

Appendix C-4

Health Risk Assessment

Contents

1. Introduction.....	1
2. Emissions Quantification	1
2.1 Construction Emission Sources.....	2
2.2 Operational Emission Sources	2
2.3 Emissions Used for Individual Cancer Risk	3
2.4 Emissions Used for Chronic HI and Chronic 8-Hour HI	4
2.5 Emissions Used for Acute HI	5
2.6 TAC Speciation	6
3. Dispersion Modeling Methodology.....	8
3.1 Model Selection.....	9
3.2 Source Representation.....	9
3.3 Temporal Distributions	17
3.4 Building Wake Effects.....	18
3.5 Receptor Locations	18
3.6 Elevations.....	22
3.7 Meteorological Data	22
3.8 Model Options	22
3.9 Modeled Averaging Times	23
4. Health Risk Assessment Methodology	23
4.1 Exposure Assumptions for Individual Cancer Risk.....	23
4.2 Exposure Assumptions for Non-Cancer Hazard Indices.....	25
4.3 Significance Criteria	26
5. Modeled Health Risk Values.....	26
5.1 Individual Cancer Risk.....	28
5.2 Non-Cancer Hazard Indices.....	30
6. References	31

List of Tables

Table C4-1.	Peak Hour Activity Assumptions for Proposed Project Construction.....	5
Table C4-2.	Peak Hour Activity Assumptions for Baseline and Proposed Project Operation.....	6
Table C4-3.	Speciation Profiles for PM10	7

Table C4-4.	Speciation Profiles for VOC.....	8
Table C4-5.	AERMOD Source Parameters.....	10
Table C4-6.	Sensitive Receptor Descriptions.....	22
Table C4-7.	Cancer Risk Exposure Assumptions.....	24
Table C4-8.	Non-Cancer Exposure Assumptions	26
Table C4-9.	Maximum Health Risk Values Associated with Unmitigated Proposed Project Construction and Operation	27
Table C4-10.	Source Contributions to Individual Cancer Risk at the Residential MEI	30

List of Figures

Figure C4-1.	AERMOD Source Representation for Baseline On-Site Operational Sources	12
Figure C4-2.	AERMOD Source Representation for Baseline Off-Site Operational Sources.....	13
Figure C4-3.	AERMOD Source Representation for Proposed Project On-Site Construction Sources ..	14
Figure C4-4.	AERMOD Source Representation for Proposed Project Off-Site Construction Sources ..	15
Figure C4-5.	AERMOD Source Representation for Proposed Project On-Site Operational Sources....	16
Figure C4-6.	AERMOD Source Representation for Proposed Project Off-Site Operational Sources....	17
Figure C4-7.	HRA Receptor Grid	20
Figure C4-8.	HRA Sensitive Receptors	21
Figure C4-9.	MEI Locations	28
Figure C4-10.	Residential Cancer Risk Contours Associated with Unmitigated Proposed Project Construction and Operation	29

1. Introduction

This appendix describes the methods and results of a health risk assessment (HRA) for the Nevada Cement Company LLC Stockton Terminal Modernization Project (proposed project). The HRA evaluated potential public health risks from toxic air contaminant (TAC) emissions that would be generated during construction and operation of the proposed project, without mitigation. TACs are compounds that are known or suspected to cause adverse health effects after short-term (acute) or long-term (chronic) exposure. The HRA quantified the following health risk values:

- Individual cancer risk, which is the additional chance for a person to contract cancer from long-term exposure to proposed project emissions (exposure times were assumed to be 70 years for residents and 40 years for off-site workers);
- Chronic hazard index (HI), which indicates the potential for non-cancer adverse health impacts from exposure to proposed project emissions over a significant fraction of a lifetime;
- Chronic 8-hour HI, which indicates the potential for non-cancer adverse health impacts from repeated 8-hour exposures to proposed project emissions over a significant fraction of a lifetime (primarily intended for off-site workers); and
- Acute HI, which indicates the potential for non-cancer adverse health impacts from infrequent one-hour exposures to proposed project emissions.

Maximum predicted health risk values were compared to significance thresholds set by the San Joaquin Valley Air Pollution Control District (SJVAPCD).

The HRA was prepared as a Tier 2 risk assessment in accordance with SJVAPCD guidance APR-1906 (Framework for Performing Health Risk Assessments) (SJVAPCD, 2020). A Tier 2 risk assessment uses refined emission estimates and dispersion modeling inputs, and conservative assumptions for human exposure parameters (such as duration of exposure and time away from home). The HRA approach was also informed by the SJVAPCD's AB 2588 Health Risk Assessment Modeling Protocol Guidance (SJVAPCD, 2021) and the California Office of Environmental Health Hazard Assessment's (OEHHA's) Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2015). Additionally, SJVAPCD staff was consulted on several occasions to clarify and confirm various aspects of the methodology (D. Garner, personal communication, October 30, 2025–March 16, 2026).

The HRA was developed using a three-step process to estimate the health risk values described above: (1) quantify baseline operational TAC emissions and proposed project construction and operational TAC emissions; (2) perform dispersion modeling to estimate ambient TAC concentrations in the communities surrounding the project site; and (3) quantify incremental health risk values (i.e., proposed project minus baseline) from inhalation and noninhalation human exposures to the ambient TAC concentrations. The following sections provide additional details on the methods used to complete the HRA.

2. Emissions Quantification

The TAC emissions included in the HRA were derived from the estimated annual and peak hour particulate matter less than 10 microns (PM₁₀) and volatile organic compound (VOC) emissions associated with the baseline and proposed project scenarios. This section identifies the sources of PM₁₀ and VOC emissions included in the HRA and the approach by which the TAC emissions were quantified.

The HRA modeled construction and operational emission sources both on-site and off-site. To fully capture potential impacts in the communities closest to the Port (i.e., within the area roughly bounded by Interstate 5, Highway 4, and Navy Drive), this HRA modeled off-site mobile sources within ½-mile of the nearest project boundary, twice the distance required by SJVAPCD dispersion modeling guidance (SJVAPCD, 2018). The off-site mobile sources would include trucks, vessels, barges, tugboats, locomotives, and construction worker vehicles.

2.1 Construction Emission Sources

The following construction emission sources were modeled in the HRA for the proposed project (there were no construction emissions associated with the 2023 baseline):

- **Construction trucks driving and idling on-site and driving off-site.** The construction trucks were assumed to follow the same off-site route as the operational cement trucks. Emissions would consist of engine exhaust, tire wear, and brake wear.
- **Construction worker vehicles driving off-site.** The worker vehicles were assumed to follow the same off-site route as the construction trucks. Emissions would consist of engine exhaust, tire wear, and brake wear.
- **Paving.** Emissions would consist of evaporative VOCs from the curing asphalt during and after on-site paving.
- **On-site construction equipment (such as dozers, excavators, front end loaders, air compressors, forklifts, etc.).** Emissions would consist of engine exhaust.
- **One general cargo vessel visiting Berth 3/4.** The vessel would deliver the proposed new ship unloader to the project site. The vessel arrival/departure route lies along the Stockton Deepwater Shipping Channel west of the project site. It also includes the turning basin east of the project site, where the vessel would be turned 180 degrees just prior to arrival or just after departure. The vessel would remain docked at berth during unloading. Emissions would consist of propulsion engine exhaust, auxiliary engine exhaust, and boiler exhaust. The propulsion engine would be turned off while the vessel is docked at berth.
- **Two tugboats assisting the general cargo vessel during its arrival and departure and while the vessel is being secured to the dock.** Emissions would consist of propulsion and auxiliary engine exhaust.
- **Marine construction equipment (barge, barge tugboat, and workboat).** The equipment would operate in the water adjacent to Berth 3/4 during upgrade of the berth. Emissions would consist of engine exhaust.

The SJVAPCD does not require general construction dust to be modeled in the HRA, as it does not consider dust to be a significant source of project TAC emissions (D. Garner, personal communication, October 30, 2025).

2.2 Operational Emission Sources

The following operational emission sources were modeled in the HRA for baseline and the proposed project:

- **Trucks driving on-site and off-site.** On-site trucks would follow dedicated routes through the loading stations. The primary off-site truck route would follow Harbor Street and S Fresno

Avenue. The analysis also assumed that 10 percent of trucks would use W Washington Street from Harbor Street to W Weber Avenue, based on the traffic study. Truck driving emissions would consist of engine exhaust, tire wear, and brake wear. The HRA also modeled on-site road dust downstream of the truck loading stations because the dust was conservatively assumed to consist entirely of cementitious material.

- **Trucks idling on-site.** Idling locations include the loading lanes (where trucks form a queue while waiting to enter the loading stations), loading stations, and hatch stations. Truck idling emissions would consist of engine exhaust.
- **Vessels arriving at and departing from Berth 2 and Berth 3/4.** The vessel arrival/departure route lies along the Stockton Deepwater Shipping Channel west of the project site. It also includes the turning basin east of the project site, where the vessel would be turned 180 degrees just prior to arrival or just after departure. Vessel emissions would consist of propulsion engine, auxiliary engine, and boiler exhaust.
- **Vessels docked at Berth 2 and Berth 3/4.** Vessel emissions would consist of auxiliary engine and boiler exhaust; propulsion engines would not operate while the vessels are docked. Note that project-related vessels only docked at Berth 2 during the 2023 baseline year.
- **Barges docked at Berth 2.** Barge emissions would consist of auxiliary engine exhaust. Note that barges would visit the project site only for the proposed project starting in year 15 (2046).
- **Tugboats assisting vessels and barges, and propelling barges, during arrivals and departures and while the vessels are being secured to the dock.** Tugboat emissions would consist of propulsion and auxiliary engine exhaust.
- **Switch locomotives transporting railcars between the project site and the rail yard near Port Road M, south of the project site.** Emissions would include engine exhaust. Note that line haul locomotives would not operate within ½ mile of the project site and therefore were not modeled.
- **Dust from the on-site loading of cementitious materials into trucks, railcars, and barges.** The loading spouts would be controlled by baghouse air filters. Dust emissions would consist of particulates exhausted from the baghouses.
- **Dust from the on-site conveying of cementitious materials between the storage bunkers and the various truck, vessel, barge, and railcar loading and unloading stations.** The conveyance system would be controlled by numerous baghouse air filters throughout the project site. Dust emissions would consist of particulates exhausted from the baghouses.
- **Mobile on-site equipment, including front end loaders, a rail shuttlewagon, sweeper, forklift, manlift, welding machine, air compressor, and utility vehicles.** Emissions would consist of engine exhaust.

Operational worker vehicle trips were not modeled in the HRA because the incremental emissions change between baseline and the proposed project would be negligible relative to the other sources.

2.3 Emissions Used for Individual Cancer Risk

To estimate individual cancer risk values, the HRA modeled multiple-year emission scenarios for proposed project construction and operation and for baseline operation. The multiple-year emission scenarios were developed for the source categories described in Sections 2.1 and 2.2 from the

calculation of annual criteria pollutant emissions described in Appendix C-1. In accordance with SJVAPCD guidance (SJVAPCD, 2021), cancer risks to residents were evaluated over 70 years of exposure to project emissions, and cancer risks to off-site workers were evaluated over 40 years of exposure to project emissions.

For the proposed project, the residential and worker exposure periods started with the first year of proposed project construction. Specifically, for residential exposures, proposed project annual emissions were modeled from 2026 through 2095 (70 years), which includes the entire construction period (2026-2031) followed by 65 additional years of proposed project operation (2031-2095)¹. For worker exposures, proposed project annual emissions were modeled from 2026 through 2065 (40 years), which includes the entire construction period (2026-2031) followed by 35 additional years of proposed project operation (2031-2065). During the construction period, construction and operational emissions were modeled together. The operational emissions during the construction period were assumed to be the same as the baseline emissions during those same years. Baseline emissions are described in the next paragraph.

