:	
Single-family areas	0.30 - 0.50
Multi-units, detached	0.40 - 0.60
Multi-units, attached	0.60 - 0.75
Suburban	0.25 - 0.40
Apartment dwelling areas	0.50 - 0.70
Industrial:	
Light areas	0.50 - 0.80
Heavy areas	0.60 - 0.90
Parks, cemeteries:	0.10 - 0.25
Playgrounds:	0.20 - 0.40
Railroad yard areas:	0.20 - 0.40
Unimproved areas:	0.10 - 0.30
Lawns:	
Sandy soil, flat, 2%	0.05 - 0.10
Sandy soil, average, 2-7%	0.10 - 0.15
Sandy soil, steep, 7%	0.15 - 0.20
Heavy soil, flat, 2%	0.13 - 0.17
Heavy soil, average, 2-7%	0.18 - 0.22
Heavy soil, steep, 7%	0.25 - 0.35
Streets:	
Asphaltic	0.70 - 0.95
Concrete	0.80 - 0.95
Brick	0.70 - 0.85
Drives and walks	0.75 - 0.85
Roofs:	0.75 - 0.95

NOTES:
(1) From HDS No. 2.

regression equations are considered the best estimates of flood frequency and are used to reduce the time-sampling error that may occur in a station flood-frequency estimate.

(d) The flood-frequency flows and the maximum peak discharges at several stations in a region should be used whenever possible for comparison with the peak discharge estimated at an ungaged site using a rainfall-runoff approach or regional regression equation. The watershed characteristics at the ungaged and gaged sites should be similar.

(4) National Resources Conservation Service (NRCS) Methods. The Soil Conservation Service's SCS (former title) National Engineering Handbook, 1972, and their 1975, "Urban Hydrology for Small Watersheds", Technical Release 55 (TR-55), present a graphical method for estimating peak discharge. Most NRCS equations and curves provide results in terms of inches of runoff for unit hydrograph development and are not applicable to the estimation of a peak design discharge unless the design hydrograph is first developed in accordance with prescribed NRCS procedures. NRCS methods and procedures are applicable to drainage areas less than 3 square miles (approx. 2,000 acres) and result in a design hydrograph and design discharge that are functionally acceptable to form the basis for the design of highway drainage facilities.

819.3 Statistical Methods

Statistical methods of predicting stream discharge utilize numerical data to describe the process. Statistical methods, in general, do not require as much subjective judgment to apply as the previously described deterministic methods. They are usually well documented mathematical procedures which are applied to measured or observed data. The accuracy of statistical methods can also be measured quantitatively. However, to assure that statistical method results are valid, the method and procedures used should be verified by an experienced engineer with a thorough knowledge of engineering statistics.

The use of flow length alone as a limiting factor for the Kinematic wave equation can lead to circumstances where the underlying assumptions are no longer valid. Over prediction of travel time can occur for conditions with significant amounts of depression storage, where there is a high Manning's n-value or for flat slopes. One study suggests that the upper limit of applicability of the Kinematic wave equation is a function of flow length, slope and Manning's roughness coefficient. This study used both field and laboratory data to propose an upper limit of 100 for the composite parameter of $nL/s^{1/2}$. It is recommended that this criteria be used as a check where the designer has uncertainty on the maximum flow length to which the Kinematic wave equation can be applied to project conditions.

Where sheet flow travel distance cannot be determined, a conservative alternative is to assume shallow concentrated flow conditions without an independent sheet flow travel time conditions. See Index 816.6(2).

Table 816.6A Roughness Coefficients For Sheet Flow

Surface Description	*n*
Hot Mix Asphalt	0.011-0.016
Concrete	0.012-0.014
Brick with cement mortar	0.014
Cement rubble	0.024
Fallow (no residue)	0.05
Grass	
Short grass prairie	0.15
Dense grass	0.24
Bermuda Grass	0.41
Woods(1)	
Light underbrush	0.40
Dense underbrush	0.80

(1) Woods cover is considered up to a height of 1 inch, which is the maximum depth obstructing sheet flow.

(2) Shallow concentrated flow travel time. After short distances, sheet flow tends to concentrate in rills and gullies, or the depth exceeds the range where use of the Kinematic wave equation applies. At that point the flow becomes defined as shallow concentrated flow. The Upland Method is commonly used when calculating flow velocity for shallow concentrated flow. This method may also be used to calculate the total travel time for both the sheet flow and the shallow concentrated flow segments under certain conditions (e.g., where use of the Kinematic wave equation to predict sheet flow travel time is questionable, or where the designer cannot reasonably identify the point where sheet flow transitions to shallow concentrated flow).

Average velocities for the Upland Method can be taken directly from Figure 816.6 (Source NRCS, National Engineering Handbook part 650) or may be calculated from the following equation:

$$V = (3.28)\, kS^{1/2}$$

Where S is the slope in percent and k is an intercept coefficient depending on land cover as shown in Table 816.6B. It is assumed that the depth range is 0.1 to 0.2 feet, except for grassed waterways, where the depth range is 0.1 to 0.4 feet,

Table 816.6B Intercept Coefficients for Shallow Concentrated Flow

Land cover/Flow regime	k
Forest with heavy ground litter; hay meadow	0.076
Trash fallow or minimum tillage cultivation; contour or strip cropped; woodland	0.152
Short grass pasture	0.213
Cultivated straight row	0.274
Nearly bare and untilled alluvial fans	0.305
Grassed waterway	0.457
Pavement and small upland gullies	0.620

Attachment D

Cultural Resources Inventory Survey, Brentwood Development Project, c. 9.5-acres, City of Redding, Shasta County, California
Gallaway Enterprises, July 19, 2022

Attachment E

Draft Delineation of Aquatic Resources, Brentwood Village Development Project
Redding, Shasta County, California
Gallaway Enterprises, September 2022

DRAFT DELINEATION OF AQUATIC RESOURCES

Brentwood Village Development Project

Redding, Shasta County, California

September 2022



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DRAFT DELINEATION OF AQUATIC RESOURCES,

Brentwood Village Development Project, Redding, California

Introduction and Project Location

Gallaway Enterprises conducted a Delineation of Aquatic Resources including waters of the United States (WOTUS) for the Brentwood Village Development Project consisting of an approximately 12-acre survey area (APN 115-170-014) (Project) located west of Interstate 5 in the City of Redding, Shasta County, California (**Figure 1 and 2**). The Project site is located within the United States Geologic Survey (USGS) Redding Quadrangle, within Section 22, Township 32N, Range 5W.

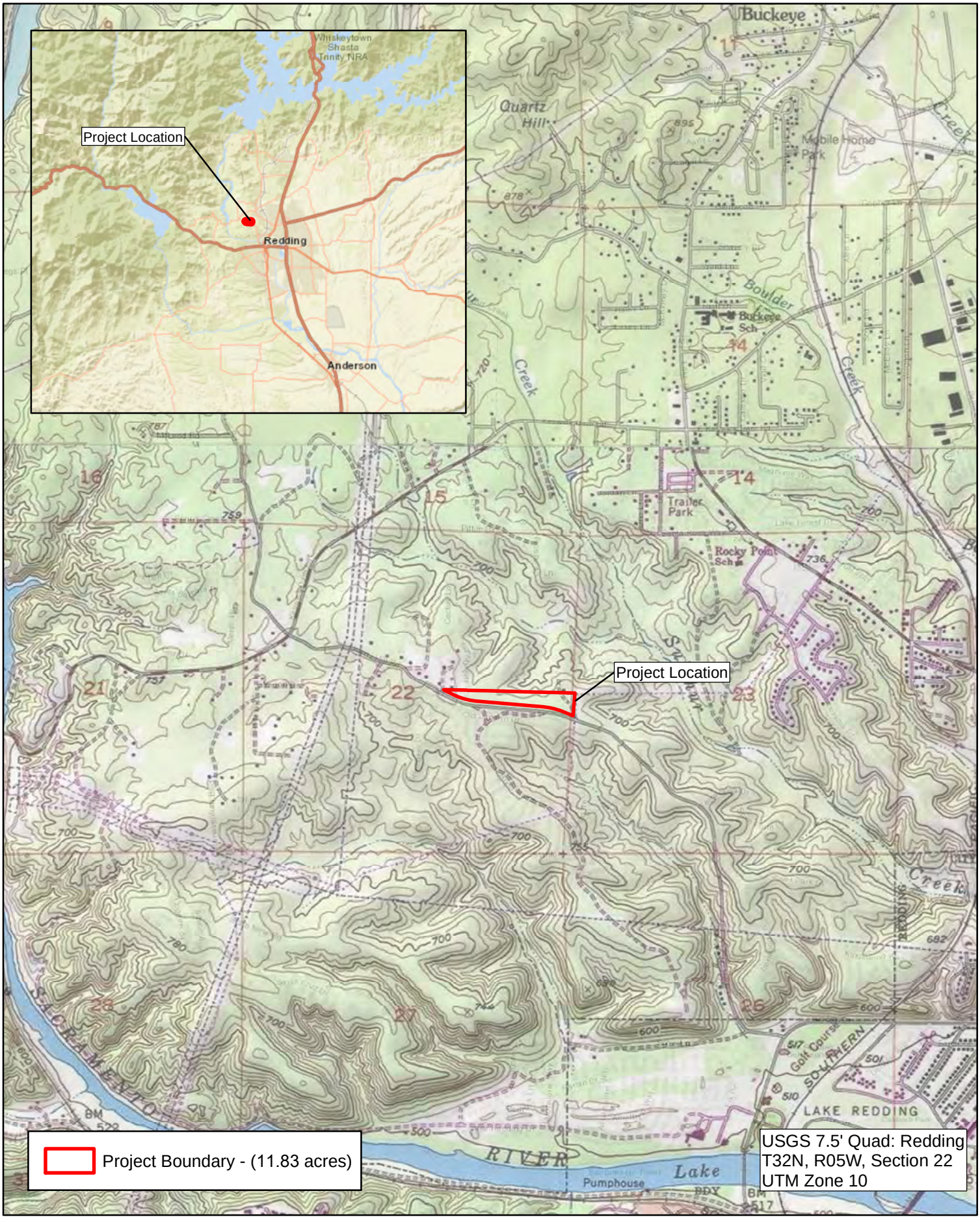
The Project site is accessible from Quartz Hill Road. To access the site from Interstate 5 heading north in the Redding area, take exit 678 and stay left to merge onto CA-44 West. Use the right two lanes to turn right onto CA-273 North/Pine Street (signs for CA-299/Weaverville/Eureka). Use the right lane to turn left at the first cross street onto CA-273 North/Eureka Way (signs for Weaverville/CA-299 W). Turn right onto South Market Street. Cross the Sacramento River and then turn left onto Quartz Hill Road. In approximately 2 miles the Project site occurs on the right-hand side of the road.

A survey of WOTUS was conducted on August 10 and 23, 2022 by Senior Botanist Elena Gregg. Data regarding the location and extent of waters of the United States and other aquatic resources were collected using a Trimble Geo Explorer 6000 Series GPS Receiver. The survey involved an examination of botanical resources, soils, hydrological features, and determination of wetland characteristics based on the *United States Army Corps of Engineers Wetlands Delineation Manual* (1987) (1987 Delineation Manual); the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (2008) (Arid West Manual); the *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* (2007); the *Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (2008), and the *2020 Arid West Regional Wetland Plant List* and the *2020 National Wetland Plant List.* Gallaway Enterprises have prepared this report in compliance with the Minimum Standards for Acceptance of Aquatic Resources Delineation Reports (January 2016).

Environmental Setting and Site Conditions

The Project site is located within northern city limits of Redding, California at the toe of the foothills associated with the eastern Klamath Range. The site is primarily composed of blue oak-foothill pine woodland with a sparse to moderately dense shrub layer of white leaf manzanita and an understory of annual grassland. The site is relatively flat to lightly sloped toward the north. The one man-made drainage flows south to north through the site. Numerous gravel and dirt roads occur within the site. A few vernal features occur within or abutting these roads in the eastern portion of the site. Dense residential development occurs to the south of the Project site and rural residential development occurs to the north west and northeast. Steeply sloped open woodland occurs to the north of the Project site.

The average annual precipitation is 33. 68 inches and the average annual temperature is 62.45° F (WRCC 2022) in the region where the Project site is located. The site occurs at an elevation of approximately 748 to 761 feet above sea level. The site is slightly sloped to the north with slopes ranging between 0 and 15 percent. Soils within the site are primarily gravelly loams with a duripan that ranges in depth from 10 to 30 inches.



NORTH

1:24,000

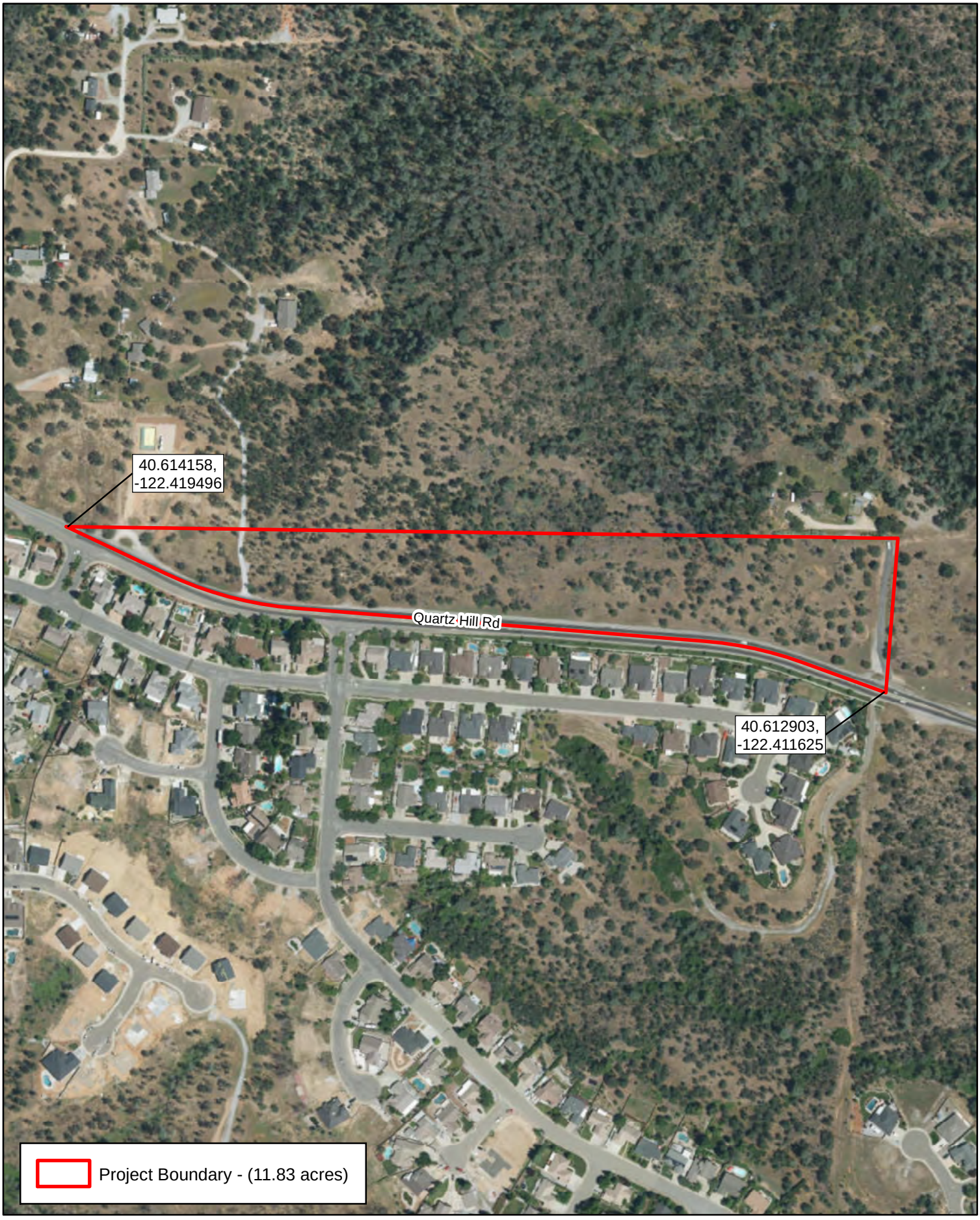
0 0.25 0.5 Miles

Data Sources: ESRI, USGS
Shasta County

Brentwood Village Development Project
Regional Location
Figure 1

gallaway ENTERPRISES

GE: #22-105 Map Date: 08/16/2022



1:4,002

0 200 400 Feet

NORTH

Data Sources: ESRI, City of Redding 05/27/2020

Brentwood Village Development Project
Project Location
Figure 2

gallaway ENTERPRISES

GE: #22-105 Map Date: 09/02/2022

Survey Methodology

The entire Project site was surveyed on-foot by Gallaway Enterprises staff on August 10 and 23, 2022 to identify any potentially jurisdictional features. The survey, mapping efforts, and report production were performed according to the current valid legal definitions of WOTUS in effect as of September 20, 2021. The boundaries of non-tidal, non-wetland waters, when present, were delineated at the ordinary high water mark (OHWM) as defined in 33 Code of Federal Regulations (CFR) 328.3. The OHWM represents the limit of United States Army Corps of Engineers (Corps) jurisdiction over non-tidal waters (e.g., streams and ponds) in the absence of adjacent wetlands (33 CFR 328.04) (Curtis, et. al. 2011). Historic aerial photographs available on Google Earth were analyzed prior to conducting the field visit. Areas identified as having potential wetland or unusual aerial signatures were assessed in the field to determine the current conditions.

Field data were entered onto data sheets using the most current format (**Appendix A**). Wetland perimeters based on the 1987 Delineation Manual and the Arid West Manual were recorded and defined according to their topographic and hydrologic orientation. Sample points were established for each wetland and corresponding upland zone for all wetland features. In addition, test pit sampling was performed and/or photographs were taken in areas displaying potential wetland signatures on aerial photographs and depressional topography. At each sampling point/test pit the data collected involved physical sampling of soils, recording dominant vegetation, and investigation regarding wetland hydrology indicators and hydrological connectivity. Only areas exhibiting the necessary wetland parameters according to the 1987 Delineation Manual and Arid West Manual on the date surveyed were mapped as wetlands. Photographs were taken to show wetland features, test pit areas, and/or areas identified as having unusual aerial signatures. The locations of the photo points are depicted in **Figure 3** and the associated photographs are provided at the end of the report.

Many of the terms used throughout this report have specific meanings relating to the federal wetland delineation process. Term definitions are based on the Corps 1987 Delineation Manual; the Arid West Manual; *Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States, (*Lichvar and McColley 2008*)* and the Corps *Jurisdictional Determination Form Instructional Guidebook* (2007). The terms defined below have specific meaning relating to the delineation of WOTUS as prescribed by §404 of the Clean Water Act (CWA) and described in 33 CFR Part 328 and 40 CFR Parts 110, 112, and 116, and 122.

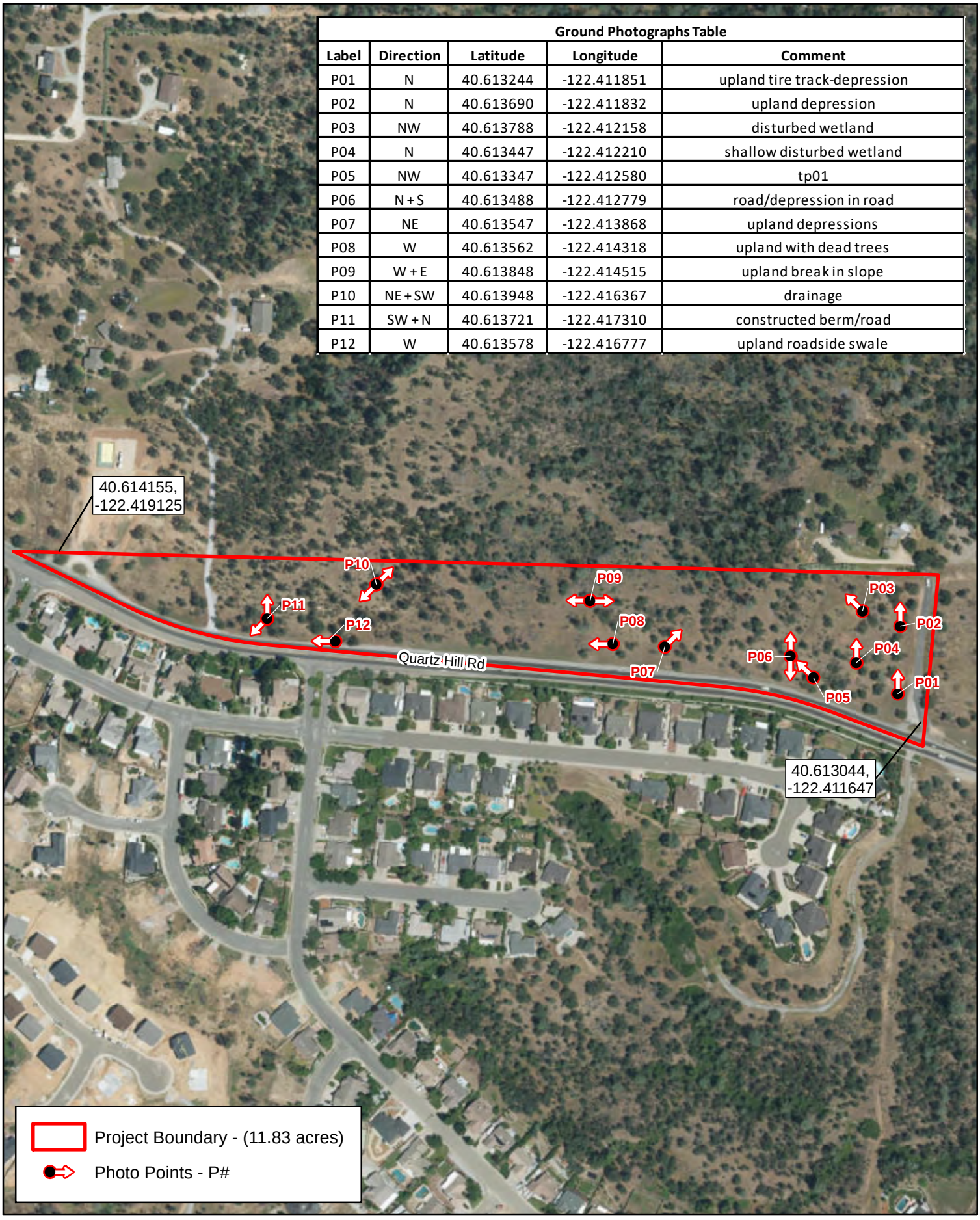
Determination of Hydrophytic Vegetation

The presence of hydrophytic vegetation was determined using the methods outlined in the 1987 Delineation Manual and the Arid West Manual. Areas were considered to have positive indicators of hydrophytic vegetation if they pass the dominance test, meaning more than 50 percent of the dominant species are obligate wetland, facultative wetland and facultative plants. Plant species were identified to the lowest taxonomy possible. Plant indicator status was determined by reviewing the 2020 Arid West Region Wetland Plant List and the 2020 National Wetland Plant List. In situations where dominance can be misleading due to seasonality, the prevalence index will be used to determine hydrophytic status of the community surrounding sample sites.

Plant indicator status categories:

Obligate wetland plants (OBL) – plants that occur almost always (estimated probability 99%) in wetlands under normal conditions, but which may also occur rarely (estimated probability 1%) in non-wetlands.

Facultative wetland plants (FACW) - plants that usually occur (estimated probability 67% to 99%) in


Ground Photographs Table
Label | Direction | Latitude | Longitude | Comment
P01 | N | 40.613244 | -122.411851 | upland tire track-depression
P02 | N | 40.613690 | -122.411832 | upland depression
P03 | NW | 40.613788 | -122.412158 | disturbed wetland
P04 | N | 40.613447 | -122.412210 | shallow disturbed wetland
P05 | NW | 40.613347 | -122.412580 | tp01
P06 | N + S | 40.613488 | -122.412779 | road/depression in road
P07 | NE | 40.613547 | -122.413868 | upland depressions
P08 | W | 40.613562 | -122.414318 | upland with dead trees
P09 | W + E | 40.613848 | -122.414515 | upland break in slope
P10 | NE + SW | 40.613948 | -122.416367 | drainage
P11 | SW + N | 40.613721 | -122.417310 | constructed berm/road
P12 | W | 40.613578 | -122.416777 | upland roadside swale
40.614155, -122.419125
40.613044, -122.411647
Quartz Hill Rd
P01
P02
P03
P04
P05
P06
P07
P08
P09
P10
P11
P12
Project Boundary - (11.83 acres)
Photo Points - P#
NORTH
1:3,600 1 inch = 300 feet
0 200 400 Feet
Data Sources: ESRI, City of Redding 05/27/2020
Brentwood Village Development Project
Ground Photographs
Figure 3
gallaway ENTERPRISES
GE: #22-105 Map Date: 09/02/2022

wetlands under normal conditions, but also occur (estimated probability 1% to 33%) in non-wetlands.

Facultative plants (FAC) – Plants with a similar likelihood (estimated probability 33% to 67%) of occurring in both wetlands and non-wetlands.

Facultative upland plants (FACU) – Plants that occur sometimes (estimated probability1% to 33%) in wetlands, but occur more often (estimated probability 67% to 99%) in non-wetlands.

Obligate upland plants (UPL) – Plants that occur rarely (estimated probability 1%) in wetlands, but occur almost always (estimated probability 99%) in non-wetlands under natural conditions.

Determination of Hydric Soils

Soil survey information was reviewed for the current site condition. The field samples were evaluated by using the Munsell soil color chart (2009 Edition), hand texturing, and assessing soil features (e.g. oxidized root channels, evidence of hardpan, Mn and Fe concretions). Information regarding local soil and series descriptions is provided in **Appendix B.** Numerous soil pits (**Appendix A**) were dug in portions of the site that exhibited concave or swale-like micro-topography. The current Natural Resources Conservation Service (NRCS) *Field Indicators of Hydric Soils in the United States, Version 8.2* (NRCS 2018) was used in conjunction with the Arid West Manual to determine the presence of hydric soil indicators.

Determination of Wetland Hydrology

Wetland hydrology was determined to be present if a site supported one or more of the following characteristics:

- Landscape position and surface topography (e.g. position of the site relative to an up-slope water source, location within a distinct wetland drainage pattern, and concave surface topography),
- Inundation or saturation for a long duration either inferred based on field indicators or observed during repeated site visits, and
- Residual evidence of ponding or flooding resulting in field indicators such as scour marks, sediment deposits, algal matting, surface soil cracks and drift lines.

The presence of water or saturated soil for approximately 12% or 14 consecutive days during the growing season typically creates anaerobic conditions in the soil, and these conditions affect the types of plants that can grow and the types of soils that develop (Wetland Training Institute 1995).

Historic aerial photographs were analyzed to look for primary and secondary wetland hydrology indicators of inundation or saturation. The historic aerial imagery reviewed was the public, readily available imagery provided on Google Earth. If aerial signatures demonstrated the presence of surface water on 1 or more of the historic aerial photographs viewed, inundation and a primary indicator of wetland hydrology was determined to be present. Saturation, a secondary indicator of wetland hydrology, was determined to be present if saturation, "darker patches within the field," were observed on 1 or more of the historic aerial photographs viewed and the presence of hydric soils was confirmed in these areas during the field survey.

Determination of Ordinary High Water Mark

Gallaway utilized methods consistent with the Arid West Manual and *Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States, (2008)* to determine the OHWM. The lateral extents of non-tidal water bodies (e.g. intermittent and ephemeral streams) were based on the OHWM, which is "the line on the shore established by the fluctuations of water" (Corps 2005). The OHWM was determined based on multiple observed physical characteristics of

the area, which can include scour, multiple observed flow events (from current and historical aerial photos), shelving, and changes in the character of soil, presence of mature vegetation, deposition, and topography. Due to the wide extent of some floodplains, adjacent riparian scrub areas characterized by hydric soils, hydrophytic vegetation, and hydrology may be included within the OHWM of a non-tidal water body (Curtis, et. al. 2011). Inclusion of minor special aquatic areas is an acceptable practice as outlined in the Arid West Manual.

Representative OHWM widths were measured in the field in feet incrementally throughout each drainage feature mapped as required by the Corps *Final Map and Drawing Standards for the South Pacific Division Regulatory Program* (2012). The widths measured in the field were used to ensure that other waters of the United States identified within the Project site are mapped and calculated at the appropriate average width for each channel segment based on the Corps definition of OHWM as defined in the Arid West OHWM Field Guide and the *Ordinary High Water Mark Identification RGL 05-05 (2005)* (RGL 05-05). When the average width of a feature changes, this change is shown on the delineation map as a feature transition and a new average channel width is determined.

Determination of Wetland Boundaries in Difficult Wetland Situations

The difficult wetland situation procedures for determining hydrophytic vegetation were used when mapping the boundary of wetlands within the Project site due to the extreme drought conditions experienced in California in 2021 and the winter of 2021/2022 (NOAA 2022). To aid in the determination, spatial patterns, analysis of aerial photographs, topography, and landscape position were used in conjunction with vegetation data to determine the wetland boundary. Areas where wetland vegetation or wetland hydrology was lacking but where the landscape position was likely to concentrate water were closely inspected. Gallaway Enterprises mapped these areas as wetlands if hydric soil indicators were detected and at least one other hydric indicator was present (i.e. wetland hydrology or hydrophytic vegetation).

Aquatic Resource Boundary Determination and Acreage Calculation

The wetland-upland boundary was determined based on the presence or inference of positive indicators of all mandatory criteria. The site was traversed on foot to identify wetland features and boundaries. The spatial data obtained during the preparation of this wetland delineation was collected using a Trimble Geo Explorer 6000 Series GPS Receiver. No readings were taken with fewer than 5 satellites. Point data locations were recorded for at least 25 seconds at a rate of 1 position per second. Area and line data were recorded at a rate of 1 position per second while walking at a slow pace. All GPS data were differentially corrected for maximum accuracy. In some cases, when visual errors and degrees of precision are identified due to environmental factors negatively influencing the precision of the GPS instrument (i.e. dense tree cover, steep topography, and other factors affecting satellite connection) mapping procedures utilized available topographic and aerial imagery datasets in order to improve accuracy in feature alignment and location.

Non-Wetland and Non-Jurisdictional Feature Boundary Determination

Areas were determined to be non-wetlands if they did not meet the necessary wetland test parameters (hydrophytic vegetation, hydric soil, and wetland hydrology) (33 CFR 328.4) and were determined to be potentially non-jurisdictional if they were consistent with the description of non-jurisdictional features as presented in the *Corps Jurisdictional Determination Form Instructional Guidebook* (2007).

During the delineation, a minutely depressed area with some algal crust was encountered in the southeastern portion of the Project site. A test pit (TP01) was taken to assess the vegetative cover and

soil characteristics at that point. Based on the data (**Figure 4**, **Appendix A**), this location did not meet the necessary parameters to be considered a wetland and was not mapped as a feature. There were also three shallow vernal pools (WF01 - WF03) mapped in close proximity to TP01. Photo points were taken of these features and to demonstrate the current site conditions at these locations on the Project site (**Figure 3**). These vernal pools are highly isolated with their hydrology entirely restricted to the Project site. Due to their highly isolated nature, these vernal pools lack a significant nexus to any potentially jurisdictional feature and, thus, do not meet the definition of a jurisdictional WOTUS. However, to verify the jurisdictional status of these features, a significant nexus determination will need to be conducted by the Corps.

Results

Table 1 Summarizes the area calculations for the pre-jurisdictional features within the Project site. A complete Draft Delineation of Aquatic Resources map, utilizing a 1" to 250' scale, is included as **Figure 4**.

Waters of the United States: Other Waters

There is one feature identified as an "other waters of the United States" (OW) within the Project site (**Figure 4**). The area and linear footage data associated with this feature is provided in **Table 1**. Other waters of the United States are seasonal or perennial water bodies, including lakes, stream channels, ephemeral and intermittent drainages, ponds, and other surface water features that exhibit an ordinary high-water mark but lack positive indicators for one or more of the three wetland parameters (hydrophytic vegetation, hydric soil, and wetland hydrology) (33 CFR 328.4). The boundaries of this OW identified within the Project site were delineated based on the observed OHWM, including physical characteristics such as natural lines impressed on the bank, shelving, changes in the character of the soil, the destruction of terrestrial vegetation, debris lines and other appropriate indicators.

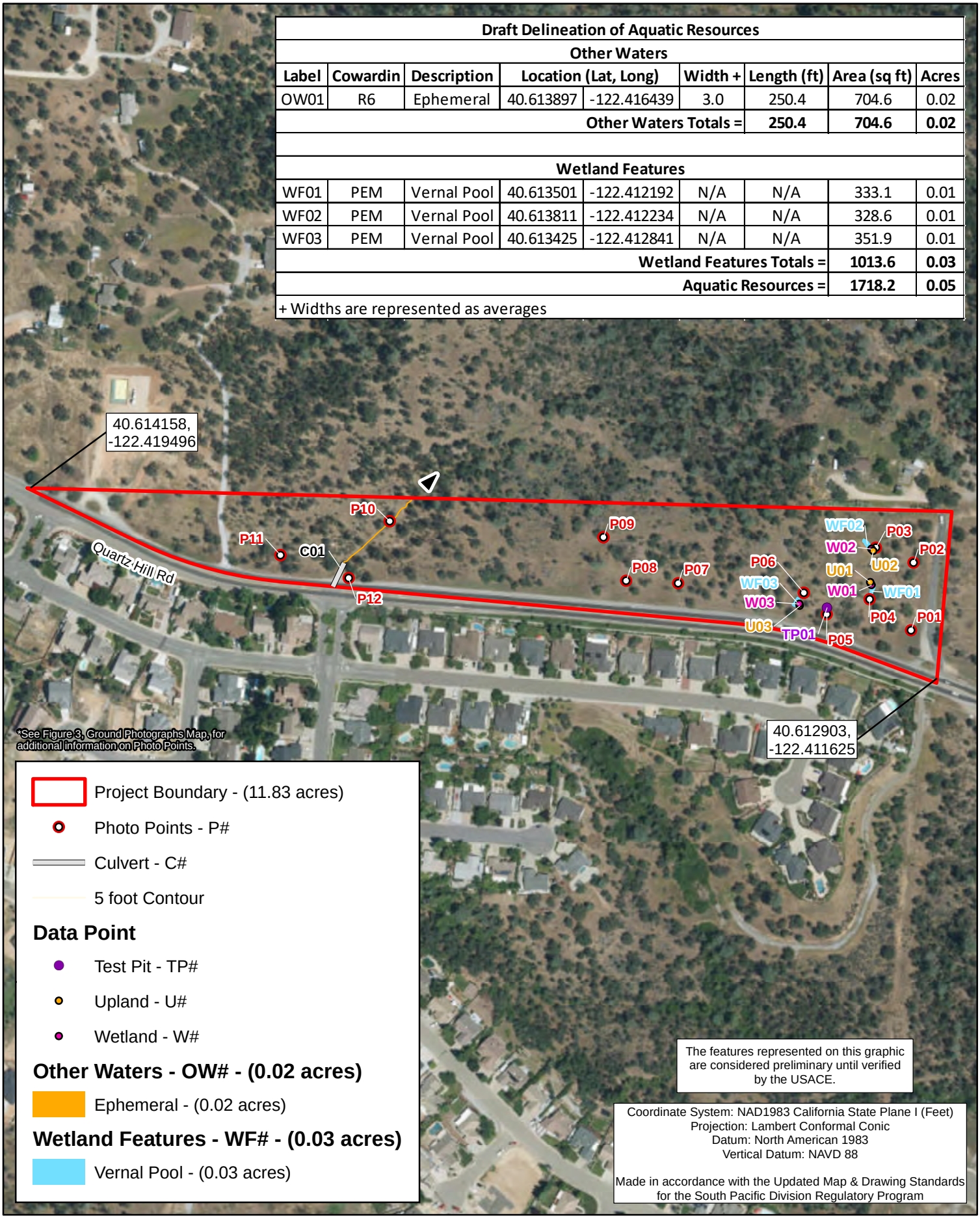
The one OW features identified within the Project has been identified as an ephemeral drainage (OW1). This is an unnamed feature that has been man-made and appears to be used as an open stormwater conveyance feature. Ephemeral drainages are classified by the Corps as Non-Relatively Permanent Waters (NRPW). Non-Relatively Permanent Waters are defined as tributaries that typically flow for less than 3 months of the year and have a documented hydrologic connection to a Traditionally Navigable Water (TNW). The drainage present on the Project site does have a hydrologic connection to the Sacramento River. The OW feature identified within the Project site was dry on the field survey date and was observed to contain appropriate morphology of bed, bank and scour; however, the OHWM indicators were discontinuous.

Waters of the United States: Wetlands

Three wetland features occurring within the Project site have been characterized as vernal pools (**Figure 4**). Vernal pools are depressional features that stay ponded or saturated into late spring and are dominated by vernal pool endemic species. All of the wetlands identified within the Project site exhibited all necessary wetland parameters (**Appendix A**). However, the vernal pools present within the Project site are completely isolated features. All of the features are either located within dirt roads or abut dirt roads. Due to the highly isolated nature of these vernal pools (WF01 - WF03), they do not meet the definition of a jurisdictional WOTUS.

Photo points were taken of the wetlands within the Project site (**Figure 3**).

Draft Delineation of Aquatic Resources								
Other Waters								
Label	**Cowardin**	**Description**	**Location (Lat, Long)**		**Width +**	**Length (ft)**	**Area (sq ft)**	**Acres**
OW01	R6	Ephemeral	40.613897	-122.416439	3.0	250.4	704.6	0.02
						Other Waters Totals =	**250.4**	**704.6**	**0.02**
Wetland Features								
WF01	PEM	Vernal Pool	40.613501	-122.412192	N/A	N/A	333.1	0.01
WF02	PEM	Vernal Pool	40.613811	-122.412234	N/A	N/A	328.6	0.01
WF03	PEM	Vernal Pool	40.613425	-122.412841	N/A	N/A	351.9	0.01
						Wetland Features Totals =	**1013.6**	**0.03**
						Aquatic Resources =	**1718.2**	**0.05**
+ Widths are represented as averages								



Project Boundary - (11.83 acres)

Photo Points - P#

Culvert - C#

5 foot Contour

Data Point

Test Pit - TP#

Upland - U#

Wetland - W#

Other Waters - OW# - (0.02 acres)

Ephemeral - (0.02 acres)

Wetland Features - WF# - (0.03 acres)

Vernal Pool - (0.03 acres)

The features represented on this graphic are considered preliminary until verified by the USACE.

Coordinate System: NAD1983 California State Plane I (Feet)
Projection: Lambert Conformal Conic
Datum: North American 1983
Vertical Datum: NAVD 88

Made in accordance with the Updated Map & Drawing Standards for the South Pacific Division Regulatory Program

NORTH

1:3,600 1 inch = 300 feet

0 200 400 Feet

Data Sources: ESRI, City of Redding 05/27/2020

Brentwood Village Development Project
Draft Delineation of Aquatic Resources
Figure 4

gallaway ENTERPRISES

GE: #22-105 Map Date: 09/06/2022

Table 1. Summary of the Draft Delineation of Aquatic Resources Results for the Brentwood Village Development Project.

Draft Delineation of Aquatic Resources						
Wetland Features						
Label	**Cowardin**	**Description**	**Width**	**Length (ft)**	**Area (sq ft)**	**Acres**
WF01	PEM	Vernal Pool	N/A	N/A	333.1	0.01
WF02	PEM	Vernal Pool	N/A	N/A	328.6	0.01
WF03	PEM	Vernal Pool	N/A	N/A	351.9	0.01
				Vernal Pool Totals =	**1013.6**	**0.03**
Other Waters						
Label	**Cowardin**	**Description**	**Width +**	**Length (ft)**	**Area (sq ft)**	**Acres**
OW01	R6	Ephemeral	3.0	250.4	704.6	0.02
				Ephemeral Totals =	**250.4**	**704.6**	**0.02**
				Aquatic Resources Totals =	**250.4**	**1718.2**	**0.05**
+ Widths are represented as averages						

Soils

Gallaway collected soil data at several locations within the Project site. Field observations of soil characteristics included soil color, texture, structure, and the visual assessment of soil features (e.g. the presence, or absence of redoximorphic features and the depth of restrictive layers such as hardpans). Gallaway's soil texture evaluations rendered gravelly loams with iron concentrations. Field observations of soil characteristics at the data point and test pit sites are included in the data sheet forms presented in **Appendix A**.

