Appendix B2

Air Dispersion Modeling

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Introduction

This appendix describes the methods and results of air dispersion modeling that predict the ground-level concentrations of criteria pollutants from construction and operation of the Shell MOTEMS project at Berths 167-169.

The air dispersion modeling methodology was performed using the U.S. Environmental Protection Agency's (USEPA's) AERMOD Modeling System (USEPA, 2015; 2017a) in accordance with its *Guideline on Air Quality Models* (USEPA, 2017b). Nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter equal or less than 10 microns in diameter (PM_{10}), and particulate matter equal or less than 2.5 microns in diameter ($PM_{2.5}$), were modeled for the proposed Project, CEQA baseline, Reduced Project Alternative, and No Project Alternative. The predicted ground-level concentrations were compared to the relevant South Coast Air Quality Management District (SCAQMD) air quality significance thresholds to determine ambient air quality impacts.

Development of Emission Scenarios Used in the Air Dispersion Modeling

1.1 Construction Emission Sources

The following construction-related sources were modeled in AERMOD:

- Off-road equipment: land-based and dredging equipment;
- On-road trucks driving and idling onsite;
- Harborcraft: tugboats used to position dredging barges and scows while adjacent to the terminal;
- Fugitive dust from earth disturbance;
- Source Control Program (SCP) - the refurbishment of existing storage tanks: The source control program includes some off-road construction equipment, fugitive dust, storage tank degassing, and a thermal oxidizer for vapor treatment during degassing. Although degassing activities would emit only VOC emissions and therefore were not modeled for criteria pollutants, they are mentioned here because they were modeled as part of the health risk assessment (Appendix B3).

In accordance with SCAQMD guidance, construction emission sources were modeled with their onsite emissions only (SCAQMD, 2005).

1.2 Derivation of Peak 1-Hour, 8-Hour, and Annual Construction Emissions

The methodology for calculating peak daily construction emissions, which were used by AERMOD to model maximum 24-hour concentrations, is described in Section 3.1 and

Appendix B1 of this EIR. The following approaches were used to derive peak hour, peak 8-hour, and annual emissions for use in AERMOD:

- **Off-Road Construction Equipment:** Peak hour emissions assume all off-road equipment used in a construction activity is active in the same hour. Peak 8-hour emissions assume all equipment runs for 8 hours (or its full daily runtime if less than 8 hours) during the same 8-hour period. Annual emissions are based on the estimated number of equipment work days for each construction activity and the estimated timeline of activities.
- **On-Road Construction Vehicles:** Peak hour emissions assume each type of vehicle (haul truck, concrete truck, delivery truck, support truck, and worker vehicle) makes 1/8 of its peak daily round trips, rounded up to the nearest whole number, in the peak hour. For example, if haul trucks make two (2) round trips and concrete trucks make 10 round trips in the peak day, the peak hour will assume haul trucks make one (1) round trip and concrete trucks make two (2) round trips. Peak 8-hour emissions assume all peak daily vehicle round trips are made during the same 8-hour period. Annual emissions are based on the total number of vehicle trips associated with each activity and the estimated timeline of activities.
- **Harborcraft:** Peak hour construction-related harborcraft emissions are assumed to be 1/8 of the peak daily emissions. Peak 8-hour emissions are assumed to be equal to the peak daily emissions. Annual emissions are based on the estimated number of harborcraft work days for each construction activity and the estimated timeline of activities.
- **Fugitive Dust:** Peak hour and 8-hour fugitive dust emissions are not modeled because the shortest modeled time period for PM_{10} and $PM_{2.5}$ is 24 hours. Annual emissions are based on the estimated quantity of material handled for each construction activity and the estimated timeline of activities.
- **Asphalt Paving Offgas:** Peak hour VOC emissions are assumed to be 1/8 of the peak daily emissions. Peak 8-hour emissions are not required for the HRA. Annual emissions assume a total of three (3) acres would be paved.
- **Source Control Program:** Peak hour storage tank degassing VOC emissions assume that it takes 2.3 hours to complete a degassing operation for a single tank; therefore, peak hour emissions equal the emissions for a single degassing event divided by 2.3. Peak hour thermal oxidizer emissions assume the thermal oxidizer would run at maximum throughput for the entire hour. Peak 8-hour thermal oxidizer emissions assume a 2.3-hour runtime during a single degassing operation. (Peak 8-hour emissions for degassing are not required for the HRA). Annual emissions assume 2 tanks are degassed per year for 5 years.

1.3 Operational Emission Sources

The following operational emission sources were modeled in AERMOD:

- Tanker ships transiting between the SCAQMD overwater boundary and the terminal (about 40 nautical miles), anchoring while waiting for an available berth, and hoteling while at berth. Tanker emission sources include propulsion engines, auxiliary engines, and boilers.
- ITBs/ATBs transiting between the SCAQMD overwater boundary and the terminal (about 40 nautical miles), anchoring while waiting for an available berth,

and hoteling while at berth. ITB/ATB emission sources include propulsion and auxiliary engines.

- Tugboats used to assist tankers and ITBs/ATBs while arriving and departing the Port. Tugboat emission sources include propulsion and auxiliary engines.
- Fugitive VOC emissions from the on-site storage tanks and associated piping. Although VOC emissions were not modeled for criteria pollutants, they are mentioned here because they were modeled as part of the health risk assessment (Appendix B3).
- Fugitive VOC and vapor destruction unit (VDU) combustion emissions from future vessel loading activities (product was only unloaded from vessels in the baseline condition). Although fugitive VOC loading emissions were not modeled for criteria pollutants, they are mentioned here along with the VDU combustion emissions because they were modeled as part of the health risk assessment (Appendix B3).

1.4 Derivation of Peak 1-Hour, 8-Hour, and Annual Operational Emissions

Worst case vessel activity scenarios for the CEQA baseline were obtained from actual ship visit data provided by the Port. The following approaches were used to derive peak hour, peak 8-hour, and annual emissions for use in AERMOD for the CEQA baseline:

- **Tankers and ITBs/ATBs:** For the peak hour, two scenarios were modeled and the highest concentration at each receptor was selected. The first scenario involves one chemical tanker hoteling at berth for a portion of the hour and then departing to sea, and another chemical tanker shifting from anchorage to berth during the same hour. The second peak hour scenario involves a panamax tanker hoteling at berth for a portion of the hour and then shifting to anchorage, and a handysize tanker shifting from anchorage to berth during the same hour.

  The peak 8-hour vessel scenario involves a panamax tanker hoteling at berth, shifting to anchorage, and departing to sea; and a handysize tanker arriving from anchorage and hoteling at berth during the same period.

  Annual emissions were based on the actual number of vessel calls averaged from 2011 to 2015, which are 25.4 tankers and 60.2 ITBs/ATBs.

- **Tugboats:** Peak hour, 8-hour, and annual tugboat emissions were calculated in conjunction with the tanker and ITB/ATB arrival and departure activity described in the preceding bullet. Section 3.1.4.1 of this EIR describes the tugboat engine runtime assumptions per vessel assist.

- **Storage Tanks and Piping:** Peak hour VOC emissions were conservatively assumed to be equal to the average daily emissions. Peak 8-hour emissions are not required for the HRA. Annual VOC emissions equal the average daily emissions multiplied by 365.

- **Vessel Loading Fugitives and VDU:** There was no loading of product onto vessels in the CEQA baseline.

Reasonable worst case future vessel activity scenarios were developed for the proposed Project, Reduced Project Alternative, and No Project Alternative based on the expected vessel fleet composition, product throughput, and number of available berths. The following approaches were used to derive peak hour, peak 8-hour, and annual emissions for use in AERMOD for the proposed Project, Reduced Project Alternative (Alternative 2), and No Project Alternative (Alternative 1):

- **Tankers and ITBs/ATBs when 2 Berths are Available:** According to the estimated construction timeline, two berths would be available for the proposed Project in 2031 and 2048, and the No Project Alternative (Alternative 1) in 2019 and 2023. For the peak hour, two scenarios were modeled and the highest concentration at each receptor was selected. The first scenario involves one chemical tanker hoteling at berth for the entire hour, another chemical tanker hoteling at berth for a portion of the hour and then departing to sea, and a panamax tanker and ITB/ATB at anchorage for the entire hour. The second peak hour scenario involves two chemical tankers hoteling at berth for the entire hour, and a panamax tanker and ITB/ATB at anchorage for the entire hour.

  The peak 8-hour vessel scenario involves one chemical tanker hoteling at berth for the entire period, another chemical tanker hoteling at berth for most of the period and then departing to sea, and a panamax tanker and ITB/ATB at anchorage for the entire period.

  Annual emissions were based on the annual number of vessel calls projected for the future analysis years, which are 27 tankers and 65 ITBs/ATBs in 2019, 51 tankers and 50 ITBs/ATBs in 2023, 59 tankers and 59 ITBs/ATBs in 2031, and 83 tankers and 83 ITBs/ATBs in 2048.

- **Tankers and ITBs/ATBs when only 1 Berth is Available:** According to the estimated construction timeline, only one berth would be available for the proposed Project in 2019, and the Reduced Project Alternative in 2019, 2031, and 2048. For the peak hour, two scenarios were modeled and the highest concentration at each receptor was selected. The first scenario involves one panamax tanker hoteling at berth for a portion of the hour and then departing to sea, and two chemical tankers and an ITB/ATB at anchorage for the entire hour. The second peak hour scenario involves one panamax tanker hoteling at berth for the entire hour, and two chemical tankers and an ITB/ATB at anchorage for the entire hour.

  The peak 8-hour vessel scenario involves one panamax tanker hoteling at berth for most of the period and then departing to sea, and two chemical tankers and an ITB/ATB at anchorage for the entire period.

  Annual emissions were based on the annual number of vessel calls projected for the future analysis years, which are 27 tankers and 65 ITBs/ATBs in 2019, 51 tankers and 50 ITBs/ATBs in 2023, 59 tankers and 59 ITBs/ATBs in 2031, and 83 tankers and 83 ITBs/ATBs in 2048.

- **Tugboats:** Peak hour, peak 8-hour, and annual tugboat emissions were calculated in conjunction with the tanker and ITB/ATB arrival and departure activity

described in the preceding bullet. Section 3.1.4.1 of this EIR describes the tugboat engine runtime assumptions per vessel assist.

- **Storage Tanks and Piping:** Peak hour VOC emissions were conservatively assumed to be equal to the average daily emissions. Peak 8-hour emissions are not required for the HRA. Annual VOC emissions equal the average daily emissions multiplied by 365.

- **Vessel Loading Fugitives and VDU:** Peak hour fugitive VOC emissions associated with vessel loading were conservatively assumed to be equal to the average daily emissions. Peak 8-hour VOC emissions are not required for the HRA. Annual VOC emissions associated with vessel loading are equal the average daily emissions multiplied by 365. Peak hour NOx emissions from the VDU were assumed equal to the SCAQMD permit limit of 4.90 pounds per hour. Peak hour emissions of other pollutants from the VDU were calculated using emission factors and a maximum propane consumption rate of 16.2 million British thermal units (Btu) per hour (derived from the permitted NOx limit). Annual emissions from the VDU were calculated based on the projected annual product throughput, conservatively assuming 20 percent of the throughput would be loaded.

Dispersion Modeling Approach

1.5 Dispersion Model Selection and Inputs

The air dispersion modeling was performed using the USEPA AERMOD dispersion model (USEPA, 2015; 2017a), based on the *Guideline on Air Quality Models* (USEPA, 2017b). The AERMOD model is a steady-state, multiple source, Gaussian dispersion model designed for use with emission sources situated in terrain where ground elevations can exceed the emission source stack heights. Selection of the AERMOD model is well suited for this analysis because it is (1) accepted by the modeling community and regulatory agencies due to of its ability to provide reasonable results for large industrial projects with multiple emission sources, (2) annual sets of hourly meteorological data are available in AERMOD format, and (3) the model can handle various sources types, including point, area, line, and volume. Finally, AERMOD is approved by the USEPA and SCAQMD for analysis of mobile sources.

The most current versions of AERMOD were used at the time of the modeling analyses. AERMOD version 16216r (USEPA, 2017a), the current version, was used to model construction emissions, and overlapping construction and operational emissions. Because operational emissions without construction were modeled at an earlier time, a previous version of AERMOD, version 15181 (USEPA, 2015), was used. However, after the modeling of operational emissions was completed, some of the operational emissions were updated as follows:

- The assumed vessel hoteling times during product loading were increased;

- The proposed Project horizon year was changed from 2047 to 2048, resulting in an additional 2 percent assumed increase in annual terminal throughput and associated emissions; and

- The VDU emissions were updated based on the SCAQMD permit conditions and increased fuel consumption.

The first two bullets had no effect on peak hour, peak 8-hour, or peak daily emissions and modeled concentrations. The calculated annual emissions associated with the proposed Project and alternatives increased only modestly, enabling a simple scaling factor adjustment to the original AERMOD results for annual NO_2 and PM_{10} without the need to re-model. An analysis of the revised annual emissions compared to the original emissions resulted in scaling factors of 1.059, 1.036, 1.033, and 1.052 applied to the 2019, 2023, 2013, and 2047 (changed to 2048) annual modeling results, respectively, for the proposed Project and alternatives. The CEQA baseline modeling results were not affected.

The third bullet resulted in a substantial revision to the estimated VDU emissions for all pollutant averaging periods, making a scaling adjustment impractical. Therefore, VDU emissions were re-modeled using AERMOD version 16216r. The maximum predicted concentrations from the revised VDU modeling were conservatively added to the scaled original AERMOD results, receptor by receptor, even though the original VDU emissions were included in the original AERMOD results (resulting in a conservative double-counting of the VDU concentrations).

To test the similarity of AERMOD versions 15181 and 16216r, baseline emissions were modeled with both versions of AERMOD, and the resulting concentrations differed by 0.0 to 0.8 percent depending on the pollutant and averaging time. Therefore, the use of either AERMOD version would produce essentially the same predicted concentrations.

1.5.1 Construction Emission Sources

Off-road equipment, on-road trucks, harborcraft, and fugitive dust associated with construction were modeled as area sources covering the portions of the terminal and adjacent water where those sources would be active. Because the source control program would work on one storage tank at a time, source control program emissions were modeled as coming from a single location in the approximate center of the terminal's tank farm.

Table B2-1 presents source parameters used in the dispersion modeling of construction emissions. The source parameters are consistent with those developed and used in prior LAHD NEPA/CEQA documents (LAHD, 2008; LAHD, 2011). The locations of the emission sources for proposed Project construction are shown in Figure B2-1.