For the CEQA baseline, the residential and worker exposure periods started with the baseline year of 2023. Specifically, for residential exposures, baseline annual emissions were modeled from 2023 through 2092 (70 years). For worker exposures, baseline annual emissions were modeled from 2023 through 2062 (40 years). To ensure a consistent emissions estimation methodology for the baseline and proposed project exposure scenarios, post-2023 baseline emissions were calculated for milestone years 2031, 2036, and 2046 using emission factors that change year-by-year in response to existing regulations, similar to the approach used to calculate proposed project emissions. Baseline operational activity in those future milestone years was assumed to remain constant at 2023 levels.

For the proposed project and baseline exposure scenarios described in the preceding two paragraphs, linear interpolation was used to estimate the annual emissions for every non-milestone year between the exposure start year and 2046. Annual emissions after 2046 were held constant at 2046 levels.

2.4 Emissions Used for Chronic HI and Chronic 8-Hour HI

To estimate chronic HI and chronic 8-hour HI values, the HRA modeled annual emissions associated with proposed project construction and operation and baseline operation. The quantification methodologies for annual emissions are described in Appendix C-1.

For proposed project construction, the HRA modeled maximum annual emissions over the entire construction period (2026-2031) for each construction source category described in Section 2.1. For proposed project operation, the HRA modeled maximum annual emissions from the operational milestone years (2031, 2036, and 2046) for each operational source category described in Section 2.2. The use of maximum annual emissions by source category is conservative, especially for construction, because the maximum annual emissions from any one source category may not happen in the same year as the maximum annual emissions from any other source category.

For baseline operation, the HRA modeled annual 2023 baseline emissions. Unlike the multiple-year exposure periods for cancer risk, it was not necessary to project baseline emissions forward beyond 2023 because the chronic HI and chronic 8-hour HI values were based on individual emission years.

¹ For the purposes of the cancer risk evaluation, total construction emissions were modeled as if they would occur within a five-year period (2026-2030 instead of 2026-2031) since the operational emission calculations assumed a full year of post-construction operational emissions would occur in 2031.

2.5 Emissions Used for Acute HI

To estimate acute HI values, the HRA modeled peak hour emissions associated with proposed project construction and operation and baseline operation. Specifically, for proposed project construction, the HRA modeled the highest hourly emissions over the entire construction period (2026-2031) for each construction source category described in Section 2.1. For proposed project operation, the HRA modeled the highest hourly emissions over all operational milestone years (2031, 2036, and 2046) for each operational source category described in Section 2.2. For baseline operation, the HRA modeled the highest hourly emissions in the 2023 baseline year for each operational source category described in Section 2.2.

Appendix C-1 describes the quantification methodologies for annual and peak day emissions associated with the CEQA baseline and proposed project. However, Appendix C-1 does not describe the quantification methodologies for peak hour emissions, which were used in the HRA. Therefore, the peak hour activity assumptions, which formed the basis for the modeled peak hour emission rates, are summarized in Table C4-1 for proposed project construction and Table C4-2 for baseline and proposed project operation.

Table C4-1. Peak Hour Activity Assumptions for Proposed Project Construction

Emission Source Category	Peak Hour Activity ^[1]
Trucks	Peak day truck activity divided by 8 hours/day ^[2]
Worker Vehicles	Peak day worker vehicle activity divided by 8 hours/day ^[2]
Paving	Peak day paving activity divided by 8 hours/day ^[2]
On-Site Construction Equipment	Peak day construction equipment activity divided by 8 hours/day ^[2]
Cargo Vessel ^[3]	1 vessel at berth for 1 hour 1 vessel arrival or departure ^[4]
Assist Tugboats	2 tugboats per vessel assist
Marine Construction Equipment	1 hour for barge auxiliary engine 1 hour for barge tugboat 1 hour for workboat

Notes:

[1] All peak hour activities in this table, and their associated peak hour emissions, were conservatively assumed to occur simultaneously in this HRA even though in practice they may occur at different times during the construction period.

[2] Annual and peak day activities and emissions for this source category were quantified by the California Air Pollution Control Officers Association (CAPCOA) emissions tool, CalEEMod (CAPCOA, 2022). Although construction would normally occur up to 10 hours per day, daily activity was conservatively divided by 8 because most of the equipment would be available for use 8 hours per day, according to the applicant.

[3] One vessel would deliver the proposed ship unloader.

[4] The peak hour vessel assumptions are conservative because the berth occupancy assumption could not occur in the same hour as a vessel arrival or departure.

Table C4-2. Peak Hour Activity Assumptions for Baseline and Proposed Project Operation

Emission Source Category ^[1]	Baseline 2023	Proposed Project 2031	Proposed Project 2036	Proposed Project 2046
Trucks ^[10]	5.2 one-way trips	7.9 one-way trips	10.5 one-way trips	15.6 one-way trips
Vessels	1 vessel at berth for 1 hour 1 vessel arrival or departure ^[7]	2 vessels at berth for 1 hour ^[9] 1 vessel arrival or departure ^[7]	2 vessels at berth for 1 hour ^[9] 1 vessel arrival or departure ^[7]	2 vessels at berth for 1 hour ^[9] 1 vessel arrival or departure ^[7]
Barges	No barges	No barges ^[3]	No barges ^[3]	No barges ^[5]
Assist Tugboats	2 tugboats per vessel assist	2 tugboats per vessel assist	2 tugboats per vessel assist	2 tugboats per vessel assist
Switch Locomotives ^[2]	1 locomotive-hour ^[4]	1 locomotive-hour ^[4]	1 locomotive-hour ^[4]	1 locomotive-hour ^[4]
Material Loading ^[6]	236 tons/hour trucks 44 tons/hour rail	196 tons/hour trucks 79 tons/hour rail	125 tons/hour trucks 140 tons/hour rail	68 tons/hour trucks 79 tons/hour rail 111 tons/hour barge
Material Conveying ^[8]	227 tons/hour	573 tons/hour	637 tons/hour	616 tons/hour
Mobile Onsite Equipment	1 hour for all equipment	1 hour for all equipment	1 hour for all equipment	1 hour for all equipment

Notes:

[1] All peak hour activities in this table, and their associated peak hour emissions, were conservatively assumed to occur simultaneously in this HRA even though in practice they may occur at different times or in different years.

[2] Activity levels are for switch locomotive operation within ½ mile of the project site.

[3] Barges would only operate starting in project year 15 (2046).

[4] Assume one switch locomotive operates the entire hour.

[5] Peak day and peak hour proposed project emissions would occur when both berths are occupied by vessels instead of barges; therefore, barge activity is not included in these scenarios.

[6] Based on a current permitted material loading limit of 6,000 tons per day. This peak day limit was apportioned to trucks railcars, and barges in proportion to their average daily loading rates on their operating days (i.e., in proportion to their annual loading rates divided by 312 days/year for truck and railcar loading and 45 days/year for barge loading). To estimate peak hour loading rates, peak day loading rates were divided by 21 hours/day for truck loading and 24 hours/day for railcar and barge loading.

[7] The peak hour vessel assumptions are conservative because the berth occupancy assumption could not occur in the same hour as a vessel arrival or departure.

[8] To estimate the peak hour conveying rate, the peak day conveying rate was divided by 24 hours/day.

[9] The HRA assumed both Berth 2 and Berth 3/4 would be occupied by an at-berth vessel in the peak hour (an uncommon but plausible scenario).

[10] The peak hour activity was scaled from peak day activity, assuming truck activity would occur 21 hours per day, from 10pm to 7pm, with 50% of trips occurring from 0000 to 0800, 40% from 0800 to 1600, and 10% from 1600 to 2400 (based on data provided by the applicant).

2.6 TAC Speciation

The HRA applied speciation profiles to the estimated PM₁₀ and VOC emissions to convert them to TAC emissions for use in the HRA. Where available, speciation profiles provided by the SJVAPCD were used (SJVAPCD, 2023). CARB profiles were used for all other source categories (CARB, 2026). The speciation profiles for PM₁₀ emissions are presented in Table C4-3. The speciation profiles for VOC emissions are presented in Table C4-4. The profiles are expressed as PM₁₀ and VOC weight fractions (unitless). For brevity, only TACs that have non-zero toxicity values in the Consolidated Table of OEHA/ARB Approved Risk Assessment Health Values (CARB 2025) are shown in the tables. The emission source categories applicable to each speciation profile are listed at the bottom of each table.

Table C4-3. Speciation Profiles for PM₁₀

Toxic Air Contaminant ^[1]	TAC ID	TAC Weight Fraction of PM ₁₀					
		Profile 9901 Diesel IC Engine Exhaust ^[2]	Profile 4001 Gasoline vehicle equipped with catalytic converter ^[3]	Profile 473 Brake wear ^[3]	Profile 472 Tire wear ^[3]	Profile 2 Diesel External Combustion ^[4]	Profile 85_86 Concrete Batch Plant Silos - Cement and Fly Ash ^[5]
Ammonia	7664417	0	0	0	0	0	0
Arsenic	7440382	0	0.000012	0.00001	0	0.000105	0.000022
Beryllium	7440417	0	0	0	0	0	0.000002
Cadmium	7440439	0	0.000043	0	0	0.0000987	0.000001
Chlorine	7782505	0	0.00108	0.0015	0.0078	0	0
Chromium(III)	16065831	0	0.000379	0.00114	0.0000285	0.0000329	0.000053
Chromium(VI)	18540299	0	0.0000200	0.00006	0.0000015	0.00000658	0.000005
Cobalt	7440484	0	0.000021	0	0	0	0
Copper	7440508	0	0.000689	0.0115	0.00049	0.000270	0.00003
DPM	9901	1.00	0	0	0	0	0
Hydrochloric acid	7647010	0	0	0	0	0.0122	0
Lead	7439921	0	0.000434	0.00005	0.00016	0.000546	0.000015
Manganese	7439965	0	0.00011	0.0017	0.0001	0.000204	0.0004
Mercury	7439976	0	0.000018	0	0	0.000132	0
Nickel	7440020	0	0.000118	0.00066	0.00005	0.000257	0.000025
Selenium	7782492	0	0.000005	0.00002	0.00002	0.000145	0.000001
Sulfates	9960	0	0.0467	0.0334	0.0025	0	0
Vanadium	7440622	0	0.00009	0.00066	0	0	0
Applicable Sources		Trucks, const equip, mobile onsite equip, vessel main & aux engines, barge aux engines, tugboats, locomotives	Worker vehicles	Trucks, worker vehicles	Trucks, worker vehicles	Vessel boilers	Cementitious loading and conveying dust, cementitious on-site road dust

Legend: TAC = toxic air contaminant; DPM = particulate matter emissions from diesel internal combustion engines; IC = internal combustion; const = construction; equip = equipment; aux = auxiliary.

Notes:

[1] Only TACs that have non-zero toxicity values in the Consolidated Table of OEHA/ARB Approved Risk Assessment Health Values (CARB 2025) are shown in the table.

[2] Profile 9901 represents diesel particulate matter (DPM) emissions from diesel internal combustion engines. The health values for DPM are representative of diesel IC engine exhaust as a whole and therefore require no further speciation (CARB 2025).

[3] This profile is from CARB (2026). This profile provided a weight fraction for total chromium but not chromium(III) or chromium(VI). Therefore, total chromium was apportioned 95% as chromium(III) and 5% as chromium(VI), in accordance with CARB's AB2588 Technical Support Document (CARB 1989), page 57.

[4] This profile is from SJVAPCD (2023).

