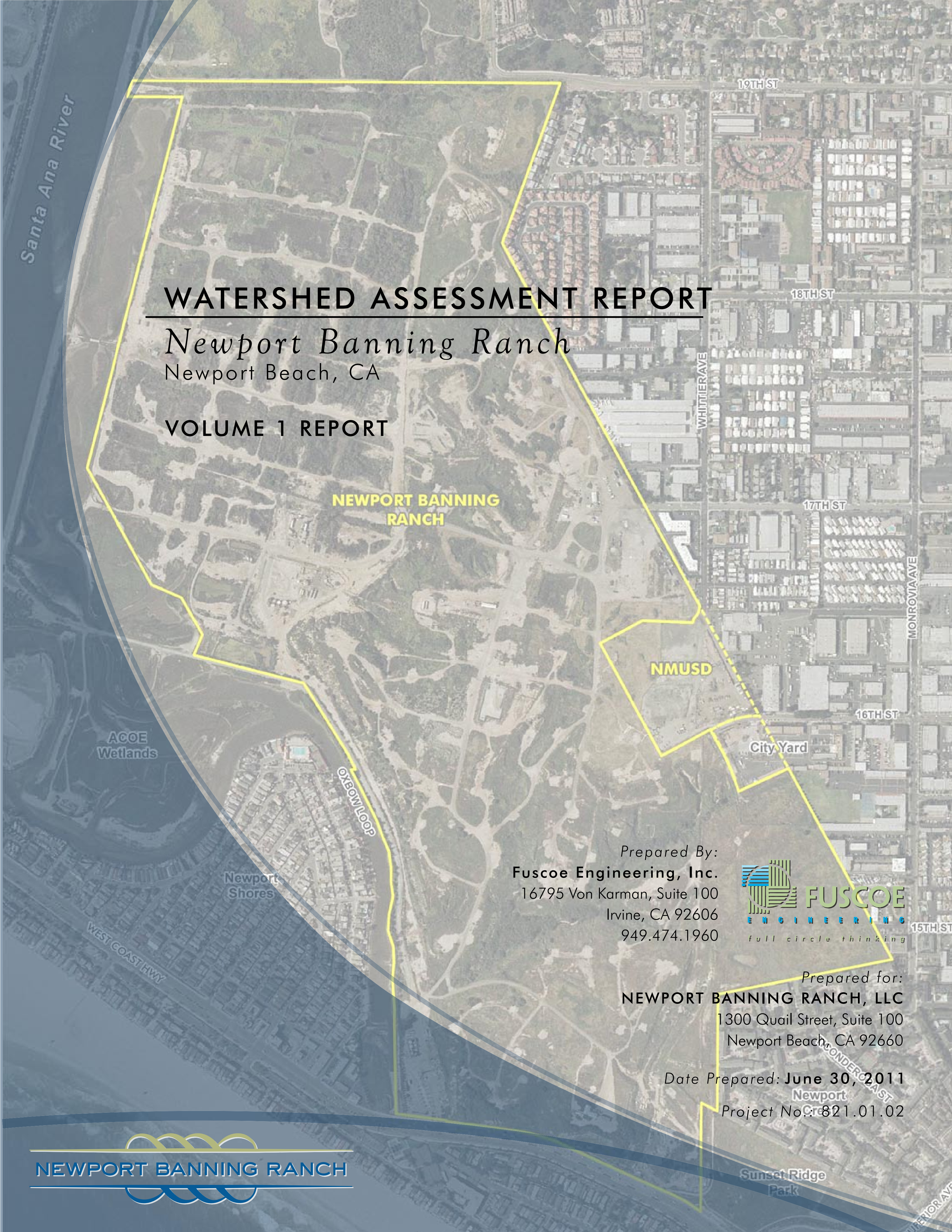
Appendix C
Hydrology and Water Quality

WATERSHED ASSESSMENT REPORT

Newport Banning Ranch

Newport Beach, CA

VOLUME 1 REPORT



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Date Prepared: **June 30, 2011**

Project No.: 821.01.02

NEWPORT BANNING RANCH

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WATERSHED ASSESSMENT REPORT

Design Applications for Hydrology, Flood Control, Water Quality, and Low Impact Development Features

City of Newport Beach, CA

FINAL DRAFT

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ACRONYMS & ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ac-ft	acre-feet
AES	Advanced Engineering Software
AHIP	Affordable Housing Implementation Plan
ATS	active treatment system
BAT	best achievable technology
BCT	best conventional technology
BMP	best management practice
Caltrans	California Department of Transportation
CASQA	California Stormwater Quality Association
CDP	Coastal Development Permit
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulation
cfs	cubic feet per second
CWA	Clean Water Act
DSA	disturbed soil area
EIR	Environmental Impact Report
ET	evapotranspiration
EV	expected value
FEMA	Federal Emergency Management Association
FIRM	Flood Insurance Rate Map
ft/s	feet per second
GCP	General Construction Permit
HC	high confidence
HEC-RAS	Hydrologic Engineering Centers River Analysis System
HSA	Hydrologic Sub-Area
IPM	Integrated Pest Management
LDR	low density residential
LID	low impact development
LIP	Local Implementation Plan
LMDR	low-medium density residential
MDR	medium density residential
MEP	maximum extent practicable
MS4	municipal separate storm sewer system

MSL	mean sea level
MU/R	mixed use & residential
NAL	numeric action level
NBR	Newport Banning Ranch
NEL	Numeric effluent limitation
NFIP	National Flood Insurance Program
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity units
OC DAMP	Orange County Drainage Area Management Plan
PADA	Pre-Annexation Development Agreement
PAH	polycyclic aromatic hydrocarbons
PRD	permit registration documents
QA/QC	quality assurance/quality control
RCB	reinforced concrete box
RCP	reinforced concrete pipe
REAP	Rain Event Action Plan
RUSLE	Revised Universal Soil Loss Equation
RWQCB	Regional Water Quality Control Board
SFHA	Special Flood Hazard Area
SIC	standard industrial classification
SQDF	Storm Water Quality Design Flow
SQDV	Storm Water Quality Design Volume
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
Tc	time of concentration
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TPH	total petroleum hydrocarbons
TSS	total suspended solids
USACOE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
US EPA	United States Environmental Protection Agency
WCH	West Coast Highway
WDR	Waste Discharge Requirement
WQMP	Water Quality Management Plan

EXECUTIVE SUMMARY

The purpose of this Watershed Assessment Report is to assess storm water runoff, flood control, and water quality impacts associated with the proposed Newport Banning Ranch development project. It also seeks to identify potential project design features and/or mitigation measures for inclusion into the Project Environmental Impact Report (EIR). The Report calculations are based on the revised Land Use Plan entitled Exhibit 2-1, NBR Planned Community Development Plan by FORMA, dated November 20, 2009.

The Newport Banning Ranch property encompasses approximately 402 acres within unincorporated County of Orange and portions of the City of Newport Beach, California. The site has been used as an operating oil field and, today, remnants of old wells and pipelines coexist with currently operating pump and processing facilities. The proposed Newport Banning Ranch Project includes the development of roughly 175 acres of the larger 402-acre project site for residential, commercial, and recreational land uses. Over fifty percent of the property will be retained as open space, with restored wetland and habitat areas located throughout the Lowland and Upland Mesa areas.

This report concentrates on sustainable design strategies for the hydrology, flood control, and water quality issues associated with the proposed Project. Project design features and best management practices (BMPs) will be implemented to reduce the potential impacts to hydrology and surface water quality. The effect of the development on groundwater, geotechnical resources and biology are not included in the scope of this report.

Hydrology Analysis

The objective of this hydrology study is to compute the existing and proposed condition peak flow discharge rates and runoff volumes for selected recurrence interval storm events and to use the results to evaluate the hydrologic impacts experienced by the watershed that are caused by the presence of the Project. The study also seeks to assess impacts to the existing and proposed drainage facilities in order to determine the level of significance of the impacts due to the Project. The results apply to three receiving facilities identified as the Salt Marsh Basin and Lowland Area, the Semeniuk Slough and the Caltrans Reinforced Concrete Box (RCB) Culvert in West Coast Highway (WCH).

- <u>Salt Marsh Basin and Lowland Area:</u> The results of the High Confidence hydrology analysis reveal that the proposed development will only marginally increase the total runoff volume in the Salt Marsh Basin and Lowland Area. This is achieved largely by preservation of open space area in the proposed land use plan to the maximum extent possible. The predicted volumetric increases are 1.5% for the 10-year recurrence interval event, and 1.3% for the 25-year recurrence interval event. The analysis also reveals that the Marsh and Lowland storage capacity is sufficient to detain the 25-year post-development runoff volume tributary to it. This result indicates that a 25-year level of protection is provided in the pre-development, condition and that the 25-year level of protection is also maintained in the post-development condition. This is a favorable result confirming that mitigation for this impact is neither needed nor warranted to compensate for the presence of the Project.

- Semeniuk Slough: The results of the Expected Value hydrology analysis reveal that the proposed development will only marginally increase the peak flow rate and runoff volume in the Semeniuk Slough. This is achieved by the re-assignment of approximately 27 acres of tributary area away from the Semeniuk Slough and toward the Lowland Area. The predicted increase in peak flow rate is 5.6% for the 2-year recurrence interval event. The predicted volumetric increase is 3.7%. The analysis also reveals that the Semeniuk Slough storage capacity is sufficient to detain the 2-year post-development runoff volume tributary to it. This result indicates that the 2-year level of protection is provided in the pre-development condition, and that the 2-year level of protection is also maintained in the post-development condition. This is a favorable result confirming that mitigation for this impact is neither needed nor warranted to compensate for the presence of the Project.

- Caltrans Reinforced Concrete Box (RCB) Culvert in West Coast Highway: The results of the High Confidence hydrology analysis reveal that the proposed development will significantly decrease the peak flow rate delivered to the lower reach node and the middle reach node of the RCB. The upper reach node is expected to experience an increase in peak flow that measures less than 1%. This result indicates that a 100-year level of protection is provided in the pre-development condition and that the 100-year level of protection is also maintained in the post-development condition. This is a favorable result confirming that mitigation for this impact is neither needed nor warranted to compensate for the presence of the Project.

Floodplain Inundation Analysis

The purpose of the channel hydraulics analysis is to establish the flow depths, velocities, water surface profiles and the resulting flood plain boundaries for a series of design storm events under the existing and proposed conditions for the Northern and Southern Arroyos. The Northern Arroyo modeling is to verify the field reconnaissance that this Arroyo is in a stable channel condition and to quantify the changes between the existing and proposed conditions. The Southern Arroyo modeling is to quantify the changes between the existing and proposed conditions and determine long-term stability of the channel.

The results of the hydraulics analysis show that the Northern Arroyo does not generate erosive velocities, even under the extreme 100-year condition event. This is consistent with the field observations that exclude any evidence of erosion in the Arroyo bed and bank. For the Southern Arroyo, based on the projected hydraulic performance of the channel and the upstream control basin to reduce the peak flows entering the Southern Arroyo, the channel is expected to remain stable under the proposed condition. In addition, measures will be taken to stabilize the eroding tributaries entering the Arroyo thereby controlling the amount of sediment available for transport to the Semeniuk Slough. Lastly, the diffuser basin at the downstream end of the Arroyo will also provide an additional measure to control sediment loading into the Semeniuk Slough.

Habitat Analysis

The purpose of the hydrologic objectives for habitat is to maintain an appropriate water budget for all preserved habitat on-site and utilize treated storm water runoff to supplement areas of enhancement and/or creation of habitat. The water budget analysis estimates the water demand and supply for the Northern Arroyo and Southern Arroyo habitats and further determines the ecological condition of the habitat from the water balance perspective.

For the Northern Arroyo, the results of the water budget analysis showed that in general, there will be no significant change in the habitat-related drainage under the proposed condition. Specifically for the Northern Arroyo habitat area, the drought season is from May to August and October, and the remaining months of the year are considered to have sufficient water budget for the habitat. There is no anticipated water budget impact on the Northern Arroyo habitat from the proposed development.

In general, under the existing condition, the Southern Arroyo habitat area has a longer drought period than the Northern Arroyo. The results show a deficit in water balance from April to October, while the remaining five months exhibit positive balances. However, based on the field reconnaissance, the existing habitat survives through the year under the existing water budget condition. For the proposed condition, although the Upland Mesa area will be converted to the residential area and be therefore removed from its drainage, the water budget results for the Southern Arroyo do not vary significantly as compared to existing conditions. The drought period is expected to remain as seven months, and the annual balance will decrease only by approximately 1 inch.

Overall, there is no significant water budget impact on the Arroyo habitats due to the proposed development. However, enhancement opportunities exist by diverting treated dry weather flows and storm event low-flows to the Arroyo from the proposed storm drain system and incorporated LID features, should this controlled input be necessary.

Water Quality Analysis

The purpose of water quality assurance plan is to define the water quality treatment approach for the Newport Banning Ranch Project consistent with the details of the current planning level, and summarize the various water quality systems and concepts being considered within the development areas. In order to reduce the amount of pollutants in storm water runoff from the new development plan, best management practices (BMPs) are required to be implemented in accordance with California Coastal Commission, the City of Newport Beach and local Regional Board standards.

The holistic approach to water quality treatment for the Newport Banning Ranch Project includes incorporation of site design/low impact development (LID) strategies and source control measures throughout the site in a systematic manner that maximizes the use of LID features to provide treatment of storm water and runoff reduction benefits. In addition, treatment control BMPs are proposed to treat runoff not treated by LID measures, as well as to treat off-site runoff from upstream areas that drain towards the Southern Arroyo. Overall, the Project will provide water quality treatment that exceeds water quality regulations for the long-term protection against downstream impacts on adjacent habitat areas and downstream receiving waters.

One of the primary LID features of importance within the Project is the use of landscaping biocells within portions of the parkway bioswales of arterial and collector streets. Biocells are small, vegetated depressions to promote infiltration and filtration of storm water runoff. Additional LID features that may also be incorporated throughout the Project include permeable/porous pavement, pocket rain gardens, cisterns and landscaped storm water planters, among others. The specific details and locations of these measures will occur during the detailed design phase of each community.

The use of the vegetation biocells and other LID applications will result in a significant treatment and reduction of runoff at the source of the development areas. Each LID feature will be designed to accommodate the required treatment volume and additional treatment where feasible. High flows will be designed to bypass the features for conveyance into the traditional storm drain system. In those instances where the individual features are not sufficient to handle treatment requirements independently, water quality calculations will quantify how much the additional treatment is required by the next downstream LID feature.

The proposed Project will also incorporate the use of water quality basins to provide the final treatment of runoff for certain portions of the site. One regional water quality facility will be implemented to accommodate the off-site (City of Costa Mesa) treatment of urban runoff and first-flush flows from areas tributary to the Southern Arroyo, and will also provide detention capabilities to reduce peak flow runoff. The water quality basin will have the capacity to accommodate a minimum of 2.3 ac-ft of treatment. A second basin is also proposed within the Lowlands of the property, which will also serve as a diffuser basin to control the rate at which water drains from the top of the Mesa down to the Lowlands. Additional water quality basins are also provided along the fringes of the development in combination with other LID features to further provide treatment of runoff.

Clearing, grading, excavation and construction activities associated with the proposed Project could impact water quality due to sheet erosion of exposed soils and subsequent deposition of particles and pollutants in drainage ways or introduction of construction-related pollutants. Under the Statewide General Construction Permit ([GCP], Order 2009-0009-DWQ), the Project proponents will submit a Notice of Intent (NOI) and associated permit registration documents (PRDs) to the SWRCB prior to commencement of construction activities. In addition, a Construction Storm Water Pollution Prevention Plan (SWPPP) will be prepared and implemented at the project site. The SWPPP will describe construction BMPs meeting the standards required by the GCP and that address pollutant source reduction, and will ensure that water quality standards are not exceeded in downstream receiving waters due to construction activities. These include, but are not limited to erosion controls, sediment controls, tracking controls, non-storm water management, materials & waste management, and good housekeeping practices. The SWPPP shall be developed in accordance with the construction plans.

As a result of the construction-related, site design/LID, source control, and additional treatment control BMPs, water quality exceedances are not anticipated, and pollutants are not expected in Project runoff that would adversely affect beneficial uses in downstream receiving waters.

1.0 INTRODUCTION

1.1 PURPOSE OF STUDY

The purpose of this Watershed Assessment Report is to assess storm water runoff, flood control, and water quality impacts associated with the proposed Newport Banning Ranch development project (referred to as the "Project"). It also seeks to identify potential project design features and/or mitigation measures for inclusion into the Project Environmental Impact Report (EIR). Activities associated with the Project have the potential to alter the existing drainage courses, modify the impervious surface makeup, and create the possibility for new potential sources of runoff contamination. The runoff management components for the Project are described in the following sections:

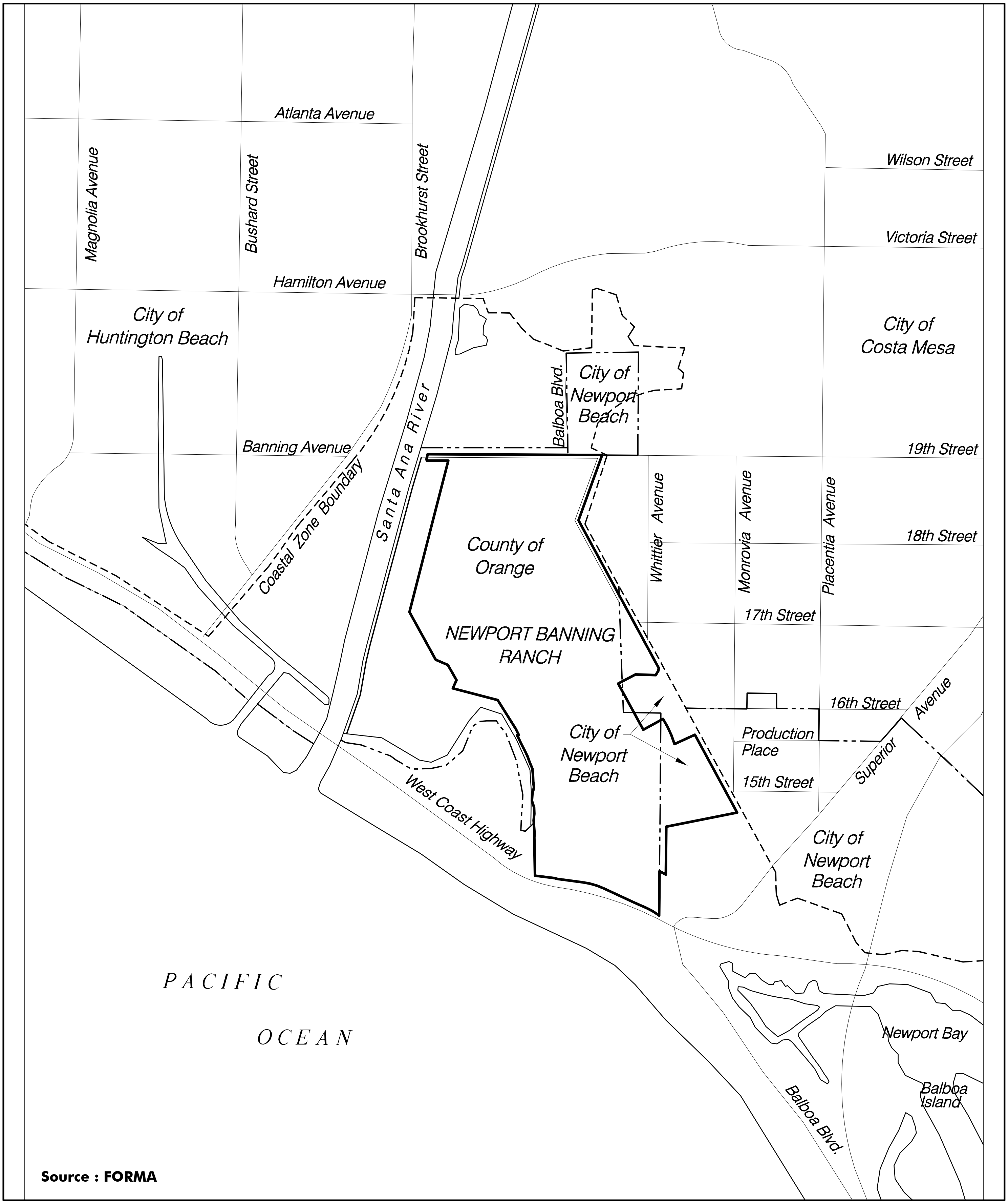
- Section 1 identifies the framework and objectives for the Watershed Assessment Report.
- Section 2 provides background regarding the Project watershed and associated drainage conditions.
- Section 3 identifies the existing versus proposed hydrologic conditions with respect to the Project watershed along with the associated flood control and drainage impacts. It also investigates the existing channel hydraulics and stability concerning the proposed development plan.
- Section 4 provides water budget demands for preserved habitat in the Arroyos to identify any potential changes to the existing water budgets of the existing Arroyos on-site and validate that the proposed Project will not significantly alter the existing hydrologic conditions.
- Section 5 summarizes the existing and proposed water quality features with an emphasis on the implementation of low impact development (LID) features.

This report concentrates on sustainable design strategies for the hydrologic, hydraulic, and water quality issues associated with the proposed Project. Project design features will be implemented to reduce the potential impacts to hydrology and surface water quality. The effect of the development on groundwater, geotechnical and biology are not included in the scope of this report; however, their objectives have been considered in the design and water quality aspects of the Project.

1.2 PROJECT AND SITE DESCRIPTION

1.2.1 LOCATION

The Newport Banning Ranch property encompasses approximately 402 acres within unincorporated County of Orange and portions of the City of Newport Beach, California. The property is bounded on the south by the West Coast Highway (WCH), to the west by the Santa Ana River channel, and by existing residential and commercial developments to the north and east (see Figure 1, Vicinity Map). The entire property is situated within the Coastal Zone Jurisdictional Boundary as established by the California Coastal Act, and is therefore also subject to the planning and regulatory jurisdiction of the California Coastal Commission. The southwestern border of the property is less than one half mile from the Pacific Ocean and adjoining beaches. The City of Costa Mesa, including Talbert Regional Park, is adjacent to the northern and a portion of the eastern project boundaries. Wetland areas restored by the US Army Corp of Engineers (USACOE) extend up the Site's western boundary and separate the site from the Santa Ana River channel. The City of Huntington Beach is located west of the Santa Ana River, adjacent to the Site's western boundary. Figure 1 is the Project's Vicinity Map.



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NEWPORT BANNING RANCH

FIGURE 1: Project Vicinity Map

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1.2.2 EXISTING SITE FEATURES

Within the project boundary, there are several primary landforms of concern that are referenced throughout this report:

- Lowland Area: Located in the northeasterly portion of the property. The Lowland Area currently consists of degraded wetland and ruderal vegetation, as well as roads, pipelines, and other facilities associated with oil operations. In addition, the Lowland Area consists of several narrow channels and shallow depressions that occasionally pond water.
- Upland Mesa: Located in the eastern portion of the properly. Similar to the Lowland Area, the Upland Mesa currently consists of existing pipelines, roads, buildings, and other equipment related to oil extraction activities.
- Bluffs: Located adjacent to the Lowland Area and include west and southwest facing slopes of varying steepness. The bluffs have suffered from erosion in localized areas, resulting in sloughing and sediment contributions to the Semeniuk Slough.
- Arroyos: There are several existing drainage courses (generally referred to as "Arroyos") that fall gradually from the eastern project boundary across the Mesa and Bluffs towards the Semeniuk Slough in the western portion of the site. The two largest Arroyos, designated as the Northern and Southern Arroyos, are considered significant drainage features and convey runoff from upstream areas (primarily off-site contributions) through the project site. The tributaries of these Arroyos, in particular the Southern Arroyo, have been subject to significant erosion and sloughing of sediment into the main arroyo channels, and these sediments are delivered downstream during storm events. The Southern Arroyo conveys the largest amount of flow and sediment to the downstream receiving water body (Semeniuk Slough) and as part of the development plan, these eroding tributaries will be stabilized to remove the source of sediment to the Semeniuk Slough.
- Semeniuk Slough (Oxbow Loop): Consists of a meandering drainage course that flanks the southern portion of the site. The Semeniuk Slough, also known as Oxbow Loop, receives runoff from both on-site and off-site areas, and drains generally west and north towards the Lowland Area. However, a small dike separates the Lowland Area from the Semeniuk Slough channel, and there are several culverts that allow for tidal exchange between the areas.

Figure 2 highlights these primary landforms and features of the site.

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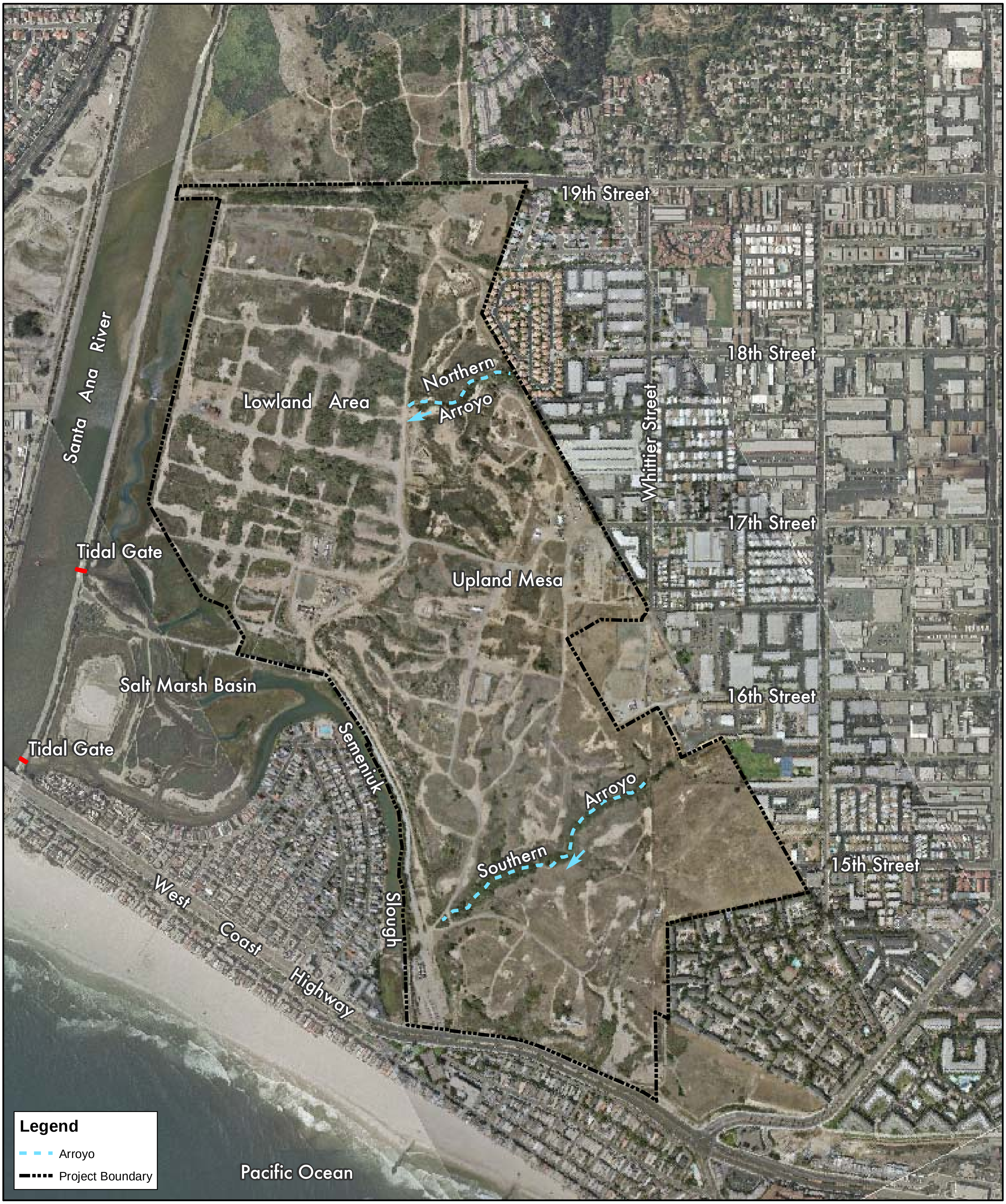

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FIGURE 2: Existing Site Features

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1.2.3 EXISTING OIL OPERATIONS

For more than 50 years, the site has been used as an operating oil field and today, remnants of old wells and pipelines coexist with currently operating pump and processing facilities. Most of the active oil facilities are located in the central portion of the Upland Mesa and adjoining Lowland Area. Currently, there are over 460 producing, potentially producing, and abandoned wells along with related roads, pipelines, and associated facilities located throughout the Newport Banning Ranch property.