The geographic region in which the Project is found is often characterized as having a naturally occurring duripan composed of cemented gravelly material that undulates throughout the region. Duripans restrict root growth, limit water infiltration, and result in a perching of the water table in certain locations. The depth of the hand dug soil pits were dug deep enough to determine/rule out the presence/absence of hydric soil indicators.

Gallaway queried the National Cooperative Soil Survey database to further evaluate the current soil conditions. A copy of the soil survey map and a description of mapped soil units for the Project site are included as **Appendix B**. One soil map unit occurs within the Project site. The map unit is listed below in **Table 2**. Based on Gallaway's review, the soil map unit identified within the Project site does not contain hydric components.

Table 2. Soil Map Units, NRCS hydric soil designation, and approximate totals for the Brentwood Village Development Project.

Map Unit Symbol	Map Unit Name	% Hydric Component in Map Unit	Landform of Hydric Component	% Map Unit in Project
RdB	Redding gravelly loam, 0 to 15 percent slopes, moist	N/A	N/A	100%

Vegetation

During the site visit, the dominant vegetation present within the various wetlands within the Project site included hyssop loosestrife (*Lythrum hyssopifolium*) (OBL), perennial ryegrass (*Festuca perennis*) (FAC), popcorn flower (*Plagiobothrys stipitatus*) (FACW), annual hairgrass (*Deschampsia danthonioides*) (FACW), and prairie plantain (*Plantago elongata*) (FACW). Within the OHWM of the one drainage present the dominant vegetation included perennial ryegrass and sparse curly dock (*Rumex crispus*) (FAC).

The upland was dominated by a tree canopy of blue oaks (*Quercus douglasii*) (UPL) and scattered foothill pines (*Pinus sabiniana*) (UPL), a sparse to moderately dense shrub canopy composed of whiteleaf manzanita (*Arctostaphylos viscida* ssp. *viscida*) (UPL), and an understory of annual grassland dominated by greater rattlesnake grass (*Briza maxima*), wild oat (*Avena barbata*), sweet vernal grass (*Anthoxanthum aristatum*) (NL), meduashead (*Elymus caput-medusae*), smooth cat's ear (*Hypochaeris glabra*), rattlesnake weed (*Daucus pusillus*), and soft chess (*Bromus hordeaceus*).

Hydrology

Precipitation, localized surface runoff and capture of runoff from the adjacent residential development provide the main hydrological inputs for the aquatic resources within the Project site. OW01 is an unnamed man-made ephemeral drainage, which functions as a stormwater conveyance feature, that flows offsite to the north into an unnamed tributary of Sulphur Creek. Sulphur Creek is a direct tributary of the Sacramento River.

Three isolated vernal pools are present in the eastern portion of the Project site (WF01 - WF03). These features have no hydrologic connection to any jurisdictional feature and, thus, do not meet the definition of a jurisdictional WOTUS. Vernal pool WF02 is a clearly defined closed depression and WF01 and WF03 are both minutely shallow depressions located within the compacted soils of dirt roads.

Site conditions suggest human alterations were made to the land and aquatic features in the Project site.

To confirm the jurisdictional status of WOTUS within the Project site, a significant nexus determination would need to be conducted by the Corps.

Site Photos Taken on August 10, 2022



P01 – Upland vehicle disturbance looking north



P04 – WF01 looking north



P02 – Upland pit/depression looking north



P05 – TP01 looking northwest



P03 – WF02 looking northwest (note tire track disturbance)



P06 – WF03 within old road looking south



P06 – Upland dirt road looking north



P09 – Upland edge of terrace looking east



P07 – Upland with undulations/depressions looking northeast



P09 – Upland edge of terrace looking west



P08 – Upland opening with fire damaged trees looking west



P10 – OW01 man-made drainage looking southwest



P10 – OW01 man-made drainage looking northeast



P11 – Upland dirt road looking north



P11 – Upland berm/cut looking southwest



P12 – Upland roadside swale looking west

Glossary

Abutting: When referring to wetlands that are adjacent to a tributary, abutting defines those wetlands that are not separated from the tributary by an upland feature, such as a berm or dike.

Adjacent: Adjacent as used in "Adjacent to traditional navigable water," is defined in Corps and EPA regulations as "bordering, contiguous, or neighboring." Wetlands separated from other waters of the U.S. by man-made dikes or barriers, natural river berms, beach dunes and the like are 'adjacent wetlands. A wetland "abuts" a tributary if it is not separated from the tributary by uplands, a berm, dike, or similar feature.

While all wetlands that meet the agencies' definitions are considered adjacent wetlands, only those adjacent wetlands that have a continuous surface connection because they directly abut the tributary (e.g., they are not separated by uplands, a berm, dike, or similar feature) are considered jurisdictional under the plurality standard. (CWA Jurisdiction Following Rapanos v US and Carabell v US 12-02-08).

The regulations define "adjacent" as follows: "[t]he term adjacent means bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes and the like are 'adjacent wetlands.'" Under this definition, a wetland does not need to meet all criteria to be considered adjacent. The agencies consider wetlands to be bordering, contiguous, or neighboring, and therefore "adjacent" if at least one of following three criteria is satisfied:

(1) There is an unbroken surface or shallow sub-surface hydrologic connection between the wetland and jurisdictional waters; or

(2) The wetlands are physically separated from jurisdictional waters by "manmade dikes or barriers, natural river berms, beach dunes, and the like;" or,

(3) Where a wetland's physical proximity to a jurisdictional water is reasonably close, that wetland is "neighboring" and thus adjacent. For example, wetlands located within the riparian area or floodplain of a jurisdictional water will generally be considered neighboring, and thus adjacent. One test for whether a wetland is sufficiently proximate to be considered "neighboring" is whether there is a demonstrable ecological interconnection between the wetland and the jurisdictional waterbody. For example, if resident aquatic species (e.g., amphibians, reptiles, fish, mammals, or waterfowl) rely on both the wetland and the jurisdictional waterbody for all or part of their life cycles (e.g., nesting, rearing, feeding, etc.), that may demonstrate that the wetland is neighboring and thus adjacent. The agencies recognize that as the distance between the wetland and jurisdictional water increases, the potential ecological interconnection between the waters is likely to decrease.

The agencies will also continue to assert jurisdiction over wetlands "adjacent" to traditional navigable waters as defined in the agencies' regulations. Under EPA and Corps regulations and as used in this guidance, "adjacent" means "bordering, contiguous, or neighboring." Finding a continuous surface connection is not required to establish adjacency under this definition. The Rapanos decision does not affect the scope of jurisdiction over wetlands that are adjacent to traditional navigable waters. The agencies will assert jurisdiction over those adjacent wetlands that have a continuous surface connection with a relatively permanent, non-navigable tributary, without the legal obligation to make a significant nexus finding.

Atypical situation (significantly disturbed): In an atypical (significantly disturbed) situation, recent human activities or natural events have created conditions where positive indicators for hydrophytic vegetation, hydric soil, or wetland hydrology are not present or observable.

Channel. "An open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water" (Langbein and Iseri 1960:5).

Channel bank. The sloping land bordering a channel. The bank has steeper slope than the bottom of the channel and is usually steeper than the land surrounding the channel.

Cobbles. Rock fragments 7.6 cm (3 inches) to 25 .4 cm (10 inches) in diameter.

Debris flow. A moving mass of rock fragments, soil, and mud where more than 50% of the particles are larger than sand-sized.

Ditch. A constructed or excavated channel used to convey water.

Drift. Organic debris oriented to flow direction(s) (larger than small twigs).

Ephemeral stream. An ephemeral stream has flowing water only in direct response to precipitation events in a typical year. Ephemeral streambeds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Facultative wetland (FACW). Wetland indicator category; species usually occurs in wetlands (estimated probability 67–99%) but occasionally found in non-wetlands.

Flat. A level landform composed of unconsolidated sediments usually mud or sand. Flats may be irregularly shaped or elongate and continuous with the shore, whereas bars are generally elongate, parallel to the shore, and separated from the shore by water.

Gravel. A mixture composed primarily of rock fragments 2mm (0 .08 inch) to 7.6 cm (3 inches) in diameter. Usually contains much sand.

Growing season. The frost-free period of the year (see U.S. Department of Interior, National Atlas 1970:110-111 for generalized regional delineation).

Herbaceous. With the characteristics of an herb; a plant with no persistent woody stem above ground.

Hydric soil. Soil is hydric that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic (oxygen-depleted) conditions in its upper part (i.e., within the shallow rooting zone of herbaceous plants).

Hydrophyte, **hydrophytic.** Any plant growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

Intermittent stream. An intermittent stream has flowing water during certain times of the year and more than in direct response from precipitation, when elevated groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water.

Jurisdictional Waters. Features that meet the definition of waters of the Unites States provided below and that fall under Corps regulations pursuant to Section 404 of the CWA are considered jurisdictional features.

Litter. Organic debris oriented to flow direction(s) (small twigs and leaves).

Man-induced wetlands. A man-induced wetland is an area that has developed at least some characteristics of naturally occurring wetlands due to either intentional or incidental human activities.

Non-Relatively Permanent Water: A non-relatively permanent water (NRPW) is defined as a tributary that is not a TNW and that typically flows for periods for less than 3 months. NRPWs are jurisdictional when they have a documented significant nexus to TNWs. All NRPWs must also contain appropriate morphology of bed, bank and scour and be clearly connected to a TNW.

Normal circumstances. This term refers to the soil and hydrologic conditions that are normally present, without regard to whether the vegetation has been removed.

Obligate hydrophytes. Species that are found only in wetlands e.g., cattail (*Typha latifolia*) as opposed to ubiquitous species that grow either in wetland or on upland-e .g., red maple (*Acer rubrum*).

Obligate wetland (OBL). Wetland indicator category; species occurs almost always (estimated probability 99%) under natural conditions in wetlands.

Other Waters of the United States. Other waters of the United States are seasonal or perennial water bodies, including lakes, stream channels, drainages, ponds, and other surface water features, that exhibit an ordinary high-water mark but lack positive indicators for one or more of the three wetland parameters (hydrophytic vegetation, hydric soil, and wetland hydrology) (33 CFR 328.4).

Palustrine the Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 parts per thousand. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m (6.6 feet) at low water; and (4) salinity due to ocean-derived salts is less than 0.5 parts per thousand.

Perennial stream. A perennial stream has flowing water year-round during atypical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Ponded. Ponding is a condition in which free water covers the soil surface (e.g., in a closed depression) and is removed only by percolation, evaporation, or transpiration.

Problem area. Problem areas are those where one or more wetland parameters may be lacking because of normal seasonal or annual variations in environmental conditions that result from causes other than human activities or catastrophic natural events**.**

Relatively Permanent Waters of the U.S. Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months).

Scour. Soil and debris movement.

Sheetflow. Overland flow occurring in a continuous sheet; a relatively high-frequency, low-magnitude event.

Shrub. A woody plant which at maturity is usually less than 6 m(20 feet) tall and generally exhibits several erect, spreading, or prostrate stems and has a bushy appearance ; e.g., speckled alder (*Alnus rugosa*) or buttonbush (*Cephalanthus occidentalis*).

Succession. Changes in the composition or structure of an ecological community.

Traditional Navigable Waters (TNWs)."[a]ll waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide." These waters are referred to in this guidance as traditional navigable waters. The traditional navigable waters include all of the "navigable waters of the United States," as defined in

33 C.F.R. Part 329 and by numerous decisions of the federal courts, plus all other waters that are navigable-in-fact (for example, the Great Salt Lake, UT, and Lake Minnetonka, MN). Thus, the traditional navigable waters include, but are not limited to, the "navigable waters of the United States" within the meaning of Section 10 of the Rivers and Harbors Act of 1899 (also known as "Section 10 waters").

Tree. A woody plant which at maturity is usually 6 m (20 feet) or more in height and generally has a single trunk, unbranched for 1 m or more above the ground, and a more or less definite crown; e.g., red maple (*Acer rubrum*), northern white cedar (*Thuja occidentalis*).

Typical Year. Defined by the EPA and Corps as meaning when precipitation and other climactic variables are within the normal periodic range for the geographic area based on a rolling thirty-year period.

Water table. The upper surface of a zone of saturation. No water table exists where that surface is formed by an impermeable body.

Waters of the United States (WOTUS). This is the encompassing term for areas under federal jurisdiction pursuant to Section 404 of the CWA. Waters of the United States are divided into "wetlands" and "other waters of the United States."

Watershed (drainage basin). An area of land that drains to a single outlet and is separated from other watersheds by a divide.

Wetland. Wetlands are defined as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3 [b], 40 CFR 230.3). To be considered under potential federal jurisdiction, a wetland must support positive indicators for hydrophytic vegetation, hydric soil, and wetland hydrology.

Woody plant. A seed plant (gymnosperm or angiosperm) that develops persistent, hard, fibrous tissues, basically xylem; e.g., trees and shrubs.

Xeric. Relating or adapted to an extremely dry habitat.

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Appendix A: Wetland Delineation Data Sheets

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Brentwood Village Development City/County: Redding, Shasta County Sampling Date: 8/10/2022

Applicant/Owner: SDS State: CA Sampling Point: TP01

Investigator(s): E. Gregg Section, Township, Range: Section 22, Township 32N, Range 5W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): slightly concave Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 40.613393 Long: -122.412580 Datum: NAD 83

Soil Map Unit Name: Redding gravelly loam, 0 to 15 percent slopes, moist NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions. Area is a minute depression. Rodent mounds occur within this depression.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Scribneria bolanderi*	20	Yes	Not Listed
2. *Deschampsia danthonioides*	10	Yes	FACW
3. *Anthoxanthum aristatum*	10	Yes	Not Listed
4. *Leontodon saxatilis*	5	No	FACU
5. *Plantago elongata*	5	No	FACW
6.			
7.			
8.			
Total Cover:	50 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 50 % % Cover of Biotic Crust 30 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	15	x 2 =	30
FAC species		x 3 =	0
FACU species	5	x 4 =	20
UPL species	30	x 5 =	150
Column Totals:	50 (A)		200 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: TP01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-0.5	10YR 4/3	98	2.5YR 4/6	2	C	PL	clay loam	
0.5-6	5YR 4/4	90					gravelly clay loam	
	5YR 5/3	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: Soil pit dug deep enough to determine the presence/absence of hydric soil indicators. No hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Brentwood Village Development | City/County: Redding, Shasta County | Sampling Date: 8/10/2022

Applicant/Owner: SDS | State: CA | Sampling Point: W01

Investigator(s): E. Gregg | Section, Township, Range: Section 22, Township 32N, Range 5W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): slightly concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.613543 | Long: -122.412194 | Datum: NAD 83

Soil Map Unit Name: Redding gravelly loam, 0 to 15 percent slopes, moist | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions. Area is a minute depression within an old dirt road. The disturbance is historic and did not appear to be recent.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Deschampsia danthonioides*	75	Yes	FACW
2. *Anthoxanthum aristatum*	5	No	Not Listed
3. *Erodium botrys*	2	No	FACU
4.			
5.			
6.			
7.			
8.			
Total Cover:	82 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 18 % | % Cover of Biotic Crust 5 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	75	x 2 =	150
FAC species		x 3 =	0
FACU species	2	x 4 =	8
UPL species	5	x 5 =	25
Column Totals:	82 (A)		183 (B)

Prevalence Index = B/A = 2.23

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: W01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 4/3	93	2.5YR 4/6	7	C	PL	clay loam	
1-6	5YR 4/4	85	5YR 5/6	5	C	PL	gravelly clay loam	
	5YR 5/3	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☒ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: Soil pit dug deep enough to determine the presence/absence of hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☒ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☒ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Brentwood Village Development | City/County: Redding, Shasta County | Sampling Date: 8/10/2022

Applicant/Owner: SDS | State: CA | Sampling Point: U01

Investigator(s): E. Gregg | Section, Township, Range: Section 22, Township 32N, Range 5W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): none | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.613560 | Long: -122.412206 | Datum: NAD 83

Soil Map Unit Name: Redding gravelly loam, 0 to 15 percent slopes, moist | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ○	No ◉	

Remarks: Drought conditions. Area is relatively flat within a historically disturbed area used as a access road.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Anthoxanthum aristatum*	30	Yes	Not Listed
2. *Deschampsia danthonioides*	10	No	FACW
3. *Erodium botrys*	10	No	FACU
4. *Gastridium phleoides*	5	No	FACU
5.			
6.			
7.			
8.			
Total Cover:	55 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 45 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	10	x 2 =	20
FAC species		x 3 =	0
FACU species	15	x 4 =	60
UPL species	30	x 5 =	150
Column Totals:	55 (A)		230 (B)

Prevalence Index = B/A = 4.18

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: U01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-0.5	10YR 4/3	96	2.5YR 4/6	4	C	PL	clay loam	
0.5-6	5YR 4/4	90					gravelly clay loam	
	5YR 5/3	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: Soil pit dug deep enough to determine the presence/absence of hydric soil indicators. No hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No wetland hydrology indicators observed.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Brentwood Village Development | City/County: Redding, Shasta County | Sampling Date: 8/10/2022

Applicant/Owner: SDS | State: CA | Sampling Point: W02

Investigator(s): E. Gregg | Section, Township, Range: Section 22, Township 32N, Range 5W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): concave | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.613780 | Long: -122.412197 | Datum: NAD 83

Soil Map Unit Name: Redding gravelly loam, 0 to 15 percent slopes, moist | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions. Area is a clear depression positioned between a dirt road and disturbance from tire tracks. The tire track disturbance did not appear to be recent.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Deschampsia danthonioides*	10	Yes	FACW
2. *Plagiobothrys stipitatus*	5	Yes	FACW
3. *Leontodon saxatilis*	5	Yes	FACU
4. *Plantago elongata*	3	No	FACW
5.			
6.			
7.			
8.			
Total Cover:	23 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 77 % | % Cover of Biotic Crust 35 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	18	x 2 =	36
FAC species		x 3 =	0
FACU species	5	x 4 =	20
UPL species		x 5 =	0
Column Totals:	23 (A)		56 (B)

Prevalence Index = B/A = 2.43

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: W02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/3	95	2.5YR 4/6	5	C	PL	clay loam	
2-6	5YR 4/4	90					gravelly clay loam	
	5YR 5/3	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☒ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: Soil pit dug deep enough to determine the presence/absence of hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☒ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Brentwood Village Development City/County: Redding, Shasta County Sampling Date: 8/10/2022

Applicant/Owner: SDS State: CA Sampling Point: U02

Investigator(s): E. Gregg Section, Township, Range: Section 22, Township 32N, Range 5W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 40.613768 Long: -122.412182 Datum: NAD 83

Soil Map Unit Name: Redding gravelly loam, 0 to 15 percent slopes, moist NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ○	No ◉	

Remarks: Drought conditions. Area is relatively flat within a historically disturbed area from vehicle use.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Leontodon saxatilis*	20	Yes	FACU
2. *Anthoxanthum aristatum*	15	Yes	Not Listed
3. *Deschampsia danthonioides*	12	Yes	FACW
4. *Logfia gallica*	5	No	UPL
5. *Erodium botrys*	3	No	FACU
6.			
7.			
8.			
Total Cover:	55 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 45 % % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	12	x 2 =	24
FAC species		x 3 =	0
FACU species	23	x 4 =	92
UPL species	20	x 5 =	100
Column Totals:	55 (A)		216 (B)

Prevalence Index = B/A = 3.93

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: U02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-0.5	10YR 4/3	98	2.5YR 4/6	2	C	PL	clay loam	
0.5-6	5YR 4/4	90					gravelly clay loam	
	5YR 5/3	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: Soil pit dug deep enough to determine the presence/absence of hydric soil indicators. No hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No wetland hydrology indicators observed.

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Brentwood Village Development City/County: Redding, Shasta County Sampling Date: 8/23/2022

Applicant/Owner: SDS State: CA Sampling Point: W03

Investigator(s): E. Gregg Section, Township, Range: Section 22, Township 32N, Range 5W

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): C - Mediterranean California Lat: 40.613416 Long: -122.412819 Datum: NAD 83

Soil Map Unit Name: Redding gravelly loam, 0 to 15 percent slopes, moist NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ◉	No ○	
Hydric Soil Present?	Yes ◉	No ○	**Is the Sampled Area within a Wetland?** Yes ◉ No ○
Wetland Hydrology Present?	Yes ◉	No ○	

Remarks: Drought conditions. Area is a depression within an old dirt road.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Deschampsia danthonioides*	25	Yes	FACW
2. *Leontodon saxatilis*	10	No	FACU
3. *Lythrum hyssopifolia*	5	No	OBL
4. *Plantago elongata*	3	No	FACW
5. *Hordeum marinum ssp. gussoneanum*	2	No	FAC
6.			
7.			
8.			
Total Cover:	45 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 55 % % Cover of Biotic Crust 25 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	28	x 2 =	56
FAC species	2	x 3 =	6
FACU species	10	x 4 =	40
UPL species		x 5 =	0
Column Totals:	45 (A)		107 (B)

Prevalence Index = B/A = 2.38

Hydrophytic Vegetation Indicators:

- ☒ Dominance Test is >50%
- ☒ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ◉ No ○

Remarks:

SOIL

Sampling Point: W03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	5YR 4/6	70	2.5YR 4/8	7	C	PL	gravelly clay loam	
	7.5YR 5/3	23						
1-6	5YR 4/6	85	2.5YR 4/8	5	C	PL	gravelly clay loam	
	7.5YR 5/3	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☒ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ◉ No ○

Remarks: Soil pit dug deep enough to determine the presence/absence of hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☒ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☒ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ◉ No ○

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Arid West Region

Project/Site: Brentwood Village Development | City/County: Redding, Shasta County | Sampling Date: 8/23/2022

Applicant/Owner: SDS | State: CA | Sampling Point: U03

Investigator(s): E. Gregg | Section, Township, Range: Section 22, Township 32N, Range 5W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): convex | Slope (%): 0

Subregion (LRR): C - Mediterranean California | Lat: 40.613403 | Long: -122.412814 | Datum: NAD 83

Soil Map Unit Name: Redding gravelly loam, 0 to 15 percent slopes, moist | NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ○ No ◉ (If no, explain in Remarks.)

Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ◉ No ○

Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ○	No ◉	
Hydric Soil Present?	Yes ○	No ◉	**Is the Sampled Area within a Wetland?** Yes ○ No ◉
Wetland Hydrology Present?	Yes ○	No ◉	

Remarks: Drought conditions. Area is moderately convex within a historically disturbed area from vehicle use.

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:	%		
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:	%		
Herb Stratum			
1. *Bromus hordeaceus*	30	Yes	FACU
2. *Leontodon saxatilis*	30	Yes	FACU
3. *Hordeum marinum ssp. gussoneanum*	5	No	FAC
4. *Plantago elongata*	3	No	FACW
5. *Deschampsia danthonioides*	2	No	FACW
6.			
7.			
8.			
Total Cover:	70 %		
Woody Vine Stratum			
1.			
2.			
Total Cover:	%		

% Bare Ground in Herb Stratum 30 % | % Cover of Biotic Crust 0 %

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0 % (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	0
FACW species	5	x 2 =	10
FAC species	5	x 3 =	15
FACU species	60	x 4 =	240
UPL species		x 5 =	0
Column Totals:	70 (A)		265 (B)

Prevalence Index = B/A = 3.79

Hydrophytic Vegetation Indicators:

- ◉ Dominance Test is >50%
- ◉ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ○ No ◉

Remarks:

SOIL

Sampling Point: U03

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	7.5YR 4/4	68	5YR 5/8	2	C	PL	gravelly clay loam	
	7.5YR 5/3	30						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. CS=Covered or Coated Sand Grains

[2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5) (**LRR C**)
- ☐ 1 cm Muck (A9) (**LRR D**)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Vernal Pools (F9)

Indicators for Problematic Hydric Soils: [3]

- ☐ 1 cm Muck (A9) (**LRR C**)
- ☐ 2 cm Muck (A10) (**LRR B**)
- ☐ Reduced Vertic (F18)
- ☐ Red Parent Material (TF2)
- ☐ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present. unless distributed or problematic

Restrictive Layer (if present):

Type: N/A

Depth (inches):

Hydric Soil Present? Yes ○ No ◉

Remarks: Soil pit dug deep enough to determine the presence/absence of hydric soil indicators. No hydric soil indicators met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1) (**Nonriverine**)
- ☐ Sediment Deposits (B2) (**Nonriverine**)
- ☐ Drift Deposits (B3) (**Nonriverine**)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Salt Crust (B11)
- ☐ Biotic Crust (B12)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Plowed Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Marks (B1) (**Riverine**)
- ☐ Sediment Deposits (B2) (**Riverine**)
- ☐ Drift Deposits (B3) (**Riverine**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ○ No ◉ Depth (inches):

Water Table Present? Yes ○ No ◉ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ○ No ◉ Depth (inches):

Wetland Hydrology Present? Yes ○ No ◉

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No wetland hydrology indicators observed.

Appendix B: NRCS Soils Map and Soil Series Description

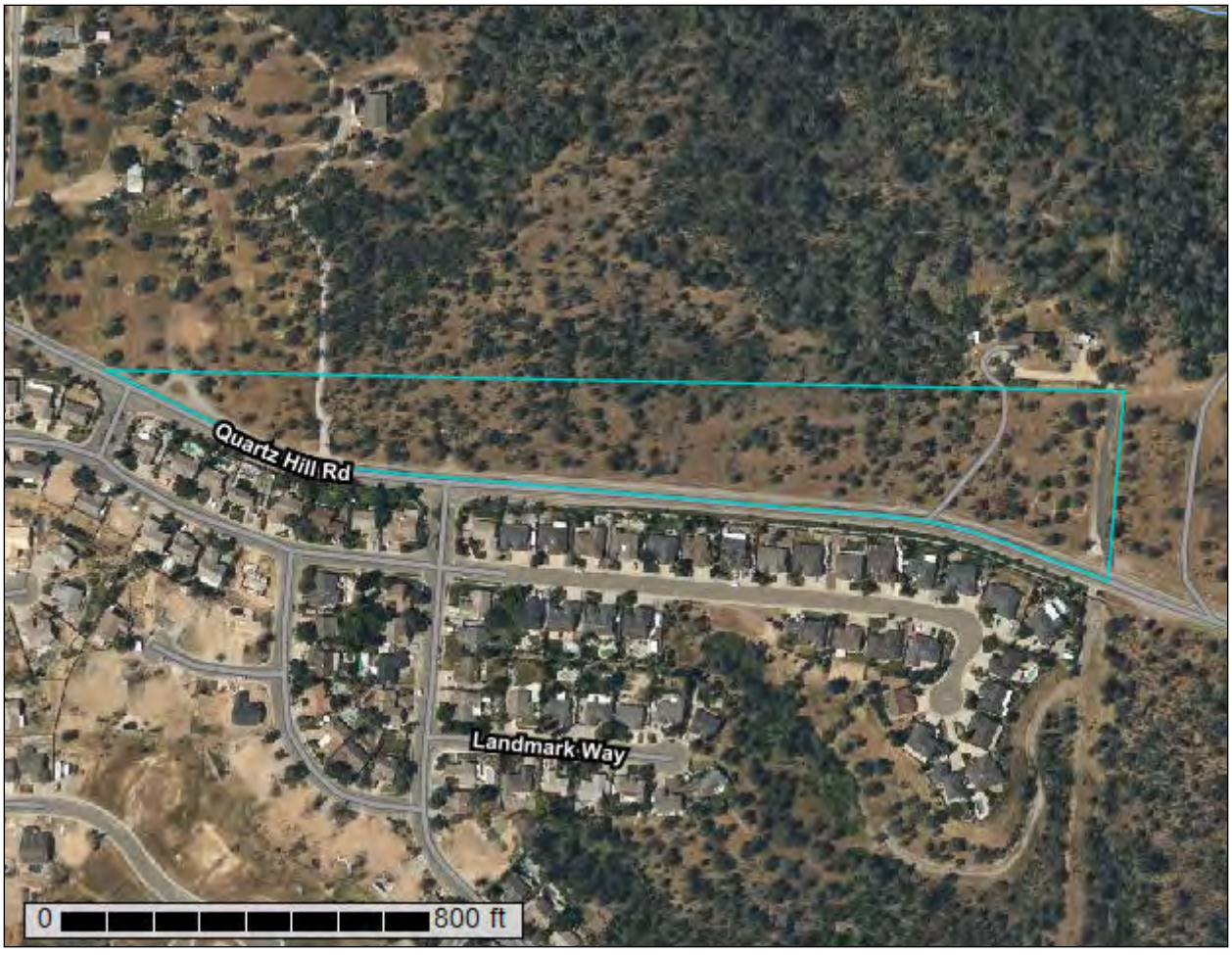
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Shasta County Area, California



September 6, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,710 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Shasta County Area, California
Survey Area Data: Version 16, Sep 6, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 8, 2019—Jun 21, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
RdB	Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17	11.8	100.0%
Totals for Area of Interest		**11.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Shasta County Area, California

RdB—Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17

Map Unit Setting

National map unit symbol: 2w8bn
Elevation: 430 to 1,100 feet
Mean annual precipitation: 28 to 48 inches
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 310 to 335 days
Farmland classification: Not prime farmland

Map Unit Composition

Redding and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redding

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous, metamorphic and sedimentary rock over clayey alluvium derived from igneous, metamorphic and sedimentary rock over cemented alluvium derived from igneous, metamorphic and sedimentary rock over tehama formation

Typical profile

A1 - 0 to 5 inches: gravelly loam
A2 - 5 to 6 inches: loam
Bt - 6 to 13 inches: clay
Btqm - 13 to 28 inches: cemented very gravelly material
2C - 28 to 60 inches: stratified sand to loam to clay

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches; 10 to 30 inches to duripan
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: About 5 to 13 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.2 to 0.5 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R017XD089CA - ACID TERRACE
Hydric soil rating: No

Minor Components

Red bluff

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Clough

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Tread
Microfeatures of landform position: Swales
Down-slope shape: Linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Newtown

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Land Classifications

This folder contains a collection of tabular reports that present a variety of soil groupings. The reports (tables) include all selected map units and components for each map unit. Land classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Hydric Soil List - All Components

This table lists the map unit components and their hydric status in the survey area. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; Hurt and others, 2002).

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin and others, 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for all of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the

upper part (Federal Register, 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

Map units that are dominantly made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units dominantly made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The criteria for hydric soils are represented by codes in the table (for example, 2). Definitions for the codes are as follows:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
    A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
    B. Show evidence that the soil meets the definition of a hydric soil;
3. Soils that are frequently ponded for long or very long duration during the growing season.
    A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or
    B. Show evidence that the soil meets the definition of a hydric soil;
4. Map unit components that are frequently flooded for long duration or very long duration during the growing season that:
    A. Based on the range of characteristics for the soil series, will at least in part meet one or more Field Indicators of Hydric Soils in the United States, or

B. Show evidence that the soil meets the definition of a hydric soil;

Hydric Condition: Food Security Act information regarding the ability to grow a commodity crop without removing woody vegetation or manipulating hydrology.

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Report—Hydric Soil List - All Components

Hydric Soil List - All Components–CA607-Shasta County Area, California					
Map symbol and map unit name	**Component/Local Phase**	**Comp. pct.**	**Landform**	**Hydric status**	**Hydric criteria met (code)**
RdB: Redding gravelly loam, 0 to 15 percent slopes, moist, MLRA 17	Redding	85	Fan remnants	No	—
	Red Bluff	5	Fan remnants	No	—
	Clough	5	Fan remnants	No	—
	Newtown	5	Fan remnants	No	—

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United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

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Attachment F

Re: Brentwood Timeline 22.0143.000,
Kevin Sevier, Gallaway Enterprises, June 4, 2025

From:	Nicole Dues
To:	Castro, Danny
Cc:	To Be Filed
Subject:	FW: Brentwood Timeline 22.0143.000
Date:	Wednesday, June 4, 2025 12:41:24 PM

CAUTION: This email originated from outside the City of Redding; please be careful with links or attachments.

Hi Danny,

As a follow up to the bio and WD questions on Brentwood, the biologist offers his responses in the email below. Please let me know if anything remains to be addressed.

Thanks!

Nicole Dues
Land Planner
Sharrah Dunlap Sawyer, Inc.
320 Hartnell Avenue, Redding, CA 96002
530.221.1792 ext. 146
www.sdsengineering.com

From: Kevin Sevier <kevin@gallawayenterprises.com>
Sent: Wednesday, June 4, 2025 12:31 PM
To: Nicole Dues <ndues@sdsengineering.com>
Cc: To Be Filed <tobefiled@sdsengineering.com>; Anthony Mclaughlin <Anthony@gallawayenterprises.com>
Subject: Re: Brentwood Timeline 22.0143.000

Waters of the State:
Yes, all of the features would likely be waters of the State. A 401 Water Quality Certification should be applied for and acquired as well as a Fish and Game Code 1602 Streambed Alteration Agreement for impacts to aquatic features at the site.

Regarding spadefoot toad surveys:
There is no specific protocol for western spadefoot toad surveys. We utilize the following survey methodology for spadefoots

- Shedd 2016 Distribution of the Western Spadefoot (Spea hammondii) in the Northern Sacramento Valley of California
- Devan-Song and Moniz 2021 Confirmation Bias Perpetuates Century-Old Ecological Misconception: Evidence Against 'Secretive' Behavior of Eastern Spadefoots, and

USFWS 2005 Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog.

Looking back to emails on this topic and project from 5/22/2024 we had a discussion on this topic: Danny asked:

- *A memo (attached) regarding the western spadefoot toad was provided. Can Gallaway confirm that the survey conducted was done at the correct time of year? Furthermore, does this change the recommendation in the BRA for spadefoot or is it still recommended that two nighttime preconstruction surveys be performed?*

My response:

- *The survey was conducted during the correct time of year and followed precipitation events per the survey protocols. My opinion is that additional nighttime surveys during the winter and after precipitation events is not needed but CDFW might have the opinion to survey again next yea*r.

If the City wants to work in an abundance of caution then sure, a follow up survey for spadefoot could be done.

Kevin Sevier
Gallaway Enterprises
(530) 332-9909

Attachment G

Re: Response to CDFW email dated December 4, 2023
titled Early Consultation for Tentative Subdivision Parcel Map S-2023-00802 (Brentwood Village)
Gallaway Enterprises, February 26, 2024

gallaway
ENTERPRISES

117 Meyers Street • Suite 120 • Chico CA 95928 • 530-332-9909

February 26, 2024

Nicole Dues
Land Planner
Sharrah Dunlap Sawyer, Inc.
320 Hartnell Avenue
Redding, CA 96002

RE: Response to CDFW email dated December 4, 2023 titled Early Consultation for Tentative Subdivision Parcel Map S-2023-00802 (Brentwood Village)

Ms. Dues,

The following is a response to the California Department of Fish and Wildlife (CDFW) early consultation letter dated December 4, 2023.

Bumble Bees

CDFW states that the Project area intersects with the range for Crotch bumble bee and that there may be potentially suitable habitat for Crotch bumble bee with the Project area. CDFW recommends a qualified biologist conduct a bumble bee habitat assessment and thorough analysis of potential impacts to bumble bees, and that the assessment and analysis should be included in the environmental document. A review of the observations and findings documented in the original BRA and a desktop analysis of the Project site was conducted. There is no suitable essential habitat for Crotch bumble bee within the Project area. Floral resources within the grassland habitat are insufficient to support Crotch bumble bees year-round; and no known Crotch bumble bee food sources were observed during the botanical survey conducted on August 10, 2022. Additionally, the nearest Crotch bumble bee CNDDB occurrence is approximately 31 miles southeast of the BSA in Red Bluff, and the nearest Bumble Bee Watch sighting is approximately 50 miles southeast of the BSA in Vina. An on-site assessment for Crotch bumble bee is not warranted due to the lack of suitable essential habitat or nearby recorded occurrences.

Sincerely,

Kevin Sevier
Vice President and Senior Planner
Gallaway Enterprises, Inc.

Attached: Copy of email comments from CDFW to Danny Castro dated December 4, 2023

From: Iacona, Erika@Wildlife
To: Castro, Danny
Subject: Early Consultation for Tentative Subdivision Parcel Map S-2023-00802
Date: Monday, December 4, 2023 12:55:27 PM
Attachments: image001.png

CAUTION: This email originated from outside the City of Redding; please be careful with links or attachments.

Dear Danny Castro,

The California Department of Fish and Wildlife (CDFW) has received the consultation request for Tentative Subdivision Parcel Map S-2023-00802, a proposal to subdivide 9.4 acres into 60 residential units (Project). As a trustee for the state's fish and wildlife resources, CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and their habitat. As a responsible agency, CDFW administers the California Endangered Species Act (CESA) and other provisions of the Fish and Game Code (Fish & Game Code) that conserve the state's fish and wildlife public trust resources. CDFW offers the following comments and recommendations on this Project in our role as a trustee and responsible agency pursuant to the California Environmental Quality Act (CEQA), California Public Resources Code section 21000 et seq. The following are informal comments intended to assist the Lead Agency in making informed decisions early in the Project development and review process.

It has been noted that the Biological Resource Assessment (BRA) was written in September 2022, but not submitted for CDFW review until November 2023. Please note that submitting biological results and reports for CDFW review early in the project development process will allow CDFW to provide more thorough and meaningful comments to assist the Lead Agency in adequately avoiding and minimizing impacts to biological resources. As a reminder, such reports may be submitted for CDFW review as early as possible, which would provide the Lead Agency more time to consider and integrate CDFW comments and recommendations. For example, and as you will see below, the California Endangered Species Act (CESA) listing status has changed for some species, now requiring a thorough impact assessment during CEQA review, since impacts to such species have the potential to be significant. Earlier submittal of study reports for CDFW review will aid in alleviating the need for rushed biological surveys and last-minute changes to CEQA documentation, while increasing the transparency of potentially significant impacts to the public and trustee agencies.

Nesting Birds

CDFW concurs with the proposed Avoidance and minimization measures (AMM) in the BRA to avoid and minimize potential impacts to nesting birds.

Bats

CDFW concurs with the proposed AMM's in the BRA to avoid and minimize potential impacts to bats.

Bumble Bees

On September 30, 2022, the candidacy of four California bumble bee species was reinstated under the CESA, including Crotch's bumble bee (*Bombus crotchii*), whose range bisects the Project area. As

such, these bumble bees receive the same legal protection afforded to an endangered or threatened species (Fish and Game Code, §§ 2074.2 & 2085). It is illegal to import, export, take (hunt, pursue, catch, capture, or kill, or attempt engage in any of these activities), possess, purchase, or sell CESA-listed species, or any part or product thereof (Fish and Game Code, §§§ 86, 2080, 2085). Crotch's bumble bees were once common throughout most of California and the western United States however, research and analysis by the Xerces Society suggests there have been sharp declines in their relative abundance due to habitat disturbances, increasing temperatures, drought, and pesticide use.

The Project area may be potentially suitable habitat for these species. Ground disturbance and land modification associated with the development of subdivided parcels may have the potential to significantly impact local bumble bee populations. Therefore, CDFW recommends having a qualified biologist conduct a bumble bee habitat assessment and thorough analysis of potential impacts to bumble bees. The assessment and analysis should be included in the environmental document. Without appropriate avoidance and minimization measures, potentially significant impacts associated with Project ground- and vegetation-disturbing activities include loss of foraging plants, changes in foraging behavior, burrow collapse resulting in entrapment or crushing in burrows, nest abandonment, reduced nest success, reduced health, and vigor of eggs, young, and/or queens, in addition to direct mortality.
If potentially suitable habitat is identified, Crotch's bumble bee's are observed, and/or ground disturbing activities occur during the overwintering periods, consultation with CDFW is warranted to discuss how to implement Project activities and avoid or minimize the risk of take. Please refer to the Survey Considerations for California Endangered Species Act (CESA) Candidate Bumble Bee Species.

Western Spadefoot

Western spadefoot is a California Species of Special Concern (SSC) and a candidate species under the federal Endangered Species Act (ESA). CEQA provides protection not only for ESA or CESA listed species, but for any species including, but not limited to, SSC that can be shown to meet the criteria for state listing. CDFW believes western spadefoot meets the CEQA definition of rare, threatened, or endangered species (CEQA Guidelines, § 15380). The western spadefoot is a burrowing toad that breeds in ephemeral pools but spends most of its life in underground burrows in adjacent terrestrial habitat. Based on the description of habitat in the BRA, potentially suitable aquatic and terrestrial habitat appears to occur within the Project area. If western spadefoot is present, Project activities may result in trampling or crushing of individuals or egg masses. Demolition and paving after false negative conclusions may trap wildlife hiding under refugia and in burrows.