Table B2-1. AERMOD Source Release Parameters – Construction Sources

Source Description	AERMOD Source Type	Release Height (m)	Initial Vertical Dimension (m) a	Exit Velocity (m/s)	Exit Temperature (K)	Stack Diameter (m)
Off-Road Equipment, On-Road Trucks [b]	Area [c]	4.57	1.06	--	--	--
Fugitive Dust [b]	Area	1.0	0.23	--	--	--
Harborcraft [b]	Area	15.2	3.5	--	--	--
Thermal Oxidizer for the Source Control Program [d]	Point	5.7	--	5.3	922	0.76
Storage Tank Degassing for the Source Control Program [e]	Volume	4.57	1.06	--	--	--

Notes:

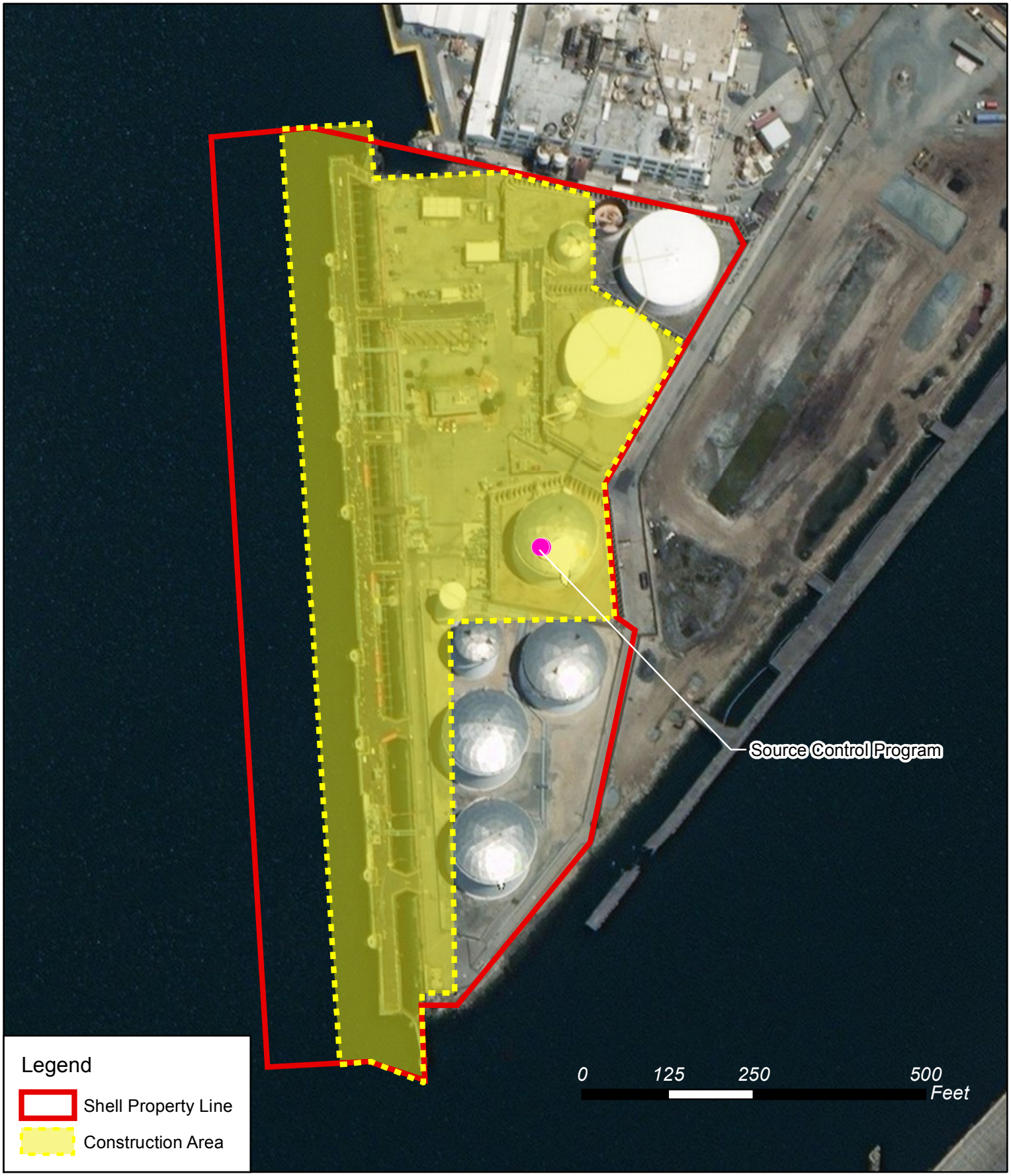
a. The initial vertical dimension of the plume (σ_z) was estimated by dividing the initial vertical thickness by 4.3 for elevated releases and by 2.15 for ground-based releases (USEPA, 2016).

b. Release height and initial vertical dimension are consistent with prior LAHD documents (LAHD 2008; LAHD 2011).

c. For the source control program, off-road equipment was modeled as a volume source in the approximate center of the storage tank farm.

d. The height, temperature, stack diameter, and burner capacity (4.8MM btu/hr) of the thermal oxidizer were provided by the manufacturer. The flow rate and exit velocity were scaled down from data for an 18 MM btu/hr thermal oxidizer in *Criteria Pollutant Air Quality Impact Analysis for the Environmental Impact Report for the Shell Carson Facility Ethanol (E10) Project* (AECOM Environment, March 2012).

e. The effective release height for storage tank degassing is assumed to be approximately 1/2 the average height of the tanks at the terminal.



Source: Castle Environmental Consulting, LLC, 2018
Base map source: NAIP, 2016

Figure B2-1
Modeled Locations for Construction

1.5.2 Operational Emission Sources

The following identifies how operational emission sources were represented in AERMOD:

- Tankers and ITBs/ATBs transiting (harbor, precautionary zone, and fairway transit segments): Emissions from vessels in transit were simulated as a series of separated volume sources extending from the Shell terminal berths to the SCAB overwater boundary. Emissions associated with each transit segment were apportioned equally among the volume sources representing that segment. Volume source spacing was 100 meters within the harbor, 300 meters in the precautionary zone, and 1,000 meters in the fairway. Tanker emissions were apportioned to the north, west, and south routes in accordance with arrival and departure statistics from the POLA 2013 Emission Inventory (POLA, 2014). ITBs/ATBs were modeled only on the north route because they are typically destined for ports along the U.S. west coast.
- Tankers and ITBs/ATBs hoteling: Hoteling tankers were modeled as stack point sources, and hoteling ITBs/ATBs were modeled as volume sources, consistent with how ships and harborcraft were modeled in prior LAHD NEPA/CEQA documents (LAHD 2008; LAHD 2011). The sources were located adjacent to each Shell terminal berth.
- Tankers and ITBs/ATBs at anchorage: Occasionally, arriving vessels are required to anchor temporarily for inspection or to await an open berth. Vessels at anchorage were modeled as an area source within the harbor.
- Tugboats: Emissions from tugboats assisting tankers and ITBs/ATBs were modeled as a series of separated volume sources extending from the Shell terminal berths to outside the Port breakwater. Volume source spacing was 100 meters.
- Storage tanks and piping fugitives: VOC emissions from storage tanks and piping fugitives were modeled as area sources encompassing the areas within the terminal where emissions are expected to occur.
- Vessel loading fugitives: Fugitive VOC emissions from the loading of product into hoteling vessels were modeled as volume sources located adjacent to each Shell terminal berth.
- Vapor destruction unit (VDU): Combustion emissions from the VDU were modeled as a point source in the most likely location for future placement, based on discussions with Port staff.

Table B2-2 presents source parameters used in the dispersion modeling of operational emissions. The source parameters are consistent with those developed and used in prior LAHD NEPA/CEQA documents (LAHD, 2008; LAHD, 2011). The locations of the emission sources for proposed Project operation are shown in Figures B2-2 through B2-4.

Table B2-2. AERMOD Source Release Parameters – Operational Sources

Source Description	AERMOD Source Type	Release Height (m)	Initial Vertical Dimension (m) a	Exit Velocity (m/s)	Exit Temperature (K)	Stack Diameter (m)
Tankers – Fairway and Precautionary Area Transit [b]	Volume	49.1	11.4	--	--	--
Tankers – Harbor Transit [b]	Volume	59.1	13.7	--	--	--
Tankers - Hoteling - Auxiliary Engines [b]	Point	37.2	--	9.22	573	0.390
Tankers - Hoteling – Boilers [b]	Point	39.9	--	18.24	559	0.494
Tankers – Anchoring [b]	Area	50.0	11.6	--	--	--
ITBs/ATBs and Assist Tugboats [b]	Area or Volume [c]	15.2	3.5	--	--	--
Storage Tanks [d]	Area	4.57	1.06	--	--	--
Piping Fugitives (valves, flanges, fittings) [b]	Area	1.0	0.23	--	--	--
Vessel Loading Fugitives [e]	Volume	9.14	4.3	--	--	--
Vapor Destruction Unit (VDU) [f]	Point	4.1	--	14.11	1,089	2.01

Notes:
a. The initial vertical dimension of the plume (σ_z) was estimated by dividing the initial vertical thickness by 4.3 for elevated releases and by 2.15 for ground-based releases (USEPA, 2016).
b. Source parameters are consistent with prior LAHD documents (LAHD 2008; LAHD 2011).
c. ITBs/ATBs and assist tugboats were modeled as volume sources except for ITBs/ATBs while anchoring, which were modeled as an area source.
d. The effective release height for storage tank losses is assumed to be approximately 1/2 the average height of the tanks at the terminal.
e. The release height for vessel loading fugitives is based on vessel deck height of 30 feet above water.
f. The source parameters for the VDU were provided by the vendor (Envent Corporation, May 11, 2016).

Source: Castle Environmental Consulting, LLC, 2018
Base map source: Esri, 2017

Figure B2-2
Modeled Locations for Tankers and ITBs/ATBs (Far Field)

Source: Castle Environmental Consulting, LLC, 2018
Base map source: NAIP, 2016

Figure B2-3
Modeled Locations for Tankers, ITBs/ATBs, and Tugboats (Near Field)

Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project

Source: Castle Environmental Consulting, LLC, 2018
Base map source: NAIP, 2016

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Figure B2-4
Modeled Locations for Fugitives and Vapor Recovery

Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project

1.5.3 Meteorological Data

The complex interaction of the ocean, land, and Palos Verdes hills near the Port may result in significant variations in wind patterns over relatively short distances (LAHD, 2010). POLA and POLB currently operate monitoring stations that collect meteorological data from several locations within and near port boundaries. For this dispersion analysis, the meteorological data collected at the Wilmington Community Station, located at Saints Peter and Paul School (SPPS), was used for dispersion modeling. SPPS is located about 1.5 mile north of the Shell terminal and is considered the most representative meteorological station for the terminal in accordance with the "Sphere of Influence" analysis conducted by POLA and POLB in 2010 (LAHD, 2010).

The meteorological data used in AERMOD was collected between September 2006 and August 2007, the first complete 12-month period recorded at all six of the site-specific monitoring stations operated by the Ports of Los Angeles and Long Beach. The use of one year of meteorological data is consistent with USEPA guidelines, which state that "at least 1 year of site-specific" data is required (USEPA, 2017b). For project-to-project consistency, this meteorological period has been used in numerous POLA and POLB EIRs since 2007.

The meteorological data were processed in 2013 using the USEPA's approved AERMET (version 12345) meteorological data preprocessor for the AERMOD dispersion model. As part of the data processing effort, the data were compared to the more recent meteorological data collected during years 2009 to 2012. It was determined that the 2006-2007 data period is representative in comparison to the 2009 to 2012 data period. The evaluation showed that the average wind speed and wind pattern of the original data period is very similar to that of the 2009 to 2012 data period across the stations at both POLA and POLB. Therefore, it was concluded that the original data period is representative (ENVIRON, 2013).

1.5.4 Model Options

Regulatory default technical options were selected for the AERMOD model for all pollutants except NO_2. Use of these options follows the USEPA modeling guidance (USEPA, 2017b). Consistent with California Air Pollution Control Officers Association (CAPCOA), SCAQMD, and USEPA guidance (CAPCOA, 2011; SCAQMD, 2012b; USEPA, 2010; USEPA, 2011a; USEPA, 2014), the conversion of nitrogen oxide (NO_X) to NO_2 in ambient air was simulated in AERMOD using the Ozone Limiting Method (OLM). The following in-stack NO_2/NO_X ratios were assumed: 0.1 for OGV propulsion engines and boilers (USEPA, 2000; Carlton, 1990); 0.11 for diesel heavy-duty trucks (CAPCOA, 2011); 0.20 for all other diesel internal combustion engines, including propulsion engines on ITBs/ATBs and auxiliary engines on tankers and ITBs/ATBs (CAPCOA, 2011); 0.09 for thermal oxidizers (NCASI, 2015); and 0.50 for all other sources (USEPA, 2011a). AERMOD used hourly ambient ozone (O_3) concentration data from the SCAQMD's North Long Beach monitoring station.

As recommended by the SCAQMD (2009), all sources were modeled with urban dispersion coefficients. An urban population of 9,862,049, representative of Los Angeles County, was used in AERMOD. Receptor and source base elevations were determined from USGS

National Elevation Dataset (NED) files using AERMAP, version 11103 (USEPA, 2011b). All coordinates were referenced to UTM NAD83, Zone 11.

1.5.5 Temporal Distribution Assumptions

For dispersion modeling purposes, construction emissions were assumed to occur between 7:00 a.m. and 9:00 p.m., evenly distributed. All other sources were modeled with constant emissions 24 hours per day.

