Section 3.8
Hydrology and Water Quality

SECTION SUMMARY

This section presents the existing hydrology and water quality associated with the project site and discusses potential impacts from the proposed project. An analysis of potential impacts to hydrology and water quality associated with the alternatives is detailed in Chapter 4 Analysis of Alternatives.

Section 3.8 Hydrology and Water Quality provides the following:

- A description of existing hydrological and water quality setting in the project site and immediate area;
- A discussion on the methodology and thresholds used to determine whether the proposed project would result in a significant impact to hydrology and water quality;
- An impact analysis of the proposed project associated with hydrology and water quality;
- A description of any Conditions of Approval that the City would impose, or mitigation measures proposed to reduce any potential impacts and residual impacts (i.e., impacts remaining after mitigation), if applicable;
- An analysis of potential cumulative impacts associated with hydrology and water quality;
- A summary of hydrology and water quality impact determinations associated with the proposed project, cumulative growth, and mitigation measures; and
- A description of significant unavoidable impacts associated with hydrology and water quality, if any.

Key Points of Section 3.8:

The aquatic portion of the proposed project is located in a water body that has identified water quality impairments (bacteria, toxics, and debris) under the Clean Water Act Section 303; however, construction and operation of the proposed project, with implementation of mitigation measures and compliance with applicable permitting measures, would not further contribute to degradation of water quality. During construction best management practices (BMPs) associated with the stormwater water pollution prevention plan (SWPPP) and regulatory permits would ensure that the potential to impact water quality would be less than significant. During operations, the site would comply with low impact development (LID) requirements required by the National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm System (MS4) Permit (Order No. R4-2012-0175 NPDES Permit No. CAS004001). Additionally, implementation of the proposed project would reduce the amount of paved surfaces currently at the project site; the imperviousness of the site would decrease from to 79 percent to 64 percent.

The types of water quality impacts that could occur during construction for activities within the water include short-term increase in turbidity, suspended sediments, and decreases in dissolved oxygen concentrations. These changes to water quality would be temporary and localized to the construction area. In particular, in-water construction activities (such as dredging and pile driving) may lead to a localized reduction of water

quality. Dredging for the proposed project would require a Section 404 permit from the U.S. Army Corps of Engineers (USACE) and a Section 401 (of the Clean Water Act) Water Quality Certification from the Los Angeles Regional Water Quality Control Board (LARWQCB). The Water Quality Certification would specify receiving water monitoring requirements, which include measurements of water quality parameters such as dissolved oxygen, light transmittance (turbidity), pH, and suspended solids at varying distances from the dredging operations. These impacts would be temporary and localized and would not result in violations of water quality standards or waste discharge requirements or otherwise substantially degrade water quality; therefore, impacts are less than significant. Section 3.3 Biological Resources, discusses potential turbidity impacts that could affect marine organisms.

The proposed project would open the Seaside Lagoon to King Harbor, consequently the existing NPDES discharge permit for the facility would no longer be required. Cooling water from the AES power generating station (AES power plant) that currently serves as the water for the facility would be replaced with tidal flows from the harbor. This would eliminate water quality requirements currently imposed on the facility, including addressing total suspended solids (TSS). The water exchange time for the area within the proposed breakwater entrance, including Seaside Lagoon and the area that is outside of the lagoon but inside of the breakwater entrance, would be approximately 20 hours, which would be much shorter than the exchange time for the three existing marina basins of King Harbor. A shorter water exchange time can potentially lead to better water quality. The results indicate that the proposed project components would have a less than significant impact to the overall water quality within King Harbor. The water residence time for the project area would be less than two days, which would be shorter than most regions of King Harbor.

The proposed project would place structures within a 100-year flood hazard as defined by the Federal Emergency Management Agency (FEMA), however these structures would not impede flood flows and the finished floor elevations of new buildings would be well above the 100-year flood hazard level.

The project site is located within a tsunami-induced inundation zone for a tsunami originating in the coastal waters of California according to the California Governor's Office of Emergency Services. Implementation of the proposed project would increase the elevation of a portion of the northern portion of the project site, which would reduce, to some degree, the potential for hazards and damage associated with a future tsunami or seiche event compared to existing conditions; however, with revitalization of the project site, including the net increase in building area and the increase in activities at, and patronage of, the project site, there is also the potential of more people being present at the project site, and at risk, should a major tsunami or seiche occur in the future. The City has developed an emergency evacuation route and other emergency procedures for its coastal areas to address potential risks associated with tsunamis. The following mitigation measure would further reduce potential exposure impacts:

MM HWQ-1: Tsunami/Seiche Awareness Notification Program

The following shall be implemented on-site to reduce risks associated with tsunami:

1. Signage shall be provided throughout the project area, showing the designated tsunami emergency evacuation route.

2. A public address system audible at both northern and southern locations of the site shall be installed and used to inform the public of evacuation order or emergency procedures in the event a tsunami warning or alert is issued. Contact information for the on-site management office with access to the public address system shall be provided to the Redondo Beach Fire Department and provided for

inclusion in City tsunami preparation/emergency response procedure manuals.

3. A tsunami evacuation map and a copy of any City tsunami preparation/emergency response procedure manuals shall be kept in the on-site management office at all times.

4. Tsunami preparedness training shall be provided to on-site security personnel.

5. Additional information, such as brochures and signage, promoting tsunami awareness and providing the website to the City's emergency preparedness website shall also be made available at the project site.

With implementation of mitigation measure MM HWQ-1, impacts associated with people potentially being exposed to a tsunami or seiche at the project site would be reduced; however, due to natural uncertainties of such an event occurring in the future, it is not possible to conclude that the associated risks would be fully mitigated. As such, the residual impact associated with tsunami or seiche exposure is considered to be significant and unavoidable.

The northern segment of the protective revetment/wall landward of the Horseshoe Pier is vulnerable to wave overtopping under the annually occurring wave condition. This would continue to occur under the proposed project and could result in inundation of the new building located along the proposed boardwalk. The following mitigation measures would be implemented to reduce impacts associated possible inundation associated with wave uprush:

MM HWQ-2: Wave Uprush Protection

A four-foot high recurved splash wall shall be placed within the existing revetment at the seaward edge of the boardwalk to redirect up-rushed water back toward the ocean (as shown in Figure 3.8-16 of the Waterfront Draft EIR), or other wave uprush protection that prevents inundation from occurring at the buildings and pedestrian boardwalk located landward of the northern portion of the Horseshoe (Municipal) Pier (just to the north and south of Kincaid's restaurant) shall be installed, subject to California Coastal Commission recommendations and approval, prior to certificates of occupancy for the buildings. The top of the splash wall shall be level with the finished grade of the boardwalk.

With implementation of mitigation measure MM HWQ-2, possible inundation associated with wave uprush would reduce this impact to less than significant. The boardwalk along the perimeter of Seaside Lagoon and Basin 3 are also currently subject to wave overtopping during storm conditions. This would continue under the proposed project; however, as no structures are located within this area and no increase in the number of people are likely to be present at these locations during storm conditions, the impact is less than significant.

Sea level rise is expected to occur in coastal waters, however the exact extent and timing is unknown. The future sea level rise projections recommended by the California Ocean Protection Council (COPC) represents a range of high, mid-level, and low projections. Based on the range, a potential sea level rise of between 0.23 feet to 1.1 feet could occur by Year 2040 and 0.99 feet to 4.5 feet by Year 2090. Sea level rise would increase the potential for wave overtopping to occur. Notwithstanding that there are many unknowns associated with sea level rise, impacts are considered significant and the following mitigation measure is recommended to reduce impacts to less than significant:

MM HWQ-3: Sea Level Rise Adaption Plan

The Applicant shall every 10 years from the first Certificate of Occupancy issued for the proposed project, review information from the National Oceanographic and Atmospheric Administration's (NOAA) tide measurement at the Santa Monica tide gauge and the recorded sea level rise trend, as well as pertinent literature that updates the sea level rise trend, to determine if sea level rise at the project site is trending toward the high, mid-level or low projections recommended by the Californian Ocean Protection Council (COPC). If the review of information shows that trend is consistent with the high projections of the COPC, than the Applicant shall design and implement a supplemental feature, such as a parapet adaptation to (and on top of) the proposed recurved splash wall or a raised splash wall to respond to sea level rise under the high projection trend (see Figure 3.8-17 of the Waterfront Draft EIR). If the future sea level rise shows an accelerating trend, the construction of such adaptations may then be implemented at an appropriate time in the future.

3.8.1 Introduction

This section provides an overview of the existing surface water hydrology and water quality within the project site and immediate area, the regulatory framework, an analysis of potential hydrology and water quality impacts with regards to these resources that would result from implementation of the proposed project, the level of significance of potential impacts on hydrology and water quality, and mitigation measures where appropriate. The analysis of the surface water hydrology incorporates information from the *Summary of Hydrology Design Intent* prepared in conjunction with Psomas (July 2015), included as Appendix I1 of this Draft EIR. The analysis of groundwater quality incorporates information from the Phase I Environmental Assessment (EA) (2015) prepared in conjunction with SCS Engineers and included in Appendix H. The analysis of water quality within King Harbor incorporates information from the *Water Circulation and Water Quality Impacts Memorandum* prepared in conjunction with Noble Consultants, Inc. (May 7, 2015), included as Appendix I2 of this Draft EIR and the *Biological Resources Assessment to Support the Redondo Beach Waterfront Revitalization Project* prepared by Merkel & Associates, Inc. (July 2015) included as Appendix D1 of this Draft EIR. The analysis of wave uprush and sea level rise is based on the *Sea Level Rise and Wave Uprush Assessment* prepared in conjunction with Noble Consultants, Inc. (August 2015) included as Appendix I3 of this Draft EIR**.** Some of the analyses in this chapter extend beyond the traditional requirements of CEQA, and have been included to address provisions contained in City's Coastal Land Use Plan.

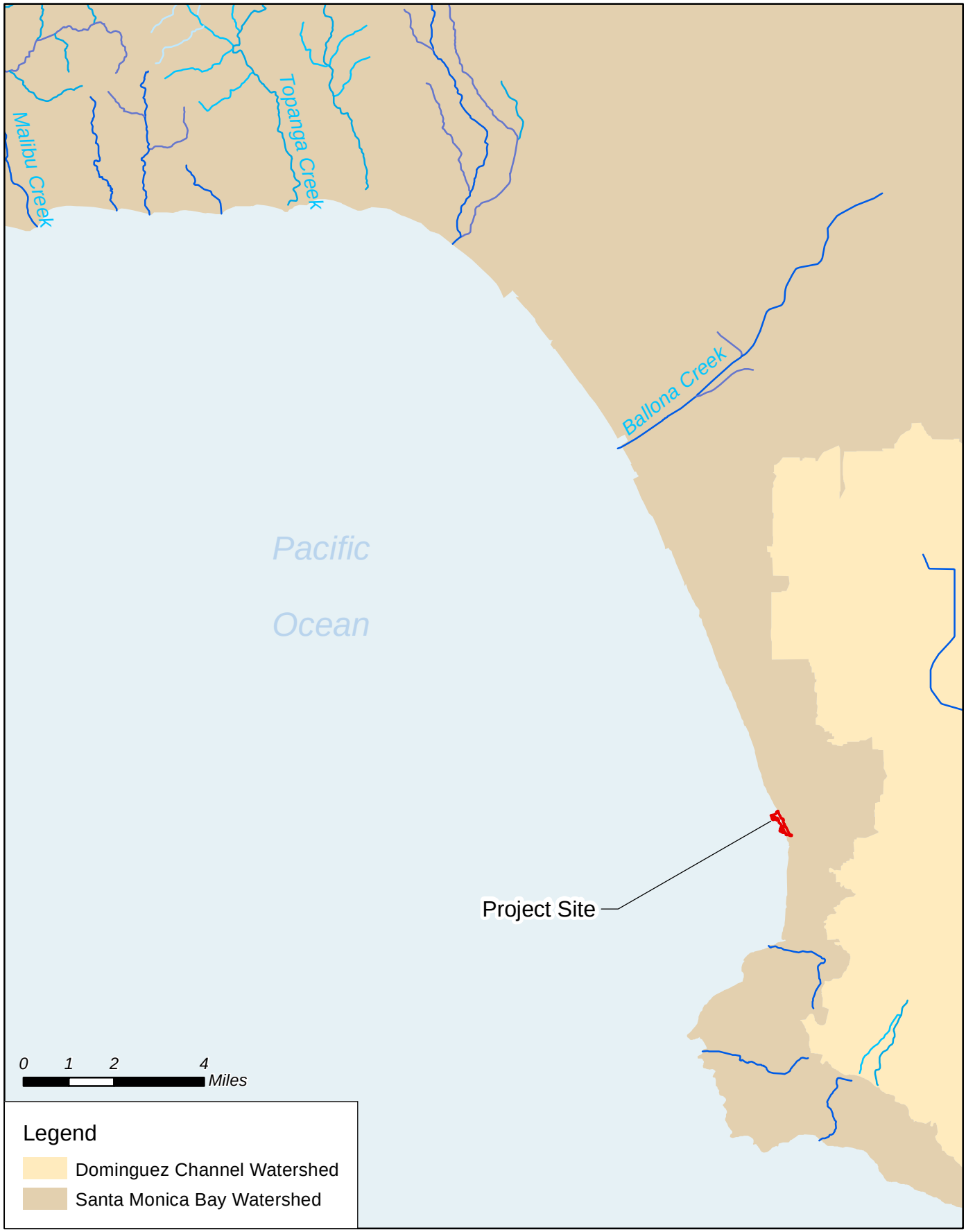
As discussed in the Initial Study, provided in Appendix A of this Draft EIR, the proposed project would not deplete groundwater or interfere with groundwater recharge, nor would it place housing within a 100-year floodplain. Therefore, impacts related to groundwater depletion and recharge of groundwater and placing housing within a 100- year floodplain do not require any further analysis.

3.8.2 Environmental Setting

3.8.2.1 Regional Setting

Surface Water Hydrology

As shown on Figure 3.8-1, the project site is located in the southern portion of the Santa Monica Bay Watershed and bounded by Dominguez Channel Watershed to the east. Santa Monica Bay Watershed encompasses approximately 400 square miles with 27 subwatersheds, extending from the Santa Monica Mountains in the north to Downtown Los Angeles in the East and Palos Verdes in the South. Headwaters originate from the Santa Monica Mountains, where terrain is open and natural, and is conveyed throughout the watershed by Ballona Creek, Malibu Creek, Topanga Creek, and numerous tributaries. In the southern and eastern parts of the watershed, surface water is also generated as runoff and transported through storm drains and channels as these areas are highly urbanized. Santa Monica Bay Watershed flows generally in the southwest direction and discharges at various locations to the Pacific Ocean. East of the project area is Dominguez Channel Watershed, which is a densely urbanized and industrialized portion of the Los Angeles Basin. Surface water is conveyed through Dominguez Channel, but also through a network of storm drains and discharges directly into the Los Angeles Harbor.



Source: Los Angeles County Hydraulic Water Conservation Division & Environmental Programs Division, 2009

Water Quality

Groundwater

Groundwater in the region belongs to the West Coast Basin, a subset of the Los Angeles Coastal Plain that includes 142 square miles of Los Angeles County. The primary aquifer in West Coast Basin is the Silverado aquifer, which comprises the majority of groundwater extracted from this basin. Recharge occurs naturally as subsurface inflow from the adjacent Central Coast Basin. Due to the coastal location of the West Coast Basin, there are two seawater intrusion barriers in place to protect groundwater quality. These barriers are the West Coast Basin Barrier Project, which runs along the coastline from Los Angeles International Airport to Palos Verdes Hills, and the Dominguez Gap Barrier Project, which begins south of the West Coast Basin Barrier Project and ends in Carson. Through the two barriers, water is injected in nearly two hundred injection wells into the Silverado and Lower San Pedro aquifers to prevent groundwater contamination from seawater intrusion.

Surface and Harbor Water Quality

Surface and harbor waters in the region are subject to compliance with multiple total maximum daily loads (TMDLs). The southern portion of Redondo Beach is within the Santa Monica Bay Watershed and the northern portions lies within the Dominguez Channel Watershed. TMDLs have been adopted for the Santa Monica Bay and Dominguez Channel Watersheds. Water quality is considered impaired at the Santa Monica Bay Beaches, Santa Monica Bay, and Dominguez Channel. The Santa Monica Bay Beaches are subject to a bacteria TMDL for dry and wet-weather. Santa Monica Bay is subject to TMDLs for nearshore debris (trash) and toxics (dichloro-diphenyl-trichloroethane [DDT] and polychlorinated biphenyls [PCBs]). Dominguez Channel is subject to TMDLs for toxics and metals (toxicity, DDT, PCBs, chlordane, dieldrin, total copper, total lead, total zinc, and polycyclic aromatic hydrocarbons [PAHs]). For additional information, see Table 3.8-13 in Section 3.8.3.2.

3.8.2.2 Local Setting

The project site is approximately 36 acres and consists of approximately 31.2 acres of land, and approximately 4.8 acres of water. Of the land acreage, 24.2 acres is hardscape and buildings under existing conditions, and seven acres is landscaping and the Seaside Lagoon. The 4.8 water acreage is comprised of Basin 3 [3.5 acres] and the proposed boat ramp area at Mole C [1.3 acres]). Existing improvements within the project site consist primarily of parking structures, surface parking lots, and restaurant, retail and office buildings with minimal landscaping, and the Redondo Beach Marina in Basin 3.

Surface Water Hydrology

The overall impervious area associated with the existing project site is approximately 79 percent of the 31.2 landside acres (Psomas, 2015 [Appendix I1 of this Draft EIR]). Table 3.8-1 provides a breakdown of existing impervious and pervious areas within the project site. The project site currently drains directly to existing drain inlets and catch basins, which connect to existing storm drains that outlet directly to the Pacific Ocean (Santa Monica Bay) or King Harbor.

Table 3.8-1: Summary of Existing Impervious and Pervious Areas Within Project Site

Ground Cover	Area (acres)	Percent Impervious	Percent Pervious
Standard Pavement and Sidewalk	17.4	100	0
Building	4.8	100	0
Landscaping	3.1	0	100
Lagoon	3.9	12	88
Piers	2.0	100	0
Total Overall	**31.2**	**79**	**21**

Source: Psomas, 2015 (Appendix I1 of this Draft EIR)

Two Los Angeles County storm drains cross the northern portion of the project site. The storm drains are 75 inches and 84 inches in diameter. Both are located in Beryl Street. The 75-inch storm drain is aligned along Portofino Way and, just north of the Seaside Lagoon, the alignment changes to the south past the Seaside Lagoon, and then turns west and outlets into the harbor just north of On the Rocks Restaurant. The 84-inch storm drain is aligned along the south side of Harbor Drive, and then crosses the project site to the west and outlets into the harbor at the same location as the 75-inch storm drain. Both storm drains route off-site flows through the project site.

Drainage from the northern portion of the project site drains into King Harbor and Basin 3. Approximately four acres of the northern area discharges into the King Harbor marina, including a portion of the Joe's Crab Shack restaurant site and parking lots east of Portofino Way. The Seaside Lagoon site (4.3 acres) currently sheet flows and comingles directly with the swimming lagoon, which has a pump and filter to recirculate the water. The main central parking lots and restaurants located on the north side of the site, approximately 6.2 acres, drain into catch basins and grate inlets and connect to the existing 84-inch storm drain main. Ultimately, the 84-inch storm drain discharges into the harbor just south of the lagoon. The remainder of the northern portion of the project site and boardwalk (approximately 3.6 acres) discharge through small pipes, 18 inches or less in diameter, directly into the harbor.

Approximately 4.7 acres of the southern portion of the project site drains primarily into deck drains and small pipes ranging in size from 8 inches to 16 inches. These pipes discharge directly to the harbor through the rock revetment on the west side of the parking structure. Approximately 2.2 acres, including the boardwalk, rooftop decks/plazas, and Parcel 10, drain into a grate inlet and discharge directly to the Basin 3. Approximately 4.2 acres, including Torrance Circle to the south, drain into a 36-inch storm drain and into the harbor. A pump station is located adjacent to the drop-off area and collects and discharges water from the lower level of the road and parking structure into the 36-inch storm drain.

Flood Hazards

FEMA has identified and mapped flood hazards to support the National Flood Insurance Program. FEMA considers land that is subject to inundation by a 100-year flood to be a Special Flood Hazard Area. The 100-year flood zone is defined as the land that would be inundated by a flood having a one percent chance of occurring in a given year. According to FEMA's Flood Insurance Rate Maps (FIRMs) for the project site (FIRM Map Nos.

06037C1907F and 06037C1909F), the project site is partially within Zones AE, VE, and X. Zone AE indicates where base flood elevations have been determined. Base flood elevations for the existing site range from seven to 11 feet. Zone VE is defined as areas subject to inundation by the one-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Zone X is defined as areas where there is 0.2 percent chance of an annual flood, areas of one percent annual chance of a flood with average depths of less than 1 foot or with drainage areas of less than one square mile, and areas protected by levees from a one percent annual chance of a flood. Areas in Zones AE, VE, and X are limited to areas within King Harbor, including Basin 3 and the Horseshoe Pier, Sportfishing Pier, and hand launch.

Water Quality

Groundwater

The project site is located on the seaward side of the West Coast Basin Barrier Project, a seawater intrusion barrier, operated by the Los Angeles County Department of Public Works (LACDPW). The barrier follows Prospect Avenue through Redondo Beach. Historically, seawater intrusion occurred in the West Coast Basin as groundwater pumping increased allowing seawater to fill the void left by the extracted groundwater. The barrier is designed to reduce seawater intrusion into the basin and inland groundwater wells by injecting a blend of imported water and recycled to block the seawater from migrating inland (LACDPW, 2015). As a result of the location of the seawater barriers, groundwater on the seaward side of barrier is not extracted.

Groundwater levels at the project site are estimated to be equivalent to the tidal level in the harbor. As such, groundwater levels are expected to be within five to ten feet below ground surface (GeoDesign, 2014 [Appendix F of this Draft EIR).

As discussed in more detail in Section 3.7 Hazards and Hazardous Materials, historical use of the site included installation of six underground storage tanks. The tanks and contaminated soil were removed in 1990. As part of the removal, a groundwater sample was collected and analyzed for total recoverable petroleum hydrocarbons (TRPH), benzene, toluene, ethylbenzene, and xylenes. No detectable amounts of these substances were located in the groundwater samples.

Surface Water Quality

The project site is located within the Santa Monica Bay Watershed Management Area. As previously discussed, water quality is impaired in this watershed for bacteria, debris (trash), and toxics (DDT and PCBs). TMDLs have been adopted for both the Santa Monica Bay Watershed and Santa Monica Bay Beaches to address these impairments. Applicable TMDLs include bacteria for dry and wet-weather at the beaches and nearshore and offshore debris and toxics for the bay. The nearshore and offshore debris TMDL has a final water quality-based effluent limitation of zero trash discharged into water bodies within the Santa Monica Bay Watershed Management Area and then discharging ultimately to the Santa Monica Bay or the shoreline of the bay no later than March 20, 2020, and every year thereafter.

As previously described, stormwater currently drains from the project site directly to existing drain inlets and catch basins which connect to existing storm drains that outlet directly to the Pacific Ocean (Santa Monica Bay) or King Harbor. Stormwater discharges from the site are subject to water discharge regulations set by the LARWQCB through a multi-year NPDES

Permit (Order No. R4-2012-0175 NPDES Permit No. CAS004001). On November 8, 2012, the LARWQCB adopted a new NPDES MS4 permit for the co-permittees in Los Angeles County, including the City, with an effective date of December 28, 2012. The Santa Monica Bay Beaches bacteria TMDL was incorporated into the latest MS4 Permit.

Harbor Water Quality

Water quality within the waterside portions of the project site reflects natural seasonal patterns. During late spring through fall, solar heating preferentially warms the ocean surface, resulting in depth-related gradients in water temperature (thermocline). A strong density gradient (pycnocline), related primarily to the water temperature changes with depth, restricts vertical mixing of the water column, which affects the depth distribution of most water quality parameters (Merkel & Associates, 2015 [Appendix D1 of this Draft EIR]). During winter and early spring, the strength of the vertical stratification decreases in response to weaker solar heating, mixing by winter storms, and upwelling.

Upwelling of cold water during periods of equatorward winds when warmer surface waters are moved offshore and replaced by deep water. Local upwelling events are only observed in winter and early spring when nearshore winds within the Southern California Bight are comparable in magnitude to those offshore (Merkel & Associates, 2015 [Appendix D1 of this Draft EIR]). The Southern California Bight encompasses the area south of Point Conception to San Diego. These colder waters have lower dissolved oxygen, but they have higher salinity, and most importantly are richer in nutrients. In summer and fall, winds are weak and local upwelling is rarely observed.

El Nino Southern Oscillation (ENSO) is major source of inter-annual climate variability in the Southern California Bight, characterized by a warming of the tropical east Pacific and a rise in sea level that propagates northward into the Southern California Bight. The high sea level anomalies in the Southern California Bight produce warmer surface water temperatures and a deeper thermocline, while the opposite conditions accompany a cold La Nina event. The ENSO cycle in the Pacific is not regular because of the complex feedback mechanisms between the tropical ocean and the atmosphere, but it occurs on average about every four years and can last a year or more. Major El Nino events can have severe climatic and ecological effects in the Southern California Bight.

Stormwater runoff from coastal rivers and streams adds large volumes of freshwater that can cause turbidity plumes and reductions in near-surface salinity up to many miles from shore. River and stream discharges also add suspended sediments, nutrients, bacteria, and other pathogens and chemical contaminants to nearshore waters. Publicly owned treatment works (POTWs) discharge treated effluent to the ocean through subsurface wastewater outfall, which introduces a low salinity plume containing suspended solids and pollutants to the marine environment. Historically, municipal wastewater discharges were the largest source of pollutants to Southern California coastal waters. However, more stringent effluent limits have reduced the mass emissions of contaminants from POTWs to the extent that non-point source inputs presently are recognized as the primary source of contaminants to coastal water of the Southern California Bight (Merkel & Associates, 2015 [Appendix D1 of this Draft EIR]).

Sediment Quality

Marine sediment quality varies in relation to grain size and proximity to input sources. Trace metal and organic contaminants in coastal waters typically have strong affinities for suspended particulates that eventually settle to the bottom where they become incorporated into the bottom sediment. Because of their high surface-to-volume ratio, finer sediments (silts and clays) generally have higher contaminant concentrations than coarse sediments (sands). Once incorporated into bottom sediments, contaminants may be remobilized through current- or storm induced resuspension, bioturbation, or mechanical disturbance such as dredging.

Within Santa Monica Bay, historic discharges of DDT and PCBs have accumulated in bay sediments and caused contamination of some seafood species. In addition, Hyperion Treatment Plant (HTP) previously discharged raw sewage into the Santa Monica Bay. Prior to 1987, sludge was disposed into Santa Monica Bay from Hyperion. Since 1998, full secondary treatment has been used at HTP and has resulted in a dramatic reduction in the discharge of solids to the bay. Offshore sediment sampling conducted in conjunction with the NPDES permit for the operation of HTP found contaminant concentrations that could have some biological impacts; however, sediment quality in the vicinity of the project site would not be expected to have elevated levels of such contaminants, including metals and organics, as the sediment material within the project vicinity is primarily courser sandy material and any fines would be expected to be resuspended and transported due to high water motion (e.g. surf and littoral currents) present in the nearshore waters.