CDFW concurs with the BRA's recommendation to perform two pre-construction surveys for Western Spadefoot. CDFW recommends the Lead Agency revise the AMM, to ensure surveys are conducted when conditions are optimal during the breeding season to avoid potential impacts to western spadefoot: "Prior to initiating any construction activities in aquatic environments, a qualified biologist shall conduct two nighttime preconstruction surveys between January and March to detect western spadefoot toad adults, egg masses, and/or tadpoles. Preconstruction surveys shall occur immediately following separate precipitation events, when breeding pools are retaining sufficient water to support breeding efforts and when water temperatures are between 9 and 30 degree

Celsius (48-86 degrees Fahrenheit). California Department of Fish and Wildlife shall be consulted prior to the initiation of project activities if any western spadefoots are observed."

Additional information may be referenced in the May 2023 Species Status Assessment Report for Western Spadefoot.

Rare Plants

The BRA states potentially suitable habitat was identified in the Project area for Henderson's bent grass and Red Bluff dwarf rush however, a protocol survey was not performed. Since potentially suitable habitat for rare plants occurs within the Project area and impacts may be potentially significant, CDFW concurs with the BRA'S recommendation to perform a protocol rare plant survey. Such surveys should follow CDFW's March 2018 Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities. CDFW strongly encourages the City of Redding to include rare plant survey results in the draft environmental document, for transparency of this Project's potentially significant impacts to the public and trustee agencies.

Oak Woodlands

The BRA states that the Project area is primarily composed of blue oak woodland. Review of the conceptual design plans exhibits nearly all onsite habitat will be permanent removed. As stated in past CEQA comment letters, on-going loss of oak woodlands without adequate mitigation is resulting in a cumulative total loss of oak woodlands throughout Shasta County. With respect to ecological functions and values, oak woodlands are essential for providing habitat for wildlife, and have higher levels of biodiversity than virtually any other terrestrial ecosystem in California.

CDFW understands the City of Redding abides by the cities tree ordinance however, this ordinance does not account for oak woodland habitat as a whole and therefore is inadequate for determining an appropriate mitigation strategy for the loss of whole habitat types. As a reminder, the City of Redding as the Lead Agency has a responsibility under Section 21083.2 of the California Public Resources Code to consider cumulative impacts and their significance. As an additional reminder, the City of Redding has the authority to require mitigation for impacts within City limits, and can require mitigation such as land preservation, enhancement, and conservation anywhere that is within the general ecological subregion, such in this instance, the northern central valley.

CDFW recommends evaluating the impacts of this Project on oak woodland habitat in accordance with an impact decision matrix, such as the Oak Woodland Impact Decision Matrix, prepared by the University of California Integrated Hardwood Range Management Program. Such tools will aid in determining the level of oak habitat function to the level of Project impact, to accurately determine a mitigation strategy and appropriate mitigation ratio for permanent loss of this habitat. Based on the results of such evaluation, CDFW advises the City of Redding to prepare a Habitat Restoration Plan, or similar, which would explicitly state the results of the decision matrix, quantify the number of trees to be removed, acres of habitat impacted, trees to be planted onsite, monitoring and success criteria, and any additional proposed mitigation strategies.

Impacts to oak woodlands may be mitigated by establishing a conservation easement to offset

impacts to oak woodlands (acres protected to acres affected) or contribute an appropriate compensation fee to the Oak Woodlands Conservation Fund, such as those managed by the California Wildlife Conservation Board. The goal of mitigation should be to effectively attain no net loss of oak woodland habitat. In addition, CDFW continues to encourage retaining, designing, and constructing around existing mature and healthy oak trees.

Aquatic Resources

CDFW discourages disturbance, staging and/or development in wetlands. Avoidance of Project activities within or adjacent to wetlands, should be avoided to the maximum extent possible. Due to the severe declines of wetlands throughout California, CDFW considers impacts to wetlands to be potentially significant.

The Delineation of Aquatic Resources Report (DARR) indicates three vernal pool features are present within the Project area. Such features may be permanently impacted with Project implementation. CDFW recommends the Lead Agency include a thorough analysis of impacts to wetlands in the draft environmental document and encourages the Lead Agency to avoid those impacts. If avoidance is unfeasible, the Lead Agency may minimize and mitigate impacts using an adequate mitigation ratio. CDFW recommends the Lead Agency mitigate permanent impacts to wetlands at a minimum 3:1 ratio, to reduce such impacts to less than significant. If onsite habitat restoration and/or enhancement is not feasible, CDFW recommends contributing funds, at a 3:1 ratio, to a conservation easement for the protection of these habitats in perpetuity or contributing funds to a conservation fund aimed to restore and/or enhance wetland habitats in Shasta County. A 3:1 ratio, or greater, may adequately mitigate the loss of ecological function, value, and temporal elements of these complex habitats.

Lake and Streambed Alteration Agreement

The DARR indicates potential impacts to stream habitat and states that OW01 is an unnamed man-made ephemeral drainage, that flows offsite to the north into an unnamed tributary of Sulphur Creek. Sulphur Creek is a direct tributary of the Sacramento River. Fish and Game Code Section 1602 requires any person, state or local governmental agency, or public utility to notify CDFW prior to beginning any activity that may do one or more of the following:

1. Substantially divert or obstruct the natural flow of the bed, channel, or bank of any river, stream, or lake; or
2. Substantially change or use any material from the bed, channel, or bank of any river, stream, or lake; or
3. Deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

To obtain information about the 1600 Notification process, please access: https://www.wildlife.ca.gov/Conservation/LSA.

California Endangered Species Act

Please be advised that a CESA permit must be obtained if the Project has the potential to result in "take" (hunt, pursue, catch, capture, kill, or attempt thereof) of plants or animals listed under CESA,

either during construction or over the life of the project. Issuance of a CESA permit is subject to CEQA documentation; the CEQA document must specify impacts, mitigation measures, and a mitigation monitoring and reporting program. If the Project will result in the take of a CESA-listed species, early consultation is encouraged, as significant modification to the Project may be necessary to minimize and fully mitigate impacts as required by Fish & Game Code Section 2081(b)(2). Information on how to attain a CESA permit is available here: https://wildlife.ca.gov/Conservation/CESA/Permitting.

Avoiding Inadvertent Wildlife Entrapment

If Project activities include trenching or excavating, CDFW recommends securely covering any open trench or excavation prior to stopping work each day and/or a wildlife exit ramp should be installed to prevent wildlife entrapment. If pipes are left out onsite, CDFW recommends inspection for wildlife prior to burying, capping, moving, or filling.

Lighting

Studies have shown that artificial lighting has adverse effects wildlife and plant species. The effects may include, but are not limited to, alteration of foraging behavior, reproductive behavior, navigation (being attracted to or deterred from), migration patterns (including movement barriers of light) and alters predator-prey dynamics. To minimize adverse effects of artificial light on wildlife, CDFW recommends that lighting fixtures associated with the Project be downward facing, fully shielded, and designed and installed to minimize photo-pollution and spillover of light onto adjacent wildlife habitat. Studies have found that it's best to use lower-intensity, warmer-colored lighting that may also be lower on the light spectrum (lower Kelvin values with fewer short-wavelength blue light emissions).

Low Impact Development

CDFW recommends the implementation of Low Impact Development (LID) strategies to ensure no-net-increase in stormwater runoff in newly developed areas. LID strategies include permeable pavement, vegetated stormwater bio-swales and retention basins to treat, retain and infiltrate stormwater runoff on-site. These LID strategies are typically designed to prevent project generated stormwater runoff from exceeding that of a 2-year storm event and to protect water quality and manage stormwater as close to its source as possible, thus mitigating potential flooding and pollution problems. Ideally, post project stormwater run-off volume, rate and duration will match pre-project conditions and hydro modification would not occur as a result of the Project. CDFW supports the use of LID strategies because they minimize impacts to aquatic habitats by filtering out pollution, preventing increased peak flows and related erosion, and because LID strategies increase ground water recharge and therefore help maintain biologically important summer low flows in local waterways.

Native Vegetation in Landscaping

CDFW recommends utilizing vegetation native to the local area in landscaping. Benefits of utilizing native vegetation in landscaping are numerous and include providing vital resources for native wildlife such as hummingbirds and other beneficial pollinators, conserving water, reducing pesticide use, and reducing landscaping maintenance. The California Native Plant Society (CNPS) website includes a variety of useful information and tools to help determine which native species occur in a

particular area, information on care and maintenance of native species, and contacts for purchasing native plants or seeds. The CNPS tool Calscape generates a list of native plants that grow in an area based on a specific address and can be used to develop a planting palate for landscaping plans. For more information regarding the importance of using native species in landscaping, please see the CNPS Guidelines for Landscaping to Protect Native Vegetation from Genetic Degradation.

Thank you for submitting biological assessment reports and results prior to the circulation of the draft environmental document, which may aid the Lead Agency in a more efficient CEQA review process. Please send all future consultation requests to R1CEQARedding@wildlife.ca.gov.

Kind Regards,
Erika

--
Erika iacona
Senior Environmental Scientist, Specialist
R1 Interior Habitat Conservation Planning
(530) 806-1389
601 Locust Street
Redding, CA 96001
CALIFORNIA DEPARTMENT OF FISH and WILDLIFE

Attachment H

Re: Western Spadefoot Survey for the Brentwood Village Development on Quartz Hill Road (APN 115-170-014); Shasta County, California
Gallaway Enterprises, February 2023

gallaway
ENTERPRISES

117 Meyers Street • Suite 120 • Chico CA 95928 • 530-332-9909

February 13, 2023

Nicole Dues
Sharrah Dunlap Sawyer, Inc.
320 Hartnell Avenue
Redding, CA 96002

RE: WESTERN SPADEFOOT SURVEY FOR THE BRENTWOOD VILLAGE DEVELOPMENT ON QUARTZ HILL ROAD (APN 115-170-014); SHASTA COUNTY, CALIFORNIA.

Gallaway Enterprises' (GE) biologists, Jessica Sellers and Alexander Smither, conducted focused biological surveys for western spadefoot toads (*Spea hammondii*) on January 31 and February 6, 2023, for the Brentwood Village Development on Quartz Hill Road, APN 030-320-034 (Project) in Shasta County, California. The purpose of the surveys was to determine the presence or absence of western spadefoot within the Project boundary. The surveys were conducted in compliance with existing state and federal environmental laws and regulations. The following are the methods, results, and recommendations of the surveys.

METHODS

Nighttime focused surveys for western spadefoot were conducted on January 31 and February 6, 2023, following recent precipitation events and when ambient temperatures were above 49˚F. The surveys began after local sunset time (approximately 5:30 pm) and were conducted on foot in all areas of suitable aquatic habitat within the Project limits. A flashlight was used to detect "eye-shine" in adult spadefoots and investigate for the presence of egg masses and/or tadpoles within suitable aquatic habitats. Additionally, an acoustic survey was conducted to determine the presence of spadefoots throughout the Project area.

A wetland delineation map produced by Gallaway Enterprises (September 2022) was used to locate aquatic features that provided potential habitat within the Project boundaries. These aquatic features were investigated for the presence of all life stages of western spadefoot. Western spadefoot observations and acoustic detections were recorded.

RESULTS

No western spadefoot were observed or acoustically detected.

RECOMMENDATIONS

Gallaway Enterprises has no recommendations at this time as no regulated species were observed during the biological surveys.

If you have any questions, please do not hesitate to contact Gallaway Enterprises at (530) 332-9909, or Jessica@gallawayenterprises.com.

Sincerely,



Jessica Sellers, Biologist
Gallaway Enterprises

Attached:

- Project Site Photos
- Draft Delineation of Aquatic Resources Map

Project Site Photos



1/31: WF01, vernal pool, facing northeast. (40.613501, -122.412192)



1/31: WF02, vernal pool, facing west. (40.613811, -122.412234)



1/31: WF03, vernal pool, facing west. (40.613425, -122.412841)



1/31: OW1, ephemeral drainage, facing northeast. (40.61368, -122.41667)



2/6: Standing water in road along eastern edge of property, facing west. (40.61329, -122.41179)



2/6: WF02, vernal pool, facing west.



2/6: WF01, vernal pool, facing southeast towards Quartz Road.

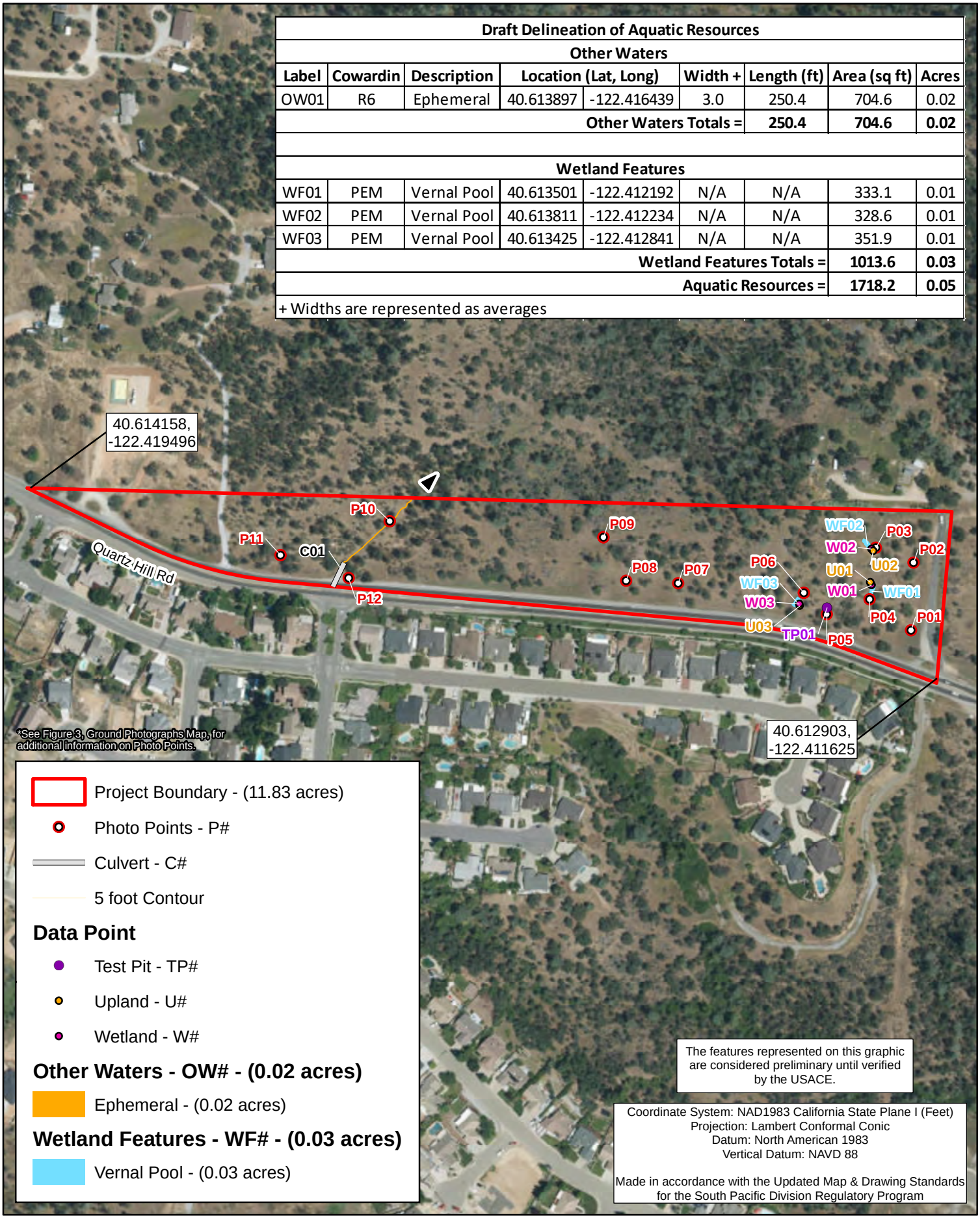


2/6: WF03, vernal pool, facing northwest.



2/6: OW01, ephemeral drainage, with standing water, facing south.

Draft Delineation of Aquatic Resources								
Other Waters								
Label	**Cowardin**	**Description**	**Location (Lat, Long)**		**Width +**	**Length (ft)**	**Area (sq ft)**	**Acres**
OW01	R6	Ephemeral	40.613897	-122.416439	3.0	250.4	704.6	0.02
						Other Waters Totals =	**250.4**	**704.6**	**0.02**
Wetland Features								
WF01	PEM	Vernal Pool	40.613501	-122.412192	N/A	N/A	333.1	0.01
WF02	PEM	Vernal Pool	40.613811	-122.412234	N/A	N/A	328.6	0.01
WF03	PEM	Vernal Pool	40.613425	-122.412841	N/A	N/A	351.9	0.01
						Wetland Features Totals =	**1013.6**	**0.03**
						Aquatic Resources =	**1718.2**	**0.05**
+ Widths are represented as averages								



Project Boundary - (11.83 acres)

Photo Points - P#

Culvert - C#

5 foot Contour

Data Point

Test Pit - TP#

Upland - U#

Wetland - W#

Other Waters - OW# - (0.02 acres)

Ephemeral - (0.02 acres)

Wetland Features - WF# - (0.03 acres)

Vernal Pool - (0.03 acres)

The features represented on this graphic are considered preliminary until verified by the USACE.

Coordinate System: NAD1983 California State Plane I (Feet)
Projection: Lambert Conformal Conic
Datum: North American 1983
Vertical Datum: NAVD 88

Made in accordance with the Updated Map & Drawing Standards for the South Pacific Division Regulatory Program

NORTH

1:3,600 1 inch = 300 feet

0 200 400 Feet

Data Sources: ESRI, City of Redding 05/27/2020

Brentwood Village Development Project
Draft Delineation of Aquatic Resources
Figure 4

gallaway ENTERPRISES

GE: #22-105 Map Date: 09/06/2022

Attachment I

Transportation Impact Study for the Brentwood Village Project
Prepared for the City of Redding
W-Trans, March 21, 2024

Transportation Impact Study for the Brentwood Village Project



Prepared for the City of Redding

Submitted by
W-Trans

March 21, 2024

TRAFFIC ENGINEERING
TRANSPORTATION PLANNING
Balancing Functionality and Livability since 1995
w-trans.com



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Executive Summary

The Brentwood Village Project includes 30 duplex units with 60 residences that would be located on the north side of Quartz Hill Road near River Ridge Drive in the City of Redding. The proposed project would be expected to generate an average of 432 trips per day, including 29 a.m. peak hour trips and 34 p.m. peak hour trips.

Though existing pedestrian and transit facilities serving the site are limited, this would be an acceptable condition given the location of the project site and anticipated demand. It is recommended that the project include the construction of sidewalks and streetlighting along project streets and along the project frontage on Quartz Hill Road. The project should also include provision of ADA-compliant curb ramps at new intersections and street connections. The City may wish to study adding transit service on Quartz Hill Road west of Benton Drive should more residential projects be constructed in the area.

Existing bicycle facilities in the vicinity of the project site are adequate and would improve with construction of the planned buffered bicycle lanes on Quartz Hill Road. The project should dedicate sufficient space for buffered bicycle lanes along its frontage, as well as provide six long-term bicycle spaces on the project site plan if each residence would not have a private garage.

Based on state guidance and data contained in the countywide travel demand model and the *2018 Regional Transportation Plan and Sustainable Communities Strategy for the Shasta Region* (RTP), the project's impact on vehicle miles traveled (VMT) would be less than significant as the project is expected to have a daily VMT per capita more than 15 percent below the countywide average.

The project site would be accessed via two street new connections to Quartz Hill Road, one of which would be the northern leg of the intersection of Quartz Hill Road/River Ridge Drive and the other would be on Quartz Hill Road 1,000 feet to the east of River Ridge Drive. To be consistent with nearby intersections on Quartz Hill Road serving residential developments, the existing westbound acceleration lane at the intersection of Quartz Hill Road/River Ridge Drive and the two-way left-turn lane at the eastern connection to the project site should be restriped into eastbound left-turn lanes. Sight distances at the proposed street connections to Quartz Hill Road are adequate for entering and existing drivers provided that no signage, monuments, or structures block sight lines for drivers waiting on the minor street approaches.

Proposed site access and on-site circulation are expected to function acceptably for emergency response vehicles with applicable design standards incorporated into the site layout. Traffic from the proposed development would be expected to have a less-than-significant impact on emergency response times.

Project traffic is not expected to cause maximum queues to exceed the available stacking space at any of the study intersections for all evaluated scenarios. Therefore, the proposed project would have a less-than-significant impact on queueing. Additionally, all study intersections are expected to operate at acceptable Levels of Service without and with the addition of project trips; as a result, the project's effect on operations would be considered acceptable.

The proposed passenger vehicle parking supply could not be evaluated as the project is still preliminary. The project should provide two vehicle parking spaces per duplex unit, including at least one covered space.

Introduction

This report presents an analysis of the potential traffic impacts and adverse operational effects that would be associated with development of a proposed residential project which includes 30 duplex units with 60 residences total to be located on the north side of Quartz Hill Road near River Ridge Drive in the City of Redding. The traffic study was completed in accordance with the criteria established by the City of Redding and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a transportation impact study is to provide City staff and policy makers with data that they can use to make an informed decision regarding the potential transportation impacts of a proposed project, and any associated improvements that would be required to mitigate these impacts to an acceptable level under the California Environmental Quality Act (CEQA), the City's General Plan, or other policies. This report provides an analysis of those items that are identified as areas of environmental concern under CEQA and that, if significant, require an Environmental Impact Report (EIR). Impacts associated with access for pedestrians, bicyclists, and to transit; the vehicle miles traveled (VMT) generated by the project; potential safety concerns; and emergency access are addressed in the context of the CEQA criteria. While no longer a part of the CEQA review process, vehicular traffic service levels at key intersections were evaluated for consistency with General Plan policies by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on anticipated travel patterns specific to the proposed project, then analyzing the effect the new traffic would be expected to have on the study intersections and need for improvements to maintain acceptable operation. Adequacy of parking is also addressed as a policy issue.

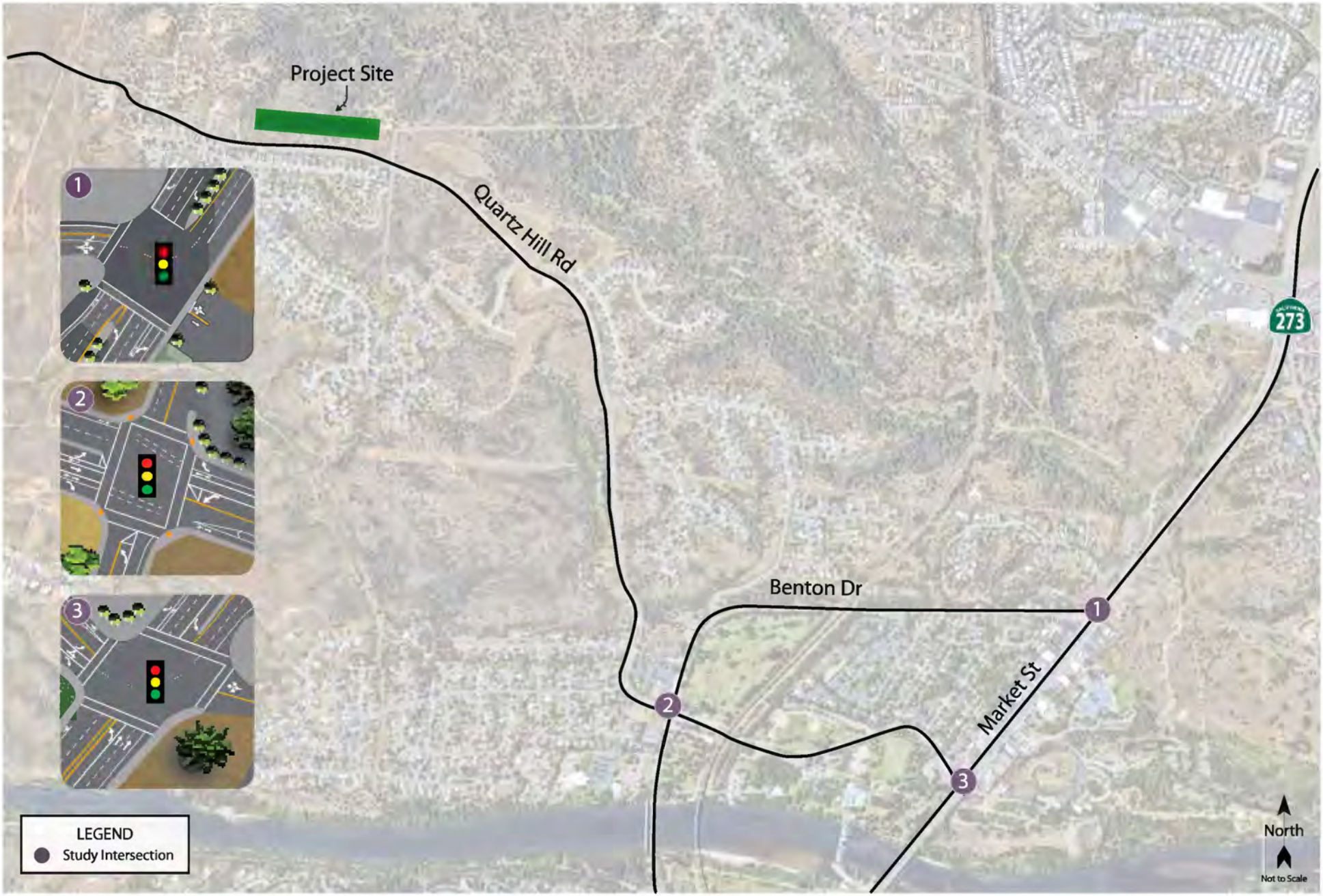
The report is organized to provide background data that supports the various aspects of the analysis, followed by the assessment of CEQA issues and then the evaluation of policy-related issues. The CEQA criteria evaluated are as follows.

Would the project:

a. Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?
b. Conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b)?
c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?
d. Result in inadequate emergency access?

Project Profile

The proposed residential project includes 30 duplex units with 60 residences to be located on the north side of Quartz Hill Road near River Ridge Drive. The project would be accessed via two new street connections to Quartz Hill Road; the westerly street connection would be a new north leg at the Quartz Hill Road/River Ridge Drive intersection. The project site is located at location, as shown in Figure 1.



red020.ai 11/22

Transportation Impact Study for the Brentwood Village Project

Figure 1 – Study Area and Existing Lane Configurations

W-Trans

Transportation Setting

Study Area and Periods

The study area varies depending on the topic. For pedestrian trips it consists of all streets within a half-mile of the project site that would lie along primary routes of pedestrian travel, or those leading to nearby generators. For bicycle trips it consists of all streets within one mile of the project site that would lie along primary routes of bicycle travel. For the safety and operational analyses, it consists of the project frontage and the following intersections:

1. Market Street/Benton Drive
2. Quartz Hill Road/Benton Drive
3. Quartz Hill Road/Market Street

Operating conditions during the a.m. and p.m. peak periods were evaluated to capture the highest potential impacts for the proposed project as well as the highest volumes on the local transportation network. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and typically reflects the highest level of congestion during the homeward bound commute. Counts were obtained for the study intersections on Thursday, November 3, 2022.

Study Intersections

Market Street/Benton Drive is a signalized four-legged intersection with protected left-turn phasing on the northbound and southbound approaches. The east leg is a driveway to A-1 Smog & Auto Repair Center. Marked crosswalks with pedestrian phasing are available on the west and south leg and bicycle lanes are present on the south leg.

Quartz Hill Road/Benton Drive is a signalized four-legged intersection with protected left-turn phasing on the northbound and southbound approaches. There are marked crosswalks with pedestrian phasing on all four legs and bicycle lanes exist on the east and west legs.

Quartz Hill Road/Market Street is a signalized four-legged intersection, which includes protected left-turn phasing on the northbound and southbound approaches. Marked crosswalks with pedestrian phasing are present on all four legs and bicycle lanes are available on the west and north legs.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

Collision History

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision rates were calculated based on records available from the California Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available is October 1, 2017, through September 30, 2022.

As presented in Table 1, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2019 Collision Data on California State Highways*, California Department of Transportation (Caltrans). These average rates statewide are for intersections in the same environment (urban, suburban, or rural), with the same number of approaches (three or four), and the same controls (all-way stop, two-way stop, or traffic signal). The calculated collision rates for the study intersections were less than the statewide averages except for the intersection of Market Street/Benton Drive, which was slightly above the statewide average so was further reviewed. The collision rate calculations are provided in Appendix A.

Table 1 – Collision Rates for the Study Intersections			
Study Intersection	**Number of Collisions (2017-2022)**	**Calculated Collision Rate (c/mve)**	**Statewide Average Collision Rate (c/mve)**
1. Market St/Benton Dr	11	**0.29**	0.24
2. Quartz Hill Rd/Benton Dr	3	0.13	0.24
3. Quartz Hill Rd/Market St	5	0.15	0.24

Note: c/mve = collisions per million vehicles entering; **bold** number = calculated collision rate greater than statewide average.

The recorded collisions at Market Street/Benton Drive included five rear-ends, two broadsides, two hit objects, one sideswipe, and one "other" collision. The rear-end collisions involved motorists traveling on the southbound or northbound approaches and were attributed to unsafe speed. These types of collisions are common at signalized intersections with high approach speeds that can experience congestion during peak hours such as the subject location. Based on a review of field conditions, sight lines are adequate on both the northbound and southbound approaches and given that the collision rate is only marginally higher than the statewide average, no remedial actions appear necessary.

Project Data

The project consists of 30 duplex, or 60 single-family attached, residential units. The proposed project site plan is shown in Figure 2.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 11th Edition, 2021 for "Single Family Attached Housing" (LU #215). Based on application of these rates, the proposed project would be expected to generate an average of 432 trips per day, including 29 trips during the a.m. peak hour and 34 trips during the p.m. peak hour. A summary of the trip generation potential for the proposed project is shown in Table 2.

Table 2 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Single-Family Attached Housing	60 du	7.20	432	0.48	29	9	20	0.57	34	19	15

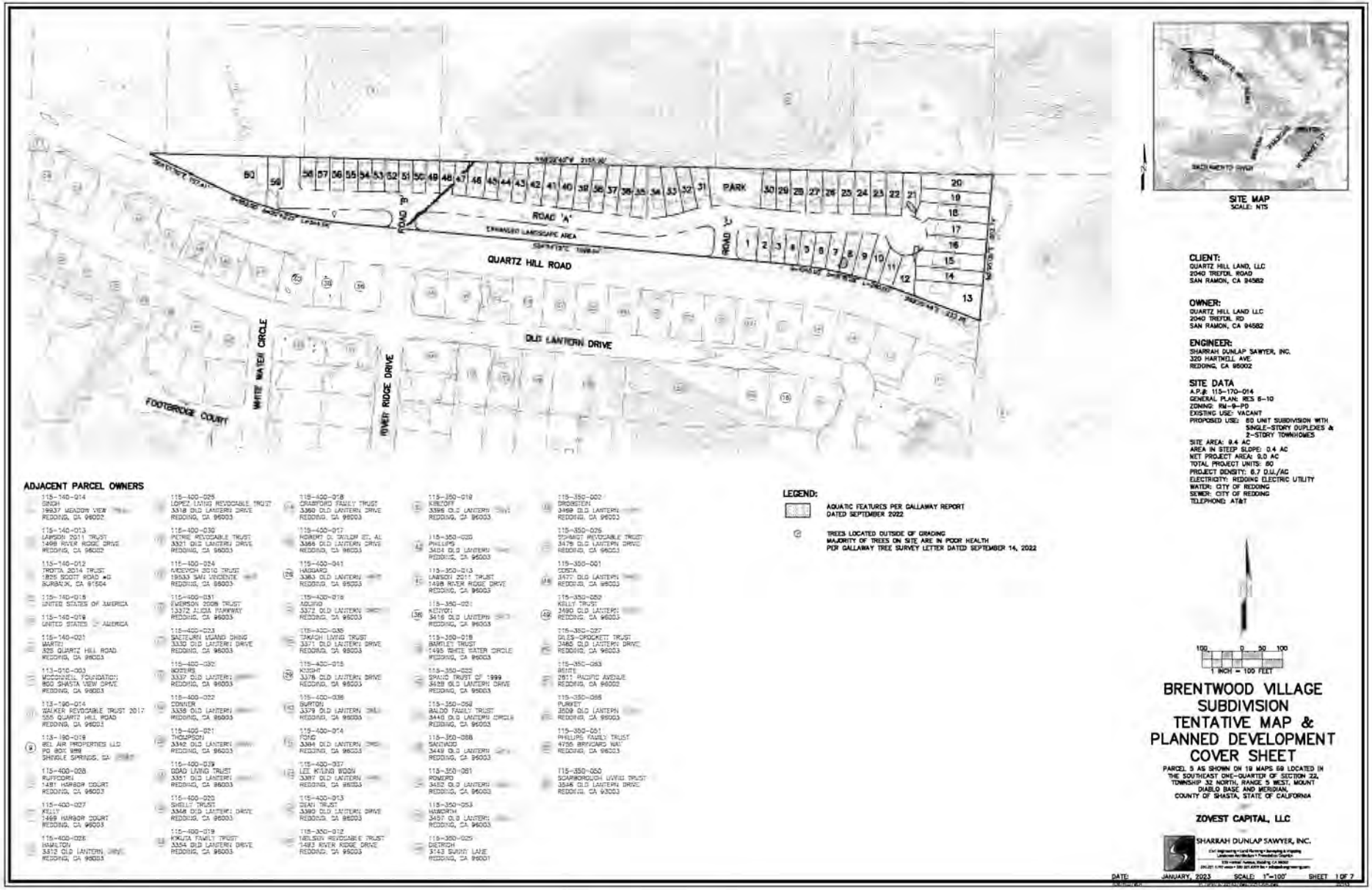
Note: du = dwelling unit

Trip Distribution

Given the location of the project site in the northwestern part of the City, nearly all project trips were assumed to be to and from the southeast on Quartz Hill Road toward Downtown, Market Street, and the SR 44 and I-5 freeways. As a result, a distribution of 90 percent of project trips was applied to/from the southeast on Quartz Hill Road with 10 percent to/from the northwest. The pattern used to allocate new project trips through the study intersections was determined based on the familiarity with travel patterns in the area and likely origins and destinations for residents of the project. The applied distribution assumptions that were approved by City staff are shown in Table 3.

Table 3 – Trip Distribution Assumptions

Route	Percent
To/From Market St South of Quartz Hill Rd	45%
To/From Benton Dr South of Quartz Hill Rd	20%
To/From Market St North of Quartz Hill Rd	25%
To/From Quartz Hill Rd West of River Ridge Dr	10%
TOTAL	**100%**



Source: Sharrah Dunlap Sawyer 1/24

red020.ai 11/22

Transportation Impact Study for the Brentwood Village Project

Figure 2 – Site Plan

Circulation System

This section addresses the first transportation bullet point on the CEQA checklist, which relates to the potential for a project to conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

Pedestrian Facilities

Existing and Planned Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In the study area, there is a network of sidewalks, curb ramps, and street lighting as part of the single-family housing development that would neighbor the project site, including an approximately half-mile-long sidewalk on the south side of Quartz Hill Road. However, there is a sidewalk gap of about 1,750 feet on Quartz Hill Road to the east of the project site. According to the *City of Redding Active Transportation Plan*, there are plans to install sidewalks on Quartz Hill Road along the existing 1,750-foot sidewalk gap.

Pedestrian Safety

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue for pedestrians. Collision records for the five-year period detailed above indicate that there were no reported collisions involving pedestrians at the study intersections.

Project Impacts on Pedestrian Facilities

Given the location of the site is in a historically rural part of the City, pedestrian trips are expected to be limited; however, the surrounding area is transitioning to a suburban setting as more residential developments are constructed so to be consistent with neighboring development sidewalks and street lighting should be installed along all project streets and on the north side of Quartz Hill Road along the project frontage. Additionally, ADA-compliant curb ramps should be provided at the new intersections to be built within the project site as well as at the two new street connections to Quartz Hill Road. With these improvements, the proposed residences would be connected to other residences in the neighborhood and the surrounding pedestrian network. At such time as the neighboring parcel to the east develops and sidewalks are constructed along that frontage, a continuous walking route would be provided on the north side of Quartz Hill Road between Benton Drive and River Ridge Drive.

Finding – The project site plan is a concept sketch and does not identify any pedestrian facilities such as sidewalks, crosswalks, or curb ramps. Although there are existing sidewalk gaps in the study area, limited pedestrian trips to and from the site are expected given the location of the project site; therefore, this condition is considered acceptable. Planned improvements would fill in an existing sidewalk gap and would further improve access for pedestrians.

Recommendation – Sidewalks and streetlighting should be installed along all project streets, including the north side of Quartz Hill Road along the project frontage. ADA-compliant curb ramps should be provided at new intersections and connections to Quartz Hill Road.

Bicycle Facilities

Existing and Planned Bicycle Facilities

The *Highway Design Manual*, Caltrans, 2020, classifies bikeways into four categories:

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.
- **Class IV Bikeway** – also known as a separated bikeway, a Class IV Bikeway is for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking.

In the project area, there are Class II bicycle lanes on Quartz Hill Road between Stone Canyon Drive and Benton Drive, and there are buffered Class II bicycle lanes on Quartz Hill Road east of Benton Drive, extending to Market Street. According to the *City of Redding Active Transportation Plan* (ATP), the remaining segment of Quartz Hill Road, which connects to the project site, is currently designated as a Class III bicycle route. As outlined in the City's ATP, the existing bicycle lanes on Quartz Hill Road west of Benton Drive would be extended to the City Limit and upgraded to buffered Class II bicycle lanes. A planned Class I multi-use pathway beginning at Keswick Dam Road would run within a half-mile of the project site; however, it is unknown whether there would be a usable connection from the project site to the trail. Table 4 summarizes the existing and planned bicycle facilities in the project vicinity.

Table 4 – Bicycle Facility Summary

Status Facility	Class	Length (miles)	Begin Point	End Point
Existing				
Sacramento River Trl	I	5.50	Hilltop Dr	City Limit
Quartz Hill Rd	II	1.10	Stone Canyon Dr	Benton Dr
Benton Dr	II	0.47	Riverside Dr	Quartz Hill Rd
Quartz Hill Rd	IIB	0.66	Benton Dr	Market St
Quartz Hill Rd	III	0.72	City Limit	Stone Canyon Dr
Benton Dr	III	1.00	Quartz Hill Rd	Market St
Planned				
Sulphur Creek Trl	I	2.84	Keswick Dam Rd	Market St
Benton Dr	II	1.47	Market St	Riverside Dr
Quartz Hill Rd	IIB	1.82	City Limit	Benton Dr

Notes: IIB = Buffered Bike Lane
Source: *Active Transportation Plan*, City of Redding, 2018

Bicyclist Safety

Collision records for the study area were reviewed to determine if there had been any bicyclist-involved crashes. During the five-year study period previously noted, there was a single bicyclist-involved collision reported in the study area which occurred at the intersection of Market Street/Benton Drive. The broadside collision involved a bicyclist proceeding straight, traveling on the wrong side of the roadway, while the driver turned right; the collision resulted in an injury to the cyclist. As also identified in the *Transportation Impact Study for the Redding School of the Arts*, the City may wish to consider installing citywide signage to warn bicyclists from riding in the wrong direction, such as sign R5-1b in the *California Manual on Uniform Traffic Control Devices* (CA-MUTCD) which depicts a bicycle symbol and says, "WRONG WAY."

Project Impacts on Bicycle Facilities

The existing bicycle facilities together with the shared use of minor streets would provide adequate access for cyclists in the near-term, and connectivity would be further improved with the installation of buffered Class II bicycle lanes on Quartz Hill Road extending to the project site and other improvements to the City's bicycle network. In conjunction with sidewalk improvements at the project site, it is recommended that the project frontage be designed to accommodate future installation of buffered bicycle lanes.