1.5.6 Receptor Locations

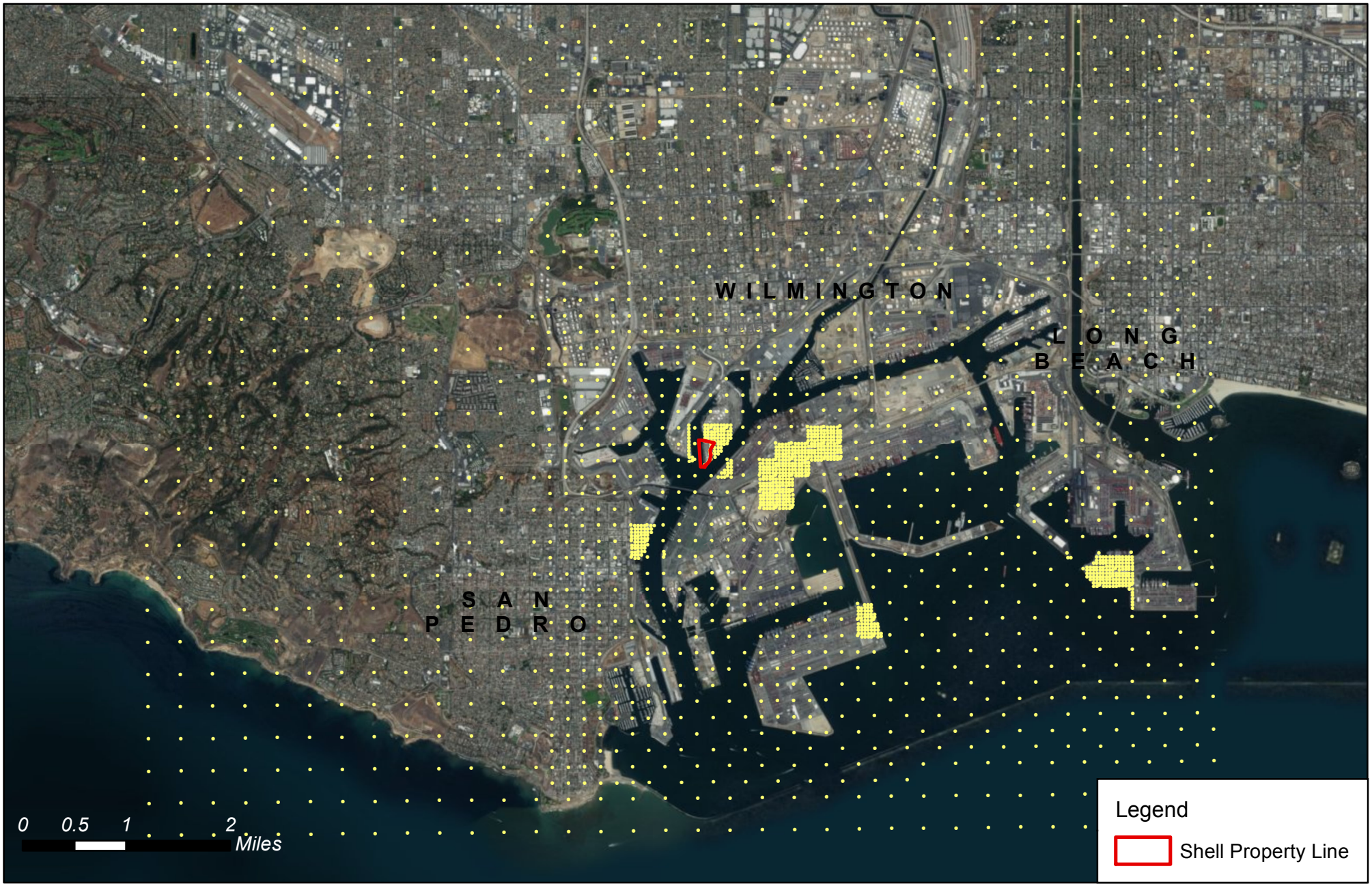
Cartesian coordinate receptor grids were used to provide adequate spatial coverage surrounding the Project area to assess ground-level pollution concentrations, identify the extent of impacts, and identify maximum impact locations. Initial AERMOD runs were conducted with a 16.5 by 12.5 kilometer (km) coarse grid, with receptors placed 500 meters (m) apart, centered over the Project site. Embedded within this receptor grid were additional receptors, placed 250 m apart, covering an area 5.5 km x 7.5 km in which maximum concentrations were anticipated to occur.

Once the locations of the maximum concentrations were identified from the coarse grid runs, additional AERMOD runs were conducted with a fine grid of receptors, placed 50 m apart, centered over locations of the maximum coarse grid concentrations and along the project site boundary. Consistent with SCAQMD guidance (SCAQMD, 2008), receptors over water and in modeled roadway traffic lanes were not considered in determining the maximum receptor locations because any human exposure there would be brief and transient. In addition, locations in the vacant land adjacent to the eastern boundary of the proposed Project footprint were considered valid for project operation but not construction since no public access would be available during construction.

Figures B2-5 and B2-6 show the receptor grids used in AERMOD.

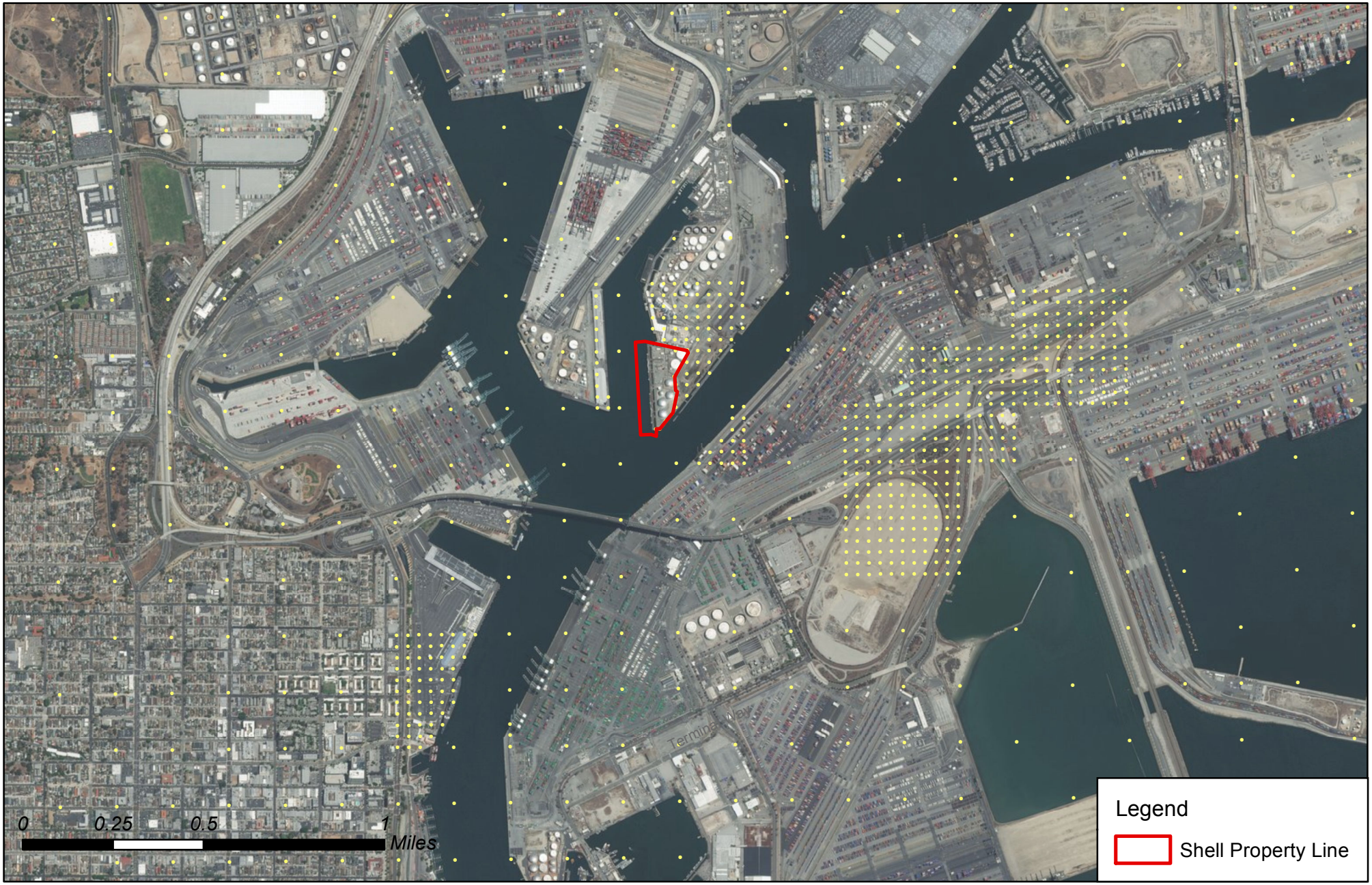
1.6 Methodology for Determination of Impacts

Construction Impact Determination. For the proposed Project and Reduced Project Alternative, construction emissions were modeled both alone and together with concurrent terminal operational emissions. Concurrent terminal operations were modeled as a concentration increment relative to the CEQA baseline. This was accomplished by subtracting the modeled concentrations associated with CEQA baseline terminal operations from the modeled concentrations associated with proposed construction plus concurrent terminal operations. When construction was modeled alone (i.e., without concurrent operations), no baseline concentrations were subtracted because the baseline for construction is assumed to be zero.



Source: Castle Environmental Consulting, LLC, 2018
Base map source: Esri, 2017

Figure B2-5
Modeled Receptor Locations (Far Field)



Source: Castle Environmental Consulting, LLC, 2018
Base map source: Esri, 2017

Figure B2-6
Modeled Receptor Locations (Near Field)

For NO_2, PM_{10}, and $PM_{2.5}$, the various combinations of overlapping construction activities were modeled individually, and the highest modeled concentration was determined at each modeled receptor. A review of the construction schedule resulted in the modeling of five unique combinations of overlapping construction activities that had the potential to yield maximum ambient concentrations. Because prior Port projects have shown that SO_2 and CO are unlikely to exceed the significance thresholds, a conservative screening approach was used for SO_2 and CO where all AERMOD sources were modeled with their maximum emissions even if they would not occur simultaneously.

Operational Impact Determination. Terminal operations were modeled as a concentration increment relative to the CEQA baseline. This was accomplished by subtracting the modeled concentrations associated with CEQA baseline terminal operations from the modeled concentrations associated with proposed terminal operations.

AERMOD modeled NO_2, PM_{10}, and $PM_{2.5}$ concentrations for each analysis year (2019, 2031, and 2048 for the proposed Project and Reduced Project Alternative; and 2019 and 2023 for the No Project Alternative). Because prior Port projects have shown that SO_2 and CO are unlikely to exceed the significance thresholds, a conservative screening approach was used for SO_2 and CO where all AERMOD sources were modeled with their maximum emissions even if they would occur in different analysis years.

Significance Thresholds. The significance thresholds used in the dispersion modeling analysis of criteria pollutant concentrations are presented in Table 3.1-8 of this EIR for construction and Table 3.1-10 of this EIR for project operation.

The significance thresholds for NO_2, SO_2, and CO are absolute thresholds based on the ambient air quality standards. This means that the modeled project concentration increments must be added to the monitored ambient background concentrations to yield total concentrations for comparison to the thresholds. This approach for determining total concentrations for the Port was endorsed by the SCAQMD (SCAQMD, 2012a; SCAQMD, 2012b). The background concentrations represent the maximum ambient concentrations in the vicinity of the project site excluding the contribution from the proposed Project or project alternative. Ambient background concentrations were obtained from the SPPS monitoring station using the most recent 3-year period of recorded data publicly available, May 2014 through April 2017. Table B2-3 shows the derivation of the background concentrations.

The significance thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds. Therefore, the concentration increments were compared directly to the thresholds without adding background concentrations.

To be consistent with the federal 1-hour NO_2 standard, the modeled federal 1-hour NO_2 concentrations represent the 98th percentile (8th highest) of the daily maximum 1-hour concentrations. Although compliance with the federal 1-hour NO_2 standard is based on a three-year average of the 98th percentile 1-hour concentrations, the USEPA states that the use of one or more years of available site specific meteorological data serves as an unbiased estimate of the 3-year average for purposes of modeling demonstrations of compliance with the NAAQS (USEPA, 2010). All other modeled pollutant concentrations, including the state 1-hour NO_2 concentration, represent the highest concentrations over the entire year of meteorological data.

Table B2-3. Background Concentrations Measured at the Wilmington Community Station at SPPS

Pollutant	Averaging Period	Monitored Concentration (ppm) [a,f]			Background Concentration [c]	
		2014	2015	2016	(ppm)	(µg/m³) [d]
NO_2	1-Hour State	0.085	0.086	0.087	0.087	164
	1-Hour Federal [b]	--	--	--	0.065	123
	Annual	0.017	0.017	0.015	0.017	32
CO	1-Hour	3.8	3.9	3.4	3.9	4,477
	8-Hour	2.5	2.4	2.2	2.5	2,870
SO_2	1-Hour State	0.027	0.04	0.038	0.04	105
	1-Hour Federal [e]	--	--	--	0.017	45
	24-Hour	0.005	0.005	0.004	0.005	13

Notes:

a. All reported values represent the highest recorded concentration during the year unless otherwise noted.

b. The background concentration reported for the federal 1-hour NO2 standard represents the three-year average (2014-2016) of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations. Therefore, the individual year concentrations are not shown.

c. The background concentrations for the 1-hour federal NO2 and SO2 concentrations are three-year averages. The background concentrations for all other pollutants or averaging periods are the maximum of the concentrations for the 3 reported years.

d. The concentration in micrograms per cubic meter (ug/m3) is calculated as follows: ug/m3 = ppm x MW / 0.0244. The molecular weights (MW) are 28.01 for CO, 46.0055 for NO2, and 64.066 for SO2.

e. The background concentration reported for the federal 1-hour SO2 standard represents the three-year average (2014-2016) of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. Therefore, the individual year concentrations are not shown.

f. The years reported in this table represent the following 12-month periods: Year 2014 represents May 2014 - April 2015, Year 2015 represents May 2015 - April 2016, and Year 2016 represents May 2016 - April 2017.

Source: POLA 2015; 2016; 2017.

1.7 Predicted Air Quality Impacts

1.7.1 Construction Impacts

Construction impacts, both without and with mitigation, were evaluated for the proposed Project and Reduced Project Alternative.

1.7.1.1 Proposed Project

Construction alone, without mitigation. Table B2-4 presents the maximum off-site total concentrations of NO_2, SO_2, and CO from construction without mitigation. The total concentrations represent the project concentrations plus background concentrations. The table shows that the maximum off-site federal and state 1-hour NO_2 concentrations from construction activities would exceed SCAQMD thresholds. The annual NO_2 concentration and all SO_2 and CO concentrations would be less than the thresholds.