1.2.4 PROPOSED DEVELOPMENT

The proposed Newport Banning Ranch Project includes the development of roughly 149 acres of the larger 402-acre project site for residential, commercial, and recreational land uses. Over fifty percent of the property will be retained as open space, with restored wetland and habitat areas located throughout the Lowland and Upland Mesa areas. The locations of the development areas have been selected and will be designed to minimize impacts on adjacent habitats and open space areas (see Figure 3). Below is a summary of the proposed development:

- Residential Areas: Approximately 76 acres (or 16%) of the project site will be devoted to Residential Land Use. This type of land use is divided into the following districts:
    - Low Density Residential (LDR) District: Approximately 13 acres of LDR use development is planned that may include custom homes or larger individual lots.
    - Low-Medium Density Residential (LMDR) District: Approximately 21 acres of LMDR land use is planned that may include single-family detached homes, single-family attached homes as well as multi-family housing.
    - Medium Density Residential (MDR) District: Approximately 42 acres of MDR land use is planned that may include single-family detached homes, single-family attached homes and multi-family residential projects. This land use will also include smaller convenience commercial sales sites and service sites to encourage pedestrian and bicycle use.
    - Mixed Use/Residential (MU/R) District: Approximately 21 acres of MU/R land use is planned along the eastern side of North Bluff Road. It adjoins Costa Mesa's "MesaWest Bluffs Urban Plan Area" (proposed mixed-use redevelopment) to the east, which currently is made up of light industrial developments and mobile home parks. Consistent with Costa Mesa's MesaWest Bluffs Urban Plan, this will be the most-urban environment within the Newport Banning Ranch site. The MU/R District will allow 3-, 4-, and 5-story attached residential neighborhoods with innovative architecture, creative parking solutions, and on-site recreation centers with the potential for lofts, live-work units, and/or commercial development as part of a vertically and/or horizontally integrated mixed use development. It is anticipated that this higher density residential area could also accommodate affordable housing units as defined by the City of Newport Beach and described in an Affordable

Housing Implementation Plan (AHIP) prepared for the Project, and potentially in the future Pre-Annexation Development Agreement (PADA) between the Landowner/Master Developer and the City.

- Visitor-Serving Resort: The Visitor-Serving Resort Overlay District will provide a maximum of 75 overnight accommodations in an "inn" type setting integrated within the base Residential District. The design will include an iconic architectural element for the community and permit a spa and wellness center, restaurant(s), and limited visitor-serving commercial facilities as part of the resort. The residential units permitted in the base district will be conventionally owned but have opportunities to use the spa and wellness center, restaurants, and/or other facilities and amenities provided by the resort.
- Parks and Recreational Areas: Both active and passive public parks will be located throughout the project site. Multiple trails will be located throughout the site and adjacent areas to connect to the regional recreational facilities. In addition, smaller greenways and neighborhood focal points will be placed within the residential areas.
- Open Space Areas: various open space uses are proposed throughout the Lowland, Upland, Bluff, and Arroyo areas, including trails, habitat, wetlands, and arroyos.
- Green Streets: Many of the larger streets and arterials throughout the project site will be designed with "green street" and other low impact development (LID) features. Green streets are carefully designed roadways that incorporate sustainable design elements that may include narrower pavement widths, canopy street trees, traffic calming features, and alternative street lighting systems. In addition, landscaping along the street edges and within setback areas provide additional opportunities for treatment of storm water runoff from the streets and adjacent development areas.
- Oil Consolidation Sites: Since on-site oil operations are expected to continue, the Project will include a phased abandonment and consolidation of facilities to specific areas of the site to continue operations after development. Well abandonment and remediation processes will be conducted in accordance with all relevant Federal, State, and local laws and regulations.

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Figure 3: Proposed Development

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1.3 STUDY OBJECTIVES

This report concentrates on the on-site hydrologic, erosion, and water quality impacts associated with the proposed Newport Banning Ranch Project, with the following objectives:

- Hydrology Analysis: The objectives of this hydrology study are to evaluate the expected discharges for a sequence of storm events to evaluate the hydrologic impacts on the Project watershed for the existing and proposed conditions (including relevant project design features). The analysis also includes estimating the 100-year storm peak discharge rates and volumes before and after the Project using design hydrology methodologies to assess impacts to the existing and proposed drainage facilities, and determine the level of significance of the impacts due to the Project. Particular attention is focused on the potential downstream impacts related to the Semeniuk Slough and the existing neighborhoods downstream of the project along the Slough. Mitigation measures will be discussed if necessary to address any identified significant impacts.
- Floodplain Inundation Analysis: The purpose of the channel hydraulics analysis is to establish the flow depths, velocities, and water surface profiles (i.e., flood plain boundaries) for a series of design storm events under the existing and proposed conditions for the Northern and Southern Arroyos. The analysis utilize agency-accepted US Army Corps of Engineers (USACOE) models to define the proposed floodplain boundary of the Arroyos and demonstrate that the proposed flood protection measures meet the flood protection and drainage guidelines. Relevant project design features will be included in the assessment, and mitigation measures will be included to address any identified significant impacts.
- Habitat Analysis: The purpose of the hydrologic objectives for habitat is to maintain an appropriate water budget for all preserved habitat on-site and utilize treated storm water runoff to supplement areas of enhancement and/or creation of habitat. The analysis will focus on smaller scale, more frequent storm events to determine potential water budget changes to the existing Arroyos on-site and validate that the proposed Project will not substantially alter the existing hydrologic conditions.
- Water Quality Analysis: The Newport Banning Ranch Project offers opportunities for storm water management that balance Project flood control requirements with preservation of natural drainage ways for improved water quality. The objective is to maximize use of low impact development (LID) features and best management practices (BMPs) to control post-development runoff as well as promote sustainability strategies such as water conservation and re-use on-site. The purpose of the water quality assurance plan is to provide a framework for the implementation of LID BMPs. The use of LID BMPs will help achieve an appropriate level of treatment for development runoff while regional water quality facilities will provide ways to improve the quality of off-site runoff for regional benefit. At the site design level, the primary LID objective is to minimize the amount of directly connected impervious areas and promote treatment of runoff through the soil profile. This will be further achieved by conserving natural drainage features, minimizing the impervious footprint of the Project and avoiding soil compaction. LID BMPs will be applied primarily to the core interior development areas and the transitional areas.

1.4 CEQA THRESHOLDS OF SIGNIFICANCE

California Environmental Quality Act (CEQA) significance criteria are used to evaluate the degree of impact caused by a development project on environmental resources such as hydrology and water quality. According to Appendix G of the CEQA Guidelines, a project would normally have a significant effect on the environment if the project would impact any of the items listed below.

Would the Project:

A. Violate any water quality standards or waste discharge requirements?
B. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater 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.)
C. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or in a manner which would result in a substantial erosion or siltation on- or off-site?
D. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?
E. Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?
F. Otherwise substantially degrade water quality?
G. 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 hazard delineation map?
H. Place within a 100-year flood hazard area structures which would impede or redirect flood flows?
I. 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?
J. Be subject to inundation by seiche, tsunami, or mudflow?

2.0 SETTING

2.1 WATERSHED

The Newport Banning Ranch project site lies within the larger Talbert watershed, which covers 21.4 square miles adjacent to the mouth of the Santa Ana River. It includes portions of the cities of Costa Mesa, Fountain Valley, Huntington Beach, Newport Beach, and Santa Ana. The Greenville-Banning Channel, which drains into the Santa Ana River, is one of two main tributaries that drain this watershed. On the western side of the Santa Ana River, the Talbert and Huntington Beach Channels drain through the Talbert Marsh before emptying into the Pacific Ocean. The Greenville-Banning Channel is located north of the project site. It runs parallel to and ultimately discharges to the Santa Ana River channel.

The Santa Ana River watershed is the largest in Orange County, covering 153.2 square miles. The river begins almost 75 miles away in the San Bernardino Mountains, crossing central Orange County before emptying into the Pacific Ocean. The Orange County portion of the watershed includes portions of the cities of Anaheim, Brea, Huntington Beach, Orange, Placentia, Santa Ana, Villa Park, and Yorba Linda. The river serves as the main tributary to the watershed.

Regionally, the project site is located within the Talbert watershed. Storm water runoff from the site generally ponds in the Semeniuk Slough and Lowland areas, and does not discharge off-site to the Greenville-Banning Channel. Therefore, the “Project watershed” is hydrologically independent of the Greenville-Banning Channel. For the purposes of the hydrology analyses presented in this report, the Project watershed studied includes all upstream areas that drain onto the project site and into the Lowland Area, but does not include areas further downstream of the Lowlands.

2.2 RECEIVING WATER BENEFICIAL USES

The Water Quality Control Plan for the Santa Ana River Basin (or “Basin Plan”) developed by the Santa Ana RWQCB designates beneficial uses and water quality objectives for surface waters and ground waters within the Santa Ana Region.[1] According to the Basin Plan, the Newport Banning Ranch project site is located within the Lower Santa Ana River Hydrologic Area and the East Coast Plain Hydrologic Sub-Area (HSA 801.11), discharging to the Santa Ana River Tidal Prism and Newport Slough. The beneficial uses of the downstream receiving water bodies of the Newport Banning Ranch Project, as outlined in the Basin Plan, are summarized in the following table.

[1] Santa Ana Regional Water Quality Control Board (RWQCB). Water Quality Control Plan for the Santa Ana River Basin (8). January 24, 1995. Updated February 2008.

SURFACE WATER BENEFICIAL USES																				
Receiving Water	MUN	AGR	IND	PROC	GWR	NAV	POW	REC1	REC2	COMM	WARM	LWRM	COLD	BIOL	WILD	RARE	SPWN	MAR	SHEL	EST
Tidal Prism of Santa Ana River & Newport Slough	+							X	X	X					X	X		X		

X Present or Potential Beneficial Use + Excepted from MUN

BIOL – biological significance
COMM – commercial and sport fishing
EST – estuarine habitat
MAR – marine habitat
MUN – municipal and domestic supply
NAV – navigation
RARE – rare, threatened, or endangered species
REC1 – contact water recreation
REC2 – non-contact water recreation
SHEL – shellfish harvesting
SPWN – spawning, reproduction, and development
WILD – wildlife habitat

Source: Santa Ana Regional Water Quality Control Board (RWQCB). Water Quality Control Plan for the Santa Ana River Basin (8). January 24, 1995. Updated February 2008.

Table 2.1 Beneficial uses for downstream receiving waters.

Though there are no specific water quality objectives for the Santa Ana River Tidal Prism & Newport Slough to maintain these beneficial uses, general water quality objectives have been prescribed in the Basin Plan for all enclosed bays and estuaries in the Santa Ana Region. Brief summaries of the applicable objectives are provided below.

WATER QUALITY OBJECTIVES FOR ENCLOSED BAYS & ESTUARIES	
Algae	Waste discharges shall not contribute to excessive algal growth in receiving waters.
Bacteria, Coliform	In waters designated for REC for fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30 day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period.
Chlorine, Total Residual	The chlorine residual in wastewater discharged to enclosed bays and estuaries shall not exceed 0.1 mg/L.
Color	Waste discharges shall not result in coloration of the receiving waters which causes a nuisance or adversely affects beneficial uses. The natural color of fish, shellfish or other bay and estuarine water resources used for human consumption shall not be impaired.
Floating Materials	Waste discharges shall not contain floating materials, including solids, liquids, foam or scum, which cause a nuisance or adversely affect beneficial uses.
Oil and Grease	Waste discharges shall not result in deposition of oil, grease, wax or other materials in concentrations which result in a visible film or in coating objects in the water, or which cause a nuisance or adversely affect beneficial uses.
Oxygen, Dissolved	The dissolved oxygen content of enclosed bays and estuaries shall not be depressed to levels that adversely affect beneficial uses as a result of controllable water quality factors.

WATER QUALITY OBJECTIVES FOR ENCLOSED BAYS & ESTUARIES	
pH	The pH of bay or estuary waters shall not be raised above 8.6 or depressed below 7.0 as a result of controllable water quality factors; ambient pH levels shall not be changed more than 0.2 units.
Radioactivity	Radioactive materials shall not be present in the bay or estuarine waters of the region in concentrations which are deleterious to human, plant or animal life.
Solids, Suspended and Settleable	Enclosed bays and estuaries shall not contain suspended or settleable solids in amounts which cause a nuisance or adversely affect beneficial uses as a result of controllable water quality factors.
Sulfides	The dissolved sulfide content of enclosed bays and estuaries shall not be increased as a result of controllable water quality factors.
Surfactants	Waste discharges shall not contain concentrations of surfactants which result in foam in the course of flow or use of the receiving water, or which adversely affect aquatic life.
Taste and Odor	The enclosed bays and estuaries of the region shall not contain, as a result of controllable water quality factors, taste- or odor-producing substances at concentrations which cause a nuisance or adversely affect beneficial uses. The natural taste and odor of fish, shellfish or other enclosed bay and estuarine water resources used for human consumption shall not be impaired.
Temperature	The maximum temperature shall not exceed the natural receiving water temperature by more than 20°F. Elevated temperature waste discharges either individually or combined with other discharges shall not create a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of a main river channel at any point. No discharge shall cause a surface water temperature rise greater than 4°F above the natural temperature of the receiving waters at any time or place.
Toxicity	Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health. The concentrations of toxic substances in the water column, sediments or biota shall not adversely affect beneficial uses.
Turbidity	All enclosed bay and estuaries of the region shall be free of changes in turbidity which adversely affect beneficial uses. Increases in turbidity shall not exceed natural levels by more than 20 percent where natural turbidity is between 0-50 NTU, and shall not exceed natural levels by more than 10% where natural turbidity is greater than 100 NTU.

NTU nephelometric turbidity units

Source: Santa Ana Regional Water Quality Control Board (RWQCB). Water Quality Control Plan for the Santa Ana River Basin (8). January 24, 1995. Updated February 2008.

Table 2.2 Water quality objectives for Santa Ana Region enclosed bays and estuaries.

Geographically, the project site is also located within the Orange County Groundwater Management Zone as defined in the Basin Plan, which consists primarily of three intra-connected confined aquifers: the Lower, Middle, and Upper Aquifers.[2] The main aquifer

[2] Santa Ana Regional Water Quality Control Board (RWQCB). Water Quality Control Plan for the Santa Ana River Basin (8). January 24, 1995. Updated February 2008.

located within the Middle Aquifer is the primary source of groundwater supply for Orange County. The elevation of the groundwater table within the vicinity of the Newport Banning Ranch project site is generally at mean sea level (MSL), and is subject to tidal influences due to the proximity to the Pacific Ocean. Although the Basin Plan identifies specific water quality objectives for total dissolved solids (TDS) and nitrate (as N) for the Orange County Groundwater Management Zone, as previously mentioned in Section 1, the effect of the development on groundwater and geotechnical resources are not included in the scope of this report.

Within the vicinity of the project site, three general soil units are present: San Pedro Formation bedrock, marine terrace deposits, and river alluvium. The San Pedro Formation bedrock generally consists of gray and dark gray to reddish yellow-stained siltstone and clayey siltstone, with sandstone interbeds. The marine terrace deposits generally consist of rounded cobbles, shells, and angular rocks similar to materials found in tidal zones. Both the bedrock and marine terrace deposits occur beneath the Mesa and elevated portions of the project site. Soils within the Lowland Area of the site are primarily alluvium, which consist of relatively young sediments of gravel, sand, and clay deposits. In addition, artificial fill is located throughout the site, mainly associated with the construction of the on-site oil facilities. [3]

2.3 EXISTING WATER QUALITY CONDITIONS

Under Section 303(d) of the Clean Water Act (CWA), States are required to identify water bodies that do not meet their water quality standards. Once a water body has been listed as impaired, a Total Maximum Daily Load (TMDL) for the constituent of concern (pollutant) must be developed for that water body. A TMDL is an estimate of the daily load of pollutants that a water body may receive from point sources, non-point sources, and natural background conditions (including an appropriate margin of safety), without exceeding its water quality standard. Those facilities and activities that are discharging into the water body, collectively, must not exceed the TMDL.

Storm water runoff from the project site ultimately discharges into the Lowland Area and into the Tidal Prism of the Santa Ana River, Newport Slough and Semeniuk Slough. These water bodies are not listed as impaired according to the 2006 303(d) list published by the Santa Ana RWQCB, and do not have any TMDLs in place.[4] However, according to the 2008 California 303(d)/305(b) Integrated Report, the Newport Slough is recommended to be listed as impaired for enterococcus, fecal coliform, and total coliform.[5] Once approved by the SWRCB and US EPA, the 303(d) List will then be revised to include the new impairments.

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[3] GMU Geotechnical, Inc. Report of Geotechnical Studies. Proposed Newport Banning Ranch Development, City of Newport Beach/County of Orange. Draft March 2008.

[4] Santa Ana Regional Water Quality Control Board (RWQCB). 2006 Clean Water Act Section 303(d) List of Limited Water Quality Segments. October 25, 2006.

[5] Santa Ana Regional Water Quality Control Board (RWQCB). Final 2008 California 303(d)/305(b) Integrated Report Supporting Information. Approved by RWQCB Order No. R8-2009-0032, April 23, 2009.

2.4 EXISTING DRAINAGE CONDITIONS

In general, the Project's natural drainage flows from the higher elevations in the east toward lower elevations to the west. Off-site drainage from the existing urban areas of the cities of Costa Mesa and Newport Beach enter the project site through storm drain culverts at the upstream ends of the Arroyos. Within the project boundary, the Northern and Southern Arroyos and Semeniuk Slough convey runoff towards the Salt Marsh Basin and Lowland Area. There are no major existing storm drain facilities within the project boundary. In the southern-most portion of the site, an existing underground reinforced concrete box (RCB) storm drain along West Coast Highway (WCH) also collects runoff from the site, discharging to the Semeniuk Slough channel. The existing RCB storm drain at WCH is owned and operated by the California Department of Transportation (Caltrans). There are several tidal gates and control pipes that regulate tidal flows between the Santa Ana River and the Semeniuk Slough and Lowland Area of the project site. The default position of the gates is open to allow tidal flows to circulate through the Marsh basin. The water surface elevation of the Santa Ana River controls the gates and determines whether local storm water runoff can be discharged into the river. Refer to Figure 4 for the Project watershed under existing conditions.

2.5 PROPOSED DRAINAGE PLAN

The objective of the proposed drainage plan is to design the on-site storm drain system and other drainage features in a manner to neutralize any adverse effects induced by the Project in storm runoff quantity and quality. In general, no major changes in the drainage patterns are proposed as compared to the existing conditions of the Project watershed; however, some minor adjustments in the sub-watershed boundaries are considered necessary for better overall storm runoff management. In addition, this proposed drainage plan integrates LID features as well as aesthetic features with traditional local drainage design. The proposed drainage facilities are described in detail in the following sections. Refer to Figure 5 for the locations and layout.

2.5.1 PROPOSED STORM DRAINS

The proposed condition contains six primary on-site storm drain systems that will drain Project flows to downstream receiving water bodies. They are described below as follows:

- Storm Drain A (Drainage Area "A"): Discharges to the existing Caltrans box culvert under the WCH. Storm Drain A (SD-A)is designed to reduce the tributary drainage area of this storm drain system as compared to the existing condition to account for the increase in Project runoff in the proposed condition.
- Storm Drains B and C (Drainage Area "A"): Collect flows from the development areas adjacent to the Southern Arroyo and delivers these flows to a diffuser basin located downstream of the Arroyo adjacent to the Semeniuk Slough. The design of Storm Drains B and C (SD-B, SD-C) serves three primary functions: 1) to minimize the discharge of storm water flows directly to the Arroyo channel to protect the long-term channel stability, 2) dissipate erosive energy before flows enter the Semeniuk Slough, and 3) control sediment contributions to the Semeniuk Slough.

- Storm Drains D and E (Drainage Area "C"): Collect flows from the larger development areas of the Project and delivers storm flows to the Lowland Area. Under the existing conditions, a portion of drainage from Storm Drain D (SD-D) is tributary to the Southern Arroyo and Semeniuk Slough. The proposed drainage re-direction is specifically designed to maximize the amount of flow to be directed towards the Lowland Area in order to reduce the flood loading of the Semeniuk Slough. A second diffuser basin will be installed downstream of Storm Drains D and Storm Drain E (SD-E) to reduce the momentum of the flows from the pipes and to spread the distribution of runoff to the Lowland in a manner that will enable future habitat restoration efforts.
- Storm Drain F (Drainage Area "B"): Collects flows from the northernmost development area. The tributary drainage area has been designed to match existing runoff conditions to the Northern Arroyo. An energy dissipater will be installed at the outlet to Storm Drain F (SD-F) to transition flows from erosive velocities to mild velocities, and to deliver non-erosive flows to the natural channel.
- Storm Drain G (Drainage Area "D"): Collects flows from the northerly most portion of the northern development area. Flow in Storm Drain G (SD-G) is delivered to the Lowland Area via a culvert and a storm drain located in the new Bluff Road roadway extension to 19th Street.

2.5.2 LOWLAND AREA

While the proposed land use of the Lowland Area is designated as habitat, there could potentially be an opportunity to increase the flood storage capacity in the area in the future to accommodate more local runoff during the high tide condition that closes the tidal gates at the Santa Ana River. The Lowland is located adjacent to the Salt Marsh Basin habitat area. Currently, the Lowland is not subject to the tidal water circulation because its surface elevations are higher than the tidal flux elevations. Therefore, if the Lowland Area could be graded lower in the future, it would create additional sub-tidal channels for tidal circulation and annexed into the existing Salt Marsh Basin habitat. Thus, flood storage capacity would also increase. Increasing the storm runoff retention capacity of the Lowland Area during the high tide condition can effectively lower the flood depth and further reduce the existing flooding problem in the Semeniuk Slough (further discussed in Section 3.2.2), although it is not part of the Project proposal at this time. By directing more flow to the Lowland Area, the Southern Arroyo and Semeniuk Slough will receive less available flows. This will tend to reduce sediment transport from the eroding Southern Arroyo tributaries and into the Semeniuk Slough. As part of the proposed drainage plan, these eroding tributaries will be stabilized to prevent the primary sources of sediment from entering the Arroyos.

2.5.3 OFF-SITE RUNOFF WATER QUALITY / DETENTION BASIN

Under the existing condition, approximately 48 acres of off-site flows from the 16th Street drainage area of Costa Mesa enter the property (via a 48" RCP) from the east and discharge into the Southern Arroyo. In general, these flows contain urban runoff pollutants and also convey sediment from the eroding tributaries of the Arroyo to the downstream end, ultimately discharging into the Semeniuk Slough during severe storms. Thus, a water quality/detention basin will be implemented to intercept these off-site flows. As shown in Figure 5, the basin is proposed within the property boundary at the southeast corner of the proposed 16th Street entrance. The required basin capacity is estimated to be approximately 2.3 acre-feet, which can treat all dry weather and a portion of first-flush runoff from the off-site tributary as well as reduce a portion of peak flow discharge (calculations are provided in Appendix E). In addition to hydrology and water quality benefits, the basin can also alleviate flood loading for the downstream channel, such as the Semeniuk Slough, when the reduced flood peak propagates toward downstream from the basin. The reduction in peak discharges combined with the stabilization of the eroding tributaries of the Arroyo will serve to control the current sediment loads into the Semeniuk Slough.