[5] Profile from SJVAPCD (2023). Because the proportions of cement and supplementary cementitious materials were not provided for the proposed project, this profile conservatively represents the maximum of Profiles 85 (Cement Silos) and 86 (Fly Ash Silos), determined TAC-by-TAC.

Table C4-4. Speciation Profiles for VOC

Toxic Air Contaminant [1]	TAC ID	TAC Weight Fraction of VOC		
		Profile 2303_2304 Gasoline - catalyst - stabilized exhaust - E6 [2]	Profile 257 Asphalt Concrete w/o Rubber [3]	Profile 2 Diesel External Combustion [3]
Acetaldehyde	75070	0.0274	0	0.0443
Acrolein	107028	0.0000928	0	0.0443
Benzene	71432	0.0650	0.0218	0.000555
1,3-Butadiene	106990	0.00405	0	0.00187
Chlorobenzene	108907	0	0	0.0000252
Ethyl benzene	100414	0.0187	0.00226	0.0000252
Formaldehyde	50000	0.0361	0	0.0443
Hexane	110543	0.0130	0	0.000442
Isoprene	78795	0.00111	0	0
Methanol	67561	0.00106	0	0
Methyl ethyl ketone	78933	0.00252	0	0
Methyl tert-butyl ether	1634044	0.00782	0	0
Naphthalene	91203	0.00615	0	0.000669
PAHs	1151	0	0.0065	0
Propylene	115071	0.0367	0	0.00126
Styrene	100425	0.00365	0.0117	0
Toluene	108883	0.0794	0.00574	0.000555
Trimethylbenzenes	25551137	0.0762	0	0
Xylenes	1330207	0.0847	0.00536	0.000202
Applicable Sources:		Worker vehicles	Paving	Vessel boilers

Legend: TAC = toxic air contaminant; PAHs = polycyclic aromatic hydrocarbons.

Notes:

[1] Only TACs that have non-zero toxicity values in the Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values (CARB 2025) are shown in the table.

[2] This profile is from CARB (2026). It represents the maximum of Profiles 2303 (summer fuel blend) and 2304 (winter fuel blend), determined on a TAC-by-TAC basis.

[3] This profile is from SJVAPCD (2023).

3. Dispersion Modeling Methodology

This section describes the dispersion modeling inputs and methods used to predict ambient TAC concentrations for the HRA. The following regulatory guidance was used in developing the dispersion modeling methodology: SJVAPCD's AB 2588 Health Risk Assessment Modeling Protocol Guidance (SJVAPCD, 2021), SJVAPCD's Guidance for Air Dispersion Modeling (SJVAPCD, 2022), and EPA's *Guideline on Air Quality Models* (EPA, 2024). Additionally, SJVAPCD staff was consulted on several occasions to

clarify and confirm various aspects of the methodology (D. Garner, personal communication, October 30, 2025–March 16, 2026).

3.1 Model Selection

Air dispersion modeling was performed using the U.S. EPA AERMOD dispersion model, version 24142 (U.S. EPA 2024b). AERMOD model is a steady-state, multiple source, Gaussian dispersion model designed for applications which include flat areas as well as areas of ground elevations that exceed emission source stack heights. AERMOD is well suited for this analysis because it is: (1) accepted by the modeling community and regulatory agencies due to its ability to provide reasonable results for large industrial projects with multiple emission sources; (2) the model can handle various source types, including point, area, line, and volume; and (3) AERMOD has been approved by the U.S. EPA and SJVAPCD for its analysis of stationary and mobile sources.

3.2 Source Representation

The HRA modeled construction and operational emission sources both on-site and off-site, within ½-mile of the nearest project boundary. The sources are identified and described in Sections 2.1 and 2.2. Table C4-5 presents the source parameters modeled in AERMOD for the HRA. The rationale for the source parameter values is described in the table notes. The source parameters are generally consistent with SJVAPCD guidance and were developed through consultation with SJVAPCD staff.

Table C4-5. AERMOD Source Parameters

Emission Source Category	Source Type	Release Height (m)	Line Source Width (m)	Initial Horiz. Dimension (m)	Initial Vert. Dimension (m)	Stack Exit Temp. (K)	Stack Exit Velocity (m/s)	Stack Inside Diam. (m)	Notes
Trucks driving	Line	1.8	9.1-13.4	--	1.42	--	--	--	[1]
Trucks idling - loading lanes, hatch stations	Point	3.8	--	--	--	366	0.001	0.1	[2]
Trucks idling - loading stations	Volume	3.8	--	2.33	2.33	--	--	--	[3]
Worker vehicles driving	Line	0.8	9.1-13.4	--	0.71	--	--	--	[15]
Vessels arriving and departing	Line	50	38	--	23.3	--	--	--	[4]
Vessels at berth	Point	33	--	--	--	618	16	0.5	[5]
Barges at berth (auxiliary engine)	Volume	6	--	1	1	--	--	--	[6]
Tugboats – arrival/departure assist	Line	6	15	--	2.79	--	--	--	[7]
Tugboats - docking assist	Area	6	--	--	2.79	--	--	--	[8]
Switch locomotives	Line	5	9.1	--	2.33	--	--	--	[9]
Loading dust - truck lanes 1 and 2	Volume	7.32	--	3.02	4.96	--	--	--	[10]
Loading dust - truck lanes 3 and 4	Volume	9.14	--	4.34	4.96	--	--	--	[10]
Loading dust - new truck loading station (pozzolan)	Volume	13.1	--	3.02	6.10	--	--	--	[10]
Loading dust - existing railcar loading station	Volume	9.14	--	1.84	4.25	--	--	--	[10]
Loading dust - new railcar loading station	Volume	18.0	--	1.84	8.36	--	--	--	[10]
Loading dust - barge loading	Volume	12.2	--	1	1	--	--	--	[11]
Conveying dust - baseline	Area	14.0	--	--	9.6	--	--	--	[12]
Conveying dust - proposed project	Area	21.0	--	--	17.7	--	--	--	[13]
Mobile onsite equipment; Onsite construction equipment	Area	5	--	--	1	--	--	--	[14]
Marine construction equipment	Area	6	--	--	1	--	--	--	[16]
Paving	Area	0	--	--	1	--	--	--	[17]

Notes:

[1] Height is from Page 75 of SJVAPCD (2006). Width is the width of traveled way plus 10 feet (or 3 meters) mixing zone on each side.

[2] Parameters are from Page 76 of SJVAPCD (2006). Horizontal exhaust pipe was conservatively assumed.

[3] Emissions would occur within a structure with open sides. Assume the release height is the same as the point source release height. Table 3-3 of EPA (2024d) was used to determine the initial horizontal and vertical dimensions.

[4] Height and initial vertical dimension are from CARB (2006). Width is a typical vessel width (32m) plus 3 meters mixing zone on each side.

[5] Temperature, velocity, and diameter are from CARB (2006). Stack height was measured from an elevation diagram of a typical cement vessel.

[6] Assume the same height as mobile on-site equipment except add 1 meter to account for the barge deck height above the waterline. Assume nominal initial vertical and horizontal dimensions of 1 meter.

[7] Height and initial vertical dimension are from CARB (2006). Assume a typical tugboat width of 30 feet plus 10 feet mixing zone width on each side.

[8] From CARB (2006).

[9] Height and initial vertical dimension are from CARB (2006). Assume a locomotive width of 10 feet plus 10 feet mixing zone width on each side.

[10] Height was provided by the applicant. The baghouse would discharge inside a structure with open sides. Table 3-3 of EPA (2024d) was used to determine the initial horizontal and vertical dimensions.

[11] Assume the barge loading spout would be equipped with a dust filter that exhausts 40 feet above the waterline, consistent with typical marine bulk loading equipment of this type and capacity. Assume a nominal value of 1 meter for the initial vertical and horizontal dimensions.

[12] The average release height of all existing conveying baghouses is 46 feet (14 meters). The initial vertical dimension was derived from the range of baghouse heights using Table 3-3 of EPA (2024d).

[13] The average release height of all proposed conveying baghouses would be 68 feet (21 meters). The initial vertical dimension was derived from the range of baghouse heights using Table 3-3 of EPA (2024d).

[14] From Sacramento Metropolitan Air Quality Management District (SMAQMD, 2013). Assume mobile onsite equipment would have the same parameters as construction equipment.

[15] Parameters were developed using a similar approach as for trucks driving, except the average vehicle height was assumed to be 5 feet, resulting in a plume centerline height of 2.5 feet (0.8 meters).

[16] From CARB (2006). Harborcraft parameters were used. Barge mounted equipment (auxiliary engine) was also assumed to have the same parameters, which is consistent with the mobile onsite equipment and onsite construction equipment, plus 1 meter added to the height to allow for the barge deck height.

[17] From SMAQMD (2013). Assume paving VOC emissions would have the same parameters as construction dust emissions.

Figure C4-1 and Figure C4-2 show the on-site and off-site AERMOD source representations, respectively, for 2023 baseline operation. Figure C4-3 and Figure C4-4 show the on-site and off-site AERMOD source representations, respectively, for proposed project construction. Figure C4-5 and Figure C4-6 show the on-site and off-site AERMOD source representations, respectively, for proposed project operation.

Figure C4-1. AERMOD Source Representation for Baseline On-Site Operational Sources

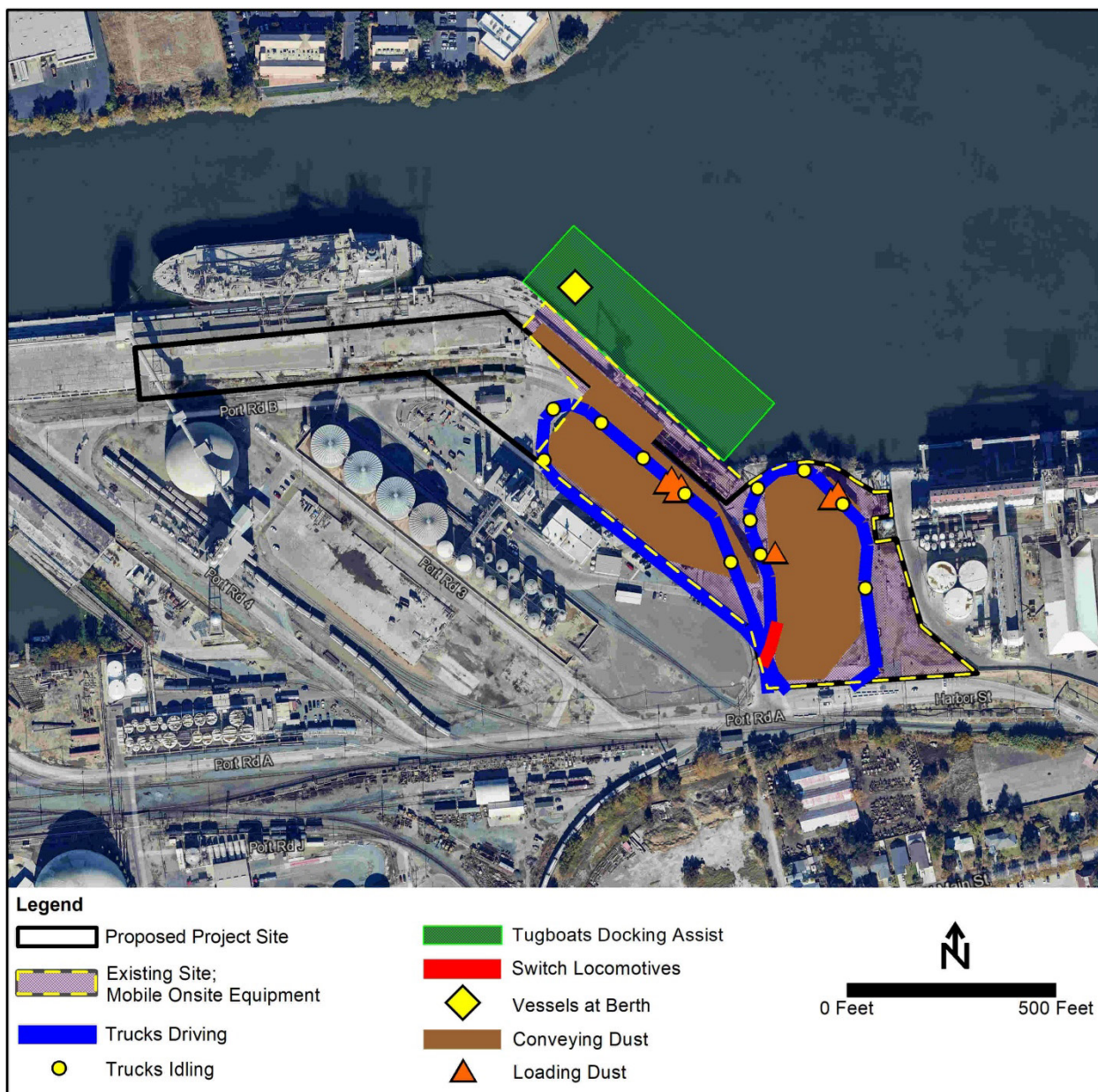


Figure C4-2. AERMOD Source Representation for Baseline Off-Site Operational Sources