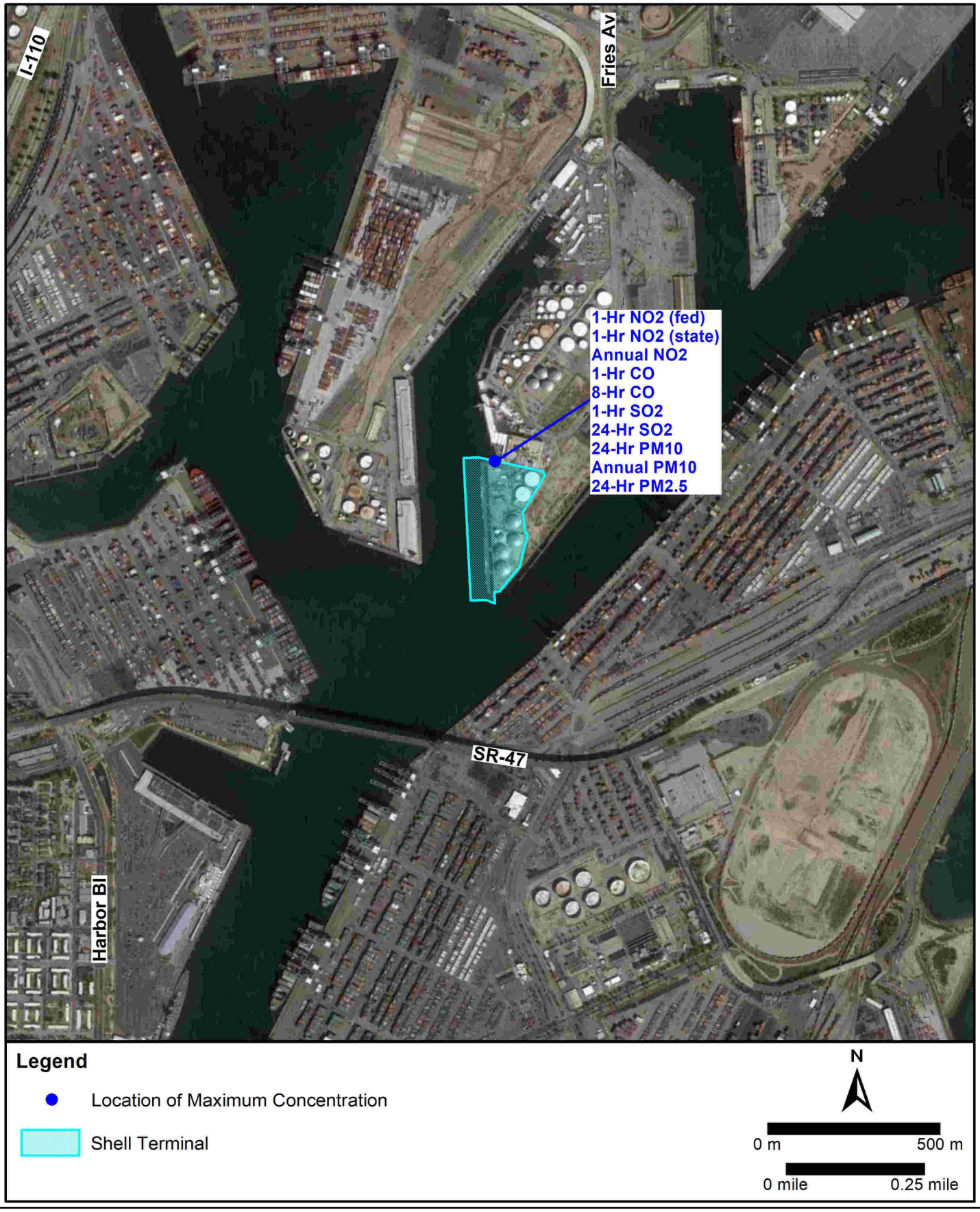
Table B2-5 presents the maximum off-site CEQA increment concentrations (project minus baseline) of PM_{10} and $PM_{2.5}$ from construction without mitigation. Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the PM_{10} and $PM_{2.5}$ increment concentrations. The table shows that the maximum off-site incremental PM_{10} and $PM_{2.5}$ concentrations from construction activities would be less than the SCAQMD thresholds.

Figure B2-7 shows the maximum air quality impact locations for unmitigated proposed Project construction.

Concurrent construction and terminal operation, without mitigation. Table B2-6 presents the maximum off-site total concentrations of NO_2, SO_2, and CO from concurrent construction and terminal operation without mitigation. The concentrations represent the increment concentrations (project construction and operation minus baseline operation) plus background concentrations. Depending on the receptor location, the effect of project operation minus baseline operation may be either positive or negative; therefore, the concentrations from concurrent construction and operation (Table B2-6) can sometimes be less than the concentrations from construction alone (Table B2-4). Table B2-6 shows that the maximum off-site federal and state 1-hour NO_2 concentrations from concurrent construction and operational activities would exceed SCAQMD thresholds. The annual NO_2 concentration and all SO_2 and CO concentrations would be less than the thresholds.

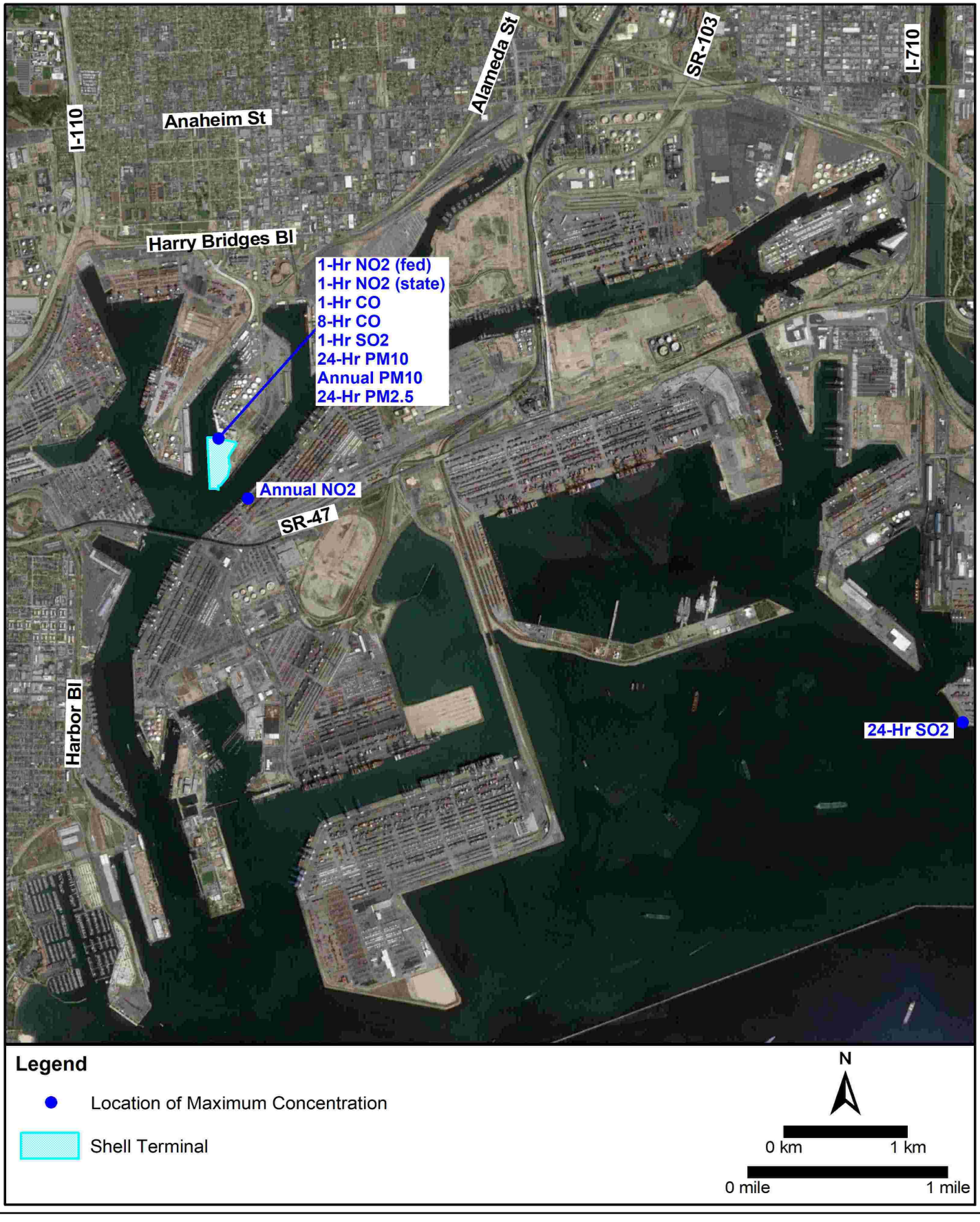
Table B2-7 presents the maximum off-site CEQA increment concentrations of PM_{10} and $PM_{2.5}$ from concurrent construction and terminal operation without mitigation. The concentrations represent project construction and operation minus baseline operation. Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the increment concentrations. Depending on the receptor location, the effect of project operation minus baseline operation may be either positive or negative; therefore, the concentrations from concurrent construction and operation (Table B2-7) can sometimes be less than the concentrations from construction alone (Table B2-5). Table B2-7 shows that the maximum off-site incremental PM_{10} and $PM_{2.5}$ concentrations from concurrent construction and operational activities would be less than the SCAQMD thresholds.

Figure B2-8 shows the maximum air quality impact locations for unmitigated proposed Project concurrent construction and operation.



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-7
Maximum Air Quality Impact Locations – Proposed Project Construction without Mitigation
Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-8
Maximum Air Quality Impact Locations – Proposed Project
Combined Construction and Operation without Mitigation

Table B2-4: Maximum Off-site NO_2, SO_2, and CO Concentrations—Proposed Project Construction without Mitigation

Pollutant	Averaging Time	Background Concentration (µg/m³)[b]	Maximum Modeled Concentration of Proposed Project (µg/m³)	Total Concentration (µg/m³)[c]	SCAQMD Threshold (µg/m³)	Total Concentration above Threshold?
NO_2	Federal 1-hour[a]	123	198	***321***	188	***Yes***
	State 1-hour	164	346	***510***	339	***Yes***
	Annual	32	5.2	37	57	No
SO_2	Federal 1-hour	45	1.7	47	197	No
	State 1-hour	105	1.7	107	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	1,515	5,992	23,000	No
	8-hour	2,870	394	3,264	10,000	No

Notes:

[a] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. All other 1-hour, 8-hour, and 24-hour modeled concentrations represent the maximum concentrations.

[b] The background concentrations for NO_2, SO_2, and CO were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[c]The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Concentration of Proposed Project*. Exceedances of the thresholds are indicated in ***bold/italic***.

Table B2-5: Maximum Off-site PM_{10} and $PM_{2.5}$ Concentrations—Proposed Project Construction without Mitigation

Pollutant	Averaging Time	Maximum Modeled Concentration of Proposed Project (µg/m³)[a]	SCAQMD Threshold (µg/m³)	Concentration above Threshold?
PM_{10}	24-hour	8.4	10.4	No
	Annual	0.3	1.0	No
$PM_{2.5}$	24-hour	5.4	10.4	No

Notes:

[a]Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the *Maximum Modeled Concentration of Proposed Project*.

Table B2-6: Maximum Off-site NO_2, SO_2, and CO Concentrations—Proposed Project Combined Construction and Operation without Mitigation

Pollutant	Averaging Time	Background Concentration (µg/m3)[b]	Maximum Modeled Project Concentration Increment (µg/m3)[c]	Total Concentration (µg/m3)[d]	SCAQMD Threshold (µg/m3)	Total Concentration above Threshold?
NO_2	Federal 1-hour[a]	123	158	***281***	188	***Yes***
	State 1-hour	164	306	***470***	339	***Yes***
	Annual	32	4.3	36	57	No
SO_2	Federal 1-hour[b]	45	5.6	51	197	No
	State 1-hour	105	5.6	111	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	1,513	5,990	23,000	No
	8-hour	2,870	391	3,261	10,000	No

Notes:

[a] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. All other 1-hour, 8-hour, and 24-hour modeled concentrations represent the maximum concentrations.

[b] The background concentrations for NO_2, SO_2, and CO were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[c]The *Modeled Project Concentration Increment* represents the modeled concentration of the proposed Project (construction and operation during the construction period) minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

[d]The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Project Concentration Increment*. Exceedances of the thresholds are indicated in ***bold/italic*.**

Table B2-7: Maximum Off-site PM_{10} and $PM_{2.5}$ Concentrations—Proposed Project Combined Construction and Operation without Mitigation

Pollutant	Averaging Time	Maximum Concentration CEQA Increment (µg/m3)[a,b]	SCAQMD Threshold (µg/m3)	CEQA Increment above Threshold?
PM_{10}	24-hour	8.0	10.4	No
	Annual	0.3	1.0	No
$PM_{2.5}$	24-hour	5.2	10.4	No

Notes:

[a]The *Concentration CEQA Increment* represents the modeled concentration of the proposed Project (construction and operation during the construction period) minus the modeled concentration of the CEQA baseline (operations only).

[b]Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the *Maximum Concentration CEQA Increment*.

Construction alone, with mitigation. Table B2-8 presents the maximum off-site total concentrations of NO_2, SO_2, and CO from construction, with application of mitigation measures MM AQ-1 through MM AQ-4. The table shows that the federal and state 1-hour NO_2 concentrations would be reduced but would continue to exceed the thresholds. The annual NO_2 concentration and all SO_2 and CO concentrations would remain less than the thresholds. PM_{10} and $PM_{2.5}$ concentrations were not modeled with mitigation because they were shown to be less than significant without mitigation.

Figure B2-9 shows the maximum air quality impact locations for mitigated proposed Project construction.

Concurrent construction and terminal operation, with mitigation. Table B2-9 presents the maximum off-site total concentrations of NO_2, SO_2, and CO from concurrent construction and terminal operation, with application of mitigation measures MM AQ-1 through MM AQ-4. The table shows that the federal and state 1-hour NO_2 concentrations would be reduced but would continue to exceed the thresholds. The annual NO_2 concentration and all SO_2 and CO concentrations would remain less than the thresholds. PM_{10} and $PM_{2.5}$ concentrations were not modeled with mitigation because they were shown to be less than significant without mitigation.

Figure B2-10 shows the maximum air quality impact locations for mitigated proposed Project concurrent construction and operation.

The maximum 1-hour NO_2 concentrations reported in Tables B2-8 and B2-9 would occur directly on the northern proposed Project site boundary. They are predicted to occur at sometime within a 7-month period during the construction of Berth 168. The predicted concentrations would decrease rapidly as one moves away from the maximum locations. For example, with mitigation, no significant NO_2 concentrations would occur at any residential location during proposed Project construction.

The frequency at which the 1-hour NO_2 concentrations would exceed the significance thresholds at the maximum location during proposed Project construction is difficult to estimate. The modeling analysis is geared toward determining maximum concentrations, and tends to be overly conservative when analyzing the frequency of exceedances. For example, the 1-hour NO_2 model simulation assumes all construction equipment associated with the worst case combination of construction activities would operate continuously from 7:00 a.m. to 9:00 p.m. every day for an entire year of meteorological data. It also assumes the NO_2 background concentration would remain at its highest level every hour of the year. In practice, the construction emissions and background concentration would be highly variable over the course of a year, resulting in a wide range of 1-hour concentrations at and below the peak level.

One way to gain a general sense for the frequency of 1-hour NO_2 exceedances during construction would be to consider the annual average NO_2 concentration. The annual concentration is merely an average of all the 1-hour concentrations over the course of a year, and is based on long-term average construction equipment usage and an annual average background concentration. For example, Table B2-8 shows that the maximum annual NO_2 concentration of 37 $\mu g/m^3$ is only 20 percent of the federal 1-hour threshold and 11 percent of the state 1-hour threshold. This suggests that, most of the time, the 1-hour NO_2 concentrations during construction would be less than, and in many cases much less than, the 1-hour thresholds.

Table B2-8: Maximum Off-site NO_2, SO_2, and CO Concentrations—Proposed Project Construction with Mitigation

Pollutant	Averaging Time	Background Concentration (µg/m^3)[b]	Maximum Modeled Concentration of Proposed Project (µg/m3)	Total Concentration (µg/m^3)[c]	SCAQMD Threshold (µg/m^3)	Total Concentration above Threshold?
NO_2	Federal 1-hour[a]	123	187	***310***	188	***Yes***
	State 1-hour	164	320	***484***	339	***Yes***
	Annual	32	4.8	37	57	No
SO_2	Federal 1-hour	45	1.7	47	197	No
	State 1-hour	105	1.7	107	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	1,351	5,828	23,000	No
	8-hour	2,870	346	3,216	10,000	No

Notes:

[a] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. All other 1-hour, 8-hour, and 24-hour modeled concentrations represent the maximum concentrations.