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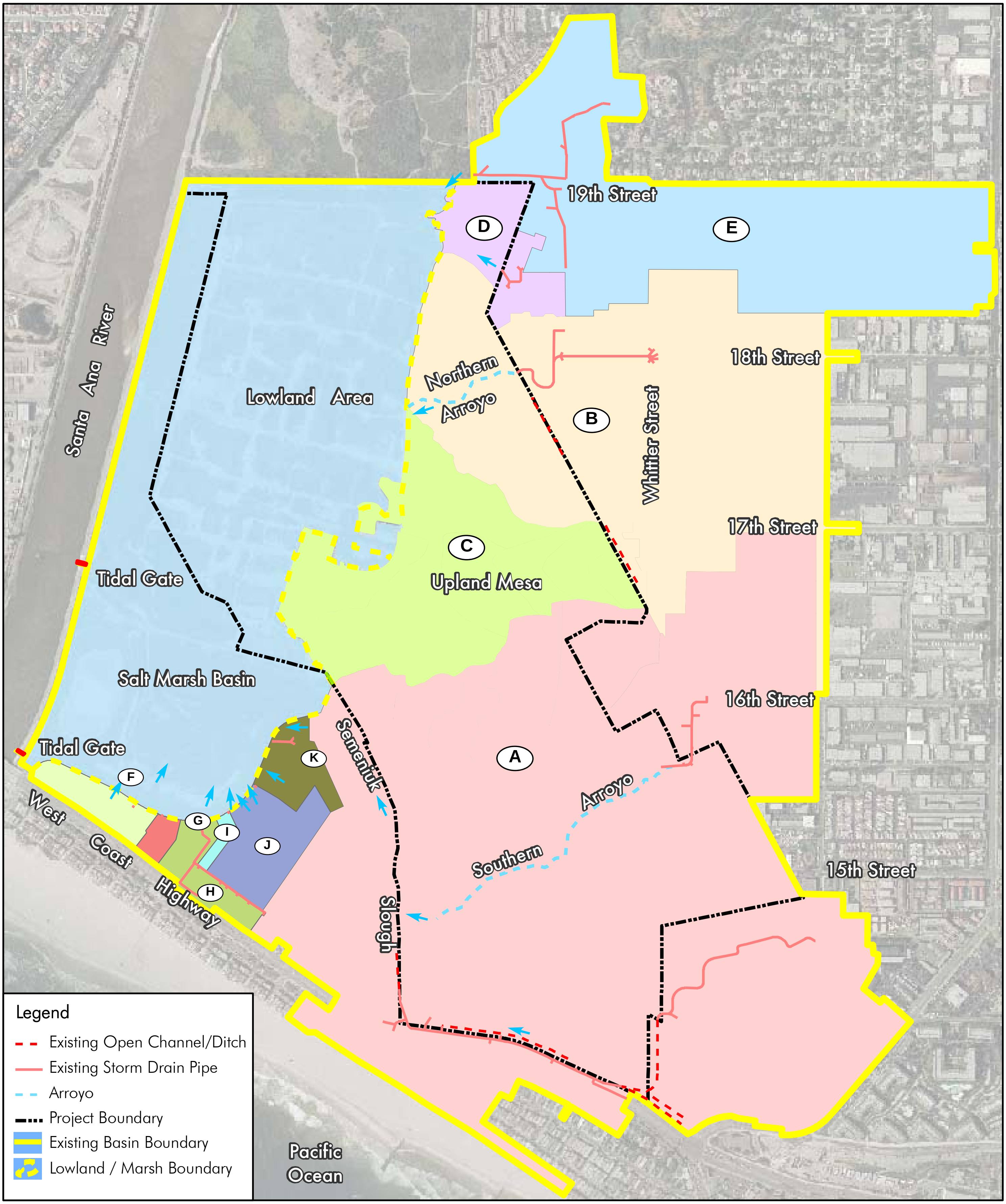

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FIGURE 4: Existing Watershed

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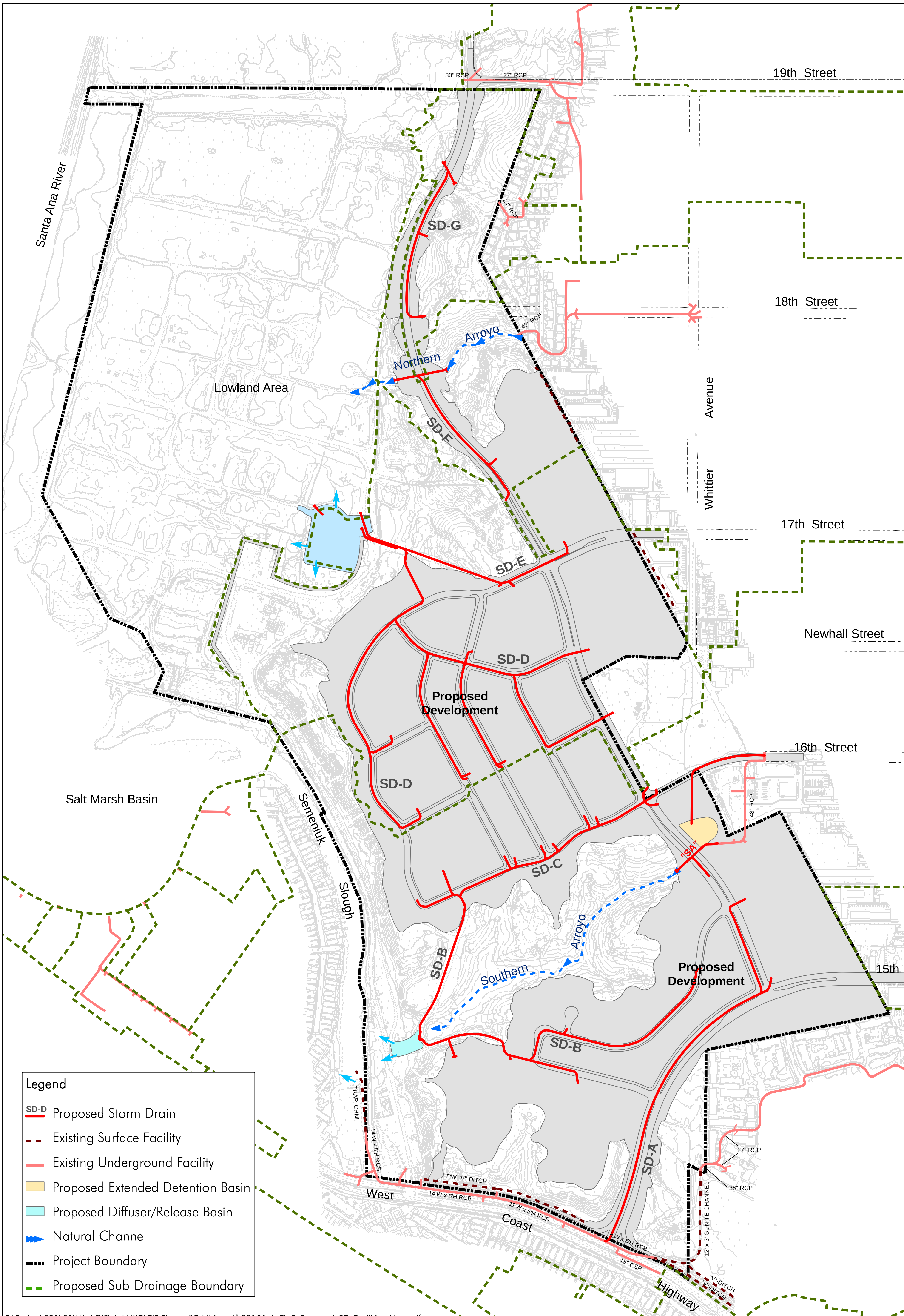

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FIGURE 5: Proposed Drainage Plan

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2.6 FEMA SPECIAL FLOOD HAZARD AREAS

The National Flood Insurance Act of 1968 established the National Flood Insurance Program (NFIP). The NFIP sets minimal requirements for flood plain management and is designed to minimize flood damage within Special Flood Hazard Areas (SFHA). The Federal Emergency Management Agency (FEMA) is the agency that administers the NFIP. Special Flood Hazard Areas (SFHA) are defined as areas that have a 1% chance of flooding within a given year. The 1% chance flood is also known as the 100-year flood. FEMA developed Flood Insurance Rate Maps (FIRMs) to identify areas of flood hazards within a community.

The FIRM that applies to the Newport Banning Ranch project site is FIRM Map Number 06059C026H which was revised on February 18, 2004. A copy of the map is provided in Appendix A. The northwest portion of the site (the Lowland Area) and the southwest corner of the site are located within the 0.2% annual chance flood (500-year flood plain). The balance of the project site is in the area defined to be outside the 0.2% annual chance (500-year floodplain) boundary.

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3.0 HYDROLOGY ASSESSMENT

The purpose of this hydrology analysis is to assess the potential hydrologic impacts in the Project watershed as a result of the proposed development. In general, the proposed change in land uses and flow patterns will inherently alter impervious surfaces and runoff potential within the project site, which in turn, affects the downstream hydrology in the watershed. As a result of the increase in impervious surfaces as compared to existing conditions, an increase in peak flow runoff and volume of runoff is expected from the site. The increased peak discharge rate or volume could potentially cause flood control or environmental issues in the watershed. Thus, a comprehensive modeling approach is necessary to quantify the difference in hydrologic response of the Project's watershed in converting from existing to proposed conditions.

For the purposes of this study, the modeling procedures specified in the Orange County Hydrology Manual (1986) its Addendum Number 1 were used in the modeling analyses. Two types of design events defined by Orange County were use for Project watershed analysis: 1) High-Confidence (HC) events, and 2) Expected-Value (EV) events. As described in the Manual, HC events are used for flood control facility design and loading assessment, and EV events are used for mitigation of increased runoff due to development. The following hydrologic conditions with a range of storm return frequencies were analyzed for each of the sub-watershed areas within the Project watershed:

- Existing Condition 10-year, 25-year, 100-year HC events;
- Existing Condition 2-year and 100-year EV events;
- Proposed Condition 10-year, 25-year, 100-year HC events;
- Proposed Condition 2-year and 100-year EV events.

Although the calculations listed above were performed for all Project watershed drainage areas, the results of the peak flow rate and runoff volume have been presented and summarized to pertain to the various project features of concern thereby allowing for detailed understanding of Project impacts on existing features.

3.1 METHODOLOGY

3.1.1 RATIONAL METHOD

Since the Project's watershed is less than 640 acres, the Rational Method can be used to model the peak flow rate within the watershed. In accordance with the Orange County Hydrology Manual, the Rational Method is expressed by the following equation (Equation 3.1):

$$Q = (C)(I)(A) \tag{3.1}$$

Where:	Q	=	peak flow rate in cubic feet per second (cfs)
	C	=	runoff coefficient (unitless)
	I	=	critical rainfall intensity (inches per hour)
	A	=	drainage area (acres)

Data required for the rational method calculations are: 1) rainfall intensity over duration for a specific design storm; 2) drainage area characteristics of size, shape, slope; and 3) a runoff coefficient. These data inputs are defined in the Orange County Hydrology Manual or can be retrieved from the topographic data, both of which have been used in the calculations for this study. The rational method calculations were executed using Advanced Engineering Software (AES) Flood Routing and Rational Method computer software (Version 8.0), following the procedures outlined in the Hydrology Manual.

3.1.2 SMALL AREA UNIT HYDROGRAPH METHOD

In order to model the volume of runoff generated within the Project watershed, the design storm runoff hydrograph is developed. According the Orange County Hydrology Manual, for watersheds where the time of concentration (Tc) is less than 25 minutes (such as the proposed Project watershed), a small area unit hydrograph method can be used to generate the runoff hydrograph. In this procedure, the unit hydrograph is defined to be a triangle with a base of 2*Tc, and a peak flow rate at time of Tc, where Tc is acquired from the rational method modeling. In this study, AES Version 8.0 computer software was also used to perform the small area unit hydrograph calculation.

3.2 RESULTS & DISCUSSION

The following sections summarize the results of the existing and proposed conditions analyses for peak flow runoff rates and volumes for each of the larger drainage areas within the Project's watershed. Potential flood control impacts caused by the Project are also discussed in terms of the modeling result differences between the existing and proposed conditions. Figure 6 provides a breakdown of the sub-watershed areas within the Project watershed, and Rational Method Hydrology Maps for both existing and proposed conditions are provided in Section 6, Exhibits.

3.2.1 LOWLAND AREA AND SALT MARSH BASIN

As shown in Figure 4, under the existing conditions, storm water runoff within the Project watershed is generally conveyed through the Semeniuk Slough and Arroyos towards the Lowland and Salt Marsh Basin areas, adjacent to the east levee of the Santa Ana River. The Salt Marsh is an engineered-restored habitat. It is located west of the project site near the Santa Ana River mouth between 100 ft to 4,400 ft upstream of the West Coast Highway (WCH) bridge. Two tidal gates are installed under the east levee of Santa Ana River, allowing the circulation of natural tidal flows into and out of the Marsh. The default position of the gates is open. However, in order to prevent excess storm water of the Santa Ana River from entering the Marsh, the gates would close if the water level in the Marsh reaches a certain elevation. Once the gates close, a decrease in water level on the Marsh side (via several relief pipes) is be needed to re-open the gates. Thus, while the gates remain closed, storm water runoff is retained inside and stored within the Salt Marsh Basin and Lowland Area.

According to the design elevations of the tidal gates, they will begin to close when the Marsh water level reaches 3.0 ft mean sea level[6] (MSL), and will be completely closed at the water level of 3.5 ft MSL. The maximum design water level within the Salt Marsh is 6.0 ft MSL. As a result, the elevation range from 3.5 ft to 6.0 ft MSL can be viewed as the storage capacity in the Salt Marsh basin for storing local runoff once the gates are closed. The Salt Marsh has a footprint of approximately 90 acres, and the Lowland Area has a footprint of approximately 126 acres. Examination of the Marsh Basin "As-Built" grading plan and of the Lowland Area topographic map indicates that the combined flood storage capacity of the two areas is estimated to be 345 acre-feet.

The results for the existing and proposed runoff volume calculations for HC events are summarized in Tables 3.1 and 3.2, respectively, for the Lowland and Salt Marsh drainage areas. Since the Lowland and Salt Marsh drainage areas function as flood control basins rather than conveyance facilities, peak flow runoff rates were not included in the tables below. However, detailed calculations for peak flow rates are available under Appendix B. Refer to Figure 6 for locations of the sub-watershed areas for the Lowland Area and Salt Marsh Basin.

LOWLAND AREA AND SALT MARSH BASIN EXISTING CONDITION RUNOFF VOLUME SUMMARY (HC EVENTS)				
Sub-Watershed	Drainage Area (ac)	10-year (ac-ft)	25-Year (ac-ft)	100-Year (ac-ft)
"A"	349.6	67.3	86.1	131.7
"B"	135.1	30.9	38.9	54.0
"C"	63.6	11.5	15.0	24.0
"D"	14.3	2.8	3.6	5.6
"E"	97.2	22.4	28.1	39.4
"F"	5.8	1.3	1.6	2.1
"G"	1.8	0.4	0.5	0.7
"H"	7	1.5	1.9	2.6
"I"	1.1	0.2	0.3	0.4
"J"	11	2.4	3.0	4.0
"K"	6.3	1.4	1.7	2.3
Lowland Area[a]	126	38.6	47.1	59.1
Salt Marsh Basin[a]	90	27.6	33.7	42.2
Total	**908.8**	**208.6**	**261.5**	**368.1**
a For the Lowland & Marsh areas, the runoff volume is estimated by the following: Precipitation (in) x Area (ac) / 12				

Table 3.1 Existing condition runoff volume summary for Lowland Area and Salt Marsh Basin.

[6] NGVD29 Datum.

LOWLAND AREA AND SALT MARSH BASIN PROPOSED CONDITION RUNOFF VOLUME SUMMARY (HC EVENTS)				
Sub-Watershed	Drainage Area (ac)	10-year (ac-ft)	25-Year (ac-ft)	100-Year (ac-ft)
"A"	322.0	64.2	81.2	118.3
"B"	120.6	27.5	34.7	48.7
"C"	97.6	19.9	25.5	38.6
"D"	22.4	4.4	5.6	8.8
"E"	97.2	22.4	28.1	39.4
"F"	5.8	1.3	1.6	2.1
"G"	1.8	0.4	0.5	0.7
"H"	7	1.5	1.9	2.6
"I"	1.1	0.2	0.3	0.4
"J"	11	2.4	3.0	4.0
"K"	6.3	1.4	1.7	2.3
Lowland Area[a]	126	38.6	47.1	59.1
Salt Marsh Basin[a]	90	27.6	33.7	42.2
Total	908.8 (+0)	211.8 (+3.2)	264.9 (+3.4)	367.2 (-0.9)

Note: Numbers in parentheses represent change as compared to existing condition.

a For the Lowland & Marsh areas, the runoff volume is estimated by the following: Precipitation (in) x Area (ac) / 12

Table 3.2 Proposed condition runoff volume summary for Lowland Area and Salt Marsh Basin.

As shown in Table 3.1, the existing condition 25-year runoff volume is 261.5 acre feet (ac-ft). Since this value is less than the combined flood storage capacity of the Marsh and Lowland Area value of 345 acre-feet, a 25-year level of protection is provided in the existing condition. As shown in Table 3.2, the proposed condition 25-year runoff volume increases slightly to 264.9 ac-ft. However, the proposed condition 25-year runoff volume larger value is still less than the 345 ac-ft storage capacity of the combined Salt Marsh and Lowland Areas.

This comparison demonstrates that a 25-year level of protection is provided after development in the proposed condition, and indicates that mitigation is not needed to maintain the pre-development level of protection.

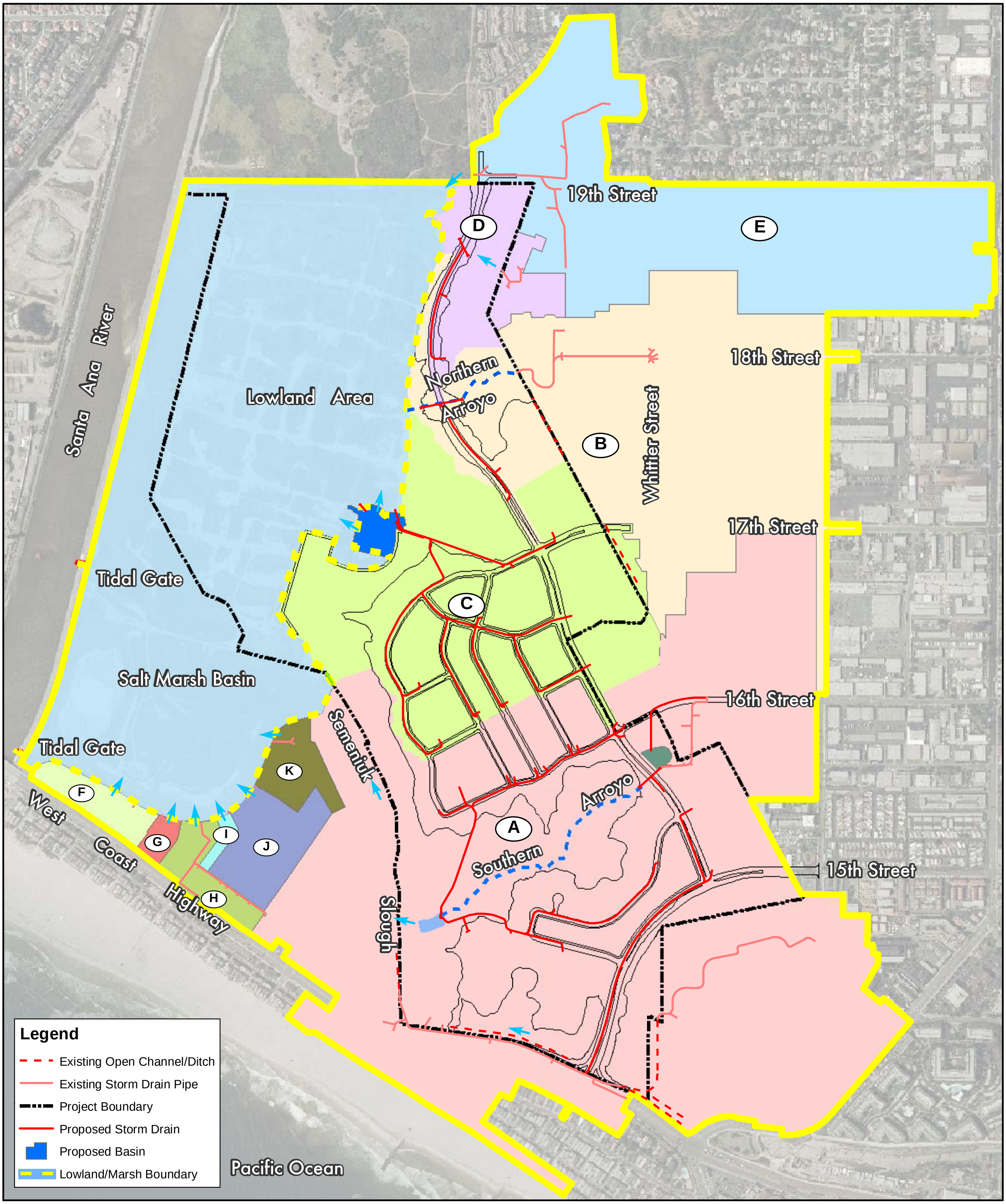

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FIGURE 6: Proposed Sub-Watershed Basins

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3.2.2 SEMENIUK SLOUGH

The Semeniuk Slough is a remnant sub-tidal channel of the former braided river mouth opening of the Santa Ana River that was present prior to channelization of the River. The Semeniuk Slough begins at the southerly tidal gate and migrates south around an existing Newport Shores residential neighborhood, ending at the WCH. During high tides, the tidal prism occupies the channel and leaves limited capacity for storm water conveyance. According to the field reconnaissance and conversations with the residents along the Semeniuk Slough, the channel floods when a high tide and a large storm occur simultaneously.

Storm flows within the Semeniuk Slough are generally stored in the southerly portion of the Salt Marsh Basin. As shown in Figures 7 and 8, under the existing conditions, the drainage area of the Semeniuk Slough is composed primarily of Sub-Watershed A and the Newport Shores residential neighborhood area along the Semeniuk Slough, encompassing approximately 350 acres. The sub-watershed areas in Newport Shores are labeled as F through K, and encompass approximately 33 acres. Based on the topographic data, the elevation of the channel bank on the residential side is approximately at 5 ft MSL. When the tidal gate is completely closed at 3.5 ft MSL, there is approximately 1.5 ft of depth in the Salt Marsh Basin available for use to store local runoff between the top of the channel bank and the closed tidal gate limit. However, due to the presence of several habitat islands constructed in the Salt Marsh Basin, the basin storage volume is diminished. At present, under this reduced storage volume condition, the available capacity within the Semeniuk Slough is estimated to be ±28 ac-ft. This value is approximately equal to the 2-year event (EV) runoff volume delivered to the Slough. This situation indicates that the existing condition has a limited storage capacity in the area the Semeniuk Slough surrounding Newport Shores. This limited capacity is roughly equivalent to a 2-year level of protection.

The drainage plan proposed for the Newport Banning Ranch Project is customized to preserve the 2-year storage capacity limit in the Semeniuk Slough. The plan was devised to avoid any significant increase in discharge rate or volume delivered to the Slough that would exceed the meager 2-year storage condition. Thus, under proposed conditions, a portion of on-site development tributary sub-area formerly assigned to the Semeniuk Slough has been re-assigned away from the Slough and toward the Lowland Area. This is achieved by strategic site grading and storm drain routing at the interface between Drainage Area "A" and Drainage Area "C". In this manner, the proposed condition peak flow rate and volume directed to the Slough is limited to roughly the existing condition 2-year values.

Tables 4.3 and 4.4 summarize the modeling results with respect to the existing and proposed conditions under two expected value (EV) storm frequencies including the 2-year and 100-year events. Since the Semeniuk Slough functions both as a flood conveyance and storage facility, both runoff volumes and peak flow rates are summarized in the following tables. The time of concentration (Tc) value has also been provided for the 2-year evaluation per the requirements of Section XII.D of the fourth-term MS4 Storm Water Permit.[7] Figure 7 illustrates

[7] California Regional Water Quality Board, Santa Ana Region (RWQCB). Order R8-2009-0030, Amended by Order No. R8-2010-0062, NPDES Permit No. CAS618030 Waste Discharge Requirements (WDR) the County of Orange, Orange
[continues on next page]

the node locations and basin boundaries in the Semeniuk Slough drainage area. This evaluation includes contributions from the Caltrans Box Culvert drainage area (see Section 3.2.3). Detailed calculations are provided in Appendix B.

SEMENIUK SLOUGH EXISTING CONDITION RUNOFF VOLUME (EV EVENTS)			
Sub-Watershed	Drainage Area (acres)	2-Year Volume (ac-ft)	100-Year Volume (ac-ft)
"A"	349.6	17.3	85.2
"F"	5.8	0.5	1.6
"G"	1.8	0.2	0.5
"H"	7	0.6	1.9
"I"	1.1	0.1	0.3
"J"	11	0.9	3.0
"K"	6.3	0.5	1.7
Salt Marsh Basin[a]	54	6.5	20.2
Total	436.6	26.6	114.4
EXISTING CONDITION PEAK FLOW RATE (EV EVENTS)			
Location	Drainage Area (acres)	2-Year Peak Flow (cfs) / Tc[b]	100-Year Peak Flow (cfs)
Node 19 (upstream)	155.1	80.8 / 19.24	323.4
Node 23 (downstream)	349.6	121.3 / 37.45	501.2

cfs cubic feet per second

a For the Salt Marsh basin, the runoff volume is estimated by the following: Precipitation (in) x Area (ac) / 12
b Tc = Time of Concentration noted for 2-year event per Section XII.D of fourth-term MS4 Storm Water Permit.

Table 3.3 Existing condition hydrology summary for Semeniuk Slough

County Flood Control District and The Incorporated Cities of Orange County within the Santa Ana Region Areawide Urban Storm Water Runoff, Orange County. May 22, 2009.

SEMENIUK SLOUGH PROPOSED CONDITION RUNOFF VOLUME (EV EVENTS)			
Sub-Watershed	Drainage Area (acres)	2-Year Volume (ac-ft)	100-Year Volume (ac-ft)
"A"	322.0	18.3	81.2
"F"	5.8	0.5	1.6
"G"	1.8	0.2	0.5
"H"	7	0.6	1.9
"I"	1.1	0.1	0.3
"J"	11	0.9	3.0
"K"	6.3	0.5	1.7
Salt Marsh Basin[a]	54	6.5	20.2
Total	409.0 (–27.6)	27.6 (+1.0)	110.4 (–4.0)
PROPOSED CONDITION PEAK FLOW RATE (EV EVENTS)			
Location	Drainage Area (acres)	2-Year Peak Flow (cfs) / Tc [b]	100-Year Peak Flow (cfs)
Node 19 (upstream)	145.8 (–9.3)	72.7 (–8.1) / 19.54 (+0.03)	302.2 (–21.2)
Node 23 (downstream)	322.0 (–27.6)	128.1 (+6.8) / 37.51 (+0.06)	513.9 (+12.7)

Note: Numbers in parentheses represent change as compared to existing condition.
cfs cubic feet per second

a For the Salt Marsh area, the runoff volume is estimated by the following: Precipitation (in) x Area (ac) / 12
b Tc = Time of Concentration noted for 2-year event per Section XII.D of fourth-term MS4 Storm Water Permit

Table 3.4 Proposed condition hydrology summary for Semeniuk Slough

As previously described, a portion of the existing Sub-Watershed A drainage area formerly tributary to the Semeniuk Slough will be reassigned in the proposed condition. The size of proposed Sub-Watershed A will be reduced by 27.6 acres (349.6 to 322.0 acres) as compared to the existing condition. While the proposed condition runoff is anticipated to be slightly higher in the entire Project watershed, the overall results show that the storm runoff of the proposed condition will be limited to roughly reflect existing conditions. Specifically, in runoff volume there is a 1.0 ac-ft increase under the 2-year EV event and a 4.0 ac-ft decrease under the 100-year EV event in comparison to existing conditions. Further, the proposed condition will also have a slight reduction in peak flow rates throughout the channel except at Node 23, where there is an increase of 10 cfs under the 2-year frequency and 12.7 cfs increase under the 100-year frequency. Overall, the proposed Project is not expected to measurably increase the flood loading of the Semeniuk Slough beyond the existing 2-year return frequency limiting condition.

The fourth-term MS4 Storm Water Permit requires that the 2-year storm event be analyzed for pre- and post-condition to determine hydrologic conditions of concern (Order R8-2009-0030, Amended by Order No. R8-2010-0062, Section XII.D). Based on the requirements of the Permit, the project would not have a hydrologic condition of concern if the volume and the time of concentration of storm water runoff for the post-development condition does not significantly exceed those of the pre-development condition for a 2-year frequency storm event (a difference of 5% or less is considered insignificant).[8] Based on the analysis, the results demonstrate compliance with these requirements as the proposed volumes and time of concentration are both within 5% of the existing condition. Therefore, the Project does not have a hydrologic condition of concern for flows directed to the Semeniuk Slough.

This comparison also demonstrates that a 2-year level of protection is provided after development in the proposed condition, and indicates that mitigation is not needed to maintain the pre-development level of protection.

[8] Section XII.D.2.a of Order No. R8-2009-0030.

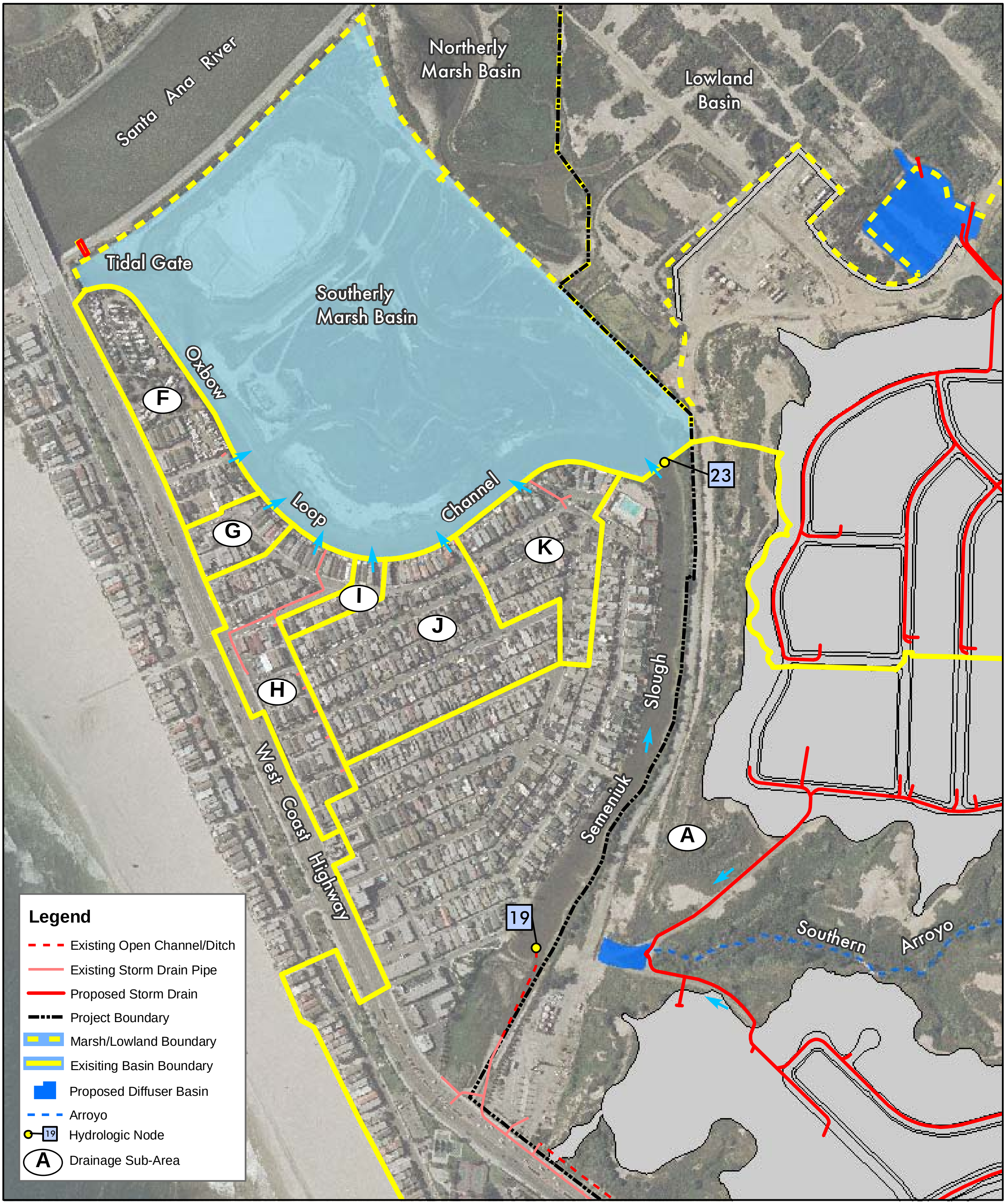

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FIGURE 7: Semeniuk Slough Drainage

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3.2.3 CALTRANS BOX CULVERT AT WCH

Currently, there is an existing underground reinforced concrete box (RCB) culvert under a portion of WCH along the southern project boundary that is owned and operated by Caltrans. The existing RCB varies in size, from 8'W x 5'H at the upstream end (Node 16) and increases to a final size of 14'W x 5'H at the downstream portion (Node 18), where it outlets to a trapezoidal channel upstream of the Semeniuk Slough. As shown in Figure 8, this Caltrans RCB receives street flow on WCH. It also receives flows from areas north and south of WCH, in addition to flows from areas as far north as 15th Street. Its tributary sub-area includes developed and undeveloped areas, and the undeveloped portion exists primarily within the project site.