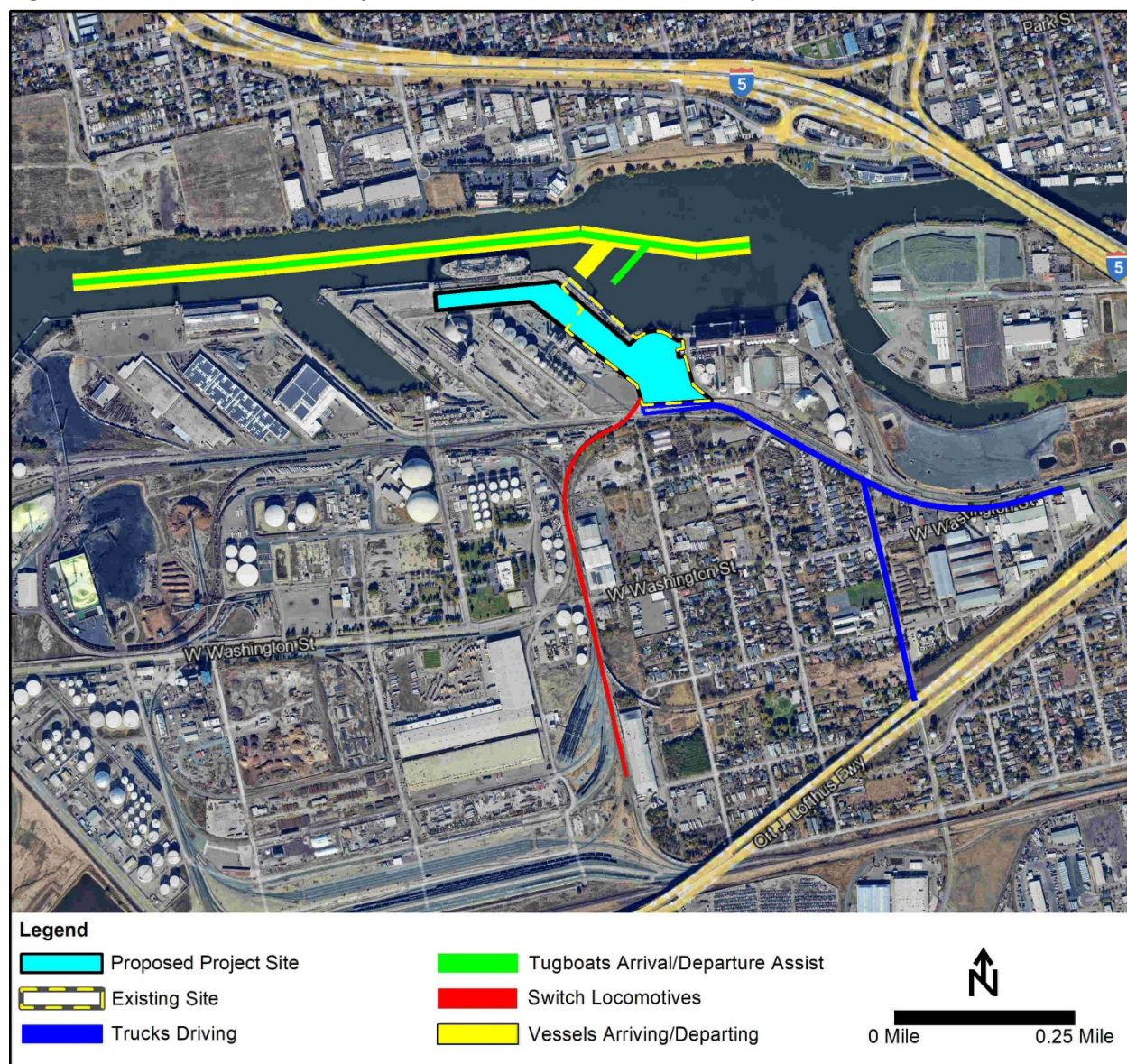


Figure C4-3. AERMOD Source Representation for Proposed Project On-Site Construction Sources

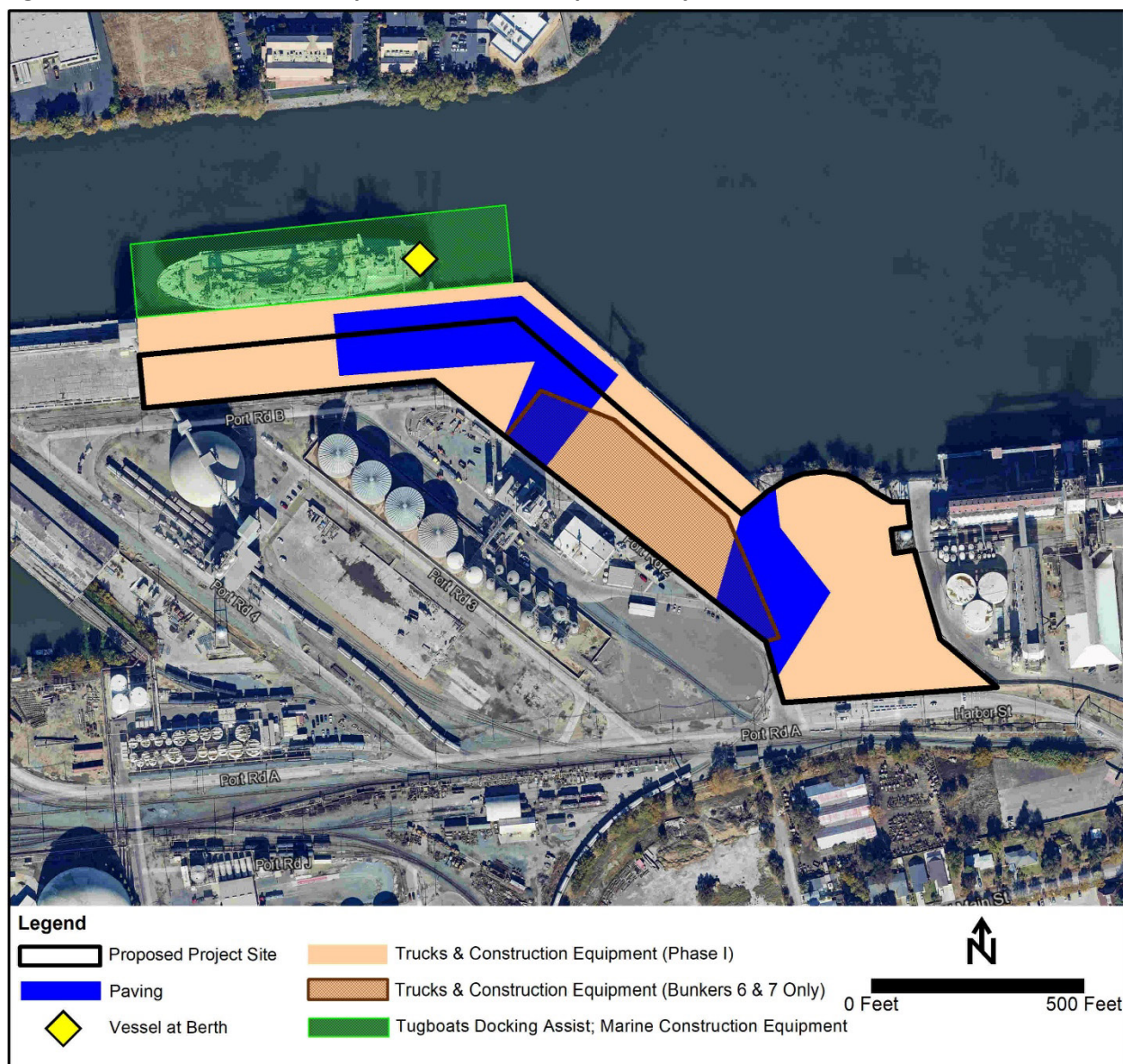


Figure C4-4. AERMOD Source Representation for Proposed Project Off-Site Construction Sources

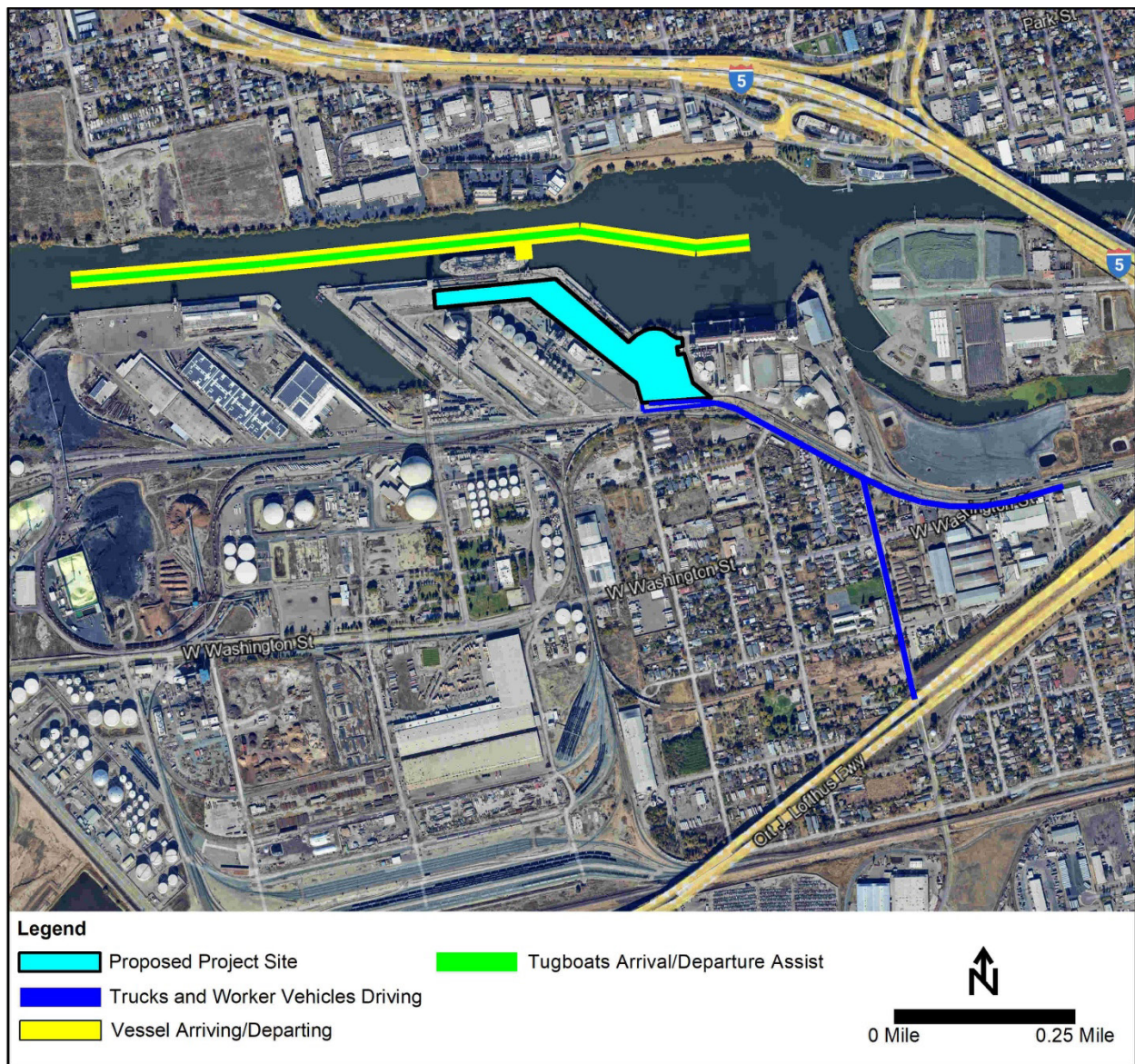


Figure C4-5. AERMOD Source Representation for Proposed Project On-Site Operational Sources