[b] The background concentrations for NO_2, SO_2, and CO were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[c]The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Concentration of Proposed Project*. Exceedances of the thresholds are indicated in ***bold/italic***.

Table B2-9: Maximum Off-site NO_2, SO_2, and CO Concentrations—Proposed Project Combined Construction and Operation with Mitigation

Pollutant	Averaging Time	Background Concentration (µg/m³)[b]	Maximum Modeled Project Concentration Increment (µg/m³)[c]	Total Concentration (µg/m³)[d]	SCAQMD Threshold (µg/m³)	Total Concentration above Threshold?
NO_2	Federal 1-hour[a]	123	148	***271***	188	***Yes***
	State 1-hour	164	281	***445***	339	***Yes***
	Annual	32	4.0	36	57	No
SO_2	Federal 1-hour[b]	45	5.6	51	197	No
	State 1-hour	105	5.6	111	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	1,349	5,826	23,000	No
	8-hour	2,870	343	3,213	10,000	No

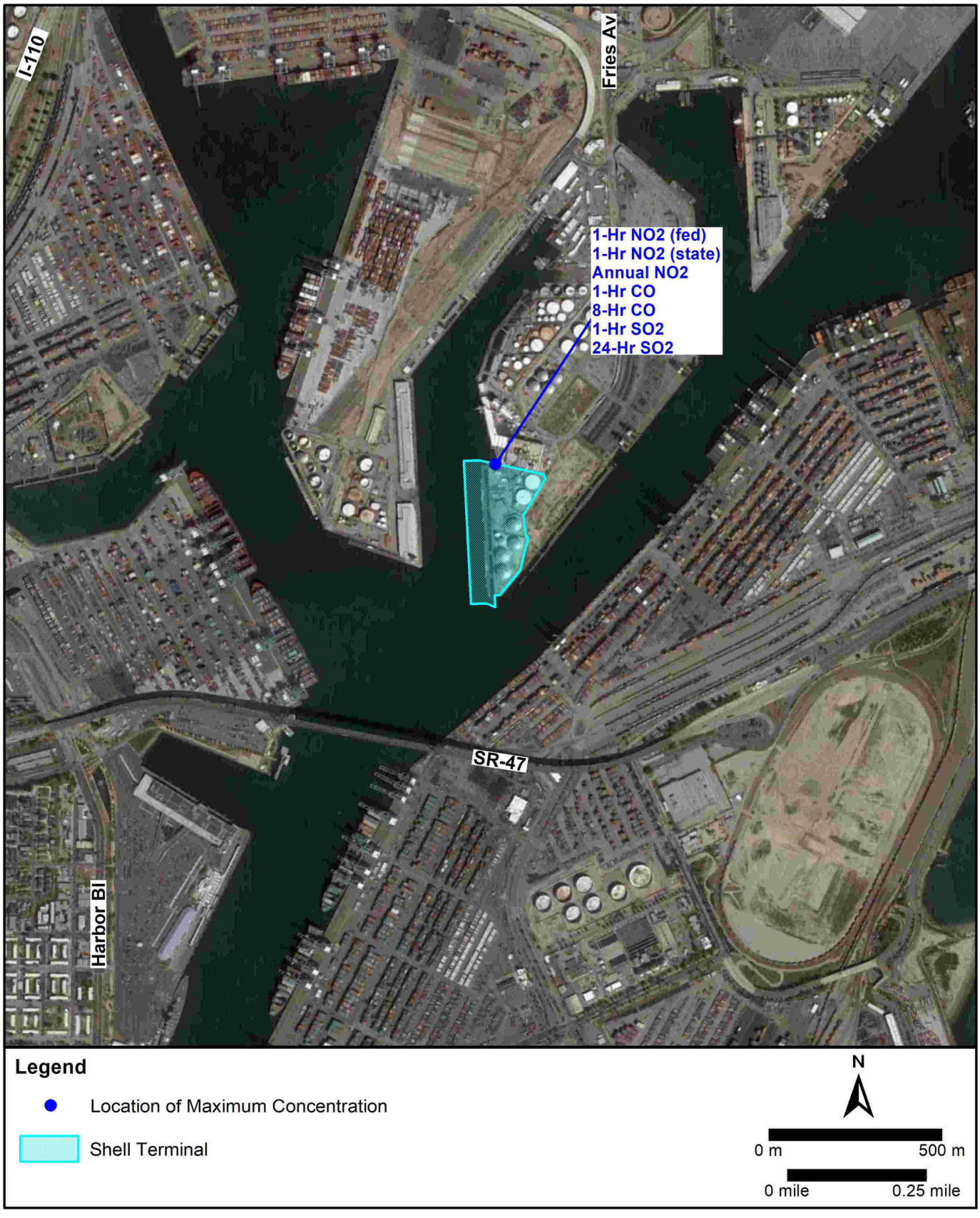
Notes:

[a] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. All other 1-hour, 8-hour, and 24-hour modeled concentrations represent the maximum concentrations.

[b] The background concentrations for NO_2, SO_2, and CO were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

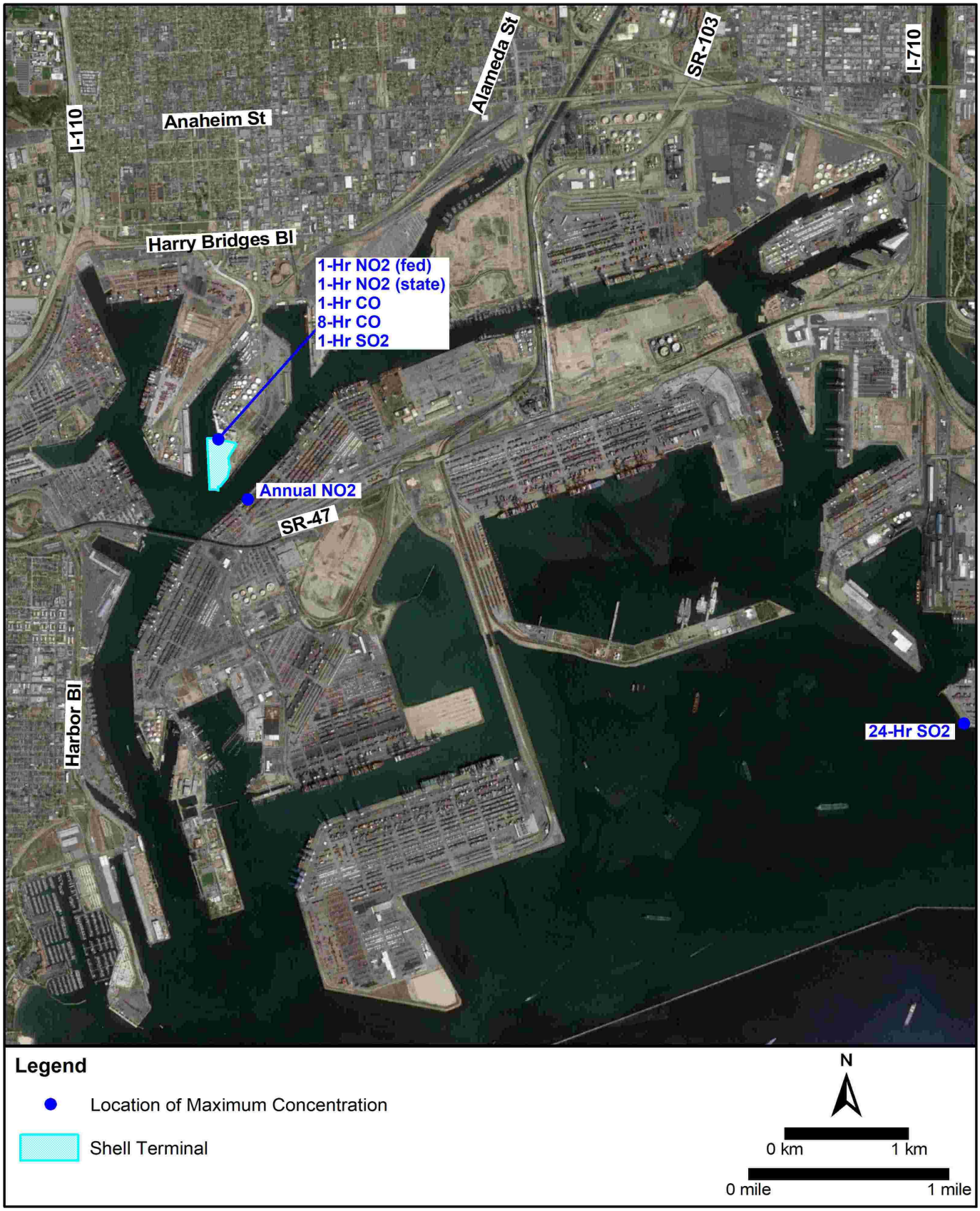
[c] The *Modeled Project Concentration Increment* represents the modeled concentration of the proposed Project (construction and operation during the construction period) minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

[d]The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Project Concentration Increment*. Exceedances of the thresholds are indicated in ***bold/italic*.**



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-9
Maximum Air Quality Impact Locations – Proposed Project Construction with Mitigation
Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-10
Maximum Air Quality Impact Locations – Proposed Project
Combined Construction and Operation with Mitigation

1.7.1.2 Reduced Project Alternative

Construction alone, without mitigation. Table B2-10 presents the maximum off-site total concentrations of NO_2, SO_2, and CO from construction without mitigation. The total concentrations represent the project concentrations plus background concentrations. The table shows that the maximum off-site federal and state 1-hour NO_2 concentrations from construction activities would exceed SCAQMD thresholds. The annual NO_2 concentration and all SO_2 and CO concentrations would be less than the thresholds.

Table B2-11 presents the maximum off-site CEQA increment concentrations (project minus baseline) of PM_{10} and $PM_{2.5}$ from construction without mitigation. Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the PM_{10} and $PM_{2.5}$ increment concentrations. The table shows that the maximum off-site incremental PM_{10} and $PM_{2.5}$ concentrations from construction activities would be less than the SCAQMD thresholds.

Figure B2-11 shows the maximum air quality impact locations for unmitigated Reduced Project Alternative construction.

Concurrent construction and terminal operation, without mitigation. Table B2-12 presents the maximum off-site total concentrations of NO_2, SO_2, and CO from concurrent construction and terminal operation without mitigation. The concentrations represent the increment concentrations (project construction and operation minus baseline operation) plus background concentrations. Depending on the receptor location, the effect of project operation minus baseline operation may be either positive or negative; therefore, the concentrations from concurrent construction and operation (Table B2-12) can sometimes be less than the concentrations from construction alone (Table B2-10). Table B2-12 shows that the maximum off-site federal and state 1-hour NO_2 concentrations from concurrent construction and operational activities would exceed SCAQMD thresholds. The annual NO_2 concentration and all SO_2 and CO concentrations would be less than the thresholds.

Table B2-13 presents the maximum off-site CEQA increment concentrations of PM_{10} and $PM_{2.5}$ from concurrent construction and terminal operation without mitigation. The concentrations represent project construction and operation minus baseline operation. Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the increment concentrations. Depending on the receptor location, the effect of project operation minus baseline operation may be either positive or negative; therefore, the concentrations from concurrent construction and operation (Table B2-13) can sometimes be less than the concentrations from construction alone (Table B2-11). Table B2-13 shows that the maximum off-site incremental PM_{10} and $PM_{2.5}$ concentrations from concurrent construction and operational activities would be less than the SCAQMD thresholds.

Figure B2-12 shows the maximum air quality impact locations for unmitigated Reduced Project Alternative concurrent construction and operation.

Table B2-10: Maximum Off-site NO_2, SO_2, and CO Concentrations—Reduced Project Alternative Construction without Mitigation

Pollutant	Averaging Time	Background Concentration (µg/m³)[b]	Maximum Modeled Concentration of Reduced Project (µg/m³)	Total Concentration (µg/m³)[c]	SCAQMD Threshold (µg/m³)	Total Concentration above Threshold?
NO2	Federal 1-hour[a]	123	198	*321*	188	*Yes*
	State 1-hour	164	347	*511*	339	*Yes*
	Annual	32	5.1	37	57	No
SO2	Federal 1-hour	45	1.7	47	197	No
	State 1-hour	105	1.7	107	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	1,515	5,992	23,000	No
	8-hour	2,870	394	3,264	10,000	No

Notes:

[a] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. All other 1-hour, 8-hour, and 24-hour modeled concentrations represent the maximum concentrations.

[b] The background concentrations for NO_2, SO_2, and CO were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[c]The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Concentration of Reduced Project*. Exceedances of the thresholds are indicated in ***bold/italic***.

Table B2-11: Maximum Off-site PM_{10} and $PM_{2.5}$ Concentrations—Reduced Project Alternative Construction without Mitigation

Pollutant	Averaging Time	Maximum Modeled Concentration of Reduced Project (µg/m³)[a]	SCAQMD Threshold (µg/m³)	Concentration above Threshold?
PM_{10}	24-hour	8.4	10.4	No
	Annual	0.3	1.0	No
$PM_{2.5}$	24-hour	5.4	10.4	No

Notes:

[a]Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the *Maximum Modeled Concentration of Reduced Project*.

