5.4 Hydrology and Water Quality

5.4 HYDROLOGY AND WATER QUALITY

This section analyzes potential project impacts on existing drainage patterns, surface hydrology, and flood control facilities and water quality conditions in the project area. Mitigation measures are recommended to avoid potential impacts or reduce them to a less than significant level. The discussion in this section is based on information and conclusions contained in the following studies:

- *Hydrology Study for TTM 15353 & 17300* (Hydrology Study), prepared by Hunsaker & Associates Irvine, Inc., dated February 19, 2013; refer to Appendix 11.4, *Hydrology and Water Quality Assessment*.

- *Water Quality Management Plan (WQMP) for Portola Center Tentative Tract Map No. 15353 Lake Forest, CA* (WQMP TTM 15353) prepared by Hunsaker and Associates Irvine, Inc., dated March 18, 2013; refer to Appendix 11.4, *Hydrology and Water Quality Assessment*.

- *Water Quality Management Plan (WQMP) for Portola Center Tentative Tract Map No. 17300 Lake Forest, CA* (WQMP TTM 17300) prepared by Hunsaker and Associates Irvine, Inc., dated March 18, 2013; refer to Appendix 11.4, *Hydrology and Water Quality Assessment*.

5.4.1 EXISTING SETTING

HYDROLOGY AND DRAINAGE CONDITIONS

The project site is located within the Aliso Creek and San Diego Creek (also referred to as the Newport Bay) Watersheds. TTM 15353 is located completely within the Aliso Creek Watershed. A majority of TTM 17300 (approximately 98.1 acres) is located within the Aliso Creek Watershed and the remaining area (1.4 acres) is located within the San Diego Creek Watershed. More specifically, the 1.4 acres is in the Serrano Creek drainage area of Watershed F, San Diego Creek Subwatershed. The 1.4 acres of TTM 17300 flows to the offsite Serrano Creek Channel (F19), San Diego Creek Channel (F05), and the Upper Newport Bay/Pacific Ocean.

Aliso Creek is located offsite and east of the project site. It is a natural creek located along the west side of El Toro Road. The creek flows through natural open space and urban development and outlets at the ocean at Aliso Creek Beach. Aliso Creek's watershed encompasses 23,000 acres, and includes natural open space, rural and urban development, agriculture and ranching, regional parks and other recreational facilities.

The San Diego Creek Watershed covers 112.2 square miles in central Orange County. Its main tributary, San Diego Creek, drains into Upper Newport Bay. Smaller tributaries include Serrano Creek, Borrego Canyon Wash, Agua Chinon Wash, Bee Canyon Wash, Peters Canyon Wash, Sand Canyon Wash, Bonita Canyon Creek, and the Santa Ana Delhi Channel.

The project site is comprised of six major drainage areas (Drainage Areas "A" through "F") that discharge storm water runoff into natural drainage courses at 13 concentration nodes (outlets) located around the southern and eastern perimeter of the project site; refer to Exhibit 5.4-1, *Existing Conditions Hydrology*. The site generally drains from north to south with the highest elevations in the northeast corner and the lowest elevations in the southeast corner of the site. All of the drainage runoff discharging from the 13 outlets is tributary to natural drainage courses that drain to Serrano Creek and Aliso Creek.

Drainage Area "A" is approximately 214 acres in size and includes more than 150 acres of offsite area in the Portola Hills Community, located north of the project site. Runoff from the portion of the Portola Hills Community located in Drainage Area "A" drains in a south to southwesterly direction into the Portola Center site via an existing 60-inch reinforced concrete storm drain located underneath Saddleback Ranch Road. These storm water flows are routed through an approximately 12-acre-foot earthen detention basin located in the southwest corner of the project site, southwest of the Saddleback Ranch Road and Glenn Ranch Road intersection. This basin was originally designed to detain the 10-year, 25-year, and 100-year rainfall events of 151 cubic feet per second (cfs), 195 cfs, and 264 cfs, respectively using the Expected Value (EV) methodology identified in the Orange County Hydrology Manual. The basin is at the downstream portion of Drainage Area "A" and discharges runoff onto the Southern California Edison Transmission Corridor property abutting and immediately to the southwest of the project site.

The remaining five drainages (Drainage Areas "B" through "F") account for a total acreage of approximately 138 acres. These drainage areas are located primarily within the project site boundaries and discharge storm water runoff in a south and southeasterly direction into natural drainage courses along the perimeter of the project site that are tributary to Aliso Creek and Serrano Creek.

Table 5.4-1, *Existing Flowrates*, provides existing conditions peak flow rates for the 2-, 5-, 10-, 25-, 50- and 100-year storm events.

Table 5.4-1
Existing Flowrates

Drainage Area	Node	Area (Acres)	Peak Flow Rate (cfs)											
			2-yr		5-yr		10-yr		25-yr		50-yr		100-yr	
			EV	HC	EV	HC	EV	HC	EV	HC	EV	HC	EV	HC
A	377	213.9	187.9	224.0	247.8	290.1	285.2	348.5	343.6	426.6	379.7	494.2	421.7	572.4
	382	1.3	0.7	1.6	1.3	2.4	2.3	3.1	3.0	3.8	3.5	4.3	3.7	4.9
	383	4.9	2.5	6.1	5.1	9.1	8.8	11.7	11.4	14.2	13.1	16.1	13.9	18.4
	384	0.6	0.2	0.7	0.5	1.0	1.0	1.3	1.3	1.6	1.4	1.8	1.5	2.0
	385	3.6	1.4	4.1	3.1	6.1	5.8	8.0	7.7	9.7	8.6	11.1	9.4	12.7
B	82	77.1	7.3	58.0	38.5	91.8	86.5	121.4	116.2	150.4	132.9	172.9	145.1	198.7
C	116	17.2	4.7	17.2	12.8	26.2	24.7	34.2	32.7	41.9	37.6	47.8	40.4	54.8
D	200.5	13.4	4.0	12.8	10.1	19.6	19.0	25.6	25.1	31.3	28.5	35.8	30.8	41.1
	202.1	5.8	2.3	6.5	5.2	9.9	9.6	12.9	12.6	15.7	14.1	17.9	15.4	20.5
	204.2	3.1	1.2	3.3	2.7	5.0	4.9	6.6	6.5	8.0	7.3	9.2	7.9	10.5
	207	3.2	1.1	3.3	2.6	5.0	4.9	6.6	6.5	8.1	7.4	9.2	8.0	10.5
E	402	14.6	7.1	17.6	14.3	26.5	25.5	34.5	33.6	42.0	38.4	47.9	41.1	54.9
F	501	3.1	1.2	3.4	2.7	5.2	5.0	6.7	6.5	8.2	7.4	9.3	8.0	10.6

cfs = cubic feet per second; yr = year; EV = expected values; HC = high confidence.

Source: Hunsaker & Associates Irvine, Inc., *Hydrology Study for TTM 15353 & 17300*, February 19, 2013.

Source: Hunsaker & Associates Irvine, Inc., February 19, 2013.

NOT TO SCALE

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PORTOLA CENTER PROJECT
SUBSEQUENT ENVIRONMENTAL IMPACT REPORT

Existing Conditions Hydrology

Exhibit 5.4-1

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FLOODPLAIN MAPPING

The City of Lake Forest is a participant in the National Flood Insurance Program (NFIP). Communities participating in the NFIP must adopt and enforce minimum floodplain management standards, including identification of flood hazards and flooding risks. Participation in the NFIP allows communities to purchase low cost insurance protection against losses from flooding. The project site can be found on Flood Insurance Rate Map (FIRM) Number 06056C03217J, dated December 3, 2009 and is located in Zone X, which is defined as areas protected by levees from the one percent annual flood; refer to Section 2 of the Hydrology Study (as provided in Appendix 11.4).

SOILS

Onsite earth materials are generally comprised of colluvial material consisting of silty sand, brown to grayish brown, slightly moist, porous and subject to consolidation. This material was mapped where thicknesses are greater than four feet. Alluvial material consisted of silty sand, medium brown to grayish brown, slightly moist to moist and is medium dense in consistency. These materials are subject to consolidation and not suitable for structural support. Sandstone of the Capistrano formation, Oso Member, has been mapped throughout the site. This unit is characteristically light gray to white in color, and structurally massive. The sandstone is generally moderately hard and can be locally friable as well as cemented. The materials vary from silty fine sandstone to coarse grained sandstone.

The Natural Resources Conservation Service Web Soil Survey 2.0 shows the project site as being comprised of 65.3 percent D-group soil, 16.7 percent C-group soil and 18 percent B-group soil, in general. Group B Soils have moderate infiltration rates when thoroughly wetted and primarily consist of moderately deep to deep, moderately well to well drained sandy-loam soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission. Group C soils have slow infiltration rates when thoroughly wetted and consist chiefly of silty-loam soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission. Soils in the Group D category are described as soils having a high runoff potential, soils having very slow infiltration rates when thoroughly wetted and consist of clay soils with a high swelling potential; soils with a permanent high water table; soils with a claypan or clay layer at or near the surface; and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission, and as a result, are not suitable for infiltration.