Bicycle Storage

The project site plan does not identify the provision of bicycle parking or storage facilities. If all units are designed to have private garages with restricted access, then separate bicycle parking is not required. Otherwise, the required bicycle parking should conform to Section 5.106.4 of the California Green Building Standards Code (CalGreen) as directed by Section 10.21.050 of the City of Redding Municipal Code. According to the CalGreen, the number of long-term bicycle parking spaces must be equal to or greater than five percent of the number of vehicle parking spaces provided. Based on a requirement of 120 vehicle parking spaces, a minimum of six covered long-term bicycle parking spaces would need to be installed.

Finding – The existing bicycle facilities in the project vicinity are adequate in the near-term and would improve upon completion of planned buffered bicycle lanes on Quartz Hill Road. Bicycle storage is not indicated in the project site plan.

Recommendation – The project frontage on Quartz Hill Road should be designed with sufficient space for the future provision of buffered bicycle lanes. While it is anticipated that each residence would have a private garage, should that not be the case, a minimum of six long-term bicycle parking spaces would need to be identified on the project site plan.

Transit Facilities

Existing Transit Facilities

The Redding Area Bus Authority (RABA) provides fixed route bus service in the City of Redding. As there are no transit stops within a one-half mile walk of the project site, the project is not readily accessible by transit.

Dial-a-ride, also known as paratransit or door-to-door service, is available for those who are unable to independently use the transit system due to a physical or mental disability. RABA offers a dial-a-ride service within 0.75 mile from a transit stop and operates during the same hours as the local bus routes. Although the northeastern corner of the project site is within the service area for RABA's dial-a-ride, the project roads and Quartz Hill Road along the project frontage do not appear to be within the service area. The dial-a-ride service would be accessible to residents upon completion of planned sidewalks on Quartz Hill Road east of the project site.

Impact on Transit Facilities

Demand for transit is anticipated to be minimal given the location of the project site. While the nearest bus stop is not within a half-mile walking distance, residents could bike to the nearest stop at Quartz Hill Road/Benton Drive, which is approximately 1.5 miles away from the site, and board with their bike. Therefore, the limited access to transit in this area of the City is considered acceptable given the minimal expected demand from the project. However, the City may wish to investigate adding transit service to Quartz Hill Road west of Benton Drive should more residential projects be approved and constructed in the area.

Finding – The limited access to transit is considered adequate as minimal demand is expected due to the location and context of the project site.

Vehicle Miles Traveled (VMT)

The potential for the project to conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b) was evaluated based the project's anticipated Vehicle Miles Traveled (VMT).

Background and Guidance

Senate Bill (SB) 743 established VMT as the metric to be applied for determining transportation impacts associated with development projects. Like many other jurisdictions in California, the City of Redding has not yet adopted a policy or thresholds of significance regarding VMT so the project related VMT impacts were assessed based on guidance provided by the California Governor's Office of Planning and Research (OPR) in the publication *Transportation Impacts (SB 743) CEQA Guidelines Update and Technical Advisory*, 2018. Under this guidance, residential developments that have a VMT per capita that is 15 percent or more below the existing average countywide residential VMT per capita would have a less-than-significant transportation impact.

The Shasta Regional Transportation Agency (SRTA) is in the process of conducting an extensive countywide VMT baseline analysis and updating the travel demand model to include readily available commercial and residential VMT information per capita along with screening maps that can be used to identify certain types of projects that can be presumed to have a less-than-significant impact. The updated model is not yet available; however, the existing model does include sufficient information to estimate a project's total VMT per capita (as opposed to residential VMT per capita) so it was relied on to assess the project's potential impacts. At the direction of City staff and has been applied for other projects within the City, the "2020 Project Average Daily VMT per capita" published in the SRTA *2018 Regional Transportation Plan and Sustainable Communities Strategy for the Shasta Region* (RTP) was used as the existing countywide baseline number.

Project Impact

The SRTA ShastaSIM travel demand model includes hundreds of traffic analysis zones (TAZs) within the region that contain information for scenario years between 2015 and 2040. The model has aggregate travel data for factors such as trips, distances traveled, total VMT, population, and employment. The project site is located within TAZs 462 and 463; the combined projected total VMT for these two TAZs in 2020 (the closest analysis year to the date of this analysis) is 20,275 miles per day. For a combined population of 1,305 persons, the total daily VMT per capita would be 15.5. Proposed projects are generally presumed to generate comparable travel patterns to similar land uses in their geographical area; therefore, the proposed subdivision would be expected to have a daily VMT per capita of 15.5.

As contained in the 2018 RTP, the projected total daily VMT per capita with implementation of the RTP initiatives is 26.8 miles per day in 2020. Applying OPR's guidance, a residential project generating a VMT that is 15 percent or more below this value, or 22.8 miles per capita per day or less, would have a less-than-significant VMT impact. The proposed project is expected to have a daily VMT per capita of 15.5, which is approximately 42 percent below the countywide average. Since this is more than 15 percent below the countywide average value, the project would have a less-than-significant transportation impact on VMT based on OPR's guidance. This information is summarized in Table 5.

Table 5 – Vehicle Miles Traveled Analysis Summary

VMT Metric	Countywide Baseline 2020 VMT Rate	Significance Threshold	TAZ 462 & 463 VMT Rate	Resulting Significance
Total VMT per Capita	26.8	22.8	15.5	Less than Significant

Note: VMT Rate is measured in total VMT/Capita, or the number of daily miles driven per resident

Finding – Based on OPR guidance and information contained within the SRTA travel demand model and the 2018 RTP, the project's impact on VMT would be considered less than significant.

Safety Issues

The potential for the project to impact safety was evaluated in terms of the adequacy of sight distance and need for turn lanes at the project access(es) as well as the adequacy of stacking space in dedicated turn lanes at the study intersections to accommodate additional queuing due to adding project-generated trips and need for additional right-of-way controls. This section addresses the third transportation bullet on the CEQA checklist which is whether or not the project would substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

Site Access

The project site would be accessed from a new northern leg of the intersection of Quartz Hill Road/River Ridge Drive and from a new street connection approximately 1,000 feet to the east. The eastern street connection would create a new tee intersection with Quartz Hill Road. All residences would be accessible from each of the two street connections, as they would be connected by a project road labeled "Private Drive" on the concept plan.

Sight Distance

At unsignalized intersections and driveways, a substantially clear line of sight should be maintained between the driver of a vehicle waiting at the crossroad and the driver of an approaching vehicle. Adequate time should be provided for the waiting vehicle to either cross, turn left, or turn right, without requiring the through traffic to radically alter their speed.

Sight distances along Quartz Hill Road at the proposed locations of the project access points were evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distance at intersections of public streets is based on corner sight distances, with more sight distance needed for making a left turn versus a right turn, while recommended sight distances for minor street approaches that are either a private road or a driveway are based on stopping sight distance. Both use the approach travel speeds as the basis for determining the recommended sight distance. Although the project street would be a private roadway, it would be designed similar to a public street connection with a stop-controlled minor street approach so the corner sight distance criteria was applied. Additionally, the stopping sight distance needed for a following driver to stop if there is a vehicle slowing to turn into a side street or driveway is evaluated based on stopping sight distance criterion and the approach speed on the major street.

For the posted speed limit of 45 mph on Quartz Hill Road, the minimum corner sight distance needed is 430 feet for right-turn movements and 500 feet for left-turn movements. Field measurements were obtained to and from the position of a vehicle waiting on the project street approaches and were determined to extend more than 500 in each direction, which is adequate for the posted speed limit. Additionally, adequate sight lines are available for a following motorist to notice and react to a preceding vehicle slowing to turn into the project site. To preserve existing sight lines, any new signage, monuments, or other structures to be placed near the project entrances should be positioned outside of the vision triangles of a driver waiting on the minor street approach.

Finding – Sight lines at the project connections to Quartz Hill Road would be adequate to accommodate all turns into and out of the project site.

Recommendation – To preserve existing sight lines, any new signage, monuments, or other structures to be placed near the project entrances should be positioned outside of the vision triangles of a driver waiting on the minor street approaches.

Left-Turn Lane Warrants

The need for left-turn lanes at the two proposed street connections to Quartz Hill Road was evaluated based on criteria contained in the *Intersection Channelization Design Guide*, National Cooperative Highway Research Program (NCHRP) Report No. 279, Transportation Research Board, 1985, as well as an update of the methodology developed by the Washington State Department of Transportation and published in the *Method For Prioritizing Intersection Improvements*, January 1997. The NCHRP report references a methodology developed by M. D. Harmelink that includes equations that can be applied to expected or actual traffic volumes to determine the need for a left-turn pocket based on safety issues.

Volumes in the vicinity of the project site were sourced from peak hour counts obtained on Thursday, November 3, 2022, at the intersection of Quartz Hill Road/River Ridge Drive and factored up based on information contained within the Shasta Regional Transportation Agency (SRTA) travel demand model. All left turns into the site were assumed to occur at a single access point to reflect worst case conditions. It is noted that few left turn volumes into the project site are expected as most inbound trips would come from Quartz Hill Road to the southeast and turn right into the project site. Based on Future plus Project a.m. and p.m. peak hour volumes it was determined that a left-turn lane is not warranted on Quartz Hill Road at either access point during either of the peak periods evaluated.

However, as the surrounding area is becoming less rural and more suburban with the development of multiple residential subdivisions, it is recommended that the existing westbound acceleration lane to the west of River Ridge Drive be restriped into an eastbound left-turn lane. This would conform with driver expectation wherein either both approaches or neither approach to a four-legged intersection have left-turn pockets. No or minimal roadway widening would be necessary with this improvement, which could potentially be accomplished solely by restriping the intersection. Similarly, it is recommended that the existing two-way left-turn lane (TWLTL) on Quartz Hill Road be restriped into an eastbound left-turn lane at the project's eastern access point to be consistent with how other intersections on Quartz Hill Road are treated. Copies of the turn lane warrants analysis spreadsheets are provided in Appendix B.

Recommendation – While not warranted based on vehicle volumes, to achieve a standard configuration and conform with driver expectation it is recommended that the existing westbound acceleration lane on the west leg of the Quartz Hill Road/River Ridge Drive intersection and the existing TWLTL at the eastern access point both be restriped into eastbound left-turn lanes.

Queuing

An increase in queue length due to project traffic was considered a potentially significant impact if the increase would cause the queue to extend out of a dedicated turn lane into a through lane, or the back of queue into a visually restricted area, such as a blind corner. If queues would already be expected to extend past a dedicated turn lane without project traffic, the impact was only considered significant if this would result in the back of queue extending into an adjacent intersection or creating a sight distance impact.

Under each scenario, the projected 95th percentile queues in left-turn pockets at the study intersections were determined using Synchro. Summarized in Table 6 are the predicted queue lengths in dedicated turn lanes. Copies of the Synchro projections are contained in Appendix C.

Table 6 – Maximum Left-Turn Queues in Dedicated Turn Lanes

Study Intersection Approach	Turn Lane Length	95th Percentile Queues											
		AM Peak Hour						PM Peak Hour					
		E	E+P	B	B+P	F	F+P	E	E+P	B	B+P	F	F+P
Market St/Benton Dr													
Eastbound Left Turn	150	120	122	123	125	123	125	**181**	**183**	**183**	**188**	**200**	**203**
Quartz Hill Rd/Benton Dr													
Northbound Left Turn	105*	89	91	91	93	97	98	196	200	202	205	202	205
Quartz Hill Rd/Market St													
Northbound Left Turn	150	**171**	**180**	**180**	**187**	**186**	**195**	**390**	**409**	**421**	**438**	**421**	**438**

Notes: 95th percentile queue based on Synchro output; all distances are measured in feet; E = existing conditions; E+P = existing plus project conditions; B = baseline conditions; B+P = baseline plus project conditions; F = future conditions; F+P = future plus project conditions; * = two-way left-turn lane (TWLTL) provides additional storage; **Bold** text = queue length exceeds available storage

Under Existing conditions, the left-turn queue on the eastbound approach to the intersection of Market Street/Benton Drive exceeds storage capacity during the p.m. peak hour, and the left-turn queue on the northbound Market Street approach to the intersection with Quartz Hill Road exceeds storage capacity during both the a.m. and p.m. peak hours. Additionally, the left-turn queue on the northbound approach to Quartz Hill Road/Benton Drive exceeds storage capacity during the p.m. peak hour under Existing conditions; however, as the queue spills back into an existing two-way left-turn lane (TWLTL), it does not impact through traffic. It is noted that the Benton Drive queue blocks left turns from the existing driveway at 2250 Benton Drive and, while this is not ideal operationally for the driveway, there are no safety implications associated with this condition. Storage capacities would continue to be exceeded under Baseline, Future, and "plus Project" conditions. This is considered a less-than-significant impact as the adverse queuing conditions would not be a result of adding project traffic.

Finding – The project would have a less-than-significant impact on queueing, as there are no scenarios in which the projected 95th percentile queues exceed the available stacking space due to the addition of project traffic.

Emergency Access

The final transportation bullet on the CEQA checklist requires an evaluation as to whether the project would result in inadequate emergency access or not.

Adequacy of Site Access

The project site would be accessed via two new street connections to Quartz Hill Road; the westerly street connection would be a new north leg at the Quartz Hill Road/River Ridge Drive intersection. While the site plan is still preliminary, it is anticipated that all aspects of the site, including street and driveway widths and turning radii, would be designed in accordance with applicable standards; therefore, access would be expected to function acceptably for emergency response vehicles. The project site would have multiple access points, so should one means of access be compromised during an emergency, responders would be able to use another access point to reach the various parcels.

Off-Site Impacts

While the project would be expected to result in increases in delay for traffic on Quartz Hill Road, emergency response vehicles can claim the right-of-way by using their lights and sirens; therefore, the project would be expected to have a nominal effect on emergency response times.

Finding – Emergency access and circulation are anticipated to function acceptably with incorporation of applicable design standards into the site layout, and traffic from the proposed development would be expected to have a less-than-significant impact on emergency response times.

Capacity Analysis

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersections were analyzed using the "Signalized" methodology published in the *Highway Capacity Manual* (HCM) 6th Edition, Transportation Research Board, 2018. This methodology is based on factors including traffic volumes, green time for each movement, phasing, whether the signals are coordinated or not, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For the purposes of this study, delays were calculated using actual timing parameters obtained from City and Caltrans staff.

The ranges of delay associated with the various levels of service are indicated in Table 7.

Table 7 – Signalized Intersection Level of Service Criteria	
LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual*, Transportation Research Board, 2018

Traffic Operation Standards

City of Redding

Per the *City of Redding 2000-2020 General Plan*, the City strives to maintain LOS C operation for most arterials and their intersections, except within the Downtown area where LOS D is considered acceptable. Additionally, LOS D is considered acceptable for streets and intersections on the state highway network and river-crossing street corridors where capacity is affected by adjacent intersections. This applies to the overall operation of the intersection at signalized locations and to the worst-case movement on the stop-controlled approach(es) at unsignalized locations. A project would have an adverse effect on the surrounding transportation system if it would cause any study intersection to exceed the acceptable threshold for the facility. Based on the City of Redding's General Plan and TIA Guidelines, a standard of LOS C was applied to Quartz Hill Road/Benton Drive and LOS D was applied to Market Street/Benton Drive and Market Street/Quartz Hill Road since the latter two intersections are Caltrans facilities. The following thresholds were used to determine if an effect would be considered adverse.

Signalized intersections: The project is considered to have an adverse effect if:

- The project causes an acceptable LOS to decline to an unacceptable LOS; or
- The project increases the overall average delay by more than 5 seconds per vehicle at an intersection having an unacceptable LOS without project traffic.

The City of Redding allows operational deficiencies attributed to a project in a Cumulative (Baseline or Future) scenario to be adequately addressed via payment of the City's traffic impact fees (TIFs) if the improvement is included in the City's TIF program and the project's proportional share of the total growth in volumes at the intersection is less than 25 percent. However, if the project's proportional share of growth is 25 percent or more, then the necessary improvements must be constructed as part of the project with the potential for reimbursement in the form of impact fee credits.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the a.m. and p.m. peak periods. This condition does not include project-generated traffic volumes. Volume data was collected on Thursday, November 3, 2022, while local schools were in session. Peak hour factors (PHFs) were calculated based on the counts obtained and used in the analysis, unless the PHF was calculated to be less than 0.85 in which case this value was used as a "floor" to avoid overly conservative results.

Under existing conditions, the study intersections operate acceptably at LOS B or C. A summary of the intersection Level of Service calculations is contained in Table 8. The existing traffic volumes are shown in Figure 3, and copies of the calculations for all evaluated scenarios are provided in Appendix D.

Table 8 – Existing Peak Hour Intersection Levels of Service

Study Intersection	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
1. Market St/Benton Dr	16.9	B	14.6	B
2. Quartz Hill Rd/Benton Dr	29.8	C	19.1	B
3. Quartz Hill Rd/Market St	25.6	C	22.8	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Baseline Conditions

Baseline (Existing plus Approved) operating conditions were assessed with traffic from approved or pending projects in the study area that could be operational in the next two to five years added to the Existing volumes. The following development project was identified by City staff to be included in the evaluation of Baseline Conditions; the location of the baseline project is shown in Figure 4.

- **The Cottages at Bel Air** is a proposed residential project of 55 single-family residences to be located on the south side of Quartz Hill Road near Stone Canyon Drive to the east of the proposed project site. Based on the trip generation assumptions which have been reviewed and approved by City staff, the project would be expected to generate an average of 519 daily trips, including 39 during the a.m. peak hour and 52 during the p.m. peak hour.

Upon adding trips associated with the pending development project to Existing volumes and with no changes to the existing intersection lane configurations and controls, all study intersections would operate acceptably at LOS B or C. Baseline volumes are shown in Figure 5, and these results are summarized in Table 9.



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Figure 3 – Existing Traffic Volumes

W-Trans

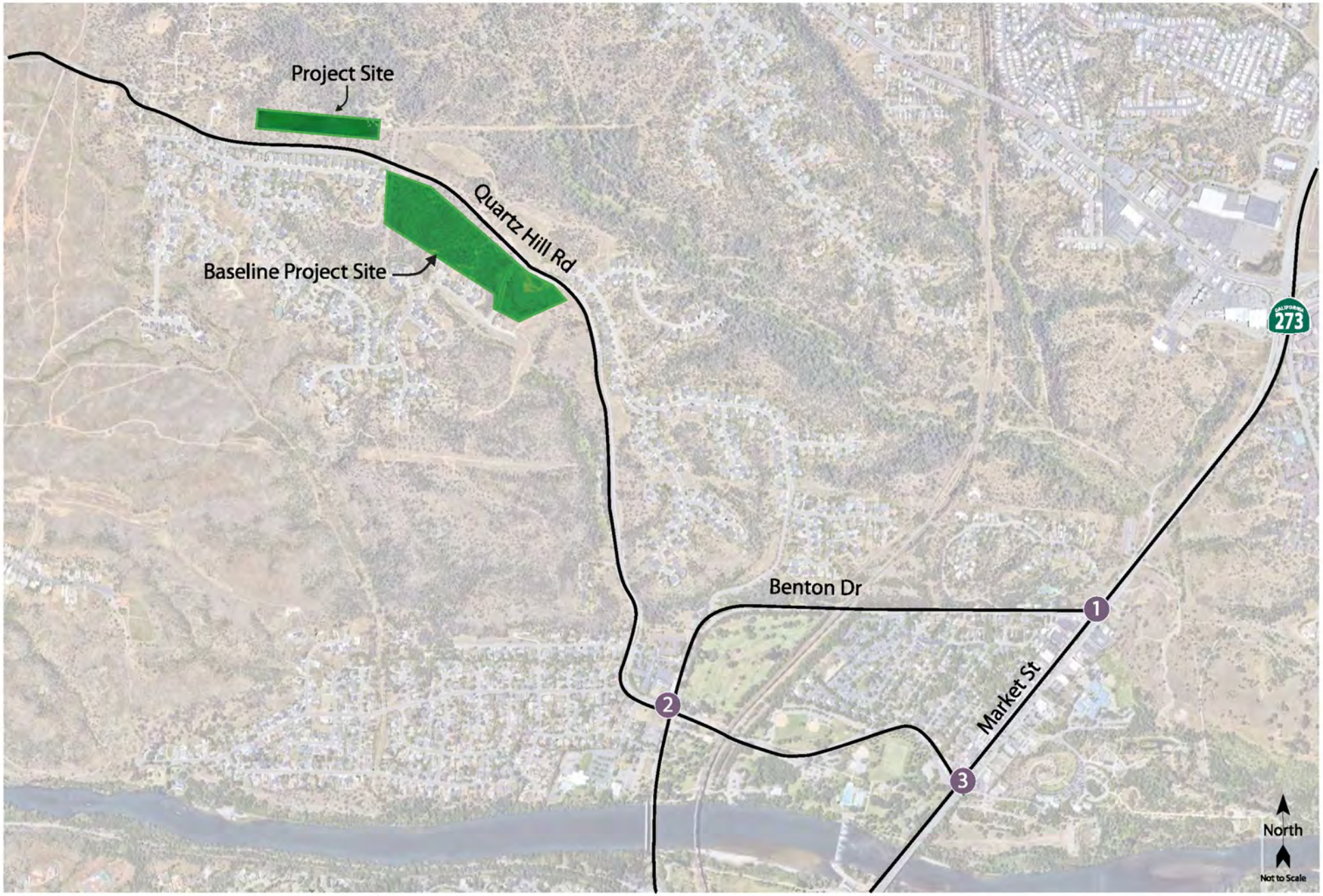

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Figure 4 – Baseline Project Location

W-Trans



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Transportation Impact Study for the Brentwood Village Project

Figure 5 – Baseline Traffic Volumes

W-Trans

Table 9 – Baseline Peak Hour Intersection Levels of Service				
Study Intersection	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. Market St/Benton Dr	16.9	B	14.7	B
2. Quartz Hill Rd/Benton Dr	30.2	C	20.5	C
3. Quartz Hill Rd/Market St	25.9	C	23.9	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Future Conditions

Segment volumes for the horizon year of 2040 were obtained from the Shasta Regional Transportation Agency (SRTA) travel demand model and translated to turning movement volumes at each of the study intersections using the "Furness" method. The Furness method is an iterative process that employs existing turn movement data, existing link volumes and future link volumes to project likely turning future movement volumes at intersections. In some instances, the model projected a traffic volume decrease compared to Baseline Conditions; rather than assume volume decreases, Baseline volumes were maintained as a "floor". This is a common technique used to ensure that the future projections are conservative.

Under the anticipated Future volumes, and with no changes to existing geometrics or controls, the study intersections are expected to operate acceptably at LOS B or C. Operating conditions are summarized in Table 10, and future volumes are shown in Figure 6.

Table 10 – Future Peak Hour Intersection Levels of Service				
Study Intersection	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
1. Market St/Benton Dr	18.1	B	15.1	B
2. Quartz Hill Rd/Benton Dr	32.1	C	19.5	B
3. Quartz Hill Rd/Market St	33.2	C	26.9	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

It should be noted that the average delay at the intersection of Quartz Hill Road/Benton Drive decreases slightly during the p.m. peak hour between Baseline and Future conditions. While this is counter-intuitive, this condition occurs when trips are added to movements that are currently underutilized or have delays that are below the intersection average, resulting in a better balance between approaches and lower overall average delay. Under Future conditions, traffic is added predominantly to the eastbound right-turn movement, which has an average delay that is lower than the average for the intersection as a whole, resulting in a slight reduction in the overall average delay.

Project Conditions

The plus Project Conditions analyses include evaluation of intersection operations with the addition of project-generated trips to the existing, baseline, and future volumes.



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Transportation Impact Study for the Brentwood Village Project

Figure 6 – Future Traffic Volumes

W-Trans

Existing plus Project Conditions

Upon the addition of project-related traffic to the existing volumes the study intersections are expected to continue operating acceptably at LOS B or C with no or minor increases to the overall delays. These results are summarized in Table 11. Project traffic volumes are shown in Figure 7.

Table 11 – Existing and Existing plus Project Peak Hour Intersection Levels of Service

Study Intersection	Existing Conditions				Existing plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Market St/Benton Dr	16.9	B	14.6	B	16.9	B	14.7	B
2. Quartz Hill Rd/Benton Dr	29.8	C	19.1	B	30.0	C	19.9	B
3. Quartz Hill Rd/Market St	25.6	C	22.8	C	25.8	C	23.6	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Finding – The study intersections are expected to continue operating acceptably at the same Levels of Service upon the addition of project-generated traffic to existing volumes and the project's near-term effect on operations would therefore be considered acceptable.

Baseline plus Project Conditions

With project-related traffic added to Baseline volumes, the study intersections are expected to operate acceptably at the same Level of Service as without project traffic. These results are summarized in Table 12.

Table 12 – Baseline and Baseline plus Project Peak Hour Intersection Levels of Service

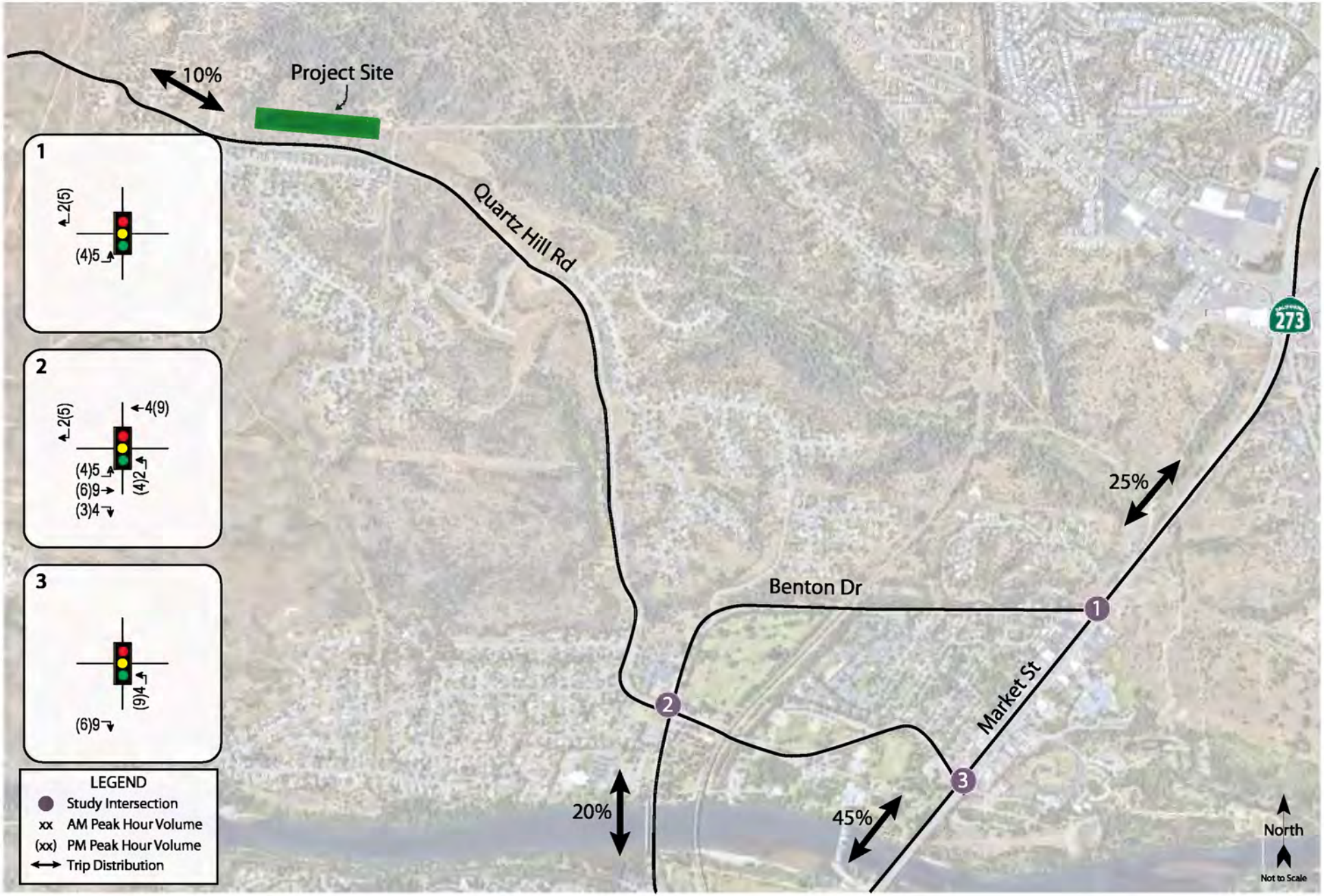
Study Intersection	Baseline Conditions				Baseline plus Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Market St/Benton Dr	16.9	B	14.7	B	17.0	B	14.7	B
2. Quartz Hill Rd/Benton Dr	30.2	C	20.5	C	30.7	C	21.4	C
3. Quartz Hill Rd/Market St	25.9	C	23.9	C	26.0	C	24.7	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Finding – The study intersections are expected to continue operating acceptably with the addition of project-generated traffic to Baseline volumes at the same Levels of Service as without project trips.

Future plus Project Conditions

Upon the addition of project-generated traffic to the anticipated future volumes, the study intersections are expected to operate acceptably at LOS B or C. The Future plus Project operating conditions are summarized in Table 13.



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Transportation Impact Study for the Brentwood Village Project

Figure 7 – Project Traffic Volumes and Trip Distribution

W-Trans

Table 13 – Future and Future plus Project Peak Hour Intersection Levels of Service								
Study Intersection	**Future Conditions**				**Future plus Project**			
	AM Peak		**PM Peak**		**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
1. Market St/Benton Dr	18.1	B	15.1	B	18.1	B	15.1	B
2. Quartz Hill Rd/Benton Dr	32.1	C	19.5	B	32.6	C	21.3	C
3. Quartz Hill Rd/Market St	33.2	C	26.9	C	33.5	C	27.7	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Finding – The study intersections are expected to continue operating acceptably with project traffic added to future volumes; therefore, the project's long-term effect on operations would be considered acceptable.

Parking

As the site plan is still preliminary, the parking supply could not be evaluated. However, based on the City of Redding Municipal Code, Section 18.41.040; Off-Street Parking Space Required, two parking spaces, including at least one covered parking space, are required per two-family dwelling; as the project includes 60 duplex units, a total of 120 parking spaces would be required, 60 of which must be covered.

Finding – The project is still preliminary so the parking supply could not be evaluated. However, two parking spaces, including at least one covered parking space, would be required per duplex unit.

Recommendation – Two parking spaces, including one covered parking and one other parking space, should be provided per duplex unit.

Conclusions and Recommendations

Conclusions

- The project is expected to generate an average of 432 trips per day, including 29 a.m. peak hour trips and 34 p.m. peak hour trips.
- Pedestrian facilities in the vicinity of the project site are adequate given the location of the project site and would be improved upon the completion of planned sidewalks on Quartz Hill Road. The project site plan is a concept sketch and does not identify pedestrian facilities.
- Existing bicycle facilities serving the project site are adequate in the near-term and would improve with the installation of planned buffered bicycle lanes on Quartz Hill Road. The preliminary project site plan does not identify bicycle parking, though none would be required if the units have garages.
- The lack of transit facilities serving the project is adequate given the location of the project site.
- The project is expected to have a less-than-significant impact on VMT.
- Sight lines at the two proposed street connections to Quartz Hill Road are adequate.
- A left-turn lane would not be warranted on Quartz Hill Road at either of the proposed street connections based on projected future vehicle volumes.
- The project would have a less-than-significant impact on queueing as the addition of project-generated traffic would not cause queues to exceed the available stacking space.
- Emergency access and circulation within the project site would be adequate with incorporation of applicable design standards into the site plan. The project would have a less-than-significant impact on emergency response times.
- All three study intersections would operate at acceptable Levels of Service under Existing, Baseline, and Future conditions, without and with traffic generated by the project.
- Adequacy of the proposed parking supply could not be evaluated as the project site plan is still conceptual and is lacking details.

Recommendations

- Sidewalks and streetlighting should be installed along the project streets and frontage on Quartz Hill Road, as well as ADA-compliant curb ramps at the proposed street connections and intersections of project streets.
- The project frontage on Quartz Hill Road should be designed with sufficient roadway width to accommodate provision of buffered bicycle lanes planned by the City.
- If the residences are not designed to have private garages, six long-term bicycle parking spaces should be provided on-site.
- New signage, monuments, or other structures near the project entrances should be positioned outside the sight triangles of a driver waiting on the minor street approaches.

- It is recommended that both the existing westbound acceleration lane at the intersection of Quartz Hill Road/River Ridge Drive and the existing TWLTL at the eastern connection to the project site be restriped into eastbound left-turn lanes.

- Two parking spaces should be provided per duplex unit, including at least one covered parking space.

Study Participants and References

Study Participants

Principal in Charge	Dalene J. Whitlock, PE (Civil, Traffic), PTOE
Transportation Engineer	Cameron Nye, PE (Traffic)
Assistant Engineer	Nathan Sharafian, EIT
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Editing/Formatting	Hannah Yung-Boxdell, Jessica Bender
Quality Control	Dalene J. Whitlock, PE (Civil, Traffic), PTOE

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Appendix A

Collision Rate Calculations



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Intersection Collision Rate Worksheet

TIS for the Brentwood Village Project

Intersection # 1: Market St & Benton Dr
Date of Count: Thursday, November 3, 2022

Number of Collisions: 11
Number of Injuries: 7
Number of Fatalities: 0
Average Daily Traffic (ADT): 20500
Start Date: October 1, 2017
End Date: September 30, 2022
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Signals
Area: Urban

$$\text{Collision Rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times \text{Days per Year} \times \text{Number of Years}}$$

$$\text{Collision Rate} = \frac{11 \times 1{,}000{,}000}{20{,}500 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.29 c/mve**	**0.0%**	**63.6%**
Statewide Average*	**0.24 c/mve**	**0.5%**	**46.9%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2019 Collision Data on California State Highways, Caltrans

Intersection # 2: Quartz Hill Rd & Benton Dr
Date of Count: Thursday, November 3, 2022

Number of Collisions: 3
Number of Injuries: 1
Number of Fatalities: 0
Average Daily Traffic (ADT): 13000
Start Date: October 1, 2017
End Date: September 30, 2022
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Signals
Area: Urban

$$\text{Collision Rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times \text{Days per Year} \times \text{Number of Years}}$$

$$\text{Collision Rate} = \frac{3 \times 1{,}000{,}000}{13{,}000 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.13 c/mve**	**0.0%**	**33.3%**
Statewide Average*	**0.24 c/mve**	**0.5%**	**46.9%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2019 Collision Data on California State Highways, Caltrans

Intersection Collision Rate Worksheet

TIS for the Brentwood Village Project

Intersection # 3: Quartz Hill Rd & Market St
Date of Count: Thursday, November 3, 2022

Number of Collisions: 5
Number of Injuries: 3
Number of Fatalities: 0
Average Daily Traffic (ADT): 18400
Start Date: October 1, 2017
End Date: September 30, 2022
Number of Years: 5

Intersection Type: Four-Legged
Control Type: Signals
Area: Urban

$$\text{Collision Rate} = \frac{\text{Number of Collisions} \times 1 \text{ Million}}{\text{ADT} \times \text{Days per Year} \times \text{Number of Years}}$$

$$\text{Collision Rate} = \frac{5 \times 1{,}000{,}000}{18{,}400 \times 365 \times 5}$$

	Collision Rate	Fatality Rate	Injury Rate
Study Intersection	**0.15 c/mve**	**0.0%**	**60.0%**
Statewide Average*	**0.24 c/mve**	**0.5%**	**46.9%**

Notes
ADT = average daily total vehicles entering intersection
c/mve = collisions per million vehicles entering intersection
* 2019 Collision Data on California State Highways, Caltrans

Appendix B

Turn Lane Warrant Spreadsheets



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Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Quartz Hill Road/Eastern Project Road
Study Scenario: Future AM plus Project

Direction of Analysis Street: East/West

Cross Street Intersects: From the North

Quartz Hill Rd

Westbound Volumes (veh/hr)

Through Volume = 112

Right Turn Volume = 8

Quartz Hill Rd

Eastbound Volumes (veh/hr)

300 = Through Volume

1 = Left Turn Volume

Project Driveway

Westbound Speed Limit: 45 mph
Westbound Configuration: 2 Lanes - Undivided

Eastbound Speed Limit: 45 mph
Eastbound Configuration: 2 Lanes - Undivided

Westbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	120
If AV<Va then warrant is met		-

Right Turn Lane Warranted: **NO**

Westbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	120
If AV<Va then warrant is met		-

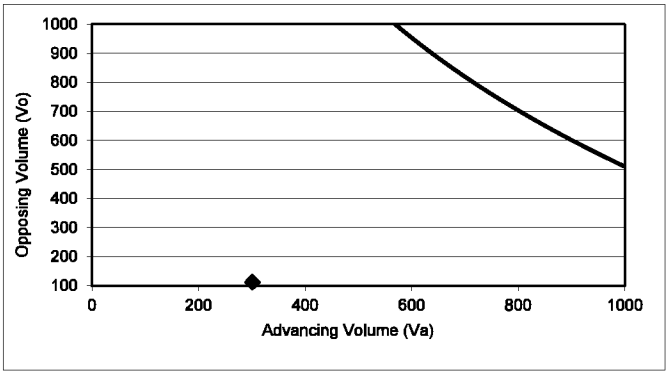
Right Turn Taper Warranted: **NO**

Eastbound Left Turn Lane Warrants

Percentage Left Turns %lt 0.3 %

Advancing Volume Threshold AV 1581 veh/hr

If AV<Va then warrant is met



◆ Study Intersection

——— Two lane roadway warrant threshold for: 45 mph

Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements* , January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - Tee Intersections

Study Intersection: Quartz Hill Road/Eastern Project Road
Study Scenario: Future PM plus Project

Direction of Analysis Street: East/West

Cross Street Intersects: From the North

Quartz Hill Rd

Westbound Volumes (veh/hr)

Through Volume = 240

Right Turn Volume = 18

Westbound Speed Limit: 45 mph

Westbound Configuration: 2 Lanes - Undivided

Project Driveway

Quartz Hill Rd

Eastbound Volumes (veh/hr)

147 = Through Volume

2 = Left Turn Volume

Eastbound Speed Limit: 45 mph

Eastbound Configuration: 2 Lanes - Undivided

Westbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	258
If AV<Va then warrant is met		-

Right Turn Lane Warranted: **NO**

Westbound Right Turn Taper Warrants
(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper

Advancing Volume Threshold	AV =	-
Advancing Volume	Va =	258
If AV<Va then warrant is met		-

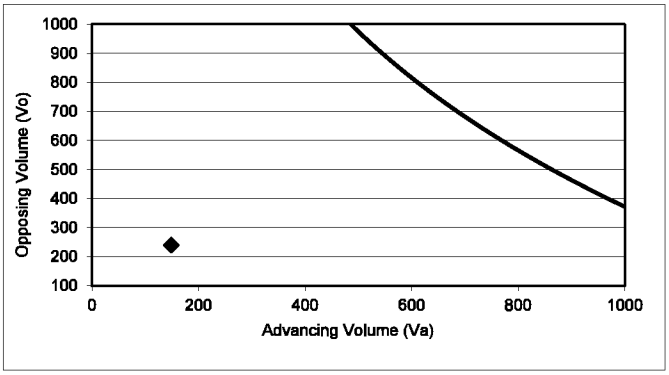
Right Turn Taper Warranted: **NO**

Eastbound Left Turn Lane Warrants

Percentage Left Turns %lt 1.3 %

Advancing Volume Threshold AV 1165 veh/hr

If AV<Va then warrant is met



◆ Study Intersection

Two lane roadway warrant threshold for: 45 mph

Turn lane warranted if point falls to right of warrant threshold line

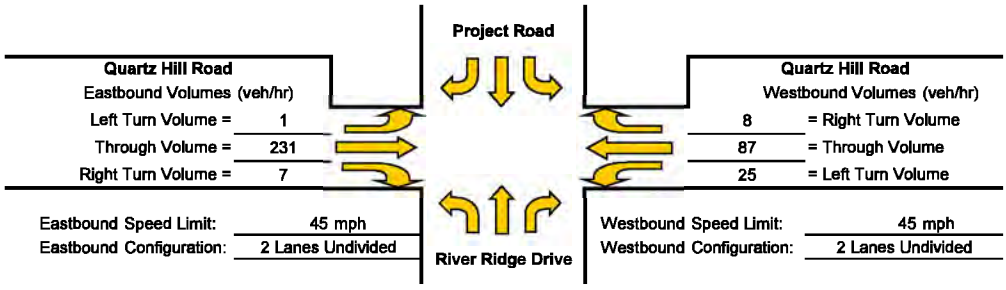
Left Turn Lane Warranted: **NO**

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements* , January 1997.
The right turn lane and taper analysis is based on work conducted by Cottrell in 1981.
The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - 4 Legged Intersections