Water Quality

The partially enclosed configuration of King Harbor (which is partially enclosed by the North [Outer] breakwater) allows for less exchange with ocean water. The ocean tends to be less polluted due to dilution and other factors. Because less exchange with ocean water occurs within King Harbor, there is an increased likelihood of impairments within the harbor as compared to the ocean. Approximately 25 percent of the indicator bacteria data from King Harbor in 2014 exceeded the water quality objectives for *Enterococcus*, *Fecal Coliform*, and *Total Coliform* single sample limits. Of these violations, 25 to 43 percent occurred during the dry season suggesting that exceedances occur year-round and only slightly more frequently during the wet season. Previous monitoring data from Seaside Lagoon also indicated that total suspended solids (TSS) is a pollutant of concern, having comprised a significant portion of water quality violations in the lagoon since 1999. However, the frequency of violations has lessened in recent years despite unknown causes for the improvement. Chronic toxicity data from recent years and historic trends suggest that the lagoon is in compliance with regard to toxicity. Discharges from Seaside Lagoon are regulated by a separate NPDES permit as discussed further in this section.

Water Circulation in Relation to Water Quality

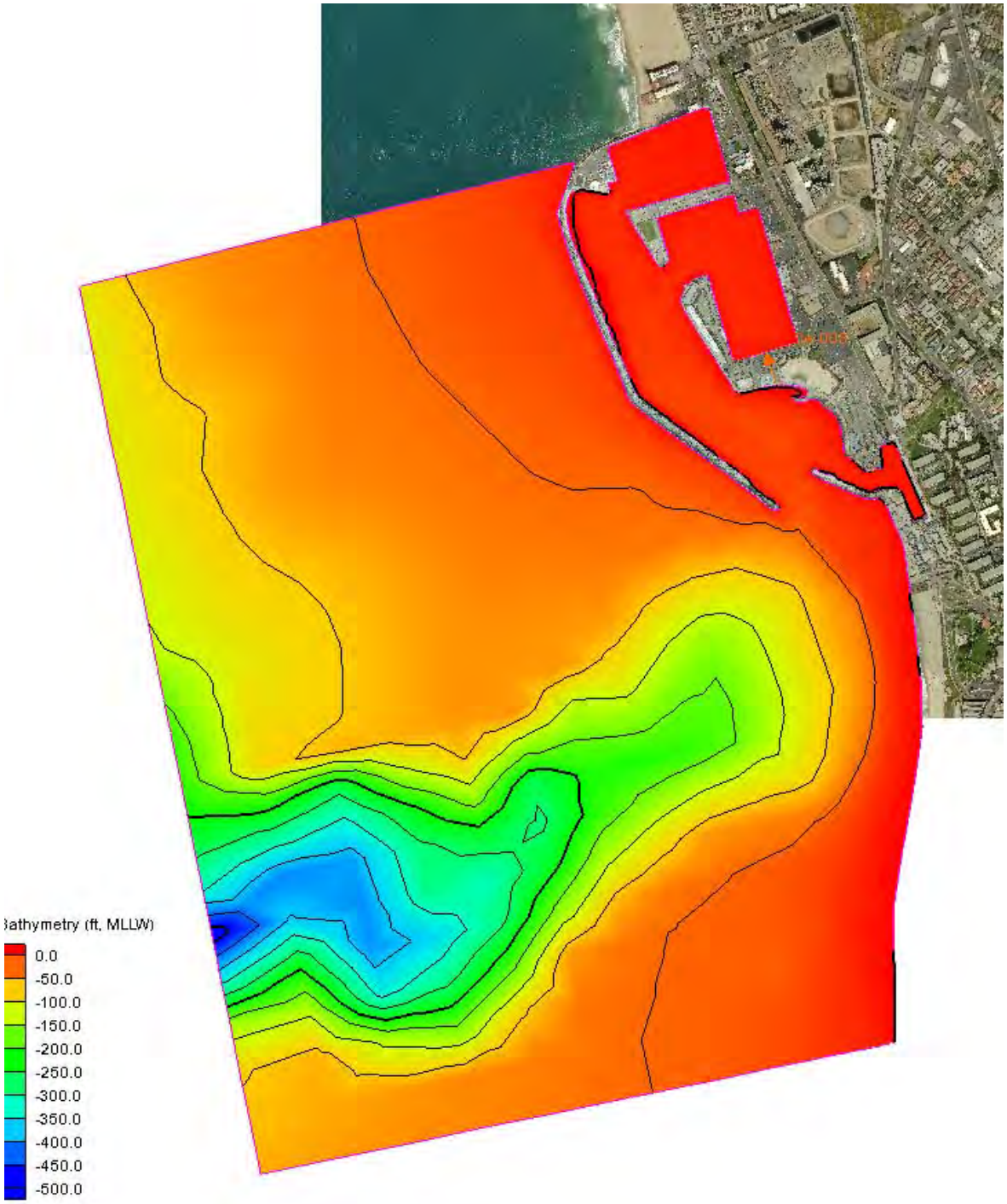
A water circulation and water quality analysis of the existing conditions in the harbor was conducted and is described below (Noble, 2015a [Appendix I2 of this Draft EIR]).

The two-dimensional hydrodynamic model RMA2 and the water quality model RMA4, both developed by the USACE, were used to conduct the water circulation and water quality study. The RMA2 model was developed to compute the water surface elevation and horizontal velocity for sub-critical, free-surface flow in two-dimensional flow fields. RMA4 is a two-dimensional finite element water quality transport model for simulating depth-average advection-diffusion processes in an aquatic environment.

The area of interest in this water circulation and water quality assessment is King Harbor, including three existing marina basins, and the proposed Seaside Lagoon for the project condition. The ocean included in the modeled domain extends from the shoreline to approximately 7,000 feet offshore, with an alongshore extent of approximately 8,500 feet. While water surface area of King Harbor is approximately 100 acres, the entire modeled domain exceeds 1,200 acres.

The existing bathymetry of the modeled domain was developed based on: (1) the January 2015 bathymetric survey conducted by Nearshore and Wetland Surveys for Basin 3; (2) the August 2012 bathymetric survey prepared by Fugro Consultants; (3) the 2004 bathymetric survey prepared by Fugro Consultants; and (4) the NOAA navigational chart (ID: 18744) for the ocean outside of the harbor. For the areas with overlapping coverage, the most recent survey points were used. The existing bathymetry is shown in Figure 3.8-2 for the entire modeled domain, in Figure 3.8-3 for King Harbor, and in Figure 3.8-4 for Basin 3 and the project site for Seaside Lagoon (Noble, 2015a [Appendix I2 of this Draft EIR]).

Two water quality indicators, the water exchange time and the constituent residence time, are commonly used for water quality evaluation. The water exchange time defines the minimum time for the water body in an embayment (lagoon) to be replaced by the ambient water in the ocean. The residence time indicates how long it takes for the concentration of a (non-specified) constituent, if present in the embayment, to drop to a given level.



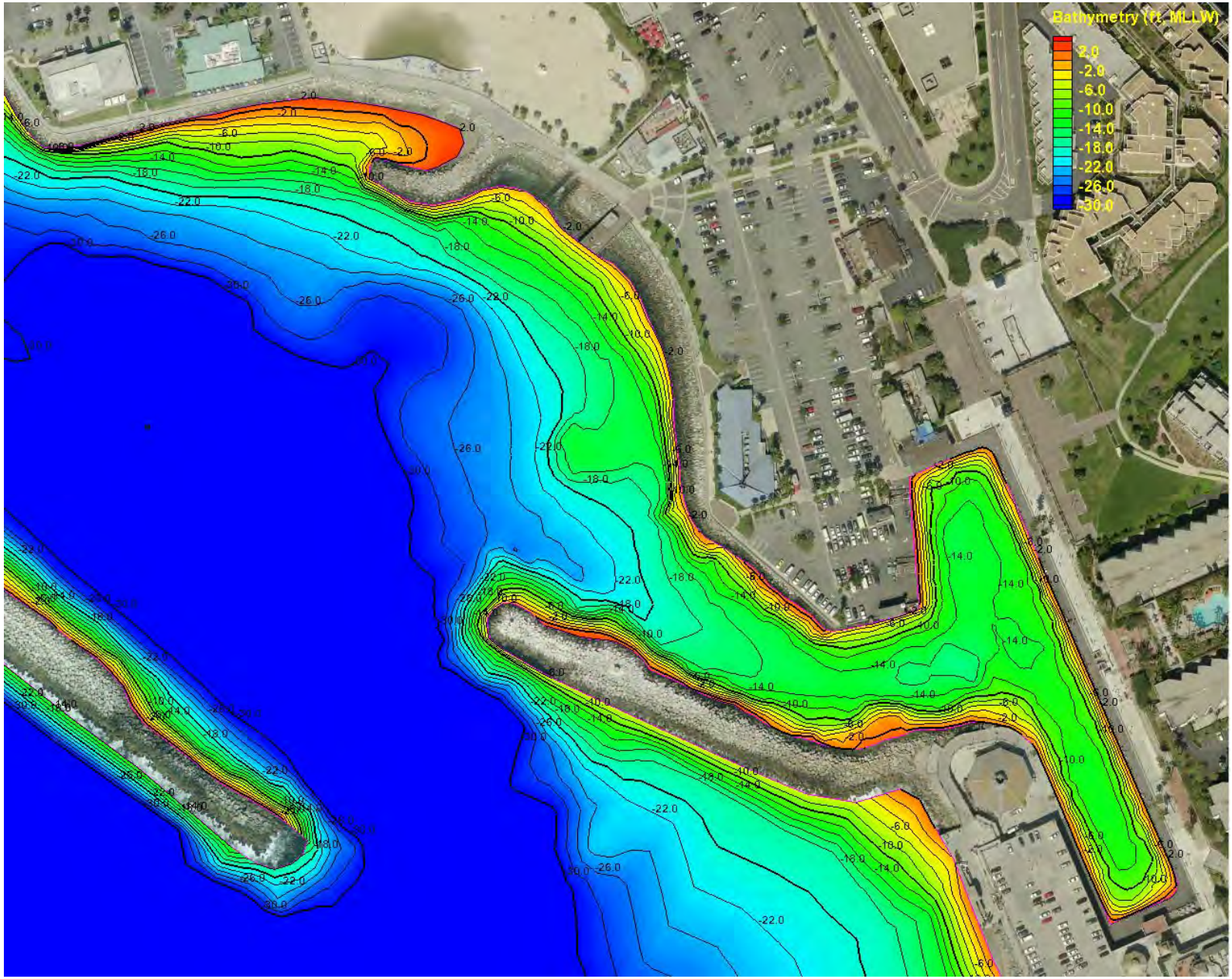
Source: Noble Consultants, Inc., 2015

Figure 3.8-2
Bathymetry of Modeled Domain

Source: Noble Consultants, Inc., 2015

Figure 3.8-3

Bathymetry of King Harbor



Source: Noble Consultants, Inc., 2015

Figure 3.8-4

Bathymetry of Basin 3 and Harbor Entrance

The water exchange time, defined as the ratio of the embayment storage volume at MHW to the average water exchange rate between the embayment and ambient water outside (i.e., ocean water), was computed for various basins of King Harbor. Water exchange times for existing conditions are provided in Table 3.8-2 based on the results of the model. The water exchange time under existing conditions is approximately 47 hours for Basin 3, while it is more than 60 hours for Basins 1 and 2. A shorter water exchange time can lead to better water quality. Therefore, given its faster exchange times, the project site is likely to have better water quality than other portions of King Harbor.

Table 3.8-2: Water Exchange Time Existing Conditions

Embayment	MHW Area (acres)	MHW Storage (acre-feet)	Current Water Exchange Time (Hours)
Entire King Harbor	100	2,012	71
Basin 3	3	42	47
Basin 2	24	456	67
Basin 1	15	256	61
Seaside Lagoon Area[1]	3	25	N/A

Notes: Area within proposed breakwater entrance, including Seaside Lagoon and the area that is outside of the lagoon, but within the breakwater entrance.
MHW = Mean High Water
Source: Noble, 2015a (Appendix I2 of this Draft EIR)

The constituent residence time is another important indicator of how fast for the water of an embayment to be renewed, and thus provides a means for assessing the water quality. A typical application to calculate the residence time across an embayment is to hypothetically release a constituent with initially uniform concentration throughout the embayment. The diffusion and advection processes will gradually transport the constituent out of the embayment, and thus the constituent concentration will drop with time. Quantification of the residence time at a given location is typically defined as the time for the constituent concentration to drop to exp(-1), or 37 percent of its initial value. A longer residence time indicates that the water of an embayment is renewed less readily by ocean water, leading to a less desirable water quality.

Figure 3.8-5 shows the snapshots of the constituent concentration in the harbor for an eight day period after the initial release of constituent under existing conditions. The time series of the constituent concentrations are shown in Figure 3.8-6 for the locations at the entrances of King Harbor and of the three basins, respectively.

As shown in Figure 3.8-5 and in Figure 3.8-6, the constituent concentration near the harbor entrance, including the project site, would decay faster with time than the inner harbor that is further away from the entrance. As an example, the concentration will drop below 30 percent of the initial concentration in two days at the harbor entrance area, including Basin 3 and the turning basin; however, at the same time, the concentration will still exceed 70 percent at Basins 1 and 2. The lower concentration and faster concentration decay in the harbor entrance area are attributed to the stronger constituent advection and diffusion processes due to the stronger water circulation and short distance to the ocean where the concentration was assigned to zero.

The constituent residence time for the existing condition was determined based on the constituent concentration predicted by the RMA4 model, and is shown in Figure 3.8-7. The residence time is less than 1.5 days for Basin 3 and less than 2 days for the turning basin, while the residence time exceeds 6 days for Basins 1 and 2. Comparison of the residence time indicates that water quality in Basin 3 and the turning basin is expected to be better than most portions of King Harbor, and would be much better than Basins 1 and 2.

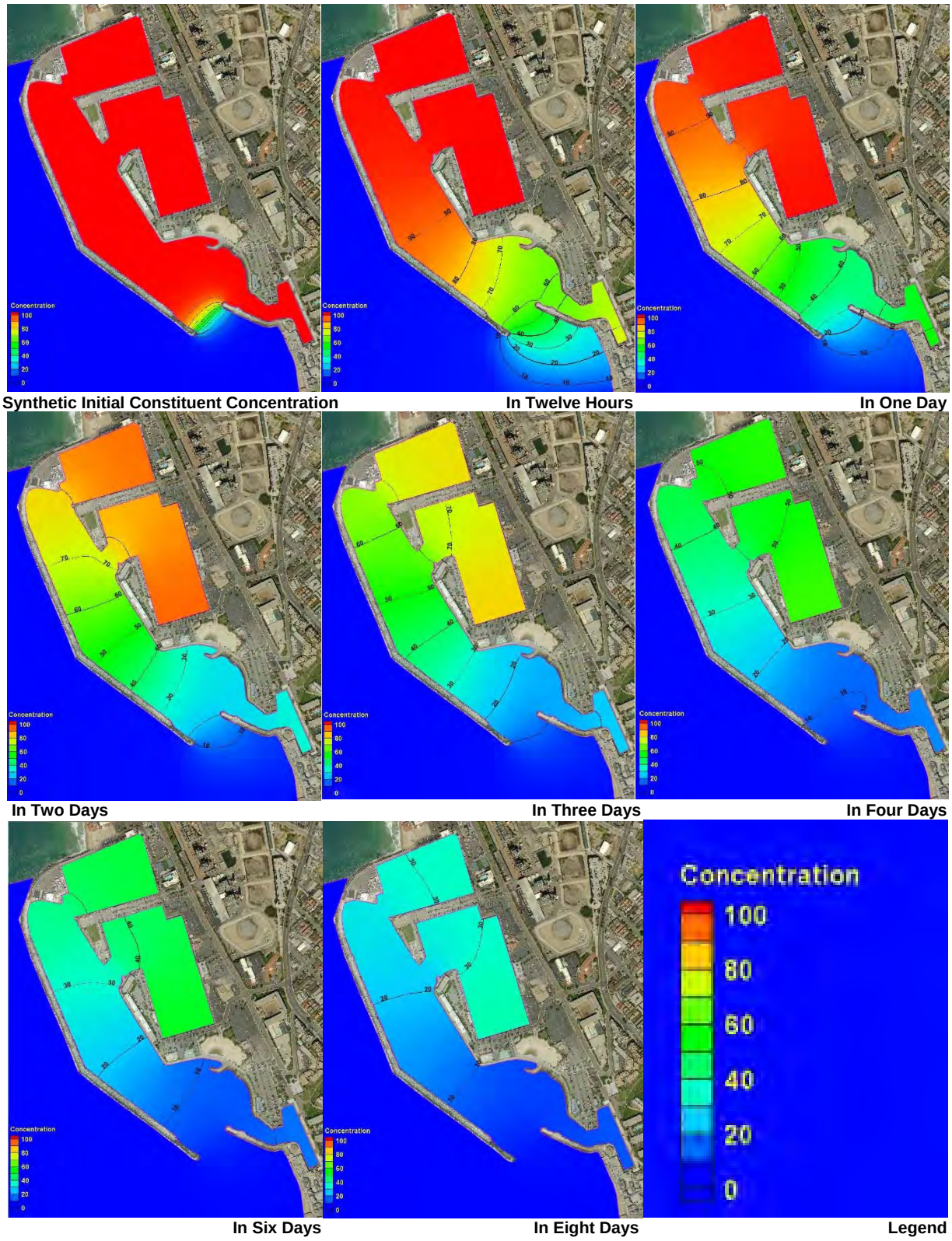
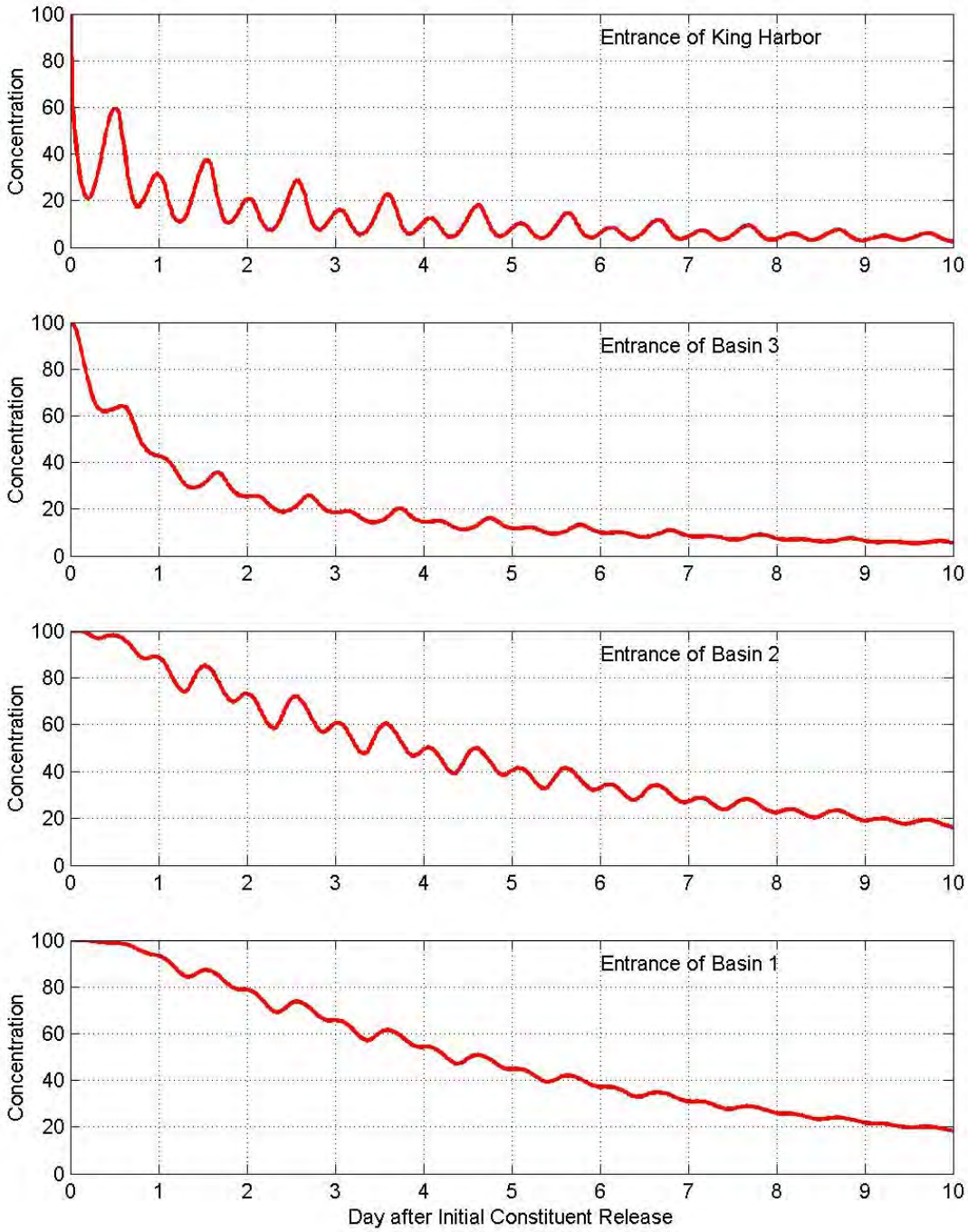


Figure 3.8-5
Constituent Concentration Over Time – Existing Condition



Source: Noble Consultants, Inc., 2015

Figure 3.8-6

Relative Concentration at Entrances of King Harbor and Three Basins
Existing Condition

Source: Noble Consultants, Inc., 2015

Figure 3.8-7

Constituent Residence Time in Days - Existing Condition

Seaside Lagoon

Background

The Seaside Lagoon is a 3.75-acre recreation amenity that operates as a full water and events facility during summer months. Over the course of a typical year, the facility's open space and enclosed saltwater lagoon serve 75,000 seasonal swimmers, supply picnic tables to approximately 475 user groups, host 80 private parties, provide space for roughly 600 participants in the City's Breakwater and Sailing Camp programs, and serve more than 25,000 patrons during special events such as the Lobster Fest, July 4 Fireworks, and the Super Bowl 10K Run.

Seaside Lagoon, when originally built in 1963, was designed as a recreational aquatic park with a mechanical system that, for water intake purposes, took advantage of a heated water supply made available by the nearby power plant (now the AES power plant) and for discharge purposes utilized proximity to the harbor. Water in the lagoon is supplied by cooling water used in the nearby AES power plant. The AES power plant pumps water from outside the breakwater to the AES power plant where it is used to cool the turbines. A portion of the heated water is then piped from the AES power plant to Seaside Lagoon.

The facility was constructed years before adoption of the Clean Water Act and the establishment of basic water chlorination practices for public swimming facilities. Now, the water is chlorinated on entry into the lagoon. The water is then dechlorinated and returned to the harbor. The Seaside Lagoon is subject to swimming water quality standards established by the Los Angeles County Health Department and water discharge regulations set by the LARWQCB through a multi-year Permit (CA0064297). The permit established Waste Discharge Requirements (WDRs) in Order No. R4-2010-0185.

While chlorination and dechlorination functions have been added to the lagoon, the rudimentary elements of the original water system design remain the same. However, compliance with LARWQCB discharge regulations over than last 10 years has been difficult. Since the implementation of the lagoon's first NPDES Permit in 1999, the City has been fined $195,000 for water discharge violations. The vast majority of these violations were for the discharge of TSS. After extensive examination by water quality experts and City Engineering staff, it was determined that there would be no cost effective way to treat or filter TSS in the high volume of water discharged by the lagoon. The filtration approach suggested by LARWQCB staff in 2007, as an example, would require the installation of a multi-million dollar treatment plant and the acquisition of several acres of harbor area property.

Over the years the City has been put in the position of either (1) closing the facility; (2) spending significant capital resources to rehabilitate the facility and implement a contemporary water delivery and filtration system to eliminate discharge into the Harbor; or (3) working with the LARWQCB to modify the lagoon's NPDES Permit to allow for increased water discharge limits. In 2007, the City pursued the last option and successfully collaborated with the LARWQCB in the adoption of a Time Schedule Order (TSO) that significantly increased the lagoon's TSS limits in exchange for the completion of an extensive water quality study. The study concluded that all but one of the lagoon's problematic effluent categories could be managed through changes to operating procedures and testing methods, but that there was no cost effective way, given the facility's rudimentary water delivery system, to treat or filter the lagoon's TSS. It also concluded that, on average, 94 percent of the TSS in the lagoon's water discharge was in the ocean water before it entered the facility and

the quality of the lagoon's water discharge was effectively at the mercy of the ocean's natural conditions.

After determining that there was no cost effective way to eliminate the TSS problems through modification of the existing facility, the City pursued an extension of the TSO to allow for continued operation of the lagoon while developing plans to reconstruct the facility (open the lagoon to the ocean) and ultimately eliminate water discharge into the harbor. The LARWQCB agreed to extend the lagoon's TSO for two years (through February 28, 2010). In January 2010, the City pursued a third TSO providing a continued relief of the TSS permit limits.

The first TSO issued in 2007 expired on January 31, 2008. The second TSO issued in 2008 expired on February 28, 2010. The third and most recent TSO was issued in 2010 and expired September 10, 2013. Since the TSO has expired, the lagoon is now subject to the water discharge limits established in the facility's current Five-Year NPDES Permit.

In recent years, the City has been successful in protecting itself from increasingly restrictive NPDES Permit limitations and reducing the lagoon's water discharge liability. Part of this success is attributed to the City's active evaluation of the facility's water quality monitoring results and, in collaboration with LARWQCB staff, implementing modifications to water testing methodologies that have improved testing accuracy.

In September 2014, Seaside Lagoon completed its fourth season of water quality monitoring under the current Five-Year NPDES Permit, which runs through September 2015. In the past, the facility has struggled with two primary water effluent discharge categories: TSS and Biochemical Oxygen Demand (BOD). The lagoon's water quality data for the 2011, 2012, and 2013 operating seasons has improved significantly in these areas and last March, the City Council directed staff to continue to operate the lagoon for the 2014 and 2015 season.

To operate the lagoon beyond the 2015 season, a renewal application was filed with the LARWQCB in March 2015, and is currently under review. Given tightening water quality restrictions, it is unknown based on the renewal application filed by the City whether another permit will be granted. Submitting a renewal application gives the City maximum flexibility as it decides whether to operate the lagoon beyond the 2015 swim season.

Current Permit Limits

Seaside Lagoon's current NPDES Permit was issued on October 7, 2010 and expired on September 10, 2015; although as discussed above, a renewal application was filed by the City in March 2015 and submitting a renewal application gives the City maximum flexibility as it decides whether to operate the lagoon beyond the 2015 swim season. Under the current permit, permit limits for TSS are as follows: monthly average 50 milligram per liter (mg/L); daily maximum, 75 mg/L. For the first three operating seasons of the current permit, Seaside Lagoon was regulated by the 2010 TSO setting the limits as follows: monthly average 60 mg/L; daily maximum, 120 mg/L. There are no effluent limits established for DDT and PCBs in effluent and receiving waters, however annual monitoring is required in effluent and receiving waters (U.S. Environmental Protection Agency [USEPA] Region IX, 2012).

The City has also been historically concerned with the potential inclusion of metal discharge limitations in the permit. Currently the permit does not include specific metal limitations; however, it does require the City to regularly test, monitor and report on the discharge of

arsenic, cadmium, copper, nickel, selenium, silver, thallium and zinc. It is assumed that the LARWQCB intends to utilize the metals data collected by the City to assess the need for including metal discharge limitations in future Seaside Lagoon NPDES permits. When initially preparing the current permit, the LARWQCB considered including metal limitations, but, after the City challenged the inclusion, settled for inserting a re-opener clause in the permit that gave them the option to add metals limitations at a later date. The re-opener clause also included an expiration date, which passed on March 31, 2013. As the LARWQCB did not elect to reopen the permit by the set date, the lagoon will not be subject to metals discharge limitations until the adoption of a new NPDES Permit, which cannot occur until at least 2016.