EXISTING STORM WATER QUALITY CONDITIONS

Nonpoint Source Pollutants

Nonpoint source pollutants have been characterized by the following major categories in order to assist in determining the pertinent data and its use. Receiving waters can assimilate a limited quantity of various constituent elements; however, there are thresholds beyond which the measured amount becomes a pollutant and results in an undesirable impact. Standard water quality categories of typical urbanization impacts are:

- *Sediment*. Sediment is made up of tiny soil particles that are washed or blown into surface waters. It is the major pollutant by volume in surface water. Suspended soil particles can cause the water to look cloudy or turbid. The fine sediment particles also act as a vehicle to transport other pollutants, including nutrients, trace metals, and hydrocarbons. Construction sites are the largest source of sediment for urban areas under development. Another major source of sediment is streambank erosion, which may be accelerated by increases in peak rates and volumes of run-off due to urbanization.

- *Nutrients*. Nutrients are a major concern for surface water quality, especially phosphorous and nitrogen, which can cause algal blooms and excessive vegetative growth. Of the two, phosphorus is usually the limiting nutrient that controls the growth of algae in lakes. The orthophosphorous form of phosphorus is readily available for plant growth. The ammonium form of nitrogen can also have severe effects on surface water quality. The ammonium is converted to nitrate and nitrite forms of nitrogen in a process called nitrification. This process consumes large amounts of oxygen, which can impair the dissolved oxygen levels in water. The nitrate form of nitrogen is very soluble and is found naturally at low levels in water. When nitrogen fertilizer is applied to lawns or other areas in excess of plant needs, nitrates can leach below the root zone, eventually reaching ground water. Orthophosphate from auto emissions also contributes phosphorus in areas with heavy automobile traffic. As a general rule of thumb, nutrient export is greatest from development sites with the most impervious areas. Other problems resulting from excess nutrients are: 1) surface algal scums; 2) water discolorations; 3) odors; 4) toxic releases; and 5) overgrowth of plants. Common measures for nutrients are total nitrogen, organic nitrogen, total Kjeldahl nitrogen (TKN), nitrate, ammonia, total phosphate, and total organic carbon (TOC).

- *Pesticides*. Pesticides are carried in stormwater from application sites by becoming dissolved or suspended in runoff or by binding to particulate matter carried in runoff. Pesticides can contaminate surface or groundwater through infiltration devices or overflow. The fate and transport of pesticides are dependent on their physical and chemical properties and their chemical interactions with the environment. Processes that determine the path of pesticides in the environment are primarily photolysis (degradation in light), hydrolysis (degradation in the presence of water), and sorption reactions that are dependent on the chemical nature and solubility of the pesticide and the percentage of particulate and organic matter present in the sediment. Some pesticides, such as aldicarb, are highly soluble in water and are easily flushed into aquatic ecosystems or groundwater. Pesticides with low solubility may accumulate in sediments by adhering to particulate matter. Adsorption and absorption increase with the amount of organic matter present. These factors and the resistance to degradation of certain pesticides (expressed as the half-life) increase the persistence of these substances in the environment.

- *Trace Metals*. Trace metals are primarily a concern because of their toxic effects on aquatic life, and their potential to contaminate drinking water supplies. The most common trace metals found in urban run-off are lead, zinc, and copper. Fallout from automobile emissions is also a major source of lead in urban areas. A large fraction of the trace metals in urban run-off are attached to sediment; this effectively reduces the level, which is immediately available for biological uptake and subsequent bioaccumulation. Metals associated with sediment settle out rapidly and accumulate in the soils. Urban run-off events typically occur over a shorter duration, reducing the amount of exposure, which could be toxic to the aquatic environment. The toxicity of trace metals in run-off varies with the hardness of the receiving water. As total hardness of the water increases, the threshold concentration levels for adverse effects increases.

- *Oxygen-Demanding Substances*. Aquatic life is dependent on the dissolved oxygen in the water. When organic matter is consumed by microorganisms, dissolved oxygen is consumed in the process. A rainfall event can deposit large quantities of oxygen-demanding substance in lakes and streams. The biochemical oxygen demand of typical urban run-off is on the same order of magnitude as the effluent from an effective secondary wastewater treatment plant. A problem from low dissolved oxygen (DO) results when the rate of oxygen-demanding material exceeds the rate of replenishment. Oxygen demand is estimated by direct measure of DO and indirect measures such as biochemical oxygen demand (BOD), chemical oxygen demand (COD), oils and greases, and TOC.

- *Bacteria*. Bacteria levels in undiluted urban run-off exceed public health standards for water contact recreation almost without exception. Studies have found that total coliform counts exceeded the U.S. Environmental Protection Agency's (EPA) water quality criteria at almost every site and almost every time it rained. The coliform bacteria that are detected may not be a health risk by themselves, but are often associated with human pathogens.

- *Oil and Grease*. Oil and grease contain a wide variety of hydrocarbons, some of which could be toxic to aquatic life in low concentrations. These materials initially float on water and create the familiar rainbow-colored film. Hydrocarbons have a strong affinity for sediment and quickly become absorbed to it. The major source of hydrocarbons in urban run-off is through leakage of crankcase oil and other lubricating agents from automobiles. Hydrocarbon levels are highest in the run-off from parking lots, roads, and service stations. Residential land uses generate less hydrocarbon export, although illegal disposal of waste oil into storm water can be a local problem.

- *Other Toxic Chemicals*. Priority pollutants are generally related to hazardous wastes or toxic chemicals and can be sometimes detected in storm water. Priority pollutant scans have been conducted in previous studies of urban run-off, which evaluated the presence of over 120 toxic chemicals and compounds. The scans rarely revealed toxins that exceeded the current safety criteria. The urban run-off scans were primarily conducted in suburban areas not expected to have many sources of toxic pollutants (with the possible exception of illegally disposed or applied household hazardous wastes). Measures of priority pollutants in storm water include: 1) phthalate (plasticizer compound); 2) phenols and creosols (wood preservatives); 3) pesticides and herbicides; 4) oils and greases; and 5) metals.

PHYSICAL CHARACTERISTICS OF SURFACE WATER QUALITY

Standard parameters, which can assess the quality of storm water, provide a method of measuring impairment. A background of these typical characteristics assists in understanding water quality requirements. The quantity of a material in the environment and its characteristics determine the degree of availability as a pollutant in surface run-off. In an urban environment, the quantity of certain pollutants in the environment is a function of the intensity of the land use. For instance, a high density of automobile traffic makes a number of potential pollutants (such as lead and hydrocarbons) more available. The availability of a material, such as a fertilizer, is a function of the quantity and the manner in which it is applied. Applying fertilizer in quantities that exceed plant needs leaves the excess nutrients available for loss to surface or ground water.

The physical properties and chemical constituents of water traditionally have served as the primary means for monitoring and evaluating water quality. Evaluating the condition of water through a water quality standard refers to its physical, chemical, or biological characteristics. Water quality parameters for storm water comprise a long list and are classified in many ways. Typically, the concentration of an urban pollutant, rather than the annual load of that pollutant, is required to assess a water quality problem. Some of the physical, chemical, or biological characteristics that evaluate the quality of the surface run-off are listed below.

- *Dissolved Oxygen*. DO in the water has a pronounced effect on the aquatic organisms and the chemical reactions that occur. It is one of the most important biological water quality characteristics in the aquatic environment. The DO concentration of a water body is determined by the solubility of oxygen, which is inversely related to water temperature, pressure, and biological activity. DO is a transient property that can fluctuate rapidly in time and space, and represents the status of the water system at a particular point and time of sampling. The decomposition of organic debris in water is a slow process, as are the resulting changes in oxygen status. The oxygen demand is an indication of the pollutant load and includes measurements of biochemical oxygen demand or chemical oxygen demand.

- *Biochemical Oxygen Demand*. The BOD is an index of the oxygen-demanding properties of the biodegradable material in the water. Samples are taken from the field and incubated in the laboratory at 20°C, after which the residual dissolved oxygen is measured. The BOD value commonly referenced is the standard 5-day values. These values are useful in assessing stream pollution loads and for comparison purposes.

- *Chemical Oxygen Demand*. The COD is a measure of the pollutant loading in terms of complete chemical oxidation using strong oxidizing agents. It can be determined quickly because it does not rely on bacteriological actions as with BOD. COD does not necessarily provide a good index of oxygen demanding properties in natural waters.

- *Total Dissolved Solids*. Total dissolved solids (TDS) concentration is determined by evaporation of a filtered sample to obtain residue whose weight is divided by the sample volume. The TDS of natural waters varies widely. There are several reasons why TDS is an important indicator of water quality. Dissolved solids affect the ionic bonding strength related to other pollutants such as metals in the water. TDS are also a major determinant of aquatic habitat. TDS affects saturation concentration of dissolved oxygen and influences the ability of a water body to assimilate wastes. Eutrophication rates depend on TDS.

- *pH*. The pH of water is the negative log, base 10, of the hydrogen ion (H^+) activity. A pH of 7 is neutral; a pH greater than 7 indicates alkaline water; a pH less than 7 represents acidic water. In natural water, carbon dioxide reactions are some of the most important in establishing pH. The pH at any one time is an indication of the balance of chemical equilibrium in water and affects the availability of certain chemicals or nutrients in water for uptake by plants. The pH of water directly affects fish and other aquatic life; generally, toxic limits are pH values less than 4.8 and greater than 9.2.

- *Alkalinity*. Alkalinity is the opposite of acidity, representing the capacity of water to neutralize acid. Alkalinity is also linked to pH and is caused by the presence of carbonate, bicarbonate, and hydroxide, which are formed when carbon dioxide is dissolved. A high alkalinity is associated with a high pH and excessive solids. Most streams have alkalinities less than 200 milligrams per liter (mg/l). Ranges of alkalinity of 100-200mg/l seem to support well-diversified aquatic life.