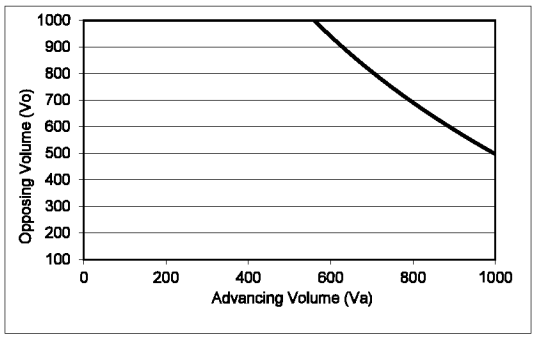
Study Intersection: Quartz Hill Road/River Ridge Drive
Study Scenario: Future AM plus Project

Direction of Analysis Street: East/West



Eastbound Left Turn Lane Warrants

Percentage Left Turns %lt: 0.4 %
Advancing Volume Threshold AV: 1604 veh/hr
If AV<Va then warrant is met

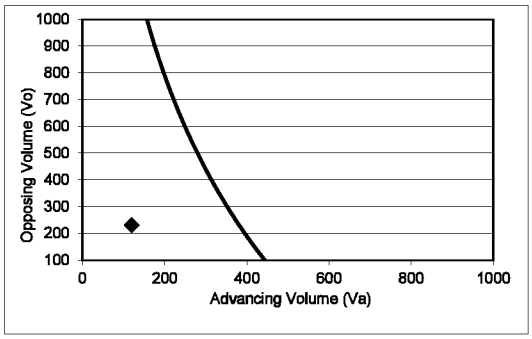


◆ Study Intersection
——— Two lane roadway warrant threshold for: 45 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: NO

Westbound Left Turn Lane Warrants

Percentage Left Turns %lt: 20.8 %
Advancing Volume Threshold AV: 382 veh/hr
If AV<Va then warrant is met



◆ Study Intersection
——— Two lane roadway warrant threshold for: 45 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: NO

Note: If one direction has a left turn lane warranted, a left turn lane should be installed on the other side as well

Eastbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane
Advancing Volume Threshold: AV = -
Advancing Volume Va = 239
If AV<Va then warrant is met -

Right Turn Lane Warranted: NO

Eastbound Right Turn Taper Warrants

(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 40 vehicles

2. Check advance volume threshold criteria for taper
Advancing Volume Threshold AV = 1100
Advancing Volume Va = 239
If AV<Va then warrant is met No

Right Turn Taper Warranted: NO

Westbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane
Advancing Volume Threshold: AV = -
Advancing Volume Va = 120
If AV<Va then warrant is met -

Right Turn Lane Warranted: NO

Westbound Right Turn Taper Warrants

(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper
Advancing Volume Threshold AV = -
Advancing Volume Va = 120
If AV<Va then warrant is met -

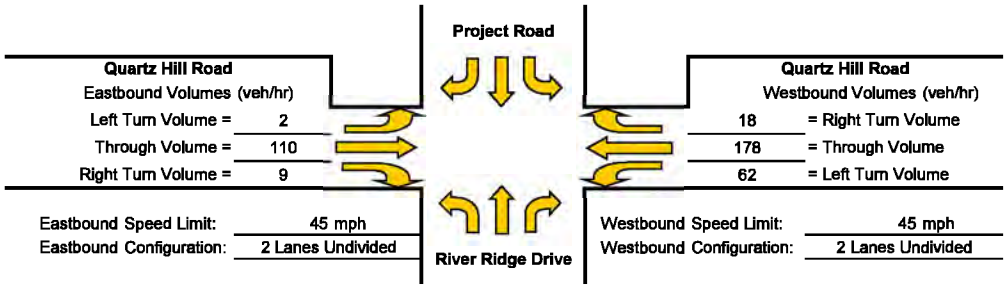
Right Turn Taper Warranted: NO

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, Jan. 1997. The right turn lane and taper analysis is based on work conducted by Cottrell in 1981. The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Turn Lane Warrant Analysis - 4 Legged Intersections

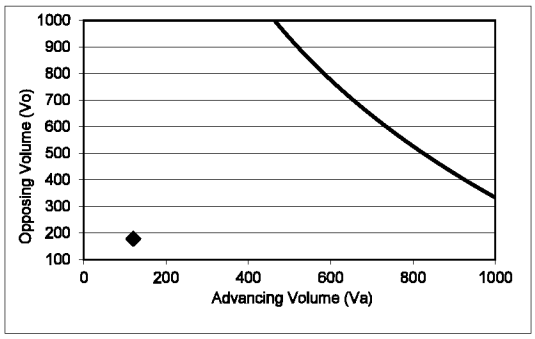
Study Intersection: Quartz Hill Road/River Ridge Drive
Study Scenario: Future PM plus Project

Direction of Analysis Street: East/West



Eastbound Left Turn Lane Warrants

Percentage Left Turns %lt: 1.7 %
Advancing Volume Threshold AV: 1196 veh/hr
If AV<Va then warrant is met

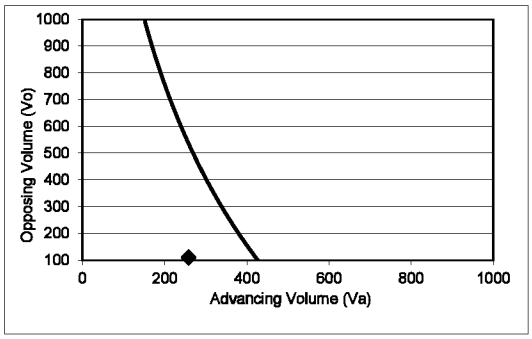


◆ Study Intersection
——— Two lane roadway warrant threshold for: 45 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: NO

Westbound Left Turn Lane Warrants

Percentage Left Turns %lt: 24.0 %
Advancing Volume Threshold AV: 422 veh/hr
If AV<Va then warrant is met



◆ Study Intersection
——— Two lane roadway warrant threshold for: 45 mph
Turn lane warranted if point falls to right of warrant threshold line

Left Turn Lane Warranted: NO

Note: If one direction has a left turn lane warranted, a left turn lane should be installed on the other side as well

Eastbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane
Advancing Volume Threshold: AV = -
Advancing Volume Va = 121
If AV<Va then warrant is met -

Right Turn Lane Warranted: NO

Eastbound Right Turn Taper Warrants

(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 40 vehicles

2. Check advance volume threshold criteria for taper
Advancing Volume Threshold AV = 1033
Advancing Volume Va = 121
If AV<Va then warrant is met No

Right Turn Taper Warranted: NO

Westbound Right Turn Lane Warrants

1. Check for right turn volume criteria

NOT WARRANTED Less than 40 vehicles

2. Check advance volume threshold criteria for turn lane
Advancing Volume Threshold: AV = -
Advancing Volume Va = 258
If AV<Va then warrant is met -

Right Turn Lane Warranted: NO

Westbound Right Turn Taper Warrants

(evaluate if right turn lane is unwarranted)

1. Check taper volume criteria

NOT WARRANTED - Less than 20 vehicles

2. Check advance volume threshold criteria for taper
Advancing Volume Threshold AV = -
Advancing Volume Va = 258
If AV<Va then warrant is met -

Right Turn Taper Warranted: NO

Methodology based on Washington State Transportation Center Research Report *Method For Prioritizing Intersection Improvements*, Jan. 1997. The right turn lane and taper analysis is based on work conducted by Cottrell in 1981. The left turn lane analysis is based on work conducted by M.D. Harmelink in 1967, and modified by Kikuchi and Chakroborty in 1991.

Appendix C

Queuing Calculations



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Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	148	145	5	65	612	2	5	847	370
v/c Ratio	0.36	0.35	0.01	0.19	0.34	0.00	0.02	0.61	0.44
Control Delay	22.7	20.0	0.0	29.0	14.4	0.0	30.8	22.3	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	20.0	0.0	29.0	14.4	0.0	30.8	22.3	5.0
Queue Length 50th (ft)	46	38	0	18	42	0	1	126	0
Queue Length 95th (ft)	120	108	0	81	248	0	14	#420	73
Internal Link Dist (ft)		1706	264		2041			339	
Turn Bay Length (ft)	150			350		50	100		330
Base Capacity (vph)	414	417	443	347	1800	861	316	1390	846
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.35	0.01	0.19	0.34	0.00	0.02	0.61	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	46	157	326	75	59	9	109	268	476
v/c Ratio	0.30	0.46	0.53	0.49	0.15	0.02	0.34	0.79	0.87
Control Delay	33.9	24.2	7.2	42.4	18.2	0.1	27.0	43.6	41.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.9	24.2	7.2	42.4	18.2	0.1	27.0	43.6	41.5
Queue Length 50th (ft)	15	49	23	24	14	0	32	81	149
Queue Length 95th (ft)	#55	88	49	#96	40	0	89	#258	#417
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	153	390	626	153	438	528	338	358	591
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.40	0.52	0.49	0.13	0.02	0.32	0.75	0.81

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	54	54	184	41	122	733	26	819	94
v/c Ratio	0.15	0.15	0.36	0.10	0.49	0.53	0.10	0.76	0.17
Control Delay	28.5	28.5	7.2	21.3	43.5	26.6	37.9	35.5	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	28.5	7.2	21.3	43.5	26.6	37.9	35.5	2.9
Queue Length 50th (ft)	22	22	0	12	54	125	11	200	0
Queue Length 95th (ft)	64	64	47	39	#171	#431	44	#497	12
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	369	372	507	419	250	1377	250	1071	564
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.15	0.36	0.10	0.49	0.53	0.10	0.76	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	191	188	11	71	921	3	541	305
v/c Ratio	0.52	0.37	0.03	0.18	0.49	0.00	0.41	0.40
Control Delay	29.2	7.7	17.2	22.7	9.4	0.0	16.1	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.2	7.7	17.2	22.7	9.4	0.0	16.1	4.6
Queue Length 50th (ft)	60	2	1	20	72	0	72	0
Queue Length 95th (ft)	#181	56	15	62	187	0	153	54
Internal Link Dist (ft)		1706	264		2041		339	
Turn Bay Length (ft)	150			350		50		330
Base Capacity (vph)	367	502	336	386	1888	899	1334	772
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.37	0.03	0.18	0.49	0.00	0.41	0.40

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	42	80	171	56	159	21	282	360	272
v/c Ratio	0.28	0.27	0.22	0.31	0.43	0.04	0.51	0.62	0.77
Control Delay	37.8	25.0	1.5	36.5	25.1	0.2	22.3	23.9	42.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.8	25.0	1.5	36.5	25.1	0.2	22.3	23.9	42.0
Queue Length 50th (ft)	13	24	0	17	40	0	80	103	78
Queue Length 95th (ft)	#70	70	11	#84	123	0	196	246	#337
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	150	334	779	186	415	503	579	605	390
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.24	0.22	0.30	0.38	0.04	0.49	0.60	0.70

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	21	22	140	46	252	883	29	593	59
v/c Ratio	0.05	0.05	0.27	0.10	0.73	0.50	0.10	0.63	0.12
Control Delay	30.4	30.4	6.4	19.8	49.4	25.2	39.9	33.4	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.4	30.4	6.4	19.8	49.4	25.2	39.9	33.4	0.5
Queue Length 50th (ft)	9	9	0	12	123	159	13	143	0
Queue Length 95th (ft)	34	36	42	42	#390	#563	50	#358	0
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	414	416	522	463	393	1771	285	1073	557
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.05	0.27	0.10	0.64	0.50	0.10	0.55	0.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	152	149	5	65	612	2	5	847	373
v/c Ratio	0.37	0.36	0.01	0.19	0.34	0.00	0.02	0.61	0.44
Control Delay	22.8	20.3	0.0	29.0	14.4	0.0	30.8	22.3	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.8	20.3	0.0	29.0	14.4	0.0	30.8	22.3	5.0
Queue Length 50th (ft)	47	41	0	18	42	0	1	126	0
Queue Length 95th (ft)	123	111	0	81	248	0	14	#420	73
Internal Link Dist (ft)		1706	264		2041			339	
Turn Bay Length (ft)	150			350		50	100		330
Base Capacity (vph)	414	417	443	347	1800	861	316	1390	848
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.36	0.01	0.19	0.34	0.00	0.02	0.61	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	54	172	333	75	63	9	111	268	479
v/c Ratio	0.35	0.49	0.54	0.49	0.19	0.02	0.35	0.79	0.87
Control Delay	36.3	24.9	7.4	42.6	19.8	0.1	27.1	44.0	42.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.3	24.9	7.4	42.6	19.8	0.1	27.1	44.0	42.1
Queue Length 50th (ft)	17	54	24	24	18	0	33	81	150
Queue Length 95th (ft)	#67	95	51	#96	42	0	91	#258	#421
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	153	389	627	153	389	492	336	357	589
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.44	0.53	0.49	0.16	0.02	0.33	0.75	0.81

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	54	54	199	41	127	733	26	819	94
v/c Ratio	0.14	0.14	0.38	0.10	0.50	0.54	0.10	0.78	0.17
Control Delay	28.5	28.5	7.1	21.3	43.8	26.7	37.9	36.2	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	28.5	7.1	21.3	43.8	26.7	37.9	36.2	2.9
Queue Length 50th (ft)	22	22	0	12	56	125	11	200	0
Queue Length 95th (ft)	64	64	49	39	#180	#431	44	#497	12
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	375	378	523	425	254	1356	254	1049	556
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.14	0.38	0.10	0.50	0.54	0.10	0.78	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	194	191	11	71	921	3	541	315
v/c Ratio	0.53	0.38	0.03	0.18	0.50	0.00	0.41	0.41
Control Delay	29.5	7.9	17.2	22.6	9.4	0.0	16.2	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.5	7.9	17.2	22.6	9.4	0.0	16.2	4.6
Queue Length 50th (ft)	61	3	1	20	72	0	72	0
Queue Length 95th (ft)	#183	57	15	62	187	0	153	55
Internal Link Dist (ft)		1706	264		2041		339	
Turn Bay Length (ft)	150			350		50		330
Base Capacity (vph)	368	502	337	387	1893	901	1329	776
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.38	0.03	0.18	0.49	0.00	0.41	0.41

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	48	89	176	56	176	21	290	360	282
v/c Ratio	0.32	0.29	0.23	0.31	0.46	0.04	0.54	0.64	0.78
Control Delay	39.0	25.2	1.6	36.4	25.4	0.2	23.0	24.5	41.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.0	25.2	1.6	36.4	25.4	0.2	23.0	24.5	41.9
Queue Length 50th (ft)	15	27	0	18	45	0	84	104	81
Queue Length 95th (ft)	#80	76	11	#84	135	0	202	246	#348
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	151	339	788	188	419	506	583	608	394
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.26	0.22	0.30	0.42	0.04	0.50	0.59	0.72

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	21	22	149	46	269	883	29	593	59
v/c Ratio	0.05	0.05	0.29	0.10	0.76	0.50	0.10	0.63	0.12
Control Delay	30.5	30.4	7.3	19.8	51.2	25.1	40.0	33.7	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.5	30.4	7.3	19.8	51.2	25.1	40.0	33.7	0.5
Queue Length 50th (ft)	9	9	0	12	133	159	13	143	0
Queue Length 95th (ft)	34	36	49	42	#421	#563	50	#358	0
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	410	411	518	458	388	1778	281	1061	552
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.05	0.29	0.10	0.69	0.50	0.10	0.56	0.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	152	149	5	66	774	2	5	963	375
v/c Ratio	0.37	0.36	0.01	0.19	0.43	0.00	0.02	0.69	0.44
Control Delay	22.9	20.3	0.0	29.0	15.5	0.0	30.8	23.7	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.9	20.3	0.0	29.0	15.5	0.0	30.8	23.7	5.0
Queue Length 50th (ft)	47	41	0	19	57	0	1	150	0
Queue Length 95th (ft)	123	111	0	82	#352	0	14	#505	74
Internal Link Dist (ft)		1706	264		2041			339	
Turn Bay Length (ft)	150			350		50	100		330
Base Capacity (vph)	410	414	441	344	1814	867	313	1404	854
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.36	0.01	0.19	0.43	0.00	0.02	0.69	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	54	172	333	75	63	9	121	273	491
v/c Ratio	0.36	0.50	0.55	0.50	0.19	0.02	0.38	0.81	0.88
Control Delay	36.7	25.1	7.7	43.2	19.8	0.1	27.7	45.8	42.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.7	25.1	7.7	43.2	19.8	0.1	27.7	45.8	42.5
Queue Length 50th (ft)	17	54	26	24	18	0	36	83	155
Queue Length 95th (ft)	#67	95	52	#96	42	0	97	#263	#433
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	150	383	618	150	383	487	329	350	577
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.45	0.54	0.50	0.16	0.02	0.37	0.78	0.85

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	54	55	199	43	130	916	31	914	100
v/c Ratio	0.14	0.15	0.38	0.10	0.51	0.68	0.12	0.87	0.18
Control Delay	28.5	28.4	7.1	20.6	44.1	29.7	37.9	41.9	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	28.4	7.1	20.6	44.1	29.7	37.9	41.9	3.5
Queue Length 50th (ft)	22	22	0	12	58	167	13	~258	0
Queue Length 95th (ft)	64	65	49	39	#186	#577	49	#571	16
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	375	378	524	425	255	1354	255	1047	555
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.15	0.38	0.10	0.51	0.68	0.12	0.87	0.18

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	207	201	11	73	982	3	651	317
v/c Ratio	0.57	0.41	0.03	0.19	0.52	0.00	0.48	0.40
Control Delay	31.1	8.8	17.2	22.9	9.6	0.0	16.8	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.1	8.8	17.2	22.9	9.6	0.0	16.8	4.5
Queue Length 50th (ft)	67	6	1	21	78	0	90	0
Queue Length 95th (ft)	#200	64	15	63	203	0	186	55
Internal Link Dist (ft)		1706	264		2041		339	
Turn Bay Length (ft)	150			350		50		330
Base Capacity (vph)	361	495	330	380	1888	899	1349	785
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.41	0.03	0.19	0.52	0.00	0.48	0.40

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	56	89	223	56	176	21	290	329	282
v/c Ratio	0.37	0.29	0.29	0.31	0.52	0.05	0.55	0.60	0.77
Control Delay	40.6	25.1	1.7	36.3	28.4	0.2	23.4	23.3	41.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.6	25.1	1.7	36.3	28.4	0.2	23.4	23.3	41.0
Queue Length 50th (ft)	18	27	0	18	55	0	84	93	81
Queue Length 95th (ft)	#96	76	13	#84	135	0	202	221	#348
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	152	342	819	190	376	475	590	616	399
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.26	0.27	0.29	0.47	0.04	0.49	0.53	0.71

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	21	22	149	52	269	982	33	712	53
v/c Ratio	0.05	0.06	0.29	0.12	0.78	0.55	0.12	0.73	0.10
Control Delay	30.4	30.4	7.3	20.7	52.9	26.1	39.9	35.8	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.4	30.4	7.3	20.7	52.9	26.1	39.9	35.8	0.4
Queue Length 50th (ft)	9	9	0	15	133	184	15	180	0
Queue Length 95th (ft)	34	36	49	47	#421	#648	56	#461	0
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	398	400	508	449	376	1783	273	1028	539
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.06	0.29	0.12	0.72	0.55	0.12	0.69	0.10

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	151	148	5	65	612	2	5	847	372
v/c Ratio	0.36	0.35	0.01	0.19	0.34	0.00	0.02	0.61	0.44
Control Delay	22.8	20.1	0.0	29.0	14.4	0.0	30.8	22.3	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.8	20.1	0.0	29.0	14.4	0.0	30.8	22.3	5.0
Queue Length 50th (ft)	47	40	0	18	42	0	1	126	0
Queue Length 95th (ft)	122	110	0	81	248	0	14	#420	73
Internal Link Dist (ft)		1706	264		2041			339	
Turn Bay Length (ft)	150			350		50	100		330
Base Capacity (vph)	414	418	443	347	1800	861	316	1390	847
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.35	0.01	0.19	0.34	0.00	0.02	0.61	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	52	168	331	75	63	9	111	268	478
v/c Ratio	0.34	0.48	0.54	0.49	0.19	0.02	0.35	0.79	0.87
Control Delay	35.8	24.7	7.4	42.5	19.8	0.1	27.1	43.8	41.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	24.7	7.4	42.5	19.8	0.1	27.1	43.8	41.8
Queue Length 50th (ft)	17	52	24	24	18	0	33	81	150
Queue Length 95th (ft)	#63	93	50	#96	42	0	91	#258	#419
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	153	390	627	153	390	492	337	357	590
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.43	0.53	0.49	0.16	0.02	0.33	0.75	0.81

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	54	54	194	41	127	733	26	819	94
v/c Ratio	0.14	0.14	0.37	0.10	0.50	0.54	0.10	0.78	0.17
Control Delay	28.5	28.5	7.2	21.3	43.9	26.7	37.9	36.0	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	28.5	7.2	21.3	43.9	26.7	37.9	36.0	2.9
Queue Length 50th (ft)	22	22	0	12	56	125	11	200	0
Queue Length 95th (ft)	64	64	48	39	#180	#431	44	#497	12
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	373	376	518	423	253	1362	253	1056	558
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.14	0.37	0.10	0.50	0.54	0.10	0.78	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	194	190	11	71	921	3	541	311
v/c Ratio	0.53	0.38	0.03	0.18	0.50	0.00	0.41	0.40
Control Delay	29.5	7.9	17.2	22.7	9.4	0.0	16.2	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.5	7.9	17.2	22.7	9.4	0.0	16.2	4.6
Queue Length 50th (ft)	61	2	1	20	72	0	72	0
Queue Length 95th (ft)	#183	57	15	62	187	0	153	55
Internal Link Dist (ft)		1706	264		2041		339	
Turn Bay Length (ft)	150			350		50		330
Base Capacity (vph)	368	502	336	387	1891	900	1330	775
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.38	0.03	0.18	0.49	0.00	0.41	0.40

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	47	87	174	56	169	21	287	360	277
v/c Ratio	0.31	0.29	0.23	0.31	0.45	0.04	0.53	0.63	0.78
Control Delay	38.8	25.2	1.6	36.4	25.3	0.2	22.8	24.3	42.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.8	25.2	1.6	36.4	25.3	0.2	22.8	24.3	42.0
Queue Length 50th (ft)	15	27	0	18	43	0	83	104	79
Queue Length 95th (ft)	#78	75	11	#84	131	0	200	246	#343
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	151	339	787	189	420	506	585	610	395
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.26	0.22	0.30	0.40	0.04	0.49	0.59	0.70

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	21	22	147	46	262	883	29	593	59
v/c Ratio	0.05	0.05	0.28	0.10	0.76	0.50	0.10	0.63	0.12
Control Delay	30.5	30.4	7.1	19.8	50.9	25.2	39.9	33.5	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.5	30.4	7.1	19.8	50.9	25.2	39.9	33.5	0.5
Queue Length 50th (ft)	9	9	0	12	129	159	13	143	0
Queue Length 95th (ft)	34	36	47	42	#409	#563	50	#358	0
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	413	414	521	462	391	1774	284	1069	555
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.05	0.28	0.10	0.67	0.50	0.10	0.55	0.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	155	151	5	65	612	2	5	847	375
v/c Ratio	0.37	0.36	0.01	0.19	0.34	0.00	0.02	0.61	0.44
Control Delay	22.9	20.4	0.0	29.0	14.4	0.0	30.8	22.3	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.9	20.4	0.0	29.0	14.4	0.0	30.8	22.3	5.0
Queue Length 50th (ft)	48	41	0	18	42	0	1	126	0
Queue Length 95th (ft)	125	113	0	81	248	0	14	#420	74
Internal Link Dist (ft)		1706	264		2041			339	
Turn Bay Length (ft)	150			350		50	100		330
Base Capacity (vph)	414	417	443	347	1800	861	316	1390	849
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.36	0.01	0.19	0.34	0.00	0.02	0.61	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	60	183	338	75	68	9	114	268	482
v/c Ratio	0.44	0.54	0.53	0.55	0.20	0.02	0.39	0.85	0.93
Control Delay	40.5	26.4	7.3	46.6	20.0	0.1	28.0	51.4	50.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.5	26.4	7.3	46.6	20.0	0.1	28.0	51.4	50.7
Queue Length 50th (ft)	19	58	25	24	20	0	34	81	152
Queue Length 95th (ft)	#76	101	52	#96	44	0	93	#258	#423
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	137	357	639	137	357	468	301	321	528
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.51	0.53	0.55	0.19	0.02	0.38	0.83	0.91

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	54	54	209	41	131	733	26	819	94
v/c Ratio	0.14	0.14	0.39	0.10	0.51	0.55	0.10	0.79	0.17
Control Delay	28.5	28.5	7.1	21.3	44.1	26.8	37.9	36.6	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	28.5	7.1	21.3	44.1	26.8	37.9	36.6	2.9
Queue Length 50th (ft)	22	22	0	12	58	125	11	200	0
Queue Length 95th (ft)	64	64	50	39	#187	#431	44	#497	12
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	378	381	533	428	257	1343	257	1037	551
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.14	0.39	0.10	0.51	0.55	0.10	0.79	0.17

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	197	192	11	71	921	3	541	321
v/c Ratio	0.53	0.38	0.03	0.18	0.50	0.00	0.41	0.41
Control Delay	29.7	8.0	17.2	22.6	9.4	0.0	16.2	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.7	8.0	17.2	22.6	9.4	0.0	16.2	4.6
Queue Length 50th (ft)	62	3	1	20	72	0	72	0
Queue Length 95th (ft)	#188	58	15	62	187	0	153	55
Internal Link Dist (ft)		1706	264		2041		339	
Turn Bay Length (ft)	150			350		50		330
Base Capacity (vph)	369	503	338	388	1896	902	1328	780
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.38	0.03	0.18	0.49	0.00	0.41	0.41

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	52	96	179	56	186	21	294	360	287
v/c Ratio	0.34	0.31	0.24	0.31	0.54	0.05	0.56	0.65	0.78
Control Delay	39.9	25.4	1.6	36.4	29.0	0.2	23.5	25.0	42.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.9	25.4	1.6	36.4	29.0	0.2	23.5	25.0	42.0
Queue Length 50th (ft)	17	29	0	18	59	0	86	104	83
Queue Length 95th (ft)	#87	81	11	#84	142	0	205	246	#354
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	152	345	796	189	375	474	588	613	398
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.28	0.22	0.30	0.50	0.04	0.50	0.59	0.72

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	21	22	156	46	279	883	29	593	59
v/c Ratio	0.05	0.05	0.30	0.10	0.78	0.50	0.10	0.64	0.12
Control Delay	30.5	30.4	7.6	19.8	51.8	25.1	40.0	33.8	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.5	30.4	7.6	19.8	51.8	25.1	40.0	33.8	0.5
Queue Length 50th (ft)	9	9	0	12	138	159	13	143	0
Queue Length 95th (ft)	34	36	53	42	#438	#563	50	#358	0
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	405	406	516	454	383	1779	278	1047	547
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.05	0.30	0.10	0.73	0.50	0.10	0.57	0.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	155	151	5	66	774	2	5	963	377
v/c Ratio	0.38	0.36	0.01	0.19	0.43	0.00	0.02	0.69	0.44
Control Delay	23.0	20.4	0.0	29.0	15.5	0.0	30.8	23.7	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.0	20.4	0.0	29.0	15.5	0.0	30.8	23.7	4.9
Queue Length 50th (ft)	48	41	0	19	57	0	1	150	0
Queue Length 95th (ft)	125	113	0	82	#352	0	14	#505	74
Internal Link Dist (ft)		1706	264		2041			339	
Turn Bay Length (ft)	150			350		50	100		330
Base Capacity (vph)	410	414	441	344	1814	867	313	1404	855
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.36	0.01	0.19	0.43	0.00	0.02	0.69	0.44

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	60	183	338	75	68	9	123	273	494
v/c Ratio	0.44	0.55	0.54	0.55	0.20	0.02	0.42	0.86	0.94
Control Delay	40.7	26.5	7.5	47.0	20.0	0.1	28.7	53.2	53.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.7	26.5	7.5	47.0	20.0	0.1	28.7	53.2	53.0
Queue Length 50th (ft)	19	58	26	24	20	0	37	83	157
Queue Length 95th (ft)	#76	101	53	#96	44	0	98	#263	#436
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	136	355	632	136	355	467	299	320	524
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.52	0.53	0.55	0.19	0.02	0.41	0.85	0.94

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	54	55	209	43	135	916	31	914	100
v/c Ratio	0.14	0.14	0.39	0.10	0.53	0.68	0.12	0.88	0.18
Control Delay	28.5	28.4	7.1	20.6	44.5	29.9	37.9	42.9	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	28.4	7.1	20.6	44.5	29.9	37.9	42.9	3.5
Queue Length 50th (ft)	22	22	0	12	60	167	13	~258	0
Queue Length 95th (ft)	64	65	50	39	#195	#577	49	#571	16
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	379	382	534	428	257	1340	257	1033	549
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.14	0.39	0.10	0.53	0.68	0.12	0.88	0.18

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
1: Market St & Benton Dr

12/22/2022



Lane Group	EBL	EBT	WBT	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	209	203	11	73	982	3	651	323
v/c Ratio	0.58	0.41	0.03	0.19	0.52	0.00	0.48	0.41
Control Delay	31.3	8.9	17.2	22.9	9.6	0.0	16.8	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.3	8.9	17.2	22.9	9.6	0.0	16.8	4.5
Queue Length 50th (ft)	67	6	1	21	78	0	90	0
Queue Length 95th (ft)	#203	65	15	63	203	0	186	56
Internal Link Dist (ft)		1706	264		2041		339	
Turn Bay Length (ft)	150			350		50		330
Base Capacity (vph)	361	496	331	380	1887	898	1347	788
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.41	0.03	0.19	0.52	0.00	0.48	0.41

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
2: Benton Dr & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT
Lane Group Flow (vph)	60	96	227	56	186	21	294	360	287
v/c Ratio	0.40	0.31	0.29	0.31	0.54	0.05	0.55	0.65	0.78
Control Delay	41.7	25.5	1.7	36.4	29.1	0.2	23.3	24.7	42.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.7	25.5	1.7	36.4	29.1	0.2	23.3	24.7	42.4
Queue Length 50th (ft)	19	29	0	18	59	0	86	104	83
Queue Length 95th (ft)	#103	81	13	#84	142	0	205	246	#354
Internal Link Dist (ft)		474			765			602	772
Turn Bay Length (ft)	105			105		300	105		
Base Capacity (vph)	151	344	818	188	373	473	585	610	397
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.28	0.28	0.30	0.50	0.04	0.50	0.59	0.72

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues
3: Market St & Quartz Hill Rd

12/22/2022



Lane Group	EBL	EBT	EBR	WBT	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	21	22	156	52	279	982	33	712	59
v/c Ratio	0.05	0.06	0.31	0.12	0.79	0.55	0.12	0.73	0.11
Control Delay	30.4	30.4	7.7	20.7	53.6	26.1	39.9	36.0	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.4	30.4	7.7	20.7	53.6	26.1	39.9	36.0	0.5
Queue Length 50th (ft)	9	9	0	15	138	184	15	180	0
Queue Length 95th (ft)	34	36	53	47	#438	#648	56	#461	0
Internal Link Dist (ft)		760		925		434		2041	
Turn Bay Length (ft)	130		160		150		150		
Base Capacity (vph)	393	395	506	444	372	1784	269	1015	534
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.06	0.31	0.12	0.75	0.55	0.12	0.70	0.11

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Appendix D

Intersection Level of Service Calculations



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HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	241	1	31	1	0	4	60	569	2	5	788	344
Future Volume (veh/h)	241	1	31	1	0	4	60	569	2	5	788	344
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	280	0	0	1	0	1	65	612	2	5	847	294
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	709	372	0	5	0	5	225	1528	678	24	1126	502
Arrive On Green	0.20	0.00	0.00	0.01	0.00	0.01	0.13	0.43	0.43	0.01	0.32	0.32
Sat Flow, veh/h	3563	1870	0	837	0	837	1781	3554	1578	1781	3554	1585
Grp Volume(v), veh/h	280	0	0	2	0	0	65	612	2	5	847	294
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1675	0	0	1781	1777	1578	1781	1777	1585
Q Serve(g_s), s	3.7	0.0	0.0	0.1	0.0	0.0	1.8	6.5	0.0	0.2	11.7	8.5
Cycle Q Clear(g_c), s	3.7	0.0	0.0	0.1	0.0	0.0	1.8	6.5	0.0	0.2	11.7	8.5
Prop In Lane	1.00		0.00	0.50		0.50	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	709	372	0	9	0	0	225	1528	678	24	1126	502
V/C Ratio(X)	0.40	0.00	0.00	0.22	0.00	0.00	0.29	0.40	0.00	0.21	0.75	0.59
Avail Cap(c_a), veh/h	719	377	0	307	0	0	359	1528	678	327	1226	547
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.0	0.0	0.0	27.0	0.0	0.0	21.6	10.7	8.9	26.6	16.7	15.6
Incr Delay (d2), s/veh	0.4	0.0	0.0	4.3	0.0	0.0	0.5	0.2	0.0	3.2	2.9	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	0.0	0.0	0.0	0.0	0.7	1.9	0.0	0.1	4.2	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.4	0.0	0.0	31.3	0.0	0.0	22.1	10.9	8.9	29.8	19.6	17.7
LnGrp LOS	B	A	A	C	A	A	C	B	A	C	B	B
Approach Vol, veh/h		280			2			679			1146	
Approach Delay, s/veh		19.4			31.3			12.0			19.1	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	29.6		15.4	11.1	23.5		4.5				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	2.2	8.5		5.7	3.8	13.7		2.1				
Green Ext Time (p_c), s	0.0	3.8		0.5	0.0	3.6		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	16.9
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	137	284	65	51	8	95	189	44	11	376	27
Future Volume (veh/h)	40	137	284	65	51	8	95	189	44	11	376	27
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	46	157	259	75	59	6	109	217	31	13	432	28
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	66	292	512	95	322	273	298	267	38	14	471	31
Arrive On Green	0.04	0.16	0.16	0.05	0.17	0.17	0.17	0.17	0.17	0.28	0.28	0.28
Sat Flow, veh/h	1781	1870	1580	1781	1870	1585	1781	1595	228	51	1688	109
Grp Volume(v), veh/h	46	157	259	75	59	6	109	0	248	473	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1580	1781	1870	1585	1781	0	1822	1848	0	0
Q Serve(g_s), s	1.4	4.2	7.1	2.2	1.4	0.2	2.9	0.0	7.0	13.3	0.0	0.0
Cycle Q Clear(g_c), s	1.4	4.2	7.1	2.2	1.4	0.2	2.9	0.0	7.0	13.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.13	0.03		0.06
Lane Grp Cap(c), veh/h	66	292	512	95	322	273	298	0	305	516	0	0
V/C Ratio(X)	0.70	0.54	0.51	0.79	0.18	0.02	0.37	0.00	0.81	0.92	0.00	0.00
Avail Cap(c_a), veh/h	136	292	512	136	322	273	298	0	305	516	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	25.6	20.9	14.7	25.2	19.0	18.5	19.8	0.0	21.6	18.8	0.0	0.0
Incr Delay (d2), s/veh	4.9	1.1	0.3	11.4	0.1	0.0	0.3	0.0	14.3	21.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	1.7	3.0	1.2	0.6	0.1	1.1	0.0	3.9	7.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.5	21.9	15.0	36.6	19.1	18.5	20.1	0.0	35.9	39.7	0.0	0.0
LnGrp LOS	C	C	B	D	B	B	C	A	D	D	A	A
Approach Vol, veh/h		462			140			357			473	
Approach Delay, s/veh		18.9			28.4			31.1			39.7	
Approach LOS		B			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.4	13.4		20.0	5.5	14.3		14.0				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	4.1	8.4		15.0	4.1	8.4		9.0				
Max Q Clear Time (g_c+I1), s	4.2	9.1		15.3	3.4	3.4		9.0				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.0		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	29.8
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	6	158	25	2	9	105	613	17	22	704	81
Future Volume (veh/h)	87	6	158	25	2	9	105	613	17	22	704	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	106	0	58	29	2	1	122	713	15	26	819	50
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	781	0	341	154	11	5	244	1225	26	103	942	418
Arrive On Green	0.22	0.00	0.22	0.10	0.10	0.10	0.14	0.34	0.34	0.06	0.27	0.27
Sat Flow, veh/h	3563	0	1554	1612	111	56	1781	3557	75	1781	3554	1576
Grp Volume(v), veh/h	106	0	58	32	0	0	122	356	372	26	819	50
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1779	0	0	1781	1777	1855	1781	1777	1576
Q Serve(g_s), s	1.6	0.0	2.0	1.1	0.0	0.0	4.1	10.7	10.7	0.9	14.3	1.6
Cycle Q Clear(g_c), s	1.6	0.0	2.0	1.1	0.0	0.0	4.1	10.7	10.7	0.9	14.3	1.6
Prop In Lane	1.00		1.00	0.91		0.03	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	781	0	341	170	0	0	244	612	639	103	942	418
V/C Ratio(X)	0.14	0.00	0.17	0.19	0.00	0.00	0.50	0.58	0.58	0.25	0.87	0.12
Avail Cap(c_a), veh/h	822	0	359	383	0	0	274	612	639	274	962	427
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	0.0	20.6	27.1	0.0	0.0	26.0	17.5	17.5	29.3	22.8	18.1
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.4	0.0	0.0	0.6	2.2	2.1	0.5	9.2	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.7	0.5	0.0	0.0	1.6	4.1	4.2	0.4	6.4	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.5	0.0	20.8	27.5	0.0	0.0	26.6	19.7	19.6	29.8	32.0	18.4
LnGrp LOS	C	A	C	C	A	A	C	B	B	C	C	B
Approach Vol, veh/h		164			32			850			895	
Approach Delay, s/veh		20.6			27.5			20.7			31.2	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.9	28.2		18.5	13.1	23.0		10.4				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	17.6		* 15	* 10	17.6		14.0				
Max Q Clear Time (g_c+I1), s	2.9	12.7		4.0	6.1	16.3		3.1				
Green Ext Time (p_c), s	0.0	2.7		0.4	0.0	0.9		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	25.6
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	314	0	35	3	1	6	65	847	3	0	498	281
Future Volume (veh/h)	314	0	35	3	1	6	65	847	3	0	498	281
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	364	0	0	3	1	2	71	921	3	0	541	233
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	761	400	0	14	5	9	243	1696	756	3	919	400
Arrive On Green	0.21	0.00	0.00	0.02	0.02	0.02	0.14	0.48	0.48	0.00	0.26	0.26
Sat Flow, veh/h	3563	1870	0	861	287	574	1781	3554	1583	1781	3554	1547
Grp Volume(v), veh/h	364	0	0	6	0	0	71	921	3	0	541	233
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1723	0	0	1781	1777	1583	1781	1777	1547
Q Serve(g_s), s	4.6	0.0	0.0	0.2	0.0	0.0	1.8	9.4	0.1	0.0	6.8	6.7
Cycle Q Clear(g_c), s	4.6	0.0	0.0	0.2	0.0	0.0	1.8	9.4	0.1	0.0	6.8	6.7
Prop In Lane	1.00		0.00	0.50		0.33	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	761	400	0	28	0	0	243	1696	756	3	919	400
V/C Ratio(X)	0.48	0.00	0.00	0.22	0.00	0.00	0.29	0.54	0.00	0.00	0.59	0.58
Avail Cap(c_a), veh/h	766	402	0	337	0	0	383	1696	756	348	1305	568
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	17.6	0.0	0.0	24.9	0.0	0.0	19.9	9.4	7.0	0.0	16.6	16.6
Incr Delay (d2), s/veh	0.6	0.0	0.0	1.5	0.0	0.0	0.5	0.5	0.0	0.0	1.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	0.0	0.1	0.0	0.0	0.7	2.5	0.0	0.0	2.4	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.2	0.0	0.0	26.3	0.0	0.0	20.4	9.9	7.0	0.0	17.6	18.9
LnGrp LOS	B	A	A	C	A	A	C	A	A	A	B	B
Approach Vol, veh/h		364			6			995			774	
Approach Delay, s/veh		18.2			26.3			10.6			18.0	
Approach LOS		B			C			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	0.0	30.6		15.5	11.2	19.4		5.0				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	0.0	11.4		6.6	3.8	8.8		2.2				
Green Ext Time (p_c), s	0.0	4.6		0.7	0.0	4.4		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	14.6
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	72	154	50	143	19	254	282	42	11	182	52
Future Volume (veh/h)	38	72	154	50	143	19	254	282	42	11	182	52
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	42	80	129	56	159	11	282	313	40	12	202	39
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	65	226	578	80	242	204	436	396	51	15	254	49
Arrive On Green	0.04	0.12	0.12	0.04	0.13	0.13	0.24	0.24	0.24	0.18	0.18	0.18
Sat Flow, veh/h	1781	1870	1572	1781	1870	1573	1781	1619	207	86	1448	280
Grp Volume(v), veh/h	42	80	129	56	159	11	282	0	353	253	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1572	1781	1870	1573	1781	0	1826	1814	0	0
Q Serve(g_s), s	1.0	1.8	2.5	1.4	3.6	0.3	6.3	0.0	8.1	6.0	0.0	0.0
Cycle Q Clear(g_c), s	1.0	1.8	2.5	1.4	3.6	0.3	6.3	0.0	8.1	6.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	0.05		0.15
Lane Grp Cap(c), veh/h	65	226	578	80	242	204	436	0	447	318	0	0
V/C Ratio(X)	0.65	0.35	0.22	0.70	0.66	0.05	0.65	0.00	0.79	0.80	0.00	0.00
Avail Cap(c_a), veh/h	163	310	648	203	352	296	558	0	572	406	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.2	18.0	9.8	21.0	18.5	17.1	15.1	0.0	15.8	17.7	0.0	0.0
Incr Delay (d2), s/veh	4.0	0.3	0.1	4.1	1.1	0.0	0.7	0.0	4.3	6.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.7	1.1	0.6	1.4	0.1	2.2	0.0	3.3	2.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.3	18.4	9.9	25.2	19.6	17.1	15.8	0.0	20.1	24.0	0.0	0.0
LnGrp LOS	C	B	A	C	B	B	B	A	C	C	A	A
Approach Vol, veh/h		251			226			635			253	
Approach Delay, s/veh		15.2			20.9			18.2			24.0	
Approach LOS		B			C			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.5	10.4		12.8	5.1	10.8		15.9				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	7.4		10.0	4.1	8.4		14.0				
Max Q Clear Time (g_c+I1), s	3.4	4.5		8.0	3.0	5.6		10.1				
Green Ext Time (p_c), s	0.0	0.1		0.2	0.0	0.1		0.8				