Monitoring Results

In 2011, TSS levels were well below the permit limits. The peak monthly average was 18.5 mg/L, which was significantly below the permit monthly averages of 60 mg/L and 50 mg/L set by the TSO and permit respectively. Similarly, in 2012, TSS peak monthly average showed 6.8 mg/L. In 2013, the monthly average indicated a peak of 38.2 mg/L. Single samples taken within this period between 2011 and 2013 were all below 41 mg/L. One sample taken on September 2, 2013 registered 100 mg/L. On that day, the TSS level in the harbor showed similar strength, demonstrating that the elevated level was not caused by Seaside Lagoon. While the single sample on September 2, 2013 exceeded the permit threshold, the discharge was within the limits of the TSO, and therefore, no violation occurred.

Chronic toxicity testing is required on an annual basis. For the 2013 operating season, this particular test was conducted in mid-August and the results showed an exceedance above permit established limits. Upon discovery, an accelerated chronic toxicity testing was implemented as outlined in the NPDES Permit. The City was able to do only one test during the off-season special event because the Lagoon was closed for the season. An accelerated chronic toxicity test conducted in September 2013 showed no exceedance beyond Permit limits. City staff contacted the LARWQCB and discussed with the regulators the efforts taken by City staff to source track the cause of the exceedance but no discoveries were found. At the beginning of the 2014 season, the annual chronic toxicity test was conducted and results showed the lagoon was within Permit established limits.

In 2014, TSS levels were well below the Permit limits. The peak monthly average was 21.4 mg/L, which was significantly below the Permit monthly averages of 50 mg/L. The highest single sample of TSS in 2014 came in at 39 mg/L again well below the single sample limit of 75 mg/L.

To adhere to the requirements of the Los Angeles County Health Department, and to protect the health of lagoon users, the facility is required to maintain a chlorine residual level. Prior to discharging into the harbor, the water must be de-chlorinated per the requirements of the LARWQCB to protect marine life. City staff operating and maintaining the facility keeps a constant watch of the chlorine residual level within the lagoon at various locations, as well as at the outfall throughout each operating day. During the 2014 operating season, water quality sampling showed one instance of not meeting the chlorine residual limit at the lagoon's discharge outfall. Additionally, for three days during the 2014 swim season the bacteria limits were exceeded. All three exceedance events were separate – occurring on different days. Repeat bacteria sampling conducted two days after an exceedance event showed bacteria levels returned to within acceptable limits eliminating the possibility of a chronic issue.

Risk Assessment

Monitoring data analysis showed that the TSS levels at Seaside Lagoon are below permit limits. There is no apparent explanation for the improved results as City staff has continued to operate the facility as in years past. In 2011, in collaboration with the LARWQCB, the standard operating procedures for analyzing water samples for TSS by the City's hired laboratory, Michelson Laboratory Inc., (Michelson) was modified. This change in laboratory procedures may have affected the most current results of TSS levels. As with many other variables, it is difficult to pin point a single source to explain the variability of the water quality in the ocean and harbor.

The chronic toxicity test is designed to assess the effects of the lagoon discharge on marine life in the harbor. Seaside Lagoon has not had issues passing the chronic toxicity test in years 2010 and 2011. In the last three years between 2011 and 2013, there has been no overage of the Permit levels and there was only one instance of exceedance. Based on historical trending and the results of the follow up test, the lagoon is not anticipated to fail future toxicity tests.

Clean water mandates have imposed extensive obligations on the operation of Seaside Lagoon. After years of open dialogue with the regulators and increased staff training, water quality targets can be achieved at the lagoon.

Permit Renewal

In September 2014, Seaside Lagoon completed its fourth season of water quality monitoring under the current Five-Year NPDES Permit, which runs through September 2015. The City is required to apply for and obtain a new NPDES Permit for the Seaside Lagoon upon the expiration of the current Permit. The current permit will remain in effect pending issuance of a new permit so long as requirements of the federal NPDES program are met. An expired NPDES Permit will remain in effect if the following two conditions are satisfied: (1) the City has submitted a timely and complete application for a new Permit; and (2) through no fault of the City, the LARWQCB does not issue a new permit with an effective date on or before the expiration date of the previous permit. The City is obligated to commence the renewal process and must file its application for a new permit at least 180 days prior to the expiration date of the current permit, or March 14, 2015. The City applied for the renewal of the Permit within the allocated timeframe. If the LARWQCB fails to approve a new Permit by September 10, 2015, the current permit will continue in effect until the LARWQCB issues a new permit. During the renewal process, the USEPA will have an opportunity to comment on the application and the LARWQCB will conduct a public hearing before approving the final permit.

Seiche and Tsunamis

Seiches are seismically induced water waves that surge back and forth in an enclosed basin and could occur in Basin 3 as a result of an earthquake. Effects from a seiche at the existing site would be less detrimental than those of a tsunami.

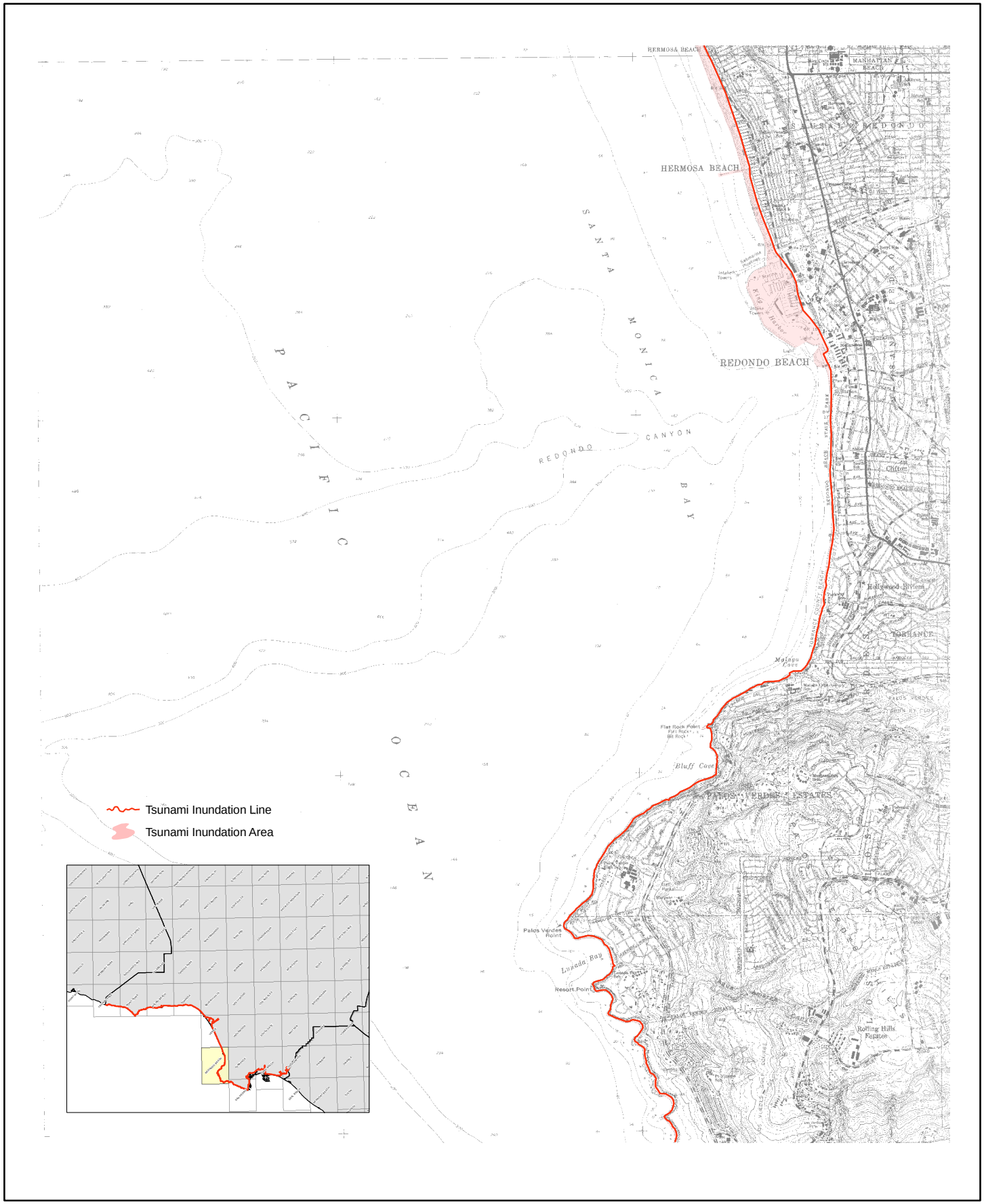
Tsunamis are long period waves caused by an underwater disturbance such as volcanic eruptions or earthquakes. Tsunami waves propagate across the deep ocean as very long waves of low amplitude. Tsunami waves can be significantly amplified by shoaling, diffraction, refraction, convergence, and resonance when they reach coastal areas. Tsunamis from nearby earthquakes may take a only few minutes to reach coastal areas while tsunamis from distant earthquakes can take three to 22 hours to reach coastal areas (City of Redondo Beach, 2004).

Accordingly, warning times for a tsunami can be a few minutes to many hours. Warnings are issued by NOAA's Alaska Tsunami Warning Center. The tsunami warning includes an estimate of the potential wave height and time a tsunami will reach shore.

History of tsunamis in California is generally limited by a written record that only goes back to the late 1700s. Based on this available information, no tsunami has ever significantly affected the Los Angeles coast in the past. Although historic tsunamis were originated from the coasts of Chile and Alaska, the propagation impacts to Redondo Beach have been small. Occurrences of the 2011 tsunami in Japan and the 2010 tsunami in Chile only elevated 2 to 3 feet of sea level in Southern California (Noble, 2015b [Appendix I3 of this Draft EIR]). In 1930, unusually high waves were reported in the Santa Monica Bay, which may have been caused by an underwater landslide associated with a magnitude 5.2 earthquake offshore of Santa Monica. This event has been reported as a possible tsunami or seiche with a wave uprush of as much as 6.1 meters (20 feet) (Borrero et al., 2002; NOAA, 2015). The event resulted in one drowning death in Redondo Beach (City of Redondo Beach, 2004).

The entire project site is located along the Pacific Ocean and within the tsunami-induced inundation limit for a tsunami originating in the coastal water of southern California, according to the potential inundation map for the Redondo Beach area prepared by the California Governor's Office of Emergency Services (OES) as illustrated in Figure 3.8-8 (OES, 2009). OES identifies the area up to 12 meters (approximately 40 feet) of elevation as being subject to tsunami run-up from a reasonably expected tsunami based on modeling of potential earthquake sources and hypothetical major landslide sources (City of Redondo Beach, 2004). Since no subduction zone (a fault where one continental plate slides under another in an earthquake) exists in the coastal waters of Southern California, a local earthquake event that produces underwater disturbance capable of generating a tsunami within this coastal region is highly unlikely. However, a submarine landslide, including at the Redondo Beach Submarine Canyon, located off-shore of the project site, is capable of a moderate earthquake or landslide, which could trigger a tsunami that affects the entire Santa Monica Bay coastline, such as the event in 1930 discussed above, which resulted in a drowning death in Redondo Beach (City of Redondo Beach, 2004). However, while a locally generated tsunami would result in greater risk to Redondo Beach, the likelihood of this occurring is much lower than a tsunami generated from an offshore earthquake in other locations around the Pacific Rim such as Alaska, Chile, or Japan.

The Tsunami Research Center at the University of Southern California (TRC-USC) has performed various studies to quantify the potential tsunami events that are generated by local tectonic shifts and submarine landslide in the Southern California Bight (Borrero, et al., 2004). Based on these studies, the California Geological Survey and other state agencies have prepared tsunami inundation maps along the California coast to assist local agencies in identifying potential tsunami hazard zones and formulating an emergency plan to minimize the potential impact in the event that a tsunami centering in Southern California occurs. In light of the moderate impact to the West Coast induced by the 2010 and 2011 tsunamis originating in Chile and Japan, the United States Geologic Survey (USGS) is currently conducting extensive studies to reassess the hazards of tsunamis to the West Coast. The studies are expected to be completed in 2016 (USGS, 2015). A study publicized in 2013 by the USGS's Science Application for Risk Reduction (SAFRR) project assessed possible impacts on the California coast resulting from a large hypothetical tsunami generated by a magnitude 9.1 earthquake



Source: State of California/County of Los Angeles, 2009

Figure 3.8-8

Potential Inundation Map for Redondo

occurring offshore of the Alaska Peninsula (USGS SAFRR, 2013). This tsunami scenario involves larger waves than waves that have been recorded for historical tsunamis. Based on the modeling results, under this scenario, the maximum wave height in the vicinity of Redondo Beach would be approximately one meter.

The California Geological Survey (CGS) in coordination with other agencies including the University of Southern California, NOAA, and the California Governor's Office of Emergency Services, are in the process of working with the City to finalize Maritime Tsunami Response Playbook and Mitigation Guidance (Playbook). The draft Playbook includes maps showing potential current speed occurring within King Harbor and potential associated damage under several distant tsunami scenarios. Table 3.8-3 describes the damage to the harbor that may occur depending on the current speed.

Table 3.8-3: Current Speed and Potential Damage

Current Speed (knots)	Damage Level	Potential Damage
0-3	No Damage	No damage/small buoys moved
3-6	Minor/Moderate Damage	1-2 docks/small boats damaged, large buoys moved
6-9	Moderate/Major Damage	Moderate deck/boat damage, mid-sized vessels off moorings
>9	Major/Complete Damage	Major dock/boat damage, large vessels off moorings/complete destruction

Source: CGS, 2015

Under the various scenarios presented, the greatest currents would generally occur at the mouth of the harbor between the north and south breakwaters. This varies from three to six knots under the least damaging scenarios to greater than nine in the worst-case scenarios. Under the worst-case scenarios (a magnitude 9.4 earthquake in north Chile and a 9.2 earthquake offshore in Alaska), in addition to the greater than nine knot currents that would occur at the harbor mouth, six to nine knot currents could occur along the main channel in the harbor and near the entrances to Basins 1 and 2. Currents of three to six knots could occur along the edges of the main channel, Basins 1 and 2, and within the project area, along the turning basin and Horseshoe Pier.

While unrelated to tsunamis, sea level rise can worsen the effects of a tsunami because a higher sea level would result in a high wave height.

In the unlikely event of a tsunami, the City has developed an emergency evacuation route located at: http://www.redondo.org/civica/filebank/blobdload.asp?BlobID=24256. Within the project vicinity, the evacuation route extends eastward from the coast to along Beryl Street and Torrance Boulevard. For further discussion on the evacuation route for tsunamis and a map of the evacuation route, see Section 3.7 Hazards and Hazardous Materials and Figure 3.7-1 therein.

In addition to an evacuation route, there are other mechanisms in place to respond in the case of issuance of a tsunami warning, including the City of Redondo Beach Standardized Emergency Management System- Multi-Hazards Functional Plan (SEMS-MHFP) adopted in

2002. The SEMS-MHFP provides for a standardized response and better organization in response to any local emergency, from a local level through the need to request state and federal assistance. Additionally, Los Angeles County has developed a Tsunami Annex as part of its Operational Area Emergency Response Plan. The Operational Area Emergency Response Plan is designed to incorporate and coordinate county facilities and personnel, along with resources of cities and other districts within the county, including Redondo Beach, to respond to any emergency using SEMS, mutual aid and other appropriate response procedures. The Tsunami Annex establishes the county's emergency policies and procedures in the event of tsunami.

The draft Maritime Tsunami Response Playbook and Mitigation Guidance described above is designed to help the maritime community within Redondo Beach prepare, plan, and respond to strong currents and potential damage that could occur as a result of a tsunami. The guidance establishes steps to follow if an alert is issued, such as evacuating the harbor area and securing and strengthening mooring lines.

Mudflow

A mudflow (or debris flow) is a rapidly moving slurry of water, rock, vegetation, and debris. The existing site is located in an urban area. The site is not located on a slope or in a naturalized area that could cause debris flow from or over the site.

Sea Level Rise

Multiple scientific studies predict a rise in sea levels that may potentially impact coastal communities in southern California. Risks associated with rising sea levels include inundation of low-lying areas along the coast, exposure of new areas to flood risk, an increase in the intensity and risk in areas susceptible to flooding, and an increase in coastal erosion in erosion prone areas. An analysis of sea level rise at the existing project site was conducted in the *Sea Level Rise and Wave Uprush Assessment* prepared by Noble Consultants, Inc. (August, 2015) included as Appendix I3 of this Draft EIR.

Existing Water Levels

Variations in water level along the Southern California shoreline are due principally to astronomical tides, storm surge driven by spatial variation in barometric pressure and wind, and wave setup occurring where waves break and wave energy is dissipated. Tides within the Redondo Beach area are of the mixed-diurnal type. Typically, a lunar day, approximately 24 hours, consists of two high and two low tides, each of different magnitudes. The lower-low normally follows the higher-high by seven to eight hours; the next higher-high (after the lower-high and higher-low waters) follows in about 17 hours. Tide characteristics along the coast of Redondo Beach are referenced to the Santa Monica tide gauge as shown in Table 3.8-4. It should be noted that the highest water level of +8.5 feet, Mean Lower Low Water (MLLW) recorded at Santa Monica Pier on November 30, 1982 includes storm surge and wave setup.

Table 3.8-4: Redondo Beach Tide Characteristics Referenced to Santa Monica Tide Gauge

Datum or Level	Santa Monica Pier (feet)
Maximum Measured Water Level[1]	8.5
Mean Higher High Water (MHHW)	5.4
Mean High Water (MHW)	4.7
Mean Tide Level (MTL)	2.8
Mean Sea Level (MSL)	2.8
North American Vertical Datum (NAVD)	0.2
Mean Low Water (MLW)	0.9
Mean Lower Low Water (MLLW)	0.0
Minimum Measured Water Level[1]	-2.9

Note: The maximum and minimum water levels measured at Santa Monica Pier were on November 30, 1982 and December 17, 1993.
Source: Noble, 2015a (Appendix I2 of this Draft EIR)

Sea Level Rise Projections

Several notable studies were prepared to predict the increasing rates of future sea level rise due to greenhouse gas emission (NRC, 1981, IPCC, 2007 and 2008). These studies indicate the trend of warmer global temperatures will accelerate melting of glaciers, which will consequently release more water into the oceans. In addition, warmer ocean temperatures cause the water to expand, further raising the sea level.

The California Sea-Level Rise Task Force has provided interim guidance on planning for future sea-level rise through the year 2100. Their study was recently updated by the Committee on Sea Level Rise in California, Oregon, and Washington. The recommendations are largely based upon research published by Vermeer and Rahmstorf in 2009 who forecast future sea level rise by modeling six different global warming scenario groups previously established by the Intergovernmental Panel on Climate Change (IPCC). Their predictions rely upon statistical models that use semi-empirical relationships between past and predicted future global temperature changes. Continuous research and studies have provided updated projections of future global sea level rise (NRC, 2012; IPCC, 2014).

Other summaries of future sea level rise scenarios have been summarized by the USACE. The USACE report prepared in 2013 shows the wide uncertainty in forecasting the future because of issues related to accurately predicting climate change and how it would impact sea level rise over this century (USACE, 2013). The future sea level rise recommended by the California Ocean Protection Council (COPC) that was updated in 2013 presents a range of the potential sea level rise as listed in Table 3.8-5 (COPC, 2013). Using 2015 as the base year for the project site, the projected sea level rises in the 25th, 50th, and 75th years for the proposed project are deduced and illustrated in Figure 3.8-9 and Table 3.8-6. As shown graphically in Figure 3.8-9, the variation in the range of predictions (low, mid-level, and high) increases over time. This is because the uncertainties in sea level rise projections increase as the projected time horizon is extended, due in large part to uncertainties about future global greenhouse gas emissions, inherent unpredictability of natural climate variation, and modeling uncertainties (COPC, 2013).

Table 3.8-5: Sea Level Rise Projection from Year 2000

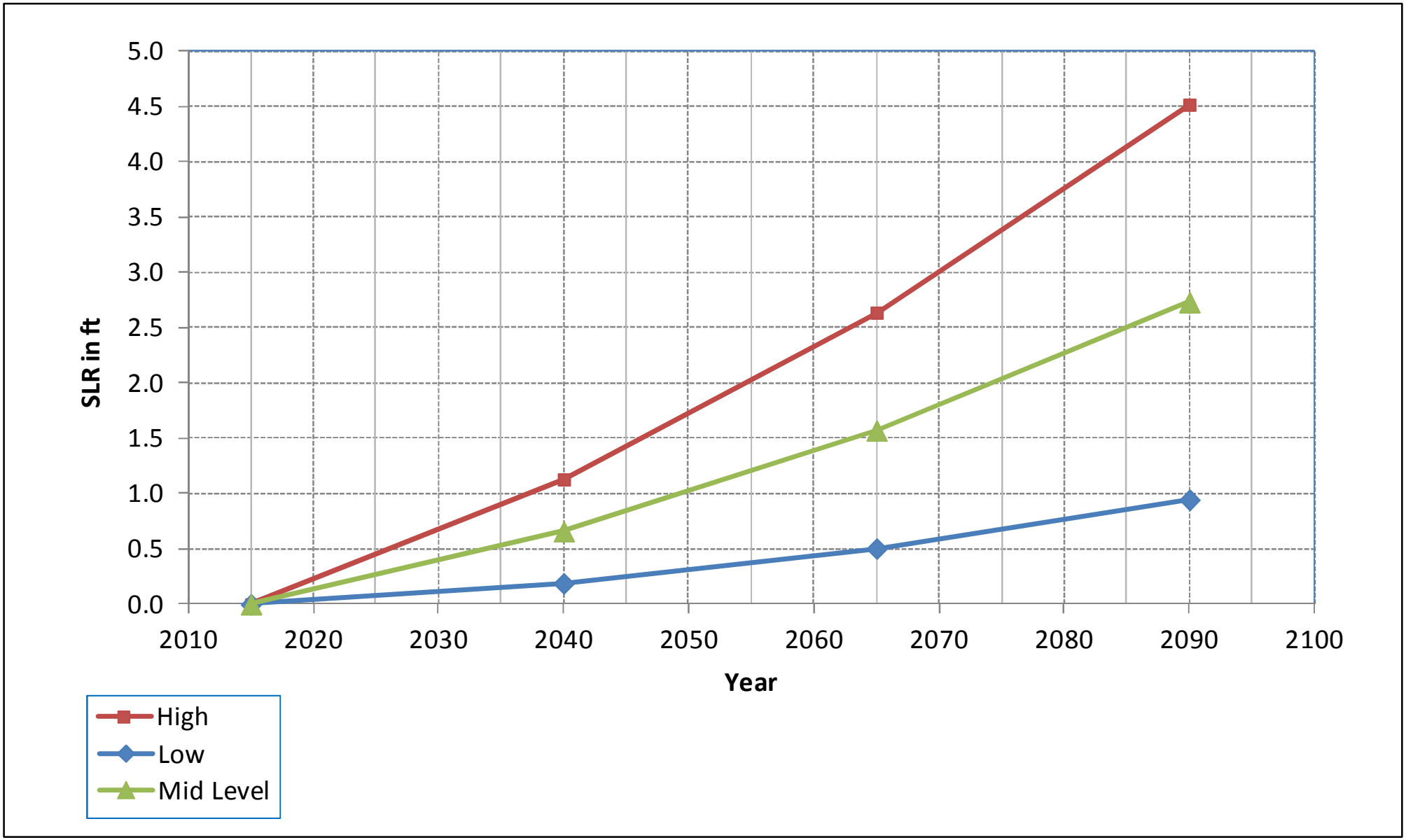
Time Period	Sea Level Rise Projection South of Cape Mendocino (feet)	
	Low Estimate	High Estimate
2000 - 2030	0.13	0.98
2000 - 2050	0.39	2.0
2000 - 2100	1.38	5.48

Source: Noble, 2015b (Appendix I3 of this Draft EIR)

Table 3.8-6: Derived Sea Level Rise at Individual Years for Site

Year	Years in Future	SLR from 2000		SLR from 2015[1]		Mid-Level Average[1]
		Low (feet)	High (feet)	Low (feet)	High (feet)	
2015	0	0.04	0.43	0.0	0.0	0.0
2040	25	0.23	1.56	0.2	1.1	0.7
2065	50	0.55	3.07	0.5	2.6	1.6
2090	75	0.99	4.95	0.9	4.5	2.7

Note: Sea Level Rise values rounded out to the first digit.
Source: Noble, 2015b (Appendix I3 of this Draft EIR)



Source: Noble Consultants, Inc., 2015

Figure 3.8-9
Projected Sea Level Rises

Wave Climatology

Wave climate in southern California is strongly influenced by not only El Nino-Southern Oscillation (ENSO), which tends to vary on a timescale of two to seven years, but also the Pacific Decadal Oscillation (PDO) that shifts phases on an inter-decadal time scale of 20 to 30 years. In addition, the global warming trend not only results in the acceleration of sea level rise but also may intensify individual storm events. During the PDO warm period as well as the El Nino seasons, impinging storm waves are higher, have a longer wave period, and approach from a more westerly direction that increases the storm wave attack potential to the Los Angeles coast (Adam, et al, 2007).

Wind waves and swells in the Southern California Bight, inclusive of the site, are produced by the following meteorological patterns: (1) extratropical cyclone of the northern hemisphere; (2) northwest winds in the outer coastal waters; (3) west to northwest local sea; (4) pre-frontal local sea; (5) tropical storm swell; and (6) extratropical cyclone of the southern hemisphere.

The nearstorm wave characteristics at the Horseshoe Pier were obtained from a 36-year hindcasted[1] deepwater wave climate that was transformed to the nearshore location for various selected storm events. Table 3.8-7 lists the derived annual and other return storm wave conditions (1-, 10-, 25-, 50-, and 100-year) at a nearshore station (Station 1) in a depth of approximately 30 feet. Due to the presence of the Redondo Submarine Canyon, the 100-year return wave is only about 7.2 feet, which is considerably small as compared to return waves along the adjacent coastline regions. Return storm wave heights inside King Harbor (Station 2 and 3) were obtained from a physical model simulation at USACE Waterways Experiment Station under various severe design storm conditions, as presented in Table 3.8-6. It is noted the return wave heights at Stations 2 and 3 were respectively derived from different offshore approaching wave angles (260 degrees for Station 2 and 240 degrees for Station 3). Figure 3.8-10 illustrates the respective locations of these wave conditions.

Table 3.8-7: Estimated Return Wave Heights

Location	Return Wave Heights (feet)				
	1-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Station 1: Near Multiple Pier	5.1	6.2	6.5	6.8	7.2
Station 2: Mole D Area[1]	2.1	2.3	2.7	2.7	3.9
Station 3: North End of Proposed Lagoon[1]	1.3	1.6	2.0	1.8	3.6

Note: Offshore incoming wave angles are 260 degrees for Station 2 and 240 degrees for Station 3.
Source: Noble, 2015b (Appendix I3 of this Draft EIR)

[1] A study performed by the California Climate Change Center to assess likely winter wave height changes along the California coast under various scenarios of greenhouse gas emissions (sea level rise) in the future concluded that the intensity of future storm events is expected to follow a slightly negative trend within southern California, as the mean cyclone track with a warmer climate tends to move north. Therefore, the water conditions hindcasted in the 1979-2001 period would yield more conservative representation of the future wave climate in Southern California.