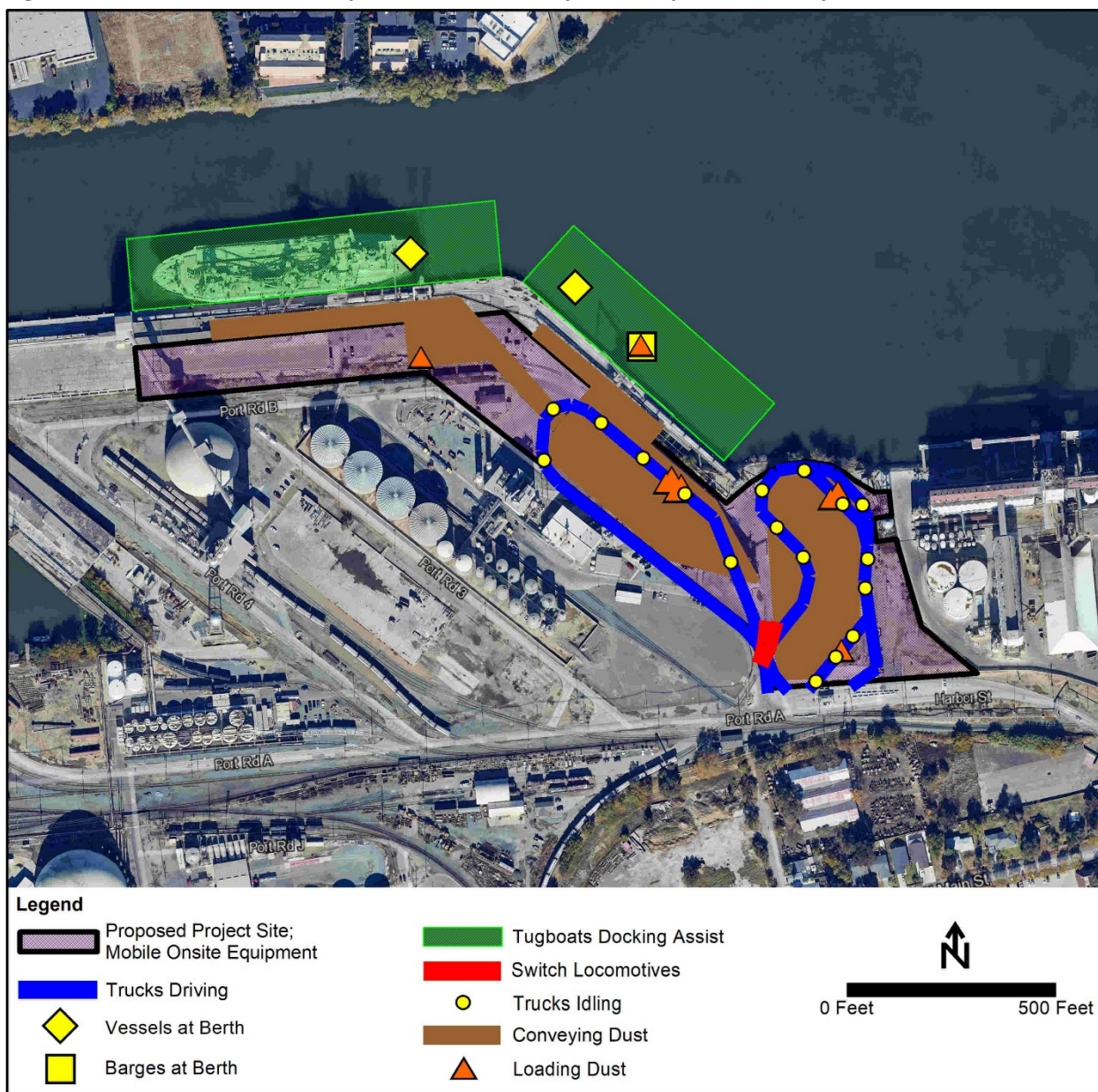
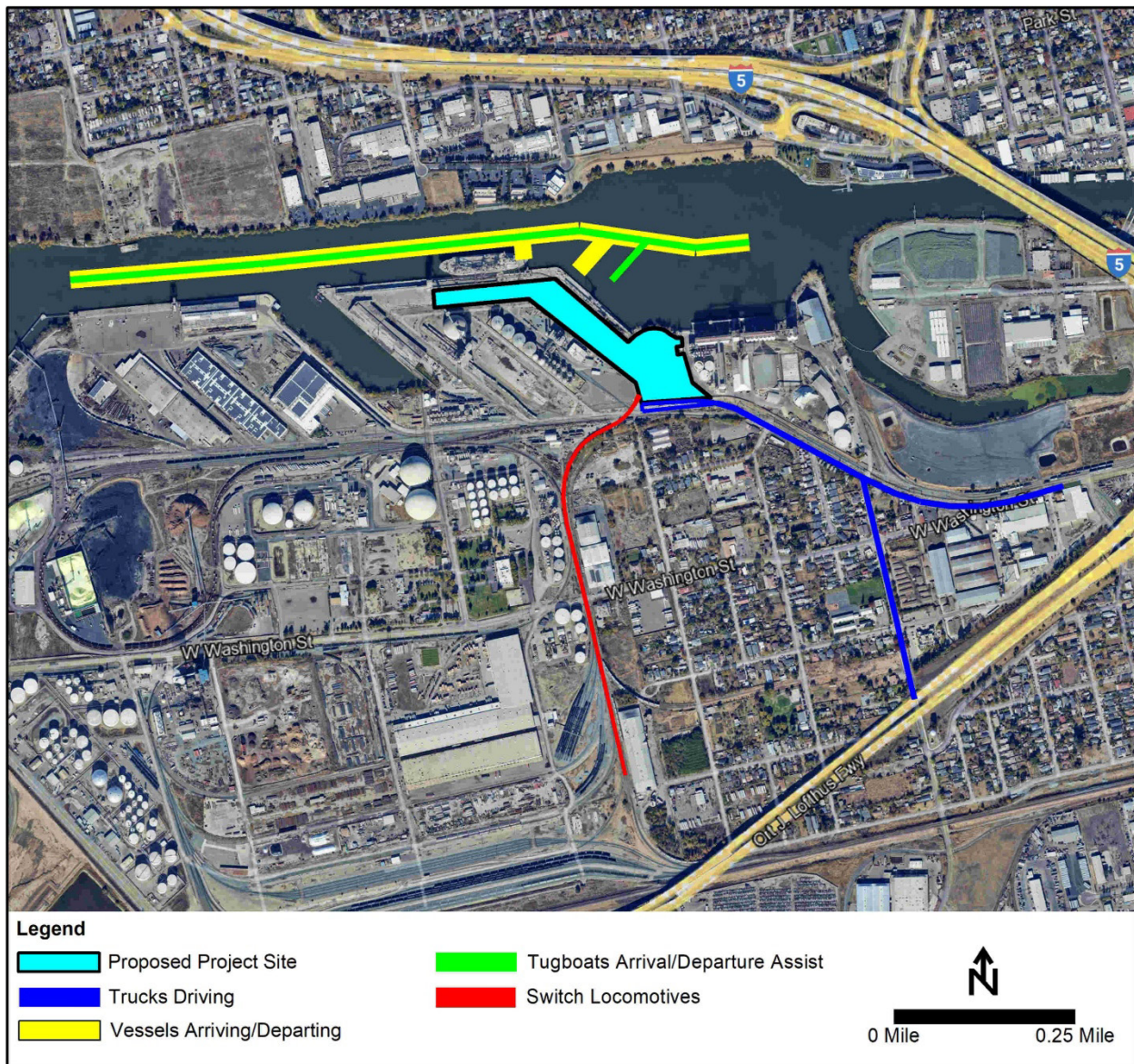


Figure C4-6. AERMOD Source Representation for Proposed Project Off-Site Operational Sources



3.3 Temporal Distributions

Based on the proposed project description and additional information provided by the applicant, the HRA applied hour-of-day (HROFDY) factors to the emissions in AERMOD to better represent the times of day that the source emissions would occur. The following assumptions were modeled for the baseline and proposed project scenarios:

- Annual construction emissions from trucks, worker vehicles, paving, on-site construction equipment, and marine construction equipment were distributed uniformly from 7:00 a.m. to 6:00 p.m. Peak hour emissions from these construction sources were modeled for every hour within that same time range.

- Annual and hourly operational emissions from truck idling, truck driving, and cementitious material loading into trucks were distributed from 10:00 p.m. to 7:00 p.m (21 hours per day), with 50 percent of the emissions occurring from 12:00 a.m. to 8:00 a.m., 40 percent of the emissions occurring from 8:00 a.m to 4:00 p.m, and 10 percent of the emissions occurring from 4:00 p.m to 7:00 p.m and 10:00 p.m. to 12:00 a.m.
- Annual operational emissions from switch locomotives were distributed uniformly from 6:00 a.m. to 10:00 p.m. Peak hour switch locomotive emissions were modeled for every hour within that same time range.

Annual emissions from all other sources were distributed uniformly, 24 hours per day; and peak hour emissions were modeled for every hour of the day.

3.4 Building Wake Effects

AERMOD can simulate the aerodynamic wake effects, also called downwash effects, of buildings and other large structures on the emission plumes from point sources (i.e., stacks). Therefore, EPA's BPIP-Prime, version 04274, was used to develop downwash parameters for input into AERMOD (EPA, 2004). Figure C3-5 in Appendix C-3 shows the existing structures included in the downwash analysis for baseline operation and proposed project construction. Figure C3-6 in Appendix C-3 shows the proposed structures included in the downwash analysis for proposed project operation.

3.5 Receptor Locations

The HRA modeled TAC concentrations and health risk values over a grid of 1,039 receptor points covering an area approximately 10 kilometers by 10 kilometers. The grid provided adequate spatial coverage surrounding the project site to determine the extent of residential and worker impacts and to identify maximum impact locations. Specifically, coarse grid receptors were positioned every 50 meters to approximately 200 meters from the project site, then every 100 meters to approximately 1 kilometer from the project site, then every 250 meters to approximately 2 kilometers from the project site, and finally every 500 meters to the outermost boundary of the grid. Additionally, fine grid receptors were positioned every 25 meters surrounding the coarse grid maximum impact locations. Figure C4-7 shows the receptor grid points evaluated in the HRA. For visual clarity, the outer portions of the grid are not shown in the figure.