Intersection Summary			
HCM 6th Ctrl Delay		19.1	
HCM 6th LOS		B	

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	1	126	22	4	16	227	767	28	26	534	53
Future Volume (veh/h)	38	1	126	22	4	16	227	767	28	26	534	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	43	0	28	24	4	5	252	852	29	29	593	37
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	627	0	274	129	21	27	302	1233	42	114	875	379
Arrive On Green	0.18	0.00	0.18	0.10	0.10	0.10	0.17	0.35	0.35	0.06	0.25	0.25
Sat Flow, veh/h	3563	0	1554	1275	213	266	1781	3503	119	1781	3554	1538
Grp Volume(v), veh/h	43	0	28	33	0	0	252	432	449	29	593	37
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1753	0	0	1781	1777	1845	1781	1777	1538
Q Serve(g_s), s	0.6	0.0	0.9	1.0	0.0	0.0	8.2	12.5	12.5	0.9	9.0	1.1
Cycle Q Clear(g_c), s	0.6	0.0	0.9	1.0	0.0	0.0	8.2	12.5	12.5	0.9	9.0	1.1
Prop In Lane	1.00		1.00	0.73		0.15	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	627	0	274	177	0	0	302	625	650	114	875	379
V/C Ratio(X)	0.07	0.00	0.10	0.19	0.00	0.00	0.83	0.69	0.69	0.25	0.68	0.10
Avail Cap(c_a), veh/h	892	0	389	410	0	0	410	670	696	297	1115	483
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.6	0.0	20.7	24.7	0.0	0.0	24.1	16.6	16.6	26.7	20.4	17.4
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.4	0.0	0.0	7.8	3.9	3.7	0.4	2.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.3	0.4	0.0	0.0	3.7	4.8	4.9	0.4	3.4	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.6	0.0	20.9	25.1	0.0	0.0	31.9	20.5	20.4	27.1	22.6	17.7
LnGrp LOS	C	A	C	C	A	A	C	C	C	C	C	B
Approach Vol, veh/h		71			33			1133			659	
Approach Delay, s/veh		20.7			25.1			23.0			22.5	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	26.9		14.8	14.4	20.6		10.3				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	22.6		* 15	* 14	18.8		14.0				
Max Q Clear Time (g_c+I1), s	2.9	14.5		2.9	10.2	11.0		3.0				
Green Ext Time (p_c), s	0.0	4.9		0.1	0.1	3.6		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		22.8	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	248	1	31	1	0	4	60	569	2	5	788	347
Future Volume (veh/h)	248	1	31	1	0	4	60	569	2	5	788	347
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	288	0	0	1	0	1	65	612	2	5	847	297
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	710	373	0	5	0	5	225	1528	678	24	1126	502
Arrive On Green	0.20	0.00	0.00	0.01	0.00	0.01	0.13	0.43	0.43	0.01	0.32	0.32
Sat Flow, veh/h	3563	1870	0	837	0	837	1781	3554	1578	1781	3554	1585
Grp Volume(v), veh/h	288	0	0	2	0	0	65	612	2	5	847	297
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1675	0	0	1781	1777	1578	1781	1777	1585
Q Serve(g_s), s	3.8	0.0	0.0	0.1	0.0	0.0	1.8	6.5	0.0	0.2	11.7	8.6
Cycle Q Clear(g_c), s	3.8	0.0	0.0	0.1	0.0	0.0	1.8	6.5	0.0	0.2	11.7	8.6
Prop In Lane	1.00		0.00	0.50		0.50	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	710	373	0	9	0	0	225	1528	678	24	1126	502
V/C Ratio(X)	0.41	0.00	0.00	0.22	0.00	0.00	0.29	0.40	0.00	0.21	0.75	0.59
Avail Cap(c_a), veh/h	719	377	0	307	0	0	359	1528	678	327	1225	546
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.0	0.0	0.0	27.0	0.0	0.0	21.6	10.7	8.9	26.6	16.7	15.7
Incr Delay (d2), s/veh	0.5	0.0	0.0	4.3	0.0	0.0	0.5	0.2	0.0	3.2	2.9	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.0	0.0	0.0	0.0	0.7	1.9	0.0	0.1	4.2	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.5	0.0	0.0	31.3	0.0	0.0	22.1	10.9	8.9	29.8	19.6	17.8
LnGrp LOS	B	A	A	C	A	A	C	B	A	C	B	B
Approach Vol, veh/h		288			2			679			1149	
Approach Delay, s/veh		19.5			31.3			12.0			19.2	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	29.6		15.5	11.1	23.5		4.5				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	2.2	8.5		5.8	3.8	13.7		2.1				
Green Ext Time (p_c), s	0.0	3.8		0.6	0.0	3.6		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	16.9
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	150	290	65	55	8	97	189	44	11	376	30
Future Volume (veh/h)	47	150	290	65	55	8	97	189	44	11	376	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	54	172	266	75	63	6	111	217	31	13	432	31
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	73	292	512	95	315	267	298	267	38	14	468	34
Arrive On Green	0.04	0.16	0.16	0.05	0.17	0.17	0.17	0.17	0.17	0.28	0.28	0.28
Sat Flow, veh/h	1781	1870	1580	1781	1870	1585	1781	1595	228	50	1676	120
Grp Volume(v), veh/h	54	172	266	75	63	6	111	0	248	476	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1580	1781	1870	1585	1781	0	1822	1846	0	0
Q Serve(g_s), s	1.6	4.6	7.4	2.2	1.6	0.2	3.0	0.0	7.0	13.5	0.0	0.0
Cycle Q Clear(g_c), s	1.6	4.6	7.4	2.2	1.6	0.2	3.0	0.0	7.0	13.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.13	0.03		0.07
Lane Grp Cap(c), veh/h	73	292	512	95	315	267	298	0	305	515	0	0
V/C Ratio(X)	0.74	0.59	0.52	0.79	0.20	0.02	0.37	0.00	0.81	0.92	0.00	0.00
Avail Cap(c_a), veh/h	136	292	512	136	315	267	298	0	305	515	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	25.5	21.1	14.8	25.2	19.2	18.7	19.9	0.0	21.6	18.8	0.0	0.0
Incr Delay (d2), s/veh	5.3	2.1	0.4	11.4	0.1	0.0	0.3	0.0	14.3	22.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	2.0	3.1	1.2	0.6	0.1	1.1	0.0	3.9	8.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.7	23.2	15.2	36.6	19.4	18.7	20.2	0.0	35.9	41.0	0.0	0.0
LnGrp LOS	C	C	B	D	B	B	C	A	D	D	A	A
Approach Vol, veh/h		492			144			359			476	
Approach Delay, s/veh		19.7			28.3			31.0			41.0	
Approach LOS		B			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.4	13.4		20.0	5.7	14.0		14.0				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	4.1	8.4		15.0	4.1	8.4		9.0				
Max Q Clear Time (g_c+I1), s	4.2	9.4		15.5	3.6	3.6		9.0				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.1		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	30.2
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	6	171	25	2	9	109	613	17	22	704	81
Future Volume (veh/h)	87	6	171	25	2	9	109	613	17	22	704	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	106	0	73	29	2	1	127	713	15	26	819	50
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	787	0	344	154	11	5	245	1225	26	103	939	416
Arrive On Green	0.22	0.00	0.22	0.10	0.10	0.10	0.14	0.34	0.34	0.06	0.26	0.26
Sat Flow, veh/h	3563	0	1554	1612	111	56	1781	3557	75	1781	3554	1576
Grp Volume(v), veh/h	106	0	73	32	0	0	127	356	372	26	819	50
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1779	0	0	1781	1777	1855	1781	1777	1576
Q Serve(g_s), s	1.6	0.0	2.5	1.1	0.0	0.0	4.3	10.7	10.7	0.9	14.4	1.6
Cycle Q Clear(g_c), s	1.6	0.0	2.5	1.1	0.0	0.0	4.3	10.7	10.7	0.9	14.4	1.6
Prop In Lane	1.00		1.00	0.91		0.03	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	787	0	344	170	0	0	245	612	639	103	939	416
V/C Ratio(X)	0.13	0.00	0.21	0.19	0.00	0.00	0.52	0.58	0.58	0.25	0.87	0.12
Avail Cap(c_a), veh/h	818	0	357	381	0	0	273	612	639	273	957	424
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	0.0	20.8	27.2	0.0	0.0	26.2	17.6	17.6	29.5	23.0	18.3
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.4	0.0	0.0	0.6	2.2	2.1	0.5	9.5	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.9	0.5	0.0	0.0	1.7	4.1	4.3	0.4	6.4	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.5	0.0	21.1	27.6	0.0	0.0	26.8	19.8	19.7	29.9	32.5	18.5
LnGrp LOS	C	A	C	C	A	A	C	B	B	C	C	B
Approach Vol, veh/h		179			32			855			895	
Approach Delay, s/veh		20.8			27.6			20.8			31.6	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	28.3		18.6	13.2	23.1		10.4				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	17.6		* 15	* 10	17.6		14.0				
Max Q Clear Time (g_c+I1), s	2.9	12.7		4.5	6.3	16.4		3.1				
Green Ext Time (p_c), s	0.0	2.7		0.4	0.0	0.9		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		25.9	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	319	0	35	3	1	6	65	847	3	0	498	290
Future Volume (veh/h)	319	0	35	3	1	6	65	847	3	0	498	290
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	370	0	0	3	1	2	71	921	3	0	541	243
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	758	398	0	14	5	9	243	1705	760	3	930	405
Arrive On Green	0.21	0.00	0.00	0.02	0.02	0.02	0.14	0.48	0.48	0.00	0.26	0.26
Sat Flow, veh/h	3563	1870	0	861	287	574	1781	3554	1583	1781	3554	1547
Grp Volume(v), veh/h	370	0	0	6	0	0	71	921	3	0	541	243
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1723	0	0	1781	1777	1583	1781	1777	1547
Q Serve(g_s), s	4.7	0.0	0.0	0.2	0.0	0.0	1.8	9.4	0.1	0.0	6.8	7.1
Cycle Q Clear(g_c), s	4.7	0.0	0.0	0.2	0.0	0.0	1.8	9.4	0.1	0.0	6.8	7.1
Prop In Lane	1.00		0.00	0.50		0.33	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	758	398	0	28	0	0	243	1705	760	3	930	405
V/C Ratio(X)	0.49	0.00	0.00	0.22	0.00	0.00	0.29	0.54	0.00	0.00	0.58	0.60
Avail Cap(c_a), veh/h	762	400	0	335	0	0	381	1705	760	346	1299	565
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	17.8	0.0	0.0	25.0	0.0	0.0	20.0	9.4	7.0	0.0	16.5	16.6
Incr Delay (d2), s/veh	0.6	0.0	0.0	1.5	0.0	0.0	0.5	0.5	0.0	0.0	1.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	0.0	0.1	0.0	0.0	0.7	2.5	0.0	0.0	2.4	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.4	0.0	0.0	26.5	0.0	0.0	20.5	9.8	7.0	0.0	17.5	19.1
LnGrp LOS	B	A	A	C	A	A	C	A	A	A	B	B
Approach Vol, veh/h		370			6			995			784	
Approach Delay, s/veh		18.4			26.5			10.6			18.0	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	0.0	30.9		15.5	11.2	19.7		5.0				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	0.0	11.4		6.7	3.8	9.1		2.2				
Green Ext Time (p_c), s	0.0	4.6		0.7	0.0	4.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		14.7	
HCM 6th LOS		B	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	80	158	50	158	19	261	282	42	11	182	61
Future Volume (veh/h)	43	80	158	50	158	19	261	282	42	11	182	61
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	48	89	134	56	176	11	290	313	40	12	202	49
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	71	247	592	79	255	215	432	393	50	15	250	61
Arrive On Green	0.04	0.13	0.13	0.04	0.14	0.14	0.24	0.24	0.24	0.18	0.18	0.18
Sat Flow, veh/h	1781	1870	1573	1781	1870	1573	1781	1619	207	82	1385	336
Grp Volume(v), veh/h	48	89	134	56	176	11	290	0	353	263	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1573	1781	1870	1573	1781	0	1826	1804	0	0
Q Serve(g_s), s	1.2	2.0	2.7	1.4	4.1	0.3	6.8	0.0	8.4	6.5	0.0	0.0
Cycle Q Clear(g_c), s	1.2	2.0	2.7	1.4	4.1	0.3	6.8	0.0	8.4	6.5	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	0.05		0.19
Lane Grp Cap(c), veh/h	71	247	592	79	255	215	432	0	443	326	0	0
V/C Ratio(X)	0.68	0.36	0.23	0.71	0.69	0.05	0.67	0.00	0.80	0.81	0.00	0.00
Avail Cap(c_a), veh/h	158	300	636	197	340	286	540	0	553	391	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.9	18.3	9.9	21.8	19.0	17.3	15.8	0.0	16.4	18.2	0.0	0.0
Incr Delay (d2), s/veh	4.1	0.3	0.1	4.3	1.7	0.0	1.3	0.0	5.1	8.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.8	1.2	0.6	1.7	0.1	2.4	0.0	3.5	3.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.0	18.6	9.9	26.1	20.7	17.4	17.1	0.0	21.5	26.6	0.0	0.0
LnGrp LOS	C	B	A	C	C	B	B	A	C	C	A	A
Approach Vol, veh/h		271			243			643			263	
Approach Delay, s/veh		15.6			21.8			19.5			26.6	
Approach LOS		B			C			B			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.5	11.1		13.3	5.3	11.3		16.2				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	7.4		10.0	4.1	8.4		14.0				
Max Q Clear Time (g_c+I1), s	3.4	4.7		8.5	3.2	6.1		10.4				
Green Ext Time (p_c), s	0.0	0.1		0.2	0.0	0.1		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			20.5									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	1	134	22	4	16	242	767	28	26	534	53
Future Volume (veh/h)	38	1	134	22	4	16	242	767	28	26	534	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	43	0	37	24	4	5	269	852	29	29	593	37
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	652	0	284	128	21	27	318	1250	43	113	859	372
Arrive On Green	0.18	0.00	0.18	0.10	0.10	0.10	0.18	0.36	0.36	0.06	0.24	0.24
Sat Flow, veh/h	3563	0	1554	1275	213	266	1781	3503	119	1781	3554	1538
Grp Volume(v), veh/h	43	0	37	33	0	0	269	432	449	29	593	37
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1753	0	0	1781	1777	1845	1781	1777	1538
Q Serve(g_s), s	0.6	0.0	1.2	1.1	0.0	0.0	9.1	12.8	12.8	1.0	9.4	1.2
Cycle Q Clear(g_c), s	0.6	0.0	1.2	1.1	0.0	0.0	9.1	12.8	12.8	1.0	9.4	1.2
Prop In Lane	1.00		1.00	0.73		0.15	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	652	0	284	176	0	0	318	634	658	113	859	372
V/C Ratio(X)	0.07	0.00	0.13	0.19	0.00	0.00	0.85	0.68	0.68	0.26	0.69	0.10
Avail Cap(c_a), veh/h	862	0	376	396	0	0	396	648	673	287	1077	466
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.9	0.0	21.2	25.6	0.0	0.0	24.6	17.0	17.0	27.6	21.4	18.3
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.4	0.0	0.0	11.0	3.8	3.7	0.4	2.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.4	0.5	0.0	0.0	4.3	5.0	5.1	0.4	3.7	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.0	0.0	21.4	26.0	0.0	0.0	35.6	20.8	20.6	28.1	23.8	18.5
LnGrp LOS	C	A	C	C	A	A	D	C	C	C	C	B
Approach Vol, veh/h		80			33			1150			659	
Approach Delay, s/veh		21.2			26.0			24.2			23.7	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	27.9		15.5	15.3	20.8		10.4				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	22.6		* 15	* 14	18.8		14.0				
Max Q Clear Time (g_c+I1), s	3.0	14.8		3.2	11.1	11.4		3.1				
Green Ext Time (p_c), s	0.0	4.7		0.1	0.1	3.4		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			23.9									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	248	1	31	1	0	4	61	720	2	5	896	349
Future Volume (veh/h)	248	1	31	1	0	4	61	720	2	5	896	349
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	288	0	0	1	0	1	66	774	2	5	963	299
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	697	366	0	5	0	5	225	1564	695	24	1163	519
Arrive On Green	0.20	0.00	0.00	0.01	0.00	0.01	0.13	0.44	0.44	0.01	0.33	0.33
Sat Flow, veh/h	3563	1870	0	837	0	837	1781	3554	1578	1781	3554	1585
Grp Volume(v), veh/h	288	0	0	2	0	0	66	774	2	5	963	299
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1674	0	0	1781	1777	1578	1781	1777	1585
Q Serve(g_s), s	3.9	0.0	0.0	0.1	0.0	0.0	1.9	8.7	0.0	0.2	13.9	8.7
Cycle Q Clear(g_c), s	3.9	0.0	0.0	0.1	0.0	0.0	1.9	8.7	0.0	0.2	13.9	8.7
Prop In Lane	1.00		0.00	0.50		0.50	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	697	366	0	9	0	0	225	1564	695	24	1163	519
V/C Ratio(X)	0.41	0.00	0.00	0.22	0.00	0.00	0.29	0.49	0.00	0.21	0.83	0.58
Avail Cap(c_a), veh/h	705	370	0	301	0	0	352	1564	695	320	1202	536
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.6	0.0	0.0	27.5	0.0	0.0	22.0	11.1	8.7	27.1	17.3	15.5
Incr Delay (d2), s/veh	0.5	0.0	0.0	4.3	0.0	0.0	0.5	0.3	0.0	3.2	5.2	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.0	0.0	0.0	0.0	0.7	2.6	0.0	0.1	5.4	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	0.0	0.0	31.9	0.0	0.0	22.6	11.5	8.7	30.3	22.5	17.6
LnGrp LOS	C	A	A	C	A	A	C	B	A	C	C	B
Approach Vol, veh/h		288			2			842			1267	
Approach Delay, s/veh		20.0			31.9			12.3			21.4	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	30.7		15.5	11.2	24.4		4.5				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	2.2	10.7		5.9	3.9	15.9		2.1				
Green Ext Time (p_c), s	0.0	4.2		0.5	0.0	2.3		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	150	290	65	55	8	105	193	44	11	386	30
Future Volume (veh/h)	47	150	290	65	55	8	105	193	44	11	386	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	54	172	266	75	63	6	121	222	31	13	444	31
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	73	292	512	95	315	267	298	268	37	14	469	33
Arrive On Green	0.04	0.16	0.16	0.05	0.17	0.17	0.17	0.17	0.17	0.28	0.28	0.28
Sat Flow, veh/h	1781	1870	1580	1781	1870	1585	1781	1600	223	49	1680	117
Grp Volume(v), veh/h	54	172	266	75	63	6	121	0	253	488	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1580	1781	1870	1585	1781	0	1823	1847	0	0
Q Serve(g_s), s	1.6	4.6	7.4	2.2	1.6	0.2	3.3	0.0	7.2	13.9	0.0	0.0
Cycle Q Clear(g_c), s	1.6	4.6	7.4	2.2	1.6	0.2	3.3	0.0	7.2	13.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	0.03		0.06
Lane Grp Cap(c), veh/h	73	292	512	95	315	267	298	0	305	515	0	0
V/C Ratio(X)	0.74	0.59	0.52	0.79	0.20	0.02	0.41	0.00	0.83	0.95	0.00	0.00
Avail Cap(c_a), veh/h	136	292	512	136	315	267	298	0	305	515	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	25.5	21.1	14.8	25.2	19.2	18.7	20.0	0.0	21.6	19.0	0.0	0.0
Incr Delay (d2), s/veh	5.3	2.1	0.4	11.4	0.1	0.0	0.3	0.0	16.2	26.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	2.0	3.1	1.2	0.6	0.1	1.2	0.0	4.1	8.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.7	23.2	15.2	36.6	19.4	18.7	20.3	0.0	37.8	45.6	0.0	0.0
LnGrp LOS	C	C	B	D	B	B	C	A	D	D	A	A
Approach Vol, veh/h		492			144			374			488	
Approach Delay, s/veh		19.7			28.3			32.1			45.6	
Approach LOS		B			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.4	13.4		20.0	5.7	14.0		14.0				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	4.1	8.4		15.0	4.1	8.4		9.0				
Max Q Clear Time (g_c+I1), s	4.2	9.4		15.9	3.6	3.6		9.2				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.1		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	32.1
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	6	171	25	2	10	112	768	20	27	786	86
Future Volume (veh/h)	88	6	171	25	2	10	112	768	20	27	786	86
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	107	0	73	29	2	3	130	893	18	31	914	56
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	780	0	340	150	10	15	245	1203	24	117	946	419
Arrive On Green	0.22	0.00	0.22	0.10	0.10	0.10	0.14	0.34	0.34	0.07	0.27	0.27
Sat Flow, veh/h	3563	0	1554	1505	104	156	1781	3560	72	1781	3554	1576
Grp Volume(v), veh/h	107	0	73	34	0	0	130	446	465	31	914	56
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1764	0	0	1781	1777	1855	1781	1777	1576
Q Serve(g_s), s	1.6	0.0	2.5	1.2	0.0	0.0	4.5	14.7	14.7	1.1	16.8	1.8
Cycle Q Clear(g_c), s	1.6	0.0	2.5	1.2	0.0	0.0	4.5	14.7	14.7	1.1	16.8	1.8
Prop In Lane	1.00		1.00	0.85		0.09	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	780	0	340	175	0	0	245	600	627	117	946	419
V/C Ratio(X)	0.14	0.00	0.21	0.19	0.00	0.00	0.53	0.74	0.74	0.27	0.97	0.13
Avail Cap(c_a), veh/h	808	0	353	374	0	0	269	600	627	269	946	419
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.8	0.0	21.2	27.3	0.0	0.0	26.5	19.4	19.4	29.4	24.0	18.5
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.4	0.0	0.0	0.7	5.9	5.7	0.4	21.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.9	0.5	0.0	0.0	1.8	6.1	6.3	0.4	8.9	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.9	0.0	21.5	27.7	0.0	0.0	27.2	25.3	25.1	29.8	45.7	18.8
LnGrp LOS	C	A	C	C	A	A	C	C	C	C	D	B
Approach Vol, veh/h		180			34			1041			1001	
Approach Delay, s/veh		21.1			27.7			25.4			43.7	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.5	28.1		18.7	13.3	23.4		10.8				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	17.6		* 15	* 10	17.6		14.0				
Max Q Clear Time (g_c+I1), s	3.1	16.7		4.5	6.5	18.8		3.2				
Green Ext Time (p_c), s	0.0	0.7		0.4	0.0	0.0		0.1				

Intersection Summary			
HCM 6th Ctrl Delay		33.2	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	334	0	41	3	1	6	67	903	3	0	599	292
Future Volume (veh/h)	334	0	41	3	1	6	67	903	3	0	599	292
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	393	0	0	3	1	2	73	982	3	0	651	245
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	733	385	0	14	5	9	243	1765	787	3	1001	436
Arrive On Green	0.21	0.00	0.00	0.02	0.02	0.02	0.14	0.50	0.50	0.00	0.28	0.28
Sat Flow, veh/h	3563	1870	0	861	287	574	1781	3554	1583	1781	3554	1547
Grp Volume(v), veh/h	393	0	0	6	0	0	73	982	3	0	651	245
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1723	0	0	1781	1777	1583	1781	1777	1547
Q Serve(g_s), s	5.2	0.0	0.0	0.2	0.0	0.0	2.0	10.2	0.1	0.0	8.6	7.2
Cycle Q Clear(g_c), s	5.2	0.0	0.0	0.2	0.0	0.0	2.0	10.2	0.1	0.0	8.6	7.2
Prop In Lane	1.00		0.00	0.50		0.33	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	733	385	0	27	0	0	243	1765	787	3	1001	436
V/C Ratio(X)	0.54	0.00	0.00	0.22	0.00	0.00	0.30	0.56	0.00	0.00	0.65	0.56
Avail Cap(c_a), veh/h	735	386	0	323	0	0	368	1765	787	334	1254	546
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	18.9	0.0	0.0	25.9	0.0	0.0	20.7	9.3	6.8	0.0	16.8	16.3
Incr Delay (d2), s/veh	0.9	0.0	0.0	1.5	0.0	0.0	0.5	0.5	0.0	0.0	1.3	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.0	0.0	0.1	0.0	0.0	0.7	2.8	0.0	0.0	3.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.8	0.0	0.0	27.4	0.0	0.0	21.2	9.8	6.8	0.0	18.1	18.3
LnGrp LOS	B	A	A	C	A	A	C	A	A	A	B	B
Approach Vol, veh/h		393			6			1058			896	
Approach Delay, s/veh		19.8			27.4			10.6			18.2	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	0.0	32.7		15.6	11.5	21.2		5.0				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	0.0	12.2		7.2	4.0	10.6		2.2				
Green Ext Time (p_c), s	0.0	4.5		0.6	0.0	4.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		15.1	
HCM 6th LOS		B	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	80	201	50	158	19	261	282	42	11	182	61
Future Volume (veh/h)	50	80	201	50	158	19	261	282	42	11	182	61
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	56	89	181	56	176	11	290	282	40	12	202	49
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	1.00	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	79	257	580	79	257	216	408	366	52	15	251	61
Arrive On Green	0.04	0.14	0.14	0.04	0.14	0.14	0.23	0.23	0.23	0.18	0.18	0.18
Sat Flow, veh/h	1781	1870	1574	1781	1870	1574	1781	1595	226	82	1385	336
Grp Volume(v), veh/h	56	89	181	56	176	11	290	0	322	263	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1574	1781	1870	1574	1781	0	1821	1804	0	0
Q Serve(g_s), s	1.4	2.0	3.7	1.4	4.1	0.3	6.8	0.0	7.5	6.3	0.0	0.0
Cycle Q Clear(g_c), s	1.4	2.0	3.7	1.4	4.1	0.3	6.8	0.0	7.5	6.3	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	0.05		0.19
Lane Grp Cap(c), veh/h	79	257	580	79	257	216	408	0	418	327	0	0
V/C Ratio(X)	0.70	0.35	0.31	0.70	0.68	0.05	0.71	0.00	0.77	0.81	0.00	0.00
Avail Cap(c_a), veh/h	161	305	620	200	346	291	549	0	562	397	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.4	17.7	10.3	21.4	18.6	17.0	16.1	0.0	16.4	17.8	0.0	0.0
Incr Delay (d2), s/veh	4.2	0.3	0.1	4.2	1.4	0.0	1.4	0.0	3.0	7.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.7	1.6	0.6	1.6	0.1	2.4	0.0	2.9	2.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.6	18.0	10.4	25.6	20.1	17.0	17.5	0.0	19.4	25.7	0.0	0.0
LnGrp LOS	C	B	B	C	C	B	B	A	B	C	A	A
Approach Vol, veh/h		326			243			612			263	
Approach Delay, s/veh		15.1			21.2			18.5			25.7	
Approach LOS		B			C			B			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.5	11.2		13.2	5.5	11.2		15.4				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	7.4		10.0	4.1	8.4		14.0				
Max Q Clear Time (g_c+I1), s	3.4	5.7		8.3	3.4	6.1		9.5				
Green Ext Time (p_c), s	0.0	0.1		0.2	0.0	0.1		0.8				

Intersection Summary	
HCM 6th Ctrl Delay	19.5
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	1	134	27	4	16	242	844	40	30	641	53
Future Volume (veh/h)	38	1	134	27	4	16	242	844	40	30	641	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	43	0	37	30	4	5	269	938	42	33	712	33
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	630	0	275	149	20	25	315	1265	57	123	915	396
Arrive On Green	0.18	0.00	0.18	0.11	0.11	0.11	0.18	0.37	0.37	0.07	0.26	0.26
Sat Flow, veh/h	3563	0	1553	1352	180	225	1781	3460	155	1781	3554	1539
Grp Volume(v), veh/h	43	0	37	39	0	0	269	482	498	33	712	33
Grp Sat Flow(s),veh/h/ln	1781	0	1553	1757	0	0	1781	1777	1838	1781	1777	1539
Q Serve(g_s), s	0.7	0.0	1.3	1.3	0.0	0.0	9.7	15.6	15.6	1.2	12.3	1.1
Cycle Q Clear(g_c), s	0.7	0.0	1.3	1.3	0.0	0.0	9.7	15.6	15.6	1.2	12.3	1.1
Prop In Lane	1.00		1.00	0.77		0.13	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	630	0	275	194	0	0	315	649	672	123	915	396
V/C Ratio(X)	0.07	0.00	0.13	0.20	0.00	0.00	0.85	0.74	0.74	0.27	0.78	0.08
Avail Cap(c_a), veh/h	809	0	353	373	0	0	372	649	672	270	1012	438
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.6	0.0	22.9	26.7	0.0	0.0	26.3	18.2	18.2	29.2	22.8	18.6
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.4	0.0	0.0	13.6	5.5	5.3	0.4	4.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.5	0.6	0.0	0.0	4.8	6.3	6.5	0.5	5.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.7	0.0	23.1	27.1	0.0	0.0	39.9	23.7	23.5	29.6	27.3	18.8
LnGrp LOS	C	A	C	C	A	A	D	C	C	C	C	B
Approach Vol, veh/h		80			39			1249			778	
Approach Delay, s/veh		22.9			27.1			27.1			27.0	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.7	29.9		15.9	15.9	22.8		11.5				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	22.6		* 15	* 14	18.8		14.0				
Max Q Clear Time (g_c+I1), s	3.2	17.6		3.3	11.7	14.3		3.3				
Green Ext Time (p_c), s	0.0	3.5		0.1	0.1	2.6		0.1				

Intersection Summary	
HCM 6th Ctrl Delay	26.9
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	246	1	31	1	0	4	60	569	2	5	788	346
Future Volume (veh/h)	246	1	31	1	0	4	60	569	2	5	788	346
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	286	0	0	1	0	1	65	612	2	5	847	296
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	709	372	0	5	0	5	225	1528	678	24	1126	502
Arrive On Green	0.20	0.00	0.00	0.01	0.00	0.01	0.13	0.43	0.43	0.01	0.32	0.32
Sat Flow, veh/h	3563	1870	0	837	0	837	1781	3554	1578	1781	3554	1585
Grp Volume(v), veh/h	286	0	0	2	0	0	65	612	2	5	847	296
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1675	0	0	1781	1777	1578	1781	1777	1585
Q Serve(g_s), s	3.8	0.0	0.0	0.1	0.0	0.0	1.8	6.5	0.0	0.2	11.7	8.6
Cycle Q Clear(g_c), s	3.8	0.0	0.0	0.1	0.0	0.0	1.8	6.5	0.0	0.2	11.7	8.6
Prop In Lane	1.00		0.00	0.50		0.50	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	709	372	0	9	0	0	225	1528	678	24	1126	502
V/C Ratio(X)	0.40	0.00	0.00	0.22	0.00	0.00	0.29	0.40	0.00	0.21	0.75	0.59
Avail Cap(c_a), veh/h	719	377	0	307	0	0	359	1528	678	327	1225	546
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.0	0.0	0.0	27.0	0.0	0.0	21.6	10.7	8.9	26.6	16.7	15.6
Incr Delay (d2), s/veh	0.4	0.0	0.0	4.3	0.0	0.0	0.5	0.2	0.0	3.2	2.9	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	0.0	0.0	0.0	0.0	0.7	1.9	0.0	0.1	4.2	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.5	0.0	0.0	31.3	0.0	0.0	22.1	10.9	8.9	29.8	19.6	17.8
LnGrp LOS	B	A	A	C	A	A	C	B	A	C	B	B
Approach Vol, veh/h		286			2			679			1148	
Approach Delay, s/veh		19.5			31.3			12.0			19.2	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	29.6		15.5	11.1	23.5		4.5				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	2.2	8.5		5.8	3.8	13.7		2.1				
Green Ext Time (p_c), s	0.0	3.8		0.6	0.0	3.6		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	16.9
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	146	288	65	55	8	97	189	44	11	376	29
Future Volume (veh/h)	45	146	288	65	55	8	97	189	44	11	376	29
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	52	168	264	75	63	6	111	217	31	13	432	30
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	72	292	512	95	316	268	298	268	38	14	469	33
Arrive On Green	0.04	0.16	0.16	0.05	0.17	0.17	0.17	0.17	0.17	0.28	0.28	0.28
Sat Flow, veh/h	1781	1870	1580	1781	1870	1585	1781	1600	229	51	1680	117
Grp Volume(v), veh/h	52	168	264	75	63	6	111	0	248	475	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1580	1781	1870	1585	1781	0	1828	1847	0	0
Q Serve(g_s), s	1.6	4.5	7.3	2.2	1.6	0.2	3.0	0.0	7.0	13.4	0.0	0.0
Cycle Q Clear(g_c), s	1.6	4.5	7.3	2.2	1.6	0.2	3.0	0.0	7.0	13.4	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.13	0.03		0.06
Lane Grp Cap(c), veh/h	72	292	512	95	316	268	298	0	306	515	0	0
V/C Ratio(X)	0.73	0.57	0.52	0.79	0.20	0.02	0.37	0.00	0.81	0.92	0.00	0.00
Avail Cap(c_a), veh/h	136	292	512	136	316	268	298	0	306	515	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	25.5	21.0	14.8	25.2	19.2	18.6	19.9	0.0	21.6	18.8	0.0	0.0
Incr Delay (d2), s/veh	5.1	1.8	0.4	11.4	0.1	0.0	0.3	0.0	14.0	21.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	1.9	3.1	1.2	0.6	0.1	1.1	0.0	3.9	8.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.7	22.8	15.2	36.6	19.3	18.6	20.2	0.0	35.6	40.6	0.0	0.0
LnGrp LOS	C	C	B	D	B	B	C	A	D	D	A	A
Approach Vol, veh/h		484			144			359			475	
Approach Delay, s/veh		19.5			28.3			30.8			40.6	
Approach LOS		B			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.4	13.4		20.0	5.7	14.1		14.0				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	4.1	8.4		15.0	4.1	8.4		9.0				
Max Q Clear Time (g_c+I1), s	4.2	9.3		15.4	3.6	3.6		9.0				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.1		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	30.0
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	6	167	25	2	9	109	613	17	22	704	81
Future Volume (veh/h)	87	6	167	25	2	9	109	613	17	22	704	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	106	0	68	29	2	1	127	713	15	26	819	50
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	785	0	343	154	11	5	246	1226	26	103	939	417
Arrive On Green	0.22	0.00	0.22	0.10	0.10	0.10	0.14	0.34	0.34	0.06	0.26	0.26
Sat Flow, veh/h	3563	0	1554	1612	111	56	1781	3557	75	1781	3554	1576
Grp Volume(v), veh/h	106	0	68	32	0	0	127	356	372	26	819	50
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1779	0	0	1781	1777	1855	1781	1777	1576
Q Serve(g_s), s	1.6	0.0	2.3	1.1	0.0	0.0	4.3	10.7	10.7	0.9	14.4	1.6
Cycle Q Clear(g_c), s	1.6	0.0	2.3	1.1	0.0	0.0	4.3	10.7	10.7	0.9	14.4	1.6
Prop In Lane	1.00		1.00	0.91		0.03	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	785	0	343	170	0	0	246	612	639	103	939	417
V/C Ratio(X)	0.13	0.00	0.20	0.19	0.00	0.00	0.52	0.58	0.58	0.25	0.87	0.12
Avail Cap(c_a), veh/h	819	0	357	381	0	0	273	612	639	273	958	425
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	0.0	20.7	27.2	0.0	0.0	26.1	17.5	17.5	29.4	23.0	18.2
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.4	0.0	0.0	0.6	2.2	2.1	0.5	9.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.8	0.5	0.0	0.0	1.7	4.1	4.3	0.4	6.4	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.5	0.0	21.0	27.6	0.0	0.0	26.8	19.8	19.7	29.9	32.4	18.5
LnGrp LOS	C	A	C	C	A	A	C	B	B	C	C	B
Approach Vol, veh/h		174			32			855			895	
Approach Delay, s/veh		20.7			27.6			20.8			31.6	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	28.3		18.6	13.2	23.1		10.4				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	17.6		* 15	* 10	17.6		14.0				
Max Q Clear Time (g_c+I1), s	2.9	12.7		4.3	6.3	16.4		3.1				
Green Ext Time (p_c), s	0.0	2.7		0.4	0.0	0.9		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		25.8	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	318	0	35	3	1	6	65	847	3	0	498	286
Future Volume (veh/h)	318	0	35	3	1	6	65	847	3	0	498	286
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	369	0	0	3	1	2	71	921	3	0	541	239
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	760	399	0	14	5	9	243	1701	758	3	925	402
Arrive On Green	0.21	0.00	0.00	0.02	0.02	0.02	0.14	0.48	0.48	0.00	0.26	0.26
Sat Flow, veh/h	3563	1870	0	861	287	574	1781	3554	1583	1781	3554	1547
Grp Volume(v), veh/h	369	0	0	6	0	0	71	921	3	0	541	239
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1723	0	0	1781	1777	1583	1781	1777	1547
Q Serve(g_s), s	4.7	0.0	0.0	0.2	0.0	0.0	1.8	9.4	0.1	0.0	6.8	6.9
Cycle Q Clear(g_c), s	4.7	0.0	0.0	0.2	0.0	0.0	1.8	9.4	0.1	0.0	6.8	6.9
Prop In Lane	1.00		0.00	0.50		0.33	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	760	399	0	28	0	0	243	1701	758	3	925	402
V/C Ratio(X)	0.49	0.00	0.00	0.22	0.00	0.00	0.29	0.54	0.00	0.00	0.58	0.59
Avail Cap(c_a), veh/h	764	401	0	336	0	0	382	1701	758	347	1302	567
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	17.7	0.0	0.0	24.9	0.0	0.0	19.9	9.4	7.0	0.0	16.6	16.6
Incr Delay (d2), s/veh	0.6	0.0	0.0	1.5	0.0	0.0	0.5	0.5	0.0	0.0	1.0	2.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	0.0	0.1	0.0	0.0	0.7	2.5	0.0	0.0	2.4	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.3	0.0	0.0	26.4	0.0	0.0	20.4	9.9	7.0	0.0	17.6	19.0
LnGrp LOS	B	A	A	C	A	A	C	A	A	A	B	B
Approach Vol, veh/h		369			6			995			780	
Approach Delay, s/veh		18.3			26.4			10.6			18.0	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	0.0	30.8		15.5	11.2	19.6		5.0				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	0.0	11.4		6.7	3.8	8.9		2.2				
Green Ext Time (p_c), s	0.0	4.6		0.7	0.0	4.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		14.7	
HCM 6th LOS		B	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	78	157	50	152	19	258	282	42	11	182	57
Future Volume (veh/h)	42	78	157	50	152	19	258	282	42	11	182	57
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	47	87	132	56	169	11	287	313	40	12	202	44
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	70	240	588	79	250	210	434	394	50	15	252	55
Arrive On Green	0.04	0.13	0.13	0.04	0.13	0.13	0.24	0.24	0.24	0.18	0.18	0.18
Sat Flow, veh/h	1781	1870	1573	1781	1870	1573	1781	1619	207	84	1416	308
Grp Volume(v), veh/h	47	87	132	56	169	11	287	0	353	258	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1573	1781	1870	1573	1781	0	1826	1809	0	0
Q Serve(g_s), s	1.2	1.9	2.6	1.4	3.9	0.3	6.6	0.0	8.3	6.2	0.0	0.0
Cycle Q Clear(g_c), s	1.2	1.9	2.6	1.4	3.9	0.3	6.6	0.0	8.3	6.2	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	0.05		0.17
Lane Grp Cap(c), veh/h	70	240	588	79	250	210	434	0	444	322	0	0
V/C Ratio(X)	0.67	0.36	0.22	0.71	0.68	0.05	0.66	0.00	0.79	0.80	0.00	0.00
Avail Cap(c_a), veh/h	160	304	641	199	345	290	547	0	561	397	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.6	18.2	9.8	21.5	18.8	17.2	15.6	0.0	16.2	18.0	0.0	0.0
Incr Delay (d2), s/veh	4.1	0.3	0.1	4.2	1.2	0.0	1.0	0.0	4.7	7.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.7	1.2	0.6	1.5	0.1	2.3	0.0	3.4	2.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.7	18.5	9.9	25.7	20.0	17.3	16.6	0.0	20.9	25.4	0.0	0.0
LnGrp LOS	C	B	A	C	C	B	B	A	C	C	A	A
Approach Vol, veh/h		266			236			640			258	
Approach Delay, s/veh		15.5			21.2			19.0			25.4	
Approach LOS		B			C			B			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.5	10.9		13.1	5.3	11.1		16.1				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	7.4		10.0	4.1	8.4		14.0				
Max Q Clear Time (g_c+I1), s	3.4	4.6		8.2	3.2	5.9		10.3				
Green Ext Time (p_c), s	0.0	0.1		0.2	0.0	0.1		0.8				
Intersection Summary												
HCM 6th Ctrl Delay			19.9									
HCM 6th LOS			B									