- *Specific Conductance*. The specific conductivity of water, or its ability to conduct an electric current, is related to the total dissolved ionic solids. Long term monitoring of project waters can develop a relationship between specific conductivity and TDS. Its measurement is quick and inexpensive and can be used to approximate TDS. Specific conductivities in excess of 2000 microohms per centimeter (μohms/cm) indicate a TDS level too high for most freshwater fish.

- *Turbidity*. The clarity of water is an important indicator of water quality that relates to the alkalinity of photosynthetic light to penetrate. Turbidity is an indicator of the property of water that causes light to become scattered or absorbed. Turbidity is caused by suspended clays and other organic particles. It can be used as an indicator of certain water quality constituents, such as predicting sediment concentrations.

- *Nitrogen*. Sources of nitrogen in storm water are from the additions of organic matter to water bodies or chemical additions. Ammonia and nitrate are important nutrients for the growth of algae and other plants. Excessive nitrogen can lead to eutrophication since nitrification consumes dissolved oxygen in the water. Nitrogen occurs in many forms. Organic nitrogen breaks down into ammonia, which eventually becomes oxidized to nitrate-nitrogen, a form available for plants. High concentrations of nitrate-nitrogen (N/N) in water can stimulate growth of algae and other aquatic plants, but if phosphorus (P) is present, only about 0.30 mg/l of nitrate-nitrogen is needed for algal blooms. Some fish life can be affected when nitrate-nitrogen exceeds 4.2 mg/l. There are a number of ways to measure the various forms of aquatic nitrogen. Typical measurements of nitrogen include Kjeldahl nitrogen (organic nitrogen plus ammonia), ammonia, nitrite plus nitrate, nitrite, and nitrogen in plants. The principal water quality criterion for nitrogen focuses on nitrate and ammonia.

- *Phosphorus*. Phosphorus is an important component of organic matter. In many water bodies, phosphorus is the limiting nutrient that prevents additional biological activity from occurring. The origin of this constituent in urban storm water discharge is generally from fertilizers and other industrial products. Orthophosphate is soluble and is considered to be the only biologically available form of phosphorus. Since phosphorus strongly associates with solid particles and is a significant part of organic material, sediments influence concentration in water and are an important component of the phosphorus cycle in streams. Important methods of measurement include detecting orthophosphate and total phosphorus.

Existing Storm Water Quality Conditions

There are no preexisting water quality issues associated with the project site. However, the majority of the project site is tributary to Aliso Creek. Aliso Creek is under the San Diego Regional Water Quality Control Board (RWQCB), which has listed Aliso Creek and Aliso Creek Mouth on the 303(d) list of impaired water bodies. Existing pollutants affecting Aliso Creek are indicator bacteria, phosphorus, selenium, total nitrogen as N, and toxicity. Pollutants affecting Aliso Creek Mouth is indicator bacteria.

The remaining portion of the project site is tributary to Serrano Creek. Flows to Serrano Creek drain to San Diego Creek Reach 2 and San Diego Reach 1, which extends to Upper Newport Bay. Further downstream are Lower Newport Bay and the Pacific Ocean. Serrano Creek, San Diego Creek, and Newport Bay are under the jurisdiction of the Santa Ana RWQCB, which has listed Serrano Creek, San Diego Creek Reach 2, San Diego Creek Reach 1, Newport Bay (Upper) and Newport Bay (Lower) on the 303(d) list of impaired water bodies. Existing pollutants affecting Serrano Creek are ammonia (unionized) and pH. Pollutants affecting San Diego Creek Reach 2 are nutrients, sedimentation/siltation, and unknown toxicity. Pollutants affecting San Diego Reach 1 are fecal coliform, nutrients, pesticides, sedimentation/siltation, selenium, and toxaphene. Pollutants affecting Newport Bay (Upper) are chlordane, copper, dichlorodiphenyltrichloroethane (DDT), indicator bacteria, metals, nutrients, PCBs, pesticides, sediment toxicity, and sedimentation/siltation. Pollutants affecting Newport Bay (Lower) are chlordane, copper, DDT, indicator bacteria, nutrients, PCBs, pesticides, and sediment toxicity.

The project site does not contain or discharge to Environmentally Sensitive Areas or Areas of Special Biological Significance.

Beneficial Uses

The Water Quality Control Plan (Basin Plan) recognizes and reflects regional differences in existing water quality, the beneficial uses of the region's ground and surface waters, and local water quality conditions and problems. The *Water Quality Control Plan for the San Diego Basin* (San Diego Basin Plan) identifies beneficial uses for waters within the San Diego Region. A beneficial use is one of the various ways that water can be used for the benefit of people and/or wildlife. Although more than one beneficial use may be identified for a given waterbody, the most sensitive use must be protected. The San Diego Basin Plan identifies the following beneficial uses for the Aliso Creek Watershed[1]:

- AGR – Agricultural Supply;
- REC1 – Water Contact Recreation;
- REC2 – Non-Contact Water Recreation;
- WARM – Warm Freshwater Habitat; and
- WILD – Wildlife Habitat.

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[1] Includes English Canyon, Sulphur Creek, and Wood Canyon as tributaries to Aliso Creek as receiving waters.

The following beneficial uses have been identified for Aliso Creek Mouth:

- REC1 – Water Contact Recreation;
- REC2 – Non-Contact Water Recreation;
- WILD – Wildlife Habitat;
- RARE – Rare, Threatened, or Endangered Species; and
- MAR – Marine Habitat.

The *Water Quality Control Plan for the Santa Ana Basin* (Santa Ana Basin Plan) identifies beneficial uses for waters within the Santa Ana Region. The Santa Ana Basin Plan identifies the following beneficial uses for San Diego Creek, including Reach 1, Reach 2, and other tributaries:

- GWR – Groundwater Recharge;
- REC1 – Water Contact Recreation;
- REC2 – Non-Contact Water Recreation;
- WARM – Warm Freshwater Habitat; and
- WILD – Wildlife Habitat.

TSUNAMI, SEICHE, AND MUDFLOW RUN-UP

Tsunami

A tsunami is a seismic sea-wave caused by sea-bottom deformations that are typically associated with a submarine earthquake. They are also generated by landslides, volcanic eruptions, or more rarely by asteroid impact. The project site is not located within a tsunami inundation area.

Seiching

Seiching involves an enclosed body of water oscillating due to ground shaking, usually following an earthquake. Lakes and water towers are typical bodies of water affected by seiching. Given that there are no large, enclosed open bodies of water or reservoirs upgradient of the project area, the likelihood of seiche is considered remote.

Mudflows

Mudflows result from the downslope movement of soil and/or rock under the influence of gravity. The project site is surrounded by existing development and is not located in proximity to a reservoir, harbor, lake, or ocean that would result in mudflow.

5.4.2 REGULATORY SETTING

This section discusses the Federal, State, and local drainage policies and requirements applicable to the project site.

FEDERAL LEVEL

Federal Clean Water Act (Section 404)

The project would be subject to Federal permit requirements under the Federal Clean Water Act (CWA). The CWA requires that the discharge of pollutants to "Waters of the U.S." from any point source be effectively prohibited, unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) Permit. Under the NPDES permit program, the EPA established regulations for discharging storm water by municipal and industrial facilities and construction activities.

The NPDES permit is broken up into two Phases: I and II. Phase I requires medium and large cities, or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their storm water discharges. Phase II requires regulated small Municipal Separate Storm Sewer Systems (MS4s) in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their storm water discharges. Polluted storm water run-off is commonly transported through MS4s. This run-off is often untreated and discharged into local water bodies.

National Flood Insurance Program

The National Flood Insurance Program (NFIP) was created by Congress in 1968. It provided a means for property owners to financially protect themselves from flood damage. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the program. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding. The City of Lake Forest is a participating community and must adhere to the NFIP.

STATE LEVEL

California Porter-Cologne Act

The CWA places the primary responsibility for the control of surface water pollution and for planning the development and use of water resources with the states, although it does establish certain guidelines for the states to follow in developing their programs and allows the EPA to withdraw control from states with inadequate implementation mechanisms.

California's primary statute governing water quality and water pollution issues with respect to both surface waters and groundwater is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act). The Porter-Cologne Act grants the State Water Resources Control Board (SWRCB) and the RWQCBs authority and responsibility to adopt plans and policies, to regulate discharges to surface and groundwater, to regulate waste disposal sites, and to require cleanup of discharges of hazardous materials and other pollutants. The Porter-Cologne Act also establishes reporting requirements for unintended discharges of any hazardous substance, sewage, or oil or petroleum product.

Each RWQCB must formulate and adopt a water quality control plan for its region. The regional plans are to conform to the policies set forth in the Porter-Cologne Act and established by the SWRCB in its state water policy. The Porter-Cologne Act also provides that a RWQCB may include within its regional plan water discharge prohibitions applicable to particular conditions, areas, or types of waste.

State Water Resources Control Board

The SWRCB administers water rights, water pollution control, and water quality functions throughout the State, while the RWQCBs conduct planning, permitting, and enforcement activities. For the proposed project, the NPDES permit is divided into two parts: construction and post-construction. The construction permitting is administered by the SWRCB, while the post-construction permitting is administered by the RWQCB.