The Project's proposed drainage plan will modify the existing Caltrans RCB in WCH to accept a new storm drain connection from the development area. Tables 3.5 and 3.6 summarize the peak flow results for existing and proposed conditions, respectively. Since the existing RCB provides conveyance of storm flows and does not provide any flood storage, only peak flow rates are presented. Since this portion of the Project ultimately drains into the Semeniuk Slough, the 2-year analysis for hydrologic conditions of concern for this drainage area was incorporated into the Tables 3.3 and 3.4 under Section 3.2.2. Refer to Figure 8 for locations of the nodes summarized in the tables. Detailed calculations are provided in Appendix B.

CALTRANS BOX CULVERT AT WCH EXISTING CONDITION PEAK FLOW RATE (HC EVENTS)				
Location	Drainage Area (acres)	10-Year Peak Flow (cfs)	25-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
Node 16 (upstream)	63.3	129.2	156.9	203.4
Node 17 (middle)	118.6	213.3	261.6	341.5
Node 18 (downstream)	142.7	262.4	310.3	405.5
cfs cubic feet per second				

Table 3.5 Existing condition hydrology summary for Caltrans Box Culvert at WCH

CALTRANS BOX CULVERT AT WCH PROPOSED CONDITION PEAK FLOW RATE (HC EVENTS)				
Location	Drainage Area (acres)	10-Year Peak Flow (cfs)	25-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)
Node 16 (upstream)	63.7 (+0.4)	130.1 (+0.9)	158.0 (+1.1)	204.9 (+1.5)
Node 17 (middle)	109.8 (–8.8)	198.7 (–14.6)	243.3 (–18.3)	318.0 (–23.5)
Node 18 (downstream)	133.4 (–9.3)	237.9 (–24.5)	291.6 (–18.7)	381.4 (–24.1)
Note: Numbers in parentheses represent change as compared to existing condition. cfs cubic feet per second				

Table 3.6 Proposed condition hydrology summary for Caltrans Box Culvert at WCH

For the three analyzed HC event frequencies summarized in Tables 3.5 and 3.6, the proposed drainage plan will result in a slight increase in peak flow rate at Node 16 located at the upstream end of the RCB. The slight discharge increase at this location is due to the inclusion of new manufactured slope drainage from the project site. The connection of the proposed on-site storm drain system is located downstream of Node 16. At Nodes 17 and 18 (the middle and downstream sections of the RCB respectively), the proposed condition peak flow rates are less than the existing conditions as a result of the reduced size of the sub-area that is directing flow to the RCB. Overall, the WCH RCB culvert will experience reduced flood loading as compared to the existing condition. The slight loading increase at Node 16 is not expected to overload the system because the existing RCB local capacity value at Node 16 exceeds the proposed peak flow value expected to pass through the RCB at that location.

This comparison demonstrates that a 100-year level of protection is provided after development in the proposed condition, and indicates that mitigation is not needed to maintain the pre-development level of protection.

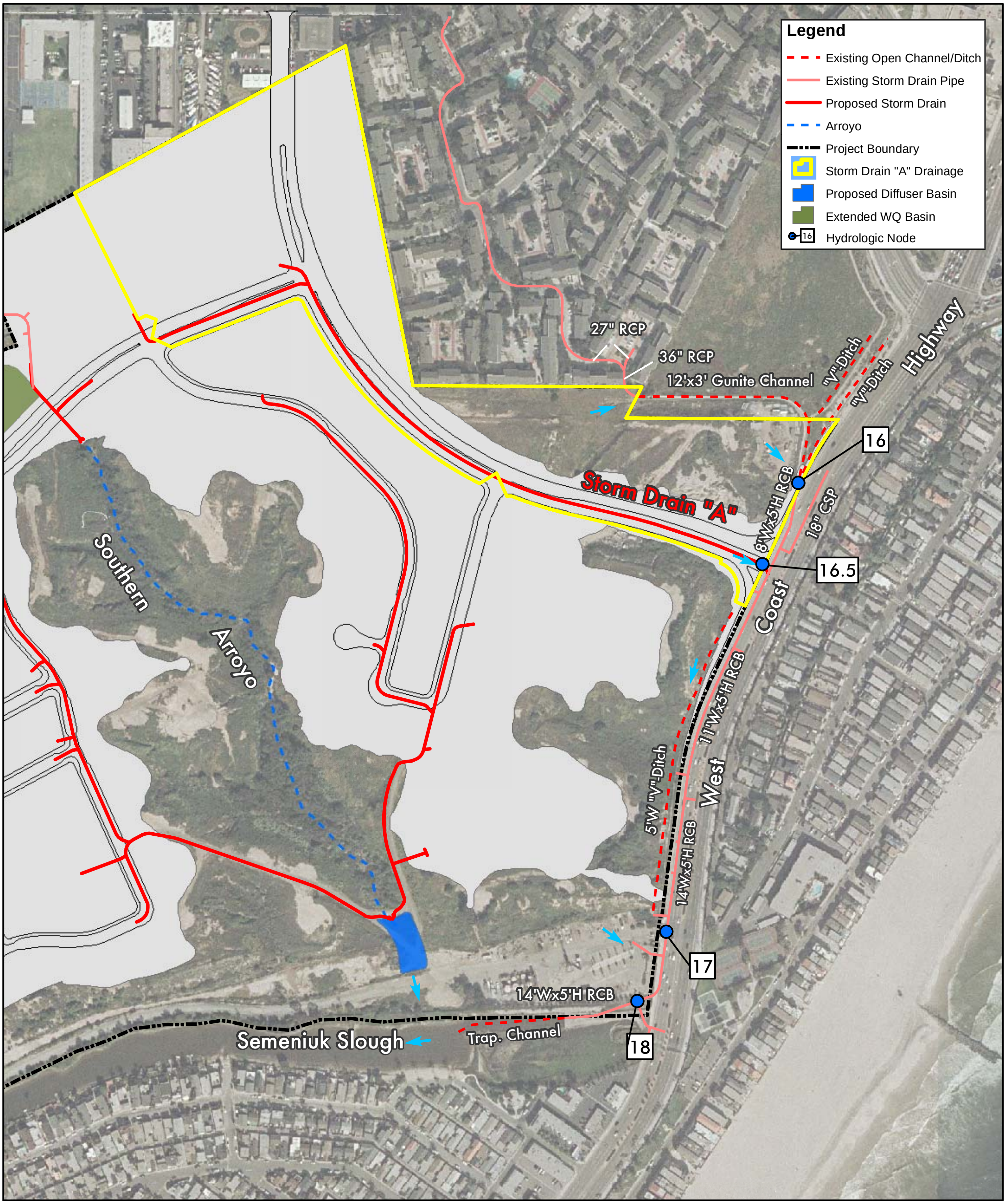

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FIGURE 8: Caltrans Box Culvert

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3.3 FLOODPLAIN INUNDATION ANALYSIS

The purpose of the channel floodplain inundation analysis is to assess the potential impacts on the riverine areas (Arroyos) due to the hydrology changes resulting from the proposed development. A typical riverine area is usually comprised of a vegetated channel with a soft bottom and banks providing flood containment and habitat benefits. Adverse influences on the riverine area may be attributed to changes in the floodplain that cause flooding/ capacity issues, or by changes in the riparian inundation area that may disrupt diversity and alter habitat type, or by changes in channel velocity causing channel instability problems. In order to assess the above potential impacts to the riverine areas of the Project, a comprehensive hydraulic modeling approach is necessary.

In this analysis, riverine studies are performed on the Northern Arroyo and the Southern Arroyo. These two arroyos are the main watercourses through the property and reside adjacent to the proposed development. From the hydrology analysis discussed in the previous section, the results show that the Southern Arroyo will experience some changes in its tributary area in association with the proposed development. The Northern Arroyo will be crossed by the new Bluff Road roadway extension to 19th Street. Thus, to address the expected hydrologic changes, the following conditions are included in the riverine modeling:

<u>Northern Arroyo:</u>

- Existing condition 2-year and 100-year EV events
- Proposed condition 2-year and 100-year EV events

<u>Southern Arroyo:</u>

- Existing condition 2-year and 100-year EV events
- Proposed condition 2-year and 100-year EV events

The Northern Arroyo modeling is to verify the field reconnaissance used to establish that the Arroyo is operating in a stable manner in the existing condition, and to evaluate the affect of the new roadway crossing in the proposed condition. The Southern Arroyo modeling is to quantify the changes between the existing and proposed conditions. In addition to the modeling efforts, it should be noted that field observations indicate severe erosion and sloughing of sediment into the Southern Arroyo from the adjacent on-site tributary areas entering the Arroyo. During large storm events, sediments from the tributaries enters the Arroyo and are conveyed downstream to the Semeniuk Slough, resulting in large sediment fans within the channel following these rain events. Historical photos of the site indicate the erosion and undercutting within the tributaries has been occurring since the 1930's.

<u>3.3.1 METHODOLOGY</u>

<u>HEC-RAS Model</u>

The "Hydrologic Engineering Centers River Analysis System" (HEC-RAS) is a one-dimensional hydraulics computation application developed by USACOE. It is designed to model irregular channel cross sections (such as in the natural stream system), and was selected as the modeling tool in this study. In HEC-RAS models, the channel cross sections are taken along the stream centerline, covering the overbank areas and channel thalwag. The locations of the cross sections should represent a typical reach in the channel. For this study, six cross sections were taken for the Northern Arroyo and 12 cross sections were taken to compose the Southern Arroyo. Figures 10, 11, and 12 illustrate the established HEC-RAS models for the Arroyos.

For hydraulic parameters, the critical depth condition was used to set the "low tailwater" condition for the downstream water surface boundary. For the roughness coefficient, the Manning's n-value of 0.06 was selected to reflect the good vegetation cover existing in both the Arroyos. In addition, some blocked flow areas (or ineffective flow areas) were set as necessary to reflect a realistic flow conveyance width.

Hydrology Inputs

As previously mentioned, the discharges of this hydraulics modeling are based on the EV event hydrology analysis results. The tables below describe the modeled discharges and the corresponding station locations. Existing and proposed conditions are presented for the Northern and Southern Arroyos. Refer to Figures 10, 11, and 12 for locations of the stations. Refer to Appendix C for detailed calculations.

NORTHERN ARROYO DISCHARGE SUMMARY (EV)				
Station No.	2-Year Peak Flow (cfs)		100-Year Peak Flow (cfs)	
	Existing	Proposed	Existing	Proposed
8+55	45	45 (+0)	156	156 (+0)
4+00	45	48 (+3)	156	181 (+25)

Note: Numbers in parentheses represent change as compared to existing condition.
cfs cubic feet per second

Table 3.7 Discharge summary for Northern Arroyo used for HEC-RAS models.

SOUTHERN ARROYO DISCHARGE SUMMARY (EV)				
Station No.[a]	2-Year Peak Flow (cfs)		100- Year Peak Flow (cfs)	
	Existing	Proposed	Existing	Proposed
20+62	27	28 (+1)	95	109 (+14)
11+12	34	28 (–6)	138	114 (–24)
4+81	45	28 (–17)	198	114 (–84)

Note: Numbers in parentheses represent change as compared to existing condition.
cfs cubic feet per second
a The existing channel starts at 22+56; no discharge change from 22+56 to 20+62.

Table 3.8 Discharge summary for Southern Arroyo used for HEC-RAS models.

3.3.2 RESULTS AND DISCUSSION

Northern Arroyo

Tables 3.9 and 3.10 show the modeling summary results for the Northern Arroyo with respect to the existing and proposed 2-year and 100-year conditions. As shown in Table 3.10, the majority of flows in the channel are in the sub-critical flow regime (Froude Number less than one), which means higher water surface and lower velocity. Accordingly, the depth range is from 0.9 to 2.4 ft under the 2-year event, and from 1.9 to 4.8 ft under the 100-year event. The 100-year condition does not exhibit an erosive channel velocity (generally greater than 6 ft/s). Even with the relatively mild discharge velocity, some consideration may be warranted for the installation of an energy dissipation device at the culvert outlet. The determination to do so will be deferred to the final design phase, but the device may consist of a conventional design such as a rip-rap bed lining or similar solution. The modeling results are consistent with the field reconnaissance. Figures 9 and 10 show the 100-year floodplain and the 2-year riparian inundation areas for the existing and proposed conditions, respectively. Detailed calculations are provided in Appendix C.

NORTHERN ARROYO EXISTING CONDITION HEC-RAS MODELING SUMMARY						
Station No.	Water Depth (ft)		Velocity (ft/s)		Froude No.	
	2-Year	100-Year	2-Year	100-Year	2-Year	100-Year
8+09	1.7	2.8	2.0	3.2	0.34	0.43
6+85	0.7	1.3	4.0	5.3	1.01	0.98
5+19	1.2	2.0	3.8	6.3	0.77	1.01
3+99	2.0	3.6	2.7	2.9	0.47	0.37
2+66	2.5	4.1	3.1	5.0	0.41	0.55
1+32	1.6	2.4	4.3	5.9	0.97	1.01

Table 3.9 Existing condition HEC-RAS modeling results for the Northern Arroyo.

NORTHERN ARROYO PROPOSED CONDITION HEC-RAS MODELING SUMMARY						
Station No.	Water Depth (ft)		Velocity (ft/s)		Froude Number	
	2-Year	100-Year	2-Year	100-Year	2-Year	100-Year
8+55	2.0	3.3	1.8	2.7	0.28	0.34
6+95	0.9	1.9	5.2	5.6	1.02	1.01
5+00	1.1	2.9	4.8	3.4	1.01	0.45
4+00	2.4	4.8	1.1	1.5	0.15	0.14
1+00	0.9	1.5	1.8	3.0	0.44	0.55
0+00	0.2	0.5	2.4	3.6	0.33	0.44
Note: A comparison of changes as compared to existing conditions were not provided due to differing station numbers. ft/s feet per second						

Table 3.10 Proposed condition HEC-RAS modeling results for the Northern Arroyo.

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FIGURE 9 : Northern Arroyo Existing Condition Floodplain

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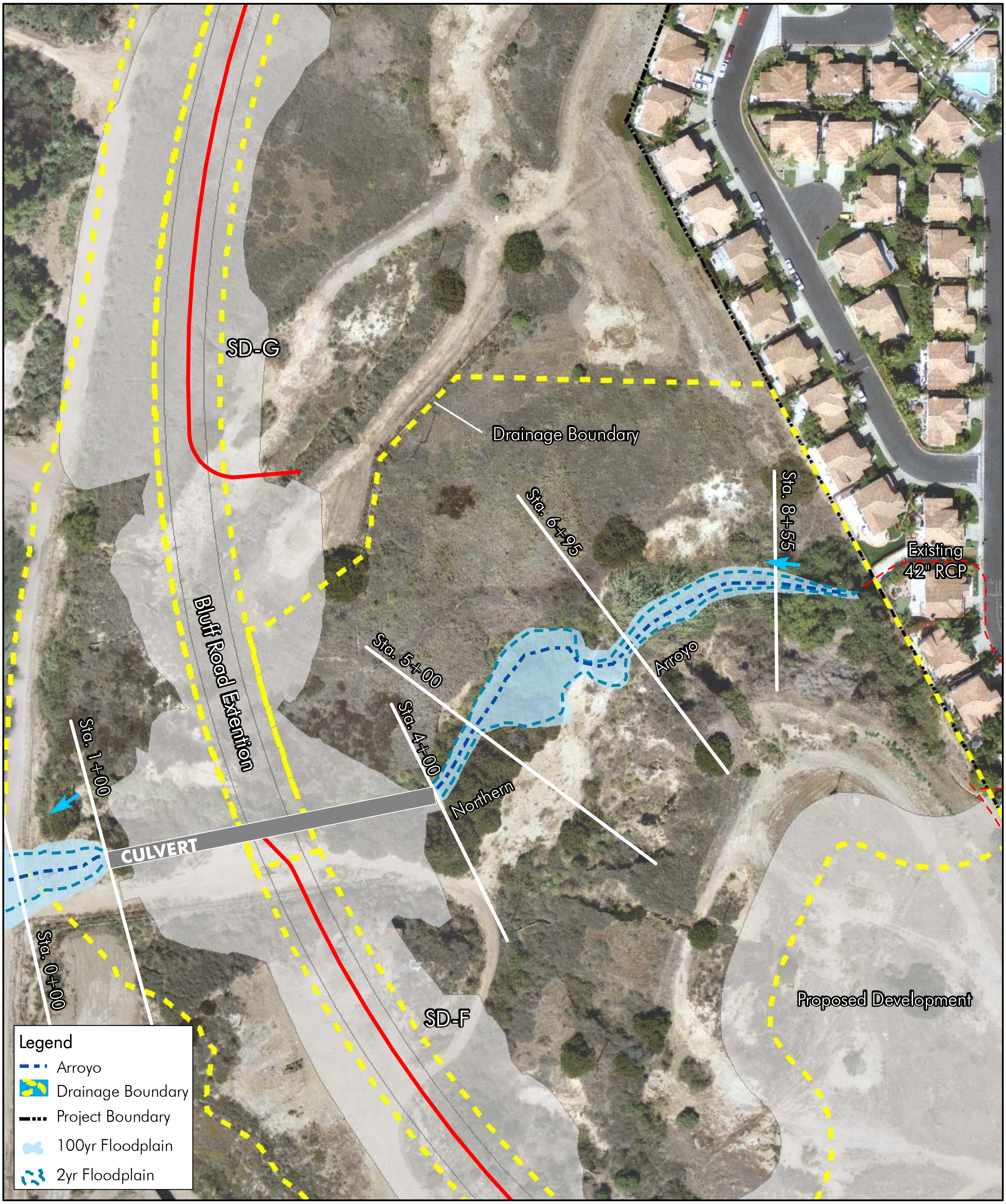

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NEWPORT BANNING RANCH **FIGURE 10: Northern Arroyo Proposed Condition Floodplain**

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Southern Arroyo

Tables 3.11 and 3.12 summarize the modeling results for the Southern Arroyo with respect to the 2-year and 100-year conditions and the existing and proposed development conditions. In general, the majority of flows in the channel are in the sub-critical flow regime, similar to the Northern Arroyo. There is no significant hydraulic difference between the existing and proposed conditions. Specifically, under the 2-year event, the velocity range is from 1.1 to 3.8 ft/s. The velocity difference between the existing and proposed conditions is from 0 to 0.4 ft/s. Under the 100-year event, the velocity range is from 1.5 to 5.6 ft/s, and velocity difference between the existing and proposed conditions is from 0.1 to 0.7 ft/s. The above velocities are considered to be within a range that is acceptable for stable channel conditions.

In water depth, the proposed condition is similar to existing conditions. The difference is from 0 to 0.2 ft under the 2-year event, and from 0 to 0.5 ft under the 100-year event. This range of differences would only cause a slight change in the floodplains, as shown in Figure 10 (100-year floodplain) and Figure 11 (2-year floodplain).

SOUTHERN ARROYO HEC-RAS MODELING SUMMARY (2-YEAR)						
Station No.	Water Depth (ft)		Velocity (ft/s)		Froude No.	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
20+62	0.8	0.9	3.6	3.6	0.84	0.84
19+02	0.7	0.7	1.7	1.7	0.39	0.39
16+57	0.5	0.5	3.7	3.8	1.01	1.01
14+63	1.5	1.6	1.3	1.3	0.20	0.20
12+92	0.3	0.4	3.2	3.2	1.00	1.00
11+12	1.0	1.0	1.2	1.1	0.24	0.23
8+96	0.4	0.4	3.2	3.0	1.01	1.00
6+56	0.6	0.6	1.3	1.2	0.30	0.30
4+81	0.8	0.6	1.2	1.1	0.30	0.31
3+31	1.4	1.2	2.3	2.0	0.45	0.42
1+25	0.3	0.3	3.0	2.6	1.00	1.00
ft/s feet per second						

Table 3.11 HEC-RAS modeling results for the Southern Arroyo, 2-year event.

SOUTHERN ARROYO HEC-RAS MODELING SUMMARY (100-YEAR)						
Station No.	Water Depth (ft)		Velocity (ft/s)		Froude No.	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
20+62	1.5	1.6	5.3	5.6	0.90	0.92
19+02	1.4	1.5	2.7	2.8	0.45	0.45
16+57	1.0	1.1	5.4	5.6	1.00	1.01
14+63	2.6	2.8	2.2	2.4	0.28	0.29
12+92	0.7	0.8	4.7	4.8	1.00	1.00
11+12	1.9	1.8	2.1	1.9	0.30	0.29
8+96	0.9	0.8	4.6	4.4	1.01	1.01
6+56	1.3	1.1	2.2	2.2	0.37	0.40
4+81	1.7	1.3	1.7	1.5	0.28	0.27
3+31	2.5	2.0	3.7	3.1	0.56	0.52
1+25	0.8	0.6	4.6	3.9	1.00	1.01
ft/s feet per second						

Table 3.12 HEC-RAS modeling results for the Southern Arroyo, 100-year event.

Based on the proposed design of tributary areas, the upstream water quality / detention basin to reduce peak flows entering the Southern Arroyo and the projected hydraulic performance of the channel the channel is expected to remain stable under the proposed condition. In addition, measures will be taken to stabilize the eroding tributaries entering the Arroyo thereby controlling the amount of sediment available for transport to the Semeniuk Slough. These measures include use of improved grading, soil compaction, drainage improvements to reduce sheet flow runoff, as well as increased vegetation to further stabilize slopes. Lastly, the diffuser basin at the downstream end of the Arroyo will also provide an additional measure to control sediment loading into the Semeniuk Slough.

This portion of the Project ultimately drains into the Semeniuk Slough. The 2-year analysis for hydrologic conditions of concern for this drainage area was incorporated into the Tables 3.3 and 3.4 within Section 3.2.2.

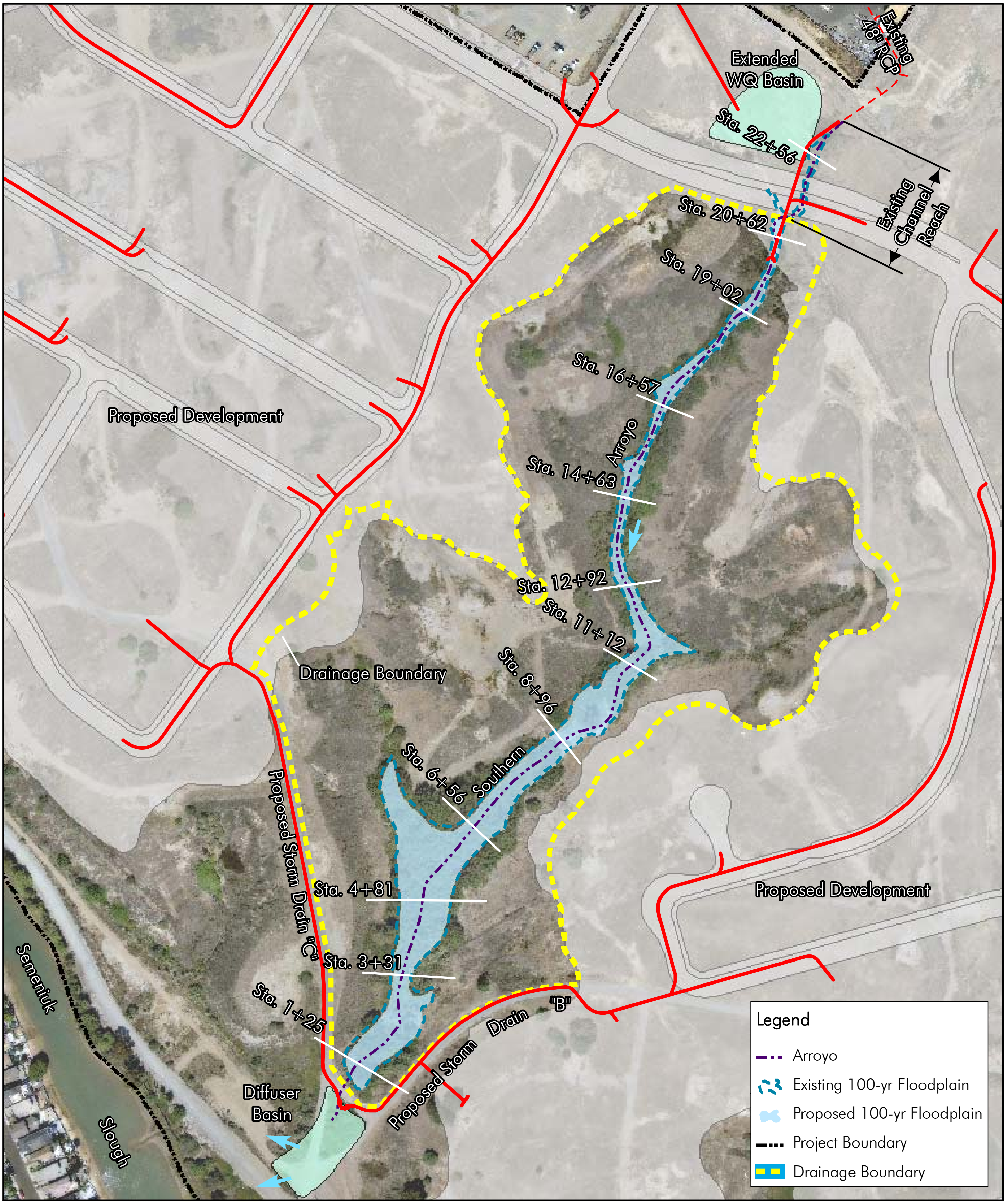

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FIGURE 11: Southern Arroyo 100-Yr Floodplain

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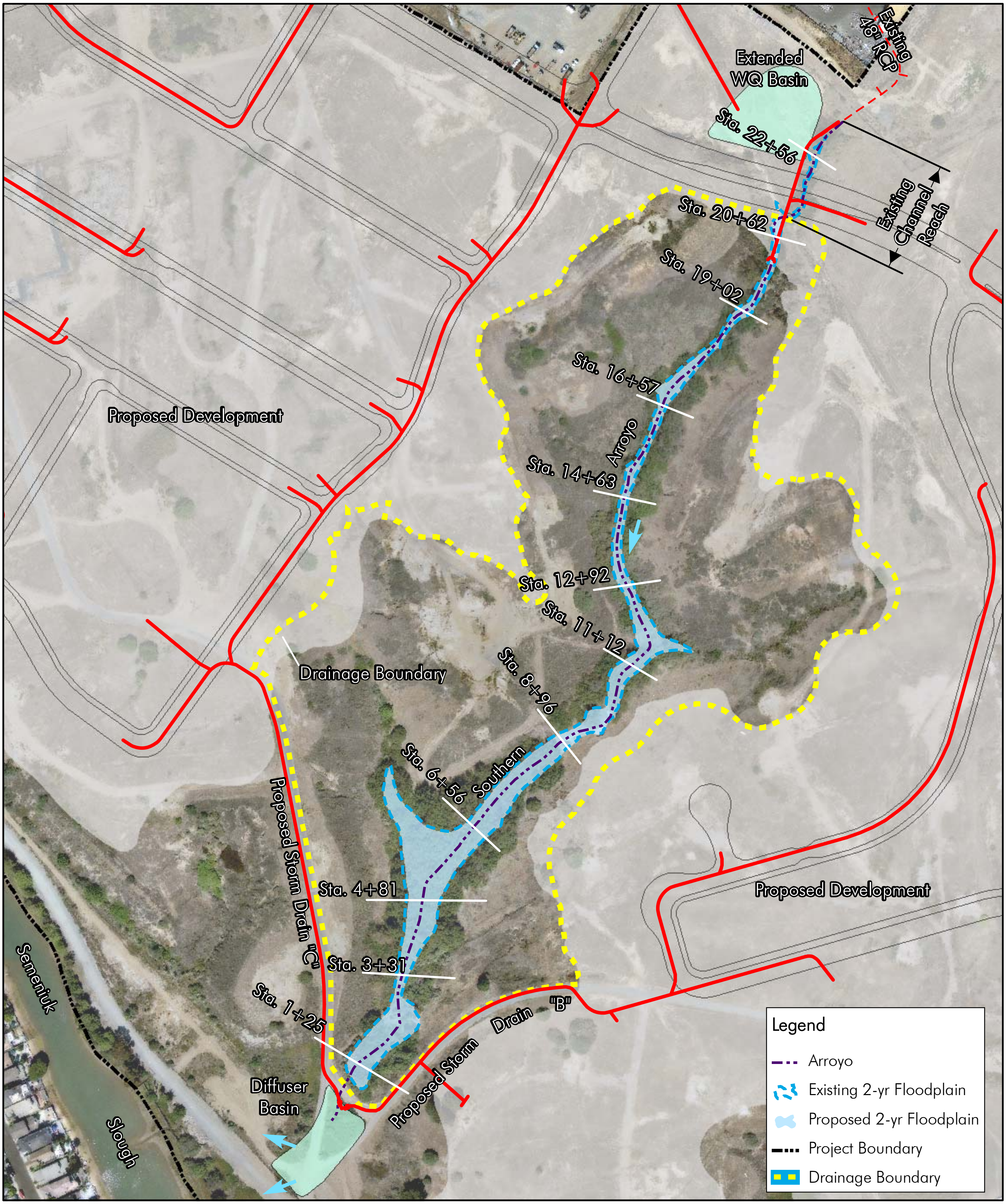

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FIGURE 12: Southern Arroyo 2-Yr Floodplain

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3.4 HYDROLOGY/HYDRAULICS IMPACT ASSESSMENT

This hydrology assessment estimated the peak flow runoff potential for a sequence of storm events to evaluate the hydrologic impacts on the Project watershed for the existing and proposed conditions. In addition, a channel hydraulics analysis was performed for the Northern and Southern Arroyos.