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	1	132	22	4	16	236	767	28	26	534	53
Future Volume (veh/h)	38	1	132	22	4	16	236	767	28	26	534	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	43	0	35	24	4	5	262	852	29	29	593	37
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	648	0	283	128	21	27	311	1241	42	113	864	374
Arrive On Green	0.18	0.00	0.18	0.10	0.10	0.10	0.17	0.35	0.35	0.06	0.24	0.24
Sat Flow, veh/h	3563	0	1554	1275	213	266	1781	3503	119	1781	3554	1538
Grp Volume(v), veh/h	43	0	35	33	0	0	262	432	449	29	593	37
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1753	0	0	1781	1777	1845	1781	1777	1538
Q Serve(g_s), s	0.6	0.0	1.2	1.1	0.0	0.0	8.7	12.7	12.7	1.0	9.3	1.1
Cycle Q Clear(g_c), s	0.6	0.0	1.2	1.1	0.0	0.0	8.7	12.7	12.7	1.0	9.3	1.1
Prop In Lane	1.00		1.00	0.73		0.15	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	648	0	283	176	0	0	311	630	654	113	864	374
V/C Ratio(X)	0.07	0.00	0.12	0.19	0.00	0.00	0.84	0.69	0.69	0.26	0.69	0.10
Avail Cap(c_a), veh/h	871	0	380	400	0	0	401	654	680	290	1089	471
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.8	0.0	21.0	25.3	0.0	0.0	24.5	16.9	16.9	27.4	21.1	18.0
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.4	0.0	0.0	9.8	3.9	3.7	0.4	2.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.4	0.4	0.0	0.0	4.1	4.9	5.1	0.4	3.6	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.8	0.0	21.2	25.7	0.0	0.0	34.3	20.8	20.6	27.8	23.4	18.3
LnGrp LOS	C	A	C	C	A	A	C	C	C	C	C	B
Approach Vol, veh/h		78			33			1143			659	
Approach Delay, s/veh		21.0			25.7			23.8			23.3	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.1	27.5		15.4	14.9	20.7		10.4				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	22.6		* 15	* 14	18.8		14.0				
Max Q Clear Time (g_c+I1), s	3.0	14.7		3.2	10.7	11.3		3.1				
Green Ext Time (p_c), s	0.0	4.7		0.1	0.1	3.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			23.6									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	253	1	31	1	0	4	60	569	2	5	788	349
Future Volume (veh/h)	253	1	31	1	0	4	60	569	2	5	788	349
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	293	0	0	1	0	1	65	612	2	5	847	299
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	710	373	0	5	0	5	225	1528	678	24	1126	502
Arrive On Green	0.20	0.00	0.00	0.01	0.00	0.01	0.13	0.43	0.43	0.01	0.32	0.32
Sat Flow, veh/h	3563	1870	0	837	0	837	1781	3554	1578	1781	3554	1585
Grp Volume(v), veh/h	293	0	0	2	0	0	65	612	2	5	847	299
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1675	0	0	1781	1777	1578	1781	1777	1585
Q Serve(g_s), s	3.9	0.0	0.0	0.1	0.0	0.0	1.8	6.5	0.0	0.2	11.7	8.7
Cycle Q Clear(g_c), s	3.9	0.0	0.0	0.1	0.0	0.0	1.8	6.5	0.0	0.2	11.7	8.7
Prop In Lane	1.00		0.00	0.50		0.50	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	710	373	0	9	0	0	225	1528	678	24	1126	502
V/C Ratio(X)	0.41	0.00	0.00	0.22	0.00	0.00	0.29	0.40	0.00	0.21	0.75	0.60
Avail Cap(c_a), veh/h	718	377	0	307	0	0	359	1528	678	327	1225	546
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	0.0	0.0	27.0	0.0	0.0	21.6	10.7	8.9	26.6	16.7	15.7
Incr Delay (d2), s/veh	0.5	0.0	0.0	4.3	0.0	0.0	0.5	0.2	0.0	3.2	2.9	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.0	0.0	0.0	0.0	0.7	1.9	0.0	0.1	4.2	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.5	0.0	0.0	31.4	0.0	0.0	22.1	11.0	8.9	29.8	19.6	17.9
LnGrp LOS	B	A	A	C	A	A	C	B	A	C	B	B
Approach Vol, veh/h		293			2			679			1151	
Approach Delay, s/veh		19.5			31.4			12.0			19.2	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	29.7		15.5	11.1	23.5		4.5				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	2.2	8.5		5.9	3.8	13.7		2.1				
Green Ext Time (p_c), s	0.0	3.8		0.6	0.0	3.6		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	17.0
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	159	294	65	59	8	99	189	44	11	376	32
Future Volume (veh/h)	52	159	294	65	59	8	99	189	44	11	376	32
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	60	183	271	75	68	6	114	217	31	13	432	34
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	78	292	512	95	309	262	298	267	38	14	464	37
Arrive On Green	0.04	0.16	0.16	0.05	0.17	0.17	0.17	0.17	0.17	0.28	0.28	0.28
Sat Flow, veh/h	1781	1870	1580	1781	1870	1585	1781	1595	228	50	1663	131
Grp Volume(v), veh/h	60	183	271	75	68	6	114	0	248	479	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1580	1781	1870	1585	1781	0	1822	1844	0	0
Q Serve(g_s), s	1.8	4.9	7.5	2.2	1.7	0.2	3.1	0.0	7.0	13.6	0.0	0.0
Cycle Q Clear(g_c), s	1.8	4.9	7.5	2.2	1.7	0.2	3.1	0.0	7.0	13.6	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.13	0.03		0.07
Lane Grp Cap(c), veh/h	78	292	512	95	309	262	298	0	305	515	0	0
V/C Ratio(X)	0.76	0.63	0.53	0.79	0.22	0.02	0.38	0.00	0.81	0.93	0.00	0.00
Avail Cap(c_a), veh/h	136	292	512	136	309	262	298	0	305	515	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	25.4	21.2	14.8	25.2	19.4	18.8	19.9	0.0	21.6	18.9	0.0	0.0
Incr Delay (d2), s/veh	5.7	3.2	0.5	11.4	0.1	0.0	0.3	0.0	14.3	23.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	2.2	3.2	1.2	0.7	0.1	1.2	0.0	3.9	8.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.1	24.4	15.4	36.6	19.6	18.8	20.2	0.0	35.9	42.3	0.0	0.0
LnGrp LOS	C	C	B	D	B	B	C	A	D	D	A	A
Approach Vol, veh/h		514			149			362			479	
Approach Delay, s/veh		20.4			28.1			31.0			42.3	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.4	13.4		20.0	5.9	13.9		14.0				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	4.1	8.4		15.0	4.1	8.4		9.0				
Max Q Clear Time (g_c+I1), s	4.2	9.5		15.6	3.8	3.7		9.0				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.1		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	30.7
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	87	6	180	25	2	9	113	613	17	22	704	81
Future Volume (veh/h)	87	6	180	25	2	9	113	613	17	22	704	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	106	0	83	29	2	1	131	713	15	26	819	50
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	790	0	345	154	11	5	247	1225	26	102	937	415
Arrive On Green	0.22	0.00	0.22	0.10	0.10	0.10	0.14	0.34	0.34	0.06	0.26	0.26
Sat Flow, veh/h	3563	0	1554	1612	111	56	1781	3557	75	1781	3554	1576
Grp Volume(v), veh/h	106	0	83	32	0	0	131	356	372	26	819	50
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1779	0	0	1781	1777	1855	1781	1777	1576
Q Serve(g_s), s	1.6	0.0	2.9	1.1	0.0	0.0	4.5	10.8	10.8	0.9	14.5	1.6
Cycle Q Clear(g_c), s	1.6	0.0	2.9	1.1	0.0	0.0	4.5	10.8	10.8	0.9	14.5	1.6
Prop In Lane	1.00		1.00	0.91		0.03	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	790	0	345	170	0	0	247	612	639	102	937	415
V/C Ratio(X)	0.13	0.00	0.24	0.19	0.00	0.00	0.53	0.58	0.58	0.25	0.87	0.12
Avail Cap(c_a), veh/h	815	0	356	380	0	0	272	612	639	272	954	423
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.5	0.0	21.0	27.3	0.0	0.0	26.3	17.6	17.6	29.5	23.1	18.4
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.4	0.0	0.0	0.7	2.2	2.1	0.5	9.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	1.0	0.5	0.0	0.0	1.8	4.1	4.3	0.4	6.5	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.5	0.0	21.3	27.7	0.0	0.0	26.9	19.8	19.7	30.0	32.8	18.6
LnGrp LOS	C	A	C	C	A	A	C	B	B	C	C	B
Approach Vol, veh/h		189			32			859			895	
Approach Delay, s/veh		20.9			27.7			20.9			31.9	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	28.4		18.7	13.3	23.1		10.5				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	17.6		* 15	* 10	17.6		14.0				
Max Q Clear Time (g_c+I1), s	2.9	12.8		4.9	6.5	16.5		3.1				
Green Ext Time (p_c), s	0.0	2.7		0.4	0.0	0.8		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		26.0	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	323	0	35	3	1	6	65	847	3	0	498	295
Future Volume (veh/h)	323	0	35	3	1	6	65	847	3	0	498	295
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	374	0	0	3	1	2	71	921	3	0	541	249
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	755	397	0	14	5	9	242	1711	762	3	939	409
Arrive On Green	0.21	0.00	0.00	0.02	0.02	0.02	0.14	0.48	0.48	0.00	0.26	0.26
Sat Flow, veh/h	3563	1870	0	861	287	574	1781	3554	1583	1781	3554	1547
Grp Volume(v), veh/h	374	0	0	6	0	0	71	921	3	0	541	249
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1723	0	0	1781	1777	1583	1781	1777	1547
Q Serve(g_s), s	4.8	0.0	0.0	0.2	0.0	0.0	1.9	9.4	0.1	0.0	6.8	7.3
Cycle Q Clear(g_c), s	4.8	0.0	0.0	0.2	0.0	0.0	1.9	9.4	0.1	0.0	6.8	7.3
Prop In Lane	1.00		0.00	0.50		0.33	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	755	397	0	28	0	0	242	1711	762	3	939	409
V/C Ratio(X)	0.50	0.00	0.00	0.22	0.00	0.00	0.29	0.54	0.00	0.00	0.58	0.61
Avail Cap(c_a), veh/h	759	398	0	334	0	0	379	1711	762	345	1294	563
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	17.9	0.0	0.0	25.1	0.0	0.0	20.1	9.4	7.0	0.0	16.5	16.7
Incr Delay (d2), s/veh	0.6	0.0	0.0	1.5	0.0	0.0	0.5	0.4	0.0	0.0	1.0	2.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.0	0.1	0.0	0.0	0.7	2.5	0.0	0.0	2.4	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.5	0.0	0.0	26.5	0.0	0.0	20.6	9.8	7.0	0.0	17.5	19.2
LnGrp LOS	B	A	A	C	A	A	C	A	A	A	B	B
Approach Vol, veh/h		374			6			995			790	
Approach Delay, s/veh		18.5			26.5			10.6			18.0	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	0.0	31.1		15.5	11.2	19.8		5.0				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	0.0	11.4		6.8	3.9	9.3		2.2				
Green Ext Time (p_c), s	0.0	4.6		0.7	0.0	4.3		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		14.7	
HCM 6th LOS		B	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	86	161	50	167	19	265	282	42	11	182	66
Future Volume (veh/h)	47	86	161	50	167	19	265	282	42	11	182	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	52	96	137	56	186	11	294	313	40	12	202	54
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	75	259	600	79	263	221	430	390	50	15	248	66
Arrive On Green	0.04	0.14	0.14	0.04	0.14	0.14	0.24	0.24	0.24	0.18	0.18	0.18
Sat Flow, veh/h	1781	1870	1574	1781	1870	1574	1781	1619	207	81	1356	362
Grp Volume(v), veh/h	52	96	137	56	186	11	294	0	353	268	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1574	1781	1870	1574	1781	0	1826	1799	0	0
Q Serve(g_s), s	1.4	2.2	2.8	1.5	4.5	0.3	7.1	0.0	8.6	6.7	0.0	0.0
Cycle Q Clear(g_c), s	1.4	2.2	2.8	1.5	4.5	0.3	7.1	0.0	8.6	6.7	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	0.04		0.20
Lane Grp Cap(c), veh/h	75	259	600	79	263	221	430	0	440	329	0	0
V/C Ratio(X)	0.70	0.37	0.23	0.71	0.71	0.05	0.68	0.00	0.80	0.81	0.00	0.00
Avail Cap(c_a), veh/h	155	294	630	193	334	281	530	0	543	382	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	22.2	18.4	9.9	22.2	19.3	17.5	16.2	0.0	16.8	18.4	0.0	0.0
Incr Delay (d2), s/veh	4.3	0.3	0.1	4.4	3.0	0.0	1.6	0.0	5.5	9.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.8	1.2	0.6	1.9	0.1	2.6	0.0	3.7	3.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.5	18.7	10.0	26.6	22.3	17.5	17.8	0.0	22.3	28.1	0.0	0.0
LnGrp LOS	C	B	A	C	C	B	B	A	C	C	A	A
Approach Vol, veh/h		285			253			647			268	
Approach Delay, s/veh		16.0			23.0			20.3			28.1	
Approach LOS		B			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	11.5		13.6	5.5	11.6		16.3				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	7.4		10.0	4.1	8.4		14.0				
Max Q Clear Time (g_c+I1), s	3.5	4.8		8.7	3.4	6.5		10.6				
Green Ext Time (p_c), s	0.0	0.1		0.1	0.0	0.1		0.7				

Intersection Summary	
HCM 6th Ctrl Delay	21.4
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	1	140	22	4	16	251	767	28	26	534	53
Future Volume (veh/h)	38	1	140	22	4	16	251	767	28	26	534	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	43	0	44	24	4	5	279	852	29	29	593	37
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	668	0	291	127	21	26	327	1259	43	112	849	368
Arrive On Green	0.19	0.00	0.19	0.10	0.10	0.10	0.18	0.36	0.36	0.06	0.24	0.24
Sat Flow, veh/h	3563	0	1554	1275	213	266	1781	3503	119	1781	3554	1538
Grp Volume(v), veh/h	43	0	44	33	0	0	279	432	449	29	593	37
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1753	0	0	1781	1777	1845	1781	1777	1538
Q Serve(g_s), s	0.6	0.0	1.5	1.1	0.0	0.0	9.6	13.0	13.0	1.0	9.7	1.2
Cycle Q Clear(g_c), s	0.6	0.0	1.5	1.1	0.0	0.0	9.6	13.0	13.0	1.0	9.7	1.2
Prop In Lane	1.00		1.00	0.73		0.15	1.00		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	668	0	291	175	0	0	327	638	663	112	849	368
V/C Ratio(X)	0.06	0.00	0.15	0.19	0.00	0.00	0.85	0.68	0.68	0.26	0.70	0.10
Avail Cap(c_a), veh/h	844	0	368	388	0	0	388	638	663	281	1055	457
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.2	0.0	21.5	26.2	0.0	0.0	25.0	17.2	17.2	28.3	22.0	18.8
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.4	0.0	0.0	13.0	3.8	3.6	0.4	2.5	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.5	0.5	0.0	0.0	4.7	5.1	5.2	0.4	3.8	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.2	0.0	21.8	26.5	0.0	0.0	38.0	20.9	20.8	28.7	24.6	19.0
LnGrp LOS	C	A	C	C	A	A	D	C	C	C	C	B
Approach Vol, veh/h		87			33			1160			659	
Approach Delay, s/veh		21.5			26.5			25.0			24.4	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.2	28.6		16.1	15.8	20.9		10.5				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	22.6		* 15	* 14	18.8		14.0				
Max Q Clear Time (g_c+I1), s	3.0	15.0		3.5	11.6	11.7		3.1				
Green Ext Time (p_c), s	0.0	4.6		0.2	0.1	3.3		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	24.7
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	253	1	31	1	0	4	61	720	2	5	896	351
Future Volume (veh/h)	253	1	31	1	0	4	61	720	2	5	896	351
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	293	0	0	1	0	1	66	774	2	5	963	301
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	697	366	0	5	0	5	225	1564	695	24	1162	519
Arrive On Green	0.20	0.00	0.00	0.01	0.00	0.01	0.13	0.44	0.44	0.01	0.33	0.33
Sat Flow, veh/h	3563	1870	0	837	0	837	1781	3554	1578	1781	3554	1585
Grp Volume(v), veh/h	293	0	0	2	0	0	66	774	2	5	963	301
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1674	0	0	1781	1777	1578	1781	1777	1585
Q Serve(g_s), s	4.0	0.0	0.0	0.1	0.0	0.0	1.9	8.7	0.0	0.2	13.9	8.8
Cycle Q Clear(g_c), s	4.0	0.0	0.0	0.1	0.0	0.0	1.9	8.7	0.0	0.2	13.9	8.8
Prop In Lane	1.00		0.00	0.50		0.50	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	697	366	0	9	0	0	225	1564	695	24	1162	519
V/C Ratio(X)	0.42	0.00	0.00	0.22	0.00	0.00	0.29	0.49	0.00	0.21	0.83	0.58
Avail Cap(c_a), veh/h	705	370	0	301	0	0	352	1564	695	320	1201	536
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.6	0.0	0.0	27.5	0.0	0.0	22.0	11.1	8.7	27.1	17.3	15.5
Incr Delay (d2), s/veh	0.5	0.0	0.0	4.3	0.0	0.0	0.5	0.3	0.0	3.2	5.3	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.0	0.0	0.0	0.0	0.7	2.6	0.0	0.1	5.4	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.1	0.0	0.0	31.9	0.0	0.0	22.6	11.5	8.7	30.3	22.5	17.7
LnGrp LOS	C	A	A	C	A	A	C	B	A	C	C	B
Approach Vol, veh/h		293			2			842			1269	
Approach Delay, s/veh		20.1			31.9			12.3			21.4	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	30.7		15.5	11.2	24.4		4.5				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	2.2	10.7		6.0	3.9	15.9		2.1				
Green Ext Time (p_c), s	0.0	4.2		0.6	0.0	2.3		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	18.1
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	159	294	65	59	8	107	193	44	11	386	32
Future Volume (veh/h)	52	159	294	65	59	8	107	193	44	11	386	32
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	60	183	271	75	68	6	123	222	31	13	444	34
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	78	292	512	95	309	262	298	268	37	14	466	36
Arrive On Green	0.04	0.16	0.16	0.05	0.17	0.17	0.17	0.17	0.17	0.28	0.28	0.28
Sat Flow, veh/h	1781	1870	1580	1781	1870	1585	1781	1600	223	49	1668	128
Grp Volume(v), veh/h	60	183	271	75	68	6	123	0	253	491	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1580	1781	1870	1585	1781	0	1823	1845	0	0
Q Serve(g_s), s	1.8	4.9	7.5	2.2	1.7	0.2	3.3	0.0	7.2	14.1	0.0	0.0
Cycle Q Clear(g_c), s	1.8	4.9	7.5	2.2	1.7	0.2	3.3	0.0	7.2	14.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	0.03		0.07
Lane Grp Cap(c), veh/h	78	292	512	95	309	262	298	0	305	515	0	0
V/C Ratio(X)	0.76	0.63	0.53	0.79	0.22	0.02	0.41	0.00	0.83	0.95	0.00	0.00
Avail Cap(c_a), veh/h	136	292	512	136	309	262	298	0	305	515	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	25.4	21.2	14.8	25.2	19.4	18.8	20.0	0.0	21.6	19.0	0.0	0.0
Incr Delay (d2), s/veh	5.7	3.2	0.5	11.4	0.1	0.0	0.3	0.0	16.2	28.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	2.2	3.2	1.2	0.7	0.1	1.3	0.0	4.1	9.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.1	24.4	15.4	36.6	19.6	18.8	20.4	0.0	37.8	47.1	0.0	0.0
LnGrp LOS	C	C	B	D	B	B	C	A	D	D	A	A
Approach Vol, veh/h		514			149			376			491	
Approach Delay, s/veh		20.4			28.1			32.1			47.1	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.4	13.4		20.0	5.9	13.9		14.0				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	4.1	8.4		15.0	4.1	8.4		9.0				
Max Q Clear Time (g_c+I1), s	4.2	9.5		16.1	3.8	3.7		9.2				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	0.1		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	32.6
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	6	180	25	2	10	116	768	20	27	786	86
Future Volume (veh/h)	88	6	180	25	2	10	116	768	20	27	786	86
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	107	0	83	29	2	3	135	893	18	31	914	56
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	783	0	341	149	10	15	246	1203	24	117	943	418
Arrive On Green	0.22	0.00	0.22	0.10	0.10	0.10	0.14	0.34	0.34	0.07	0.27	0.27
Sat Flow, veh/h	3563	0	1554	1505	104	156	1781	3560	72	1781	3554	1576
Grp Volume(v), veh/h	107	0	83	34	0	0	135	446	465	31	914	56
Grp Sat Flow(s),veh/h/ln	1781	0	1554	1764	0	0	1781	1777	1855	1781	1777	1576
Q Serve(g_s), s	1.6	0.0	2.9	1.2	0.0	0.0	4.7	14.7	14.7	1.1	16.9	1.8
Cycle Q Clear(g_c), s	1.6	0.0	2.9	1.2	0.0	0.0	4.7	14.7	14.7	1.1	16.9	1.8
Prop In Lane	1.00		1.00	0.85		0.09	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	783	0	341	175	0	0	246	601	627	117	943	418
V/C Ratio(X)	0.14	0.00	0.24	0.19	0.00	0.00	0.55	0.74	0.74	0.27	0.97	0.13
Avail Cap(c_a), veh/h	806	0	352	372	0	0	269	601	627	269	943	418
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.8	0.0	21.3	27.4	0.0	0.0	26.6	19.4	19.4	29.5	24.1	18.6
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.4	0.0	0.0	0.8	5.9	5.7	0.4	22.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	1.1	0.5	0.0	0.0	1.8	6.1	6.4	0.4	9.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.9	0.0	21.7	27.8	0.0	0.0	27.4	25.3	25.1	29.9	46.4	18.9
LnGrp LOS	C	A	C	C	A	A	C	C	C	C	D	B
Approach Vol, veh/h		190			34			1046			1001	
Approach Delay, s/veh		21.2			27.8			25.5			44.3	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.6	28.2		18.8	13.4	23.4		10.8				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	17.6		* 15	* 10	17.6		14.0				
Max Q Clear Time (g_c+I1), s	3.1	16.7		4.9	6.7	18.9		3.2				
Green Ext Time (p_c), s	0.0	0.7		0.4	0.0	0.0		0.1				

Intersection Summary			
HCM 6th Ctrl Delay		33.5	
HCM 6th LOS		C	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
1: Market St & Benton Dr

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	338	0	41	3	1	6	67	903	3	0	599	297
Future Volume (veh/h)	338	0	41	3	1	6	67	903	3	0	599	297
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	397	0	0	3	1	2	73	982	3	0	651	251
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	733	385	0	14	5	9	243	1766	787	3	1002	436
Arrive On Green	0.21	0.00	0.00	0.02	0.02	0.02	0.14	0.50	0.50	0.00	0.28	0.28
Sat Flow, veh/h	3563	1870	0	861	287	574	1781	3554	1583	1781	3554	1547
Grp Volume(v), veh/h	397	0	0	6	0	0	73	982	3	0	651	251
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1723	0	0	1781	1777	1583	1781	1777	1547
Q Serve(g_s), s	5.3	0.0	0.0	0.2	0.0	0.0	2.0	10.2	0.1	0.0	8.6	7.4
Cycle Q Clear(g_c), s	5.3	0.0	0.0	0.2	0.0	0.0	2.0	10.2	0.1	0.0	8.6	7.4
Prop In Lane	1.00		0.00	0.50		0.33	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	733	385	0	27	0	0	243	1766	787	3	1002	436
V/C Ratio(X)	0.54	0.00	0.00	0.22	0.00	0.00	0.30	0.56	0.00	0.00	0.65	0.58
Avail Cap(c_a), veh/h	735	386	0	323	0	0	367	1766	787	334	1253	546
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	18.9	0.0	0.0	25.9	0.0	0.0	20.7	9.3	6.8	0.0	16.8	16.4
Incr Delay (d2), s/veh	0.9	0.0	0.0	1.5	0.0	0.0	0.5	0.5	0.0	0.0	1.3	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.0	0.0	0.1	0.0	0.0	0.7	2.8	0.0	0.0	3.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.9	0.0	0.0	27.4	0.0	0.0	21.2	9.8	6.8	0.0	18.1	18.5
LnGrp LOS	B	A	A	C	A	A	C	A	A	A	B	B
Approach Vol, veh/h		397			6			1058			902	
Approach Delay, s/veh		19.9			27.4			10.6			18.2	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	0.0	32.7		15.6	11.5	21.2		5.1				
Change Period (Y+Rc), s	* 4.2	6.2		4.6	* 4.2	6.2		4.2				
Max Green Setting (Gmax), s	* 10	19.8		11.0	* 11	18.8		10.0				
Max Q Clear Time (g_c+I1), s	0.0	12.2		7.3	4.0	10.6		2.2				
Green Ext Time (p_c), s	0.0	4.5		0.6	0.0	4.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		15.1	
HCM 6th LOS		B	

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: Benton Dr & Quartz Hill Rd

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	54	86	204	50	167	19	265	282	42	11	182	66
Future Volume (veh/h)	54	86	204	50	167	19	265	282	42	11	182	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	60	96	185	56	186	11	294	313	40	12	202	54
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	82	266	606	78	263	221	428	389	50	15	248	66
Arrive On Green	0.05	0.14	0.14	0.04	0.14	0.14	0.24	0.24	0.24	0.18	0.18	0.18
Sat Flow, veh/h	1781	1870	1574	1781	1870	1574	1781	1619	207	81	1356	362
Grp Volume(v), veh/h	60	96	185	56	186	11	294	0	353	268	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	1574	1781	1870	1574	1781	0	1826	1799	0	0
Q Serve(g_s), s	1.6	2.2	3.9	1.5	4.5	0.3	7.1	0.0	8.6	6.8	0.0	0.0
Cycle Q Clear(g_c), s	1.6	2.2	3.9	1.5	4.5	0.3	7.1	0.0	8.6	6.8	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	0.04		0.20
Lane Grp Cap(c), veh/h	82	266	606	78	263	221	428	0	439	329	0	0
V/C Ratio(X)	0.73	0.36	0.31	0.71	0.71	0.05	0.69	0.00	0.80	0.82	0.00	0.00
Avail Cap(c_a), veh/h	154	292	627	192	331	279	526	0	539	379	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	22.3	18.4	10.2	22.4	19.5	17.6	16.4	0.0	17.0	18.6	0.0	0.0
Incr Delay (d2), s/veh	4.6	0.3	0.1	4.5	3.1	0.0	1.7	0.0	5.8	9.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.8	1.7	0.6	1.9	0.1	2.6	0.0	3.7	3.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.9	18.7	10.3	26.8	22.6	17.7	18.1	0.0	22.7	28.5	0.0	0.0
LnGrp LOS	C	B	B	C	C	B	B	A	C	C	A	A
Approach Vol, veh/h		341			253			647			268	
Approach Delay, s/veh		15.6			23.3			20.6			28.5	
Approach LOS		B			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	11.8		13.7	5.7	11.7		16.4				
Change Period (Y+Rc), s	3.5	5.0		5.0	3.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	7.4		10.0	4.1	8.4		14.0				
Max Q Clear Time (g_c+I1), s	3.5	5.9		8.8	3.6	6.5		10.6				
Green Ext Time (p_c), s	0.0	0.1		0.1	0.0	0.1		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			21.3									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
3: Market St & Quartz Hill Rd

12/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	1	140	27	4	16	251	844	40	30	641	53
Future Volume (veh/h)	38	1	140	27	4	16	251	844	40	30	641	53
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	43	0	44	30	4	5	279	938	42	33	712	37
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	644	0	281	148	20	25	324	1273	57	122	905	392
Arrive On Green	0.18	0.00	0.18	0.11	0.11	0.11	0.18	0.37	0.37	0.07	0.25	0.25
Sat Flow, veh/h	3563	0	1553	1352	180	225	1781	3460	155	1781	3554	1539
Grp Volume(v), veh/h	43	0	44	39	0	0	279	482	498	33	712	37
Grp Sat Flow(s),veh/h/ln	1781	0	1553	1757	0	0	1781	1777	1838	1781	1777	1539
Q Serve(g_s), s	0.7	0.0	1.6	1.4	0.0	0.0	10.2	15.8	15.8	1.2	12.6	1.2
Cycle Q Clear(g_c), s	0.7	0.0	1.6	1.4	0.0	0.0	10.2	15.8	15.8	1.2	12.6	1.2
Prop In Lane	1.00		1.00	0.77		0.13	1.00		0.08	1.00		1.00
Lane Grp Cap(c), veh/h	644	0	281	193	0	0	324	654	676	122	905	392
V/C Ratio(X)	0.07	0.00	0.16	0.20	0.00	0.00	0.86	0.74	0.74	0.27	0.79	0.09
Avail Cap(c_a), veh/h	794	0	346	365	0	0	365	654	676	265	992	430
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.9	0.0	23.3	27.3	0.0	0.0	26.7	18.4	18.4	29.8	23.4	19.2
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.4	0.0	0.0	15.7	5.3	5.1	0.4	4.9	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.6	0.6	0.0	0.0	5.3	6.4	6.6	0.5	5.2	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.9	0.0	23.5	27.7	0.0	0.0	42.4	23.7	23.6	30.2	28.2	19.4
LnGrp LOS	C	A	C	C	A	A	D	C	C	C	C	B
Approach Vol, veh/h		87			39			1259			782	
Approach Delay, s/veh		23.2			27.7			27.8			27.9	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.8	30.6		16.4	16.4	22.9		11.6				
Change Period (Y+Rc), s	* 4.2	5.8		* 4.2	* 4.2	5.8		4.2				
Max Green Setting (Gmax), s	* 10	22.6		* 15	* 14	18.8		14.0				
Max Q Clear Time (g_c+I1), s	3.2	17.8		3.6	12.2	14.6		3.4				
Green Ext Time (p_c), s	0.0	3.4		0.2	0.1	2.5		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			27.7									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.
User approved volume balancing among the lanes for turning movement.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Attachment J

Tree Inventory for the Brentwood Village Development Project – Redding, California,
Gallaway Enterprises, September 2022

gallaway ENTERPRISES

117 Meyers Street • Suite 120 • Chico CA 95928 • 530-332-9909

September 14, 2022

Sharrah Dunlap Sawyer, Inc.
Attn.: Mike Dormer
6590 Lockheed Drive
Redding, CA 96002

Re: Tree Inventory for the Brentwood Village Development Project – Redding, California.

As requested, Gallaway Enterprises conducted a Tree Inventory for the approximately 12-acre Brentwood Village Development Project (Project) site in August 2022. Please find enclosed a summary of the results of the inventory conducted.

Project Location and Environmental Setting

The Project site is located within the north western city limits of Redding, California, and is bound to the south by Quartz Hill Road. The Project site is composed of one parcel, APN 115-170-014. The site falls within the "Redding" 7.5-minute United States Geological Survey (USGS) quadrangle, Section 22, Township 32N, Range 5W; latitude 40.61378, longitude -122.41519. The site is currently dominated by blue oak-foothill pine woodland with an understory of manzanita and annual grassland. Blue oak-foothill pine woodland continues offsite to the north of the Project site. Residential development occurs to the south and west and blue oak-foothill pine woodland continues immediately to the east. Two gravel roads occur in the Project site, one along the eastern boundary and one near the western boundary (Sunray Way).

Regulatory Framework

California Department of Fish and Wildlife (CFGC Section 1602)

Removal of riparian vegetation associated with a project's impacts to streambeds is regulated by the California Department of Fish and Wildlife (CDFW) under the California Fish and Game Code (§1600 et seq.). During the process of notification of streambed alteration, CDFW requires documentation of trees or shrubs with a single main trunk 4 inches or greater in diameter at breast height (DBH) that occur within riparian areas.

City of Redding

The Project site is located within the City of Redding and, therefore, requires compliance with the Redding Zoning Ordinance. Pursuant to Chapter 18.45 of the Redding Zoning Ordinance, removal of any tree exceeding 6 inches in DBH requires a tree removal permit. The provisions for tree removal are described in Section 18.45.060 of the Zoning Ordinance.

Survey Method

The Tree Inventory was conducted on August 23, 29, and 31, 2022 by ISA Certified Arborist Elena Gregg. No riparian areas occur within the Project site. No riparian areas occur within the Project site, therefore, this tree inventory was conducted only in accordance with the guidelines outlined in the City of Redding Tree Preservation Ordinance (Chapter 18.45 of the Municipal Code) and the City of Redding's *Trees & Construction: A Guide to Preservation*[1]. All trees present within the Project site that had any one co-dominant trunk with a DBH of 6 inches or greater were identified to the species level, numbered using an aluminum tree tag, the DBH was measured, and their locations recorded using a Trimble Geo Explorer 6000 Series GPS Receiver. Gallaway Enterprises then conducted a health assessment for all of the trees identified. A level 2 basic visual assessment (per ISA's ANSI A300 Part 9 and companion BMP guidelines) of each tree was conducted from the ground by walking completely around the tree and looking at the growing site, trunk, trunk collar, and branches. Standing dead trees were not mapped or assessed for DBH or condition.

Following this visual assessment, each inventoried tree was assigned a health rating of 1 to 5, with 1 being a tree with poor health and 5 being a tree in excellent health. The ratings were based on the following standards:

1: These trees have a major defect that could result in instability of the tree or a portion of the tree failing that could be considered a hazard. The defect is typically extensive dead and/or decay.

2: These are generally sound trees but often have prominent leans, trunk elongation from competition with other trees, or general branching defects. Other potential health detractors include excessive deadwood or decay in the branches or overgrowth by vines.

3: These are average trees; they are generally in good health and without prominent defects in their branching pattern and overall structure. These trees also have adequate growing room and are not overgrown with vines (e.g. mistletoe, ivy, grape, blackberry).

4: These trees are above average, with good branch form. The trees are not overcrowded or light-starved and have plenty of room to grow. These trees often look much like a "3" except they are larger, older, and better established in the tree stand.

5: These trees are considered excellent in all aspects: form, branching, and structure.

Results of the Survey

The entire Project site was dominated by blue oak-foothill pine woodland, with an understory of manzanita and annual grassland. Native blue oaks (*Quercus douglasii*) were the dominant tree in the tree canopy throughout the site. A few scattered foothill pines (*Pinus sabiniana*) were also present. No riparian areas or riparian vegetation was observed within the Project site. The location of all the inventoried trees within the Project site is depicted in **Attachment A**. A total of 303 blue oaks and 15 foothill pines were

[1] City of Redding. Trees & Construction, A Guide to Preservation. Document can be found at: http://www.cityofredding.org/home/showdocument?id=3720

inventoried within the Project site (**Attachment B**). The average DBH of the inventoried trees throughout the Project site is 10 inches and the average health of the trees inventoried was 2.

The low average health of the trees on the site was largely due to drought stress brought on by the consecutive extreme droughts that the region has experienced. The impacts of drought stress on the trees was more severe where there was also extensive soil excavation due to rodent burrows at the base of the tree trunks, where the trees were crowded, and where other health concerns were present (e.g. cavities or decay in the trunk). Drought stress was evidenced by the above average amount of suckering and dead branches, as well as early browning of the leaves.

A table listing each tree inventoried within the Project site and its assessed health rating is provided in **Attachment B**. Photos documenting the conditions of select trees on the site are provided as **Attachment C**.

A level 2 basic visual assessment from ground level was conducted; however, visual signs of decline may not have been outwardly evident or evident from the ground surface. As such, the accuracy of the heath rating is limited by the visual appearance of the trees at the time of the survey. An Arborist's Disclaimer Statement is provided as **Attachment D**.

Recommendations

It is recommended that as many healthy native tree species (trees with a health rating of 3 or greater, **Attachment B**) as feasible, based on the proposed Project goals, be retained within the Project site due to their aesthetics and usefulness to wildlife. However, the pine cones of foothill pine trees are very large, therefore, foothill pine trees are not recommended for retention if the dripline of the pine trees overlap areas proposed for regular human use due to dangers posed from falling pine cones.

The removal of any City regulated trees (heritage trees and native oaks with a single trunk 6 inches or greater or multiple trunks 10 inches in aggregate or greater in DBH) on the Project site must be in compliance with the City's zoning ordinance. City regulated trees present within the Project site include the inventoried blue oak trees. If regulated trees are proposed to be removed on the site, a tree removal permit will be required to be obtained from the City. Mitigation for removal of trees will be determined through consultation with the City.