Development projects typically result in the disturbance of soil that requires compliance with the NPDES General Permit, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction Activities (Order No. 2009-0009-DWQ, NPDES Number CAS000002). This Statewide General Construction permit regulates discharges from construction sites that disturb one or more acres of soil. By law, all storm water discharges associated with construction activity where clearing, grading, and excavation results in soil disturbance of at least one acre of total land area must comply with the provisions of this NPDES Permit, and develop and implement an effective Storm Water Pollution Prevention Plan (SWPPP). The project applicant must submit a Notice of Intent (NOI) to the SWRCB, to be covered by the NPDES General Permit, and prepare the SWPPP before beginning construction. Implementation of the plan starts with the commencement of construction and continues through the completion of the project. Upon completion of the project, the applicant must submit a Notice of Termination (NOT) to the SWRCB to indicate that construction is completed.

REGIONAL LEVEL

Santa Ana and San Diego Regional Water Quality Control Boards

The SWRCB oversees the nine RWQCBs in the state of California. The City of Lake Forest is within the jurisdictional boundaries of the Santa Ana RWQCB (Region 8) and the San Diego RWQCB (Region 9). The NPDES MS4 permit program is administered by the RWQCB, which develops and enforces water quality objectives and implementation plans that safeguard the quality of water resources in its region. Its duties include developing "basic plans" for its hydrologic area, issuing waste discharge requirements, taking enforcement action against violators, and monitoring water quality.

Non-Point Source Pollution Control Program

The purpose of the Non-Point Source Pollution (NPS) Control Program (NPS Program Plan) is to improve the State's ability to effectively manage NPS pollution and conform to the requirements of the CWA and the Federal Coastal Zone Act Reauthorization Amendments of 1990. These documents were developed by staff of the SWRCB's Division of Water Quality and the California

Coastal Commission (CCC), in coordination with the RWQCBs and staff from over 20 other State agencies.

Orange County Public Works

The specific water pollutant control elements of the Orange County Stormwater Program are documented in the *2003 Drainage Area Management Plan* (DAMP). The Orange County Stormwater Program is a municipal regulatory compliance initiative focused on the management and protection of Orange County's streams, rivers, creeks, and coastal waters.

The Orange County DAMP is the Permittees' (County of Orange, the Orange County Flood Control District, and the incorporated cities of Orange County) primary policy, planning, and implementation document for municipal NPDES Stormwater Permit compliance. The focus of the DAMP is addressing the impacts of urban runoff on water quality.

Fourth Term Permits were adopted in the Santa Ana Region (Permit No. CAS618030, Order No. R8-2009-0030, amended by Order R8-2010-0062) and the San Diego Region (Permit No. CAS0108740, Order No. R9-2009-0002) in 2009. The Orange County Permittees are working to revise the 2003 DAMP to assist with current MS4 Permit compliance and program implementation. The updates to the DAMP are anticipated to be completed by the end of 2013. As part of the DAMP, OC Watersheds has produced an updated *Exhibit 7.II - Model Water Quality Management Plan* (Model WQMP) along with a Technical Guidance Document (TGD), dated May 19, 2011. The Model WQMP and TGD were approved by the Santa Ana Regional Board on May 19, 2011 but have not been approved by the San Diego Regional Board. However, it is anticipated that the proposed project would be required to follow the May 2011 Model WQMP requirements.

Additional requirements of the Fourth Term Permit for the San Diego Region include those pertaining to hydromodification. The term "hydromodification" refers to the changes in runoff characteristics from a watershed caused by changes in land use condition. The Permittees of South Orange County, including the City of Lake Forest, have submitted a draft Hydromodification Management Plan (HMP) to the San Diego Regional Board in October 2012; however, the San Diego Regional Board has not approved the Draft HMP. The Fourth Term Permit for the San Diego Region does include "interim" hydromodification requirements until the HMP is approved. At this time, it is anticipated that the proposed project would be required to comply with the "interim" hydromodification requirements or the HMP when it is approved.

Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) as defined by the San Diego Region Permit (Order No. R9-2009-0002) are areas that include but are not limited to all CWA Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Resources Control Board (Water Quality Control Plan for the San Diego Basin [1994] and amendments); State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Resources Control Board (Water Quality Control Plan for the San Diego Basin [1994] and amendments); areas designated as preserves or their equivalent under the Natural Communities Conservation Program within the Cities and County of Orange; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. Aliso Creek and San Diego Creek are identified as ESAs.

The 2010 303(d) list identifies impairments in Aliso Creek for pathogens, nutrients, metals/metalloids, and nutrients, which characterize Aliso Creek as an ESA. If a new development or redevelopment project occurring in the City of Lake Forest involves the addition of 2,500 square feet or more of impervious surface and is located within 200 feet of Aliso Creek or any area identified as ESA, the project qualifies as priority project and is subject to the WQMP requirements.

LOCAL LEVEL

City of Lake Forest General Plan

City policies pertaining to flooding are contained in the Public Facilities/Growth Management and Safety and Noise Elements of the *City of Lake Forest General Plan* (General Plan). These policies include the following:

- Protect the community from flooding hazards. (Policy 1.2)
- Coordinate water quality and supply programs with the responsible water agencies. (Policy 2.2)
- Conserve and protect important topographical features, watershed areas, and soils through appropriate site planning and grading techniques, re-vegetation and soil management practices, and other resource management techniques. (Policy 2.3)
- Work closely with the Orange County Flood Control District in determining and meeting community needs for flood control facilities and maintenance. (Policy 4.1)

Lake Forest Municipal Code

The *City of Lake Forest Municipal Code* (Municipal Code) Chapter 15.14, Stormwater Quality Management, implements the Clean Water Act and California Water Code by prohibiting the discharge of any pollutant to navigable waters of the United States from a point source unless the discharge is authorized by a permit issued pursuant to the NPDES and prohibits nonstormwater discharges into the municipal separate storm sewer system.

Municipal Code Chapter 8.30, Lake Forest Grading and Excavation Code, sets forth rules and regulations to control excavation, grading, and earthwork construction, including fills and embankments, and establishes administrative requirements for issuance of grading permits and approval of plans and inspection of grading construction in accordance with the requirements for grading and excavation as contained in the Uniform Building Code, as well as water quality requirements relevant to activities subject to this chapter.

5.4.3 IMPACT THRESHOLDS AND SIGNIFICANCE CRITERIA

CEQA SIGNIFICANCE CRITERIA

For this analysis, an impact pertaining to hydrology and water quality was considered significant under CEQA if it would result in any of the following environmental effects, which are based on the City of Lake Forest CEQA Significance Thresholds Guide and modified Initial Study Checklist. Accordingly, a project may create a significant adverse environmental impact if it would:

- During project construction, substantially impair the water quality of receiving waters? In considering water quality factors such as water temperature, dissolved oxygen levels, and turbidity should be considered (refer to Section 8.0, *Effects Found Not to be Significant*);
- Following project construction, substantially impair the water quality of receiving waters? In considering water quality factors such as water temperature, dissolved oxygen levels, and turbidity should be considered (refer to Impact Statement 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 flooding on- or off-site (refer to Impact Statement HWQ-1);
- Substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site (refer to Impact Statement HWQ-1);
- 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 on- or off-site (refer to Impact Statement HWQ-1 and HWQ-2);
- Otherwise result in substantial increase of erosion or siltation on- or off-site (refer to Impact Statement HWQ-1 and HWQ-2);
- Change runoff flow rates or volumes in a manner that substantially alters the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, and results in a significant adverse environmental impact (refer to Impact Statement HWQ-1);
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems (refer to Impact Statement HWQ-1);
- Increase impervious surfaces and runoff in a manner that substantially impairs water quality or causes other significant adverse environmental impacts (refer to Impact Statement HWQ-1 and HWQ-2);

- Provide substantial additional sources of polluted runoff or increase the discharges of pollutants such as heavy metals, pathogens, petroleum derivatives, synthetic organics, sediment, nutrients, oxygen-demanding substances, and trash (refer to Impact Statement HWQ-2);

- For projects that are tributary to water bodies that are listed as impaired on the Clean Water Act section 303(d) list, result in an increase of any pollutant for which the water body is listed as impaired (refer to Impact Statement HWQ-2);

- Substantially degrade or impair an environmentally sensitive area (refer to Impact Statement HWQ-2);

- Substantially degrade or impair surface water quality of marine, fresh, or wetland waters (refer to Impact Statement HWQ-2);

- Substantially degrade or impair ground water quality (refer to Section 8.0, *Effects Found Not to be Significant*);

- Substantially degrade aquatic, wetland, or riparian habitat (refer to Impact Statement HWQ-2);

- Otherwise substantially degrade water quality (refer to Impact Statement HWQ-2);

- Cause or contribute to an exceedance of applicable surface water or ground water receiving water quality objectives or degradation of beneficial uses (refer to Impact Statement HWQ-2);

- Violate any other water quality standards or waste discharge requirements (refer to Impact Statement HWQ-1 and HWQ-2);

- Substantially deplete ground water supplies or interfere substantially with ground water recharge such that there would be a net deficit in aquifer volume or a lowering of the local ground water table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted) (refer to Section 8.0, *Effects Found Not to be Significant*);

- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood delineation map (refer to Section 8.0, *Effects Found Not to be Significant*);

- Place within a 100-year flood hazard area structures that would impede or redirect flows (refer to Section 8.0, *Effects Found Not to be Significant*);

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam (refer to Section 8.0, *Effects Found Not to be Significant*);

- Expose people or structures to a significant risk of inundation by seiche, tsunami, or mudflow (refer to Section 8.0, *Effects Found Not to be Significant*); and/or

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam (refer to Section 8.0, *Effects Found Not to be Significant*).