The HRA also modeled TAC concentrations and health risk values at 16 sensitive receptor locations in the proposed project vicinity. OEHHA (2015) describes sensitive receptors as locations where individuals who may be more sensitive to toxic exposures than the general population, such as young children and chronically ill individuals, would be present in high densities. OEHHA listed schools, nursing homes, residential care facilities, daycare centers, and hospitals as examples of sensitive receptors. OEHHA states that although protection of sensitive individuals is incorporated into the risk assessment methodology in both cancer risk and noncancer risk assessment, the assessment of risk at specific sensitive receptor locations may be useful to assure the public that such individuals are being considered in the analysis.

Figure C4-8 shows the locations of the sensitive receptors modeled in the HRA. The figure is paired with Table C4-6, which provides descriptions and street addresses of the sensitive receptors. Consistent with SJVAPCD guidance, the sensitive receptor geographic domain for the HRA was the proposed project's zone of impact, which is defined as the area where cancer risk increments would exceed 1 per million or hazard index increments would exceed 0.1. The zone of impact is presented

in Section 5 (specifically, the 1-per-million cancer risk isopleth in Figure C4-10 represents the zone of impact for the proposed project).

Maximally exposed individual (MEI) locations were selected from the modeled receptor points for three different receptor types: residential, worker, and sensitive. The selection methodology for the MEI locations was:

- The residential MEIs were selected from all modeled receptors in residential or residentially zoned areas.
- The worker MEIs for cancer risk and chronic HI were selected from all modeled receptors outside the proposed project site boundary that are not located on water or within modeled roadways. The worker MEI for acute HI was selected using the same criteria, except locations on water were also considered valid because the acute HI is based on a short-term (1 hour) exposure.
- The sensitive receptor MEIs were selected from all modeled sensitive receptors shown in Figure C4-8 and Table C4-6.

Figure C4-8. HRA Sensitive Receptors



Table C4-6. Sensitive Receptor Descriptions

No. [1]	Receptor Description	Category	Street	City	Zip
1	Ms Loves Classic Home Preschool	Child Care	Argonaut St	Stockton	95206
2	Wayfinder Children's Services	Child Care	747 N Pershing Ave	Stockton	95203
3	AXIS Church	Church	1414 W Park St	Stockton	95203
4	Boggs Tract Church	Church	1605 W Washington St	Stockton	95203
5	Kingdom Hall of Jehovah's Witnesses	Church	1318 Ryde Ave	Stockton	95203
6	Little Flock Baptist Church	Church	1845 W Washington St	Stockton	95203
7	Mt Sinai Church - God in Christ	Church	351 S San Jose St	Stockton	95203
8	Mt Zion Missionary Baptist Church	Church	1851 W Hazelton Ave	Stockton	95203
9	Victory Open Standard Bible Church; Stockton Spanish Seventh Day Adventist Church	Church	1912 Monte Diablo Ave	Stockton	95203
10	United Way of San Joaquin County	Community Services	777 N Pershing Ave #2b	Stockton	95203
11	Boggs Tract Community Center and Park	Community Space	533 S Los Angeles Ave	Stockton	95203
12	Morelli Park	Community Space	1025 W Weber Ave	Stockton	95203
13	The Edible Schoolyard Community Farm	Community Space	466 S Ventura Ave	Stockton	95203
14	Stockton Circle of Friends Adult Prog	Rehabilitation	501 S Pershing Ave	Stockton	95203
15	one.Success School	School	702 Yale Ave	Stockton	95203
16	Washington Elementary School	School	1735 W Sonora St	Stockton	95203

Note:

[1] The Sensitive Receptor numbers correspond to Figure C4-8.

3.6 Elevations

EPA's AERMAP, version 24142, was used to determine ground-level elevations of sources, receptors, and buildings for input into AERMOD (EPA, 2024c). The elevations were determined from a USGS 1 arc-second National Elevation Dataset (NED) file. All coordinates were referenced to Universal Transverse Mercator (UTM) North American Datum of 1983 (NAD83), Zone 10.

3.7 Meteorological Data

AERMOD used five consecutive years of hourly meteorological data recorded at Stockton Metropolitan Airport (Station ID 23237), about 5 miles southeast of the project site. The meteorological data set was prepared by and obtained from the SJVAPCD (2026). Stockton Metropolitan Airport is the closest and most representative station of SJVAPCD's available data sets. The data set covered the years 2018 through 2022. The SJVAPCD processed the raw meteorological data using EPA's AERMET, version 21112 (EPA, 2021).

3.8 Model Options

The regulatory default option was used in all AERMOD runs. AERMOD was run with urban dispersion coefficients, based on the land use classification methodology developed by Auer (1978) and approved by the SJVAPCD (2022). The land use analysis completed for the HRA is described in Section 3.9 of Appendix C-3. AERMOD was run with an urban population of 324,975, representative of the City of Stockton in 2024, as published by the U.S. Census Bureau (2026).

3.9 Modeled Averaging Times

AERMOD modeled “period” concentrations (i.e., average concentrations over all five years of meteorological data) and maximum 1-hour concentrations for each source. The period average concentrations were used for cancer risk, chronic HI, and chronic 8-hour HI values, while the maximum 1-hour concentrations were used for acute HI values. For compatibility with the risk assessment methodology (see Section 4), each source group in AERMOD was modeled with a 1 gram per second “unit” emission rate. The actual TAC emission rates for each source were applied during the quantification of health risk values.

4. Health Risk Assessment Methodology

The health risk calculations were performed using the Hot Spots Analysis & Reporting Program, HARP2 version 22118 (CARB, 2022), in accordance with the Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2015) and AB 2588 Health Risk Assessment Modeling Protocol Guidance (SJVAPCD, 2021). HARP2 calculated values for individual cancer risk, chronic HI, chronic 8-hour HI, and acute HI at each modeled receptor. HARP2 evaluated health risk values for the proposed project and baseline separately. After the HARP2 modeling was completed, the baseline health risk values were subtracted from the proposed project health risk values at each receptor point to obtain the health risk increments. The maximum health risk increments at the receptor MEIs were selected for reporting and comparison to the significance thresholds.

HARP2 used the most recent data set of toxicity factors at the time the analysis was conducted (health table version 25268, September 25, 2025). The calculated health risks included the inhalation exposure pathway, and, where appropriate, the following noninhalation exposure pathways: soil ingestion, dermal contact, mother’s milk ingestion, and homegrown garden ingestion.

4.1 Exposure Assumptions for Individual Cancer Risk

Individual cancer risk is the additional chance for a person to contract cancer from long-term exposure to proposed project emissions. For residential cancer risks, the HRA assumed residential exposures of 24 hours per day, 350 days per year, for 70 years. For off-site worker cancer risks, the HRA assumed worker exposures of 8 hours per day, 250 days per year, for 40 years. Sensitive receptors were conservatively evaluated with residential exposure assumptions.

Table C4-7 summarizes the main exposure assumptions used to calculate individual cancer risks by receptor type. The exposure assumptions are consistent with OEHHA (2015) and SJVAPCD (2021) guidance.

According to OEHHA (2015), individual cancer risk is directly proportional to the frequency and duration of exposure to TACs, modified by age sensitivity factors. The age sensitivity factors multiply the risk by 10 for 3rd-trimester fetuses through infants age 1 (labeled by OEHHA as “3TM < 2”); by 3 for children from age 2 through 15 (“2 < 16”), and by 1 for persons age 16 and older.

Because the calculation of residential cancer risks involved time-variable age sensitivity factors and time-variable proposed project emissions, it was necessary to subdivide the residential cancer risks into three exposure sub-periods and run HARP2 separately for each sub-period. These sub-periods corresponded to the sensitivity factor age ranges described in the preceding paragraph. Each sub-period was modeled in HARP2 with the proposed project’s construction and operational emissions that would occur during that

sub-period (expressed as an average annual emission rate). The HARP2 cancer risk results for each age group were then summed to obtain the total cancer risk values for the entire 70-year exposure period.

The calculation of worker cancer risks assumed that the receptors would be age 16 or older, resulting in an age sensitivity factor of 1 for the entire exposure period. Therefore, the entire worker exposure period was run in HARP2 with the proposed project's construction and operational emissions that would occur over that 40-year period (expressed as an average annual emission rate). However, the calculation of worker cancer risks required the application of worker adjustment factors (WAFs) to account for an off-site worker's schedule potentially lining up with proposed project's construction and operational hours, thereby exposing the worker to a greater percentage of the project's emissions than what otherwise would be assumed in HARP2. The WAFs used in the worker cancer risk calculation are presented in Table C4-7.

Table C4-7. Cancer Risk Exposure Assumptions

Receptor Type ^[1]	Modeled Proposed Project Emissions ^{[2][3]}	Receptor Age Group ^[4]	Receptor Exposure Time (hrs/day)	Receptor Exposure Frequency (days/yr)	Receptor Exposure Duration (years)	Included Exposure Pathways ^[6]	Receptor Age Sensitivity Factor (ASF) ^[7]	Worker Adjustment Factor (WAF)
Residential and Sensitive (70-year exposure)	2026-2027	3TM < 2	24	350	2.25 ^[5]	I,S,D,M,G	10	n/a
	2028-2041	2 < 16	24	350	14	I,S,D,M,G	3	n/a
	2042-2095	16 < 70	24	350	54	I,S,D,M,G	1	n/a
Worker (40-year exposure)	2026-2065	≥ 16	8	250	40	I,S,D	1	3.5 (construction) ^[8] 1.33 (operation) ^[9]

Legend: 3TM < 2 = third trimester through age 1; 2 < 16 = age 2 through age 15; 16 < 70 = age 16 through age 69; ≥ 16 = age 16 and older; n/a = not applicable.

Sources: OEHHHA (2015) and SJVAPCD (2021).

Notes:

[1] The following additional HARP2 options (not shown) were selected in all runs: intake rate percentile = "OEHHHA Derived" method; breathing rate = long-term 24-hour; fraction of time at home (FAH) = 1.0; particle settling velocity = 0.02 meters per second; and climate zone = mixed.

[2] HARP2 modeled annual average construction and operational emissions over the indicated time ranges.

[3] The ranges of years shown in this column correspond to the proposed project scenario. For the baseline scenario, the HRA modeled emissions from 2023 through 2092 for residential and sensitive receptors and 2023 through 2062 for worker receptors (see Section 2.3).

[4] For each receptor type, the HRA summed the individual risk results for each receptor age group to obtain the total risk for the entire exposure duration (e.g., 70 years for residential, 40 years for worker).

[5] Although total exposure duration actually sums to 70.25 years when the 3rd trimester (0.25 years) is included, HARP2 rounds it to 70 years to simplify the calculation without causing a significant adjustment (OEHHHA, 2015).

[6] I = inhalation; S = soil ingestion; D = dermal contact; M = mother's milk ingestion; G = homegrown produce consumption.

[7] The age sensitivity factors (ASF) are recommended in the 2015 OEHHHA Hot Spots Guidance (OEHHHA 2015) for each age group. They are factored (multiplied) into the cancer risk values.

[8] The WAF for construction emissions adjusted worker risks higher to account for an off-site worker's schedule potentially lining up with the proposed project construction schedule. The WAF was determined using Equation 4.1 of OEHHHA (2015). $WAF = (24/8) \times (7/6) = 3.5$. The first term adjusts for construction emissions occurring 8 hours per day, and the second term adjusts for construction emissions occurring 6 days per week.