The following impact assessments are based on the significance criteria established in Section 1.4 for hydrology. In addition, a long-term sea level rise evaluation has also been provided following the standard CEQA significance criteria.

Impact B: Would the Project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (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)?

Impact B Analysis: The effect of the development on groundwater resources was not included within the scope of this report. Therefore, impacts to groundwater systems are not discussed.

Impact C: Would the Project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or in a manner which would result in a substantial erosion or siltation on- or off-site?

Impact C Analysis: The proposed Project will result in a slight alteration of existing drainage patterns due to the development areas and increase in impervious surfaces as compared to existing conditions. In addition, changes in drainage patterns will also occur due to a storm water management strategy that re-assigns flows to areas that have additional capacity, and decreases flows to areas with minimal or constrained capacity. The sheet flow runoff under the existing condition within the project site will be replaced with storm drain systems to convey flows to the Lowland Area, Semeniuk Slough, and the Caltrans RCB at WCH. Due to the capacity constraints of the Semeniuk Slough under existing conditions, a portion of the development area within this drainage area will be re-assigned to the Lowland Area to reduce proposed runoff in the Semeniuk Slough, creating a proposed condition that roughly matches the existing limiting conditions. See Tables 3.2 and 3.4 for additional details.

Off-site flows will continue to drain through the Northern and Southern Arroyos as under existing conditions. The proposed development will not alter the hydraulic behavior of the Northern Arroyo, and the results of the creek HEC-RAS modeling demonstrates that the Arroyo topography does not generate erosive channel velocities under peak flow conditions. Field verifications also support a stable channel designation. For the Southern Arroyo, HEC-RAS modeling results confirm that there is no significant hydraulic difference between the existing and proposed conditions that would lead to increased erosion or siltation. The tributaries that currently contribute to erosion and sedimentation in the Southern Arroyo will be stabilized, thereby controlling the amount of sediment available for transport to the Semeniuk Slough under post-development conditions. Because of the proposed grading layout, street layout and drainage system, it is evident that on-site and off-site erosion and siltation are considered to be less than significant. See Tables 3.9, 3.10, 3.11 and 3.12 for additional details.

Impact D: Would the Project substantially alter the existing drainage pattern of the site, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?

Impact D Analysis: As previously mentioned, the increase in impervious surfaces as compared to existing conditions will result in slight localized increases in peak flow runoff and runoff volume. However, the proposed runoff management plan will ensure that Project-wide runoff peak flows and runoff volumes are customized to emulate existing conditions for each major drainage feature or receiving water. A portion of the development area runoff from the existing Semeniuk Slough drainage area will be re-assigned to the Lowland Area to maintain drainage rates that resemble the existing condition in the Slough. The slight marginal increase in storm runoff volume delivered to the Lowland Area will be absorbed by the storage capacity of the existing Lowland Area and Salt Marsh Basin. In addition, all on-site curb-and-gutters and storm drains will be designed per City of Newport Beach Standard Plans and County of Orange Standard Plans, thereby minimizing potential impacts of on-site development area flooding. Further, off-site drainage will continue to drain through the Northern and Southern Arroyos as under existing conditions. Therefore, impacts relating to on-site or downstream flooding are considered to be less than significant.

Impact E: Would the Project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

Impact E Analysis: Refer to Analyses to Impacts C and D for additional details regarding the capacity for the downstream receiving waters to accommodate Project flood flows. Impacts to storm water runoff quality are discussed under Section 5.4.

Impact G: Would the Project 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 hazard delineation map?

Impact G Analysis: The proposed Project will not result in the creation of housing within the 100-year flood hazard area. The Santa Ana River has been channelized and improved to protect adjacent areas from the 100-year storm (1% chance of flooding). Therefore, areas within the project boundary are included in Zone X, which is defined as areas determined to be outside the 0.2% annual chance floodplain (500-year floodplain). Impacts related to flood zones are considered to be less than significant.

Impact H: Would the Project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

Impact H Analysis: As discussed under Analysis to Impact G, the proposed Project will not result in the creation of housing within the 100-year flood hazard area. Impacts are considered to be less than significant.

Impact I: Would the Project 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?

Impact I Analysis: As previously mentioned, the Santa Ana River has been improved and channelized to protect the adjacent development areas from the 100-year storm event. The majority of the development areas are located on the bluffs and at higher elevations than the River. In addition, the City of Newport Beach has developed and Emergency Management Plan, which includes procedures and evacuation, plans in the event of dam or levee failures. Therefore, impacts due to flooding are considered to be less than significant.

Impact J: Would the Project be subject to inundation by seiche, tsunami, or mudflow?

Impact J Analysis: Inundation by seiche or mudflow is not anticipated for the project site. Due to the Project's proximity to the coast, inundation by tsunami is possible. The proposed project was evaluated against a recently prepared Tsunami inundation map used for emergency preparedness (Newport Beach Quadrangle, CA Department of Conservation; March 15, 2009). The proposed development footprint within the Upper Mesa remains out of the tsunami inundation area and the project development areas would not be subject to inundation. The City of Newport Beach has also developed an Emergency Management Plan, which includes procedures and evacuation plans in the event of tsunamis. Therefore, risks are considered less than significant.

Long-term Sea Level Rise Impact Assessment

Future sea level rise scenarios are increasingly being incorporated into engineering design and environmental impact analyses for projects on or near the coast. Due to the Project's development footprint on the upper Mesa outside of the 500-year floodplain, sea level rise is not anticipated to alter the results, recommendations or conclusions derived from the analyses that were performed to investigate the existing and proposed hydrologic and hydraulic conditions at the project site. In May 2009, the Pacific Institute published a paper titled "The Impacts of Sea-level rise on the California Coast" which indicated a worse case scenario sea level rise of 55 inches or 4.6 feet along the coastline within the year 2100. Similar studies regarding sea level rise along the California coast have also been prepared, and these generally all estimate a worst case scenario similar to the sea level rise estimate range provided in the Pacific Institute report. In order to evaluate the long-term cumulative impacts of sea level rise over the next 90 years, the Project grading plan was overlayed onto the maximum sea level rise data provided by the Pacific Institute. The entire development footprint is located outside both the current coastal base flood (approximate 100-year flood extent) and the sea level rise scenario (coastal base flood plus 4.6 ft). In addition, sea level rise will not negatively impact the ability of the project to drain into the Lowlands or the Semeniuk Slough based on the hydraulic grade lines of the proposed storm drain system. Localized flooding will occur along the Semeniuk Slough during periods of high precipitation and storm conditions. In severe instances, flood flows may back up further into the Lowlands or in the Southern and Northern Arroyos, and while some limited localized impact would be expected on the performance of certain low-lying storm drain outlets that may become temporarily submerged, this will not impact the Project during this temporary condition. Sea level rise will increase the potential for flood water depths to increase against the existing slopes leading up to the development areas within the upland area, but adaptive management strategies can be taken to ensure the toe of the slopes are stabilized as sea levels rise. For example, geotextile covers with vegetation enhancement, buried groins with soil/vegetative cover and rip-rap can be applied to protect specific areas susceptible to sea level rise and erosion. Similarly, adaptive management strategies can occur with the management of the Santa Ana River levee tidal gate system administered by the Army Corps of Engineers. Based on this evaluation, the cumulative impact of sea level rise over the next 90 years is considered less than significant.

4.0 WATER BUDGET ANALYSIS

Within the project site, there are two existing arroyo habitat areas: the Northern Arroyo and the Southern Arroyo, located downstream of 18th Street and downstream of the 16th Street, respectively (Figure 6). Unlike the Salt Marsh habitats, the habitats of these two Arroyos rely on fresh water (storm water) inputs. Thus, the objective in this water budget analysis is to understand the hydrologic impact on these Arroyos due to the potential change in drainage as a result of the Project. The water budget analysis estimates the water demand and supply for habitats and further determines the ecological condition of the habitat from the water balance perspective. The water budget analysis was performed in this study following the drainage concept established in the hydrology analysis with respect to the existing and proposed condition Project watersheds.

4.1 SETTING

4.1.1 ARROYO DRAINAGE CHARACTERISTICS

In general, both of the Arroyos are found in the Upland Mesa area of the project site, in association with significant off-site drainage areas. Specifically, the Northern Arroyo is located around the northeast corner of the project site, receiving the off-site runoff primarily from a 42-inch storm drain pipe and a "V"-ditch along the project boundary. In addition, its drainage includes the natural land within the project boundary. The Arroyo starts at the discharge location of the above 42-inch pipe, runs about 930 ft to the west and discharges to the Lowland Area. Under the existing condition, there are no engineering improvements to the Northern Arroyo. The habitat's footprint is approximately 6 acres with mostly good vegetation cover. Under the proposed condition, the Arroyo will continue to receive storm water runoff from the existing 42-inch pipe. Only a small portion of the natural land in its drainage area will be converted to the residential development. In addition, a proposed roadway will be added to cross the Arroyo. The flow path of the Arroyo will cross under the roadway within a new culvert. See Figure 13 for the Northern Arroyo drainage.

The Southern Arroyo is located in the south portion of the project site, and begins at an existing 48-inch storm drain pipe discharge point. The Arroyo runs approximately 2,340 ft through the project site from east to west, and terminates at a dirt road approximately 500 ft upstream of the Semeniuk Slough. The Southern Arroyo is surrounded by approximately 30 acres of natural habitat area with a heavy vegetation cover. Evidence of undercutting and erosion of the side tributaries of the Arroyo exist on-site, and these areas will be stabilized under the proposed condition. Under the existing condition, the Southern Arroyo receives the runoff from existing off-site developments though a 48-inch pipe, as well as receives sheet flow from the surrounding natural area within the project site. Under the proposed Project, a portion of the Upland Mesa area will be converted to residential and mixed land uses and will drain towards the Arroyo under proposed conditions. See Figure 14 for the Southern Arroyo drainage.

Table 4.1 summarizes the drainage areas of the Arroyos with respect to the existing and proposed conditions. For the water budget analysis, the on-site area used in the table refers to the area of riparian habitat associated with the Arroyo. The off-site area refers to the surface inflow contribution area to the Arroyo habitat areas from both Project and upstream drainage areas. Refer to Figures 13 and 14 for locations of the drainage areas associated with the water budget analysis.

ARROYO DRAINAGE AREA SUMMARY				
Location[a]	Off-Site Drainage Area (acres)		On-Site Habitat Area (acres)	
	Existing	Proposed	Existing	Proposed
Northern Arroyo	129	121 (–8)	6	5 (–1)
Southern Arroyo	115	54 (–61)	26	24 (–2)

Note: Numbers in parentheses represent change as compared to existing condition.

a Refer to Figures 13 and 14 for locations of the on-site and off-site drainage boundaries for the Northern and Southern Arroyos, respectively.

Table 4.1 Drainage area summary of the Northern and Southern Arroyos

As shown in the table above, the Northern Arroyo will have similar off-site and on-site drainage acreages between the existing and proposed conditions. However, the Southern Arroyo will have its off-site tributary drainage areas reduced by approximately 61 acres and on-site areas by 2 acres under the proposed condition.

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NEWPORT BANNING RANCH

FIGURE 13: Proposed Northern Arroyo Drainage

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NEWPORT BANNING RANCH

FIGURE 14: Proposed Southern Arroyo Drainage

FUSCOE ENGINEERING

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4.1.2 CLIMATE

In water budget analysis, climate is an important factor affecting the water demand and supply for the habitat studied. In general, the project area exhibits a mild Mediterranean-type climate with warm/dry summers and cold/wet winters. Tables 4.2 and 4.3 below summarize the monthly temperature range and the average precipitation for the project area, respectively.

AVERAGE TEMPERATURE (°F)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum	64	64	63	65	66	69	72	73	73	72	67	64
Minimum	47	48	50	52	56	59	62	64	62	58	52	47
Source: Newport Beach Harbor Station (33.36N 117.53W 10 Feet, 11/1/1934 – 7/31/1998).												

Table 4.2 Average monthly temperatures for the project area.

AVERAGE PRECIPITATION (inches)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall Depth	2.08	2.05	1.84	0.90	0.17	0.05	0.01	0.09	0.36	0.18	1.55	1.57	10.85
Source: Newport Beach Harbor Station (33.36N 117.53W 10 Feet, 11/1/1934 – 7/31/1998).													

Table 4.3 Average monthly precipitation for the project area.

4.2 METHODOLOGY

4.2.1 WATER BUDGET MODEL

The water budget model is a water balance calculation, which accounts for the inflow and outflow of water to and from the habitat area over a certain period, while at the same, considering the habitat's water demand. The inflow water usually comes directly from precipitation or surface water run-on. The outflow water usually results from evaporation, sub-surface infiltration or surface outflow, thus referring to the amount of the inflow water that cannot be utilized by the vegetation. Alternatively, the habitat's water demand can be referred to the plant's evapotranspiration (ET) rate.

However, due to the complexity of the process, the water budget model is usually set up on a monthly basis to calculate monthly separate results rather than month-to-month continuous water balance. In addition, for the purposes of this study, all of the water losses are combined into a single loss term and calculated by using a yearly mean loss ratio in order to simplify the loss calculation. Therefore, the water budget model is expressed in the following water balance equation (Equation 4.1):

$$\text{Water Balance} = P + S_i - G_o - ET \qquad (4.1)$$

Where: P = precipitation (in inches)
S_i = surface inflow (in inches)
G_o = loss (in inches)
ET = evapotranspiration (in inches)

The monthly precipitation (P) can be directly obtained from Table 4.3. The calculations for the remaining variables are described in the following sub-sections.

4.2.2 SURFACE INFLOW

The amount of the surface inflow (S_i) is determined by the drainage area, land use and precipitation. The inflow is calculated as total runoff volume first and then converted into the depth by dividing by the habitat's footprint area. In this water budget model, the runoff volume (R) is calculated by multiplying a runoff coefficient (RV, defined as the overall average ratio of runoff to rainfall) to the precipitation (P) and drainage area (A). The runoff coefficient (RV) is computed by the following equation (Equation 4.2):

$$RV = (0.007)(IMP) + 0.1 \tag{4.2}$$

Where: RV = runoff coefficient (unitless)
IMP = percent impervious of the drainage area (%)

The runoff volume (R) is then determined by the following equation:

$$R = (P)\ (A)\ (RV/12) \tag{4.3}$$

Where: R = runoff volume (in acre-feet)
P = precipitation (in inches)
A = drainage area (in acres)
RV = runoff coefficient (unitless)

Table 4.4 summarizes the result of the surface runoff inflow factors for the Northern and Southern Arroyos in terms of drainage area, imperviousness and runoff coefficient. Refer to Appendix D for detailed calculations.

SURFACE RUNOFF INFLOW FACTORS						
Location	Drainage Area (acres)		Average % Impervious		Runoff Coefficient (RV)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed
Northern Arroyo	129	121 (–8)	68 %	73 % (+5)	0.58	0.61 (+0.03)
Southern Arroyo	115	54 (–61)	39 %	79 % (+40)	0.38	0.65 (+0.27)

Note: Numbers in parentheses represent change as compared to existing condition.

Table 4.4 Summary of surface runoff inflow factors.

4.2.3 EVAPOTRANSPIRATION

Evapotranspiration (ET) is a process involving the uptake of water by the plant system in which excess water is transpired to the atmosphere causing evaporation and transpiration. It thus can be referred as the water demand factor in the water budget model. The ET amount can be acquired from monitoring data or estimated from empirical equations. Table 4.5 shows the monthly potential evapotranspiration amount calculated by the Thornthwaite Method:

$$ET_u = (0.63)(10t_c / I)^a \qquad (4.4)$$

Where: ET_u = unadjusted potential evapotranspiration (in inches)
t_c = temperature (°F)
I = temperature efficiency index (see Appendix D)
a = $0.000000675(I)^3 - 0.0000771(I)^2 + 0.01792(I) + 0.49239$

Results are summarized in Table 4.5 below. Refer to Appendix D for detailed calculations regarding the Thornthwaite Method.

POTENTIAL EVAPOTRANSPIRATION (INCHES)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
ET	1.44	1.60	1.78	2.16	2.66	3.21	3.68	3.77	3.35	2.77	1.91	1.41	**29.74**
Source: Thornthwaite Method with Correction Factors for Monthly Sunshine Duration (Dunn & Leopold 1978)													

Table 4.5 Summary of potential evapotranspiration.

4.2.4 LOSS

For this water budget model, the water losses within the Arroyo habitat areas can be considered primarily from the infiltration and surface outflow processes. The Arroyo valleys do not have significant flat-bottom pond areas, and thus the evaporation loss from open water is considered to be negligible. Since the soils have a slow rate of water transmission (Hydrologic Soil Group D per the Orange County Hydrology Manual) and the habitats have a good vegetation cover, the average loss ratio is estimated to be 30%.

In the original water balance equation discussed at the beginning of this section, the loss term (G_o) is calculated by multiplying 30% to the sum of the precipitation term (P) and the surface inflow term (S_i).

$$G_o = (0.3)(P + S_i) \qquad (4.5)$$

Where: G_o = water loss (in inches)
P = precipitation (in inches)
S_i = surface inflow (in inches)

4.3 RESULTS & DISCUSSION

4.3.1 NORTHERN ARROYO

Tables 4.6 and 4.7 summarize the monthly water budget results for the Northern Arroyo habitat area, with respect to the existing and proposed conditions. The red number in parentheses in the balance row of the tables means a negative balance which indicates a drought month for the habitat. As shown in the tables, in general, the existing and proposed conditions exhibit very similar water balance results. Therefore, there will be no significant change in the habitat-related drainage under the proposed condition.

NORTHERN ARROYO MONTHLY WATER BUDGET FOR EXISTING CONDITION													
Factor	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
P	2.1	2.1	1.8	0.9	0.2	0.1	0.0	0.1	0.4	0.2	1.6	1.6	10.9
S_i	30.0	29.6	26.5	13.0	2.5	.7	0.1	1.3	5.2	2.6	22.3	22.6	156.4
G_o	9.6	9.5	8.5	4.2	0.8	0.2	0.0	0.4	1.7	0.8	7.2	7.3	50.2
ET	1.4	1.6	1.8	2.2	2.7	3.2	3.7	3.8	3.4	2.8	1.9	1.4	29.7
Water Balance[a]	21.0	20.5	18.1	7.6	(0.8)	(2.7)	(3.6)	(2.8)	0.5	(0.8)	14.8	15.5	87.3

Note: Red number in parentheses denotes a negative balance.
P Precipitation (inches)
S_i Surface Inflow (inches)
G_o Loss (inches)
ET Evapotranspiration (inches).

a Water balance calculated under Equation 4.1.

Table 4.6 Water Balance under existing conditions of the Northern Arroyo.

NORTHERN ARROYO MONTHLY WATER BUDGET FOR PROPOSED CONDITION													
Factor	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
P	2.1	2.1	1.8	0.9	0.2	0.1	0.0	0.1	0.4	0.2	1.6	1.6	10.9
S_i	30.0	29.6	26.5	13.0	2.5	.7	0.1	1.3	5.2	2.6	22.3	22.6	156.4
G_o	9.6	9.5	8.5	4.2	0.8	0.2	0.0	0.4	1.7	0.8	7.2	7.3	50.2
ET	1.4	1.6	1.8	2.2	2.7	3.2	3.7	3.8	3.4	2.8	1.9	1.4	29.7
Water Balance[a]	21.0	20.5	18.1	7.6	(0.8)	(2.7)	(3.6)	(2.8)	0.5	(0.8)	14.8	15.5	87.3

Note: Red number in parentheses denotes a negative balance.
P Precipitation (inches)
S_i Surface Inflow (inches)
G_o Loss (inches)
ET Evapotranspiration (inches).
a Water balance calculated under Equation 4.1.

Table 4.7 Water Balance under proposed conditions of the Northern Arroyo.

Specifically for the Northern Arroyo habitat area, the drought season is from May to August and October. July is the driest month through the year since the precipitation is only 0.01 inch. The remaining seven months of the year are considered to have sufficient water supply for the habitat. The net annual total of water is around 75 inches. Therefore, there will be no anticipated water budget impact on the Northern Arroyo habitat from the proposed development.

4.3.2 SOUTHERN ARROYO

The following tables show the monthly water budget results for the Southern Arroyo habitat area, with respect to the existing and proposed conditions.

SOUTHERN ARROYO MONTHLY WATER BUDGET FOR EXISTING CONDITION													
Factor	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
P	2.1	2.1	1.8	0.9	0.2	0.1	0.0	0.1	0.4	0.2	1.6	1.6	10.9
S_i	3.5	3.4	3.1	1.5	0.3	0.1	0.0	0.2	0.6	0.3	2.6	2.6	18.2
G_o	1.7	1.6	1.5	0.7	0.1	0.0	0.0	0.1	0.3	0.1	1.2	1.3	8.7
ET	1.4	1.6	1.8	2.2	2.7	3.2	3.7	3.8	3.4	2.8	1.9	1.4	29.7
Water Balance[a]	2.5	2.2	1.7	(0.5)	(2.3)	(3.1)	(3.7)	(3.6)	(2.7)	(2.4)	1.0	1.5	(9.4)

Note: Red number in parentheses denotes a negative balance.
P Precipitation (inches)
S_i Surface Inflow (inches)
G_o Loss (inches)
ET Evapotranspiration (inches).
a Water balance calculated under Equation 4.1.

Table 4.8 Water Balance under existing conditions of the Southern Arroyo.

SOUTHERN ARROYO MONTHLY WATER BUDGET FOR PROPOSED CONDITION													
Factor	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
P	2.1	2.1	1.8	0.9	0.2	0.1	0.0	0.1	0.4	0.2	1.6	1.6	10.9
S_i	3.1	3.1	2.7	1.3	0.3	0.1	0.0	0.1	0.5	0.3	2.3	2.3	16.2
G_o	1.6	1.5	1.4	0.7	0.1	0.0	0.0	0.1	0.3	0.1	1.2	1.2	8.1
ET	1.4	1.6	1.8	2.2	2.7	3.2	3.7	3.8	3.4	2.8	1.9	1.4	29.7
Water Balance[a]	2.2	2.0	1.4	(0.6)	(2.4)	(3.1)	(3.7)	(3.6)	(2.7)	(2.5)	0.8	1.3	(10.9)

Note: Red number in parentheses denotes a negative balance.
P Precipitation (inches)
S_i Surface Inflow (inches)
G_o Loss (inches)
ET Evapotranspiration (inches).
a Water balance calculated under Equation 4.1.

Table 4.9 Water Balance under proposed conditions of the Southern Arroyo.

In general, under the existing condition the Southern Arroyo habitat area has a longer drought period than the Northern Arroyo. The results show a deficit in water balance from April to October. The remaining five months exhibit positive water balances. However, the net water amount is significantly smaller in comparison to the Northern Arroyo habitat area, putting the net annual total of water into a deficit. The reason the Southern Arroyo receives less flow nourishment than the Northern Arroyo is that the Southern Arroyo has a greater habitat footprint area (about five times larger than the Northern Arroyo). The size of the habitat footprint attenuates the surface inflow nourishment. Therefore, based on the field reconnaissance, the existing habitat survives through the year under the existing water budget condition.

For the proposed condition, although the Upland Mesa area will be converted to the residential area and be therefore removed from its drainage, the water budget results for the Southern Arroyo do not vary significantly as compared to existing conditions. The drought period will remain as seven months, and the annual balance will decrease only by approximately 1 inch. The approximately 60 acres of natural land conversion to developed area leads to only a 10% reduction in surface inflow during the wet season. The reason for the insignificant influence by the proposed Upland Mesa area conversion is that the primary supply of the inflow water for this Arroyo is from the off-site development area, and not the development areas.

It is a commonly accepted observation that urban development, especially residential, has the potential to create sources of urban runoff during the dry season based on over irrigation, car washing, cleaning, etc., which can create changes in downstream habitats. Based on the implementation of the Project LID features and drainage systems designed to deliver initial flows to landscaped areas, dry season runoff is not expected to be a significant impact and will be controlled by the on-site water quality features. Refer to Section 5 for further discussion of the proposed water quality and LID features.

In conclusion, there is no significant water budget impact on the Southern Arroyo habitat due to the proposed development. However, enhancement opportunities exist by introducing treated dry weather flows and storm event low-flows to the Southern Arroyo from the proposed storm drain system and LID features. This creates additional hydrologic inputs to the system for maximum habitat diversity and also provides additional infiltration and evapotranspiration opportunities for on-site retention of the design capture volume. The low-flow diversion alternative will be considered during the resource agency permitting process.