5.4.4 OVERVIEW OF OSA PEIR HYDROLOGY AND WATER QUALITY ANALYSIS

The OSA PEIR analyzed potential impacts to hydrology and water quality associated with the proposed Lake Forest Opportunities Study. The OSA PEIR concluded that potential impacts to hydrology and water quality would be reduced to a less than significant level with implementation of mitigation and compliance with statutory requirements with the exception of water quality. The OSA PEIR concluded that the proposed Lake Forest Opportunities Study would affect water quality of receiving waterbodies and thus would degrade water quality. This impact is related to pesticide use only and was concluded to be significant and unavoidable.

According to the OSA PEIR, the change in runoff coefficient for the Site 2 development proposed under the OSA project, as compared to existing conditions, would be -33.3 percent; refer to OSA PEIR Table 3.8-2. Although the property is vacant, grade leveling, landscaping, and stormwater Best Management Practices (BMP), which tend to reduce the amount of stormwater runoff, and in some cases increase the amount of infiltration, which offset the potential increase in runoff due to increased impervious surfaces. Higher runoff amounts for individual sites could exceed local conveyance capacities or contribute to localized flooding if not properly addressed by each proposed project. The OSA PEIR concluded that with implementation of OSA PEIR Mitigation Measure 3.8-5, which requires preparation of a hydrology and hydraulics study, the OSA project's impacts to downstream flooding would be less than significant.

Grading activities are likely to alter existing drainage patterns and may alter watercourses. According to the OSA PEIR, development of Site 2 would likely involve grading and alteration of drainage patterns to minimize stormwater impacts to planned structures and facilities. However, existing City ordinances require a grading permit prior to initiation of construction. Disturbance of watercourse beds or banks and changes in drainage patterns would require prior approval and project requirements would be identified during the permitting process. The OSA PEIR concluded that compliance with existing regulations and implementation of OSA PEIR Mitigation Measure 3.8-1, which requires preparation of a Water Quality Management Plan (WQMP) prior to grading, would reduce potential impacts to drainage patterns to a less than significant level.

Irvine Ranch Water District (IRWD) performed a Water Supply Assessment as part of the OSA PEIR that determined adequate water resources are available to meet demands of the OSA project without contributing to degradation of the groundwater basin. Additionally, existing NPDES stormwater regulations would prevent direct contamination and degradation of groundwater resources. The OSA PEIR concluded that compliance with existing regulations, including NPDES General Construction Activity and Industrial Permits, the DAMP, the Groundwater Management Plan, City of Lake Forest Codes, and County of Orange codes would reduce potential impacts to a less than significant level.

According to the OSA PEIR, the OSA project would affect water quality of receiving waterbodies and thus would degrade water quality. The OSA PEIR concluded that compliance with the City of Lake Forest Grading and Excavation Code and Stormwater Management Code, SWPPP, and Orange County Stormwater Program 2003 DAMP would reduce potential construction activity impacts on water quality in San Diego Creek and Aliso Creek to less than significant, and therefore, beneficial uses of San Diego Creek and Aliso Creek, as well as tributaries, would not be significantly impacted.

The potential post construction changes in water quality project would be primarily a function of land use and type of land cover. According to the OSA PEIR, compliance with the DAMP and incorporation of water quality BMPs, to the maximum extent practical (MEP) would result in compliance with general waste discharge requirements and the NPDES permit. Meeting NPDES and DAMP requirements include implementation of BMPs (structural and non-structural) best suited to maximized reduction of pollutants of concern. However, water quality degradation potential would still be possible; practicable BMPs may not be available to sufficiently reduce pollutant concentrations in stormwater. The OSA PEIR concluded that despite implementation of OSA PEIR Mitigation Measures 3.8-1 through 3.8-4, the proposed OSA project impacts on water quality would remain significant and unavoidable for pesticides. OSA PEIR Mitigation Measure 3.8-1 requires that the Applicant submit a WQMP, including a hydrology study, if appropriate, for review and approval of the City Engineer.

According to the OSA PEIR, Aliso Creek is a 303d-listed ESA. Additionally, part of San Diego Creek is an ESA with impaired 303d status; however, the ESA designation for San Diego Creek stops at the Lake Forest boundary. The OSA PEIR concluded that compliance with the City of Lake Forest Grading and Excavation Code, SWPPP, and DAMP would reduce potential construction activity impacts on water quality in San Diego Creek and Aliso Creek to less than significant, and therefore, beneficial uses of San Diego Creek and Aliso Creek, as well as tributaries, would not be significantly impacted.

5.4.5 IMPACTS AND MITIGATION MEASURES

LONG-TERM HYDROLOGY/DRAINAGE IMPACTS

HWQ-1 IMPLEMENTATION OF THE PROPOSED PROJECT WOULD NOT ALTER THE EXISTING DRAINAGE PATTERN RESULTING IN A SUBSTANTIAL INCREASE IN RUNOFF, FLOODING, OR EROSION.

Impact Analysis: According to the OSA PEIR (pages 3.8-27 through 3.8-29), the change in runoff coefficient for the Site 2 development proposed under the OSA project, as compared to existing conditions, would be -33.3 percent; refer to OSA PEIR Table 3.8-2. Although the property is vacant, grade leveling, landscaping, and stormwater BMPs, which tend to reduce the amount of stormwater runoff, and in some cases increase the amount of infiltration, which offset the potential increase in runoff due to increased impervious surfaces. Higher runoff amounts for individual sites could exceed local conveyance capacities or contribute to localized flooding if not properly addressed by each proposed project. The OSA PEIR concluded that with implementation of OSA PEIR Mitigation Measure 3.8-5, which requires preparation of a hydrology and hydraulics study, the OSA project's impacts to downstream flooding would be less than significant.

Grading activities are likely to alter existing drainage patterns and may alter watercourses. According to the OSA PEIR, development of Site 2 would likely involve grading and alteration of drainage patterns to minimize stormwater impacts to planned structures and facilities. However, existing City ordinances require a grading permit prior to initiation of construction. Disturbance of watercourse beds or banks and changes in drainage patterns would require prior approval and project requirements would be identified during the permitting process. The OSA PEIR concluded that compliance with existing regulations and implementation of OSA PEIR Mitigation Measure 3.8-1, which requires preparation of a WQMP prior to grading, would reduce potential impacts to drainage patterns to a less than significant level. In compliance with OSA PEIR Mitigation Measure 3.8-1 and 3.8-5, a Preliminary Hydrology Study and Preliminary WQMPs have been prepared for TTM 15353 and 17330; refer to Appendix 11.4.

Proposed Storm Water Facilities and Drainage

Similar to existing conditions, the post-development condition would include the six drainage areas (Drainage Areas "A" through "F") discharging across the southern and eastern boundaries of the project site; refer to Exhibit 5.4-2, *Proposed Conditions Hydrology*.

Drainage Area "A" includes 151.4 acres of the existing Portola Hills Community located to the north of the project site. Runoff from the existing Portola Hills Community and a portion of the runoff from the existing Glenn Ranch Road and Saddleback Ranch Road, account for approximately 72 percent of the total runoff in this drainage area. The remaining 28 percent of these flows are from the project site. The existing flows from Portola Hills and portions of Glenn Ranch Road and Saddleback Ranch Road would not be comingled with the proposed project's flows. Instead, these existing flows would be confined to a separate bypass storm drain system and diverted into a new underground 5.4 acre-foot flow-by underground detention chamber (Basin #2) at node 336.11. Flows from those portions of Drainage Area "A" that are part of the project site would be captured and routed through a separate storm water detention and conveyance system that treats and detains these flows in compliance with water quality and hydromodification requirements, discussed below. After accounting for the project flows discharging at Node 377, Basin #2 would be sized to limit the peak discharge at Node 377 to 263.9 cfs, 178.8 cfs and 150.9 cfs, for 100-year, 25-year and 10-year Expected Value (EV) storm events, respectively.

Although the proposed project would change the size and configuration of the six drainage areas, it would maintain the existing 13 discharge locations. Four of the 13 discharge locations would be improved with storm drain outlet structures and energy dissipaters (riprap) to accommodate project runoff from developed areas. The remaining nine discharge locations would accommodate runoff from manufactured slopes and/or portions of the project site that would remain natural.

Exhibit 5.4-3, *Preliminary Detention/Hydromodification and Water Quality Facilities*, depicts the proposed project's stormwater/water quality facilities. The project would include 10 new underground detention and water quality treatment basins (large concrete vaults with modular wetlands incorporated) and one aboveground open basin (above-ground earthen detention and water quality basin) in order to reduce the runoff associated with the proposed project. Three underground basins would be located partially or completely under parking lots (Basin #2, #3, and #4) and the remaining underground basins would be located underneath park areas. The aboveground open basin would be located along the eastern perimeter of the project site in the project's fuel management zone.

Source: Hunsaker & Associates Irvine, Inc., February 19, 2013.
Note: The project's Tentative Tract Maps have been refined through the planning process since creation of this exhibit.
Refinements to the Tentative Tract Maps do not affect the environmental analysis, findings, or effectiveness of the mitigation measures contained in this SEIR.