Table B2-12: Maximum Off-site NO_2, SO_2, and CO Concentrations—Reduced Project Alternative Combined Construction and Operation without Mitigation

Pollutant	Averaging Time	Background Concentration (µg/m³)[b]	Maximum Modeled Project Concentration Increment (µg/m³)[c]	Total Concentration (µg/m³)[d]	SCAQMD Threshold (µg/m³)	Total Concentration above Threshold?
NO2	Federal 1-hour[a]	123	159	***282***	188	***Yes***
	State 1-hour	164	308	***472***	339	***Yes***
	Annual	32	3.9	36	57	No
SO2	Federal 1-hour	45	5.6	51	197	No
	State 1-hour	105	5.6	111	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	1,513	5,990	23,000	No
	8-hour	2,870	391	3,261	10,000	No

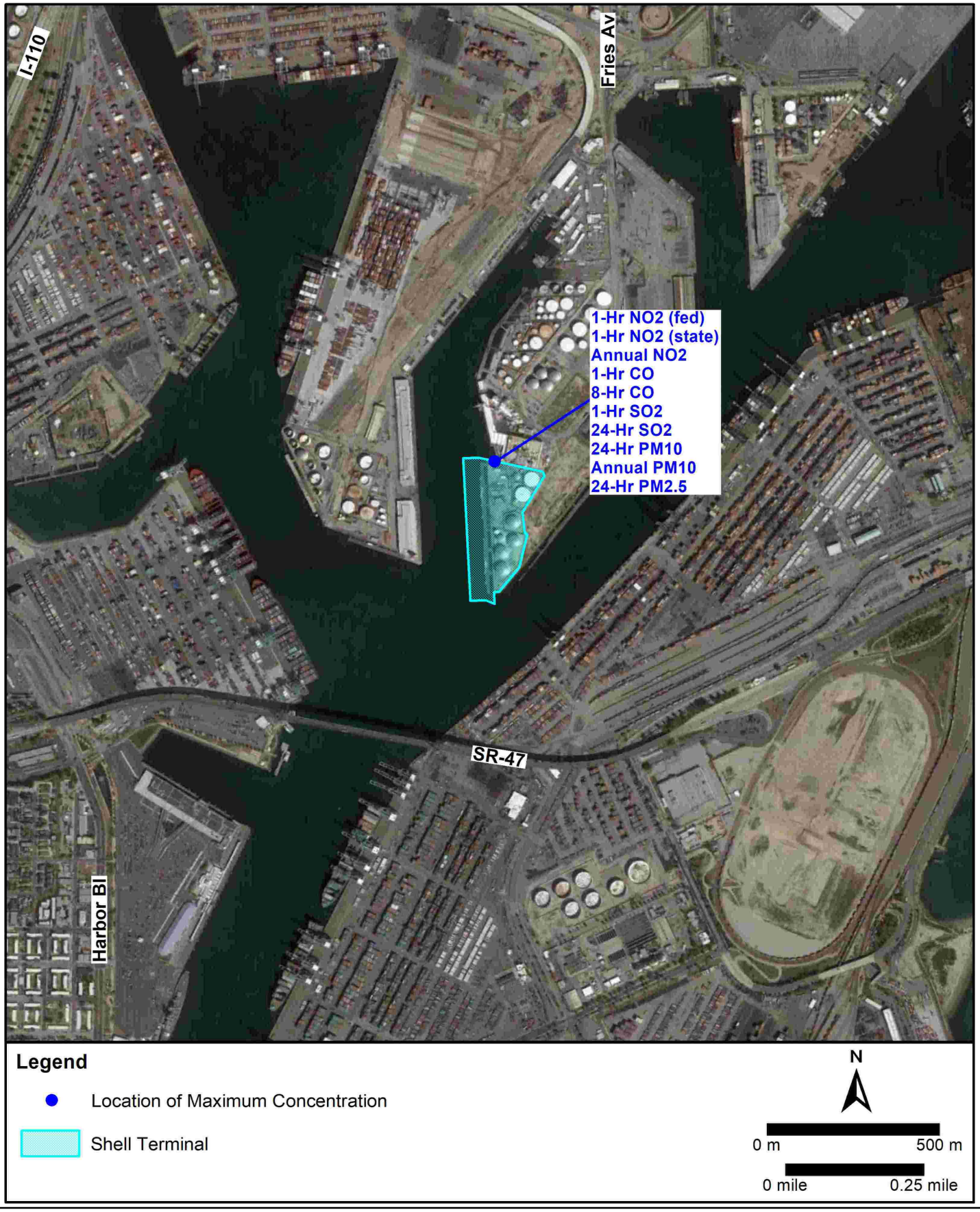
Notes:

[a] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. All other 1-hour, 8-hour, and 24-hour modeled concentrations represent the maximum concentrations.

[b] The background concentrations for NO_2, SO_2, and CO were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

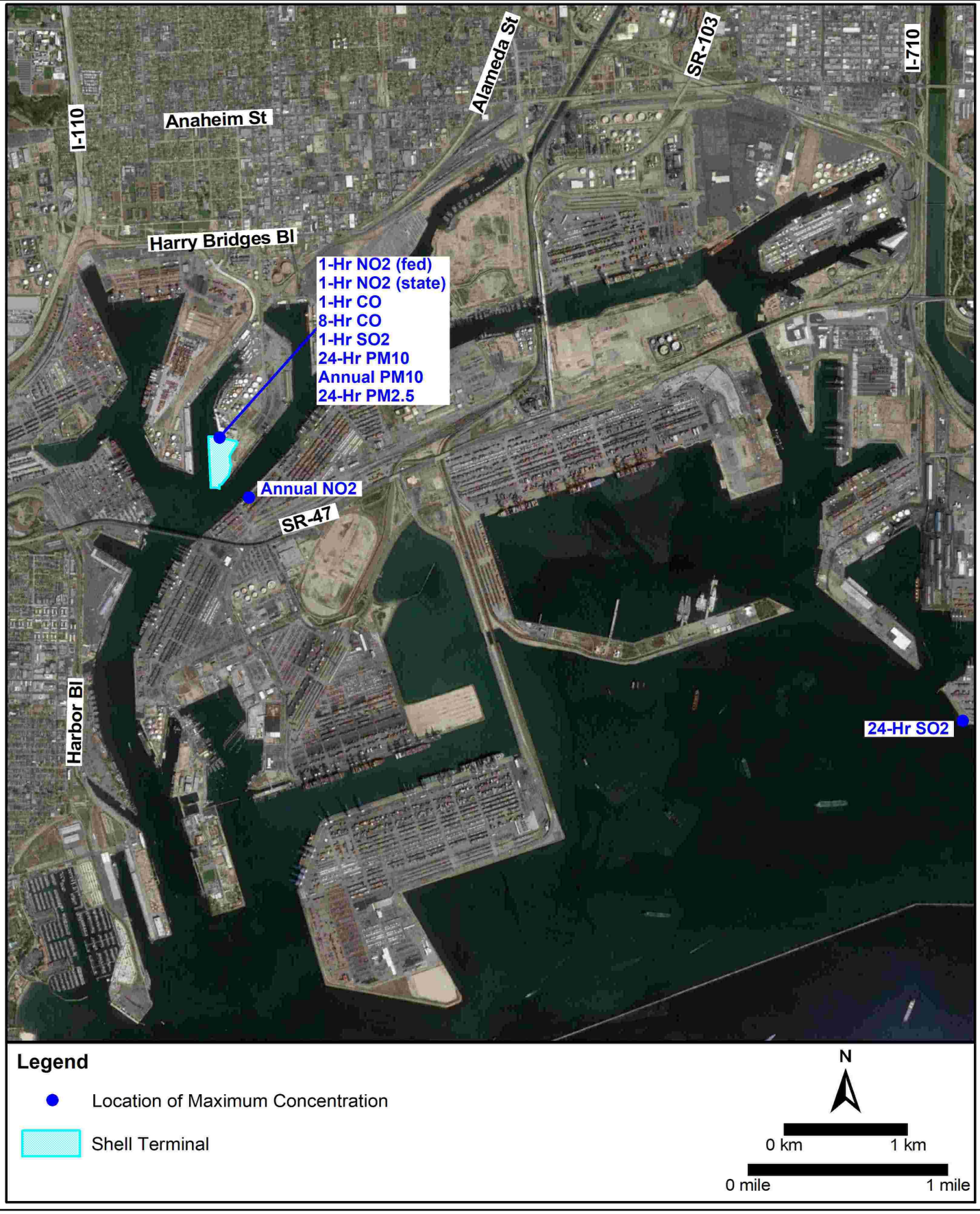
[c]The *Modeled Project Concentration Increment* represents the modeled concentration of the Reduced Project (construction and operation during the construction period) minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

[d]The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Project Concentration Increment*. Exceedances of the thresholds are indicated in ***bold/italic*.**



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-11
Maximum Air Quality Impact Locations – Reduced Project Alternative Construction without Mitigation
Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-12
Maximum Air Quality Impact Locations – Reduced Project Alternative
Combined Construction and Operation without Mitigation

Table B2-13: Maximum Off-site PM_{10} and $PM_{2.5}$ Concentrations—Reduced Project Alternative Combined Construction and Operation without Mitigation

Pollutant	Averaging Time	Maximum Concentration CEQA Increment (µg/m³)[a,b]	SCAQMD Threshold (µg/m³)	CEQA Increment above Threshold?
PM_{10}	24-hour	8.0	10.4	No
	Annual	0.3	1.0	No
$PM_{2.5}$	24-hour	5.2	10.4	No

Notes:

[a]The *Concentration CEQA Increment* represents the modeled concentration of the Reduced Project (construction and operation during the construction period) minus the modeled concentration of the CEQA baseline (operations only).

[b]Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the *Maximum Concentration CEQA Increment*.

Construction alone, with mitigation. Table B2-14 presents the maximum off-site total concentrations of NO_2, SO_2, and CO from construction, with application of mitigation measures MM AQ-1 through MM AQ-4. The table shows that the federal and state 1-hour NO_2 concentrations would be reduced but would continue to exceed the thresholds. The annual NO_2 concentration and all SO_2 and CO concentrations would remain less than the thresholds. PM_{10} and $PM_{2.5}$ concentrations were not modeled with mitigation because they were shown to be less than significant without mitigation.

Figure B2-13 shows the maximum air quality impact locations for mitigated Reduced Project Alternative construction.

Concurrent construction and terminal operation, with mitigation. Table B2-15 presents the maximum off-site total concentrations of NO_2, SO_2, and CO from concurrent construction and terminal operation, with application of mitigation measures MM AQ-1 through MM AQ-4. The table shows that the federal and state 1-hour NO_2 concentrations would be reduced but would continue to exceed the thresholds. The annual NO_2 concentration and all SO_2 and CO concentrations would remain less than the thresholds. PM_{10} and $PM_{2.5}$ concentrations were not modeled with mitigation because they were shown to be less than significant without mitigation.

Figure B2-14 shows the maximum air quality impact locations for mitigated Reduced Project Alternative concurrent construction and operation.

Table B2-14: Maximum Off-site NO_2, SO_2, and CO Concentrations— Reduced Project Alternative Construction with Mitigation

Pollutant	Averaging Time	Background Concentration (µg/m^3)[b]	Maximum Modeled Concentration of Reduced Project (µg/m^3)	Total Concentration (µg/m^3)[c]	SCAQMD Threshold (µg/m^3)	Total Concentration above Threshold?
NO2	Federal 1-hour[a]	123	188	*311*	188	*Yes*
	State 1-hour	164	322	*486*	339	*Yes*
	Annual	32	4.7	37	57	No
SO2	Federal 1-hour	45	1.7	47	197	No
	State 1-hour	105	1.7	107	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	1,351	5,828	23,000	No
	8-hour	2,870	346	3,216	10,000	No

Notes:

[a] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. All other 1-hour, 8-hour, and 24-hour modeled concentrations represent the maximum concentrations.

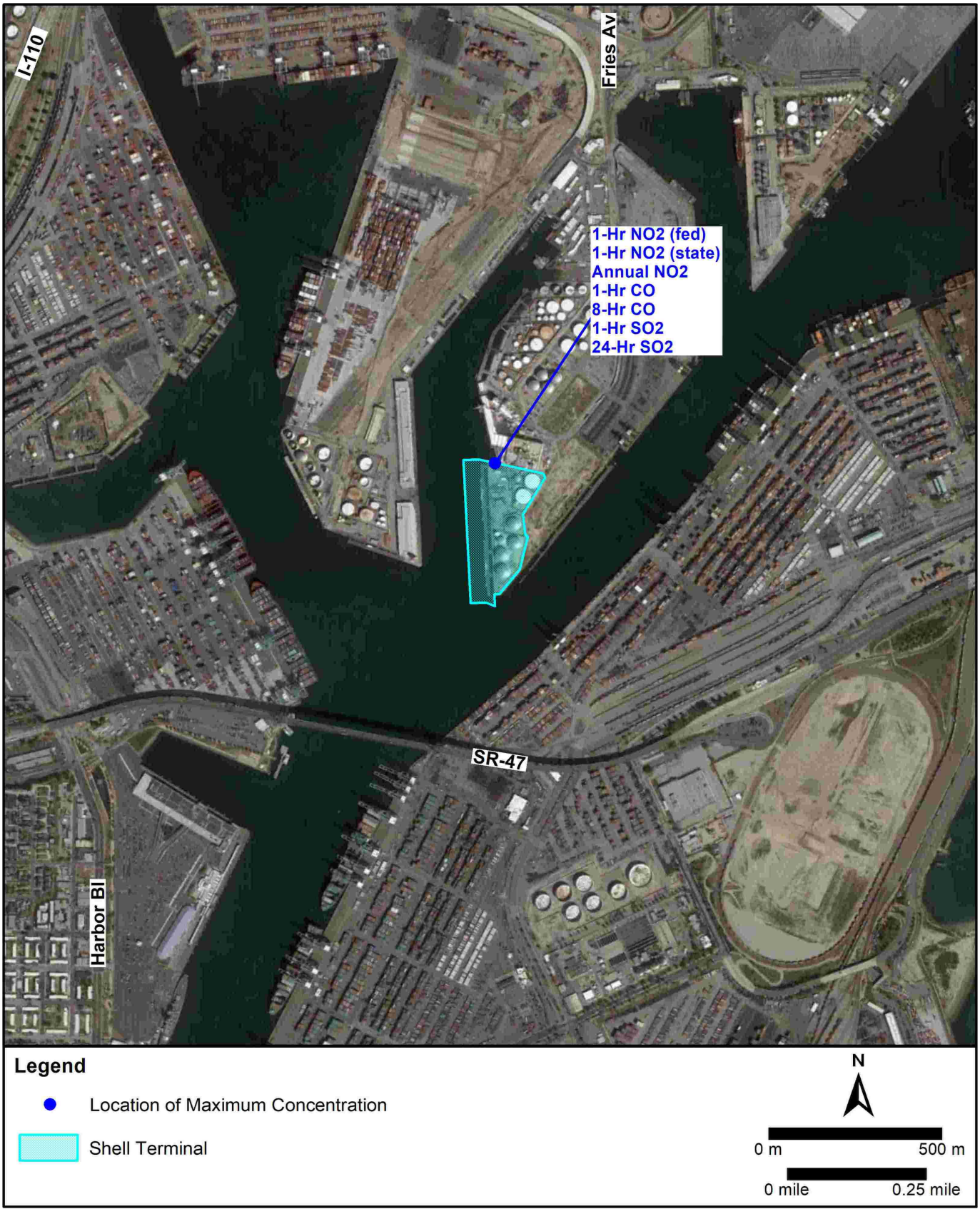
[b] The background concentrations for NO_2, SO_2, and CO were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[c]The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Concentration of Reduced Project*. Exceedances of the thresholds are indicated in ***bold/italic***.