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5.0 WATER QUALITY ASSESSMENT

The purpose of this section is to define the water quality treatment approach for the Newport Banning Ranch Project consistent with the details of the current planning level, and summarize the various water quality systems and concepts designed into the development plan. As a result of the Project's alteration of existing conditions, the proposed development will create new pollutant sources, and in turn, change the makeup of pollutant constituents generated by the Site's current operations. In order to reduce the amount of pollutants in storm water runoff from the new development plan, best management practices (BMPs) are required in accordance with the City of Newport Beach, California Coastal Commission, and local Regional Board standards.

5.1 REGULATORY FRAMEWORK

5.1.1 FEDERAL REGULATIONS

Controlling pollution of the nation's receiving water bodies has been a major environmental concern for more than three decades. Growing public awareness of the impacts of water pollution in the United States culminated in the establishment of the federal Clean Water Act[9] (CWA) in 1972, which provided the regulatory framework for surface water quality protection.

The United States Congress amended the CWA in 1987 to specifically regulate discharges to waters of the US from public storm drain systems and storm water flows from industrial facilities, including construction sites, and require such discharges be regulated through permits under the National Pollutant Discharge Elimination System (NPDES).[10] Rather than setting numeric effluent limitations for storm water and urban runoff, CWA regulation calls for the implementation of Best Management Practices (BMPs) to reduce or prevent the discharge of pollutants from these activities to the Maximum Extent Practicable (MEP) for urban runoff, and meeting the Best Available Technology Economically achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) standards for construction storm water. Regulations and permits have been implemented at the federal, state, and local level to form a comprehensive regulatory framework to serve and protect the quality of the nation's surface water resources.

In addition to reducing pollution with the regulations described above, the CWA also seeks to maintain the integrity of clean waters of the United States – in other words, to keep clean waters clean and to prevent undue degradation of others. As part of the CWA, the Federal Antidegradation Policy [40 CFR Section 131.12] states that each state "shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy…" [40 CFR Section 131.12(a)]. Three levels of protection are defined by the federal regulations:

[9] Also referred to as the Federal Water Pollution Control Act of 1972
[10] CWA Section 402(p)

1. Existing uses must be protected in all of the Nation's receiving waters, prohibiting any degradation that would compromise those existing uses;

2. Where existing uses are better than those needed to support propagation of aquatic wildlife and water recreation, those uses shall be maintained, unless the state finds that degradation is "…necessary to accommodate important economic or social development" [40 CFR Section 131.12(a)(2)]. Degradation, however, is not allowed to fall below the existing use of the receiving water; and

3. States must prohibit the degradation of Outstanding National Resource Waters, such as waters of National and State parks, wildlife refuges, and waters of exceptional recreation or ecological significance.

5.1.2 STATE AND LOCAL REGULATIONS

California Coastal Commission

The California Coastal Commission is responsible for protecting water quality in coastal environments as defined under Sections 30230 and 30231 of the California Coastal Act. These water quality provisions provide a broad basis for protecting coastal waters, habitats and biodiversity associated with new development and redevelopment projects. To meet the objectives of Sections 30230 and 30231, the Coastal Commission supports a three-pronged approach to water quality management: site design, source control and treatment control of BMPs. New development and redevelopment projects that are within the coastal zone are required to apply for a coastal development permit (CDP) through the Coastal Commission prior to construction. As part of the CDP process, projects must demonstrate water quality protection with the implementation of site design, source control, and treatment control BMPs.

State Water Resources Control Board

In the State of California, the State Water Resources Control Board (SWRCB) and local Regional Water Quality Control Boards (RWQCBs) have assumed the responsibility of implementing US EPA's NPDES Program and other programs under the CWA, such as the Impaired Waters Program and the Antidegradation Policy. The primary quality control law in California is the Porter-Cologne Water Quality Act (Water Code Sections 13000 et seq.). Under Porter-Cologne, the SWRCB issues joint federal NPDES Storm Water permits and state Waste Discharge Requirements (WDRs) to operators of municipal separate storm sewer systems (MS4s), industrial facilities, and construction sites to obtain coverage for the storm water discharges from these operations.

Basin Plan Requirement

In addition to its permitting programs, the SWRCB, through its nine RWQCBs, developed Regional Water Quality Control Plans (or Basin Plans) that designate beneficial uses and water quality objectives for California's surface waters and groundwater basins, as mandated by both the CWA and the state's Porter-Cologne Water Quality Control Act. Water quality standards are thus established in these Basin Plans and provide the foundation for the regulatory programs implemented by the state. The Santa Ana RWQCB's Basin Plan, which covers the Newport Banning Ranch project area, specifically (i) designates beneficial uses for surface waters and ground waters, (ii) sets narrative and numerical objectives that must be met in order to protect the beneficial uses and conform to the state's antidegradation policy, and (iii) describes implementation programs to protect all waters in the Region.[11] In other words, the Santa Ana RWQCB Basin Plan provides all relevant information necessary to carry out federal mandates for the antidegradation policy, 303(d) listing of impaired waters and related TMDLs, and provides information relative to NPDES and WDR permit limits.

303(d) List of Water Quality Limited Segments

Under Section 303(d) of the CWA, states are required to identify water bodies that do not meet their water quality standards. Once a water body has been listed as impaired, a Total Maximum Daily Load (TMDL) for the constituent of concern (pollutant) must be developed for that water body. A TMDL is an estimate of the daily load of pollutants that a water body may receive from point sources, non-point sources, and natural background conditions (including an appropriate margin of safety), without exceeding its water quality standard. Those facilities and activities that are discharging into the water body, collectively, must not exceed the TMDL.

Storm water runoff from the project site ultimately discharges into the Lowland Area, Semeniuk Slough as well as into the Santa Ana River Tidal Prism & Newport Slough. These water bodies are not listed as impaired according to the 2006 303(d) list published by the Santa Ana RWQCB (Region 8), and do not have any TMDLs in place. However, according to the 2008 California 303(d)/305(b) Integrated Report, the Newport Slough is recommended to be listed as impaired for enterococcus, fecal coliform, and total coliform.[12] Once approved by the SWRCB and US EPA, the 303(d) list will then be revised to include the new impairments.

General Construction Permit

The General Construction Permit (GCP), (Order 2009-0009-DWQ), updated by the SWRCB in September 2009, regulates storm water and non-storm water discharges associated with construction activities disturbing 1 acre or greater of soil. Construction sites that qualify must submit a Notice of Intent (NOI) to gain permit coverage or otherwise be in violation of the CWA and California Water Code.

The GCP requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) for each individual construction project greater than or equal to 1 acre of disturbed soil area. The SWPPP must list BMPs that the discharger will use to control sediment and other pollutants in storm water and non-storm water runoff; the BMPs must meet the BAT and BCT performance standards. Additionally, the SWPPP must contain a visual monitoring inspection program; a chemical monitoring program for "non-visible" pollutants; and a

[11] Regional Water Quality Control Board (RWQCB) Santa Ana Region. Water Quality Control Plan for the Santa Ana River Basin (8). January 24, 1995. Updated February 2008.
[12] Santa Ana Regional Water Quality Control Board (RWQCB). Final 2008 California 303(d)/305(b) Integrated Report Supporting Information. Approved by RWQCB Order No. R8-2009-0032, April 23, 2009.

sediment monitoring plan. Section XIV of the GCP describes the elements that must be contained in a SWPPP." [13]

The Project grading limit is greater than 1 acre within the City of Newport Beach, and is therefore subject to the storm water discharge requirements of the GCP. The Project will require submittal of an NOI and preparation of a SWPPP prior to the commencement of soil disturbing activities. In the Santa Ana Region, the SWRCB is the permitting authority, while the Santa Ana RWQCB provides local oversight and enforcement of the GCP.

Orange County MS4 Permit (Santa Ana Region)

In January 2002, the Santa Ana RWQCB issued the MS4 Storm Water Permit (WDR Order R8-2002-0010, NPDES Permit No. CAS618030) to the County of Orange and the incorporated cities of Orange County within the Santa Ana Region. Pursuant to this "third-term" MS4 permit, the County of Orange and incorporated cities were required to develop a Drainage Area Management Plan (DAMP). The Orange County Drainage Area Management Plan (OC DAMP) approved by the Santa Ana RWQCB in early 2002, includes a Model Local Implementation Program (LIP) for municipalities, such as the City of Newport Beach, to implement in their jurisdiction.

On May 22, 2009 the Santa Ana RWQCB re-issued the MS4 Permit for the Santa Ana Region of Orange County (Order No. R8-2009-0030, Amended by Order No. R8-2010-0062). Re-issuance of this permit will result in future changes to the OC DAMP and City of Newport Beach LIP and storm water program. This updated fourth-term MS4 Permit includes new requirements pertaining to hydromodification[14] and low impact development (LID) features associated with new developments and redevelopment projects. Within 12 months after the permit adoption, the County of Orange as the Principal Permittee must finalize a new Model Water Quality Management Plan (Countywide Mode WQMP) which incorporates feasibility criteria for LID and hydromodification requirements. Following the approval of the Model WQMP by the Santa Ana Regional Board, the City of Newport Beach will be required to update their LIP and storm water programs, and incorporate the new Model WQMP into their discretionary approval processes for new development and redevelopment projects. The Model WQMP and accompanying Technical Guidance Document was approved by the Santa Ana RWQCB on May 19, 2011 with an effective implementation date of 90 days following the approval.

City of Newport Beach Water Quality Management Plan (WQMP)

One component of the New Development / Significant Redevelopment Section of the City's LIP is the provision to prepare a Water Quality Management Plan (WQMP) for specified categories of development aimed at reducing pollutants in post-development runoff. Specifically, a project-specific WQMP includes Santa Ana RWQCB approved BMPs, where applicable, that address post-construction management of storm water runoff water quality. This includes operation and maintenance requirements for all structural or treatment control

[13] http://www.waterboards.ca.gov/water_issues/programs/stormwater/construction.shtml
[14] Hydromodification is generally defined as the alteration of natural flow characteristics.

BMPs required for specific categories of developments to reduce pollutants in post-development runoff to the MEP. The categories of development that require preparation of a project-specific WQMP as defined in the MS4 Permit include:

- All significant redevelopment projects, where significant redevelopment is defined as the addition of 5,000 or more square feet of impervious surface on an already developed site;
- New development projects that create 10,000 square feet or more of impervious surface (collectively over the entire project site) including commercial, industrial, residential housing subdivisions, mixed-use, and public projects;
- Automotive repair shops (SIC codes 5013, 5014, 5541, 7532-7534, and 7536-7539);
- Restaurants where the land area of development is 5,000 square feet or more including parking area
- All hillside developments on 5,000 square feet or more, which are located on areas with known erosive soil conditions or where natural slope is twenty-five percent or more;
- Developments of 2,500 square feet or more of impervious surface or more, adjacent to (within 200 feet) or discharging directly into environmentally sensitive areas, such as areas designated in the Ocean Plan as Areas of Special Biological Significance or water bodies listed on the CWA Section 303(d) list of impaired waters;
- Parking lots 5,000 square feet or more of impervious surface exposed to storm water runoff;
- Streets, roads, highways and freeways of 5,000 square feet or more of paved surface shall incorporate US EPA guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" in a manner consistent with the MEP standard;
- Retail gasoline outlets of 5,000 or more square feet with a projected average daily traffic of 100 or more vehicles per day.

As required by the City of Newport Beach's municipal ordinances on storm water quality management, the Project WQMP must be submitted to the City for approval prior to the City issuing any building or grading permits. Since the Newport Banning Ranch Project includes the development of several of the categories listed above, the Project is therefore subject to the requirements of the City of Newport Beach WQMP. This includes meeting any new requirements of the MS4 permit re-issuance, which includes LID features and/or hydromodification controls once the City's LIP is revised and requirements are implemented within the City.

General WDR Permit for Groundwater Discharges

Due to the relatively shallow groundwater levels within portions of the region, excess pollutants in groundwater may pose threats to surface water quality when discharged. Discharges that may pose a threat to water quality include, but are not limited to, wastes associated with well installation, development, test pumping, dewatering from subterranean seepage and groundwater dewatering wastes from construction sites. The Santa Ana RWQCB requires a permit for discharges from activities involving groundwater extraction or discharge within the Santa Ana Region. Under Order No. R8-2009-0003 (NPDES No. CAG998001), Permittees (dischargers) are required to monitor discharges to surface waters that pose an insignificant (de minimus) threat to water quality. Alternatively, long-term or permanent discharges from groundwater extraction or dewatering activities may require a separate individual permit issued by the RWQCB.

Based on the depths to groundwater within the proposed grading areas, construction dewatering is not anticipated as part of the proposed Project. Should groundwater be encountered and require dewatering, the Project shall apply for coverage and adhere to the monitoring and reporting program under Order No. R8-2009-0003.

5.2 PREDICTED POLLUTANTS AND SOURCES

The pollutants of concern for water quality are those pollutants that are anticipated (expected) or potentially could be generated by the Project, based on past and proposed land uses, along with those pollutants that have been identified by regulatory agencies as potentially impairing beneficial uses in receiving water bodies. Based on the projected land uses of the Newport Banning Ranch project site, the pollutants of concern can be divided up into anticipated pollutants and potential pollutants.[15] Anticipated and potential pollutants for the Project's general land use categories are summarized in Table 5.1, and pollutants are briefly described thereafter.

[15] Source: California Stormwater Quality Association. Stormwater Best Management Practices (BMP) Handbooks for New Development and Redevelopment. January 2003.

POLLUTANTS OF CONCERN									
Priority Project Categories and/or Project Features	Bacteria/ Virus	Heavy metals	Nutrients	Pesticides	Organic compounds	Sediments	Trash & debris	Oxygen demanding substances	Oil & grease
Detached Residential Development	X		X	X		X	X	X	X
Attached Residential Development	P		X	X		X	X	P [a]	P [b]
Commercial/Industrial Development	P [c]	P	P [a]	P [a]	P [e]	P [a]	X	P [a]	X
Restaurants	X						X	X	X
Hillside Development >10,000ft^2	X		X	X		X	X	X	X
Parking Lots	P [f]	X	P [a]	P [a]	X [d]	P [a]	X	P [a]	X
Streets, Highways & Freeways	P [f]	X	P [a]	P [a]	X [d]	X	X	P [a]	X

X Anticipated
P Potential
Source: County of Orange Flood Control District, 2003 Drainage Area Master Plan, Table 7-1.3, July 1, 2003.

a A potential pollutant if landscaping or open area exist on-site.
b A potential pollutant if the project includes uncovered parking areas.
c A potential pollutant if land use involves food or animal waste products.
d Including petroleum hydrocarbons.
e Including solvents.
f Analyses of pavement runoff routinely exhibit bacterial indicators.

Table 5.1 Anticipated and potential pollutants of concern for Project land use categories.

- Bacteria/Pathogens. Elevated pathogens are typically caused by the transport of human or animal fecal wastes from the watershed. Runoff that flows over land such as urban runoff can mobilize pathogens, including bacteria and viruses. Even runoff from natural areas can contain pathogens (e.g., from wildlife, plant matter and soils). Other sources of pathogens in urban areas include pets and leaky sanitary sewer pipes. The presence of pathogens in runoff can impair receiving waters. Total and fecal coliform, enterococcus bacteria, and E. coli bacteria are commonly used as indicators for pathogens due to the difficulty of monitoring pathogens directly.
- Trace Metals. The primary sources of trace metals in storm water are metals typically used in transportation, buildings and infrastructure and also paints, fuels, adhesives and coatings. Copper, lead, and zinc are the most prevalent metals typically found in urban runoff. Other trace metals, such as cadmium, chromium, mercury are typically not detected in urban runoff or are detected at very low levels.[16] Trace metals have the potential to cause toxic effects on aquatic life and are a potential source of groundwater contamination.

[16] Los Angeles County, 2000. Los Angeles County 1994–2000 Integrated Receiving Water Impacts Report. Los Angeles County Department of Public Works, Alhambra, CA, September 2000.

- Nutrients. Nutrients are inorganic forms of phosphorous and nitrogen. The main sources of nutrients in urban areas include fertilizers in lawns, pet wastes, failing septic systems, and atmospheric deposition from automobiles and industrial operations. The most common impact of excessive nutrient input is eutrophication of the receiving water body, resulting in excessive algal production, hypoxia or anoxia, fish kills and potential releases of toxins from sediment due to changes in water chemistry profiles.

- Pesticides. Pesticides (including herbicides) are chemical compounds commonly used to control insects, rodents, plant diseases, and weeds. Excessive application of a pesticide or impractical application of pesticides (i.e., right before rain events) may result in runoff containing toxic levels to receiving water bodies and the microorganisms.

- Organic Compounds. Organic compounds are carbon-based, and are typically found in pesticides, solvents, and hydrocarbons. Dirt, grease, and other particulates can also adsorb organic compounds in rinse water from cleaning objects, and can be harmful or hazardous to aquatic life either indirectly or directly.

- Sediment. Sheet erosion and the transport and deposition of sediment in surface waters can be a significant form of pollution that may result in water quality problems. Increases in runoff velocities and volumes can cause excessive stream erosion and sediment transport altering the sediment equilibrium of a stream or channel. Alternatively, unstable tributaries can result in excess sediment loading into the main channels thereby increasing the amount of sediment moving downstream during storm events, such as the Southern Arroyo. Excessive fine sediment, such as total suspended solids, can impair aquatic life through changes to the physical characteristics of the stream (light reduction, temperature changes, etc.).

- Trash and Debris. Improperly disposed or handled trash such as paper, plastics and debris including biodegradable organic matter such as leaves, grass cuttings, and food waste can accumulate on the ground surface where it can be entrained in urban runoff. Large amounts of trash and debris can have significant negative impacts on the recreational value of water bodies. Excessive organic matter can create a high biochemical oxygen demand in a stream and lower its water quality.

- Oxygen Demanding Substances. Oxygen-demanding substances include biodegradable organic material as well as chemicals that react with dissolved oxygen in water to form other compounds, such as proteins, carbohydrates and fats, as well as ammonia and hydrogen sulfide. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions, resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds.

- Petroleum Hydrocarbons/Oil and Grease. The most common sources of oil and grease in urban runoff stem from spilled fuels and lubricants, discharge of domestic and industrial wastes, atmospheric deposition and runoff. Runoff can contain leachate from roads, breakdown of tires/rubber and deposition of automobile exhaust. Some petroleum hydrocarbons, such as polycyclic aromatic hydrocarbons (PAHs), can bio-accumulate in aquatic organisms and are toxic at low concentrations. Hydrocarbons can be measured in a variety of ways including petroleum hydrocarbons (TPH), oil and grease, or as individual groups such as PAHs.

Hydrocarbons can persist in sediment for long periods of time in the environment and can result in adverse impacts on the diversity and abundance of benthic communities.

5.3 APPROACH

The approach to water quality treatment for the Newport Banning Ranch Project includes incorporation of site design/low impact development (LID) strategies and source control measures throughout the site in a systematic manner that maximizes the use of LID features to provide treatment of storm water and reduce runoff. In accordance with the fourth-term MS4 Storm Water Permit, the use of LID features will be consistent with the prescribed hierarchy of treatment provided in the Permit, including infiltration, evapotranspiration, harvest/re-use and bio-treatment.[17] Infiltration within the development areas will be limited due to several constraints but promoted within the Lowlands and Arroyo canyon bottoms. The Project intends to maximize the use of evapotranspiration on-site to allow for nourishment of habitat areas, particularly in the Lowland Area. Harvest and water reuse opportunities will be fairly limited based on several factors, including a reduced irrigation demand due to use of California native vegetation, existing codes that limit reuse for human health reasons and the limited areas within the residential development plan that allow for efficient collection, storage and reuse. More specifically, the use of cisterns or other storage devices are not likely to have sufficient demand to drain the systems within a timely manner, thereby reducing water quality protection from rain events that occur within short time frames of one another (i.e., back-to-back storms). The use of bio-treatment incorporated into the design of the LID features and treatment control BMPs will be a primary form of treatment prior to discharging these flows into the Lowland Area and Arroyos for additional infiltration and evapotranspiration opportunities.

For those areas of the site where LID features are not feasible or do not meet the feasibility criteria, treatment control BMPs with bio-treatment enhancement design features will be utilized to provide treatment. Thus, for purposes of CEQA impact assessment, treatment control BMPs will serve as the primary mechanism to demonstrate the Project's ability to treat the required design capture volume per the fourth-term MS4 Permit (also referred to as "first-flush"). Where applicable, LID features will be analyzed to demonstrate their ability to treat portions of the required design capture volume and reduce the size of downstream regional treatment control BMPs.

In addition to the use of on-site treatment control BMPs and LID features, it is the intent of the Project to improve the quality of off-site runoff that passes through the property to the Southern Arroyo. A regional water quality basin is proposed to provide treatment of runoff from the 16th Street drainage area of the City of Costa Mesa. This basin will provide a significant regional benefit to water quality protection and the basin will also serve to reduce the peak flow rates entering the Southern Arroyo, thereby reducing scour potential for the long-term stability of the natural drainage channel (see Section 5.3.5 for further discussion).

Consistent with regulatory requirements and design guidelines for water quality protection, the following principles are being followed for the Project and will be supported by construction

[17] Section XII.C.1 of Order No. R8-2009-0030.

level documents in the final Water Quality Management Plans (WQMPs) per each phase of development and prior to grading permit(s) issuance by the City of Newport Beach:

- Where feasible, LID features will be sized for water quality treatment credit according to local Regional Board sizing criteria as defined in the fourth-term MS4 Storm Water Permit for either flow-based or volume-based BMPs. There will be a significant effort to integrate LID techniques within the internal development areas (site design objectives), thereby providing treatment of low-flow runoff directly at the source and runoff reduction of small (i.e., more frequent) storm event runoff (first-flush). In most instances, LID features will be sized by volume-based analyses to demonstrate compliance with the required design capture volume for the Project.
- All LID features identified in this report are preliminary in nature but have been sized to show their relative footprint requirements for technical planning purposes (siting, treatment volumes, typical profiles, etc.). Detailed drainage calculations, grading, and confirmation of sizing to occur during the detailed design phase and subsequent WQMP documentation.
- Where feasible, LID features will be designed to infiltrate and/or reuse treated runoff on-site in accordance with feasibility criteria as defined in the new Countywide Model WQMP (approved May 19, 2011). Infiltration within the upper Mesa development area will be limited based on a number of factors that will influence the amount of allowable infiltration of the design capture volume, including:
    - For development areas residing on the elevated portions of the site (Mesa area), deep infiltration of storm water runoff into the underlying terrace deposits and San Pedro Formation within the Mesa should be minimized per geotech recommendations.[18]
    - Soil type D is the most predominate soil type within the proposed development areas of the Mesa, indicating limited infiltration opportunities.[19]
    - The project site is **not** located in a groundwater recharge zone thereby eliminating the long-term benefits of groundwater recharge for future aquifer replenishment.
    - The City of Newport Beach limits infiltration on development areas adjacent to coastal bluff-tops to minimize surface or sub-surface seepage into the canyons through the bluffs.

For those areas of the project where infiltration is not recommended or acceptable, LID features will be designed to treat runoff and discharge controlled effluent flows to downstream habitat areas, or will be collected for on-site re-use such as irrigation. In some circumstances, treated flows may be discharged off-site in accordance with the new Model WQMP feasibility criteria for bio-treatment and other approved treatment methods.

[18] GMU Geotechnical, Inc. Report of Geotechnical Studies Proposed Newport Banning Ranch Development, City of Newport Beach, County of Orange. Draft March 2008.
[19] Williamson and Schmid, Civil Engineers, and Orange County Environmental Management Agency. Orange County Hydrology Manual. October 1986.

5.3.1 CONSTRUCTION BEST MANAGEMENT PRACTICES

The updated GCP, Order No. 200-0009-DWQ, uses a risk-based approach for controlling erosion and sediment discharges from construction sites, since the rates of erosion and sedimentation can vary from site to site depending on factors such as duration of construction activities, climate, topography, soil condition, and proximity to receiving water bodies. The updated GCP identifies three levels of risk with differing requirements, designated as Risk Levels 1, 2 and 3, with Risk Level 1 having the fewest permit requirements and Risk Level 3 having the most-stringent requirements.

The Risk Assessment incorporates two risk factors for a project site: sediment risk (general amount of sediment potentially discharged from the site) and receiving water risk (the risk sediment discharges can pose to receiving waters). Sediment risk from a project site is determined utilizing a derivative of the Revised Universal Soil Loss Equation (RUSLE), a model developed by the US Department of Agriculture (USDA) and is utilized by the US EPA for estimating rates of soil loss at construction sites during rain events. Utilizing RUSLE, the sediment risk for the project site is thus determined by the following equation:

$$A = (R)(K)(LS)(C)(P) \tag{5.1}$$

Where:	A	=	rate of sheet and rill erosion, in tons/acre
	R	=	rainfall-runoff erosivity factor
	K	=	soil erodibility factor
	LS	=	length-slope factor
	C	=	cover factor (erosion controls)
	P	=	management operations & support practices (sediment controls)

The GCP provides the following procedure for determining the RUSLE equation factors for construction sites:

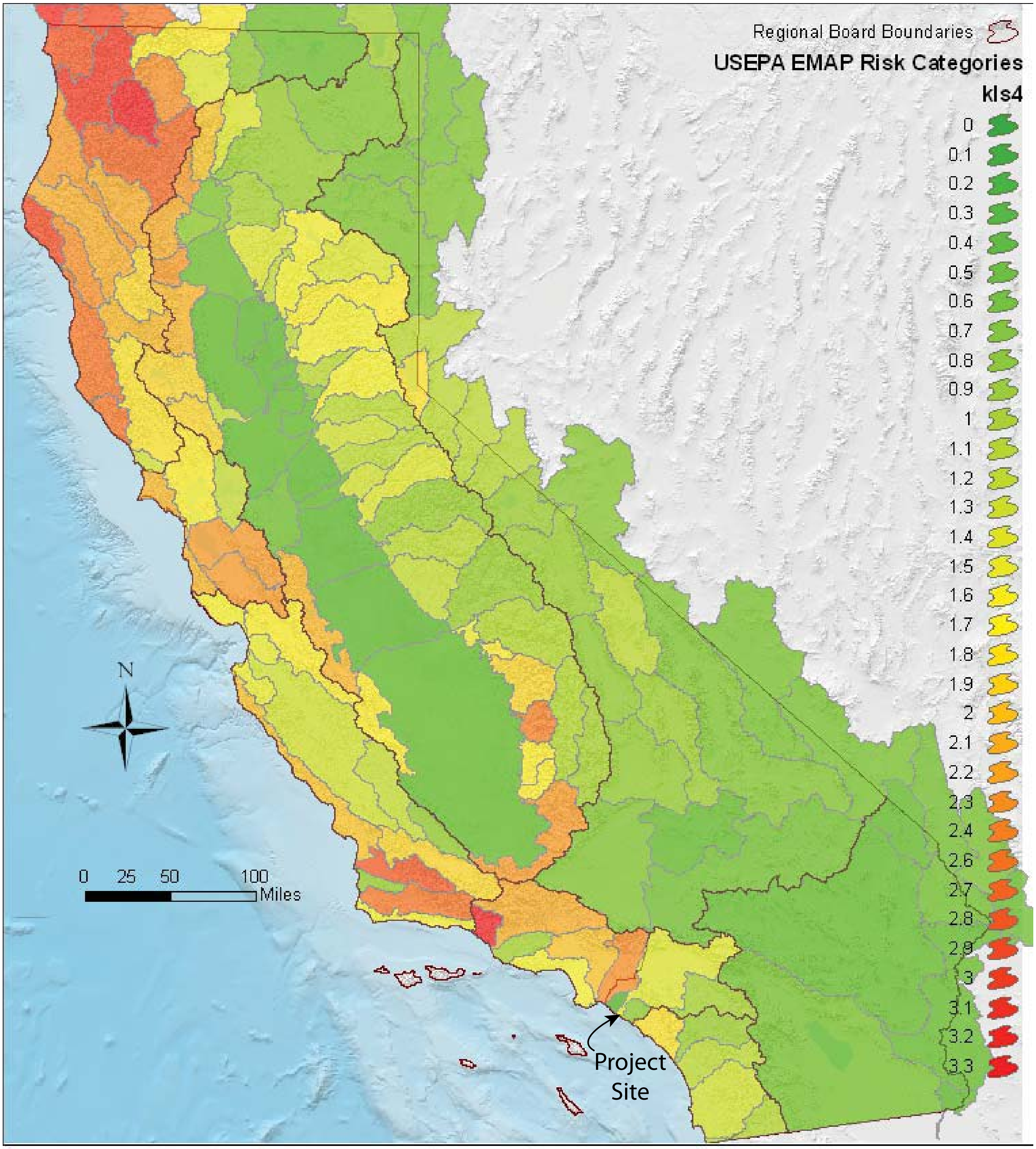
- R-Factor: Analyses of data indicated that when factors other than rainfall are held constant, soil loss is directly proportional to a rainfall factor composed of total storm kinetic energy (E) times the maximum 30-min intensity (I30).[20] The numerical value of R is the average annual sum of EI30 for storm events during a rainfall record of at least 22 years. "Isoerodent" maps were developed based on R-values calculated for more than 1,000 locations in the Western U.S. The maps may be utilized to determine the Standard Risk Assessment, and have been included in Appendix 1 of the GCP. A hand-calculation may also be utilized to determine the site's R-Factor, either by utilizing the methodology described in USDA's Agricultural Handbook 703, *Predicting soil erosion by water: A guide to conservation planning with the Revised*

[20] United States Department of Agriculture (USDA). Predicting Rainfall Erosion Losses A Guide to Conservation Planning. Agriculture Handbook 537. December 1978.