NOT TO SCALE

RBF CONSULTING A Baker Company

06/13 • JN 10-107644 [130079]

PORTOLA CENTER PROJECT
SUBSEQUENT ENVIRONMENTAL IMPACT REPORT

Proposed Conditions Hydrology

Exhibit 5.4-2

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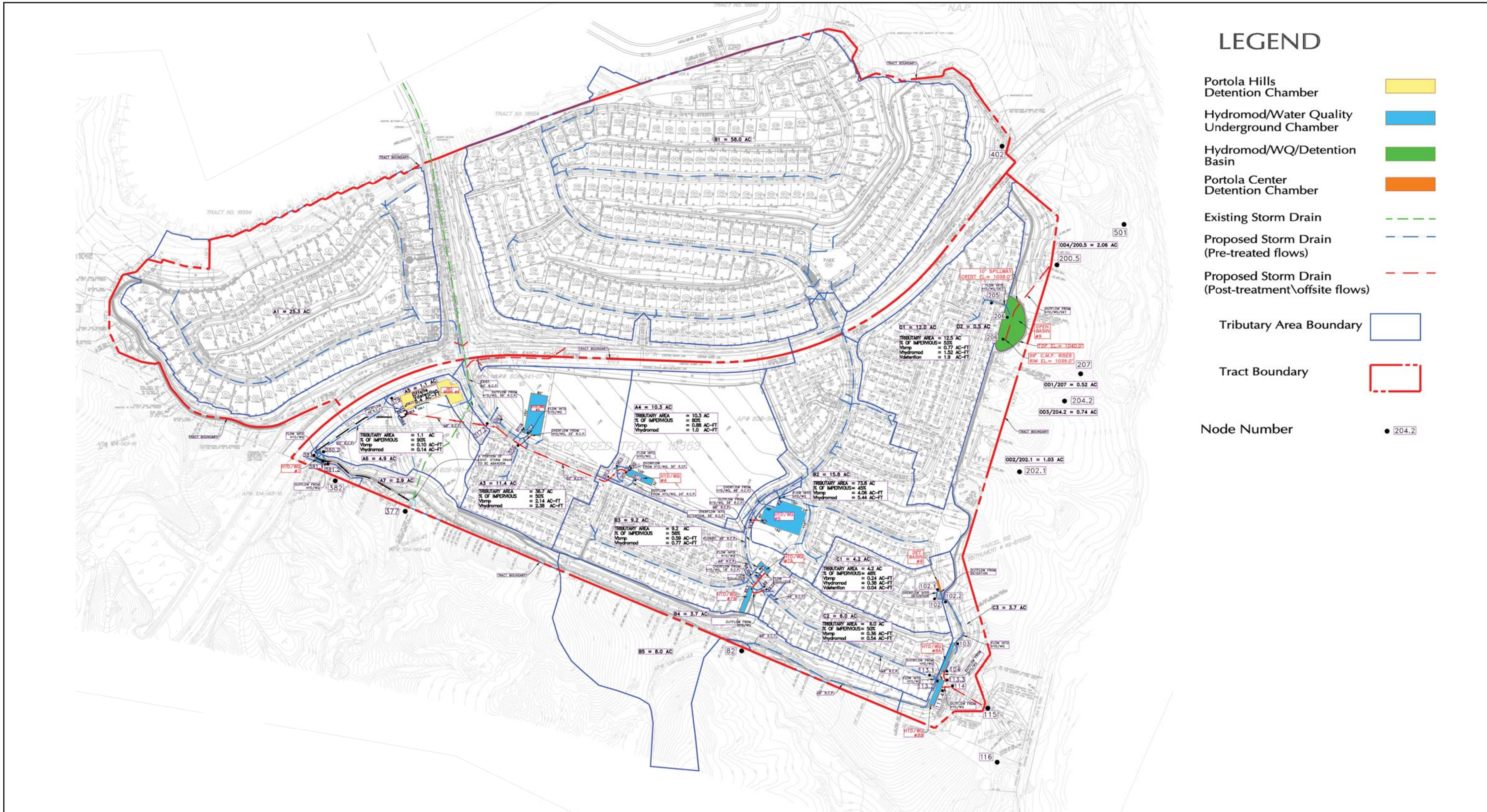

Source: Hunsaker & Associates Irvine, Inc.
Note: The project's Tentative Tract Maps have been refined through the planning process since creation of this exhibit.
Refinements to the Tentative Tract Maps do not affect the environmental analysis, findings, or effectiveness of the mitigation measures contained in this SEIR.

RBF CONSULTING A Baker Company

06/13 • JN 10-107644 [130079]

PORTOLA CENTER PROJECT
SUBSEQUENT ENVIRONMENTAL IMPACT REPORT

Preliminary Detention/Hydromodification and Water Quality Facilities

Exhibit 5.4-3

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As stated, the existing 12-acre-foot earthen flood control basin located in the southwest corner of the project site that primarily detains flows from the existing Portola Hills Community would be replaced with a new underground 5.4-acre-foot flood control basin (Basin #2) located in the footprint of the 5-acre public park. Basin #2 would replace the existing earthen basin in form and function by detaining existing flows exclusively from the Portola Hills Community and portions of Saddleback Ranch Road and Glenn Ranch Road. Project flows entering the existing basin would be directed to the project's new detention and water quality facilities for separate detention and treatment. Following detention in Basin #2, the Portola Hills Community runoff would be combined with detained and treated project runoff from Basins #1, #3, and #4 and discharged at the base of the 5.0-acre Neighborhood Park where the existing onsite detention basin presently discharges.

All of the project's detention and treatment facilities would be located in the Portola South Planning Area (TTM 15353). However, they incorporate water quality treatment, detention, and hydromodification requirements for both TTM 15353 and 17300. Thus, the proposed facilities would be sized to accommodate stormwater runoff from the Portola Northwest and Northeast Planning Areas, as well as runoff from the Portola South Planning Area. Runoff from the Portola Northwest Planning Area would enter an underground storm drain line that travels underneath Saddleback Ranch Road and Glenn Ranch Road and through the western entrance of the Portola South Planning Area where it would combine with certain stormwater flows from the south and undergo detention and treatment prior to controlled discharge along the southwestern perimeter of the project site. The runoff from the Portola Northeast Planning Area would enter an underground storm drain line that would travel underneath Glenn Ranch Road and through the eastern entrance of the Portola South Planning Area where it would combine with certain storm water flows from the south and undergo detention and treatment prior to controlled discharge along the southwestern perimeter of the project site. Following detention and treatment, stormwater runoff would flow into natural drainages on the Southern California Edison transmission corridor property and other natural drainages that are tributary to Aliso Creek.

The Hydrology Study analyzes the peak discharges from the 2-, 5-, 10-, 25-, 50-, and 100-year storm events produced from the site for existing and proposed conditions; refer to Table 5.4-2, *Comparison of Existing and Proposed Flowrates*.

As indicated in Table 5.4-2, with the proposed detention facilities, the rate of runoff at the 13 discharge locations in the proposed project condition would be less than or equal to the rate of runoff in the existing condition. Therefore, the proposed project would not result in any increase in runoff flow rates along the project boundary. Further, the outlets would be designed with riprap and/or energy dissipaters to ensure post-development discharge velocities do not exceed discharge velocities in the existing conditions. Therefore, the proposed project would not have a significant impact associated with erosion and scour at the outlet locations. Furthermore, per OSA PEIR Mitigation Measure 3.8-1, the Applicant would be required to submit a Final WQMP and Hydrology Study concurrent with the 40-scale grading plans to ensure no impacts would occur once the civil design plans have been finalized. Therefore, hydrology and drainage impacts would be less than significant.