Source: Noble Consultants, Inc., 2015

Figure 3.8-10
Locations of Return Wave Stations

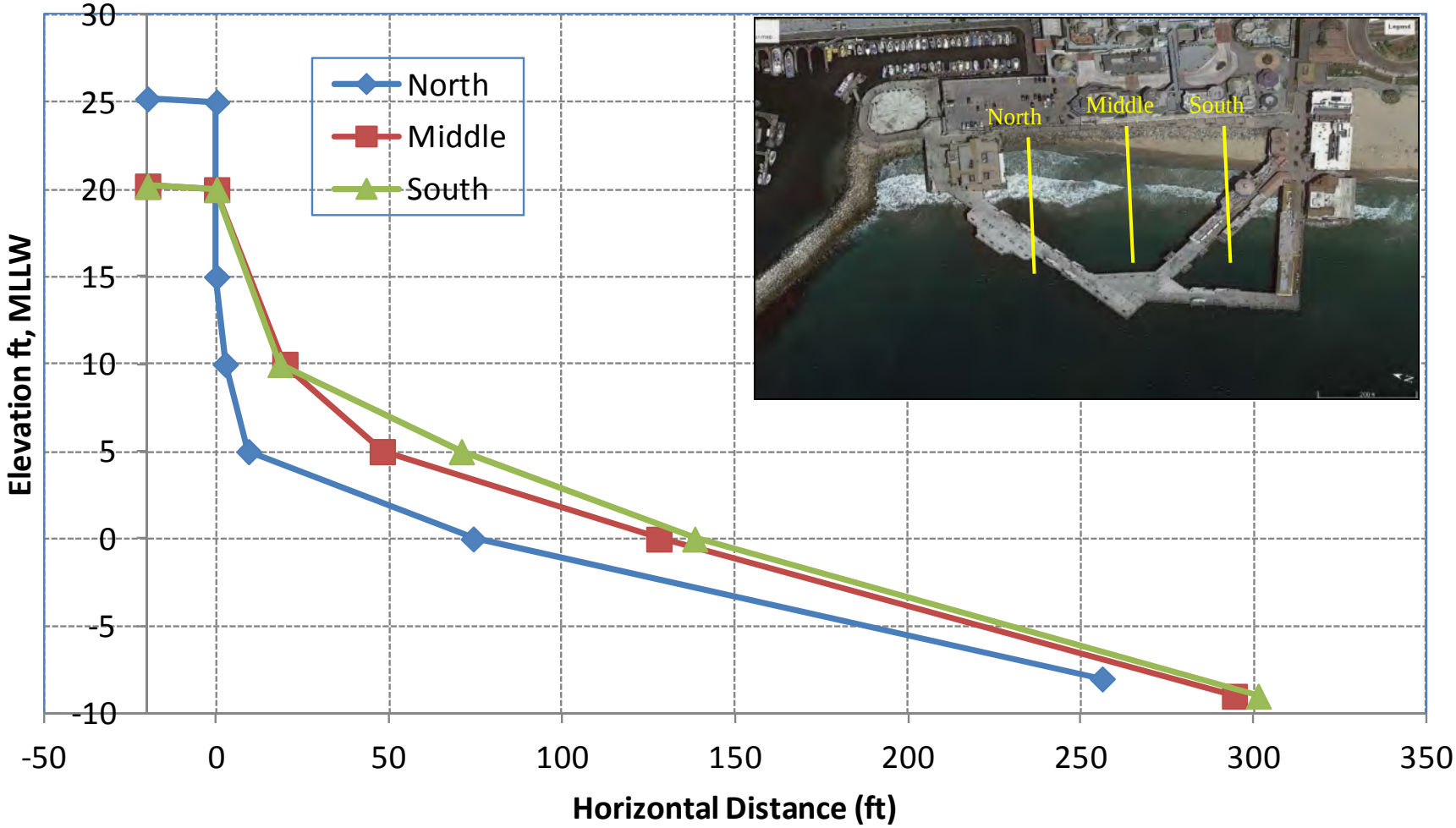
The existing site is situated within a tiny shoreline reach extending from King Harbor on the north to the terminal groin at Topaz Street (Topaz Groin) in the south. This short shoreline section has been a chronologically narrow sandy beach and is strongly influenced by the effects of the Topaz Groin and the Redondo Submarine Canyon located immediately offshore. It has been observed that steady sand losses to the canyon occur, resulting in shoreline recession over this short segment.

A beach nourishment project using dredged sand from Marina del Rey was conducted in 2000 which placed approximately 300,000 cubic yards of sand on the beach between the Topaz Groin and Horseshoe Pier. However, a significant volume of the beach fill was substantially lost into the submarine canyon within a short time after the 2000 beach nourishment. The average berm was reduced from the original width of 190 feet to approximately 60 feet by 2005. After 2005, the remaining beach appeared to be somewhat stable. Additional beach nourishment in 2012 occurred resulting in the placement of 75,000 cubic yards of sand on the beach. Measurements at reference locations between 2000 and 2014 indicate the submarine canyon limits the capacity of beach sands within this shoreline reach to a width of approximately 60 to 70 feet.

Wave Uprush

Wave uprush at the existing site currently occurs in multiple areas. City personnel indicate that wave splash overtops the northern segment of the protective revetment/wall at the Horseshoe Pier annually, while wave run-ups rarely reach higher than the existing protective revetment at the southern reach of the Horseshoe Pier (Noble, 2015b [Appendix I3 of this EIR]). Wave overtopping at Mole D has not been observed since the modification of outer breakwaters that was completed in 1990. The existing crest elevation of the bulkhead surrounding Basin 3 is at approximately + 7.5 feet, MLLW. Inundation along the accessway atop the bulkhead (access road fronting the International Boardwalk) during extreme high tides has been documented in the past.

A wave uprush analysis was therefore performed to validate field observation in the past at three locations defined as the North, Middle, and South profiles. Figure 3.8-11 illustrates the locations of these three transects and deduced cross-shore profiles. The estimated return wave run-ups for 1-year, 10-year, 25-year, 50-year, and 100-year storm severity under existing conditions are presented in Table 3.8-8. The computed results in general validate field observations that the existing walkway at an elevation of +25 feet, MLLW in the northern segment is vulnerable to wave overtopping as the wave run-up elevation reaches to approximately +25 feet, MLLW, even under the annually occurring wave condition. The wave uprush elevation in the middle and southern segments are generally below the finished slab elevation of +20 feet, MLLW for the existing boardwalk. The much higher wave uprush in the northern segment is primarily attributed to the shoreline that adjusts its orientation in relation to the approaching storm waves and the steeper upper section of the shore protective device. Under existing conditions, the computed wave run-up elevation indicates an inundation depth of at least 0.3 feet flowing across the boardwalk toward the landward end in the northern segment. Field observation indicate the wave overtopping height transitioning from the protective wall to the boardwalk would be much higher resulting in various degrees of inundation during storm conditions that coincide with king tides (the highest tides). (Noble, 2015b [Appendix I3 of this Draft EIR]). While the height of the water uprush cannot be precisely calculated, it is estimated that in extreme cases the splash could extend upwards of four feet.



Source: Noble Consultants, Inc., 2015

Figure 3.8-11

Transect Locations and Profiles along Horseshoe Pier

Table 3.8-8: Estimated Wave Run-ups Under Existing Conditions at Boardwalk Landward of the Horseshoe Pier

Return Year Storm Severity	Significant Wave Height (feet)	North	Middle	South
		Wave Run-up Elevation (feet, MLLW)		
1-Year	5.1	24.8	18.0	16.5
10-Year	6.2	25.2	18.9	17.3
25-Year	6.5	25.3	19.2	17.6
50-Year	6.7	25.3	19.2	18.0
100- Year	7.2	25.3	19.4	18.2

Note:
Wave period equals 15 seconds.
Source: Noble, 2015b (Appendix I3 of this Draft EIR)

Additional analysis was performed to assess the potential impact from future sea level rise in combination with wave uprush under the site's existing physical layout. The high value of future sea level rise that was recommended by COPC was applied. Table 3.8-9 presents the computed wave run-up elevations at the three locations. Various degrees of inundation depth resulting from the overtopped water range from a thin sheet of water (0.1 foot) to a depth of approximately one-foot. The wave overtopping height transitioning from the protective wall or revetment to the boardwalk would be much higher during storm conditions that coincide with king tides. Further, as discussed previously, an upward splash could occur as the seawater runs up the steeper wall face of the concrete wall during storm conditions that coincide with king tides. While the height of the water uprush cannot be precisely calculated, it is estimated that in extreme cases the splash could extend upwards of four feet

Table 3.8-9: Estimated Wave Run-ups Under Existing Conditions at Boardwalk Under Different Sea Level Rise Scenarios

Return Year	Significant Wave Height (feet)	2040			2065			2090		
		North	Middle	South	North	Middle	South	North	Middle	South
		Wave Run-up Elevation (feet, MLLW)								
		High Sea Level Rise Projection								
1-Year	5.1	25.6	20.1	20.1	25.8	20.4	20.3	26.2	20.7	20.6
10-Year	6.2	25.5	20.1	20.1	25.9	20.5	20.3	26.2	20.9	20.7
25-Year	6.5	25.4	20.2	20.1	25.9	20.5	20.4	26.3	20.9	20.8
50-Year	6.7	25.4	20.2	20.1	25.9	20.5	20.4	26.3	20.9	20.8
100-Year	7.2	25.4	20.2	20.1	25.9	20.5	20.4	26.2	20.9	20.8
		Low Sea Level Rise Projection								
1-Year	5.1	24.9	18.7	17.1	25.3	20.1	19.1	25.5	20.2	20.0
10-Year	6.2	25.2	19.5	18.1	25.3	20.1	19.1	25.5	20.1	20.1
25-Year	6.5	25.3	19.9	18.5	25.3	20.1	19.4	25.4	20.1	20.0
50-Year	6.7	25.3	19.8	18.5	25.3	20.1	19.7	25.4	20.2	20.1
100- Year	7.2	25.3	19.9	18.6	25.3	20.1	19.6	25.3	20.2	20.0

Source: Noble, 2015b (Appendix I3 of this Draft EIR)
Note:
Wave period equals 15 seconds

Mole D and Seaside Lagoon

Two representative cross sections along Mole D and Seaside Lagoon were developed. These cross sections are presented in Figure 3.8-12. The estimated return wave run-ups for one-year, 10-year, 25-year, 50-year, and 100-year under the without sea level rise are presented in Table 3.8-10.

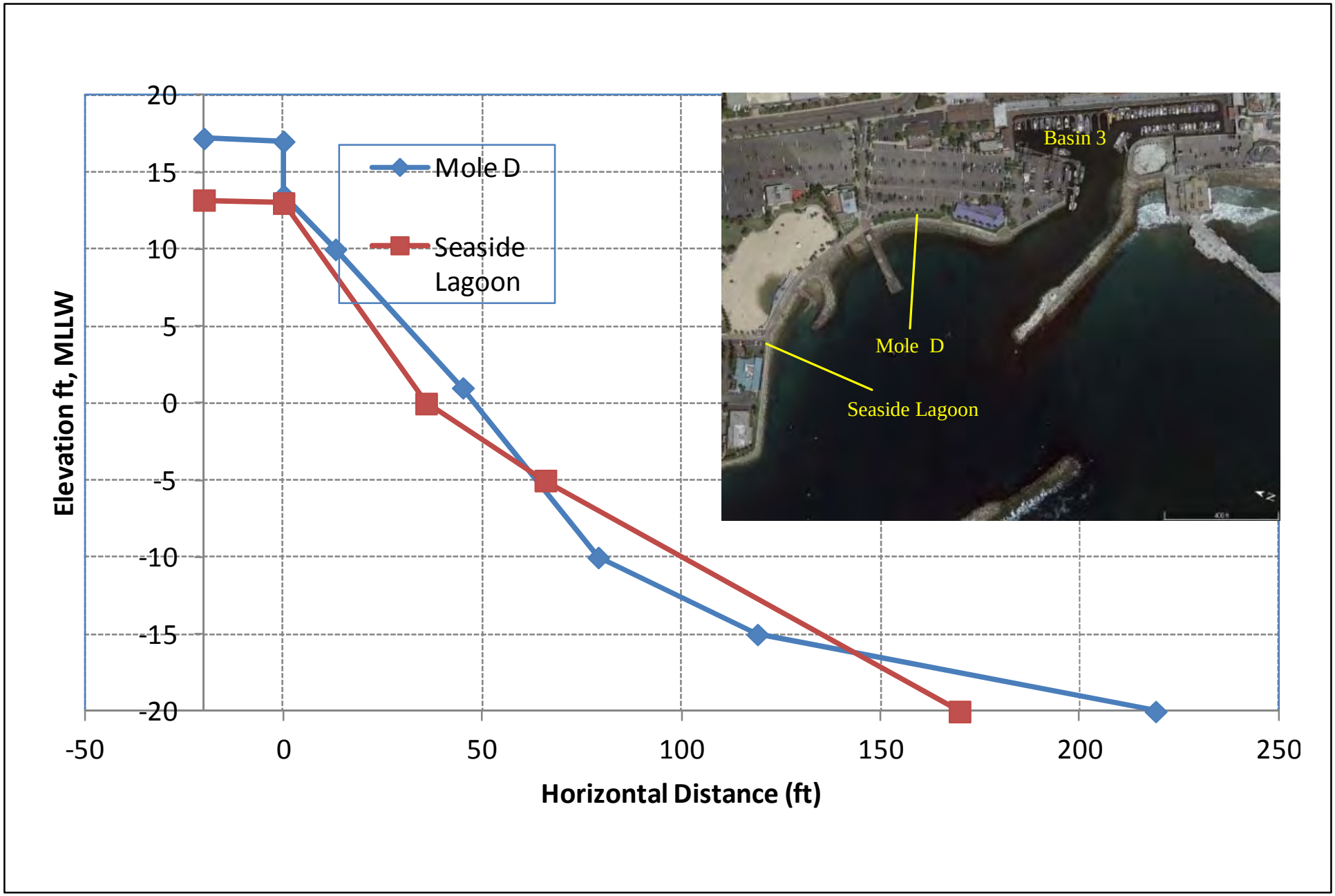
Table 3.8-10: Estimated Wave Run-ups Under Existing Conditions at Mole D and Seaside Lagoon

Return Year	Mole D		Seaside Lagoon	
	Significant Wave Height (feet)	Wave Run-up Elevation (feet, MLLW)	Significant Wave Height (feet)	Wave Run-up Elevation (feet, MLLW)
1-Year	2.1	11.9	1.3	9.7
10-Year	2.3	12.4	1.6	10.2
25-Year	2.7	13.2	2.0	11.0
50-Year	2.7	13.2	1.8	10.7
100- Year	3.9	17.0	3.6	13.7

Source: Noble, 2015b (Appendix I3 of this Draft EIR)
Note:
Wave period equals 15 seconds

Field validation via personal communications with City personnel indicate that wave overtopping at Mole D has not been observed since the modification of the outer breakwaters that was completed in 1990 (Noble, 2015b [Appendix I3 of this Draft EIR]). On the other hand, incoming waves under severe storm events (e.g. 50 and 100-year return storms) can overtop (Noble, 2015b [Appendix I3 of this Draft EIR]).

Wave uprush was also estimated at Mole D and the Seaside Lagoon under the future high sea level rise scenario. Table 3.8-11 presents the computed wave run-up elevations for various conditions.



Source: Noble Consultants, Inc., 2015

Figure 3.8-12

Transect Locations and Profiles at Mole D and Seaside Lagoon

Table 3.8-11: Estimated Wave Run-ups Under Existing Conditions at Mole D and Seaside Lagoon Under Different Sea Level Rise Scenarios

Return Year	2040		2065		2090	
	Mole D	Seaside Lagoon	Mole D	Seaside Lagoon	Mole D	Seaside Lagoon
	Wave Run-up Elevation (feet, MLLW)					
	High Sea Level Rise Projection					
1-Year	13.1	10.8	15.5	12.3	17.3	13.4
10-Year	13.7	11.3	16.3	12.8	17.5	13.6
25-Year	15.2	12.1	17.3	13.5	17.6	13.7
50-Year	15.2	11.8	17.3	13.4	17.6	13.7
100-Year	17.3	13.9	17.5	14.0	17.8	14.4
	Low Sea Level Rise Projection					
1-Year	12.1	9.8	12.5	10.2	13.0	10.6
10-Year	12.5	10.4	13.0	10.7	13.4	11.2
25-Year	13.4	11.2	14.0	11.5	15.0	11.9
50-Year	13.4	10.8	14.0	11.2	15.0	11.6
100-Year	17.1	13.8	17.2	13.8	17.3	13.9

Source: Noble, 2015b (Appendix I3 of this Draft EIR)
Note:
Wave period equals 15 seconds.

3.8.3 Regulatory Framework

Hydrology and water quality issues in the proposed project area are governed by an extensive framework of regulations at the federal, state, and local levels. Major regulations applicable to the proposed project are outlined in this section. This section does not list all applicable regulations governing hydrology and water quality issues. The Primary agencies with regulatory authority over the project area are USEPA, FEMA, USACE, the California State Water Quality Control Board (SWRCB), the California Coastal Commission, the LARWQCB, the County of Los Angeles, and City.

3.8.3.1 Federal Regulations

Clean Water Act

USEPA regulates water quality under the Clean Water Act (CWA). The CWA, enacted by the federal government in 1972 was designed to restore and maintain the chemical, physical, and biological integrity of waters in the United States. The CWA provides the legal framework for several water quality regulations, including NPDES permits, effluent limitations, water quality standards, pretreatment standards, antidegradation policy, nonpoint source discharge regulation, and wetlands protection. USEPA has delegated the responsibility for administration of portions of the CWA to state and regional agencies; therefore, the primary important sections resulting from the CWA are summarized here and discussed in the state and local regulations descriptions that follow.

Section 301(a)

Section 301(a) of the CWA prohibits discharges to receiving waters without a permit. This section serves as the basis of the NPDES program. Discharges from vessels were previously exempted from the CWA, but in December 2008, the USEPA issued the Vessel General Permit (described below).

Section 303

Section 303 of the CWA requires states to develop water quality standards for all waters and submit to the USEPA for approval all new or revised standards established for inland surface waters, estuaries, and ocean waters. Under Section 303(d), the state is required to list water segments that do not meet water quality standards and to develop action plans, called TMDLs, to improve water quality. The SWRCB and the Regional Water Quality Control Boards (RWQCBs) implement sections of the Act through the Ocean Plan, the Enclosed Bays and Estuaries Plan, the nine Water Quality Control Plans, one for each region, and permits for waste discharges.

Section 304

Section 304 of the CWA provides guidelines, water quality standards, and water quality criteria. The California Toxics Rule provides the enforcement mechanism for the guidelines as further described below in this section.

Section 401

Section 401 of the CWA requires an applicant for any federal permit that proposes an activity that may result in a discharge to waters of the United States to obtain a water quality certification. Water quality certifications are issued by the LARWQCB to certify the permit actions of the federal agency will not have adverse water quality impacts. Section 404 Permits issued by the USACE, as discussed below, require a water quality certification.

Section 402

Section 402 of the CWA established the NPDES permit program. The program requires permits for the discharge of any pollutant, except dredge or fill material covered under Section 404, into waters of the United States. Permits are administered by the LARWQCB.

Section 404

Section 404 of the CWA provides for the issuance of dredge/fill permits by the USACE. Permits are typically conditioned to minimize impacts to water quality. Conditions typically include, but are not limited to:

- USACE review and approval of sediment quality analysis prior to dredging. Sediments are tested using approved USEPA protocols;
- Detailed pre- and post-construction monitoring plan that includes disposal site monitoring;
- Timing and water quality restrictions on flow back of dredged water at the dredging site with flow-back water meeting LARWQCB Waste Water Discharge and Receiving Water Monitoring Program requirements;
- Compensation for loss of waters of the United States, including wetlands.

Section 408

Section 408 of the CWA provides that any modification to an existing USACE project requires approval of the USACE through the issuance of a permit. The USACE must find that alteration or permanent use of a USACE project is not injurious to the public interest and does not impair the usefulness of the USACE project.

Rivers and Harbors Appropriations Act of 1899

The Rivers and Harbors Appropriations Act of 1899 authorizes the USACE to exercise control over all construction projects in U.S. navigable waters. The Rivers and Harbors Act was originally designed with the intent to protect navigation and navigable capacity. These objectives were later expanded to include environmental protection. The key provision to this Act is Section 13, which makes it a crime to discharge refuse into any navigable water without the permission of the USACE. Sections 9 and 10 of the Act (33 U.S.C. Section 401 *et seq*.) regulate work and structures in navigable waters of the U.S., including dredging, filling, and bridges. Section 9 relates to bridges and causeways and is administered by the U.S. Coast Guard. Under Section 10, the USACE issues permits for construction, dumping, and dredging in navigable waters, as well as construction of piers, wharves, weirs, jetties, outfalls, aids to navigation, docks, and other structures. In coastal areas, it is typical for permits issued by the USACE to reference their Section 10 and Section 404 authorities.

National Flood Insurance Act

The US Congress established the National Flood Insurance Program (NFIP) with the passage of the National Flood Insurance Act of 1968. The NFIP is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for state and community floodplain management regulations that reduce flood damages. Participation in the NFIP is based on an agreement between communities and the federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the federal government will make flood insurance available in the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing flood damage to buildings and their contents caused by floods. Flood Insurance Rate Maps (FIRMs) are developed by FEMA to determine if a particular parcel lies in a designated 100-year flood zone.

Federal Antidegradation Policy

The federal Antidegradation Policy (40 Code of Federal Regulations [CFR] Section131.12) requires states to develop statewide antidegradation policies and identify methods for implementing them. Pursuant to the CFR, state antidegradation policies and implementation policies and implementation methods shall at a minimum, protect and maintain: (1) existing in-stream water uses; (2) existing water quality where the quality of the waters exceeds levels necessary to support beneficial uses, unless the state finds that allowing lower water quality is necessary to accommodate economic and social development in the area; and (3) water quality in waters considered an outstanding natural resource. State permitting actions must be consistent with the federal Antidegradation Policy.

3.8.3.2 State Regulations

Porter-Cologne Water Quality Act

The Porter-Cologne Water Quality Control Act (California Water Code Section 13000 *et seq*.), which is the principal law governing receiving water quality regulation in California, establishes a comprehensive program to protect water quality and the beneficial uses of state waters. Unlike the CWA, Porter-Cologne covers both surface water and groundwater. Since 1973, the SWRCB and the nine RWQCBs were established by the Act and have been delegated the responsibility for implementing its provisions and administering permitted waste discharge into the coastal marine waters of California.

The Porter-Cologne Act also implements many provisions of the federal CWA, such as the NPDES permitting program. Under the Act "any person discharging waste, or proposing to discharge waste, within any region that could affect the quality of the waters of the state" must file a report of waste discharge with the appropriate RWQCB. Regulated discharges include discharges to land or surface waters. Pursuant to the Act, the RWQCB may then prescribe "waste discharge requirements" (WDRs) that specify conditions related to control of the discharge. The Act defines what is considered pollution, contamination, or nuisance. Porter-Cologne defines "waste" broadly, and the term has been applied to a diverse array of liquid and solid materials, including non-point source pollution. Briefly defined, pollution means an alteration of water quality such that unreasonably affects the beneficial uses of the water. Contamination means an impairment of the water quality to the degree that it creates a hazard to the public health. Nuisance is defined as anything that is injurious to health, is offensive to the senses, or is an obstruction to property use, and which effects a considerable number of people.

When regulating discharges that are covered under the Federal CWA, the SWRCB and RWQCBs issue WDRs and NPDES permits as a single permitting vehicle. In April 1991, the SWRCB and other state environmental agencies were incorporated into the California EPA. Section 401 of the CWA gives the SWRCB the authority to review any proposed federally permitted or federally licensed activity that may impact water quality and to certify, condition, or deny the activity if it does not comply with state water quality standards. If the SWRCB imposes a condition on its certification, those conditions (including WDRs) must be included in the federal permit or license.

The Act was amended in 1999 to require the SWRCB to develop guidance to enforce the state's non-point source (NPS) pollution control program. The SWRCB complied by adopting the NPS Implementation and Enforcement Policy on May 20, 2004. The Office of Administrative Law approved the policy on August 26, 2004. The RWQCBs must regulate all nonpoint sources of pollution, using the administrative permitting authorities provided by the Porter-Cologne Act, and are implementing a Nonpoint Source Pollution Control Program. Under this program, dischargers must comply with the administrative permits issued by the RWQCBs by participating in the development and implementation of NPS pollution control programs, either individually or collectively as participants in third-party coalitions.

Water Quality Control Plan, Los Angeles Region (Basin Plan)

The Basin Plan (*Water Quality Control Plan: Los Angeles Region Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* [RWQCB, 1994]) is intended to preserve and enhance water quality and to protect beneficial uses of regional waters (inland surface waters, groundwater, and coastal waters such as bays and estuaries). The Basin Plan was first

adopted in 1994, and most recently updated on May 2, 2013 through Resolution No. R13-003. This update contained non-regulatory amendments to Chapter 3, Water Quality Objectives by incorporating previously adopted amendments and updated tables. The Basin Plan designates existing and potential beneficial uses of surface water and groundwater, such as contact recreation, municipal drinking water supply, and habitat. The Basin Plan also establishes water quality objectives, which are defined as "the allowable limits or levels of water quality constituents or characteristics that are established for the reasonable protection of beneficial uses of water or the prevention of nuisance in a specific area." Water quality objectives are set as numerical (quantitative) and narrative (qualitative) objectives. Water quality objectives for impaired water bodies are discussed below under, California Identified Impaired Bodies of Water.

The Basin Plan has designated 24 beneficial uses for receiving surface waters. The receiving waterbody for the proposed project drainage area is Santa Monica Bay, specifically Redondo Beach (Beach Cities Watershed Management Group, 2014). The project site is located in the Los Angeles County Coastal feature identified in the Basin Plan. Ten beneficial uses are designated for Redondo Beach in the Basin Plan and are summarized as follows:

- IND – Industrial activities that do not primarily depend on water quality;
- NAV – Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels;
- REC1 – Uses of water for contact recreational activities involving body contact with water, where ingestion of water is reasonably possible;
- REC2 – Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible;
- COMM – Uses of water for commercial or recreational collection of fish, shellfish, or other organisms, including but not limited to, uses involving organisms intended for human consumption or bait purposes;
- MAR – Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g. marine mammals, shorebirds);
- WILD – Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife, (e.g. mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources;
- MIGR – Uses of water that support habitats necessary for migration, acclimation between fresh and salt water, or other temporary activities by aquatic organism, such as anadromous fish;
- SPWN – Uses of water that support high-quality aquatic habitat for reproduction and early development of fish (most frequently used grunion spawning beaches); and
- SHELL – Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g. Clams, oysters, and mussels) for human consumption, commercial, or sports purposes.

California Ocean Plan

The Basin Plan also incorporates SWRCB statewide Water Quality Control Plans, including the California Ocean Plan (COP) (SWRCB, 2012). The COP is implemented by the SWRCB and the RWQCBs. The COP establishes water quality objectives for the ocean waters of California and provides a basis for regulation of wastes discharged to coastal waters by point and nonpoint source discharges. The COP describes beneficial uses and water quality objectives for open ocean waters. The project site is within the Santa Monica Bay watershed and the bay is a receiving waterbody as well as the beaches. Therefore, regulations in the California Ocean Plan are also applicable to the proposed project in addition to the Basin Plan.

California Toxics Rule

The USEPA has established numeric water quality criteria for certain toxic substances for California via the California Toxics Rule (CTR). The CTR establishes acute and chronic surface water quality standards for bodies of water such as inland surface waters and enclosed bays and estuaries that are designated by the RWQCBs as having beneficial uses protective of aquatic life (23 priority toxics) or human health (57 priority toxics). Numeric criteria established in the CTR are the same as those recommended by the USEPA in the CWA Section 304(a) guidance. The CTR also includes provisions for compliance schedules to be issued for new or revised NPDES permit limits when certain conditions are met. NPDES permits are discussed below under Discharge Permits.