[9] The WAF for operational emissions adjusted the worker risks higher to account for an off-site worker's schedule potentially lining up with proposed project operating hours. The WAF was determined using Equation 4.1 of OEHHHA (2015). $WAF = (24/21) \times (7/6) = 1.33$. The first term adjusts for operational emissions occurring 21 hours per day, and the second term adjusts for operational emissions occurring 6 days per week. The WAF is conservative because some sources (such as vessels) would operate 24 hours per day, 7 days per week.

4.2 Exposure Assumptions for Non-Cancer Hazard Indices

The chronic HI indicates the potential for non-cancer adverse health impacts from exposure to proposed project TAC emissions over a significant fraction of a lifetime. HARP2 calculated chronic HI values by dividing annual exposures at the modeled receptors by chronic reference exposure levels (RELs), which are levels at which no adverse noncancer health effects are anticipated even in sensitive members of the general population. A chronic HI below 1.0 indicates that significant adverse noncancer health effects from long-term exposure are not expected.

The chronic 8-hour HI indicates the potential for non-cancer adverse health impacts from repeated 8-hour exposures to proposed project TAC emissions over a significant fraction of a lifetime. It is primarily intended for off-site workers, although it was evaluated for all receptor types in this HRA. HARP2 calculated chronic 8-hour HI values by dividing WAF-adjusted annual exposures at the modeled receptors by 8-hour chronic RELs. An 8-hour chronic HI below 1.0 indicates that significant adverse noncancer health effects from repeated 8-hour exposures are not expected.

The acute HI indicates the potential for non-cancer adverse health impacts from infrequent one-hour exposures to proposed project TAC emissions. HARP2 calculated acute HI values by dividing maximum 1-hour TAC concentrations at the modeled receptors by acute RELs. Unlike the chronic and chronic 8-hour HIs, the acute HI does not have a noninhalation exposure component. An acute HI below 1.0 indicates that significant adverse noncancer health effects from short-term exposure are not expected.

Table C4-8 summarizes the primary HARP2 inputs used to calculate the chronic HI, chronic 8-hour HI, and acute HI values. HARP2 modeled HI values separately for proposed project construction and operation. The highest HI values from construction or operation (proposed project minus baseline) were selected for comparison to the significance criteria.

Table C4-8. Non-Cancer Exposure Assumptions

Health Risk Value ^{[1][2]}	Modeled Proposed Project Emissions ^[3]	Included Exposure Pathways ^[5]	Worker Adjustment Factor (WAF)
Chronic HI	Maximum Annual ^[4]	I,S,D,M,G	n/a
Chronic 8-Hour HI	Maximum Annual ^[4]	I,S,D	3.5 (construction) ^[6] 1.33 (operation) ^[7]
Acute HI	Maximum Hourly	I	n/a

Legend: 3TM < 2 = third trimester through age 1; 2 < 16 = age 2 through age 15; 16 < 70 = age 16 through age 69; ≥ 16 = age 16 and older; n/a = not applicable.

Sources: OEHHA (2015) and SJVAPCD (2021).

Notes:

[1] The following additional HARP2 options (not shown) were selected for all runs, where applicable: intake rate percentile = “OEHHA Derived” method; breathing rate = long-term 24-hour; particle settling velocity = 0.02 meters per second; and climate zone = mixed.

[2] The same HARP2 runs were used for all receptor types (residential, worker, and sensitive).

[3] HARP2 modeled HI values separately for proposed project construction and operation. The highest HI values from construction or operation were selected for comparison to the significance criteria.

[4] Maximum annual emissions were modeled for the proposed project. For the baseline scenario, 2023 annual emissions were modeled.

[5] I = inhalation; S = soil ingestion; D = dermal contact; M = mother's milk ingestion; G = homegrown produce consumption.

[6] The WAF for construction emissions adjusted worker risks higher to account for an off-site worker's schedule potentially lining up with the proposed project construction schedule. The WAF was determined using Equation 4.3 of OEHHA (2015). $WAF = (24/8) \times (7/6) = 3.5$. The first term adjusts for construction emissions occurring 8 hours per day, and the second term adjusts for construction emissions occurring 6 days per week.

[7] The WAF for operational emissions adjusted the worker risks higher to account for an off-site worker's schedule potentially lining up with proposed project operating hours. The WAF was determined using Equation 4.3 of OEHHA (2015). $WAF = (24/21) \times (7/6) = 1.33$. The first term adjusts for operational emissions occurring 21 hours per day, and the second term adjusts for operational emissions occurring 6 days per week. The WAF is conservative because some sources (such as vessels) would operate 24 hours per day, 7 days per week.

4.3 Significance Criteria

The SJVAPCD's thresholds of significance for TAC emissions are as follows (SJVAPCD, 2015):

- Cancer Risk greater than or equal to 20 in one million for the MEI
- Chronic HI greater than or equal to 1.0 for the MEI
- Acute HI greater than or equal to 1.0 for the MEI

Although not explicitly stated, this HRA also used a significance threshold of 1.0 for the chronic 8-hour HI.

5. Modeled Health Risk Values

Table C4-9 presents the maximum predicted health risk values associated with proposed project construction and operation, without mitigation. The health risk values represent increments relative to baseline (i.e., proposed project minus baseline). The table includes estimates of individual cancer risk, chronic HI, chronic 8-hour HI, and acute HI at the maximally exposed residential, off-site worker, and sensitive receptors. The table shows that all maximum health risk values would be less than significant. Figure C4-9 shows the locations of the MEIs.

Table C4-9. Maximum Health Risk Values Associated with Unmitigated Proposed Project Construction and Operation

Receptor ^[1]	Individual Cancer Risk (per million) ^[2]	Chronic HI ^[3]	Chronic 8-Hour HI ^[4]	Acute HI ^[5]
Residential MEI	17.3	0.09	0.003	0.01
Offsite Worker MEI	12.1	0.38	0.01	0.03
Sensitive ^[6]	6.0	0.04	0.001	0.006
Significance Threshold	20	1.0	1.0	1.0
Threshold Exceeded?	No	No	No	No

Notes:

[1] All displayed health risk values represent the proposed project increment (project minus baseline).

[2] Cancer risks were evaluated over a 70-year exposure period for residential and sensitive receptors, and over a 40-year exposure period for offsite workers. Therefore, the displayed cancer risk values include contributions from both project construction and operation.

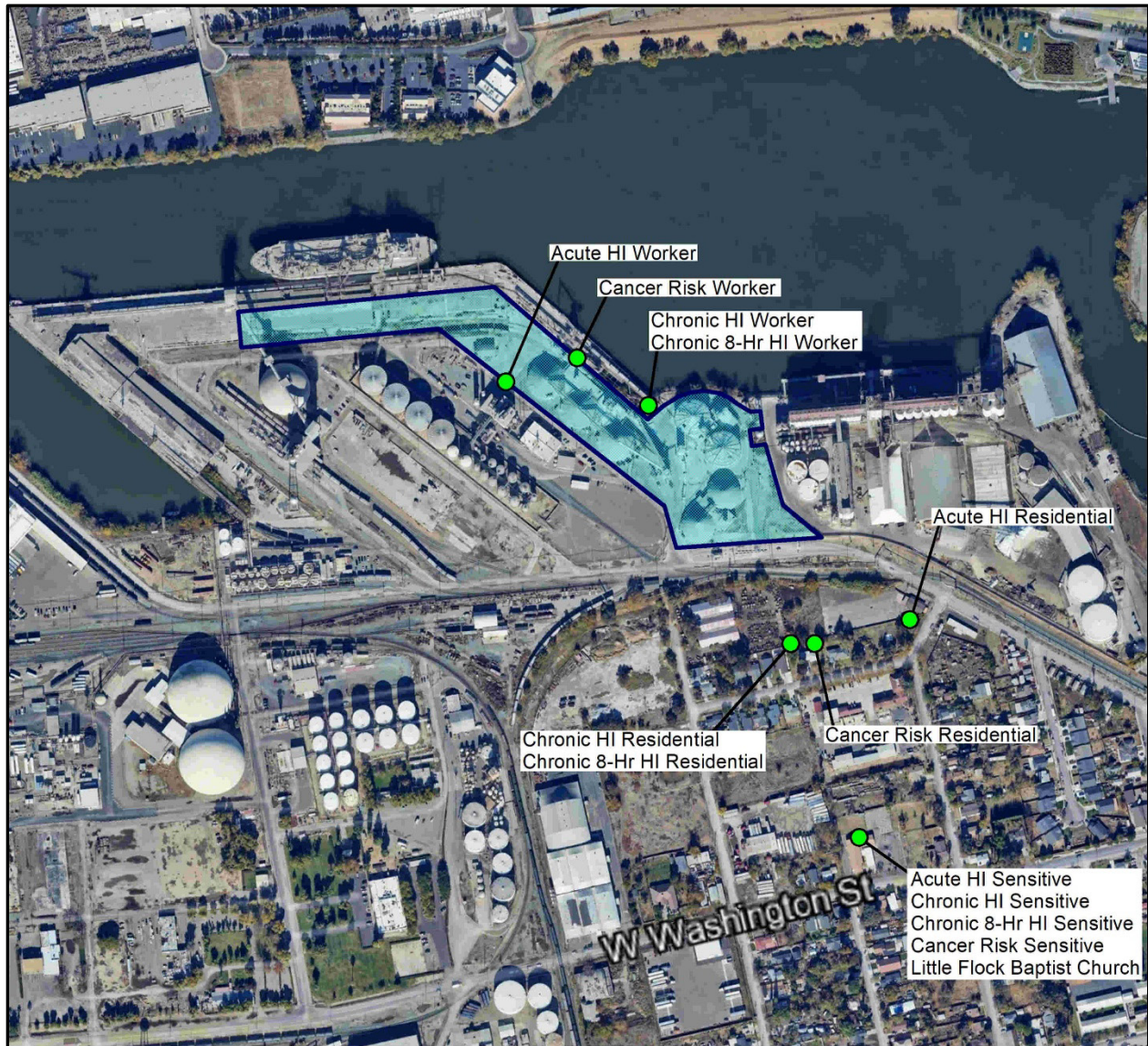
[3] The maximum chronic HIs for all receptor types would occur during proposed project operation.

[4] The maximum chronic 8-hour HIs for all receptor types would occur during proposed project operation.

[5] The maximum acute HIs for all receptor types would occur during proposed project construction.

[6] Sensitive receptors were conservatively evaluated with residential exposure assumptions.

Figure C4-9. MEI Locations



5.1 Individual Cancer Risk

As shown in Table C4-9, the maximum individual cancer risk for the unmitigated proposed project is predicted to be 17.3 in one million, at a residential receptor about 110 meters (350 feet) south-southeast of the project site. This risk value assumes a person at this location would be exposed 24 hours per day, 350 days per year, for 70-years, starting in the third trimester before birth. The maximum individual cancer risk for an off-site worker is predicted to be 12.1 in one million, at a location adjacent to the project site boundary on Berth 2. The maximum individual cancer risk for a sensitive receptor is predicted to be 6.0 in one million, at Little Flock Baptist Church on W Washington Street. This sensitive receptor risk value is conservative because it assumes 70-year residential exposure conditions at this location. All unmitigated cancer risk results would be less than the significance threshold of 20 in one million.

Figure C4-10 shows contours of residential cancer risk in the proposed project vicinity from unmitigated proposed project construction and operation. The contours reflect residential exposure conditions even though they cover all areas, both residential and non-residential. For informational purposes, the figure includes contours of 1 in one million, 10 in one million, and 20 in one million risk levels. The figure shows that the 20 in one million contour for residential cancer risk, which represents the significance threshold, does not contain any residences.