Table 5.4-2
Comparison of Existing and Proposed Flowrates

Drain Area	Node	Land Use	Area	Peak Flow Rates (cfs)											
				2-yr		5-yr		10-yr		25-yr		50-yr		100-yr	
				EV	HC	EV	HC	EV	HC	EV	HC	EV	HC	EV	HC
A	377	Design Peak Runoff[1]						151.0		195.0				264.0	
		Existing	213.9	187.9	224.0	247.8	290.1	285.2	348.5	343.6	426.6	379.7	494.2	421.7	572.4
		Proposed	217.2	204.9	236.9	267.9	306.3	303.7	367.8	365.2	448.4	403.3	518.0	445.9	598.7
		With Detention		105.0	123.1	120.8	151.5	150.9	182.3	178.8	221.5	198.4	260.0	263.9	305.6
	382	Existing	1.3	0.7	1.6	1.3	2.4	2.3	3.1	3.0	3.8	3.5	4.3	3.7	4.9
		Proposed	0.4	0.4	.07	0.6	1.0	1.0	1.3	1.3	1.6	1.4	1.8	1.5	2.0
		With Detention[2]													
	383	Existing	4.9	2.6	6.1	5.1	9.1	8.8	11.7	11.4	14.2	13.1	16.1	13.9	18.4
		Proposed	2.3	1.2	2.9	2.4	4.2	4.1	5.5	5.3	6.6	6.1	7.5	6.5	8.6
		With Detention[2]													
	384	Existing	0.6	0.2	0.7	0.5	1.0	1.0	1.3	1.3	1.6	1.4	1.8	1.5	2.0
		Proposed	0.1	0.1	0.2	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.4
		With Detention[2]													
	385	Existing	3.6	1.4	4.1	3.1	6.1	5.8	8.0	7.7	9.7	8.6	11.1	9.4	12.7
		Proposed	2.4	1.0	2.7	2.1	4.1	3.9	5.3	5.1	6.4	5.8	7.3	6.2	8.4
		With Detention[2]													
B	82	Existing	77.1	7.3	58.0	38.5	91.8	86.5	121.4	116.2	150.4	132.9	172.9	145.1	198.7
		Proposed	94.8	47.3	87.4	78.3	129.7	127.1	167.8	165.2	203.6	187.5	231.8	201.1	264.9
		With Detention		4.2	12.2	9.1	53.0	56.9	94.9	91.2	130.0	110.1	157.7	127.6	187.4
C	116	Existing	17.2	4.7	17.2	12.8	26.2	24.7	34.2	32.7	41.9	37.6	47.8	40.4	54.8
		Proposed	17.7	9.0	20.3	17.1	30.3	29.2	39.3	38.2	47.8	43.1	54.4	46.6	62.2
		With Detention		2.9	8.4	6.6	16.4	16.0	25.5	23.4	35.3	29.6	43.0	33.5	50.9
D	200.5	Existing	13.4	4.0	12.8	10.1	19.6	19.0	25.6	25.1	31.3	28.5	35.8	30.8	41.1
		Proposed	14.6	7.7	14.5	13.0	21.7	21.4	28.2	27.8	34.3	31.7	39.1	34.0	44.6
		With Detention		1.7	3.2	2.9	4.6	4.5	6.2	5.9	13.9	9.4	24.4	13.2	33.0
	202.1	Existing	5.8	2.3	6.5	5.2	9.9	9.6	12.9	12.6	15.7	14.1	17.9	15.4	20.5
		Proposed	1.8	1.5	2.9	2.5	4.3	4.2	5.6	5.5	6.7	6.3	7.6	6.6	8.7
		With Detention[2]													
	204.2	Existing	3.1	1.2	3.3	2.7	5.0	4.9	6.6	6.5	8.0	7.3	9.2	7.9	10.5
		Proposed	1.7	0.8	2.0	1.7	3.0	3.0	3.9	3.9	4.7	4.4	5.4	4.7	6.2
		With Detention[2]													
	207	Existing	3.2	1.1	3.3	2.6	5.0	4.9	6.6	6.5	8.1	7.4	9.2	8.0	10.5
		Proposed	1.5	0.7	1.7	1.4	2.6	2.5	3.3	3.3	4.1	3.8	4.6	4.1	5.3
		With Detention[2]													
E	402	Existing	14.6	7.1	17.6	14.3	26.5	25.5	34.5	33.6	42.0	38.4	47.9	41.1	54.9
		Proposed	4.8	3.8	6.7	6.1	9.8	9.5	12.6	12.4	15.3	14.5	17.4	15.0	19.9
		With Detention[2]													
F	501	Existing	3.1	1.2	3.4	2.7	5.2	5.0	6.7	6.5	8.2	7.4	9.3	8.0	10.6
		Proposed	2.5	1.0	2.7	2.2	4.1	4.0	5.4	5.3	6.5	5.9	7.5	6.4	8.5
		With Detention[2]													

cfs = cubic feet per second; yr = year; EV = expected values; HC= high confidence.

Notes:

1. The outlet of the existing detention basin (at Node 377) was designed for Expected Value (EV) peak discharges of 264 cubic feet per second (cfs), 195 cfs, and 151 cfs for the 100-, 25-, and 10-year storm events, respectively (per Portola Hills Retarding Basin Study by J.P Kapp & Associates, Inc. dated November 1989).
2. Detention facilities not required as proposed condition peak discharges would be less than existing condition peak discharges.

Source: Hunsaker & Associates Irvine, Inc., *Hydrology Study for TTM 15353 & 17300*, February 19, 2013.

Standard Conditions of Approval:

- Compliance with NPDES, DAMP, Groundwater Management Plan.
- Compliance with Lake Forest Municipal Code and County of Orange Codes regulating drainage and water quality.

Applicable OSA PEIR Mitigation Measures:

3.8-1 ~~Prior to approval of a Parcel Map or a Tentative Tract Map (whichever comes first),~~ Concurrent with submittal of the 40-scale grading plans, the applicant shall submit a Final Water Quality Management Plan (WQMP), including a Final hydrology study~~, if appropriate,~~ for review and approval of the City Engineer. The Final WQMP ~~Plan~~ shall include Best Management Practices (BMPs) in accordance with the latest City of Lake Forest Water Quality Management Plan Template User Guide and include stormwater detention/retention features~~, if necessary,~~ to mitigate impacts of changes in stormwater rates or volumes as identified in the site-specific Final hydrology study. The Final hydrology study shall comply with the Orange County Hydrology Manual (OCHM) and addresses the following as part of final design:

- The time of concentration (Tc) for the different storm events shall be calculated to provide correct times for each storm event in both existing and proposed condition rational method models.
- Orange County Hydrology Manual recommendations shall be utilized for small area hydrograph analysis or justification for the use of different values.
- Equation D.4 shall be utilized for calculating effective area, consistent with the Orange County Hydrology Manual.
- Verify details of the diversion structure for Basin #2 to ensure it functions as intended.

Additional Mitigation Measures: No additional mitigation measures are required.

Level of Significance: Less Than Significant Impact With Mitigation Incorporated.

LONG-TERM WATER QUALITY IMPACTS

HWQ-2 IMPLEMENTATION OF THE PROPOSED PROJECT WOULD NOT SUBSTANTIALLY DEGRADE OR IMPAIR SURFACE WATER QUALITY.

Impact Analysis: According to the OSA PEIR (pages 3.8-33 through 3.8-38), the potential post construction changes in water quality from the OSA project would be primarily a function of land use and type of land cover. Compliance with the DAMP and incorporation of water quality BMPs, to the maximum extent practical (MEP) would result in compliance with general waste discharge requirements and the NPDES permit. Meeting NPDES and DAMP requirements include implementation of BMPs (structural and non-structural) best suited to maximized reduction of pollutants of concern. However, water quality degradation potential would still be possible; practicable BMPs may not be available to sufficiently reduce pollutant concentrations in stormwater.

The OSA PEIR concluded that despite implementation of OSA PEIR Mitigation Measures 3.8-1 through 3.8-4, the proposed OSA project impacts on water quality would remain significant and unavoidable for pesticides. OSA PEIR Mitigation Measure 3.8-1 requires that the Applicant submit a Water Quality Management Plan (WQMP), including a hydrology study, if appropriate, for review and approval of the City Engineer.

As stated, in compliance with OSA PEIR Mitigation Measure 3.8-1, WQMPs have been prepared for TTM 15353 and 17330; refer to Appendix 11.4. The WQMPs are intended to comply with the requirements of the City of Lake Forest Urban Runoff Management Program and Storm Water Ordinance, as well as the Municipal Storm Water Permit which require the preparation of WQMPs for priority development projects.

Hydromodification

Detention is the collection and attenuation of stormwater runoff resulting in a controlled release of the runoff to prevent flooding and erosion in downstream areas. Hydromodification management is one component of detention that is based on a continuous simulation model for a flow duration control between a range of flows extending from 10 percent of the 2-year peak flow event to the 10-year peak flow event in the pre-developed/natural condition. The purpose of hydromodification management is to control erosion by mimicking the natural flows for a selected range of storms in the post development condition. Hydromodification management is often based on a separate set of flow control requirements. However, the proposed project's hydromodification detention facilities have been designed to work in conjunction with the project's flood control facilities (discussed above) which handle larger storm events out to the 100-year event.

As stated, all of the project's detention and treatment facilities would be located in the Portola South Planning Area (TTM 15353); refer to Exhibit 5.4-3. However, they incorporate water quality treatment, detention, and hydromodification requirements for both TTM 15353 and 17300. The existing 12-acre foot earthen flood control basin would be replaced with a new underground 5.4-acre-food flood control basin (Basin #2). Project flows entering the existing basin would be directed to the project's new detention and water quality facilities for separate detention and treatment. Following detention in Basin #2, the Portola Hills runoff would be combined with detained and treated project runoff from Basins #1, #3, and #4 and discharged at the base of the 5-acre public park where the existing onsite detention basin presently discharges.

In addition to Basin #2, the project would include eight underground flow-through hydromodification/water quality (HYD/WQ) chambers, and one flow-through open-basin for detention, hydromodification, and water quality (Basin #9). Nuisance runoff, and runoff during minor storms of up to 10-year frequencies, would be diverted and routed through the underground HYD/WQ chambers for treatment and flow-retardation (to meet hydromodification requirements) prior to being released to the downstream storm drain system.

The onsite portion of Drainage Area "A" has been divided into Subareas A1, A3, A4 and A5. Runoff from Subareas A1 and A3 would be routed into Basin #3, Subarea A4 would be routed through HYD/WQ Basin #4, and Subarea A5 would be routed through Basin #1.

Drainage Area "B" has been divided into Subareas B1, B2, and B3. Subareas B1 and B2 would be routed through HYD/WQ Basin #5 and Subarea B3 would be routed through two interconnected underground chambers (HYD/WQ Basin #7A and HYD/WQ Basin 7B).

Drainage Area "C" has been divided into Subareas C1 and C2. Runoff from Subarea C1 would be routed through HYD/WQ Basin #8A and Subarea C2 would be routed through HYD/WQ Basin #8B.
Drainage Area "D" consists of two Subareas D1 and D2. Runoff from both the subareas would be routed through a water quality/hydromodification/detention basin (Basin #9).