State Antidegradation Policy

In accordance with the federal Antidegradation Policy discussed previously, the SWRCB adopted Resolution No. 68-16, Statement of Policy with Respect to Maintaining High Quality Waters in California (more commonly referred to as the state Antidegradation Policy), which restricts the degradation of surface waters of the state and protects bodies of water where the existing water quality is higher than necessary for the protection of present and anticipated designated beneficial uses. The state Antidegradation Policy is implemented by the LARWQCB.

California Identified Impaired Bodies of Water

Under Section 303(d) of the CWA, the state identifies bodies of water that do not meet the established water quality standards. Water-quality-limited or “impaired” bodies of water are those bodies of water that are not, or are not expected to be, in compliance with applicable water quality standards despite the implementation of technology-based effluent limits. They are identified through water quality assessments conducted by the LARWQCB. A report is prepared listing the impairments (303(d) list) along with providing an assessment of the conditions of surface waters (305(b) report). The biennial report, known as the Integrated Report, that last contained an update for the Los Angeles Region was prepared in 2010 and approved by the SWRCB on August 4, 2010 with subsequent approval by the USEPA on October 11, 2011. Due to changes in the reporting process, the report will not be updated for the Los Angeles Region again until 2016 (SWRCB, 2013). The 2010 303(d)-listed water bodies and associated pollutants for Redondo Beach area of Santa Monica Bay, are listed in Table 3.8-12.

Table 3.8-12: 2010 303(d) Listed Water Bodies and Pollutants for Redondo Beach Area of Santa Monica Bay

Water Body	Pollutant	TMDL
Redondo Beach Coastal and Bay Shoreline	Coliform Bacteria	Bacteria TMDL for Dry and Wet Weather Effective July 15, 2003; Reconsideration of Certain Technical Matters Effective July 2, 2014[1]
	DDT	PCB/DDT TMDL Effective March 26, 2012
	PCBs	PCB/DDT TMDL Effective March 26, 2012
Santa Monica Bay Offshore/Nearshore	Debris	Debris TMDL Effective March 20, 2012
	DDT (tissue and sediment)	PCB/DDT TMDL Effective March 26, 2012
	PCBs (tissue and sediment)	
	Sediment Toxicity	
	Fish Consumption Advisory	

Sources: SWRCB, 2011 and 2015.

Once a water body is listed as impaired under Section 303(d), then TMDLs for the impaired bodies of water must be established for the pollutants causing the impairment (33 U.S.C. Section 1313[d][c]). A pollutant load allocation must be established for point and nonpoint sources that contribute to the water quality impairment. The TMDL establishes the total pollutant load from point, nonpoint, and natural sources, inclusive of a safety factor that a water body may receive and not exceed the applicable water quality standards. Once a pollutant load allocation has been set, load allocations for point sources are implemented through NPDES permits for individual dischargers. Implementation of, and compliance with, the TMDL requirements would be administered through the MS4 Permits of the County and City of Los Angeles. Table 3.8-1 above lists the TMDLs that are applicable to the project site.

Assembly Bill (AB) 411

AB 411, adopted in 1997, requires the State Department of Health Services to adopt regulations requiring the testing of all beaches for total coliform, fecal coliform, enterococci, and streptococci bacteria, establish protective minimum standards for the location of monitoring sites and monitoring frequency, to require posting in clearly visible points along affected beaches whenever state standards are violated, and to require that beaches be tested for total coliform, fecal coliform, enterococci, and streptococci bacteria and chemical pollutants including, but not limited to, PCBs, PAHs, and mercury on a weekly basis from April 1 to October 31, inclusive, of each year if certain conditions are met. Additionally, AB 411 requires the local health officer to notify the Director of Parks and Recreation within 24 hours of any beach posting, closure, or restriction, and would require the Director of Parks and Recreation to establish a telephone hotline and update it daily to inform the public of beach postings, closures, and restrictions.

Discharge Permits

Under the CWA and the CWC, the RWQCBs issues NPDES permits to all point source dischargers of waste to surface waters. The RWQCBs also can issue waste discharge requirements for discharges to land and groundwater. To ensure protection of water quality, NPDES permits contain effluent limitation on pollutants of concern, pollutant monitoring frequencies, reporting requirements, schedules of compliance (when appropriate), operating conditions, best management practices, and administrative requirements. NPDES permits apply to public owned treatment works discharges, industrial wastewater discharges, and stormwater. The proposed project alternatives do not pertain to public owned treatment works discharges or industrial wastewater discharges, as such these requirements are not discussed.

State Water Resources Control Board Stormwater Permits

The SWRCB has issued and periodically renews the statewide NPDES general permit for stormwater discharges associated with construction and land disturbance activities. The permit is known as the General Permit for Construction Activities. In 2009 the General Permit for Construction Activities was updated and revised with an effective date of July 1, 2010[2]. This permit requires monitoring for sediment and nonvisible pollutants under specified circumstances. Any project that disturbs an area more than one acre requires a Notice of Intent (NOI) to discharge under the General Permit for Construction Activities filed with the LARWQCB and preparation of a SWPPP. The SWPPP includes measures to eliminate or reduce pollutant discharges and describes the implementation and maintenance of BMPs to control stormwater and other runoff during and after construction. The SWPPP is required to include a menu of BMPs to be selected and implemented based on the phase of construction and the weather conditions to effectively control erosion, sediment, and other construction-related pollutants to meet the Best Available Technology Economically Achievable and Best Conventional Pollutant Control Technology standards. Erosion control BMPs are designed to prevent erosion, whereas sediment controls are designed to trap sediment once it has been mobilized. The following types of BMPs, as applicable, would be implemented during construction:

Erosion Control

- Physical stabilization through hydraulic mulch, soil binders, straw mulch, bonded fiber matrices, and/or erosion control blankets (i.e., rolled erosion control products).
- Soil roughening of graded areas (through track walking, scarifying, sheepsfoot rolling, or imprinting) to slow runoff, enhance infiltration, and reduce erosion.
- Wind erosion (dust) control through the application of water or other dust palliatives as necessary to prevent and alleviate dust nuisance.

Sediment Control

- Perimeter protection through silt fences, fiber rolls, gravel bag berms, sand bag barriers, and straw bale barriers.
- Storm drain inlet protection.

[2]The 2009-0009-DWQ General Permit for Construction Activities is available online at: http://www.swrcb.ca.gov/water_issues/programs/stormwater/constpermits.shtml

- Sediment capture through sediment traps, storm drain inlet protection, and sediment basins.
- Velocity reduction through check dams, sediment basins, and/or outlet protection/velocity dissipation devices.
- Reduction in off-site sediment tracking through stabilized construction entrance/exit, construction road stabilization, and/or entrance/exit tire wash.

The General Permit for Construction Activities contains receiving water limitations that contain receiving water limitations that require stormwater discharges to not cause or contribute to a violation of any applicable water quality standard. Inspections of all BMPs are required throughout construction. Construction would be covered under the statewide NPDES General Permit for Construction Activities.

The LARWQCB also regulates discharges of groundwater from construction activities in the coastal watershed of Los Angeles County under Order No. R4-2013-0095 (NPDES Permit No. CAG994004).[3] Discharges covered by this permit include, but are not limited to, treated or untreated groundwater generated from permanent or temporary dewatering operations. The order requires that discharges do not cause or contribute to a violation of any applicable water quality object or criteria and establishes monitoring and reporting requirements.

Los Angeles Countywide Municipal Separate Storm Sewer System (MS4) NPDES Permit

Under the NPDES stormwater program, operators of large, medium, and regulated small MS4s are required to have authorization to discharge pollutants to water bodies under an NPDES permit. The City and Los Angeles County are co-permittees under the Municipal Stormwater NPDES Permit No. CAS004001, Waste Discharge Requirements for Municipal Waste Discharge Requirements for Municipal Separate Storm Sewer Systems (MS4) Discharges within the Coastal Watersheds of Los Angeles County, Except Those Discharges Originating From the City of Long Beach MS4. The current permit was adopted by the LARWQCB on November 8, 2012 and became effective on December 28, 2012 through Order No. R4-2012-0175. In Los Angeles County, all of the MS4 agencies are incorporated under this single permit. This includes all 84 incorporated cities and Los Angeles County, referred to as the Permittees, except for Long Beach which has its own MS4 permit.

The purpose of the permit is to implement federal Phase 1 NPDES Stormwater Program Requirements to protect beneficial uses in receiving water bodies. The requirements include the following elements as stated in the MS4 permit: (1) a requirement to effectively prohibit non-stormwater discharges through the MS4; (2) requirements to implement controls to reduce the discharge of pollutants to the maximum extent practicable; and (3) other provisions the LARWQCB has determined appropriate for the control of such pollutants. The MS4 permit is designed to ensure the Permittees through their MS4s are not causing or contributing to exceedances of applicable water quality objectives.

[3] NPDES Permit No. CAG994004 is available online at: http://www.swrcb.ca.gov/rwqcb4/board_decisions/adopted_orders/index.shtml

Enhanced Watershed Management Program

To meet the requirements of the MS4 permit, the permit allows Permittees the flexibility to create Enhanced Watershed Management Programs (EWMPs). As defined in the MS4 permit, an EWMP "is one that comprehensively evaluates opportunities, within the participating Permittees' collective jurisdictional area in a Watershed Management Area, for collaboration among Permittees and other partners on multi-benefit regional projects" (LARWQCB, 2012). An EWMP must:

- Be consistent with the NPDES Permit requirements;
- Incorporate State agency input on establishing priorities and key implementation issues;
- Meet water quality standards and other CWA obligations;
- Include multi-benefit regional projects to ensure MS4 discharges achieve compliance with all final water quality based effluent limitations (WQBEL) and do not cause or contribute to exceedances of receiving water limitations by retaining through infiltration or capture and reuse the stormwater volume of the 85th percentile, 24-hour storm for the drainage areas tributary to the regional projects;
- Where retention of the stormwater volume from the 85th percentile, 24-hour event, is not technically feasible, include other watershed control measures to ensure MS4 discharges achieve compliance with interim and final WQBELs with compliance deadlines after approval of the EWMP and ensure discharges do not cause or contribute to exceedances of receiving water limitations;
- Maximize effectiveness of funds through analysis of alternatives and the selection and sequencing of actions needed to address human health and water quality related challenges and non-compliance;
- Incorporate effective innovative technologies, approaches, and practices including green infrastructure; and
- Ensure existing requirements to comply with technology-based effluent limitations and core requirements of elimination of non-stormwater discharges of pollutants through the MS4 and controls to reduce the discharge of pollutants in stormwater to the maximum extent feasible are not delayed; and
- Ensure a financial strategy is in place (LARWQCB, 2012).

The City is participating in an EWMP though the Beach Cities Watershed Management Group. Participants in the group are the Los Angeles County Flood Control District and the cities of Redondo Beach, Manhattan Beach, Hermosa Beach, and Torrance. The Beach Cities Watershed Management Group developed and submitted a EWMP Workplan to the LARWQCB in June 2014. The workplan was prepared in accordance with requirements stipulated under the MS4 permit. King Harbor Marina and the Redondo Beach Pier are included in the EWMP as they contain MS4 structures. A draft EWMP that is consistent with the Work Plan was submitted to the LARWQCB in June 2015. The draft EWMP includes strategies, control measures and BMPs to achieve water quality targets (i.e., WQBELs) and receiving water limitations in the Santa Monica Bay and Dominguez Channel Watersheds. The EWMP involves preparation of a Reasonable Assurance Analysis for each watershed to demonstrate the proposed BMP implementation scenarios will achieve water quality standards.

Planning and Land Development Program

The MS4 Permit requires Permittees to implement a Planning and Land Development Program for all new development and redevelopment. The proposed project involves redevelopment of more than 50 percent of an existing development and thus meets the criteria specified in the MS4 Permit for applicability of the Planning and Land Development Program. Applicable new development/redevelopment project performance criteria include:

- Controlling pollutants from the project site by minimizing impervious surface area and controlling runoff from impervious surfaces through infiltration, bioretention, and/or rainfall harvest and use;
- Retain 0.75 inch, 24-hour rain event on-site or the 85th percentile, 24-hour rain event on-site, whichever is greater;
- Bioretention[4] and biofiltration[5] systems must meet MS4 permit requirements, such as sizing specifications, geometry, planting and storage media, flow requirements, and the possible need for an overflow device and underdrain; and
- Evaluation of on-site retention, Permittee must consider maximum potential for evapotranspiration from green roofs and rainfall harvest and use.

Where it is technically infeasible to meet the project performance criteria or the project applicant is proposing an alternative off-site project to replenish regional groundwater then one of the following mitigation options meeting the specified criteria in the MS4 permit must be included:

- On-site biofiltration
- Off-site infiltration
- Groundwater replenishment
- Retrofitting an existing development
- Regional stormwater mitigation program

The City evaluates projects to determine compliance with the Planning and Land Development Program through a review of urban stormwater management plans discussed under Local Regulations.

Public Construction Activities Management

The MS4 Permit requires Permittees to implement and comply with the Planning and Land Development Program requirements discussed above at all Permittee-owned or operated construction projects. Permittee-owned or operated construction projects must comply with local stormwater and urban runoff pollution control measures implemented to comply with the

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[4] Bioretention areas are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration, and also provide for pollutant removal by filtering stormwater through the vegetation and soils.

[5] Biofiltration utilizes vegetation with slow and shallow-depth flow for runoff treatment by the combined effects of filtration, infiltration, adsorption, and biological uptake to remove pollutants. Vegetation also decreases the velocity of flow and allows for particulates to settle. Biofiltration facilities include both vegetated swales and filter strips - broad areas of turf grasses or other vegetation designed for treating sheet flow runoff from adjacent impervious surfaces.

MS4 Permit. The Permittee is required to obtain separate coverage under the NPDES General Permit for Construction Activities. All Permitee-owned or operated construction sites that disturb an area more than one acre are required to file an NOI to discharge under the General Permit for Construction with the LARWQCB and prepare a SWPPP.

3.8.3.3 Local Regulations

South Coast Air Quality Management District

The proposed project would have to comply with SCAQMD Rule 403[6] regarding incorporation of measures to reduce fugitive dust, which would also help reduce the potential for construction related erosion (SCAQMD Rule 403(d)(2)). SCAQMD Rule 403, Table1, provides measures for construction activities to reduce fugitive dust. This includes measures for the application of water or stabilizing agents to prevent generation of dust plumes, pre-watering materials prior to use, use of tarps to enclose haul trucks, stabilizing sloping surfaces using soil binders until vegetation or ground cover effectively stabilize slopes, and hydroseeding prior to rain. (See SCAQMD Rule 403, Table 1, for additional details).

City of Redondo Beach - Stormwater and Urban Runoff Pollution Control Regulations

All development projects in the City are required to comply with the Redondo Beach Municipal Code sections regulating water quality, Title 5, Chapter 7 *Stormwater and Urban Runoff Pollution Control Regulations.* Under Title 5, Chapter 7, development projects are required comply with the Municipal NPDES permit (discussed above) to lessen water quality impacts of development by using smart growth practices and integrating LID practices and standards. Based on the size of the proposed redevelopment associated with the proposed project, it is classified as a Planning Priority Project. Planning Priority Projects are subject to City conditioning and approval for the design and implementation of post-construction pollutant controls and must be designed to control pollutants, pollutant loads, and runoff volume to the maximum extent feasible through minimization of impervious surface areas and through evapotranspiration, infiltration, bioretention, and/or rainfall harvest and use.

BMPs shall be identified to control stormwater pollution from both construction activities and operation. Structural or Treatment Control BMPs must meet the minimum design standards in current MS4 Permit, including the LID requirements. If structural or treatment control BMPs are required, then the project applicant must include maintenance provisions and a signed statement accepting responsibility for the structural and treatment control BMPs until the property is transferred. Any sale or lease agreements for a property with structural and treatment control BMPs shall the sale or lease agreements or property deed to include a provision for the successor owner or lessee to assume responsibility for the existing structural or treatment control BMPs or replace the BMPs with new measures meeting the then current City requirements. The condition of transfer shall include a provision that the successor owner or lessee conduct maintenance inspections of the BMPs annually and retain proof of the inspections. City Engineer review and approval is required.

[6] Rule 403 is available online at: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-403.pdf?sfvrsn=4

Regardless of construction site size, the City through its Municipal Code requires all construction sites to comply with minimum BMPs during construction as specified in the MS4 permit. Construction sites greater than one acre must also comply with the General Permit of Construction Activities previously discussed. All priority projects are required to prepare a local stormwater pollution prevention plan (LSWPPP). LSWPPP's must meet all SWPPP requirements as specified in the General Permit for Construction Activities. If a construction site for a priority project is disturbed during the rainy season, October 15 through April 15, then a Wet Weather Erosion Control Plan (WWECP) is required. The LSWPPPs and WWECPs must identify BMPs to be implemented to mitigate impacts to stormwater quality from erosion and sediments. The City provides pamphlets containing a list of acceptable BMPs appropriate for construction activities to reduce stormwater impacts related to sediments, erosion, general site management, and materials and waste management. Prior to construction, an authorized representative of the contractor must acknowledge receipt of the pamphlets.

The following types of BMPs, as applicable, would be implemented during construction:

Erosion Control

- Physical stabilization through hydraulic mulch, soil binders, straw mulch, bonded fiber matrices, and/or erosion control blankets (i.e., rolled erosion control products).
- Soil roughening of graded areas (through track walking, scarifying, sheepsfoot rolling, or imprinting) to slow runoff, enhance infiltration, and reduce erosion.
- Wind erosion (dust) control through the application of water or other dust palliatives as necessary to prevent and alleviate dust nuisance.

Sediment Control

- Perimeter protection through silt fences, fiber rolls, gravel bag berms, sand bag barriers, and straw bale barriers.
- Storm drain inlet protection.
- Sediment capture through sediment traps, storm drain inlet protection, and sediment basins.
- Velocity reduction through check dams, sediment basins, and/or outlet protection/velocity dissipation devices.
- Reduction in off-site sediment tracking through stabilized construction entrance/exit, construction road stabilization, and/or entrance/exit tire wash.

In May 2015, the Redondo Beach City Council adopted Ordinance No. 3129-15 to amend the Redondo Beach Municipal Code regarding stormwater and urban runoff pollution control regulations, thereby bringing the City in compliance with recently updated Federal, State and Local municipal separate storm sewer system (MS4) permit requirements. The ordinance identified LID practices for new development and redevelopment projects, placing an emphasis on managing stormwater as close to its source as possible. LID includes elements such as bio-retention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable

pavements that minimize effective imperviousness. The LID practices identified in the ordinance reflect those set forth in the Los Angeles County LID Standards Manual.

All projects that incorporate street or road construction of 10,000 square feet or more of impervious surfaces (including the proposed project) must also follow the City's Green Street Policy[7] and comply with the Los Angeles County LID Standards Manual[8]. The Green Street Policy was adopted by the City Council in May 2015, and is designed to demonstrate compliance with the NPDES MS4 Permit for the Los Angeles Region (Order No. R4-20120175[9]) and required new development and/or redevelopment streets and roadway projects to incorporate green street BMPs that comply with LID requirements.

Additional elements of the City's stormwater program include a Fats, Oils, and Grease (FOG) control and inspection program for businesses that have the potential to discharge large amounts of FOG into the sewer system, which is a major cause of wastewater overflows. These facilities are inspected twice a year to ensure the FOG removal systems are being properly maintained. The City participated in the Clean Bay Restaurant Certification program to help educate restaurant operators on BMPs that reduce impacts on water quality in the Santa Monica Bay, establishes an incentive for restaurants and other food service establishments to exceed City regulations, and informs the public about restaurants meeting the higher standards.

City of Redondo Beach – Water Quality Best Management Practices

The City maintains lists of acceptable BMPs appropriate for various activities that have the potential to affect water quality in King Harbor. These "Guides to Protecting Water Quality in King Harbor" include BMP lists associated with commercial business operations, boat yard operations, boating/boat operations, and fuel dock operations.[10] The BMPs are intended to prevent or reduce pollutant discharges to storm drains through general site management, education, and outreach.

3.8.4 Impacts and Mitigation Measures

3.8.4.1 Methodology

Potential impacts of the proposed project on hydrology and water quality, including sediments and oceanography, are assessed through a combination of literature review (including applicable water quality criteria), a review of available water quality data and results from previous testing of Harbor sediments, and project-specific studies addressing tidal hydraulics, sediment transport potential, water circulation patterns, and water quality evaluation.

The evaluation of potential impacts associated with hydrology and flooding considers potential impacts associated with alterations to the amounts of pervious and impervious surfaces within the project site and changes to existing drainage patterns due to proposed buildings as well as

[7] The City of Redondo Green Street's Policy is available the Redondo Beach City Hall, 415 Diamond Street.

[8] The Los Angeles County LID Standards Manual is available online: http://dpw.lacounty.gov/wmd/dsp_LowImpactDevelopment.cfm;

[9] NPDES MS4 Permit for the Los Angeles Region (Order No. R4-20120175) is available online at: http://www.waterboards.ca.gov/losangeles/water_issues/programs/stormwater/municipal/

[10] Available online at: http://www.redondo.org/depts/eng_build/engineering/water_quality_program/bmp.asp

the opening of Seaside Lagoon to King Harbor. The potential for the proposed project to cause an exceedance of the capacity of the stormwater drainage system is evaluated, as is the potential for proposed uses to impede flows or cause an increase in flooding. Updates to aging infrastructure, including construction of a new on-site stormwater drainage system in order to address stormwater quality requirements prior to discharging on-site stormwater from the site to the receiving waters are also analyzed.

The water quality implications of construction-related impacts for erosion, sedimentation, turbidity and re-suspension of sediment are evaluated. In addition, potential water quality impacts associated with operational changes, including the proposed changes in the drainage system and opening Seaside Lagoon to King Harbor, are assessed.

Potential long-term effects associated with sea level rise consider the City's emergency planning, including the Hazard Mitigation Plan (City of Redondo Beach, 2004) and interim guidance prepared by the California Sea-Level Rise Task Force, as updated by the Committee on Sea Level Rise in California, Oregon, and Washington, and the California Coastal Commission's Sea Level Rise Policy Guidance adopted in August 2015. As described in Section 3.8.2.2, sea level rise projections considered in this analysis are based on a range recommended by the California Ocean Protection Council. The projections are uncertain, with uncertainty increasing over time, and the analysis conservatively assumes the highest projected sea level rise.

The evaluation of tsunami hazards includes consideration of historical information on past tsunamis and the evaluation of modeled hypothetical tsunami scenario by USGS SAFRR and draft guidance prepared in part by CGS. The analysis also takes in to account emergency planning preparation by the City and County and the national tsunami warning system. Additional information is obtained from the University of Southern California Tsunami Research Center and published by the California Environmental Management Agency.

3.8.4.2 Thresholds of Significance

The proposed project would result in significant impacts to hydrology and water quality if it would:

HWQ-1: Violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality.

HWQ-2: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site.

HWQ-3: Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff that would require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects not already addressed as part of the proposed project.

HWQ-4: Place structures within a 100-year flood hazard area such that flood flows would be impeded or redirected or expose people or structures to a significant risk of loss,

injury, or death involving flooding.

HWQ-5: Expose people and structures to substantial risk associated with inundation by seiche, tsunami, mudflow, or sea level rise.

3.8.4.3 Impacts and Mitigation

Proposed Project

The main components of the proposed project include the proposed demolition of approximately 207,402 square feet of existing buildings/structures, demolition of the existing Pier Parking Structure, demolition and possible reconstruction in kind of the Sportfishing Pier, construction of up to approximately 511,460 square feet to include retail, restaurant, creative office, specialty cinema, a public market hall, and a boutique hotel and retention of approximately 12,479 square feet of existing buildings/structures, resulting in approximately 304,058 square feet of net new development. The proposed project also includes enhancements to public recreation and open space, including a new boat launch ramp (for small craft), the opening of Seaside Lagoon to King Harbor as a protected beach (currently the lagoon is not directly connected to the ocean), as well as new and expanded pedestrian and bicycle pathways. Site connectivity and coastal access would be increased by the establishment of a new pedestrian/bicycle bridge across the Redondo Beach Marina/Basin 3 entrance, a new pedestrian boardwalk along the water's edge from the base of the Horseshoe Pier to Seaside Lagoon, and the Pacific Avenue Reconnection. Infrastructure, including on-site stormwater facilities, would be upgraded/replaced.

For the purposes of the hydrology and water quality analysis, this analysis assumes that the proposed boat launch ramp would require construction of a rubble-mound breakwater (which would be an approximate 420-foot long permanent structure within the turning basin), that the Seaside Lagoon's existing revetment would require modifications, and that the new pedestrian/bicycle bridge would require two piers within the entrance of Basin 3. In addition, the proposed project includes redevelopment of Basin 3 that proposes the replacement of the existing wood docks with concrete docks and modification of the dock configuration, and may possibly require the recapping of, and minor repairs to, the bulkhead. A temporary netting system would be placed within the marina/Basin 3 during the rehabilitation and repair of the bulkhead and replacement of the cap to prevent demolition debris from falling into the water.

The Pacific Avenue Reconnection and associated changes in pedestrian and bicycle connectivity would require the construction of a retaining wall adjacent to the existing retaining wall along the eastern project boundary with the residential complex. This analysis also assumes that the Sportfishing Pier would be demolished, and possibly replaced in-kind. The remaining wooden portion of the Horseshoe Pier (deck and pilings) would be replaced. These are considered conservative/worst case assumptions because of the type of construction associated with these facilities (i.e. construction work occurring within the water).

3.8.4.3.1 Impact Determination

Impact HWQ-1: The proposed project would not potentially violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality.

Construction

Construction of the proposed project would involve grading, excavation, and limited dredging activities. Construction activities would occur both on the shore, near the immediate vicinity of the shore, and in the harbor.

Construction activities would involve the use of certain hazardous materials associated with use of construction equipment on-site, including vehicle fuels (both gasoline and diesel), oils, solvents, and transmission fluids. The types and amounts of hazardous materials would vary according to the nature of the activity. These types of materials, however, are not acutely hazardous, and all storage, handling, and disposal of these materials must comply with the regulations for handling, storage, spill control, and disposal described in Section 3.7 Hazards and Hazardous Materials.

Potential construction impacts on groundwater, surface water (runoff from landside construction), and harbor water (associated with marine construction) are discussed below. As described, compliance with regulatory requirements, including implementation of BMPs would ensure that the proposed project would not potentially violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality. Therefore, construction impacts to surface water quality are considered less than significant.

Groundwater

Construction activities associated with the proposed project include the demolition of existing structures, hardscape and landscape, removal of debris, excavation, fill replacement and grading of the project site for foundation and utilities, dredging, and construction of proposed structures and installation of new hardscape and landscaping. As previously discussed, groundwater levels at the project site are estimated to be equivalent to the tidal level in the harbor. As such groundwater levels at the project site are expected to be within five to ten feet below ground surface and temporary construction dewatering may be necessary. Groundwater would likely be free of contaminants; as previously described and detailed in the Section 3.7 Hazards and Hazardous Materials, six former underground storage tanks (USTs) were removed from the project site in 1990. The site was granted closure by LACDPW, therefore the area of the former USTs has received risk-based regulatory closure and no further remediation is required, and contaminated groundwater is not expected to be encountered, nor would the proposed project cause a reduction in groundwater quality. Refer to Section 3.7 Hazards and Hazardous Materials for the impact analysis associated with the potential to encounter contaminated soils. Further, any dewatering activity that would discharge to land surface would need to comply with the provisions of the General Dewatering Permit (Los Angeles County under Order No. R4-2013-0095 [NPDES Permit No. CAG994004]), which includes requirements for ensuring that discharges will not cause or contribute to a violation of any applicable water quality objectives and establishing a monitoring and reporting program. If any contaminated groundwater is unexpectedly encountered during discharge monitoring, the developer would be required to notify RWQCB and establish a treatment system for the wastewater. With the required compliance with the General Dewatering Permit, construction impacts to groundwater quality are considered less than significant.