Table B2-15: Maximum Off-site NO_2, SO_2, and CO Concentrations—Reduced Project Alternative Combined Construction and Operation with Mitigation

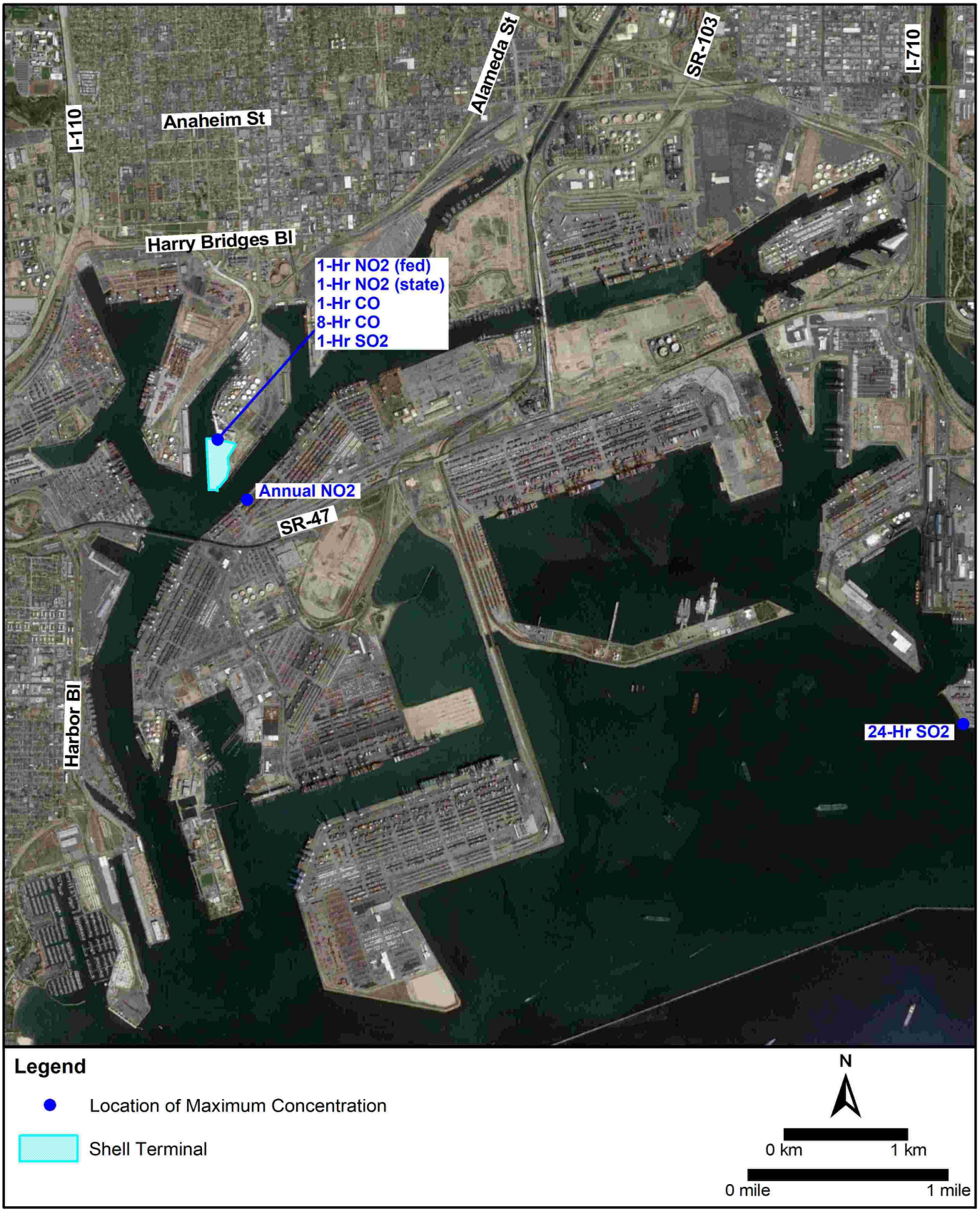
Pollutant	Averaging Time	Background Concentration (µg/m³)[b]	Maximum Modeled Project Concentration Increment(µg/m³)[c]	Total Concentration (µg/m³)[d]	SCAQMD Threshold (µg/m³)	Total Concentration above Threshold?
NO2	Federal 1-hour[a]	123	148	*271*	188	*Yes*
	State 1-hour	164	282	*446*	339	*Yes*
	Annual	32	3.7	36	57	No
SO2	Federal 1-hour	45	5.6	51	197	No
	State 1-hour	105	5.6	111	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	1,349	5,826	23,000	No
	8-hour	2,870	343	3,213	10,000	No

Notes:
[a] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. All other 1-hour, 8-hour, and 24-hour modeled concentrations represent the maximum concentrations.
[b] The background concentrations for NO_2, SO_2, and CO were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).
[c] The *Modeled Project Concentration Increment* represents the modeled concentration of the Reduced Project (construction and operation during the construction period) minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).
[d]The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Project Concentration Increment*. Exceedances of the thresholds are indicated in ***bold/italic*.**



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-13
Maximum Air Quality Impact Locations – Reduced Project Alternative Construction with Mitigation
Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-14
Maximum Air Quality Impact Locations – Reduced Project Alternative
Combined Construction and Operation with Mitigation

1.7.2 Operational Impacts

Operational impacts were evaluated for the proposed Project without mitigation; Reduced Project Alternative without mitigation, and No Project Alternative. Mitigation measures are not required for the operational impacts.

1.7.2.1 Proposed Project

Table B2-16 presents the maximum off-site total concentrations of NO_2, by analysis year, from operational activities without mitigation. The concentrations represent the increment concentrations (project operation minus CEQA baseline operation) plus background concentrations. The table shows that the maximum off-site NO_2 concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years. Moreover, the expected penetration of Tier 3 vessels into the tanker fleet would result in less-than-zero federal and state 1-hour NO_2 concentration increments by 2048, indicating that the 2048 project concentrations would be less than the baseline concentrations.

Table B2-17 presents the maximum off-site total concentrations of SO_2 and CO from operational activities without mitigation. The concentrations represent the increment concentrations (project operation minus CEQA baseline operation) plus background concentrations. Because prior Port projects have shown that SO_2 and CO are unlikely to exceed the significance thresholds, a conservative screening approach was used where all AERMOD sources were modeled with their maximum emissions even if they would occur in different analysis years. The table shows that the maximum off-site SO_2 and CO concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years.

Table B2-18 presents the maximum off-site CEQA increment concentrations of PM_{10} and $PM_{2.5}$, by analysis year, from operational activities without mitigation. The concentrations represent project operation minus CEQA baseline operation. Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the increment concentrations. The table shows that the maximum off-site incremental PM_{10} and $PM_{2.5}$ concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years.

Figure B2-15 shows the maximum air quality impact locations for unmitigated proposed Project operation.

Table B2-16: Maximum Off-site NO2 Concentrations—Proposed Project Operation without Mitigation

Pollutant	Averaging Time	Analysis Year	Background Concentration (ug/m3)[b]	Maximum Modeled Project Concentration Increment (ug/m3)[c]	Total Concentration (ug/m3)[d]	SCAQMD Threshold (ug/m3)	Total Concentration Above Threshold?
NO2	Federal 1-hour[a]	2019	123	23.5	147	188	No
		2031	123	9.8	133	188	No
		2048	123	<0	123	188	No
	State 1-hour	2019	164	25.4	189	339	No
		2031	164	14.5	178	339	No
		2048	164	<0	164	339	No
	Annual	2019	32	1.7	34	57	No
		2031	32	0.9	33	57	No
		2048	32	2.2	34	57	No

Notes:

a The federal 1-hour NO2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. The state 1-hour NO2 modeled concentration represents the maximum concentration.

b The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

c The *Modeled Project Concentration Increment* represents the modeled concentration of proposed Project operations minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

d The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Project Concentration Increment*.

Table B2-17: Maximum Off-site SO2 and CO Concentrations—Proposed Project Operation without Mitigation

Pollutant	Averaging Time	Background Concentration (ug/m^3)[a]	Maximum Modeled Project Concentration Increment (ug/m^3)[b,c]	Total Concentration (ug/m^3)[d]	SCAQMD Threshold (ug/m^3)	Total Concentration Above Threshold?
SO2	Federal 1-hour	45	6.7	52	197	No
	State 1-hour	105	6.7	112	655	No
	24-hour	13	0.8	14	105	No
CO	1-hour	4,477	16.3	4,493	23,000	No
	8-hour	2,870	2.4	2,872	10,000	No

Notes:

a The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

b The *Modeled Project Concentration Increment* represents the modeled concentration of proposed Project operations minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

c As a conservative screening approach, SO2 and CO concentrations were modeled using a blend of worst case emissions. Maximum emissions by source were modeled together regardless of the analysis year they represent. For example, one source may have been modeled with 2019 emissions, another may have been the modeled 2031 emissions, etc. This approach yields a conservative total maximum concentration.

d The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Project Concentration Increment.*

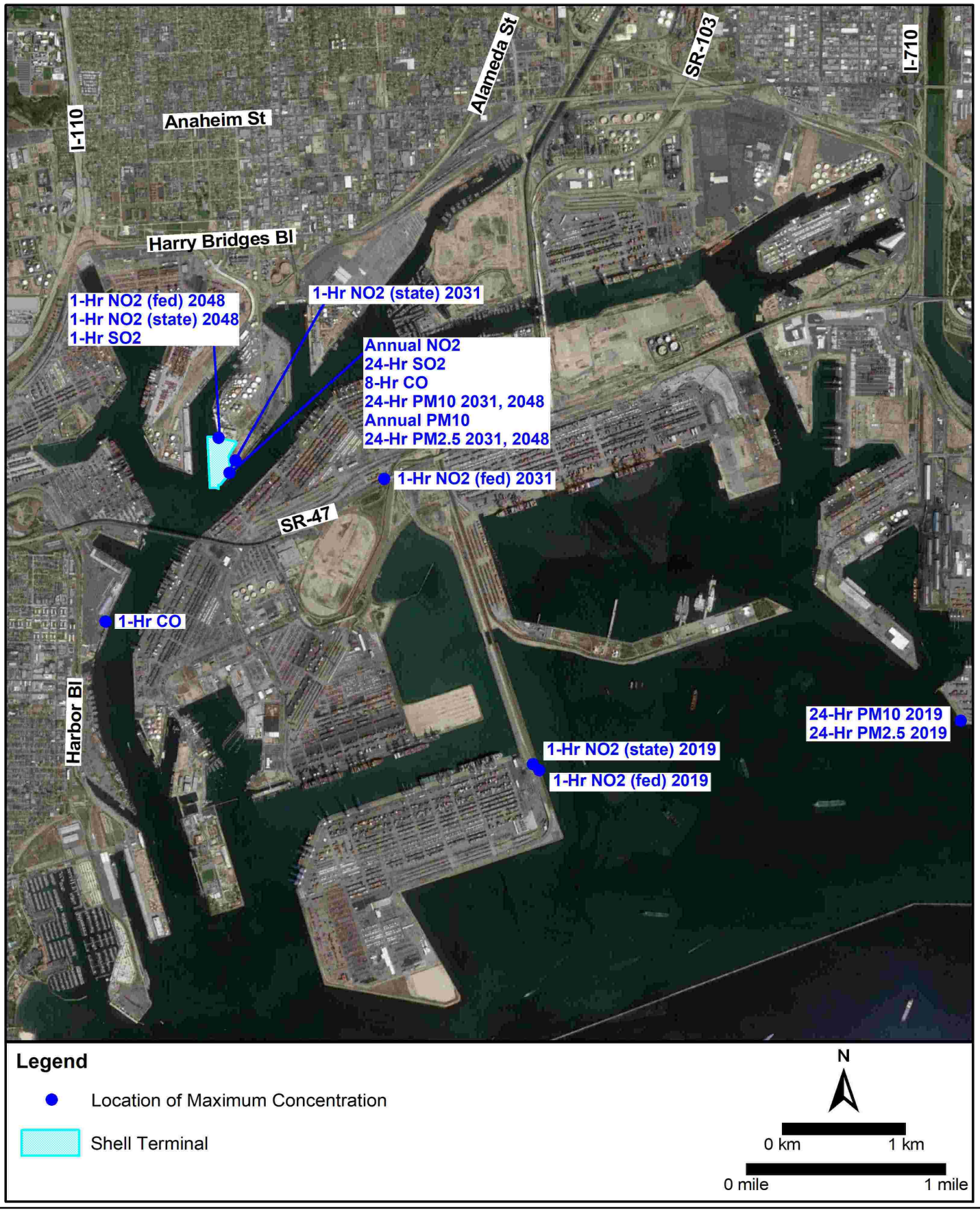
Table B2-18: Maximum Off-site PM10 and PM2.5 Concentrations—Proposed Project Operation without Mitigation

Pollutant	Averaging Time	Analysis Year	Maximum Concentration CEQA Increment (ug/m^3)[a,b]	SCAQMD Threshold (ug/m^3)	CEQA Increment Above Threshold?
PM10	24-hour	2019	0.06	2.5	No
		2031	0.2	2.5	No
		2048	0.2	2.5	No
	Annual	2019	0.05	1.0	No
		2031	0.03	1.0	No
		2048	0.09	1.0	No
PM2.5	24-hour	2019	0.05	2.5	No
		2031	0.2	2.5	No
		2048	0.2	2.5	No

Notes:

a The *Concentration CEQA Increment* represents the modeled concentration of proposed Project operations minus the modeled concentration of CEQA baseline operations.

b Because the thresholds for PM10 and PM2.5 are incremental thresholds, background concentrations are not added to the *Maximum Concentration CEQA Increment*.



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-15
Maximum Air Quality Impact Locations – Proposed Project Operation without Mitigation
Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project

1.7.2.2 Reduced Project Alternative

Table B2-19 presents the maximum off-site total concentrations of NO_2, by analysis year, from operational activities without mitigation. The concentrations represent the increment concentrations (project operation minus CEQA baseline operation) plus background concentrations. The table shows that the maximum off-site NO_2 concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years.

Table B2-20 presents the maximum off-site total concentrations of SO_2 and CO from operational activities without mitigation. The concentrations represent the increment concentrations (project operation minus CEQA baseline operation) plus background concentrations. Because prior Port projects have shown that SO_2 and CO are unlikely to exceed the significance thresholds, a conservative screening approach was used where all AERMOD sources were modeled with their maximum emissions even if they would occur in different analysis years. The table shows that the maximum off-site SO_2 and CO concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years.

Table B2-21 presents the maximum off-site CEQA increment concentrations of PM_{10} and $PM_{2.5}$, by analysis year, from operational activities without mitigation. The concentrations represent project operation minus CEQA baseline operation. Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the increment concentrations. The table shows that the maximum off-site incremental PM_{10} and $PM_{2.5}$ concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years.

Figure B2-16 shows the maximum air quality impact locations for unmitigated Reduced Project Alternative operation.