The proposed stormwater facilities would be protected and designed for the 100-year storm event per the requirements of the Orange County Local Drainage Manual and the proposed project's discharges have been designed to meet applicable water quality and the Interim Hydromodification standards.

Downstream Channels and Habitat Integrity

Hydrologic Conditions of Concern include potential water quality degradation, increased runoff volume and velocity; reduced infiltration; increased flow frequency, duration and peaks, and faster time to reach peak flow resulting from development. The project site does not contain or discharge to any Environmentally Sensitive Areas or Areas of Special Biological Significance. The proposed project would develop less than one percent of the total Aliso Creek watershed area. Since hydrologic and geomorphic conditions in the receiving stream (Aliso Creek) are driven by large-scale watershed processes in conjunction with project storm drain and site plan designs, which would result in less than significant drainage and runoff impacts (refer to Impact Statement HWQ-1), no Hydrologic Conditions of Concern have been identified for the proposed project. The project would be required to implement and maintain hydromodification control BMPs which would detain runoff for controlled release and manage excess runoff volumes. OSA PEIR Mitigation Measure 3.8-1, as modified, requires submittal of a Final WQMP, to be approved by the City, which would identify BMPs applicable to the proposed project in order to reduce potential water quality impacts. Further, hydrologic controls have been integrated into the proposed project in order to ensure proposed project runoff would not contribute additional erosive forces to the project's receiving stream channel. Thus, no significant impacts on downstream channels and habitat integrity would occur with the proposed project.

Pollutants of Concern

The WQMPs identify primary and secondary pollutants of concern, which are anticipated to be generated by the proposed project. Pollutants of concern are differentiated between primary and secondary depending on the condition of downstream receiving waters. If the project will drain to receiving water that is impaired for a pollutant anticipated from that project, that pollutant is a primary pollutant of concern. Primary project pollutants of concern for the Aliso Creek Watershed are toxicity, selenium, bacteria, viruses, total nitrogen (N), and phosphorus (nutrients). Secondary project pollutants of concern are sediment, pesticides, trash and debris, oxygen-demand substances, and oil and grease. Primary project pollutants of concern for the Newport Bay Watershed are bacteria and viruses, sediment, and pesticides. Secondary project pollutants of concern are nutrients, trash and debris, oxygen-demanding substances, and oil and grease. BMPs are identified in order to reduce the discharge of pollutants in storm water runoff. Recommended BMPs include site design, source control, and treatment control measures; refer to Section 6 of the WQMP (included as Appendix 11.4) for a complete list of BMPs. The Final WQMPs, approved by the City, would provide the final BMPs applicable to the proposed project (OSA PEIR Mitigation Measure 3.8-1, as modified). Implementation of the Final WQMP would ensure that post-construction water quality impacts, including impacts to beneficial uses of receiving waters and indirect impacts to jurisdictional waters, associated with Tentative Tract Map 15353 and 17300 would be reduced to the Maximum Extent Practicable (MEP). Additionally, the proposed project would be required to comply with OSA PEIR Mitigation Measures 3.8-2and 3.8-4, which require the applicant to submit a landscape design plan, join the Nitrogen and Selenium Working Group, implement BMPs to reduce nutrients in the watershed, and prepare a pesticide management program. Post-construction water quality impacts associated with the proposed project would be reduced to a less than significant level.

Standard Conditions of Approval:

- Compliance with NPDES, DAMP, Groundwater Management Plan.
- Compliance with Lake Forest Municipal Code and County of Orange Codes regulating drainage and water quality.

DFN4 Prior to the issuance of a certificate of occupancy related to a given area, neighborhood, or building site of the project, the applicant shall demonstrate that all structural Best Management Practices (BMP) described in the project's Final Water Quality Management Plan (WQMP) that serve as water quality treatment and detention facilities for that area, neighborhood, or building site of the project have been constructed and installed. In addition, the applicant ~~is prepared to~~ shall implement all non-structural BMP's described in the project's Final WQMP for that portion of the project site. Two (2) copies of the Final WQMP shall be available on-site. Prior to the issuance of a certificate of occupancy, all equipment shall be in place and in good working order as indicated in the Final WQMP.

Applicable OSA PEIR Mitigation Measures: In addition to the following, refer to OSA PEIR Mitigation Measure 3.8-1, as modified above.

3.8-2 ~~All City landscape contractors and project developers shall be required, as part of their contract,~~ Prior to the issuance of a grading permit the applicant shall ~~to~~ submit to the City a landscape design plan ~~including~~ that includes the following elements:

- Maximized use of native plant species with minimum water and fertilizer requirements
- Watering shall be kept to the minimum necessary to maintain new landscaping
- Drip irrigation shall be used only until the native landscaping is established
- Minimal use of fertilizers and pesticides

3.8-4 Prior to the issuance of a grading permit, the applicant shall develop and implement appropriate Best Management Practices, such as a nutrient management program, to reduce the amount of nutrients entering the watershed (see San Luis Rey Watershed Urban Runoff Management Program http://www.projectcleanwater.org/html/wurmp_san_luis_rey.html) for an example of a management program that addresses nutrients). In addition, a pesticide management program shall be developed to reduce the amounts of pesticides entering the watershed through minimizing the use of pesticides and emphasizing non-chemical controls (see the City of San Francisco's Integrated Pest Management Program (http://www.sfgov.org/site/frame.asp?u=http://www.sfwater.org/) for an example). These plans shall be approved by the City prior to issuance of a grading permit.

Additional Mitigation Measures: No additional mitigation measures are required.

Level of Significance: Less Than Significant Impact With Mitigation Incorporated.

5.4.6 CUMULATIVE IMPACTS

The basis for cumulative analysis is presented in Section 4.0, *Basis of Cumulative Analysis*. The cumulative projects are located within the cities of Lake Forest and Mission Viejo, as well as the County of Orange. Cumulative projects have the potential to interact with the proposed project to the extent that a significant cumulative drainage and water quality effect could occur.

The following discussions are included per topic area to determine whether a significant cumulative effect would occur.

- **IMPLEMENTATION OF THE PROPOSED PROJECT AND OTHER RELATED CUMULATIVE PROJECTS WOULD NOT RESULT IN A SUBSTANTIAL INCREASE IN RUNOFF, FLOODING OR EROSION.**

Impact Analysis: Higher flows resulting from future development could result in drainage and runoff impacts. Runoff from some of the cumulative projects could drain into the conveyance systems used by the project. Although runoff from some of the cumulative projects may not interact with runoff from future development within the project site, interaction could occur downstream. Future development would be required to account for higher flows on a project-by-project basis.

Cumulative projects would have the potential to affect hydrology and drainage of the area. The projects would contribute storm water flows to the local and regional storm water system and drainage facilities. However, each individual project would be required to submit individual analyses to their respective jurisdictions for review and approval prior to issuance of grading or building permits. Each analysis must illustrate how peak flows generated from each related project site would be accommodated by the existing and/or proposed storm drainage facilities. Therefore, overall cumulative impacts would be less than significant.

Implementation of the proposed project, in conjunction with related cumulative projects, would result in increased potential for hydrology and drainage impacts. However, although the project would alter drainage patterns and runoff associated with development of the project site, the project includes detention facilities, which would be designed so that the project would not increase runoff above existing conditions. Therefore, the project impacts would not be cumulatively considerable, and impacts in this regard are less than significant.

Standard Conditions of Approval:

- Compliance with NPDES, DAMP, Groundwater Management Plan.
- Compliance with Lake Forest Municipal Code and County of Orange Codes regulating drainage and water quality.
- Refer to Standard Condition of Approval DFN4.

Applicable OSA Mitigation Measures: Refer to OSA PEIR Mitigation Measures 3.8-1, 3.8-2, and 3.8-4.

Additional Mitigation Measures: No additional mitigation measures are required.

Level of Significance: Less Than Significant With Mitigation Incorporated.

■ IMPLEMENTATION OF THE PROPOSED PROJECT AND OTHER RELATED CUMULATIVE PROJECTS WOULD NOT SUBSTANTIALLY DEGRADE OR IMPAIR SURFACE WATER QUALITY.

Impact Analysis: Development of the project, along with related cumulative projects, would result in increased potential for long-term operational water quality impacts. However, the project and cumulative development must adhere to NPDES requirements, including preparation of a project-specific WQMP, which would identify BMPs for post-construction conditions. Each project would also be required to comply with existing water quality standards at the time of development review and implement site-specific improvements, further reducing operational water quality impacts associated with the proposed development. Therefore, the long-term impacts on surface water quality associated with the proposed project and cumulative development would not be cumulatively considerable with adherence to NPDES and Municipal Code requirements. Less than significant impacts are anticipated in this regard.

Standard Conditions of Approval:

- Compliance with NPDES, DAMP, Groundwater Management Plan.
- Compliance with Lake Forest Municipal Code and County of Orange Codes regulating drainage and water quality.
- Refer to Standard Condition of Approval DFN4.

Applicable OSA Mitigation Measures: Refer to OSA PEIR Mitigation Measures 3.8-1, 3.8-2, and 3.8-4.

Additional Mitigation Measures: No additional mitigation measures are required.

Level of Significance: Less Than Significant With Mitigation Incorporated.

5.4.7 SIGNIFICANT UNAVOIDABLE IMPACTS

No unavoidable significant impacts related to hydrology and water quality have been identified following implementation of the recommended mitigation measures.

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