If any of the trees present within the Project site are proposed for preservation, care should be taken to implement the avoidance and minimization measures outlined in the City of Redding's *Trees & Construction: A Guide to Preservation*. If construction activities or soil compaction occur within the dripline of a tree proposed for preservation, these activities may harm the tree to the point of failure. Preserved trees in close proximity to structures or walkways should be regularly monitored by a qualified arborist following construction activities for signs of stress or failure and properly managed (e.g. pruning dead branches, ensuring appropriate water regime for the species).

Should you have any questions or need any additional information on managing trees during construction, please do not hesitate to contact me at (530) 332-9909 or elena@gallawayenterprises.com.

Sincerely,

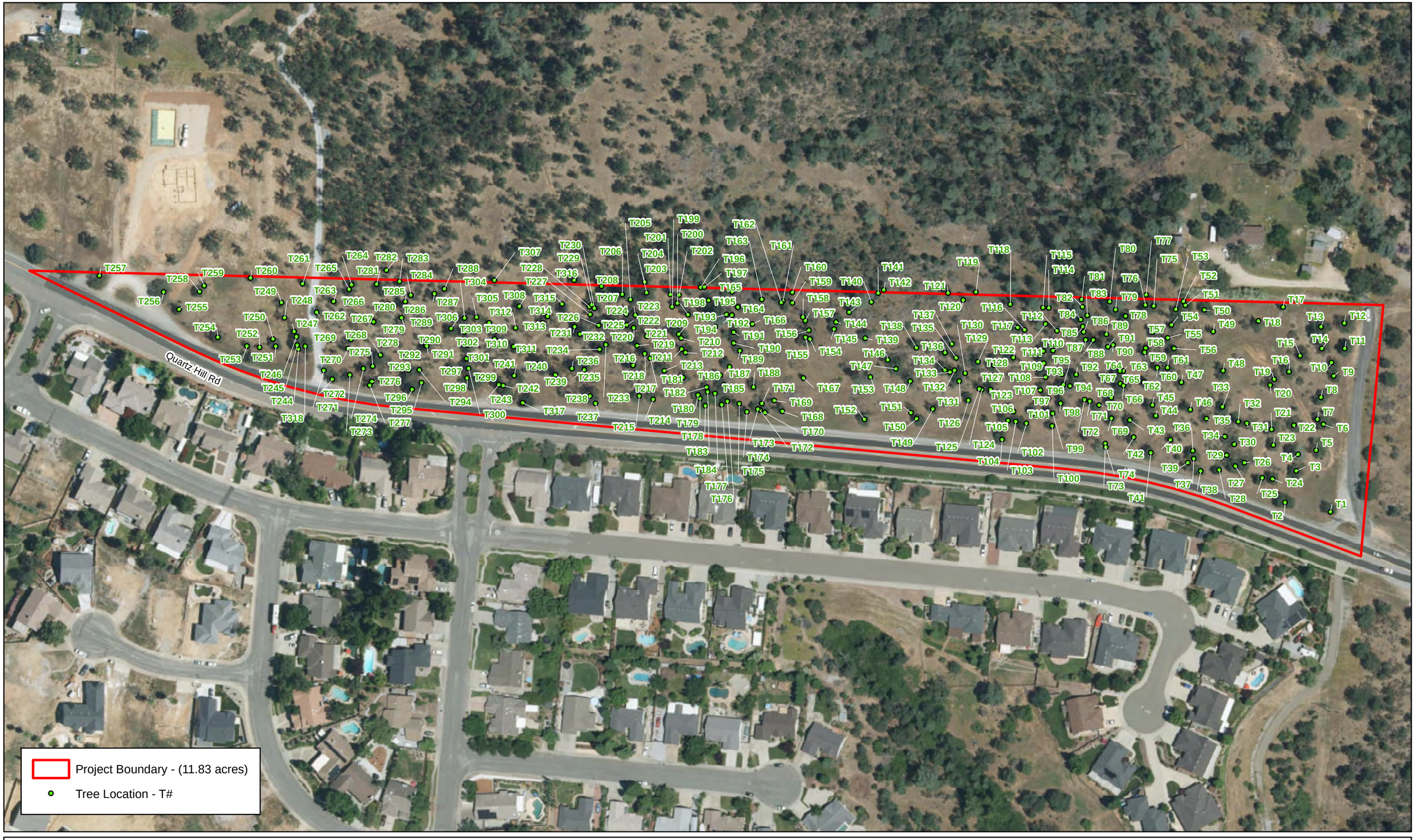


Elena Gregg, ISA Certified Arborist (WE-8033A)
Gallaway Enterprises

Attachment A: Tree Location Map
Attachment B: Tree Data Table
Attachment C: Project Site Photos
Attachment D: Arborist's Disclaimer

Attachment A

Tree Location Map



1:1,700

0 200 400 Feet

NORTH

Data Sources: ESRI, City of Redding 05/27/2020

Brentwood Village Development Project
Tree Inventory
Attachment A

gallaway ENTERPRISES

GE: #22-105 Map Date: 09/06/2022

Attachment B

Tree Data Table

Attachment B - Brentwood Village Development Tree Inventory										
Tree Tag #	**Common Name**	**Scientific Name**	**DBH 1**	**DBH 2**	**DBH 3**	**DBH 4**	**DBH 5**	**Dripline**	**Health (1-5)**	**Comments**
T1	Blue Oak	*Quercus douglasii*	13	0	0	0	0	8	3	average
T2	Blue Oak	*Quercus douglasii*	16	0	0	0	0	10	3	average
T3	Blue Oak	*Quercus douglasii*	13	0	0	0	0	10	3	average
T4	Foothill Pine	*Pinus sabiniana*	19	0	0	0	0	12	3	average
T5	Blue Oak	*Quercus douglasii*	11	11	9	0	0	14	2	suckering, some dead branches
T6	Blue Oak	*Quercus douglasii*	13	11	7	0	0	14	3	some suckering, drought stress
T7	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	suckering, some dead branches, poor form
T8	Blue Oak	*Quercus douglasii*	16	0	0	0	0	12	3	possible decay in trunk, poor branching, d. stress
T9	Blue Oak	*Quercus douglasii*	12	0	0	0	0	10	2	suckering , some dead branches
T10	Blue Oak	*Quercus douglasii*	14	0	0	0	0	12	2	drought stress=suckering /thin crown
T11	Blue Oak	*Quercus douglasii*	14	0	0	0	0	12	3	average
T12	Blue Oak	*Quercus douglasii*	15	0	0	0	0	12	2	thin crown, some dead branches
T13	Blue Oak	*Quercus douglasii*	23	0	0	0	0	18	4	poison oak at base, some broken branches
T14	Blue Oak	*Quercus douglasii*	10	9	8	0	0	12	3	posible decay at base
T15	Blue Oak	*Quercus douglasii*	16	0	0	0	0	12	2	lots of suckering, dead branches
T16	Blue Oak	*Quercus douglasii*	15	0	0	0	0	12	2	lots of suckering, dead branches
T17	Foothill Pine	*Pinus sabiniana*	9	0	0	0	0	7	3	average
T18	Blue Oak	*Quercus douglasii*	20	0	0	0	0	12	1	extensive decay (pic)
T19	Blue Oak	*Quercus douglasii*	12	0	0	0	0	10	2	lots of suckering and dead branches
T20	Blue Oak	*Quercus douglasii*	13	0	0	0	0	12	2	lots of suckering and dead branches
T21	Blue Oak	*Quercus douglasii*	17	7	7	7	0	12	3	drought stress, old wire=girdling hazard
T22	Blue Oak	*Quercus douglasii*	7	6	0	0	0	12	2	lots of suckering and dead branches
T23	Blue Oak	*Quercus douglasii*	15	0	0	0	0	12	3	drought stress
T24	Blue Oak	*Quercus douglasii*	11	0	0	0	0	10	3	average
T25	Blue Oak	*Quercus douglasii*	11	0	0	0	0	12	3	possible decay at base
T26	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	3	poor branching
T27	Blue Oak	*Quercus douglasii*	11	4	0	0	0	14	3	posible decay at base
T28	Blue Oak	*Quercus douglasii*	7	5	0	0	0	8	3	poor branching
T29	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	2	lots of suckering and dead branches
T30	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	3	average
T31	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	2	drought stress
T32	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	2	drought stress w/ poor branching
T33	Blue Oak	*Quercus douglasii*	14	0	0	0	0	12	2	decay at base
T34	Blue Oak	*Quercus douglasii*	8	5	0	0	0	10	2	lots of suckering and dead branches, poor branching
T35	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	2	drought stress
T36	Blue Oak	*Quercus douglasii*	11	0	0	0	0	12	3	average
T37	Blue Oak	*Quercus douglasii*	6	5	0	0	0	9	3	crowded
T38	Blue Oak	*Quercus douglasii*	15	0	0	0	0	10	1	decay in trunk, lots of suckering and dead branches
T39	Blue Oak	*Quercus douglasii*	14	0	0	0	0	12	1	top dead, lots of suckering
T40	Blue Oak	*Quercus douglasii*	8	6	0	0	0	10	3	drought stress
T41	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	4	above average
T42	Blue Oak	*Quercus douglasii*	14	0	0	0	0	10	2	lots of suckering and dead branches
T43	Blue Oak	*Quercus douglasii*	15	0	0	0	0	13	3	average
T44	Blue Oak	*Quercus douglasii*	7	7	0	0	0	10	2	lots of suckering and dead branches
T45	Blue Oak	*Quercus douglasii*	14	0	0	0	0	12	2	drought stress, poor branching
T46	Blue Oak	*Quercus douglasii*	10	0	0	0	0	14	2	lots of suckering and dead branches
T47	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	2	lots of suckering and dead branches
T48	Blue Oak	*Quercus douglasii*	16	0	0	0	0	13	3	drought stress
T49	Blue Oak	*Quercus douglasii*	9	0	0	0	0	8	2	top cut
T50	Blue Oak	*Quercus douglasii*	10	10	9	0	0	12	2	top cut, lots of suckering
T51	Blue Oak	*Quercus douglasii*	8	7	7	0	0	10	3	crowded
T52	Blue Oak	*Quercus douglasii*	11	0	0	0	0	10	2	crowded, drought stress
T53	Blue Oak	*Quercus douglasii*	8	8	6	6	6	14	2	poor branching, poison oak, drought stress
T54	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	3	drought stress
T55	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	lots of suckering and dead branches
T56	Blue Oak	*Quercus douglasii*	8	6	5	0	0	12	3	average
T57	Blue Oak	*Quercus douglasii*	9	0	0	0	0	12	3	drought stress
T58	Blue Oak	*Quercus douglasii*	7	7	0	0	0	10	2	crowded, drought stress, poor branching
T59	Blue Oak	*Quercus douglasii*	6	0	0	0	0	8	2	crowded
T60	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	2	possible decay at base
T61	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	average
T62	Blue Oak	*Quercus douglasii*	9	6	5	4	0	10	2	large cavity at base
T63	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	3	crowded
T64	Blue Oak	*Quercus douglasii*	11	8	0	0	0	12	3	crowded
T65	Blue Oak	*Quercus douglasii*	10	7	0	0	0	12	1	decay up trunk
T66	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	crowded, poor branching
T67	Blue Oak	*Quercus douglasii*	10	0	0	0	0	8	2	drought stress, poor branching
T68	Blue Oak	*Quercus douglasii*	10	0	0	0	0	8	1	significant decay up trunk
T69	Blue Oak	*Quercus douglasii*	8	8	7	0	0	12	3	drought stress
T70	Blue Oak	*Quercus douglasii*	7	7	0	0	0	10	3	drought stress
T71	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	1	extensive decay up trunk

Tree Tag #	Common Name	Scientific Name	DBH 1	DBH 2	DBH 3	DBH 4	DBH 5	Dripline	Health (1-5)	Comments
T72	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	drought stress, poor branching (pic)
T73	Foothill Pine	*Pinus sabiniana*	20	0	0	0	0	14	1	dead branches, growing into oak
T74	Blue Oak	*Quercus douglasii*	12	0	0	0	0	14	1	growing into pine (pic)
T75	Blue Oak	*Quercus douglasii*	11	9	8	6	0	12	3	drought stress
T76	Blue Oak	*Quercus douglasii*	8	8	0	0	0	10	2	possible decay at base, dead branches
T77	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	2	lots of dead branches
T78	Blue Oak	*Quercus douglasii*	7	5	5	0	0	12	2	cavity at base
T79	Blue Oak	*Quercus douglasii*	11	10	0	0	0	12	3	crowded, possible decay at base
T80	Blue Oak	*Quercus douglasii*	12	0	0	0	0	10	2	crowded, drought stress
T81	Foothill Pine	*Pinus sabiniana*	19	0	0	0	0	12	3	average
T82	Foothill Pine	*Pinus sabiniana*	18	0	0	0	0	12	2	crowded, dead branches
T83	Foothill Pine	*Pinus sabiniana*	20	0	0	0	0	14	3	average
T84	Blue Oak	*Quercus douglasii*	7	6	0	0	0	10	3	poor form
T85	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	2	decay in trunk
T86	Blue Oak	*Quercus douglasii*	11	0	0	0	0	14	3	slight lean
T87	Blue Oak	*Quercus douglasii*	6	0	0	0	0	8	2	poor form, crowded
T88	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	3	average
T89	Blue Oak	*Quercus douglasii*	7	0	0	0	0	10	3	average
T90	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	3	slightly crowded
T91	Foothill Pine	*Pinus sabiniana*	20	0	0	0	0	14	2	some broken branches and browning
T92	Blue Oak	*Quercus douglasii*	13	0	0	0	0	12	3	average
T93	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	3	average
T94	Foothill Pine	*Pinus sabiniana*	12	0	0	0	0	12	3	some dead branches
T95	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	1	lots of suckering and dead branches, decay
T96	Blue Oak	*Quercus douglasii*	7	0	0	0	0	10	3	slight lean
T97	Blue Oak	*Quercus douglasii*	6	6	0	0	0	14	1	decay at base, dead branches
T98	Blue Oak	*Quercus douglasii*	11	7	0	0	0	14	3	rodents at base (pic), few dead branches
T99	Blue Oak	*Quercus douglasii*	9	8	0	0	0	12	3	drought stress
T100	Blue Oak	*Quercus douglasii*	6	5	5	3	0	8	3	poor form
T101	Blue Oak	*Quercus douglasii*	9	0	0	0	0	8	2	dead branches, drought stress
T102	Blue Oak	*Quercus douglasii*	12	9	0	0	0	12	2	decay at base
T103	Blue Oak	*Quercus douglasii*	8	0	0	0	0	12	3	average
T104	Blue Oak	*Quercus douglasii*	14	0	0	0	0	14	1	lots of decay in trunk
T105	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	slight learn
T106	Blue Oak	*Quercus douglasii*	8	0	0	0	0	12	1	decay at base, dead branches
T107	Blue Oak	*Quercus douglasii*	6	6	0	0	0	8	2	very poor branching, drought stress
T108	Blue Oak	*Quercus douglasii*	7	6	6	4	0	10	2	some decay at base
T109	Blue Oak	*Quercus douglasii*	8	6	0	0	0	12	2	decay at base
T110	Blue Oak	*Quercus douglasii*	9	8	7	0	0	12	2	decay at base, dead branches
T111	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	poor form, drought stress
T112	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	1	extensive decay , dead branches
T113	Foothill Pine	*Pinus sabiniana*	16	0	0	0	0	12	3	slight lean
T114	Blue Oak	*Quercus douglasii*	8	0	0	0	0	12	3	drought stress
T115	Foothill Pine	*Pinus sabiniana*	20	0	0	0	0	14	3	average
T116	Blue Oak	*Quercus douglasii*	6	6	0	0	0	8	3	drought stress
T117	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	1	decay at base, dead branches
T118	Blue Oak	*Quercus douglasii*	9	7	6	0	0	10	1	extensive decay, dead branches
T119	Blue Oak	*Quercus douglasii*	10	0	0	0	0	9	3	average
T120	Blue Oak	*Quercus douglasii*	7	0	0	0	0	6	1	extensive decay
T121	Blue Oak	*Quercus douglasii*	7	7	0	0	0	8	2	some decay at base
T122	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	2	decay at base
T123	Blue Oak	*Quercus douglasii*	8	8	0	0	0	10	2	decay at base
T124	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	3	drought stress
T125	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	1	extensive decay at base
T126	Blue Oak	*Quercus douglasii*	9	6	0	0	0	10	2	cavity at base
T127	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	2	dead branches and suckering
T128	Blue Oak	*Quercus douglasii*	7	0	0	0	0	10	3	crowded
T129	Blue Oak	*Quercus douglasii*	11	0	0	0	0	12	3	some dead branches
T130	Blue Oak	*Quercus douglasii*	6	4	0	0	0	8	2	very poor branching, many dead branches
T131	Blue Oak	*Quercus douglasii*	13	0	0	0	0	12	3	average
T132	Blue Oak	*Quercus douglasii*	6	0	0	0	0	10	3	crowded
T133	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	crowded
T134	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	crowded
T135	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	lots of dead branches
T136	Blue Oak	*Quercus douglasii*	8	5	0	0	0	12	2	decay, lots of dead branches
T137	Blue Oak	*Quercus douglasii*	7	7	6	0	0	12	2	decay at base
T138	Blue Oak	*Quercus douglasii*	10	0	0	0	0	11	3	average
T139	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	1	extensive decay up trunk
T140	Foothill Pine	*Pinus sabiniana*	24	0	0	0	0	20	2	fire damage to branches
T141	Blue Oak	*Quercus douglasii*	11	0	0	0	0	10	1	extensive decay up trunk
T142	Blue Oak	*Quercus douglasii*	11	0	0	0	0	10	1	extensive decay up trunk
T143	Blue Oak	*Quercus douglasii*	11	0	0	0	0	12	2	decay at base

Tree Tag #	Common Name	Scientific Name	DBH 1	DBH 2	DBH 3	DBH 4	DBH 5	Dripline	Health (1-5)	Comments
T144	Blue Oak	*Quercus douglasii*	14	0	0	0	0	13	2	decay at base, drought stress
T145	Blue Oak	*Quercus douglasii*	11	0	0	0	0	10	1	extensive decay up trunk
T146	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	decay at base
T147	Blue Oak	*Quercus douglasii*	10	8	0	0	0	12	3	average
T148	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	2	lots of dead branches
T149	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	1	extensive decay at base
T150	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	3	drought stress
T151	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	1	extensive decay at base
T152	Blue Oak	*Quercus douglasii*	9	8	0	0	0	12	2	decay at base
T153	Foothill Pine	*Pinus sabiniana*	20	0	0	0	0	18	2	dead branches and fire damage
T154	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	1	decay at base, slight lean, dead branches
T155	Blue Oak	*Quercus douglasii*	19	0	0	0	0	12	1	extensive decay up trunk, dead branches
T156	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	1	extensive decay at base, dead branches
T157	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	1	extensive decay up trunk
T158	Blue Oak	*Quercus douglasii*	7	0	0	0	0	10	3	crowded, poor branching
T159	Blue Oak	*Quercus douglasii*	8	0	0	0	0	7	1	extensive decay up trunk, dead branches
T160	Blue Oak	*Quercus douglasii*	15	0	0	0	0	10	1	extensive decay in canopy
T161	Blue Oak	*Quercus douglasii*	6	0	0	0	0	7	1	extensive decay at base
T162	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	1	decay at base, lots of dead branches
T163	Blue Oak	*Quercus douglasii*	7	0	0	0	0	10	2	decay at base, thin crown
T164	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	1	extensive decay up trunk
T165	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	2	lots of suckering and dead branches
T166	Foothill Pine	*Pinus sabiniana*	8	0	0	0	0	8	3	minor fire damage
T167	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	1	extensive decay at base
T168	Blue Oak	*Quercus douglasii*	6	5	5	0	0	8	1	extensive decay at base
T169	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	1	extensive decay up trunk, undercut soil
T170	Blue Oak	*Quercus douglasii*	7	0	0	0	0	10	3	average
T171	Blue Oak	*Quercus douglasii*	6	0	0	0	0	7	2	crowded, dead branches
T172	Blue Oak	*Quercus douglasii*	8	0	0	0	0	9	2	drought stress, poor branching
T173	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	significant drought stress
T174	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	2	crown mostly brown
T175	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	2	crown mostly brown
T176	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	2	significant drought stress
T177	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	1	extensive decay up trunk, lean
T178	Blue Oak	*Quercus douglasii*	10	0	0	0	0	8	3	poison oak, drought stress
T179	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	2	significant drought stress
T180	Blue Oak	*Quercus douglasii*	7	0	0	0	0	10	2	significant drought stress
T181	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	lots of suckering
T182	Blue Oak	*Quercus douglasii*	6	0	0	0	0	10	2	crowded, significant drought stress
T183	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	2	crowded, drought stress
T184	Blue Oak	*Quercus douglasii*	6	0	0	0	0	8	2	significant drought stress
T185	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	3	poison oak, drought stress
T186	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	crowded, broken branches, drought stress
T187	Blue Oak	*Quercus douglasii*	10	7	0	0	0	12	3	average
T188	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	some dead branches
T189	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	3	average
T190	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	3	some dead branches
T191	Blue Oak	*Quercus douglasii*	11	0	0	0	0	12	3	poor branching, posible decay in trunk
T192	Blue Oak	*Quercus douglasii*	7	0	0	0	0	14	2	crowded, poor branching
T193	Foothill Pine	*Pinus sabiniana*	22	0	0	0	0	14	2	rodents at base, dead branches
T194	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	crowded
T195	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	drought stress
T196	Blue Oak	*Quercus douglasii*	8	0	0	0	0	12	2	significant drought stress, possible decay
T197	Blue Oak	*Quercus douglasii*	6	0	0	0	0	9	3	average
T198	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	3	drought stress
T199	Blue Oak	*Quercus douglasii*	7	0	0	0	0	9	3	poor form
T200	Blue Oak	*Quercus douglasii*	6	0	0	0	0	10	3	drought stress
T201	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	3	drought stress
T202	Blue Oak	*Quercus douglasii*	12	0	0	0	0	10	3	average
T203	Blue Oak	*Quercus douglasii*	9	0	0	0	0	12	3	average
T204	Blue Oak	*Quercus douglasii*	7	7	0	0	0	14	3	drought stress
T205	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	1	extensive decay up trunk
T206	Foothill Pine	*Pinus sabiniana*	13	0	0	0	0	12	3	average
T207	Blue Oak	*Quercus douglasii*	7	4	0	0	0	8	2	mostly brown
T208	Blue Oak	*Quercus douglasii*	11	0	0	0	0	8	1	cavity up trunk
T209	Blue Oak	*Quercus douglasii*	11	9	0	0	0	12	3	drought stress
T210	Blue Oak	*Quercus douglasii*	6	4	0	0	0	10	3	crowded, poor form
T211	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	1	cavity at base, mostly brown
T212	Blue Oak	*Quercus douglasii*	11	8	0	0	0	10	1	mostly dead, decay up trunk
T213	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	3	average
T214	Blue Oak	*Quercus douglasii*	6	6	0	0	0	9	3	average
T215	Blue Oak	*Quercus douglasii*	8	4	4	0	0	10	3	rodents at base

Tree Tag #	Common Name	Scientific Name	DBH 1	DBH 2	DBH 3	DBH 4	DBH 5	Dripline	Health (1-5)	Comments
T216	Blue Oak	*Quercus douglasii*	10	7	0	0	0	10	3	average
T217	Blue Oak	*Quercus douglasii*	8	0	0	0	0	9	1	cavity at base, significant drought stress
T218	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	2	crown mostly brown
T219	Blue Oak	*Quercus douglasii*	9	8	0	0	0	14	2	poison oak, decay in branches
T220	Blue Oak	*Quercus douglasii*	9	0	0	0	0	8	2	cavity at base
T221	Blue Oak	*Quercus douglasii*	6	0	0	0	0	8	2	significant drought stress
T222	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	3	crowded
T223	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	2	significant drought stress
T224	Blue Oak	*Quercus douglasii*	6	6	0	0	0	9	3	some dead branches
T225	Blue Oak	*Quercus douglasii*	11	0	0	0	0	12	3	average
T226	Blue Oak	*Quercus douglasii*	11	0	0	0	0	12	2	lots of suckering and dead branches
T227	Blue Oak	*Quercus douglasii*	6	0	0	0	0	8	1	mostly brown, decay in trunk
T228	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	2	mostly brown
T229	Blue Oak	*Quercus douglasii*	7	0	0	0	0	5	1	crown dead
T230	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	1	crown mostly dead, lots of suckering
T231	Blue Oak	*Quercus douglasii*	6	0	0	0	0	8	1	cavity at base, lean
T232	Blue Oak	*Quercus douglasii*	15	0	0	0	0	12	3	thin crown
T233	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	2	lots of suckering and dead branches
T234	Blue Oak	*Quercus douglasii*	12	0	0	0	0	11	3	average
T235	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	3	poor crotch, drought stress
T236	Blue Oak	*Quercus douglasii*	11	0	0	0	0	10	3	drought stress
T237	Blue Oak	*Quercus douglasii*	10	0	0	0	0	9	2	significant drought stress
T238	Blue Oak	*Quercus douglasii*	12	0	0	0	0	11	3	some broken branches
T239	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	3	drought stress
T240	Blue Oak	*Quercus douglasii*	17	0	0	0	0	14	3	average
T241	Blue Oak	*Quercus douglasii*	11	0	0	0	0	10	2	significant drought stress
T242	Blue Oak	*Quercus douglasii*	13	0	0	0	0	12	2	significant drought stress
T243	Blue Oak	*Quercus douglasii*	13	0	0	0	0	12	2	significant drought stress, some decay
T244	Blue Oak	*Quercus douglasii*	12	6	4	0	0	12	3	average
T245	Blue Oak	*Quercus douglasii*	10	0	0	0	0	9	3	drought stress
T246	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	drought stress, poor form
T247	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	2	drought stress, wound on trunk
T248	Blue Oak	*Quercus douglasii*	11	7	0	0	0	12	1	extensive decay up trunk, suckering and dead
T249	Blue Oak	*Quercus douglasii*	6	6	6	0	0	12	1	extensive decay, fire damaged, lots of dead
T250	Blue Oak	*Quercus douglasii*	7	0	0	0	0	8	1	poor form, significant drought stress, cavity
T251	Blue Oak	*Quercus douglasii*	10	5	0	0	0	10	3	posible decay at base
T252	Blue Oak	*Quercus douglasii*	7	0	0	0	0	5	1	crown mostly dead, extensive decay
T253	Blue Oak	*Quercus douglasii*	8	6	0	0	0	9	1	fire damaged, decay at base, lots of dead
T254	Blue Oak	*Quercus douglasii*	13	0	0	0	0	12	2	lots of dead branches
T255	Blue Oak	*Quercus douglasii*	6	5	5	0	0	10	3	average
T256	Blue Oak	*Quercus douglasii*	20	0	0	0	0	15	4	drought stress
T257	Blue Oak	*Quercus douglasii*	15	0	0	0	0	15	3	cavity at base
T258	Blue Oak	*Quercus douglasii*	9	0	0	0	0	8	1	extensive decay up trunk
T259	Blue Oak	*Quercus douglasii*	9	0	0	0	0	8	1	extensive decay up trunk
T260	Blue Oak	*Quercus douglasii*	8	0	0	0	0	8	1	extensive decay up trunk
T261	Blue Oak	*Quercus douglasii*	11	0	0	0	0	9	1	crown mostly dead, decay
T262	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	2	significant drought stress
T263	Blue Oak	*Quercus douglasii*	8	0	0	0	0	9	2	crown mostly brown
T264	Blue Oak	*Quercus douglasii*	9	0	0	0	0	9	2	poor form, drought stress
T265	Blue Oak	*Quercus douglasii*	9	0	0	0	0	11	2	significant drought stress, lots of dead
T266	Blue Oak	*Quercus douglasii*	6	6	6	0	0	10	2	significant drought stress
T267	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	average
T268	Blue Oak	*Quercus douglasii*	7	6	4	0	0	8	1	almost completely brown
T269	Blue Oak	*Quercus douglasii*	8	0	0	0	0	9	1	poor form, crown mostly brown/dead
T270	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	average
T271	Blue Oak	*Quercus douglasii*	10	0	0	0	0	9	3	thin crown
T272	Blue Oak	*Quercus douglasii*	13	0	0	0	0	14	3	average
T273	Blue Oak	*Quercus douglasii*	9	0	0	0	0	11	3	average
T274	Blue Oak	*Quercus douglasii*	9	8	0	0	0	12	3	some decay
T275	Blue Oak	*Quercus douglasii*	6	0	0	0	0	8	3	average
T276	Blue Oak	*Quercus douglasii*	8	0	0	0	0	11	2	significant drought stress
T277	Blue Oak	*Quercus douglasii*	7	7	0	0	0	10	3	crowded
T278	Blue Oak	*Quercus douglasii*	11	10	7	0	0	15	4	above average
T279	Blue Oak	*Quercus douglasii*	8	0	0	0	0	12	2	significant drought stress
T280	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	2	significant drought stress
T281	Blue Oak	*Quercus douglasii*	8	8	7	0	0	14	2	significant drought stress, poison oak
T282	Blue Oak	*Quercus douglasii*	7	0	0	0	0	9	3	average
T283	Blue Oak	*Quercus douglasii*	7	0	0	0	0	9	3	average
T284	Blue Oak	*Quercus douglasii*	9	0	0	0	0	7	2	significant drought stress
T285	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	3	drought stress
T286	Blue Oak	*Quercus douglasii*	7	7	0	0	0	8	2	significant drought stress
T287	Blue Oak	*Quercus douglasii*	6	6	6	6	6	12	3	average

Tree Tag #	Common Name	Scientific Name	DBH 1	DBH 2	DBH 3	DBH 4	DBH 5	Dripline	Health (1-5)	Comments
T288	Blue Oak	*Quercus douglasii*	9	0	0	0	0	9	2	poor form, significant drought stress
T289	Blue Oak	*Quercus douglasii*	6	6	6	0	0	12	2	significant drought stress
T290	Blue Oak	*Quercus douglasii*	7	0	0	0	0	7	3	crowded, poor form
T291	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	average
T292	Blue Oak	*Quercus douglasii*	11	0	0	0	0	12	3	average
T293	Blue Oak	*Quercus douglasii*	13	0	0	0	0	13	3	average
T294	Blue Oak	*Quercus douglasii*	7	0	0	0	0	12	3	average
T295	Blue Oak	*Quercus douglasii*	11	0	0	0	0	13	2	significant drought stress
T296	Blue Oak	*Quercus douglasii*	16	0	0	0	0	13	4	above average
T297	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	average
T298	Blue Oak	*Quercus douglasii*	16	0	0	0	0	15	4	above average
T299	Blue Oak	*Quercus douglasii*	6	5	0	0	0	8	3	crowded
T300	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	average
T301	Blue Oak	*Quercus douglasii*	6	5	5	0	0	9	2	crowded, poor form, drought stress
T302	Blue Oak	*Quercus douglasii*	9	6	0	0	0	9	2	poor branching
T303	Blue Oak	*Quercus douglasii*	11	0	0	0	0	9	2	significant drought stress
T304	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	2-3, thin crown
T305	Blue Oak	*Quercus douglasii*	12	0	0	0	0	12	1	significant decay, lots of dead branches
T306	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	average
T307	Blue Oak	*Quercus douglasii*	8	0	0	0	0	10	3	average
T308	Blue Oak	*Quercus douglasii*	9	7	0	0	0	12	2	significant drought stress
T309	Blue Oak	*Quercus douglasii*	9	0	0	0	0	10	3	lots of brown leaves
T310	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	average
T311	Blue Oak	*Quercus douglasii*	13	0	0	0	0	12	3	average
T312	Blue Oak	*Quercus douglasii*	6	0	0	0	0	7	2	significant drought stress
T313	Blue Oak	*Quercus douglasii*	9	0	0	0	0	9	1	significant decay in trunk, dead branches
T314	Blue Oak	*Quercus douglasii*	10	0	0	0	0	10	2	very poor branching, dead branches
T315	Blue Oak	*Quercus douglasii*	10	0	0	0	0	12	3	poison oak
T316	Blue Oak	*Quercus douglasii*	8	6	0	0	0	10	3	average
T317	Blue Oak	*Quercus douglasii*	6	0	0	0	0	8	1	extensive decay up trunk
T318	Blue Oak	*Quercus douglasii*	9	0	0	0	0	12	3	poor form

Attachment C

Project Site Photos

Site Photographs Taken August 23 and 31, 2022



Area around Tree #T253 looking east



Tree #T72 looking slightly southwest



Trees #T73 & T74 looking west



Tree #T97 looking northwest



Tree #T98 looking north (note rodent burrows around root crown of tree)



Area with extensive dead oaks near Tree #T153 looking west



Tree #T18 looking west (note cavities in main branches)

Attachment D

Arborist's Disclaimer

Arborist Disclaimer Statement

Arborists are tree specialists who use their education, knowledge, training, experience, and research to examine trees and woodlands. Arborists recommend measures to enhance the beauty and health of trees and forests, while attempting to reduce the risk of living near them. Clients may choose to accept or disregard the recommendations of the arborist, or to seek additional advice.

Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms subject to attack by disease, insects, fungi and other forces of nature. There are some inherent risks with trees that cannot be predicted with any degree of certainty, even by a skilled and experienced arborist. Arborists cannot predict acts of nature including, without limitation, storms of sufficient strength, which can cause even a healthy tree to fail. Any entity who develops land and builds structures with a tree in the vicinity should be aware and inform future residents of the risks of living with trees and this arborists disclaimer.

Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise remedial treatments cannot be guaranteed 100%.

Treatment, pruning, and removal of trees may involve considerations beyond the scope of the arborist's services, such as property boundaries, property ownership, disputes between neighbors and other issues. Consulting arborists cannot take such considerations into account unless complete and accurate information is disclosed to the arborist by the client.

The basic tree health assessment conducted herein does not constitute a tree risk assessment. Neither this author nor Gallaway Enterprises has assumed any responsibility for liability associated with the trees on or adjacent to this project site, their future demise and/or any damage, which may result therefrom. To live near trees is to accept some degree of risk.

Elena Gregg
ISA Certified Arborist WE-8033A
Gallaway Enterprises

BRENTWOOD VILLAGE SUBDIVISION
TENTATIVE SUBDIVISION MAP APPLICATION S-2023-00802
PLANNED DEVELOPMENT PLAN APPLICATION PD-2025-00905

MITIGATION MONITORING PROGRAM CONTENTS

This document is the Mitigation Monitoring Program (MMP) for Brentwood Village Subdivision. The MMP includes a brief discussion of the legal basis for and purpose of the program, discussion and direction regarding complaints about noncompliance, a key to understanding the monitoring matrix, and the monitoring matrix itself.

LEGAL BASIS OF AND PURPOSE FOR THE MITIGATION MONITORING PROGRAM

California Public Resources Code Section 21081.6 requires public agencies to adopt mitigation monitoring or reporting programs whenever certifying an Environmental Impact Report (EIR) or a Mitigated Negative Declaration. This requirement facilitates implementation of all mitigation measures adopted through the California Environmental Quality Act (CEQA) process.

The MMP contained herein is intended to satisfy the requirements of CEQA as they relate to the Initial Study/Mitigated Negative Declaration prepared for Brentwood Village Subdivision. It is intended to be used by City of Redding (City) staff, participating agencies, project contractors, and mitigation monitoring personnel during implementation of the Project.

Mitigation is defined by CEQA Guidelines Section 15370 as a measure that does any of the following:

- Avoids impacts altogether by not taking a certain action or parts of an action.
- Minimizes impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifies impacts by repairing, rehabilitating or restoring the impacted environment.
- Reduces or eliminates impacts over time by preservation and maintenance operations during the life of the project.
- Compensates for impacts by replacing or providing substitute resources or environments.

The intent of the MMP is to ensure the effective implementation and enforcement of adopted mitigation measures and permit conditions. The MMP will provide for monitoring of construction activities as necessary, on-site identification and resolution of environmental problems, and proper reporting to City staff

MITIGATION MONITORING TABLE

The Mitigation Monitoring Table identifies the mitigation measures proposed for Brentwood Village Subdivision. These mitigation measures are reproduced from the Initial Study and conditions of approval for the Project. The tables have the following columns:

Mitigation Measure: Lists the mitigation measures identified within the Initial Study for a specific impact, along with the number for each measure as enumerated in the Initial Study.

Timing: Identifies at what point in time, review process, or phase the mitigation measure will be completed.

Agency/Department Consultation: References the City department or any other public agency with which coordination is required to satisfy the identified mitigation measure.

Verification: Spaces to be initialed and dated by the individual designated to verify adherence to a specific mitigation measure.

NONCOMPLIANCE COMPLAINTS

Any person or agency may file a complaint asserting noncompliance with the mitigation measures associated with the project. The complaint shall be directed to the City in written form, providing specific information on the asserted violation. The City shall conduct an investigation and determine the validity of the complaint. If noncompliance with a mitigation measure has occurred, the City shall take appropriate action to remedy any violation. The complainant shall receive written confirmation indicating the results of the investigation or the final action corresponding to the particular noncompliance issue.

MITIGATION MONITORING TABLE
FOR THE BRENTWOOD VILLAGE SUBDIVISION MITIGATION MONITORING PROGRAM

Mitigation Measure	Timing/ Implementation	Enforcement/ Monitoring	Verification (Date and Initials)
Biological Resources			
MM-Bio-1: The applicant shall have a pre-construction rare plant survey of the proposed disturbance area or other Project features that may impact special status species of the Project site conducted by a qualified botanist during the appropriate survey window (blooming period) for rare and endangered plants that have the potential to occur within the Project site if such a survey has not been provided to the City. Surveys shall be done in accordance with the most current version of California Native Plant Society *Botanical Survey Guidelines* (CNPS 2001), California Department of Fish and Wildlife *Protocols for Surveying and Evaluating Impacts to Special Status Plant Species*, *Native Plant Populations and Natural Communities* and U.S. Fish and Wildlife's *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants*. If present, special status plant species plant populations will be flagged and, if possible, avoided during construction. If the population cannot be avoided during construction, a plan will be developed for approval by the California Department of Fish and Wildlife which may include transplanting the plant population, compensation, or other measures established by that agency.	At time of development	Public Works, Planning	
MM-Bio-2: To avoid all impacts to special-status vernal pool species, construction activities cannot take place within 250 feet of occupied (or assumed occupied) vernal features. If avoidance cannot be achieved, then USFWS protocol-level sampling for vernal pool fairy shrimp shall be conducted to determine the presence of vernal pool fairy shrimp, or the applicant can assume presence of vernal pool shrimp and consult with the USFWS. The consultation process will require the preparation of a Biological Assessment and the development of a mitigation plan. At a minimum the removal of the vernal pool would require mitigation by purchasing vernal pool re-establishment credits at a 1:1 ratio and vernal pool preservation credits at a 2:1 replacement ratio.	At time of development	Public Works, Planning	

MM-Bio-3: If vegetation removal and/or construction activities are to occur during the bat roosting season (March 1 through August 31), a Qualified Biologist shall conduct a preconstruction survey no more than seven days before vegetation removal or construction activities begin. If an active roost is found, a non-disturbance buffer shall be established for a distance of 500 feet around the nest unless a smaller buffer zone is approved by CDFW. Construction may resume once the young have left the nest or as approved by the Qualified Biologist. The survey shall be provided to the CDFW. If a lapse in construction activities of 14 days or more occurs during the roosting season, an additional roost survey is required to ensure no roosts were established in the area while construction was on hold. Minimum qualifications for a Qualified Biologist include a bachelor's degree in biological or environmental science, natural resources management, or related discipline; field experience in the habitat types that may occur at the Project site; familiarity with the Covered Species (or closely related species) that may occur at the Project site; and prior preconstruction survey, construction monitoring, or construction oversight experience (if and as relevant to the activity to be conducted).	At time of development	Public Works, Planning	
MM-Bio-4: To avoid impacts to nesting birds and raptors, vegetation removal and/or construction shall be conducted between September 1 and January 31. If vegetation removal and/or construction activities are to occur during the nesting season (February 1 through August 31), a qualified biologist shall conduct a preconstruction survey no more than seven (7) days before vegetation removal or construction activities begin. If an active nest is found, a non-disturbance buffer shall be established by a qualified biologist in coordination with CDFW. Construction may resume once the young have left the nest or as approved by the qualified biologist. The survey shall be provided to the CDFW. If construction activities cease for a period greater than seven (7) days, additional preconstruction surveys will be required.	At time of development	Public Works, Planning	