Surface Water

Construction of the proposed project would include implementation of construction BMPs as part of a SWPPP as required by the statewide NPDES General Permit for Construction Activities for sites disturbing one acre or more. The SWPPP includes measures to eliminate or reduce pollutant discharges and describes the implementation of BMPs to control stormwater and other runoff during construction. The General Permit for Construction Activities contains receiving water limitations that require stormwater discharges to not cause or contribute to a violation of any applicable water quality standard. Inspections of BMPs are required throughout construction. Required construction BMPs are designed to reduce potential adverse effects to the general public and the environment. Construction contract specifications would include strict on-site handling rules to keep construction and maintenance materials from entering groundwater, surface waters, and harbor. BMPs include, but are not limited to:

- Control of erosion and sedimentation associated with construction-related surface disturbance (refer to Section 3.8.3.2 for a list of the types of erosion and sediment control BMPs, as applicable, that would be implemented during construction);
- Establish a dedicated area for fuel storage and refueling activities that includes secondary containment protection measures and spill control supplies;
- Follow manufacturer's recommendations on use, storage and disposal of chemical products used in construction;
- Avoid overtopping construction equipment fuel gas tanks;
- During routine maintenance of construction equipment, properly contain and remove grease and oils.
- Properly dispose of discarded containers of fuels and other chemicals.

Therefore, construction impacts to surface water quality are considered less than significant.

Harbor Water Quality

Portions of the proposed project would be constructed within the harbor and directly adjacent to the harbor. Construction activities adjacent to or within the harbor include dredging, demolition, pile driving, potential dredged material disposal, placement of rocks, and concrete work. As discussed in greater detail below, project components occurring in the harbor or directly adjacent to the harbor include construction of a small craft boat launch ramp, demolition and potential replacement of the Sportfishing Pier, opening of Seaside Lagoon to the harbor, reconstruction of the docks and recapping of the bulkhead in Basin 3, reconstruction of the timber portion of the Horseshoe Pier, and construction of a pedestrian bridge over the entrance to Basin 3.

In general, construction activities within the water include short-term increases in turbidity, suspended sediments, and decreases in dissolved oxygen concentrations. The in-water construction activities have the potential to affect water quality by disturbing bottom sediments and potentially introducing sediment material into the water column that may impact a variety of different water quality parameters. The size of this affect varies between the different activities. The greatest potential disturbance of sediment would result from installation of the breakwater associated with the boat ramp, which would disturb approximately 62,000 square feet of soft bottom sediments, 5,800 square feet of rock/cobble

bottom, and 980 square feet of intertidal riprap. The opening of Seaside Lagoon would disturb approximately 6,300 square feet of unconsolidated bottom and, 2,000 square feet of rock/cobble/debris bottom, and 5,000 square feet of intertidal riprap. Removal and installation of piles associated with the Horseshoe Pier, Sportfishing Pier, Basin 3 dock reconstruction, and pedestrian bridge would result in approximately 500 square feet of bottom habitat disturbance.

The changes to water quality occurring during construction as a result of turbidity would be temporary and localized to the construction areas and would not be expected to result in violations of water quality standards.

Dredging for the proposed project would require a Section 404 permit from the USACE and a Section 401 (of the CWA) Water Quality Certification from the LARWQCB. As part of this regulatory/permitting process, monitoring requirements include measurements of water quality parameters such as dissolved oxygen, light transmittance (turbidity), pH, and suspended solids at varying distances from the dredging operations. In the unlikely event that construction exceeds any of the monitoring levels, the dredging permit would include corrective actions such as use of silt curtains, which would be implemented if the monitoring data indicate that water quality conditions outside of the mixing zone exceed the permit-specified limits.

While temporary and localized increases in turbidity would occur during construction activities, this would not be expected to result in violations of water quality standards, and as such, construction-related impacts to harbor water quality would be less than significant.

Small Craft Boat Launch Ramp

Construction of the small craft boat launch ramp generally consists of a two-lane concrete boat ramp, boarding floats, breakwater, and surface parking. Construction would take place within the harbor and on the shore using land based and marine equipment over an 8 month period. Construction would result in temporary effects to water quality that may include localized increases in turbidity and sedimentation, along with lowered dissolved oxygen levels associated with disturbance of anoxic sulfidic sediments. These impacts would be temporary and localized and would not result in violations of water quality standards or waste discharge requirements or otherwise substantially degrade water quality. Section 3.3 Biological Resources, discusses potential turbidity impacts that could affect marine organisms. Impacts to water quality, as related to construction of the small craft boat launch ramp are considered less than significant for the same reasons described in the previous subsection (“Harbor Water Quality”).

Sportfishing Pier

The Sportfishing Pier project element generally consists of the demolition of the existing pier and possible replacement with a new pier with similar dimensions and footprint. Demolition would take place from within the harbor using marine based equipment. If the pier is replaced construction would take place using land and harbor based equipment over a nine month period. Short-term increases in turbidity during pile removal and installation may lead to a localized reduction of water quality. These impacts would be temporary and localized and would not result in violations of water quality standards or waste discharge requirements or otherwise substantially degrade water quality. Section 3.3 Biological Resources, discusses potential turbidity impacts that could affect marine organisms. Construction-related impacts to water quality that could occur in conjunction with replacement of the Sportfishing Pier are considered less than significant for the same reasons described in the previous subsection (“Harbor Water Quality”).

Seaside Lagoon

The Seaside Lagoon project element generally consists of the conversion of the existing interior swimming lagoon into an embayment directly connected to King Harbor. Construction is anticipated to occur over four months. Demolition would include removal of the existing hand launch and dinghy dock. Most of the construction would involve land based construction equipment, except for the lagoon's entrance basin. The entrance basin would be constructed using a derrick barge with dredging using a clam shaped scoop. Dredging of approximately 6,300 cubic yards would occur. It is anticipated that if there is suitable dredge material, the material would be used as beach fill with excess material used to level the harbor bottom. Construction would result in temporary effects to water quality that may include localized increases in turbidity and sedimentation, along with lowered dissolved oxygen levels associated with disturbance of anoxic sulfidic sediments. These impacts would be temporary and localized and would not result in violations of water quality standards or waste discharge requirements or otherwise substantially degrade water quality. Section 3.3 Biological Resources, discusses potential turbidity impacts that could affect marine organisms. Construction-related impacts to water quality that could occur in conjunction with conversion of the Seaside Lagoon are considered less than significant for the same reasons described in the previous subsection ("Harbor Water Quality").

Redondo Beach Marina in Basin 3

The marina project element generally consists of the demolition of the existing slips, docks, facilities, and reconstruction/redevelopment of the entire floating dock complex and appurtenant facilities, including the bulkhead, within the marina. Construction is anticipated to occur over seven to eight months. Bulkhead repair is expected to occur over six to eight weeks. Demolition would include removal of the floating docks and piles. Demolition/construction would involve land and marine based construction equipment. Temporary impacts to water quality may include localized increases in turbidity and sedimentation, along with lower dissolved oxygen levels associated with disturbance of anoxic sulfidic sediments. During rehabilitation of the bulkhead a temporary netting system would be placed within the Basin to prevent demolition debris from falling in the basin. Short-term increases to turbidity may occur during pile removal and installation. These impacts would be temporary and localized and would not result in violations of water quality standards or waste discharge requirements or otherwise substantially degrade water quality. Section 3.3 Biological Resources, discusses potential turbidity impacts that could affect marine organisms. Construction-related impacts to water quality that could occur in conjunction with improvements proposed within Basin 3 are considered less than significant for the same reasons described in the previous subsection ("Harbor Water Quality").

Horseshoe Pier

The Horseshoe Pier project element generally consists of the demolition of the existing timber pier and replacement of the timber constructed portion of the pier. Construction is anticipated to occur over seven months. All work is anticipated to be completed using land based equipment. Short-term increases in turbidity may occur during demolition/construction. Given the substrate type (sand) and open ocean environment of the pier location, it is expected that any resuspended sediment would quickly settle to the bottom or be dispersed by water motion and these impacts would not result in violations of water quality standards or waste discharge requirements or otherwise substantially degrade water quality. Section 3.3 Biological Resources, discusses potential turbidity impacts that could affect marine organisms. Construction-related impacts to water quality that could occur in conjunction with

improvements to the Horseshoe Pier are considered less than significant for the same reasons described in the previous subsection ("Harbor Water Quality")

Pedestrian Bridge

The pedestrian bridge element generally consists of the construction of a 12-foot wide, 248 foot long fabricated steel movable bridge crossing the entrance to Basin 3. Construction is anticipated to occur over six months. Construction would involve land and marine based construction equipment. Pier foundations would be constructed at the entrance to the basin. Temporary impacts to water quality may include localized increases in turbidity. These impacts would be temporary and localized and would not result in violations of water quality standards or waste discharge requirements or otherwise substantially degrade water quality. Section 3.3 Biological Resources, discusses potential turbidity impacts that could affect marine organisms. Impacts to water quality that could occur in conjunction with construction of the Pedestrian Bridge are considered less than significant for the same reasons described in the previous subsection ("Harbor Water Quality").

Operations

Stormwater generated on-site during operation of the proposed project has the potential to convey contaminants generated on-site to the groundwater, surface water, and harbor. The proposed project involves redevelopment of an existing developed area. As previously indicated in Table 3.8-1, the 31.2 acre site is 79 percent impervious and 21 percent pervious. As summarized in Table 3.8-13, the proposed project would contain approximately 17.1 acres of hardscape and buildings, 8.2 acres of permeable pavement/pavers, 5.9 acres of landscape, and a seaside lagoon. When complete, approximately 64 percent of the site would be impervious, which is a decrease in impervious area as compared to existing conditions, which is 79 percent impervious. Runoff would be directed away from impervious surfaces and into landscaped areas, landscape features (e.g. planter boxes), or other pervious areas, which would prevent erosion and siltation from entering the storm drain system. As proposed, the proposed project would generally maintain the same drainage areas and discharge points into both King Harbor and Basin 3.

Table 3.8-13: Summary of Future Impervious and Pervious Areas With Project Implementation

Ground Cover	Area	Percent Impervious	Percent Pervious
Standard Pavement and Sidewalk	8.0	100	0
Permeable Pavers	8.2	25	75
Building	7.1	100	0
Landscaping and Filtration Planters	2.0	0	100
Lagoon	3.9	20	80
Piers	2.0	100	0
Total Overall	**31.2**	**64**	**36**

Source: Psomas 2015 (Appendix I1 of this Draft EIR)

To reduce pollutant runoff from the site, the proposed drainage systems would be designed to comply with the City's LID Ordinance, which reflects the Los Angeles County LID standards, to treat both the quantity and quality of flow. Per the Los Angeles County LID Standards,

2014 Manual for the Standard Urban Stormwater Mitigation Plan and the most recent NPDES MS4 Permit for Los Angeles County (CAS004001, Order No. R4-2012-0175), BMPs are required to treat, infiltrate, and/or retain the first 0.75 inches of rain in bio-retention basins or the 85th percentile 24-hour storm event, whichever is greater. The quantity and quality of flow would be reduced by implementing BMPs including, but not limited to, permeable pavers, infiltration, bio-filtration planters, modular wetlands and french drains. The proposed project would also add/redevelop approximately 119,000 square feet of new roadway areas (new main street and Pacific Avenue Reconnection). The new roadways would be required to comply with the City's Green Street Policy adopted in May 2015. Green streets are required to incorporate infiltration, biofiltration, and/or storage and use BMPs to collect, retain, or detain stormwater runoff in conjunction with design elements to create attractive streetscapes. These BMPs would reduce runoff and pollutants from discharging into the Pacific Ocean. Runoff from the project site would reduce contamination associated with roadways, parking lots, landscaping, and accumulated atmospheric deposition on impervious surfaces in comparison to existing conditions. Approval of a LID implementation plan is required by the City prior to beginning construction.

Storm drain design would be based on Hydrology and Hydraulic calculations using Los Angeles County's methodology and in accordance with the City's Municipal code. As LID implementation plan incorporating LID criteria would be prepared by the project developer for approval by the City of Redondo Beach. For additional discussion of storm drains and storm drain capacity, see Section 3.1.4 Utilities.

The conceptual plan for the stormwater management approach for the Redondo Beach Waterfront project incorporates BMPs to collect stormwater in catch basins and other drain inlets and directing low-flow volumes into one or multiple underground storage chambers. The stormwater would then either infiltrate into the ground, be reused as on-site irrigation water, or combination of both depending on site-specific geologic conditions as determined by project geotechnical studies. Infiltration is the preferred method; however, future geotechnical studies would be required to determine if this is feasible. Prior to obtaining building permits, detailed hydrology and hydraulic reports based on the final building designs would be prepared and submitted to the City for approval of the proposed drainage facilities. Exact storm drain line and detention feature (i.e., biofiltration or bioretention features, catch basins or underground storage chambers) sizes and locations may change depending upon the final design of the proposed project.

Additionally, as identified in Section 3.14 Utilities, the existing on-site sanitary sewer system is deteriorating, raising the risk of wastewater overflows, which would negatively impact stormwater quality. The aging sewer system would be replaced with a new system under the proposed project, thereby eliminating the risk of sewage overflows as result of the aging infrastructure. Additionally, the City has implemented a FOG control and inspection program to ensure the FOG removal systems are being properly maintained, thereby reducing the potential for accumulation of fats, oils, and grease in the sewer system to cause overflows.

As previously described, two storm drains cross the northern portion of the project site and outlet to the harbor. Portions of both of these storm drains require relocation due to the proposed building and site plan, but would reconnect just upstream of the existing discharge locations into the harbor.

For analysis purposes, since the Seaside Lagoon has its own NPDES discharge permit, the analysis of operations of Seaside Lagoon are discussed separately below.

Groundwater

Operation of the proposed project would reduce surface water runoff and contaminants in runoff in comparison to the existing site. Overall site imperviousness would decrease and BMPs would filter and treat runoff prior to entry into the storm drain system. Proposed BMPs prepared in compliance with the City's LID Ordinance, and the City's Green Street Policy would reduce contaminants in stormwater runoff. The overall project may potentially increase groundwater infiltration. Treatment of surface runoff with BMPs would be designed to prevent contaminants associated with parking lots and roadways from migrating to the underlying groundwater, through methods such as filtering the stormwater through plant material prior to entering a retention system. Therefore, operational impacts to groundwater quality are considered less than significant.

Surface Water

Operation of the proposed project would reduce surface water runoff and contaminants in runoff from project operations in comparison to the existing site. Overall site imperviousness would decrease and BMPs would filter and treat runoff prior to entry into the storm drain system. Proposed BMPs prepared in compliance the City's LID Ordinance, and the City's Green Street Policy would reduce contaminants in on-site generated stormwater runoff and conveyance of contaminants in the storm drain system. The overall project may potentially increase groundwater infiltration if feasible or reuse collected stormwater for irrigation decreasing flows to the storm drain system. Installation of BMPs would also assist with TMDL compliance through the collection of debris (trash) from the project site prior to discharge to the storm drain system and reducing conveyance and introduction of bacteria to the storm drain system. Therefore, operational impacts to surface water quality are considered less than significant.

Harbor Water

Operation of the proposed project would reduce discharges of surface water runoff and contaminants in runoff from the project area to the ultimate discharge point of the harbor in comparison to existing discharges associated with the site. Overall site imperviousness would decrease and BMPs would filter and treat runoff prior to entry into the storm drain system. Proposed BMPs, prepared in compliance with the City's LID Ordinance, and the City's Green Street Policy, in conjunction with an overall decrease in overall site imperviousness would reduce contaminants in on-site generated stormwater runoff and conveyance of contaminants in the storm drain system and ultimate discharge in the harbor. The overall project may potentially increase groundwater infiltration or reuse collected stormwater for irrigation decreasing flows to the storm drain system. Installation of BMPs would also assist with TMDL compliance through the collection of debris (trash) from the project site prior to discharge to the storm drain system and reducing conveyance and introduction of bacteria to the storm drain system.

Seaside Lagoon

The Seaside Lagoon element would convert the current non-tidal saltwater, sand-bottom swimming facility into a small embayment directly connected to King Harbor. As proposed, the lagoon would no longer receive cooling water from the AES power plant. As previously discussed, discharge of water from the lagoon is currently regulated under an NPDES permit issued by the LARWQCB (Permit No. CA00064297 and Order No. R4-2010-0185). The current permit was issued on October 7, 2010 and is valid until September 10, 2015. The City filed a renewal application in 2015. Under the proposed project, the City would no longer need to chlorinate the lagoon water, or then to dechlorinate it and discharge to the harbor.

Therefore, under the proposed project, operation of Seaside Lagoon would not require chemical treatment and would no longer be subject to an NPDES permit. This is considered to be a beneficial water quality impact of the project.

Water quality in the modified lagoon would be maintained by the contact and natural exchange of water in and out of the lagoon. The tidal range of the lagoon would be approximately six feet, similar to ocean tide levels. It is expected that a typical tide cycle would replace two thirds of the water volume within the lagoon, resulting in water residing in the lagoon for less than two days before it is exchanged.

There is the potential that trash and other debris within the harbor would drift into the Lagoon from other locations within the harbor. While based on existing patterns of trash accumulation within the harbor, this is not expected to be a common occurrence, nor is it expected to cause water quality violation. However, the flushing of the lagoon would occur more frequently than other parts of the harbor and that removal of such material would occur as part of regular park maintenance, accumulated trash and debris . would not violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality.

The proximity of the proposed launch ramp to Seaside Lagoon is not expected to negatively affect the water quality within Seaside Lagoon. The City has identified marine BMPs with which that boats using King Harbor are required to comply that would reduce the potential of discharges to occur within the harbor, including in proximity to boat ramp and Seaside Lagoon. The marine BMPs address boat yard operations, boating and boat operations, commercial business operations, and fuel dock operations. [11]

Boating and boat operations address maintenance of boats, fueling procedures, handling of bilge water, cleaning, sewage, trash and dock activities. Specific measures include (but are not limited to the following the following:

- Regularly inspect lines and hoses for leaks and deterioration
- Do not use solvents or toxic chemical to clean engines or wash parts over the water
- Do not pump contaminated water overboard
- Undertake small or moderate cleaning jobs in the water and large projects in the boatyard
- Use tarps to contain spills and use brooms or vacuums to collect debris for proper disposal
- Fuel slowly to prevent overflows
- Do not discharge sewage into the water
- Do not dump refuse or plastics into the water

Other marine BMPs that address activities occurring in the project area include commercial business operations. Specific measures include (but are not limited to the following the following:

- Train all employees to use BMPs and review the activities, operations, and procedures every six months,
- Prohibit discharge of waste from cleaning operations to storm drains or the ocean,

[11] A full list of marine BMPs is available at:
http://www.redondo.org/depts/eng_build/engineering/water_quality_program/bmp.asp

- Dispose of grease and oils only through a certified waste hauler
- Securely cover all dumpsters and garbage cans
- Clean all spills immediately using dry absorbent materials
- Do not hose wash trash receptacles unless waste can be discharged in the sewer system

The marine BMPs are in addition to regulations contained in Title 12 Article 6 of the RBMC that address sanitation regulations in the City's harbor, such as prohibitions on discharge of refuse and material such as petroleum or paint products, wastewater, and sewage (RBMC Section 12-1.601 et seq.). As with other enclosed beaches (such as Mothers Beach in Marina del Rey and Cabrillo Beach in San Pedro), exceedances of health standards may occur more frequently than at open beaches; however, as discussed in greater detail below, Seaside Lagoon is located near the mouth of the harbor and as such, the lagoon would have better circulation than other parts of King Harbor. The water circulation would mix and better dilute any bacteria or other contaminants that could be present. Further, the new lagoon beach would be tested for total coliform, fecal coliform, enterococci, and streptococci bacteria as required under AB 411. This may include weekly testing during the summer months. In the unlikely event that violations occur, notices would be posted until testing indicate that levels are below state standards.

As discussed in Section 3.3 Biological Resources, the proposed project would not create a significant impact relative to increasing the potential for increasing undesirable human-pinniped (seal and sea lion) interactions. However, there is in an existing sea lion population that uses King Harbor and this population is increasing, which would increase the potential for fecal matter to be present within harbor waters. As described above, Seaside Lagoon is located near that mouth of the harbor and thus has a better water circulation rate that promotes mixing and dilution any bacteria and contaminants in the lagoon. Further, regular water quality testing would ensure that waters are safe for swimmers. Further, as presented in Section 3.3 Biological Resources, Condition of Approval COA BIO-3 requires the establishment of a marine mammal protection program prior to the opening of the lagoon, which would include measures to prevent pinnipeds from establishing Seaside Lagoon as a haul-out location. Therefore, there is not expected to a substantial degradation of water quality in Seaside Lagoon associated with pinnipeds.

Additional discussion, including modeling results, associated with water quality in the harbor, particularly as related to Seaside Lagoon, is provided below.

Water Quality and Water Circulation with Implementation of the Project

A water circulation and water quality impacts analysis of the proposed modification of Seaside Lagoon on the harbor was conducted and is described below (Noble, 2015a [Appendix I2 of this Draft EIR]). The study analyzed the water circulation and water quality impacts associated with the lagoon, the small craft boat launch ramp, and a rubble mounded breakwater to protect boat ramp; all of which were accounted for in the RMA2 and RMA4 modeling analyses completed for the project.

The modeling results indicated that the proposed project components would have negligible impact to the water circulation within King Harbor due to the insignificant change to the harbor configuration that would be caused by those components. As shown in Table 3.8-14, the water exchange time for the area within the proposed breakwater entrance, including Seaside Lagoon and the area that is outside of the lagoon but inside of the breakwater entrance, would be approximately 20 hours, which would be much shorter than the three existing marina basins of King Harbor. The exchange time for the remainder of the harbor would remain the same.

Table 3.8-14: Water Exchange Time Existing Conditions

Embayment	MHW Area (acres)	MHW Storage (acre-feet)	Water Exchange Time (Hours)	
			Existing	Proposed Project
Entire King Harbor	100	2,012	71	71
Basin 3	3	42	47	47
Basin 2	24	456	67	67
Basin 1	15	256	61	61
Seaside Lagoon Area[1]	3	25	N/A	20

Notes: Area within proposed breakwater entrance, including Seaside Lagoon and the area that is outside of the lagoon, but within the breakwater entrance.

Source: Noble, 2015a (Appendix I2 of this Draft EIR)

As described under Existing Setting above, a longer residence time indicates that the water of an embayment is renewed less readily by ocean water, leading to a less desirable water quality. Figure 3.8-13 shows the snapshots of the constituent concentrations in the harbor for an eight day period after the initial release of constituent. The time series of concentrations are shown in Figure 3.8-14 for the entrances of King Harbor, the three marina basins, and the proposed breakwater, respectively. The constituent residence time is shown in Figure 3.8-15.

As shown in Figures 3.8-13 and 3.8-14, implementation of the proposed project would not alter the existing residence time for constituents within King Harbor, and thus the results indicate that the proposed project components would have negligible impact to the overall water quality within King Harbor. Within the project area, as under existing condition, the residence time for the project area would be less than 2 days, which would be shorter than most regions of King Harbor. While the water circulation would not be strong in the project area; due to the shallow water depth and its vicinity to the harbor entrance, the water quality in the project area would not change from existing conditions and would be better than most regions of King Harbor. Therefore, operational impacts on harbor water quality are considered less than significant.