Universal Soil Loss Equation (RUSLE), or the EPA's R-value Risk Calculator (available at http://cfpub.epa.gov/npdes/stormwater/LEW/lewCalculator.cfm).

- K-Factor: The soil-erodibility factor K represents: (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. The site-specific K-factor may be determined using the nomograph method as shown in Appendix 1 of the GCP based on a particle-size analysis (ASTM D-422) performed for the soils at the project site.
- LS Factor: The effect of topography on erosion is accounted for by the LS factor, which combines the effects of a hillslope-length factor, L, and a hillslope-gradient factor, S. Generally speaking, as hillslope length and/or hillslope gradient increase, soil loss increases. As hillslope length increases, total soil loss and soil loss per unit area increase due to the progressive accumulation of runoff in the downslope direction. As the hillslope gradient increases, the velocity and erosivity of runoff increases. The weighted average LS factor may be determined using the LS Table located in Appendix 1 of the GCP.

  Alternatively, K and LS factors can be derived from Figure 14 on the following page, provided by the SWRCB. This alternative method is termed the GIS Map Method. The map is a geographical representation of combined K and LS factors for the State of California.
- C-Factor: Cover factor based on erosion controls. Assumed to equal 1.0 to simulate bare ground conditions. The implementation of erosion control measures for the proposed project during construction will reduce the C-Factor to less than 1.0, thereby reducing the erosion potential.
- P-Factor: Management operations and support practices for sediment controls. Assumed to equal 1.0 to simulate bare ground conditions. The implementation of sediment control measures for the proposed project during construction will reduce the P-factor to less than 1.0, thereby reducing the sediment loss potential.



Water Boards

State Water Resources Control Board, January 15, 2008

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NEWPORT BANNING RANCH

Figure 15: GIS Map Method for Determining K and LS Factors

June 30, 2011

FUSCOE ENGINEERING

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With both the C-Factor and P-Factor set at 1.0 to simulate bare ground conditions rather than utilizing values to simulate conditions where construction is taking place, sediment risk is condensed to multiplying R, K, and LS factors from RUSLE (Equation 5.1). The resultant risk of soil loss (A), measured in tons per acre, is then categorized as Low, Medium, or High based on the following breakdown:

A < 15 tons/acre = **Low Sediment Risk**

A > 15 and < 75 tons/acre = **Medium Sediment Risk**

A > 75 tons/acre = **High Sediment Risk**

The second risk factor in performing a Risk Assessment is Receiving Water Risk. The Receiving Water Risk is based on whether or not the project site drains to a sediment-sensitive water body or a water body with spawning, reproduction, and development (SPAWN), cold freshwater habitat (COLD), and fish migration (MIGRATORY) beneficial uses as designated in the region's Basin Plan. The GCP identifies a **High Receiving Water Risk** if the project's receiving water meets at least one of the above characteristics. If the project does not discharge to a water body that meets one of the above categories, it is considered a **Low Receiving Water Risk**. The receiving water conditions that result in a High Receiving Water Risk is summarized below:

- The disturbed area discharges (either directly or indirectly) to a 303(d)-listed water body impaired by sediment.
- The disturbed area discharges to a water body that has a US EPA-approved TMDL implementation plan for sediment.
- The disturbed area discharges to a water body with designated beneficial uses of SPAWN, COLD, & MIGRATORY per the region's Basin Plan (see Section 2.2).

The resultant risk levels for Sediment Risk and Receiving Water Risk is then assessed in a matrix to determine the combined risk level, based on a scale of 1 to 3. The combined risk level matrix is presented as Table 5.2.

COMBINED RISK LEVEL MATRIX				
		Sediment Risk		
		Low	Medium	High
Receiving Water Risk	Low	Level 1	Level 2	
	High	Level 2		Level 3

Table 5.2 Combined construction site risk level matrix

Based on the Risk Level a project falls under, different sets of regulatory requirements are applied to the site. The main difference between Risk Levels 1, 2, and 3 are the numeric effluent standards. In Risk Level 1, there are no numeric effluent standard requirements, as it is considered a low Sediment Risk and low Receiving Water Risk (see matrix above). Instead, narrative effluent limits are prescribed. In Risk Level 2, Numeric Action Levels (NALs) of pH between 6.5-8.5 and turbidity below 250 NTU are prescribed in addition to the narrative effluent limitations found in Risk Level 1 requirements. Should the NAL be exceeded during a storm event, the discharger is required to immediately determine the source associated with the exceedance and to implement corrective actions if necessary to mitigate the exceedance. For a Risk Level 3 site, Numeric Effluent Limits (NELs) are applied in addition to the narrative and numeric effluent standards prescribed for a Risk Level 2 site. Risk Level 3 dischargers are subject to a pH NEL of 6.0-9.0 and a turbidity NEL of 500 NTU. Once an NEL is exceeded, the construction site is considered in violation of the GCP.

GCP Application to Newport Banning Ranch

At this stage in the Newport Banning Ranch Project, a detailed, site-specific Risk Assessment cannot be performed at this time, since it is unclear how the Project's development will be phased over a yet to be determined timeline. However, for the purposes of identifying potential impacts during construction at the CEQA level, a preliminary Risk Assessment of the Project in its entirety can be performed.

The sediment risk analysis component was evaluated utilizing the Standard Method outlined in Appendix 1 of the GCP. Based on an assumption of a construction timeline of three[21] years to identify the preliminary sediment risk, an R-Factor value of 120.01 was returned by the US EPA's R-value Risk Calculator. Utilizing the GIS Map Method (Figure 14), a combined K and LS Factor of 1.5 was determined. As a result, a preliminary sediment risk value (A) of 180 tons per acre was obtained. The Newport Banning Ranch Project is therefore considered a **High Sediment Risk,** since its rate of sheet and rill erosion under bare ground conditions is anticipated to be greater than 75 tons per acre over the lifetime of the project. This number, however, is not based on the site-specific conditions nor does it account for the use of any erosion control, sediment control and scheduling controls when assigning the theoretical sediment risk value.

NEWPORT BANNING RANCH SEDIMENT RISK FACTOR			
R	K * LS	A	Sediment Risk
120.01	1.5	180 tons/acre	> 75 tons/acre = **High Sediment Risk**

Table 5.3 Preliminary sediment risk factor for Newport Banning Ranch

[21] Ultimately, construction may occur in two primary phases over a longer time period (i.e., 5-7 years). Site-specific sediment Risk Assessments will be performed prior to construction.

In terms of Receiving Water Risk, the Newport Banning Ranch Project's receiving water body according to the Basin Plan (the Tidal Prism of the Santa Ana River & Newport Slough) is not 303(d) listed for sediment and is not subject to a sediment TMDL.[22] Furthermore, the receiving water body does not contain the beneficial uses of SPAWN, COLD, & MIGRATORY. The Project can therefore be considered a **Low Receiving Water Risk**.

Based on the assessment above, the Newport Banning Ranch Project is categorized as a Risk Level 2 site. This is illustrated in the matrix below.

<table>
<tr><th colspan="5">NEWPORT BANNING RANCH
COMBINED RISK LEVEL MATRIX</th></tr>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">Sediment Risk</td></tr>
<tr><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td rowspan="2">Receiving Water Risk</td><td>Low</td><td>Level 1</td><td colspan="2">Level 2</td></tr>
<tr><td>High</td><td colspan="2">Level 2</td><td>Level 3</td></tr>
</table>

Table 5.4 Combined risk level matrix for Newport Banning Ranch

Risk Level 2 Requirements

Attachment E of the GCP identifies the following requirements for Risk Level 2 dischargers:

- Implement minimum BMPs as outlined in Attachment D, Sections B through G of the GCP and briefly described in the preceding section.
- Develop Rain Event Action Plans (REAPs) designed to protect exposed portions of the site during predicted precipitation events. The REAPs must be developed and implemented within 48 hours of the predicted rain event (50% chance or greater), and be developed for all phases of the construction (i.e., grading, vertical construction phase, landscaping, final stabilization, etc.) for each rain event.
- Implement Visual Monitoring (Inspection) requirements for qualifying rain events[23] at minimum frequencies identified in Attachment D, Section I of the GCP.
- Conduct storm water effluent sampling for pH and turbidity at a minimum of three (3) samples per day for each qualifying rain event to determine whether any exceedances of NALs have occurred. In the event that an exceedance of a NAL occurs, the discharger shall submit an NAL Exceedance Report to the SWRCB no later than 10 days after the conclusion of the rain event.

[22] Santa Ana Regional Water Quality Control Board (RWQCB). 2006 Clean Water Act Section 303(d) List of Limited Water Quality Segments. October 25, 2006.
[23] "Qualified Rain Event" is defined by the GCP as "Any event that produces 0.5 inches or more precipitation with a 48 hour or greater period between rain events."

- Conduct non-storm water discharge sampling where any non-storm water discharges occurred.

In the event turbidity exceedances are observed during the required storm event monitoring, the site erosion and sediment controls shall be evaluated to improve effectiveness. If necessary, Active Treatment Systems (ATS) may be utilized to reduce sediment in storm water effluent.

Active Treatment System (ATS) Requirements

For sites that implement ATS to reduce sediment and/or turbidity from the site (regardless of Risk Level), the GCP requires the following to be implemented as described further in Attachment F of the GCP.

- Prepare and submit an ATS Plan to the SWRCB prior to 14 days of operation that includes the following:
  - ATS Operation and Maintenance Manual for all equipment
  - ATS Monitoring, Sampling & Reporting Plan, including associated quality assurance/quality control (QA/QC) information.
  - ATS Health & Safety Plan
  - ATS Spill Prevention Plan
- Design the ATS to capture and treat (within a 72 hour period) a volume equivalent to the runoff from a 10-year, 24-hour storm event using a watershed runoff coefficient of 1.0.
- Conduct, at a minimum, six site-specific jar treatment tests as well as conduct required chemical residual and toxicity tests per Attachment F, Section E of the GCP.
- Ensure the ATS meets the turbidity NELs per Attachment F, Section I of the GCP.
- Conduct ATS monitoring requirements in accordance with Attachment F, Section M of the GCP.

Construction BMP Implementation

Based on a preliminary analysis, the proposed Project falls under the Risk Level 2 category. Prior to commencement of construction activities, the SWPPP will be prepared in accordance with the site-specific sediment risk analyses based on the final rough grading plans and erosion and sediment controls proposed for each phase of construction. The phases of construction will define the maximum amount of soil disturbed, the appropriate sized sediment basins and other control measures to accommodate all active soil disturbance areas and the appropriate monitoring and sampling plans.

Table 5.5 on the following pages is a general guideline for the minimum BMPs required at all active areas of construction within the Newport Banning Ranch Project. An effective combination of erosion and sediment controls should be selected based on the specific site conditions, in particular during major soil disturbing activities. Good housekeeping practices, such as waste and materials management, non-storm water management, and tracking controls should be implemented at all times.

CASQA BMP ID	BMP NAME	MINIMUM REQUIREMENT
EROSION CONTROL		
EC-1	Scheduling	X
EC-2	Preservation of Existing Vegetation	X
EC-3	Hydraulic Mulch	X [a]
EC-4	Hydroseeding	X [a]
EC-5	Soil Binders	X [a]
EC-6	Straw Mulch	X [a]
EC-7	Geotextiles and Erosion Control Mats	X [a]
EC-8	Wood Mulching	
EC-9	Earth Dikes and Drainage Swales	
EC-10	Outlet Protection and Velocity Dissipation Devices	
EC-11	Slope Drains	
EC-12	Streambank Stabilization	
SEDIMENT CONTROL		
SE-1	Silt Fence	X [b]
SE-2	Sediment/Desilting Basin	
SE-3	Sediment Trap	
SE-4	Check Dam	
SE-5	Fiber Rolls	X [b]
SE-6	Gravel Bag Berm	X [b]
SE-7	Street Sweeping and Vacuuming	X [b]
SE-8	Sandbag Barrier	
SE-9	Straw Bale Barrier	
SE-10	Storm Drain Inlet Protection	X
WIND EROSION CONTROL		
WE-1	Wind Erosion Control	X
TRACKING CONTROL		
TR-1	Stabilized Construction Entrance/Exit	X
TR-2	Stabilized Construction Roadway	
TR-3	Entrance/Outlet Tire Wash	
NON-STORM WATER MANAGEMENT		
NS-1	Water Conservation Practices	

CASQA BMP ID	BMP NAME	MINIMUM REQUIREMENT
NS-2	Dewatering Operations	X [c]
NS-3	Paving and Grinding Operations	
NS-4	Temporary Stream Crossing	
NS-5	Clear Water Diversion	
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting	X
NS-7	Potable Water/Irrigation	
NS-8	Vehicle and Equipment Cleaning	X
NS-9	Vehicle and Equipment Fueling	X
NS-10	Vehicle and Equipment Maintenance	X
NS-11	Pile Driving Operations	
NS-12	Concrete Curing	
NS-13	Concrete Finishing	
NS-14	Material and Equipment Use Over Water	
NS-15	Demolition Adjacent to Water	
NS-16	Temporary Batch Plants	
WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL		
WM-1	Material Delivery and Storage	X
WM-2	Material Use	X
WM-3	Stockpile Management	X
WM-4	Spill Prevention and Control	X
WM-5	Solid Waste Management	X
WM-6	Hazardous Waste Management	
WM-7	Contaminated Soil Management	
WM-8	Concrete Waste Management	
WM-9	Sanitary/Septic Waste Management	X
WM-10	Liquid Waste Management	

Source: Caltrans Stormwater Quality Handbooks, Construction Site Best Management Practices Manual (March 1, 2003). California Stormwater Quality Association (CASQA). California Stormwater BMP Handbook for Construction. January, 2003.

a Contractor shall select one of the five measures listed or a combination thereof to achieve and maintain the contract's rainy season disturbed soil area (DSA) requirements

b Contractor shall select one of the three measures listed or a combination thereof to achieve and maintain the contract's rainy season disturbed soil area (DSA) requirements

c Required if groundwater is encountered during construction activities. May also require coverage under Order No. R8-2009-0009 General Waste Discharge Requirements for Discharges to Surface Waters Which Pose an Insignificant (de minimus) Threat to Water Quality (Dewatering Permit).

Table 5.5 Minimum guidelines for construction storm water management BMPs.

Though site-specific details of how construction activities will be phased for Newport Banning Ranch is not available at this point in time, it is identified in the GCP that typical tract home developments can be divided into 4 general phases of construction: (1) mass & rough grading, (2) utility and road installation, (3) vertical construction, and (4) final stabilization and landscaping. Therefore, BMP implementation can be evaluated for the Project in this general context. Further details on individual BMPs will be documented in the project SWPPP based on the final rough grading plans for the Project.

Mass Grade, Rough Grade & Oil Remediation

During mass and/or rough grading, a substantial amount of soil disturbing activities or earthwork will occur. As a consequence, soil loss potential will be at its highest risk level to exceed NALs specified for Risk Level 2 sites. Therefore, an effective combination of erosion and sediment controls must be implemented during this phase of construction. Table 5.6 is a guideline for erosion and sediment control applications for this region.

EROSION/SEDIMENT CONTROL APPLICATION GUIDELINES						
	Season	Construction BMP	Slope (V:H)			
			≤ 1:20	> 1:20 ≤ 1:4	> 1:4 ≤ 1:2	> 1:2
INACTIVE DSAs	Rainy	Erosion Control	X	X	X	X
		Sediment Control		X	X	X
		Desilting Basin				
	Non-Rainy	Erosion Control				
		Sediment Control				X
		Desilting Basin				
ACTIVE DSAs	Rainy	Erosion Control				
		Sediment Control		X	X	X
		Desilting Basin				X
	Non-Rainy	Erosion Control				
		Sediment Control				
		Desilting Basin				
Source: Caltrans Stormwater Quality Handbooks, Construction Site Best Management Practices Manual (March 1, 2003). DSA – Disturbed Soil Area						

Table 5.6 Guidelines for erosion and sediment control practices.

This region requires the use of sediment basins to control the amount of sediment discharged off-site during the rainy season (i.e., October 1 through April 30 each year). Sediment/desilting basins generally act as primary sediment control facilities at downstream locations that provide final polish of runoff prior to discharging off-site. Therefore, they are a major element in a project's erosion and sediment control design. According to the California Stormwater Quality Association's (CASQA) sediment basin design guidelines, approximately

3,600 ft^3 of basin storage volume must be provided per acre of drainage area during this phase.

$$V_{basin} = (3{,}600\ ft^3/ac) * (A) \tag{5.2}$$

Where: V_{basin} = minimum basin storage volume in cubic feet (ft^3)
A = drainage area (acres)

Over an anticipated disturbance area of 175 acres, this equates to 630,000 ft^3 of storm runoff storage capacity. Based on a minimum ponding depth of 3 ft, at least 4.82 acres is needed for sediment/desilting basin implementation. A maximum of 75 acres of tributary area is allowed to drain to a sediment basin. Therefore, the project site will require at least three (3) sediment/desilting basins.

$V_{basin} = (3{,}600\ ft^3/ac) * (175\ ac)$
$\mathbf{V_{basin} = 630{,}000\ ft^3}$

It is unlikely that there will be a need for ATS for the Project, since it is not a Risk Level 3 site. However, should the application of traditional erosion and sediment control BMPs not achieve compliance with the turbidity NAL of 250 NTU for the Project or prove infeasible, the discharger may elect to implement ATS to control sediment discharges. Under this alternative, the ATS must be designed to capture and treat a volume of runoff equivalent to a 10-year, 24-hour storm event, using a watershed runoff coefficient of 1.0. According to the Orange County Hydrology Manual Table B.2., this is equivalent to a rainfall depth of 3.68 inches.

$$V_{ATS} = C * I_{10yr\text{-}24hr} * A \tag{5.3}$$

Where: V_{ATS} = ATS minimum treatment volume in cubic feet (ft^3)
C = runoff coefficient (unitless)
$I_{10yr\text{-}24hr}$ = 10-year, 24-hour storm event (in inches)
A = drainage area (in acres)

Therefore, a capture and treat volume of 2,338,000 ft^3 would be needed for ATS. Assuming a 3 ft ponding depth, approximately 17.9 acres of land area would be needed to accommodate runoff storage for a 175-acre project area for ATS.[24]

$V_{ATS} = (1.0) * (3.68\ in.) * (175\ ac) * (1ft/12in.) * (43{,}560\ ft^2/ac)$
$\mathbf{V_{ATS} = 2{,}338{,}000\ ft^3}$

Utility and Road Installation

In addition to the erosion and sediment control BMP requirements for the rough grading phase, the utility and road installation phase will introduce materials to the Project that may cause or contribute to exceedances in the pH NAL for Risk Level 2 sites. Materials include, but are not limited to hydrated lime, concrete, mortar, Portland cement treated base, and fly ash.

[24] Depth of holding ponds can be increased to reduce the land area needed for ATS.

For this reason, pH levels must be controlled at this stage through non-storm water management and waste and materials management BMPs. Stockpile management will also be important due to the trenching activities involved in utility installation. Minimum BMPs are summarized in Table 5.5. Should NALs be exceeded at any point in time, additional site management or "good housekeeping" BMPs shall be implemented and the source of pollution controlled.

Vertical Construction

Once utilities and roads are in place, sediment controls (such as sediment/desilting basins) found in the rough grade phase may no longer be applicable as previously designed, due to the installment of curb and gutter, catch basins, and storm drain infrastructure to convey runoff off-site per the post-construction condition. BMPs at this stage will thus be more focused on on-lot sediment control BMPs and at discharge points (i.e., catch basin inlet protection). Erosion control BMPs for manufactured slopes should be in place and require periodic maintenance to retain their integrity. During vertical construction, a substantial amount of construction materials will be delivered to the site, and wastes generated from the site have the potential to negatively impact pH levels. Therefore, non-storm water management and waste and materials management BMPs will be employed regularly. Minimum BMPs are summarized in Table 5.5.

Final Stabilization and Landscaping

During final stabilization and landscaping, minimal construction will be taking place and the majority of the project site will be stabilized. The majority of activities will involve planting and landscaping lots and common areas. Finished slopes that have not been landscaped will also be planted. Sediment control at discharge locations and stockpile management will be of primary concern. Good housekeeping practices will continue in this phase of construction. Minimum BMPs are summarized in Table 5.5.

5.3.2 POST-CONSTRUCTION BEST MANAGEMENT PRACTICES

Post-construction BMPs are typically divided into three main categories: site design/LID, source control and treatment control BMPs. The following sections provide a more in depth discussion of each category.

Site Design / Low Impact Development BMPs

Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments. In general, site design objectives include a combination of factors that may include: minimization of impervious surfaces including roads and parking lots; preservation of native vegetation and root systems; minimization of erosion and sedimentation from susceptible areas such as slopes; incorporation of water quality wetlands, bio-filtration swales, etc. where such measures are likely to be effective and technically and economically feasible; and minimization of impacts from storm water and urban runoff on the biological integrity of natural drainage systems and water bodies.

Many of the site design BMPs may also be considered low impact development (LID) features. The goal of using LID features is to mimic the sites existing hydrology by using design measures that capture, filter, store, evaporate, detain and/or infiltrate runoff, rather than runoff flowing directly to piped or impervious systems. This includes directing runoff to vegetated areas, protecting native vegetation, and reducing the amount of impervious surfaces. Many LID features can also serve as treatment control BMPs when sized properly to accommodate the design capture volume of runoff from storm events. The incorporation of site design BMPs and LID features may reduce the need and/or sizing of treatment control BMPs needed for the site.

Overall, primary site design includes the integration and emphasis of landscaping features to provide treatment of runoff and control the rate and volume of runoff from impervious surfaces.

Source Control BMPs

Source control BMPs are operational practices that reduce potential pollutants at the source, and include both structural and routine non-structural practices. Example source control measures include street sweeping, low use irrigation systems, catch basin stenciling, and providing educational materials for homeowners. A list of typical source control measures for residential and commercial developments is provided in Appendix E.

Treatment Control BMPs

Treatment control BMPs are structural/engineered systems that are similar to LID features in that they are sized to capture, filter, and/or treat runoff the required runoff volume or flow prior to discharging into receiving waters. Treatment control BMPs are typically larger scale than LID features accommodating larger drainage areas, larger treatment volumes, and are typically located outside of the core development areas. Structural treatment BMPs may be located on- or off-site, used singly or in combination with other treatment controls, or may be shared by multiple communities within the project. Selection of treatment control BMPs is based on the pollutants of concern of the project site, based on the Project's land use categories (see Section 5.2) and the BMP's ability to effectively mitigate those pollutants, in consideration of site conditions and constraints. For the proposed Project, water quality basins will serve as the treatment control BMPs. These basins are typically located at low points outside the development areas as demonstrated in Figure 15. Due to the proximity to the coastal bluff-tops, infiltration opportunities will be limited and in some cases, lining of the basin floors may be required.

In accordance with local Regional Board water quality treatment requirements, the proposed water quality basins will be designed to treat runoff from a 24-hour 85th percentile storm event, as determined from the local historical rainfall record (termed design capture volume, or "first-flush"). Treated runoff will typically be distributed to the Lowland Area and Arroyo canyon bottoms for evapotranspiration and infiltration opportunities, and/or collected and reused for irrigation purposes within the development areas. In some circumstances, treated flows may be discharged off-site in accordance with the new Countywide Model WQMP feasibility criteria for bio-treatment and release of design capture volume flows.

5.3.3 INTERIOR WATER QUALITY FEATURES

Water quality protection will begin within the interior of the Project development areas (i.e. resort, hotel, condominiums, parks, common areas, etc.). It is the intent of the overall Project to include a variety of sustainable design measures that address water quality and quantity. One of the primary sustainable commitments is to incorporate LID techniques into the design phase to reduce storm water runoff, and to maximize water quality capture and treatment at the source. Rather than conveying runoff from small, frequent storm events to storm drains directly, runoff is directed to landscape features and permeable surfaces (as applicable) located on-site to reduce runoff volume via evapotranspiration and infiltration. These techniques may include pocket rain gardens within impervious areas such as courtyards and common areas, porous/permeable paving integration into traditional impermeable paved areas, landscaped storm water planters, and use of cisterns for capturing rainwater for re-use from buildings (condominiums, flats, attached units, resorts, etc.).[25] Provided below is a summary of the various opportunities for implementation of interior LID features within the major land use categories proposed for the Project:

- Single-Family Residential: For single-family residences, opportunities exist for incorporating landscaped areas into the drainage design that can also be aesthetically pleasing due to their small-scale implementation. Roof runoff and driveway runoff can drain to landscaped gardens or pocket rain gardens. Rain barrels can also be used to capture and store roof runoff for reuse as irrigation water. In addition, porous pavements can be used in driveways and patios to reduce runoff.
- Multi-Family Residential/Mixed Use – Although multi-family and mixed use developments usually have lesser amounts of landscaping than single-family developments, opportunities exist for draining impervious areas to landscaping on-site as well as for implementing porous pavements within the parking areas, drive aisles and other low traffic areas. Roof runoff can drain to landscaping or to cisterns for reuse as irrigation. Runoff from sidewalks, courtyards, and common areas can be directed to landscaped areas or to pocket rain gardens. Alternatively, sidewalks and courtyards may be constructed with porous pavement.
- Resort/Commercial Use: Opportunities for LID implementation in resort, hotel and other commercial land use areas are similar to those for multi-family and mixed use developments. Landscaping can be incorporated into the drainage design by diverting runoff from rooftops and other impervious areas (i.e., sidewalks, parking lots) to landscaping, storm water planters or pocket rain gardens. Cisterns can be used to capture runoff from rooftops for reuse as irrigation water, and parking stalls can be constructed of porous pavement to further reduce runoff.

Incorporation of these features within the interior development areas provide pre-treatment of storm water runoff, removing large sediment and trash and debris, thereby reducing the amount of pollutants reaching the larger transitional phase water quality features and improving their overall effectiveness. In addition, by capturing a portion of the first-flush

[25] County of San Diego, Department of Planning and Land Use. Low Impact Development Handbook Stormwater Management Strategies. December 31, 2007.

runoff, the volume and flow rate of runoff discharged from these features is reduced. Further details on the examples of interior LID features are discussed below.