Although not shown, cancer risk contours for workers would be substantially lower than the residential cancer risk contours because workers would be exposed fewer hours per day, fewer days per year, for fewer years than residents. Moreover, worker risks would not include elevated age sensitivity factors because workers were assumed to be age 16 or greater.

Figure C4-10. Residential Cancer Risk Contours Associated with Unmitigated Proposed Project Construction and Operation

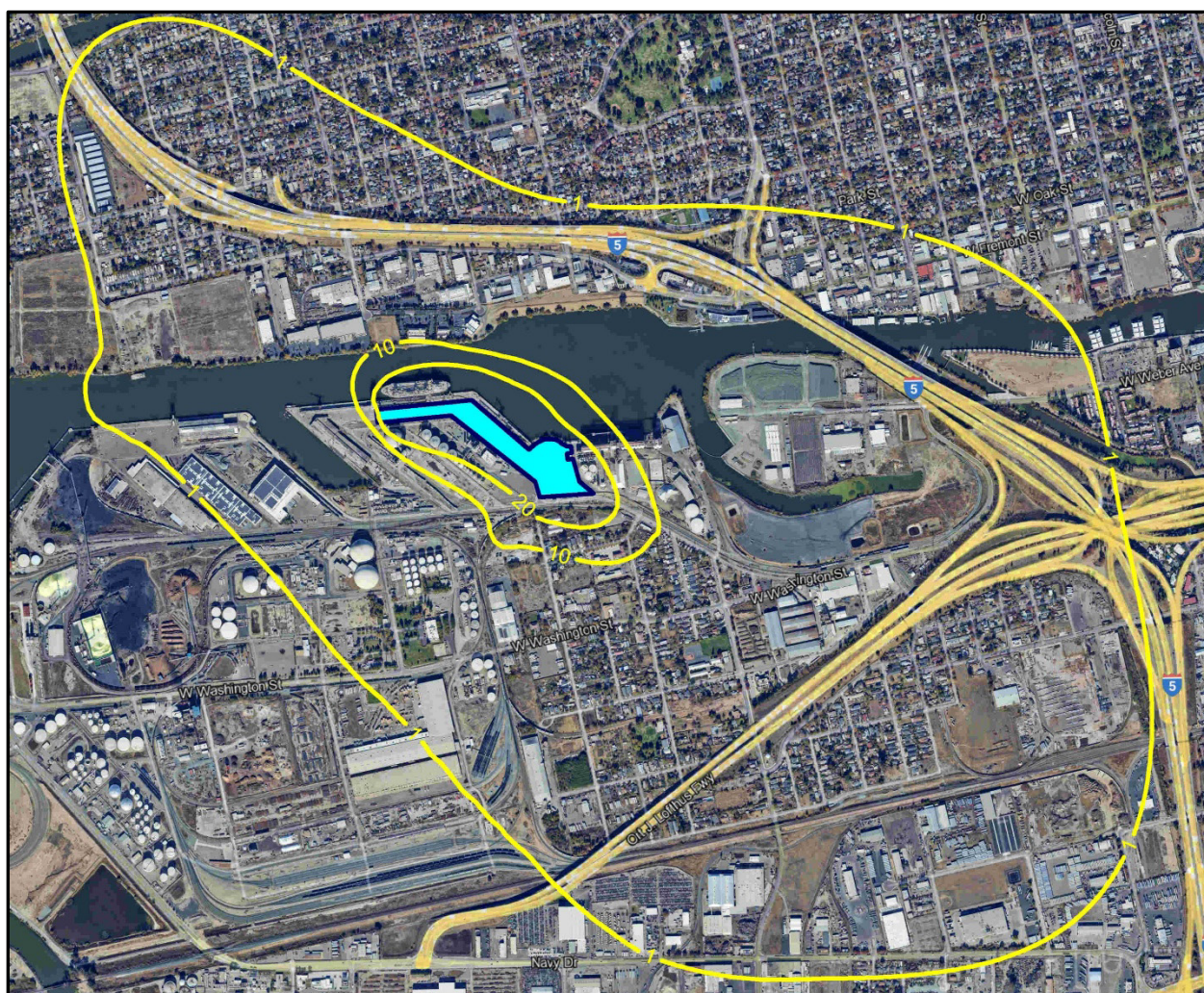


Table C4-10 shows the emission source contributions to the maximum predicted individual cancer risk at the residential MEI, for proposed project construction and operation without mitigation. The contributions would vary somewhat at other locations. At the residential MEI, construction sources would contribute approximately 44 percent of the risk, and operational sources would contribute

approximately 56 percent of the risk. The largest individual source category would be onsite construction equipment (41.5 percent), followed by mobile onsite equipment during operation (31.8 percent), vessels (11.2 percent, including operational vessels and the vessel delivering the ship unloader during construction), material loading and conveying dust (6.0 percent), and switch locomotives (5.3 percent). Together, these sources would contribute almost 96 percent of the cancer risk at that location.

Table C4-10. Source Contributions to Individual Cancer Risk at the Residential MEI

Emission Source Category	Percent Contribution
Construction Sources	
Trucks Onsite	0.4%
Trucks Offsite	0.1%
Worker Vehicles	0.0%
Paving	0.0%
Onsite Construction Equipment	41.5%
Cargo Vessel	1.1%
Assist Tugboats	0.0%
Marine Construction Equipment	1.2%
Operational Sources	
Trucks Onsite	0.3%
Trucks Offsite	0.7%
Vessels	10.1%
Barges	1.0%
Assist Tugboats	0.4%
Switch Locomotives	5.3%
Material Loading Dust	5.4%
Material Conveying Dust	0.6%
Mobile Onsite Equipment	31.8%

5.2 Non-Cancer Hazard Indices

The maximum chronic HI for the unmitigated proposed project is predicted to be 0.38, at a location adjacent to the project site boundary near Berth 2. This impact would occur during proposed project operation, after construction is completed. The maximum chronic HI values at residential and sensitive receptor locations would be 0.09 and 0.04, respectively, and would also occur during proposed project operation. All chronic HI values would be below the significance threshold of 1.0. The maximum chronic 8-hour HI and acute HI values would be well below the significance threshold (no greater than 3 percent of the threshold) for all receptor types.

6. References

- Auer, Jr., August H, 1978. Correlation of Land Use and Cover with Meteorological Anomalies. *Journal of Applied Meteorology*. Volume 17: Issue 5, p. 636. May 1. Available: https://journals.ametsoc.org/view/journals/apme/17/5/1520-0450_1978_017_0636_coluac_2_0_co_2.xml. Last accessed April 17, 2026.
- CAPCOA, 2022. California Emissions Estimator Model (CalEEMod). Version 2022.1.1.43. Available: <https://www.caleemod.com/>. Last accessed April 24, 2026.
- CARB, 1989. *Technical Guidance Document for the Emission Inventory Criteria and Guidelines Regulation for AB 2588*. Technical Support Division. August. Available: <https://ww2.arb.ca.gov/sites/default/files/2023-07/tgd1989.pdf>. Last accessed April 25, 2026.
- CARB, 2006. *Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach*. April. Table 7. Available: <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/marine2005/portstudy0406.pdf>. Last accessed April 11, 2026.
- CARB, 2022. Hotspots Analysis and Reporting Program, Version 2 (HARP2). Air Dispersion Modeling and Risk Tool (ADMRT), dated 22118. April 28. Available: <https://ww2.arb.ca.gov/resources/documents/harp-air-dispersion-modeling-and-risk-tool>. Last accessed April 27, 2026.
- CARB, 2025. Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values. October 2. Available: <https://ww2.arb.ca.gov/sites/default/files/classic/toxics/healthval/contable09252025.pdf>. Last accessed April 25, 2026.
- CARB, 2026. Speciation Profiles Used in CARB Modeling. January 29. Available: <https://ww2.arb.ca.gov/speciation-profiles-used-carb-modeling>. Last accessed March 6, 2026.
- EPA, 2004. Building Profile Input Program for PRIME (BPIPPRM - Regulatory). Version 04274. December 7. Available: <https://www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#bpip>. Last accessed April 17, 2026.
- EPA, 2021. AERMET version 21112. April 22. Available: <https://www.epa.gov/scram/meteorological-processors-and-accessory-programs#aermet>. Last accessed April 17, 2026.
- EPA, 2024. *Guideline on Air Quality Models; Enhancements to the AERMOD Dispersion Modeling System*. 40 CFR Part 51, Appendix W. November 29. Available: https://www.epa.gov/system/files/documents/2024-11/appendix_w-2024.pdf. Last accessed April 9, 2026.
- EPA, 2024b. AERMOD Modeling System. Version 24142. Support Center for Regulatory Atmospheric Modeling (SCRAM). November 20. Available: <https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models#aermod>. Last accessed April 9, 2026.
- EPA, 2024c. AERMAP Version 24142. November 20. Available: <https://www.epa.gov/scram/air-quality-dispersion-modeling-related-model-support-programs#aermap>. Last accessed April 17, 2026.
- EPA, 2024d. User's Guide for the AMS/EPA Regulatory Model (AERMOD). EPA-454/B-24-007. November. Available:

https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_userguide.pdf. Last Accessed April 17, 2026.

OEHHA, 2015. *Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments*. February. Available: <https://oehha.ca.gov/media/downloads/crn/2015guidancemanual.pdf>. Last accessed April 22, 2026.

SJVAPCD, 2006. *Guidance for Air Dispersion Modeling*. Draft. Rev 1.2. August.

SJVAPCD, 2015. Air Quality Thresholds of Significance-Toxic Air Contaminants. July 13. Available: <https://www.valleyair.org/media/2lpbkso0/2-cms-format-air-quality-thresholds-of-significance-toxic-air-contaminants.pdf>. Last accessed April 27, 2026.

SJVAPCD, 2018. APR-2030. Project Ambient Air Quality Analysis Applicability Determination under CEQA. June 12. Available: <https://www.valleyair.org/media/bo3hz35n/apr-2030.pdf>. Last accessed April 17, 2026.

SJVAPCD, 2020. APR-1906. Framework for Performing Health Risk Assessments. February 12. Available: <https://www.valleyair.org/media/0shm0mlk/apr-1906.pdf>. Last accessed April 22, 2026.

SJVAPCD, 2021. AB 2588 Health Risk Assessment Modeling Protocol Guidance. March 18. Available: <https://ww2.valleyair.org/media/fpgio1g5/ab-2588-hra-modeling-protocol-guidance-for-external-distribution.pdf>. Last accessed April 22, 2026.

SJVAPCD, 2022. *Guidance for Air Dispersion Modeling*. September. Available: https://www.valleyair.org/media/zlbhrg22/modeling_guidance.pdf. Last accessed April 9, 2026.

SJVAPCD, 2023. AB 2588 "Hot Spots" Air Toxics Profiles. January 6. Available: <https://www.valleyair.org/permitting/air-toxics-program/resources-for-regulated-facilities/toxic-emissions-inventory-plan/>. Last accessed March 6, 2026.

SJVAPCD, 2026. Meteorological and Air Monitoring Data. Available: <https://experience.arcgis.com/experience/a995874588e64007aa4840691507ce87>. Last Accessed April 27, 2026.

SMAQMD, 2013. *Dispersion Modeling of Construction-Generated PM₁₀ Emissions*. CEQA Guide. July. Available: <https://www.airquality.org/LandUseTransportation/Documents/Ch3PMDDispersionModelingGuidanceFINAL7-2013.pdf>. Last accessed April 11, 2026.

U.S. Census Bureau, 2026. QuickFacts. Stockton city, California. Available: <https://www.census.gov/quickfacts/fact/table/stocktoncitycalifornia/PST045224>. Last accessed March 3, 2026.