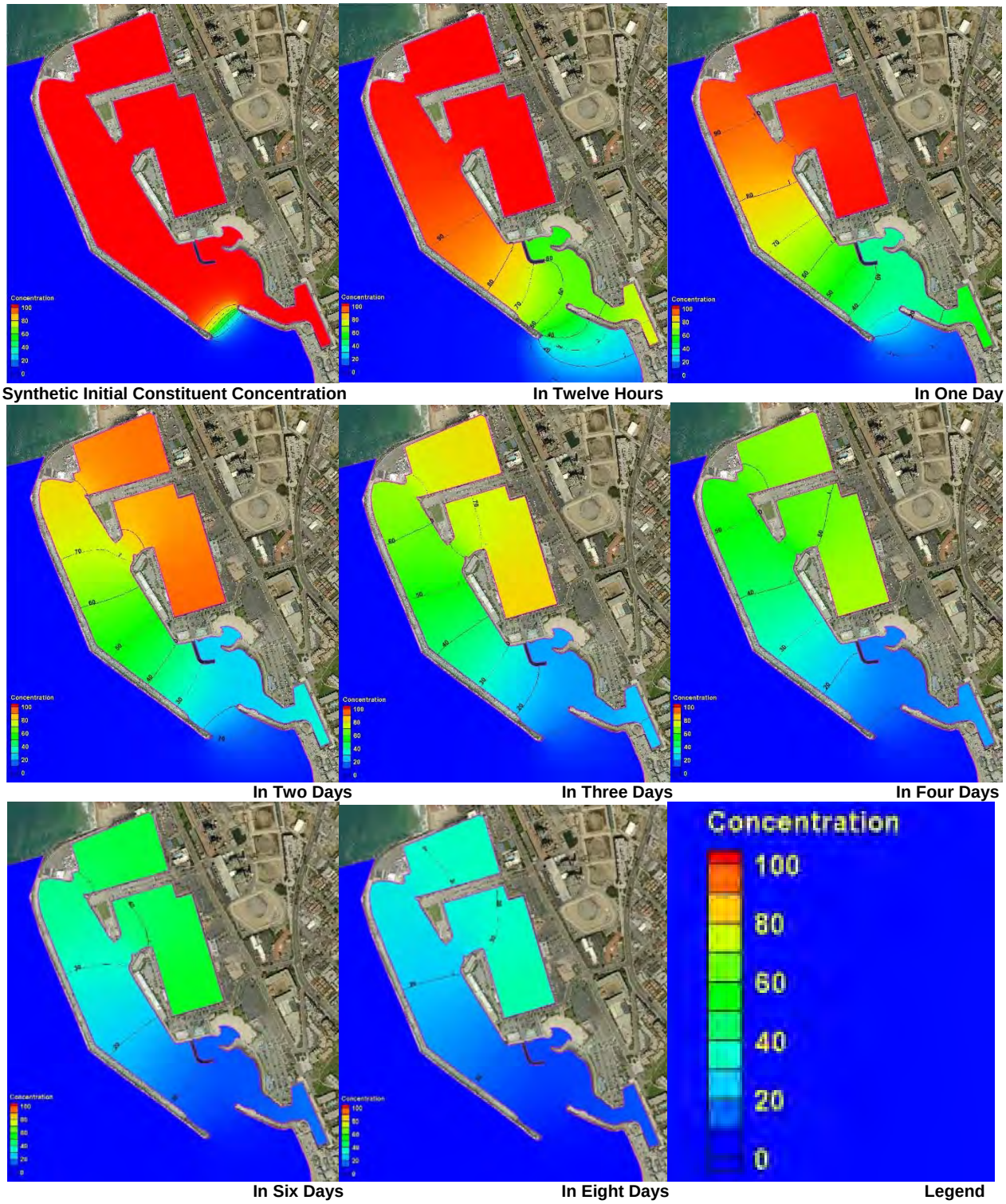
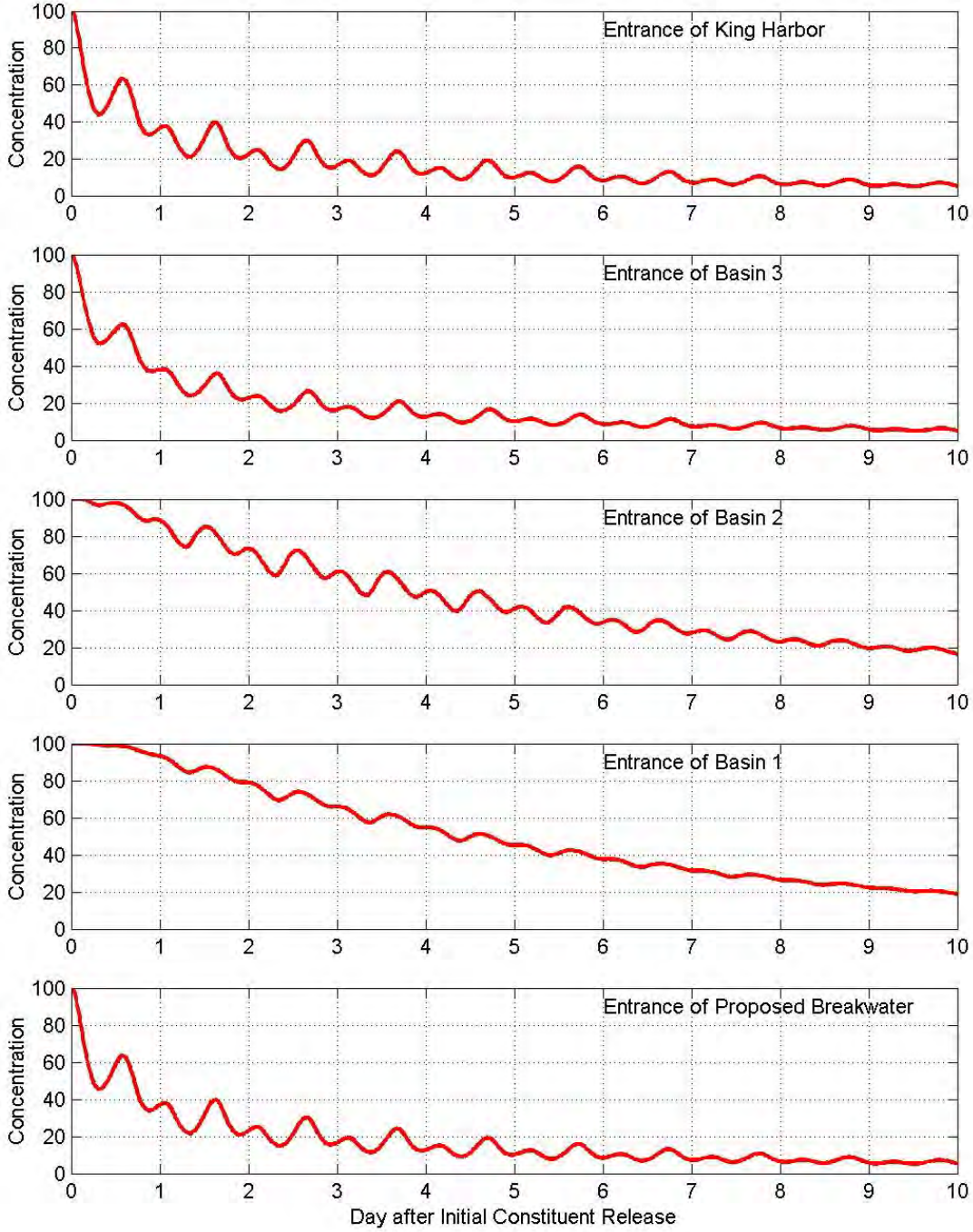


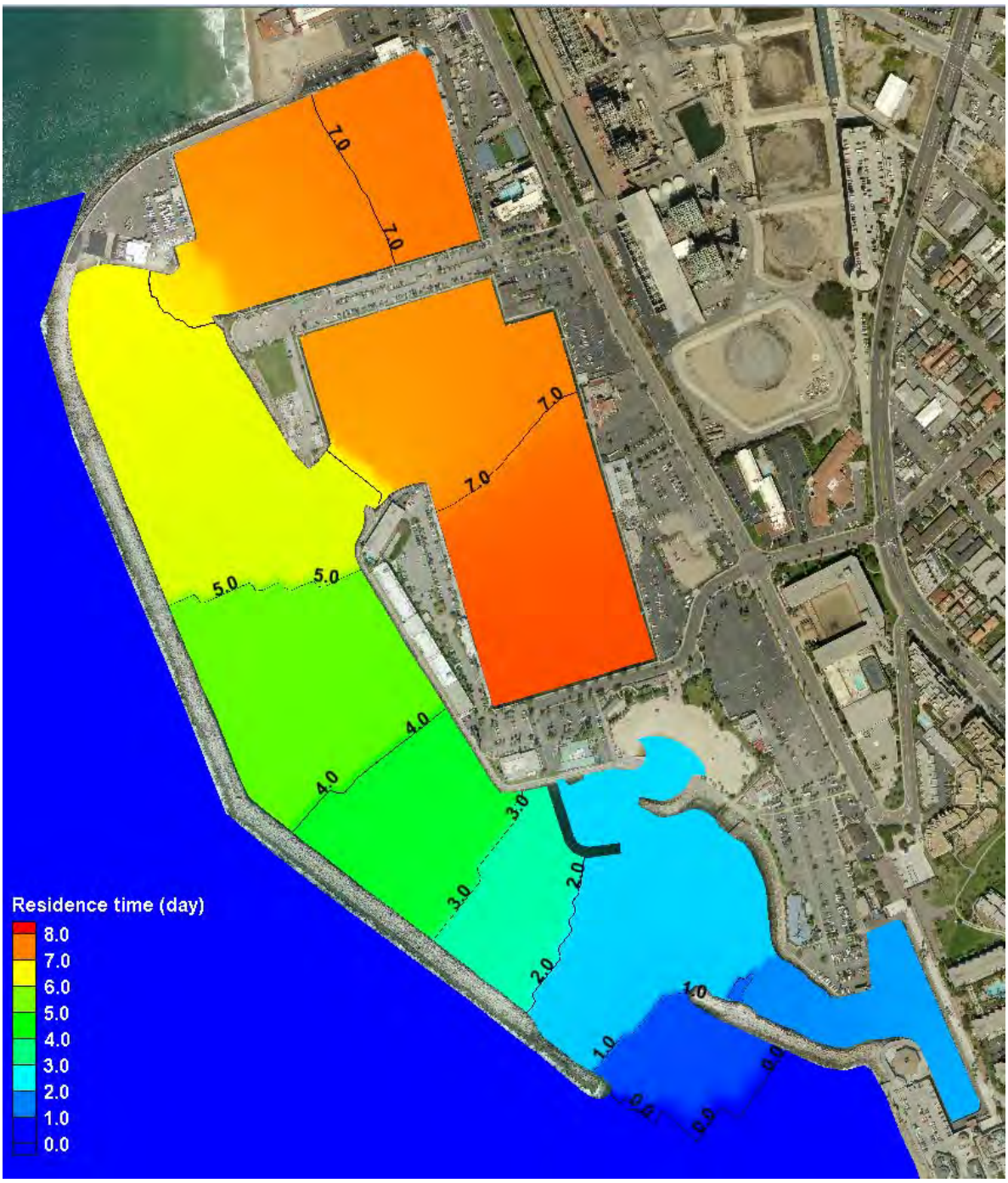
Figure 3.8-13
Constituent Concentration Over Time – Proposed Project



Source: Noble Consultants, Inc., 2015

Figure 3.8-14

Relative Concentration at Entrances of King Harbor and Three Basins
Proposed Project



Source: Noble Consultants, Inc., 2015

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Figure 3.8-15

Constituent Residence Time in Days - Proposed Project

Summary

As described above for groundwater, surface water and harbor water, the proposed project would not violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality during construction and operation. Impacts are less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact HWQ-2: The proposed project would not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site.

There are no streams or rivers located on the project site; hence, that aspect of the threshold of significance would be unaffected.

Construction

Construction of the proposed project involves grading and excavation. During construction, a majority of the existing facilities would be demolished, reducing site imperviousness thereby reducing the amount of surface runoff. Construction BMPs would also be implemented as part of a SWPPP as required by the statewide NPDES General Permit for Construction Activities for sites disturbing one acre or more. The SWPPP includes measure to eliminate or reduce pollutant discharges, including sediment, and describes the implementation of BMPs to control stormwater and erosion and siltation during construction. The General Permit for Construction Activities contains receiving water limitations that require stormwater discharges to not cause or contribute to a violation of any applicable water quality standard. Inspections of BMPs are required throughout construction. The project would also be required to comply with SCAQMD Rule 403 which includes measures for the application of water or stabilizing agents, use of tarps to enclose haul trucks, stabilizing sloping surfaces using soil binders until vegetation or ground cover effectively stabilize slopes, and hydroseeding prior to rain.

With adherence to regulations, including implementation of BMPs, the proposed project would not substantially alter the existing drainage pattern of the site or area or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site. Therefore, impacts during construction related activities are considered less than significant.

Operation

The proposed project involves redevelopment of an existing developed area and includes development of shops, restaurants, parking structures and surface parking lots. Currently, the 31.2 acre landside portion of the site is 79 percent impervious and 21 percent pervious. As previously summarized in Table 3.8-10 the proposed project would contain approximately

17.1 acres of hardscape and buildings, 8.2 acres of permeable pavement/pavers, and 5.9 acres of landscaping and a lagoon open to harbor waters. When complete, approximately 64 percent of the site would be impervious, which would represent a decrease in imperviousness over existing conditions. Runoff would be directed away from impervious surfaces and into landscaped areas, landscape features (e.g. planter boxes), or other pervious areas, which would prevent erosion and siltation from entering the storm drain system, thereby reducing on-site and off-site flooding risks. As proposed, the project would generally maintain the same drainage areas and discharge points into King Harbor and Basin 3.

To reduce runoff from the site, the proposed drainage systems would be designed to include BMPs in accordance with a LID implementation plan prepared in compliance with the City's LID Ordinance, which sets forth standards to treat both the quantity and quality of flow. Per the LID requirements, BMPs are required to treat, infiltrate, and/or retain the first 0.75 inches of rain in bio-retention basins or the 85th percentile 24-hour storm event, whichever is greater. The quantity and quality of flow would be mitigated by implementing BMPs including, but not limited to, permeable pavers, infiltration, bio-filtration planters, modular wetlands and french drains. The proposed project would also add/redevelop approximately 119,000 square feet of new roadway areas. Roadways would be required to comply with the City's Green Street Policy. Green streets are required to incorporate infiltration, biofiltration, and/or storage and use BMPs to collect, retain, or detain stormwater runoff in conjunction with design elements to create attractive streetscapes. These BMPs would reduce runoff from discharging into the Pacific Ocean. Approval of the LID implementation plan is required by the City prior to beginning construction.

Storm drain design would be based on hydrology and hydraulic calculations using Los Angeles County's methodology and in accordance with the City's Municipal code and as such would accommodate project flow amounts and flow rates. As previously discussed, a LID implementation plan incorporating LID criteria subject to approval by the City of Redondo Beach would be required for the proposed project. The proposed project would generally maintain the same drainage areas and discharge points as that of the existing condition. Further, as described above the impervious area would decrease, which is expected to reduce the amount of flow reaching the storm drain.

As previously described, two County storm drains cross the northern portion of the project site and outlet to the harbor. Portions of both of these storm drains require relocation due to the proposed building and site plan, but would reconnect just upstream of the existing discharge locations into the harbor. The off-site tributary drainage area for these storm drains are not changing. The proposed project may utilize the existing on-site inlets to these pipes for drainage. The existing storm drains are capable of accepting the proposed site runoff. Proposed on-site storm drains are shown on Figures 3.14-3 and 3.14-4 in Section 3.14 Utilities.

The stormwater management approach for the proposed project incorporates BMPs to collect stormwater in catch basins and other drain inlets and directing low-flow volumes into one or multiple underground storage chambers. The stormwater would then either infiltrate into the ground, be reused as on-site irrigation water, or combination of both depending on site-specific geologic conditions as determined by project geotechnical studies. Infiltration is the preferred method; however, future geotechnical studies would be required to determine if this is feasible. Exact storm drain line and detention feature sizes and locations may change depending upon the final design of the proposed project. Prior to obtaining building permits, detailed hydrology and hydraulic reports based on the final building designs would be prepared and submitted to the City for approval of the proposed drainage facilities.

Under the proposed project, Seaside Lagoon would be opened to the waters of King Harbor. Because the lagoon would be protected by the existing North Breakwater and small breakwater at the lagoon mouth, as well as the proposed breakwater for the boat launch ramp, the lagoon would be shelter and would be not be subject to wave action that could cause erosion of the beach sand. Therefore, no substantial erosion would occur with the modification of Seaside Lagoon.

With adherence to regulations, including LID criteria and implementation of BMPs, the proposed project would not substantially alter the existing drainage pattern of the site or area or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site. Therefore, impacts during operational activities are considered less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact HWQ-3: The proposed project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff that would require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects not already addressed as part of the proposed project.

Construction

Construction of the proposed project involves grading and excavation. During construction, a majority of the existing facilities would be demolished, reducing site imperviousness, which would reduce stormwater runoff. Construction activities would involve the use of certain hazardous materials associated with use of construction equipment on-site, including vehicle fuels (both gasoline and diesel), oils, solvents, and transmission fluids. The types and amounts of hazardous materials would vary according to the nature of the activity. These types of materials, however, are not acutely hazardous, and all storage, handling, and disposal of these materials must comply with the regulations described in Section 3.7.4 Hazards and Hazardous Materials. Consequently, the proposed project would not result in polluted runoff.

Construction BMPs would be implemented as part of a SWPPP as required by the statewide NPDES General Permit for Construction Activities for sites disturbing one acre or more. Required construction BMPs are designed to reduce potential adverse effects to the general public and the environment. The SWPPP includes measure to eliminate or reduce pollutant discharges and describes the implementation of BMPs to control stormwater and other runoff during construction. The General Permit for Construction Activities contains receiving water limitations that require stormwater discharges to not cause or contribute to a violation of any applicable water quality standard. Inspections of BMPs are required throughout construction. Construction contract specifications would include strict on-site handling rules to keep construction and maintenance materials from entering the storm drain system. BMPs include, but are not limited to:

- Control of erosion and sedimentation associated with construction-related surface disturbance (refer to Section 3.8.3.2 for a list of the types of erosion and sediment control BMPs, as applicable, that would be implemented during construction);
- Establish a dedicated area for fuel storage and refueling activities that includes secondary containment protection measures and spill control supplies;
- Follow manufacturer's recommendations on use, storage and disposal of chemical products used in construction;
- Avoid overtopping construction equipment fuel gas tanks;
- During routine maintenance of construction equipment, properly contain and remove grease and oils.
- Properly dispose of discarded containers of fuels and other chemicals.

Therefore, during construction stormwater volumes and pollutants would be reduced in comparison to existing conditions and would not require the construction of new stormwater drainage facilities or expansion of existing facilities, which could cause significant environmental effects not already addressed as part of the proposed project. Impacts would be less than significant.

Operation

The proposed project involves redevelopment of an existing developed area including development of retail, restaurants, parking structures and minimal surface parking lots. Currently, the 31.2 acre landside portion of the project site is 79 percent impervious and 21 percent pervious. As previously summarized in Table 3.8-10 the proposed project would contain approximately 17.1 acres of hardscape and buildings, 8.2 acres of permeable pavement/pavers, and 5.9 acres of landscaping and lagoon open to harbor waters. When complete, approximately 64 percent of the site would be impervious. This would be a decrease in impervious area over existing conditions and would increase infiltration and reduce site runoff.

To reduce runoff from the project site, the proposed drainage systems would be designed to comply with the City's LID Ordinance requirements to treat both the quantity and quality of flow. Per the LID Ordinance requirements, BMPs are required to treat, infiltrate, and/or retain the first 0.75 inches of rain in bio-retention basins or the 85th percentile 24-hour storm event, whichever is greater. BMPs would be implemented to address the quantity and quality of flow including, but not limited to, use of permeable pavers, infiltration, bio-filtration planters, modular wetlands and french drains. Additionally, runoff would be directed away from impervious surfaces and into landscaped areas, landscape features (e.g. planter boxes), or other pervious areas, which would reduce the volume of stormwater created and pollutants conveyed to storm drain system in comparison to existing conditions.

The proposed project would add/redevelop approximately 119,000 square feet of new roadway areas. Roadways would be required to comply with the City's Green Street Policy. Green streets are required to incorporate infiltration, biofiltration, and/or storage and use BMPs to collect, retain, or detain stormwater runoff in conjunction with design elements to create attractive streetscapes. These BMPs would reduce runoff from discharging into the Pacific Ocean. Approval of a LID implementation plan identifying operational BMPs, as well as construction BMPs, would be required by the City prior to beginning construction.

Storm drain design would be based on hydrology and hydraulic calculations using Los Angeles County's methodology and in accordance with the City's Municipal Code. As previously discussed, a LID implementation plan incorporating LID criteria would be prepared by the project applicant for approval by the City of Redondo Beach. The proposed project would generally maintain the same drainage areas and discharge points as that of the existing condition. As previously described, two Los Angeles County storm drains that route off-site flows cross the northern portion of the project site and outlet to the harbor. Portions of both of these storm drains within the project site require relocation due to the proposed building and site plan, but would reconnect just upstream of the existing discharge locations into the harbor. The re-routed storm drains would maintain existing capacity and would not affect off-site storm drainage. Additional information on storm drain design is included in Section 3.14 Utilities. The secondary impacts associated with the construction of these drainage facilities were accounted for as part of the proposed project.

The stormwater management approach for the proposed project incorporates BMPs to collect stormwater in catch basins and other drain inlets and directing low-flow volumes into one or multiple underground storage chambers. The stormwater would then infiltrate into the ground, be reused as on-site irrigation water, or combination of both depending on site-specific geologic conditions as determined by project geotechnical studies. The design- and project-specific geotechnical evaluation(s) and detailed hydrology and hydraulic reports and plans based on the final building designs would be submitted to the City's Building and Safety Division during the design phase and would include recommendations and specific conditions that are project site-specific. With project implementation, the amount of pervious surface area within the project site would increase and LID criteria would be implemented; thus, stormwater volumes and pollutants would be reduced in comparison to existing conditions and would not require the construction of new stormwater drainage facilities or expansion of existing facilities which could cause significant environmental effects not already addressed as part of the proposed project. Impacts would be less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact HWQ-4: The proposed project would not create or place structures within a 100-year flood hazard area such that flood flows would be impeded or redirected or expose people or structures to a significant risk of loss, injury, or death involving flooding.

According to FEMA's FIRM maps for the project site, the project site is partially within Zones AE, VE, and X. The portions of the project site located within such flood zones are limited to the ocean and beach areas. Proposed structures that would be built in such zones include a new restaurant located on Pad 2 of the Horseshoe Pier and possibly a replacement building on the Sportfishing Pier, if the pier is rebuilt. The finished floor elevation of the buildings located on the piers would be a minimum of nine feet above the 100-year flood elevation and would not impede or redirect flows, nor would the new/rebuilt buildings expose people or structures to a significant risk of loss, injury, or death involving flooding. Other structures that would be constructed within the 100-year flood zone consist of the pedestrian bridge and small craft boat launch ramp and associated breakwater. Additionally, the wooden portion of the

Horseshoe Pier would be replaced, and the Sportfishing Pier would be demolished and potentially replaced. All the new structures would be placed with the waters of King Harbor and none would impede or redirect flood flows. It should also be noted, while not in the 100-year flood hazard area, areas within the northern portion of the project site would be raised in elevation as compared to existing elevations. Therefore, impacts would be less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact HWQ-5: The proposed project would expose people and structures to substantial risk associated with inundation by seiche, tsunami, mudflow, or sea level rise.

Seiche

Seiches are seismically induced water waves that surge back and forth in an enclosed basin and could occur in Basin 3 as a result of an earthquake. Effects from a seiche at the project site would likely be less detrimental than those of a tsunami, therefore, for purposes of analysis tsunamis are considered as a worst-case scenario, however, potential impacts associated are considered similar.

Tsunami

As previously discussed, the project site is located within a tsunami-induced inundation zone for a tsunami originating in the coastal waters of California, according to the potential inundation map for the Redondo Beach area prepared by the California Governor's Office of Emergency Services (Noble, 2015b [Appendix I3 of this Draft EIR).

While the potential is rare, given the potential for future occurrence of earthquakes and tsunamis along the Pacific Rim, on- or near-shore development in southern California, including the project site, would involve some measure of risk of impacts from a tsunami or seiche. Although rare, should a large tsunami or seiche occur, it would be expected to cause some amount of damage and possibly injuries and risk of life to most on or near-shore locations. As a result, this is considered as the average or normal condition for most on- and near-shore locations in southern California, which would include the project site.

Since tsunamis and seiches are derived from wave action, the risk of damage or injuries from these events is lessened if the location is high enough above sea level, far enough inland, or protected by structures such as dikes or concrete walls. The height of a given site above sea level is either the result of an artificial structure (e.g., a dock or wall), topography (e.g., a hill or slope), or both, and a key variable related to the height of a site location relative to sea level is the behavior of tides. How high a site must be located above sea level to avoid substantial wave action during a tsunami or seiche depends upon the height of the tide at the time of the event and the height of the potential tsunami or seiche wave. While most of the boardwalk along the water's edge would be located at a similar elevation and location as the existing walkway, a portion of the northern portion of the project would be raised in elevation from existing conditions by approximately four feet on average, which, depending on the wave

height of a potential future tsunami, would reduce the potential amount of damage that may occur in comparison to existing conditions.

Implementation of the proposed project would include raising the site elevation in the northern portion of the site. Specifically, the boardwalk would be raised approximately four feet and the overall raising of the site would vary from zero to eight feet. Site elevations would not substantially change on the southern portion. The raising of the boardwalk and some portions of the site in the northern portion would reduce, to some degree, the potential for hazards and damage associated with a future tsunami or seiche event compared to existing conditions; however, with revitalization of the project site, including the net increase in building area and the desired increase in activities at, and patronage of, the project site, there is also the potential of more people being present at the project site, and at risk, should a major tsunami or seiche occur in the future. Emergency planning and coordination by the City of Redondo Beach Fire Department and other City and County agencies, would contribute to reducing onsite injuries during a tsunami. However, the effectiveness of an emergency response would vary depending on amount of warning time provided (i.e., a distant tsunami may provide ample time to initiate an evacuation or other safety precautions, but there may only be a few minutes warning for local event.) While no tsunami is known to have ever significantly affected the Los Angeles Coast in the past, the likelihood of such a future event is largely unknown, the potential exposure of buildings and people at the project site to risk and damage associated with a tsunami or seiche is considered to be a significant impact.

Mud Flow

A mudflow (or debris flow) is a rapidly moving slurry of water, rock, vegetation, and debris. The project site is located in an urban area. The project site is not located on a slope or in a naturalized area that could cause debris flow from or over the site. No mudflow impacts would occur.

Wave Overtopping (Uprush) and Sea Level Rise

A sea level analysis was conducted for the proposed project. As part of this analysis a wave uprush analysis was completed to formulate an adaption strategy and ensure protection for the proposed project. The wave uprush assessment was based on existing conditions, as well as an estimate of future sea level rise that was recommended by the COPC in 2013 as previously discussed in Section 3.8.2.2 above. This translates to the range of potential sea level rise from 0.20 feet to 1.1 feet at Year 2040 and 0.99 feet to 4.5 feet at Year 2090 (i.e., 25 and 75 years from the present day).

Boardwalk East of Horseshoe Pier

The proposed boardwalk immediately landward of the Horseshoe Pier has an elevation of +23 feet MLLW on the northern end and tapers down to 20 feet MLLW at the southern limit, which is similar to the elevation of the existing walkway in this location. As previously described, under existing conditions, wave splash occurs the northern segment of the protective revetment/wall annually, as the wave run-up elevation reaches to approximately +23 feet, MLLW under the annual occurring wave condition, which is the existing and proposed height of the boardwalk. In the southern reach, wave run-ups rarely reach higher than the existing protective revetment. As the elevation and location of the proposed boardwalk would be similar to the existing walkway, wave uprush would continue to overtop the northern segment, but is not likely to overtop the southern segment.

The computed wave run-up elevation indicates an inundation depth of at least 0.3 feet flowing across the proposed boardwalk toward the landward end in the northern segment during a 25 year storm event. Further, an upward splash could occur as the sea water runs up the steeper wall face of the concrete wall during storm conditions that coincide with king tides. While the height of the water uprush cannot be precisely calculated, it is estimated that in extreme cases the splash could extend upwards of four. The potential for overtopping that would occur in this location would not change with implementation of the proposed project, and while risks would be localized and occur only during storm conditions when fewer people are likely to be present, there is a risk of injury or damage to structures to an increased number of site patrons and structures. Thus, while the heights and frequency of wave overtopping would not change under the proposed project, given the potential increase for injury and structural damage to occur, wave overtopping along this the boardwalk east of Horseshoe Pier is considered a significant impact.

Other segments of the boardwalk along the pier would not be susceptible to storm wave attack that induces the uprush water reaching the crest of the boardwalk.

Mole D and Seaside Lagoon

The proposed top elevations of the boardwalk along Mole D and along the perimeter revetment of the Seaside Lagoon are at +17 and +13 feet MLLW, respectively, which is an approximate increase of 4 feet in elevation from existing conditions. Based on two representative cross sections as described and shown on Table 3.8-12 in Section 3.8.2.2, above, the wave run-up elevation is either below or at the finish slab elevation of 17+ feet, MLLW under existing oceanographic conditions and thus no uprush water is expected to overtop this segment of the boardwalk. However, under existing conditions, incoming waves under severe storm events (e.g., 50- and 100-year return storms) can overtop the proposed boardwalk with a proposed crest elevation of 13.7 feet, MLLW along the west perimeter of the Seaside Lagoon. The inundation depth resulting from wave overtopping can be approximately one foot in depth at Mole D and exceeding one foot in depth across the walkway perimeter of the Seaside Lagoon. An upward splash could occur as the sea water runs up the steeper wall face of the concrete wall during storm conditions that coincide with king tides. While the height of the water uprush cannot be precisely calculated, it is estimated that in extreme cases the splash could extend upwards of four feet. It is not anticipated that there would be any increased use of the boardwalk during storm conditions under the proposed project, thus no increased risks of injury associated with this overtopping would occur. Additionally, the increase of elevation that would occur under the proposed project would reduce the incidences of overtopping that would occur as compared to current conditions.

At the opening of Seaside Lagoon, the breakwater at the mouth of the lagoon would reduce the energy of waves entering the lagoon. The wave energy would further dissipate within the lagoon and on the beach. No uprush is anticipated to reach the proposed walkway and accessory structures on the eastern perimeter of the lagoon. Further, it is not expected that people would be present at Seaside Lagoon during storm conditions, thus no increased risks of injury or structural damage associated with this overtopping would occur with the proposed modification of Seaside Lagoon.

As described above, there is the potential for wave uprush to overtop the boardwalk at the western edge of Seaside Lagoon. However, under the proposed project, the elevation would increase by approximately four feet, which would reduce the incidences and height of wave uprush that would occur and no increased risk of injury or structure damage would occur.

Therefore, potential impacts associated with inundation at Mole D and Seaside Lagoon are less than significant.