Table B2-19: Maximum Off-site NO2 Concentrations—Reduced Project Alternative Operation without Mitigation

Pollutant	Averaging Time	Analysis Year	Background Concentration (ug/m^3)[b]	Maximum Modeled Project Concentration Increment (ug/m^3)[c]	Total Concentration (ug/m^3)[d]	SCAQMD Threshold (ug/m^3)	Total Concentration Above Threshold?
NO2	Federal 1-hour[a]	2019	123	23.5	147	188	No
		2031	123	9.8	133	188	No
		2048	123	1.4	124	188	No
	State 1-hour	2019	164	25.4	189	339	No
		2031	164	11.4	175	339	No
		2048	164	7.9	172	339	No
	Annual	2019	32	1.7	34	57	No
		2031	32	0.7	33	57	No

Notes:

a The federal 1-hour NO2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. The state 1-hour NO2 modeled concentration represents the maximum concentration.

b The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

c The *Modeled Project Concentration Increment* represents the modeled concentration of Reduced Project operations minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

d The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Project Concentration Increment*.

Table B2-20: Maximum Off-site SO2 and CO Concentrations—Reduced Project Alternative Operation without Mitigation

Pollutant	Averaging Time	Background Concentration (ug/m^3)[a]	Maximum Modeled Project Concentration Increment (ug/m^3)[b,c]	Total Concentration (ug/m^3)[d]	SCAQMD Threshold (ug/m^3)	Total Concentration Above Threshold?
SO2	Federal 1-hour	45	6.7	52	197	No
	State 1-hour	105	6.7	112	655	No
	24-hour	13	0.8	14	105	No
CO	1-hour	4,477	15.7	4,493	23,000	No
	8-hour	2,870	2.5	2,872	10,000	No

Notes:

a The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

b The *Modeled Project Concentration Increment* represents the modeled concentration of Reduced Project operations minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

c As a conservative screening approach, SO2 and CO concentrations were modeled using a blend of worst case emissions. Maximum emissions by source were modeled together regardless of the analysis year they represent. For example, one source may have been modeled with 2019 emissions, another may have been the modeled 2031 emissions, etc. This approach yields a conservative total maximum concentration.

d The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled Project Concentration Increment.*

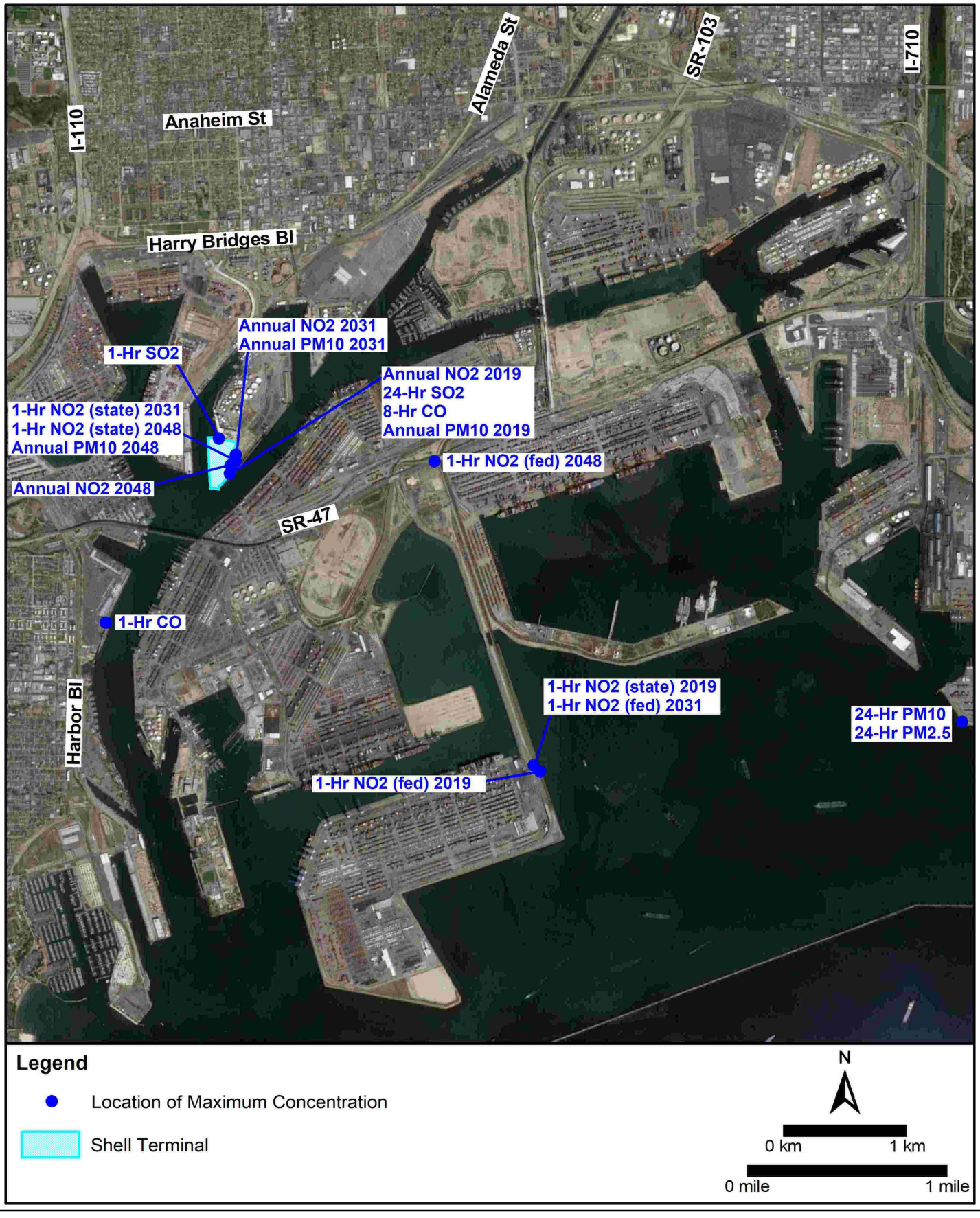
Table B2-21: Maximum Off-site PM10 and PM2.5 Concentrations—Reduced Project Alternative Operation without Mitigation

Pollutant	Averaging Time	Analysis Year	Maximum Concentration CEQA Increment (ug/m^3)[a,b]	SCAQMD Threshold (ug/m^3)	CEQA Increment Above Threshold?
PM10	24-hour	2019	0.06	2.5	No
		2031	0.06	2.5	No
		2048	0.06	2.5	No
	Annual	2019	0.05	1.0	No
		2031	0.03	1.0	No
		2048	0.09	1.0	No
PM2.5	24-hour	2019	0.05	2.5	No
		2031	0.05	2.5	No
		2048	0.05	2.5	No

Notes:

a The *Concentration CEQA Increment* represents the modeled concentration of Reduced Project operations minus the modeled concentration of CEQA baseline operations.

b Because the thresholds for PM10 and PM2.5 are incremental thresholds, background concentrations are not added to the *Maximum Concentration CEQA Increment*.



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-16
Maximum Air Quality Impact Locations – Reduced Project Alternative Operation without Mitigation
Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project

1.7.2.3 No Project Alternative

Table B2-22 presents the maximum off-site total concentrations of NO_2, by analysis year, from No-Project operational activities. The concentrations represent the increment concentrations (No-Project operation minus CEQA baseline operation) plus background concentrations. The table shows that the maximum off-site NO_2 concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years.

Table B2-23 presents the maximum off-site total concentrations of SO_2 and CO from No-Project operational activities. The concentrations represent the increment concentrations (No-Project operation minus CEQA baseline operation) plus background concentrations. Because prior Port projects have shown that SO_2 and CO are unlikely to exceed the significance thresholds, a conservative screening approach was used where all AERMOD sources were modeled with their maximum emissions even if they would occur in different analysis years. The table shows that the maximum off-site SO_2 and CO concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years.

Table B2-24 presents the maximum off-site CEQA increment concentrations of PM_{10} and $PM_{2.5}$, by analysis year, from No-Project operational activities. The concentrations represent No-Project operation minus CEQA baseline operation. Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the increment concentrations. The table shows that the maximum off-site incremental PM_{10} and $PM_{2.5}$ concentrations from operational activities would be less than the SCAQMD thresholds for all averaging times and analysis years.

Figure B2-17 shows the maximum air quality impact locations for No Project Alternative operation.

Table B2-22: Maximum Off-site NO2 Concentrations—No Project Alternative Operation

Pollutant	Averaging Time	Analysis Year	Background Concentration (ug/m^3)[b]	Maximum Modeled No-Project Concentration Increment (ug/m^3)[c]	Total Concentration (ug/m^3)[d]	SCAQMD Threshold (ug/m^3)	Total Concentration Above Threshold?
NO2	Federal 1-hour[a]	2019	123	24.3	147	188	No
		2023	123	24.3	147	188	No
	State 1-hour	2019	164	25.6	190	339	No
		2023	164	25.6	190	339	No
	Annual	2019	32	0.6	33	57	No
		2023	32	0.2	32	57	No

Notes:

a The federal 1-hour NO2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. The state 1-hour NO2 modeled concentration represents the maximum concentration.

b The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

c The *Modeled No-Project Concentration Increment* represents the modeled concentration of No-Project operations minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

d The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled No-Project Concentration Increment*.

Table B2-23: Maximum Off-site SO2 and CO Concentrations—No Project Alternative Operation

Pollutant	Averaging Time	Background Concentration (ug/m^3)[a]	Maximum Modeled No-Project Concentration Increment (ug/m^3)[b,c]	Total Concentration (ug/m^3)[d]	SCAQMD Threshold (ug/m^3)	Total Concentration Above Threshold?
SO2	Federal 1-hour	45	1.6	47	197	No
	State 1-hour	105	1.6	107	655	No
	24-hour	13	0.1	13	105	No
CO	1-hour	4,477	15.8	4,493	23,000	No
	8-hour	2,870	2.0	2,872	10,000	No

Notes:

a The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

b The *Modeled No-Project Concentration Increment* represents the modeled concentration of No-Project operations minus the modeled concentration of existing terminal operations (i.e., CEQA baseline operations).

c As a conservative screening approach, SO2 and CO concentrations were modeled using a blend of worst case emissions. Maximum emissions by source were modeled together regardless of the analysis year they represent. For example, one source may have been modeled with 2019 emissions, another may have been the modeled 2023 emissions, etc. This approach yields a conservative total maximum concentration.

d The *Total Concentration* equals the *Background Concentration* plus the *Maximum Modeled No-Project Concentration Increment.*

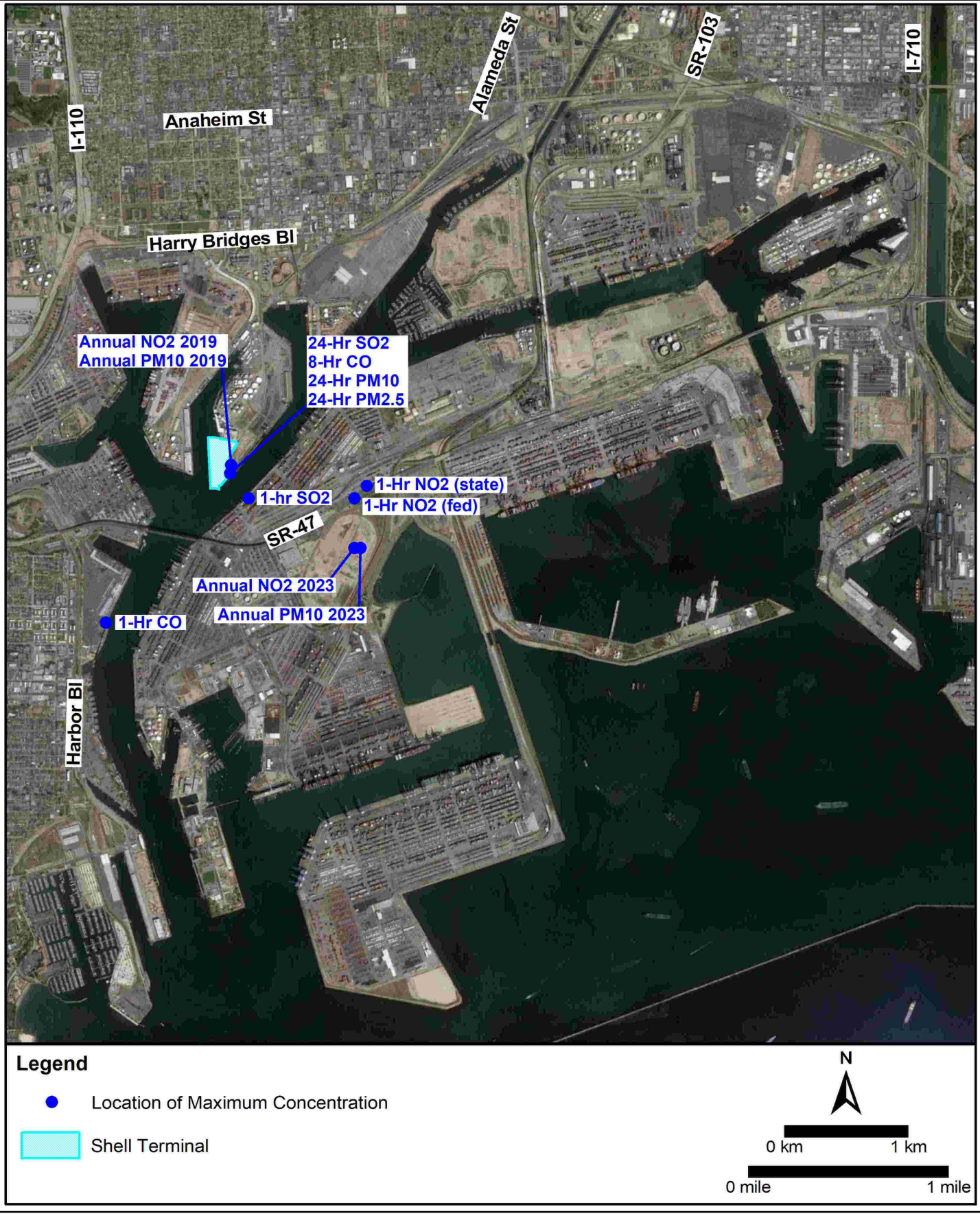
Table B2-24: Maximum Off-site PM10 and PM2.5 Concentrations—No Project Alternative Operation

Pollutant	Averaging Time	Analysis Year	Maximum Concentration CEQA Increment (ug/m^3)[a,b]	SCAQMD Threshold (ug/m^3)	CEQA Increment Above Threshold?
PM10	24-hour	2019	0.2	2.5	No
		2023	0.2	2.5	No
	Annual	2019	0.02	1.0	No
		2023	0.009	1.0	No
PM2.5	24-hour	2019	0.2	2.5	No
		2023	0.2	2.5	No

Notes:

a The *Concentration CEQA Increment* represents the modeled concentration of No-Project operations minus the modeled concentration of CEQA baseline operations.

b Because the thresholds for PM10 and PM2.5 are incremental thresholds, background concentrations are not added to the *Maximum Concentration CEQA Increment*.



Source: Castle Environmental Consulting, LLC, 2018

Figure B2-17
Maximum Air Quality Impact Locations – No Project Alternative Operation
Berths 167-169 [Shell] Marine Oil Terminal Wharf Improvements Project

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