Basin 3

The existing crest elevation of the bulkhead surrounding Basin 3 is at approximately +7.5 feet, MLLW. As previously discussed under existing conditions, inundation along the existing accessway atop the bulkhead (access road along the International Boardwalk) during extreme high tides has been documented in the past. Since the proposed project does not elevate the existing bulkhead that encloses Basin 3, occasional flooding atop the bulkhead during extreme high tide conditions is to be expected under the proposed project, as currently occurs. Temporary inundation would be confined to the proposed boardwalk behind the bulkhead. The Pacific Avenue Reconnection is at an elevation of +12 feet, MLLW and would not be susceptible to tide-induced flooding. Wave uprush at Basin 3 would be temporary and would not result in inundation of any proposed buildings or the Pacific Avenue Reconnection. It is not anticipated that there would be any increased use of the boardwalk during storm conditions under the proposed project, and thus no increased risks of injury associated with this overtopping would occur. Further, under existing conditions, the International Boardwalk is subject to possible inundation; however, under the proposed project, the buildings would be removed, thereby eliminating the risk of structural damage and injury to people located within the structures. Therefore, while overtopping along Basin 3 would continue to occur under the proposed project, it would not result in increased risk of injury or damage to structures. Therefore, potential impacts associated with inundation at Basin 3 are less than significant.

Sea Level Rise

More frequent inundation and associated nuisance from the flooding events would occur due to future sea level rise, particularly if the projected high sea level rise is materialized. As described in Section 3.8.2.2 and shown on Tables 3.8-9 and 3.8-11, additional analysis was performed to assess the potential wave run-ups under future sea level rise scenarios. This additional analysis is used in order to formulate an adaption plan for the proposed project. To ensure the adequacy of the adaption plan, the high value of future sea level rise that was identified by COPC was applied.

It is uncertain whether the actual sea level rise trend in the future would follow the low or high projection that was identified by the COPC. The wave uprush analysis performed for the project indicates wave overtopping along the boardwalk landward of the Horseshoe Pier and the perimeter of Mole D and the Seaside Lagoon would occur if the high sea level rise if observed in the future.

Along the boardwalk landward of the Horseshoe Pier, as shown on Table 3.8-9, various degrees of inundation depth resulting from the overtopped water range from a thin sheet of water (0.1 foot) at the middle and south portion of the boardwalk to a depth of approximately one foot at the north area. While this does not represent a notable increase in the potential inundation depth as compared to existing sea level conditions, the potential for inundation to occur would be more frequent. For example, a one year storm would be more likely to result in overtopping with a rise in sea level than under existing conditions.

At Mole D and the Seaside Lagoon under the future high sea level rise scenario, the results indicate there exists potential wave overtopping under severe wave climate (e.g. 50 and 100-year waves). The inundation depth resulting from wave overtopping can be approximately one

foot in depth at Mole D and approximately 1.4 foot in depth across the walkway perimeter of the Seaside Lagoon.

Along Basin 3, while more frequent inundation would occur due to future sea level rise, inundation would continue to be confined to the boardwalk and not inundate the Pacific Avenue Reconnection. The State's recommended guidelines related to sea level rise adaption plans, when compared to other forecast scenarios suggest that the COPC's guidelines, may be conservative given the current level of understanding of the phenomenon. The wave uprush assessment under future sea level rise conditions presented above was based on the high end of the COPC's recommendation.

Sea level rise would not be affected by the proposed project, and the raising of the northern portion would reduce the potential for hazards and damage associated with future sea level rise as compared to existing conditions. However, sea level rise would increase the frequency and maximum elevation of wave uprush, and therefore, the areas within the project site that may be subject to inundation would increase compared to existing conditions. With revitalization of the project site, including the net increase in building area, the desired increase in activities at, and patronage of, the project site, there is the potential that more people and structures would be subject to risks associated with inundation as a result of sea level rise. Therefore, should the projected high sea level rise occur in the future, the potential impacts are considered significant.

Mitigation Measures

The following mitigation measure would be implemented to reduce impacts associated with people being exposed to potential hazards associated with a future tsunami or seiche:

MM HWQ-1: Tsunami/Seiche Awareness Notification Program

The following shall be implemented on-site to reduce risks associated with tsunami:

1. Signage shall be provided throughout the project area, showing the designated tsunami emergency evacuation route.

2. A public address system audible at both northern and southern locations of the site shall be installed and used to inform the public of evacuation order or emergency procedures in the event a tsunami warning or alert is issued. Contact information for the on-site management office with access to the public address system shall be provided to the Redondo Beach Fire Department and provided for inclusion in City tsunami preparation/emergency response procedure manuals.

3. A tsunami evacuation map and a copy of any City tsunami preparation/emergency response procedure manuals shall be kept in the on-site management office at all times.

4. Tsunami preparedness training shall be provided to on-site security personnel.

5. Additional information, such as brochures and signage, promoting tsunami awareness and providing the website to the City's emergency preparedness website shall also be made available at the project site.

The following mitigation measures would be implemented to reduce impacts associated possible inundation associated with wave uprush and sea level rise:

MM HWQ-2: Wave Uprush Protection

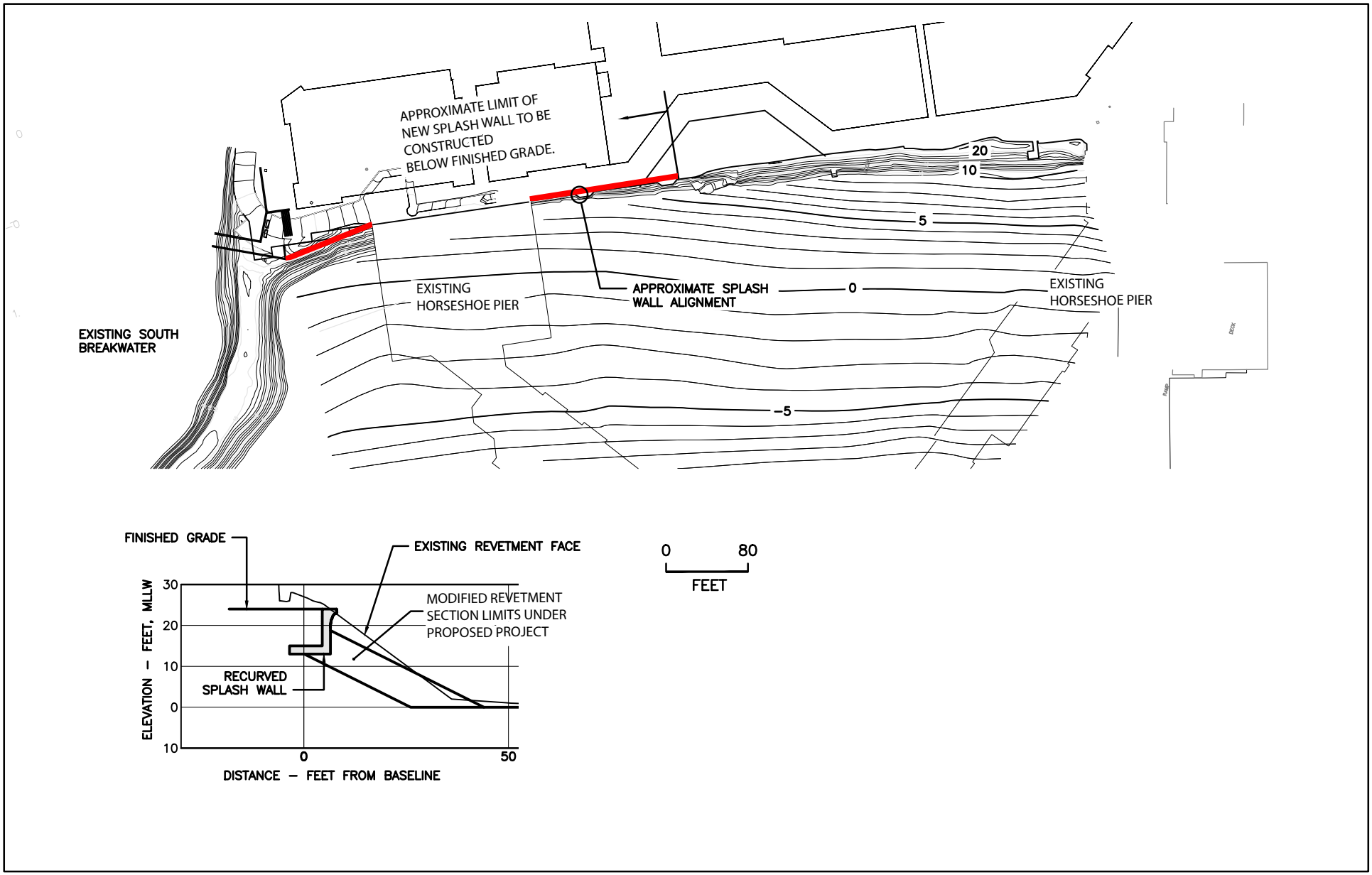
A four-foot high recurved splash wall shall be placed within the existing revetment at the seaward edge of the boardwalk to redirect up-rushed water back toward the ocean (as shown in Figure 3.8-16 of the Waterfront Draft EIR), or other wave uprush protection that prevents inundation from occurring at the buildings and pedestrian boardwalk located landward of the northern portion of the Horseshoe (Municipal) Pier (just to the north and south of Kincaid's restaurant) shall be installed, subject to California Coastal Commission recommendations and approval, prior to certificates of occupancy for the buildings. The top of the splash wall shall be level with the finished grade of the boardwalk.

MM HWQ-3: Sea Level Rise Adaption Plan

The Applicant shall every 10 years from the first Certificate of Occupancy issued for the proposed project, review information from the National Oceanographic and Atmospheric Administration's (NOAA) tide measurement at the Santa Monica tide gauge and the recorded sea level rise trend, as well as pertinent literature that updates the sea level rise trend, to determine if sea level rise at the project site is trending toward the high, mid-level or low projections recommended by the Californian Ocean Protection Council (COPC). If the review of information shows that trend is consistent with the high projections of the COPC, than the Applicant shall design and implement a supplemental feature, such as a parapet adaptation to (and on top of) the proposed recurved splash wall or a raised splash wall to respond to sea level rise under the high projection trend (see Figure 3.8-17 of the Waterfront Draft EIR). If the future sea level rise shows an accelerating trend, the construction of such adaptations may then be implemented at an appropriate time in the future.

Residual Impacts

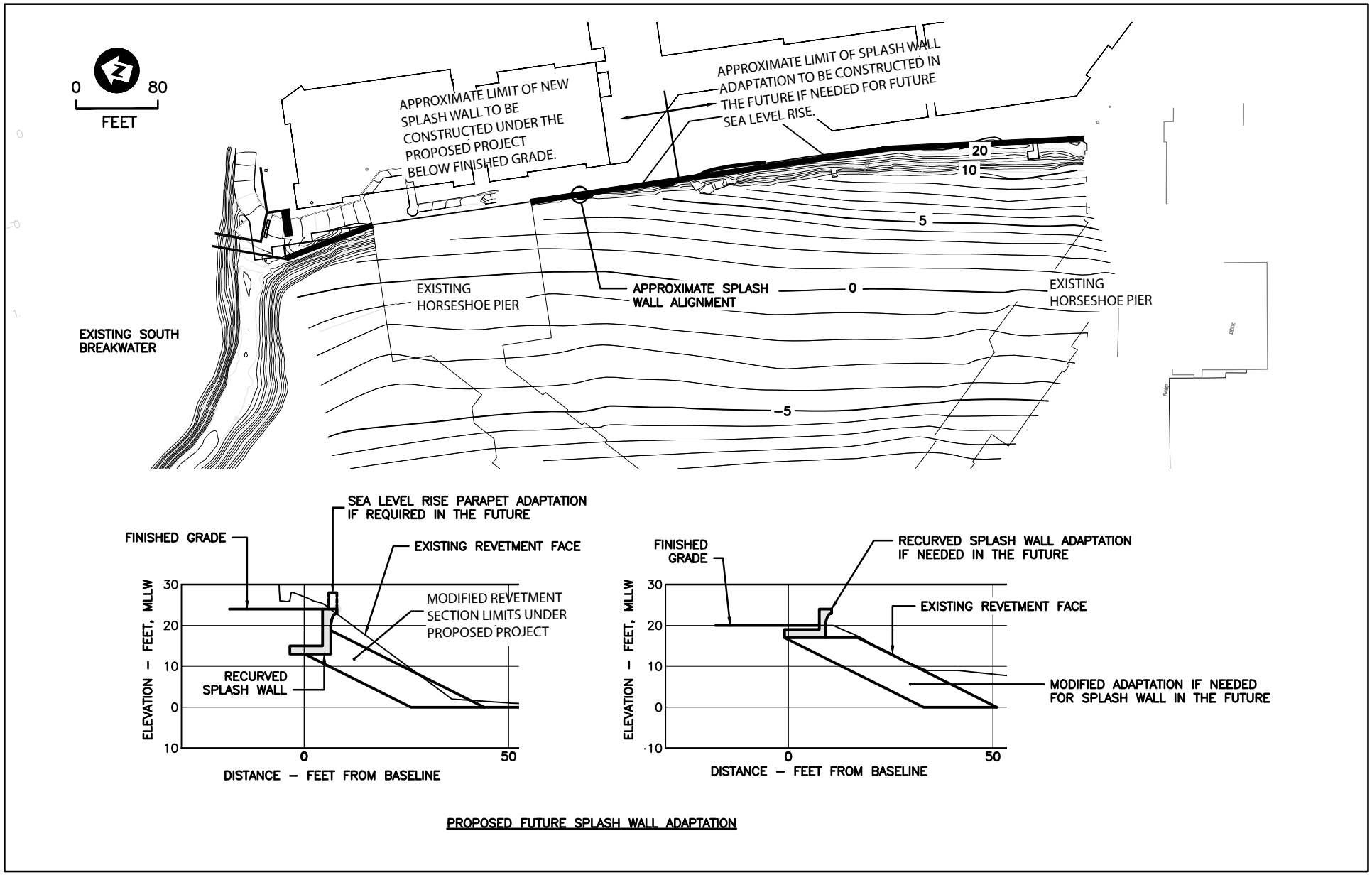
With implementation of mitigation measure MM HWQ-1, impacts associated with people potentially being exposed to a tsunami or seiche at the project site would be reduced; however, due to natural uncertainties of such an event occurring in the future, it is not possible to conclude that the associated risks would be fully mitigated. As such, the residual impact associated with tsunami or seiche exposure is considered to be significant and unavoidable.



Source: Noble Consultants, Inc., 2015

Figure 3.8-16

Recurved Splash Wall



Source: Noble Consultants, Inc., 2015

MM HWQ-2 requires a four-foot high recurved splash wall be placed at the seaward edge of the boardwalk and within the existing revetment landward of the northern portion of the Horseshoe Pier. The splash wall would redirect the up-rushed water back toward the ocean, thereby deflecting the water away from the boardwalk and preventing inundation from occurring. Installation of a splash wall along the revetment would be subject to Coastal Commission approval. Alternatively, as stated in MM HWQ-2, the Coastal Commission may recommend an alternative method to reduce potential for inundation to occur. With implementation of mitigation measure MM HWQ-2, impacts associated with possible inundation from wave uprush under current sea levels would be less than significant.

MM HWQ-3 requires that a plan be developed to address future sea level rise within the project area by instituting a monitoring program to assess sea level changes, and by identifying structural options to be implemented if necessary (subject to approval by the applicable regulatory agencies), that reduce risks to people and structures within the coastal zone. With implementation of mitigation measure MM HWQ-3, impacts associated with possible inundation from wave uprush under future sea level rise conditions would be less than significant.

3.8.5 Cumulative Impacts

Short-term construction impacts on hydrology and water quality tend to be location-specific and do not compound or increase in combination with past, present or future projects unless it is occurring concurrently adjacent to or close enough to the same sensitive receptors. Any future development within the geographic scope of the City (i.e., the boundary of the City) would be required to meet all City regulations and plans to minimize impacts.

The aquatic portion of the proposed project is located in a water body that is 303(d)-listed for water quality impairments (bacteria, toxics, and debris); however, construction and operation of the proposed project, with implementation of mitigation measures and compliance with applicable permitting measures, would not further contribute to degradation of water quality. The proposed project would open the Seaside Lagoon to King Harbor, consequently the existing NPDES discharge permit for the facility would no longer be required. The water exchange time for the area within the proposed breakwater entrance, including Seaside Lagoon and the area that is outside of the lagoon but inside of the breakwater entrance, would be approximately 20 hours, which would be much shorter than the exchange time for the three existing marina basins of King Harbor. A shorter water exchange time can potentially lead to better water quality. The results indicate that the proposed project components would have negligible impact to the overall water quality within King Harbor. The water residence time for the project area would be less than two days, which would be shorter than most regions of King Harbor. Therefore, implementation of the proposed project would not result in a cumulatively considerable contribution to a violation of water quality standards or waste discharge requirements or otherwise substantially degrade water quality (Impact HWQ-1).

With the exception of approximately 12,479 square feet of existing structures (which consists of Kincaid's restaurant and the restroom facility at the Seaside Lagoon), the proposed project includes the demolition of existing structures at the project site, as well as (with the exception of the 2,600-square foot building in the northwest corner of the site) and associated parking and landscaping. Implementation of the proposed project would reduce the amount of paved surfaces currently at the project site; the imperviousness of the site would decrease from to 79 percent to 64 percent. This decrease in impervious surfaces would reduce the amount of run-

off from the project site under proposed conditions. During construction BMPs associated with the SWPPP and regulatory permits would reduce the potential to impact to water quality to less than significant. During operations, compliance with LID requirements required by the NPDES MS4 Permit would reduce stormwater discharges and treat runoff prior to discharge. In addition, to reduce runoff from the site, the proposed drainage system would be designed to include BMPs in accordance with the City's LID Ordinance, which sets forth standards to treat both the quantity and quality of flow. Therefore, implementation of the proposed project would not result in a cumulatively considerable contribution to a substantial alteration to the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site (Impact HWQ-2). In addition, the proposed drainage system would be sized as to not create or contribute runoff water that would result in a cumulatively considerable contribution to an exceedance in the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff that would require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects not already addressed as part of the proposed project (Impact HWQ-3).

The project site is partially within Zones AE, VE, and X. The portions of the project site located within such flood zones are limited to the ocean and beach areas. Proposed structures that would be built in such zones include a new restaurant located on Pad 2 of the Horseshoe Pier and possibly a replacement building on the Sportfishing Pier, if the pier is rebuilt. The finished floor elevation of the buildings located on the piers would be a minimum of 9 feet above the 100-year flood elevation and would not impede or redirect flows, nor would the new/rebuilt buildings expose people or structures to a significant risk of loss, injury, or death involving flooding. Other structures that would be constructed within the 100-year flood zone consist of the pedestrian bridge and boat launch ramp and associated breakwater. Additionally, the wooden portion of the Horseshoe Pier would be replaced, and the Sportfishing Pier would be demolished and potentially replaced. All the new structures would be placed with the waters of King Harbor and none would impede or redirect flood flows. Therefore, the implementation of the proposed project would not result in a cumulatively considerable contribution to creation or placement of structures within a 100-year flood hazard area such that flood flows would be impeded or redirected or expose people or structures to a significant risk of loss, injury, or death involving flooding (Impact HWQ-4).

The project site is located within a tsunami-induced inundation zone for a tsunami originating in the coastal waters of California. Implementation of the proposed project would include development of new structures having base elevations higher than those of existing structures onsite, which would reduce, to some degree, the potential for hazards and damage associated with a future tsunami or seiche event compared to existing conditions; however, with revitalization of the project site, including the net increase in building area and the increase in activities at, and patronage of, the project site, there is also the potential more people being present at the project site, and at risk, should a major tsunami or seiche occur in the future. The City has developed an emergency evacuation route for its coastal areas to address potential risks associated with tsunamis and there are City-wide emergency response procedures that would be enacted should a tsunami warning occur. The likelihood of such a future event is largely unknown; however, with the increase of structures and patrons at the project site, implementation of the proposed project in conjunction with other growth in the harbor area would result in a significant cumulative impact (Impact HWQ-5). With implementation of mitigation measure MM HWQ-1, impacts associated with people

potentially being exposed to a tsunami or seiche at the project site would be reduced; however, due to natural uncertainties of the likelihood and magnitude of such an event occurring in the future, it is not possible to conclude that the associated risks would be fully mitigated. As such, the residual impact associated with tsunami or seiche exposure is considered to be significant and unavoidable. Consequently, implementation of the proposed project in conjunction with other growth in the harbor area would result in a significant and unavoidable cumulative impact.

Wave uprush currently overtops, on an annual basis, the northern segment of the protective revetment/wall landward of the Horseshoe Pier. This would continue to occur under the proposed project and could result in inundation of the boardwalk and new buildings located along the boardwalk, which constitutes a significant impact (cumulatively considerable contribution without mitigation) as a greater number of people and structures would be exposed to risk (Impact HWQ-5). With implementation of mitigation measures MM HWQ 2 and 3, possible inundation associated with wave uprush would reduce this impact to less than significant; therefore, the implementation of the proposed project would not result in a cumulatively considerable impact associated with wave uprush after mitigation.

Sea level rise is expected to occur in coastal waters, however the exact extent and timing is unknown. Therefore, sea level rise impacts are considered significant (Impact HWQ-5). With implementation of mitigation measure MM HWQ-2 and 3, impacts associated possible inundation associated with sea level rise would be less than significant; therefore, the implementation of the proposed project would not result in a cumulatively considerable impact associated with sea level rise.

Cumulative Mitigation Measures

Implementation of mitigation measure MM HWQ-1 would largely, but not completely, mitigate the proposed project's cumulatively considerable contribution to a significant cumulative impact related to tsunamis. No other additional mitigation measures are available.

With implementation of mitigation measures MM HWQ-2 and MM HWQ-3, possible impacts from inundation associated with wave uprush and sea level rise would be reduced to less than significant.

Cumulative Residual Impacts

Impacts associated with tsunami or seiche exposure is considered to be cumulatively significant and unavoidable.

3.8.5.1 Summary of Impact Determinations

The following Table 3.8-15 summarizes the impact determinations of the proposed project in addition to adopted growth projections (i.e., potential cumulative impacts), related to hydrology and water quality, as described in the detailed discussion above.

Table 3.8-15: Summary Matrix of Potential Impacts and Mitigation Measures for Hydrology and Water Quality Associated with the Proposed Project and Cumulative Growth

Environmental Impacts	Impact Determination	Mitigation Measures	Impacts after Mitigation
HWQ-1: The proposed project would not violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality.	Proposed Project: Less than significant	Proposed Project: No mitigation is required	Proposed Project: Less than significant
	Cumulative: Less than significant (no cumulatively considerable contribution)	Cumulative: No mitigation is required	Cumulative: Less than significant (not cumulatively considerable)
HWQ-2: The proposed project would not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on-site or off-site.	Proposed Project: Less than significant	Proposed Project: No mitigation is required	Proposed Project: Less than significant
	Cumulative: Less than significant (no cumulatively considerable contribution)	Cumulative: No mitigation is required	Cumulative: Less than significant (not cumulatively considerable)
HWQ-3: The proposed project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff that would require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects not already addressed as part of the proposed project.	Proposed Project: Less than significant	Proposed Project: No mitigation is required	Proposed Project: Less than significant
	Cumulative: Less than significant (no cumulatively considerable contribution)	Cumulative: No mitigation is required	Cumulative: Less than significant (not cumulatively considerable)
HWQ-4: The proposed project would not create or place structures within a 100-year flood hazard	Proposed Project: Less than significant	Proposed Project: No mitigation is required	Proposed Project: Less than significant
	Cumulative: Less	Cumulative: No	Cumulative: Less

Table 3.8-15: Summary Matrix of Potential Impacts and Mitigation Measures for Hydrology and Water Quality Associated with the Proposed Project and Cumulative Growth

Environmental Impacts	Impact Determination	Mitigation Measures	Impacts after Mitigation
area such that flood flows would be impeded or redirected or expose people or structures to a significant risk of loss, injury, or death involving flooding.	than significant (no cumulatively considerable contribution)	mitigation is required	than significant (not cumulatively considerable)
HWQ-5: The proposed project would expose people and structures to substantial risk associated with inundation by seiche, tsunami, mudflow, or sea level rise	Proposed Project: Significant - operation	Proposed Project: Mitigation measures MM HWQ-1, MM HWQ-2, and MM HWQ-3	Proposed Project: Significant and unavoidable – operation (tsunami)
	Cumulative: Significant (cumulatively considerable contribution) - operation	Cumulative: Mitigation measures MM HWQ-1, MM HWQ-2, and MM HWQ-3	Cumulative: Significant and unavoidable (cumulatively considerable contribution) – operation (tsunami)

3.8.5.2 Summary of Mitigation Measures

Implementation of the following mitigation measures would be required to reduce potential hydrology and water quality impacts associated with the proposed project:

MM HWQ-1: Tsunami/Seiche Awareness Notification Program

The following shall be implemented on-site to reduce risks associated with tsunami:

1. Signage shall be provided throughout the project area, showing the designated tsunami emergency evacuation route.

2. A public address system audible at both northern and southern locations of the site shall be installed and used to inform the public of evacuation order or emergency procedures in the event a tsunami warning or alert is issued. Contact information for the on-site management office with access to the public address system shall be provided to the Redondo Beach Fire Department and provided for inclusion in City tsunami preparation/emergency response procedure manuals.

3. A tsunami evacuation map and a copy of any City tsunami preparation/emergency response procedure manuals shall be kept in the on-site management office at all times.

4. Tsunami preparedness training shall be provided to on-site security personnel.

5. Additional information, such as brochures and signage, promoting tsunami awareness and providing the website to the City's emergency preparedness website shall also be made available at the project site.

MM HWQ-2: Wave Uprush Protection

A four-foot high recurved splash wall shall be placed within the existing revetment at the seaward edge of the boardwalk to redirect up-rushed water back toward the ocean (as shown in Figure 3.8-16 of the Waterfront Draft EIR), or other wave uprush protection that prevents inundation from occurring at the buildings and pedestrian boardwalk located landward of the northern portion of the Horseshoe (Municipal) Pier (just to the north and south of Kincaid's restaurant) shall be installed, subject to California Coastal Commission recommendations and approval, prior to certificates of occupancy for the buildings. The top of the splash wall shall be level with the finished grade of the boardwalk.

MM HWQ-3: Sea Level Rise Adaption Plan

The Applicant shall every 10 years from the first Certificate of Occupancy issued for the proposed project, review information from the National Oceanographic and Atmospheric Administration's (NOAA) tide measurement at the Santa Monica tide gauge and the recorded sea level rise trend, as well as pertinent literature that updates the sea level rise trend, to determine if sea level rise at the project site is trending toward the high, mid-level or low projections recommended by the Californian Ocean Protection Council (COPC). If the review of information shows that trend is consistent with the high projections of the COPC, than the Applicant shall design and implement a supplemental feature, such as a parapet adaptation to (and on top of) the proposed recurved splash wall or a raised splash wall to respond to sea level rise under the high projection trend (see Figure 3.8-17 of the Waterfront Draft EIR). If the future sea level rise shows an accelerating trend, the construction of such adaptations may then be implemented at an appropriate time in the future.

3.8.6 Significant Unavoidable Impacts

The project site is located within a tsunami-induced inundation zone for a tsunami originating in the coastal waters of California. Implementation of the proposed project would include development of new structures having base elevations higher than those of existing structures on-site, which would reduce, to some degree, the potential for hazards and damage associated with a future tsunami or seiche event compared to existing conditions; however, with revitalization of the project site, including the net increase in building area and the increase in activities at, and patronage of, the project site, there is also the potential more people being present at the project site, and at risk, should a major tsunami or seiche occur in the future.

With implementation of mitigation measure MM HWQ-1, impacts associated with people potentially being exposed to a tsunami or seiche at the project site would be reduced; however, due to natural uncertainties of the likelihood and magnitude of such an event occurring in the future, it is not possible to conclude that the associated risks would be fully mitigated. As such, the residual impact associated with tsunami or seiche exposure is considered to be significant and unavoidable