- Cisterns and Rain Barrels: Cisterns are storage vessels that are designed to collect and store storm water runoff for non-potable uses, such as irrigation water. Cisterns may be placed either above ground or below ground, placed below decks, or may be decorative in nature to improve aesthetics. Smaller cisterns, ranging from 75 to 150 gallons, are typically referred to as "rain barrels", and are typically used at single-family residences and small buildings. Larger cisterns can range in size from 150 gallons to over 10,000 gallons, and are more typically used at high-density multi-family housing or larger commercial buildings. Cisterns are typically sized based on the size of the building and irrigation water demand, and typically are not sized to treat water quality volume requirements unless provided in large quantities.
- Storm Water Planters: Storm water planters are structural, vegetated planters that receive storm water runoff from roof downspouts and allow pollutants to filter and settle out prior to discharging off-site. Runoff collected in the planter filters through a minimum of 18 inches of soil where vegetation will uptake nutrients (e.g., nitrogen and phosphorous), microbial contaminants, oil and grease, pesticides, and sediments and fine particulates can settle out. Treated runoff is drained at the bottom of the planter through a gravel layer and perforated underdrain system, if necessary based on soil conditions. In general, storm water planters can be sized with a 0.04 sizing factor (surface area of planter / surface area of tributary impervious area). [26]
- Common Area Porous Pavement: Permeable pavement, such as permeable pavers, grass pavers, porous concrete, and porous asphalt, provides a surface suitable for courtyards, common areas, and other light-load applications in which water can drain through pore spaces to an underlying rock reservoir (approximately 1-3 ft deep) underneath. The sub-surface base allows for physical and microbial filtering processes to take place thereby removing pollutants such as particulates, organics, hydrocarbons and total suspended sediments, including attached heavy metals. Porous pavement can be generally sized based on its capacity to store runoff in the rock reservoir. In general, an approximate ratio of 25% porous pavement to impervious pavement is sufficient to accommodate treatment requirements for a reservoir depth of 10-12 inches.
- Tree Box Filters: Tree box filters are similar to storm water planters, in that they are a contained planter that receives storm water runoff. Whereas storm water planters are typically located above ground and receive roof runoff, tree box filters are installed below grade along a curb line and receive runoff from streets, sidewalks and other impervious surfaces. Tree box filters consist of a concrete box containing a filter media designed to capture and filter pollutants. One tree or large shrub is planted within the media to provide biological processes to provide additional pollutant removal. A standard curb inlet catch basin is typically placed immediately

[26] LFR Inc. and Dan Cloak Environmental Consulting. Contra Costa Clean Water Program Infiltration Site Characterization Criteria and Guidance Study, Milestone Report #3. April 1, 2005.

downstream of the tree box filter to capture high flows that bypass the filter. On average, one tree box filter can treat up to 0.5-1 acre of impervious surface.[27]

- Pocket Rain Gardens: Rain gardens are small, vegetated depressions that promote filtration of storm water runoff. They combine shrubs, grasses, and flowering perennials in depressions (approximately 6-8 inches deep) that allow water to pool, infiltrate or evaporate and/or slowly drain out within 48-72 hours. Additional design details include a soil planting depth between 18 inches to 4 ft deep (depending on plants selected), with a 2-3 inch mulch layer on top to protect from erosion. Perforated underdrains may be provided for soils with low infiltration rates and in areas with high groundwater levels to discharge treated water back into the storm drain system. Due to the limited ponding area, pocket rain gardens treat small areas of adjacent impervious runoff from sidewalks and courtyards, but typically are not suitable for treating large drainage areas.

The specific details and locations of these measures occur during the detailed design phase of each community, and will be implemented during the design phase and accounted for in the project-level WQMPs. All LID site design features sized to handle and retain the design capture volume (also referred to as "first-flush") on-site will be identified in the WQMPs and the downstream treatment control basin sizes will be adjusted accordingly.

5.3.4 TRANSITIONAL PHASE WATER QUALITY FEATURES

The transitional phase refers to those primary streets and travelways that lead into and out of the development areas. Whereas the interior water quality features provide treatment of runoff at the source and partial reduction of design capture volume runoff quantities, transitional phase water quality features provide treatment primarily along the major roadways of the project. Treatment of runoff mainly occurs through integrated bio-retention type "green street" features which aids in dropping out particulates, sediment and pollutants adsorbed into sediment. Green streets incorporate slotted curbs and parkway bioswales with enhanced bio-filtration zones (biocells) within portions of the landscape setback areas for a variety of different sized streets within the project area. This allows for the treatment of water quality at the source as well as the reduction of peak storm water runoff volumes and rates. These streets will provide the necessary water quality treatment of flows generated from the streets themselves, and provide treatment of adjacent interior core development areas dependent upon the volumes available within the LID landscaping features. The use of storm water treatment within the landscape setback areas of the proposed streets is consistent with the intent of the US EPA guidance on green streets.[28]

The primary features proposed for the transitional phase are referred to as landscaping biocells, which will be incorporated into select portions of the parkway bioswales identified in the arterial and collector street cross sections on the Tentative Tract Map No. 17308. These features function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The major treatment of

[27] Filterra Bioretention Systems, a division of Americast. Engineering Design Assistance Kit (DAKit) v08-WZ. 2009.
[28] Lukes, R., Kloss, C., & Low Impact Development Center. Managing Wet Weather with Green Infrastructure Municipal Handbook, Green Streets. EPA-833-F-08-009. December 2008.

runoff occurs through the percolation of runoff through several layers of the biocell within the parkway bioswale prior to either infiltrating into the ground or collected by sub-drains and returned back to the storm drain system. Landscaping biocells are typically sized based on the water stored within the cell and the amount of water filtering through the biocell during storm events.

Biocells function similarly in nature to bioretention cells and rain gardens but tend to have shallower depths based on a higher reliance on sand-based soil amendments. Biocells remove storm water pollutants through processes such as adsorption, filtration, plant uptake, microbial activity, decomposition, sedimentation and volatilization.[29] Adsorption is the process whereby particulate pollutants attach to soil (e.g., clay) or vegetation surfaces. Filtration occurs as runoff passes through the biocell media, such as the plant cover and planting soil which aids in dropping out particulates, sediment and pollutants adsorbed onto sediment (including, for example certain pesticides and pathogens). Pollutants removed by adsorption include metals, phosphorus, and hydrocarbons.

The following properties of landscaping biocells within the Green Streets were used to calculate the water quality treatment potential for these features as an example for the Project:

- 8-16 inch gravel base above the sub-grade with perforated drainage pipes to remove any excess water that does not infiltrate
- 18 inch of sandy loam with filter fabric to separate from the gravel base.
- 8-12 inch of topsoil
- 2-4 inch of mulch
- 3-6 inch ponding depth where the bottom occurs at the top of the mulch and the top occurs at the spill over elevation where water will bypass the biocell and drain towards the nearest catch basin inlet when at full capacity.
- The volume of treatment for each cell will be demonstrated by adding the minimum volume of capacity of each layer with the designed drawdown time (infiltration capacity) of the storage reservoir for a total volume of treatment (see Table 5.7).

Drainage from the roadways and adjacent lot drainage may be directed to the parkway bioswales with the landscaping biocell features via sheet flow, curb cuts and shallow first-flush collection pipes for water quality treatment. In some instances, a surface slope (longitudinally) may be required within the biocell. In these instances, the slope and ponding depth will be accounted for in the treatment volume calculation. Figure 16 provides a typical section of a "green street" and a typical cross section of a biocell within the parkway bioswale. The profile and depths of the biocell will vary in the final design, and all changes will be accounted for in the treatment volume calculations. In most instances, it will not be necessary to construct the biocell sub-surface design feature into all portions of the parkway bioswale locations. Based on the upstream tributary areas and the treatment capacity of the biocells, only a portion of the parkway bioswale will need to include the biocell sub-surface design feature to meet the

[29] US Environmental Protection Agency (US EPA). Storm Water Phase II Proposed Rule Fact Sheet Series, Fact Sheet 3.0. April 1999.

volume treatment requirements of the upstream road runoff (approximately 25% ratio of biocell to parkway bioswale is needed to treat the road runoff). In the event it is feasible to direct surface runoff from the lots in addition to the road runoff into the parkway bioswales, the size of biocell component will be increased accordingly.

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NEWPORT BANNING RANCH

Figure 16: Water Quality BMP Plan

June 30, 2011

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In order to determine the maximum treatment potential of the proposed subsurface biocells, the volume capacity was evaluated to determine if the features could accommodate runoff from the core development areas in addition to the localized street runoff. More specifically, the landscaping biocell areas within the parkway bioswale were evaluated to determine the appropriate volume they could treat based on the upstream tributary drainage areas. Results of the sizing analyses for the biocell sizing options are summarized in Table 5.7 below. Detailed calculations are provided in Appendix E.

LANDSCAPING BIOCELL SIZING OPTIONS					
Symbol	Parameter	Typical Green Street Landscaping Biocell Dimensions (ft)			
		5′ x 10′	10′ x 20′	8′ x 100′	10′ x 100′
A_T	Top Area (ft^2)	50	200	800	1,000
A_B	Bottom Area (ft^2)	24	108	392	588
P	Average Ponding Depth (ft)	0.25	0.25	0.25	0.5
M	Mulch Depth (ft)	0.16	0.16	0.16	0.16
η_M	Mulch Porosity (%)	0.4	0.4	0.4	0.4
G	Gravel Depth (ft)	0.67	0.67	0.67	0.67
η_G	Gravel Porosity (%)	0.4	0.4	0.4	0.4
S	Planting Soil Depth (ft)	0.67	0.67	0.67	0.67
η_S	Planting Soil Porosity (%)	0.3	0.3	0.3	0.3
S_o	Sand Filter Depth (ft)	1.5	1.5	1.5	1.5
η_{So}	Sand Filter Porosity (%)	0.3	0.3	0.3	0.3
T	Total Depth Below Surface (ft)	3	3	3	3
w	Soil Water Content (%)	0.5	0.5	0.5	0.5
F_P	Infiltration Capacity (in/hr)	0.5	0.5	0.5	0.5
SF	Safety Factor for Infiltration	1	1	1	1
v_i	Infiltration Velocity (ft/hr)	0.28	0.28	0.28	0.28
T	Time Infiltration Occurs (hr)	18.6	18.6	18.6	18.6
V_P	Ponding Volume (ft^3)	7	39	149	397
V_{MGS}	Volume in Gravel/Sand/Mulch (ft^3)	4	58	209	313
V_{So}	Volume in Sand Filter (ft^3)	2	24	88	132
V_I	Volume Infiltrated (ft^3)	39	155	620	775
V_{BC}	Total Volume Treated (ft^3)	52	275	1,066	1,618
Note: Table represents sizing for typical landscaping biocell designs to determine average sizing ratios. Detailed calculations are provided in Appendix E.					

Table 5.7 Summary of landscaping biocell water quality sizing options.

Based on the analyses summarized in Table 5.7, an average conservative ratio of 1.3 (cubic feet treated/square foot of landscaping biocell) was determined to satisfy water quality requirements. For every square foot of biocell landscaping with the sub-surface profile parameters set forth above, 1.3 cubic feet of treatment is provided. For example, if 1,100 ft^2 of biocell is implemented within a parkway bioswale with a top width of 8′ (8′W x 140′L), a treatment capacity of 1,430 ft^3 would be accommodated within this parkway. This volume is equivalent to 0.65 acre of drainage from an 80% impervious tributary area (e.g., high-density attached condominiums). Based on these ratios, appropriate landscaping areas can be set for each development area and integrated within the Green Streets or more internally within to the development areas.

Table 5.8 below provides a summary of the total acreage of roadways proposed with the parkway bioswale area for both the arterial streets and the collector streets. The minimum treatment capacity is based on the assumption that approximately 25% of the total parkway acreage will include the biocell subsurface feature, which is sufficient to bio-treat the entire tributary area of the road. In order to minimize maintenance of the landscaping biocells while maximizing water quality treatment of runoff from the streets, a minimum length of 25 ft of parkway bioswale will be provided upstream of each landscaping biocell feature to control sediments and organic particulates from entering the biocells. [30]

In specific locations, there may be additional capacity within the parkway bioswales to accommodate additional biocell enhancement beyond the requirements for treating the design capture volume for the street drainage. In these locations, the biocells may be expanded to treat additional runoff from adjacent lots, parking surfaces, and other hardscape areas. These locations and extent of the biocell enhancement will be documented in the final WQMPs for the associated phases of development.

GREEN STREET TREATMENT POTENTIAL					
Green Street with Landscaping Biocells	Area	Minimum Design Capture Volume[b]	Minimum Treatment Capacity[c]	BMP Type	Primary Treatment Mechanism
Arterial Streets	19.42 acres	0.94 ac-ft	~0.94 ac-ft	Green Street Biocells/Bioswales	Bio-treatment[d]
Collector Streets	4.14 acres	0.20 ac-ft	~0.2 ac-ft	Green Street Biocells/Bioswales	Bio-treatment

ac-ft acre feet

a Refer to Exhibit 2 – Proposed Hydrology Map for locations of the drainage boundaries used for BMP calculations.
b Minimum design capture volume is the required SQDV for the contributing street drainage areas. Detailed calculations are provided in Appendix E.
c Minimum treatment capacity assumes approximately 25% of the proposed parkway bioswales include the biocell sub-surface component at the downstream end of the swale, sufficient to treat the design capture volume for associated street runoff.. In some areas, the biocell sub-surface enhancements may be expanded to bio-treat additional areas beyond the street drainage where feasible.
d "Bio-treatment" is generally defined as soil and plant-based filtration BMPs, such as bioretention where the runoff volume is filtered through vegetation and soil filtration layers. Bio-treatment BMPs that release treated flows off-site are subject to feasibility criteria per OC DAMP and Countywide Model WQMP. Where feasible, infiltration of treated runoff will be utilized.

Table 5.8 Summary of BMP sizing for green street features.

[30] Claytor, R.A., & Schueler, T.R. (1996, December). *Design of Stormwater Filtering Systems.* Silver Spring, MD: The Center for Watershed Protection.

The use of the landscaping biocells within the parkway bioswales in combination with other interior LID features will result in significant treatment and reduction of runoff at the source of the development areas. Each biocell will be designed to accommodate the required treatment volume, and flow beyond this requirement will be designed to bypass the features for conveyance into the traditional storm drain system. In those instances where the LID features are not sufficient to handle treatment requirements independently, water quality calculations will quantify how much the additional treatment is required by the next downstream LID feature or water quality basin.

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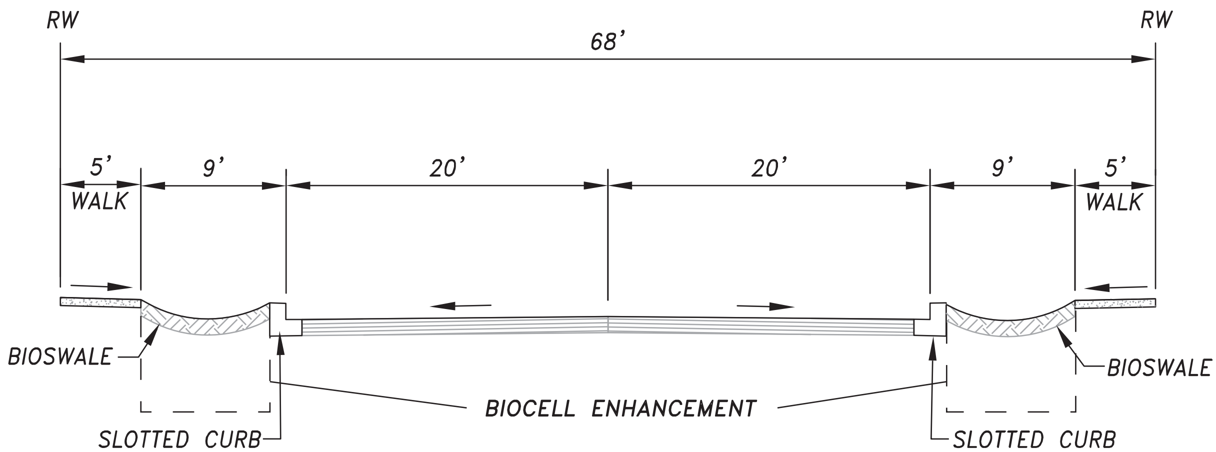
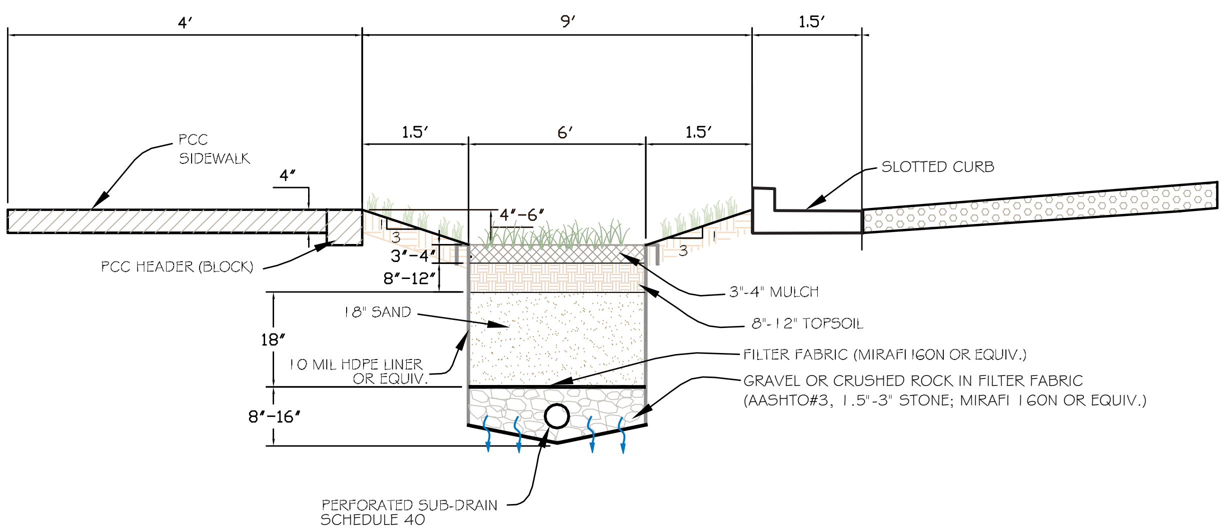


TYPICAL GREEN STREET W/ BIOSWALE SECTION



BIOCELL ENHANCEMENT CROSS SECTION

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Figure 17: Typical Green Street w/ Biocell Enhancement

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Infiltration and Sub-Drain Systems

LID features will include sub-drains where necessary to ensure flows are treated, collected and either (1) distributed to the Lowland Area and Arroyo canyon bottom for evapotranspiration and infiltration benefits; (2) reused on-site for irrigation and other allowable uses; or (3) discharged back to the backbone storm drain system for delivery off-site in accordance with bio-treatment feasibility criteria. Although heavy reliance on infiltration within the development footprint or near coastal bluff-tops is not expected or desired, field percolation tests will be performed throughout the site to determine if perforated sub-drains may be allowed within the proposed LID features and landscaping biocell features for minor infiltration within the shallow soil layers.

Maintenance Considerations

Based on the high level of reliance of the LID features for water quality treatment, maintenance of the facilities and enforcement of the appropriate measures to control the loading of sediment-causing clogging from entering these features will be required. For the landscaping biocells and other LID landscaping features, the key components to ensuring the long-term functionality of each system include the following:

- Minimum pre-treatment lengths of parkway bioswales upstream of bio-treatment feature such as landscaping biocells to maximize sediment and particulate capture (25 ft recommended).
- Trash and debris removal (typically 1x/week).
- Weeding, trimming, and landscape maintenance (typically monthly) to ensure the vegetative height does not prohibit runoff from entering the biocell.
- Visual inspection for health of vegetation, excess ponded water, and excess trapped sediment and debris (minimum 4x/year).
- Inspect inlet/outlet facilities for signs of damage, and clean out as necessary.
- Integrated pest management (IPM) to reduce reliance on pesticides in accordance with City standards and guidelines.

5.3.5 REGIONAL NATURAL TREATMENT SYSTEMS & WATER QUALITY BASINS

The proposed Project will also incorporate the use of water quality basins to provide the backbone treatment system for the majority of the site. The size of the basins will account for any upstream LID features that treat and retain the design capture volume independently.

Water quality basins are typically designed with a small debris/entrapment area, a spreading ground, and a deeper pool prior to discharging out the riser tower. Regional water quality basins are typically planted emergent wetland bottoms with vegetated side slopes that impound surface runoff and gradually filtrates through the sub-soil. The detained runoff is filtered through the soil beneath the basin, removing both fine and soluble pollutants. Removal mechanisms include absorption, filtering, and microbial decomposition in the basin subsoil. Due to the slow velocity, fine particles will settle in the bottom of the channel and vegetation will uptake fertilizers and nutrients (e.g., nitrogen and phosphorous), soluble metals, microbial contaminants, pesticides and organic matter. The underlying clays in the native soil below the sub-surface permeable soil will provide absorption sites for heavy metals, nutrients and other pollutants for further treatment.[31] To increase treatment potential and storage areas, sub-surface improvements can be made to introduce bioretention enhancements to the water quality basins. Over-excavating the lower portion of the basin floor 36-48 inches and replacing with sand and soil layers to increase storage, treatment capacity and increased filtration processes serve to improve the effectiveness of the basins. For the Lowland Area, the introduction of bioretention components serves to increase the chance of infiltration into the Lowland soils. For those water quality basins along the fringes of the development adjacent to the coastal bluff-tops, the entire system must be lined with sub-drains to reduce infiltration into the soils and provide long-term integrity of the soils. Bio-treated flows will be either discharged off-site or collected and reused on-site in accordance with the new Countywide Model WQMP feasibility criteria.

Community Water Quality Basins

Similar to the example provided under Section 5.3.4 for landscaping biocells, the Project analyzed the potential for implementing water quality basins at the perimeter buffer areas to accommodate the water quality treatment requirements for the tributary residential areas. The basins within the perimeter trail parkways as well as the multi-family residential areas were evaluated to determine the appropriate footprints and depths required to treat the required volume based on the upstream drainage areas. In addition, the potential for utilizing landscaping biocells within the parkway bioswales in lieu of water quality basins was also evaluated for several of the drainage areas. The results are summarized in Table 5.9 below, and detailed calculations are provided in Appendix E. The total design capture volume noted in the table represents the requirement for the entire development.

[31] California Stormwater Quality Association (CASQA). California Stormwater BMP Handbook for New Development and Redevelopment. January 2003.

WATER QUALITY BASINS TREATMENT SUMMARY							
Development Area	Drainage Area[a]	Runoff Coefficient	Minimum Design Capture Volume[b]	BMP Capacity[c]	BMP Type	Treatment Mechanism(s)	% of Site Design Capture Volume
LOWLANDS DRAINAGE AREA							
Medium/Medium-Low/Low Density Residential (SD-D)	60.54	0.66	2.32 ac-ft	~6.2 ac-ft	Multi-Use Basin	Evapotranspiration, Retention	44%
Mixed Use Residential (SD-F)	4.57	0.75	0.20 ac-ft	~0.20 ac-ft	WQ Basin(s) or equivalent BMP	Evapotranspiration, Retention	
SOUTHERN ARROYO/SEMENIUK SLOUGH DRAINAGE AREAS							
Medium/Medium-Low/Low Density Residential (SD-C)	21.54	0.63	0.79 ac-ft	~0.79 ac-ft	WQ Basin(s) or equivalent BMP	Evapotranspiration, Reuse, Bio-treatment[d]	40%
Low Density/Visitor Resort Residential (SD-B)	31.48	0.65	1.2 ac-ft	~1.2 ac-ft	WQ Basin(s) or equivalent BMP	Evapotranspiration, Reuse, Bio-treatment	
Community Parks (SD-A)	22.41	0.26	0.30 ac-ft	~0.3 ac-ft	WQ Basin(s) or equivalent BMP	Evapotranspiration, Reuse, Bio-treatment	
OTHER							
Community Park w/ WQ Basin for Off-site Flows[d]	2.39	0.71	0.10 ac-ft	+0.1 ac-ft	WQ Basin	Evapotranspiration, Retention	1%
Green Streets[e]	17.52	0.83	0.84	~0.84 ac-ft	Biocells & Bioswales	Evapotranspiration, Bio-treatment	15%
Total Design Capture Volume			5.79 ac-ft	9.63 ac-ft	--	--	100%

ac-ft acre feet
SD storm drain
WQ water quality

a Refer to Exhibit 2 – Proposed Hydrology Map for locations of the drainage boundaries used for BMP calculations.
b Sizing is approximate based on minimum SQDV for contributing drainage areas of proposed for development. Detailed calculations are provided in Appendix E.
c Minimum treatment capacity assumes approximately 25% of the proposed parkway bioswales include the biocell sub-surface component at the downstream end of the swale, sufficient to treat the design capture volume for associated street runoff.. In some areas, the biocell sub-surface enhancements may be expanded to bio-treat additional areas beyond the street drainage where feasible. "Bio-treatment" is generally defined as soil and plant-based filtration BMPs, such as bioretention where the runoff volume is filtered through vegetation and soil filtration layers. Biotreatment BMPs that release treated flows off-site are subject to feasibility criteria per OC DAMP and Countywide Model WQMP. Where feasible, infiltration of treated runoff will be utilized.
d Acreage and sizing refers to on-site park area only. Water quality basin will be sized for additional upstream, off-site flows, of which are not included in this table. Refer to Appendix E for additional calculations for off-site tributary area.
e Green streets that are located outside of the above listed drainage areas. For total green street acreages, refer to Table 5.8 and Appendix E.

Table 5.9 Summary of BMP sizing for water quality basins.

Figure 15 provides a typical representation of how the water quality basins may be integrated within the design of the Project. Similar to the landscaping biocell transitional features, the use of water quality basins at multiple locations throughout the site, in combination with other LID and green street features, will result in a significant treatment of runoff from the development areas.

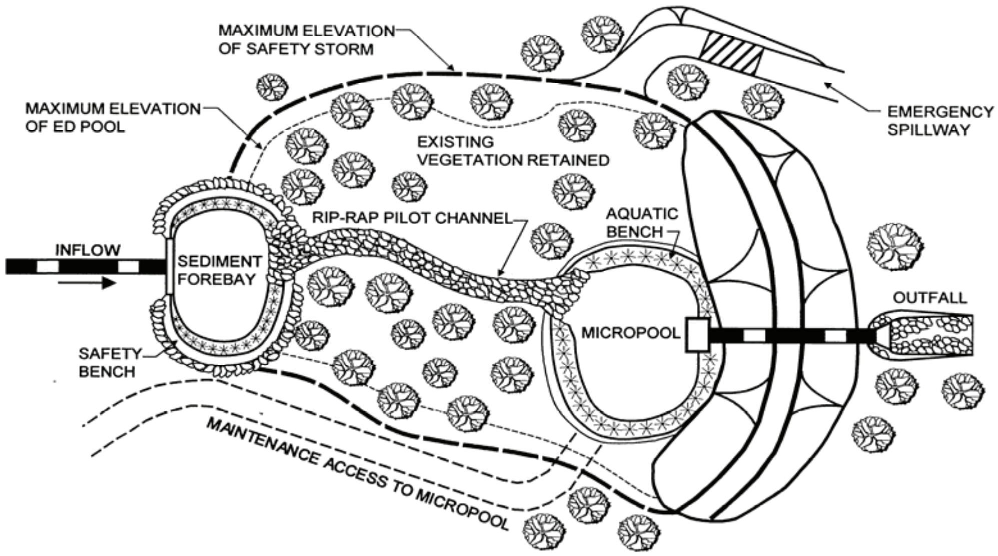
Water Quality Basin for Off-Site Runoff

One regional water quality facility will be implemented to accommodate the off-site treatment of urban runoff from areas tributary to the Southern Arroyo. The off-site drainage area located within the City of Costa Mesa encompasses approximately 48 acres and is 100% built-out. The regional facility will be designed to accommodate approximately 2.3-acre-feet of water quality treatment, which will accommodate all urban runoff (dry weather) and almost the entire first-flush event in terms of water quality treatment control standards. In addition, the basin will also provide detention capabilities to reduce peak flow runoff discharging into the Southern Arroyo. Refer to Figure 15 for location of the proposed basin treating off-site runoff.

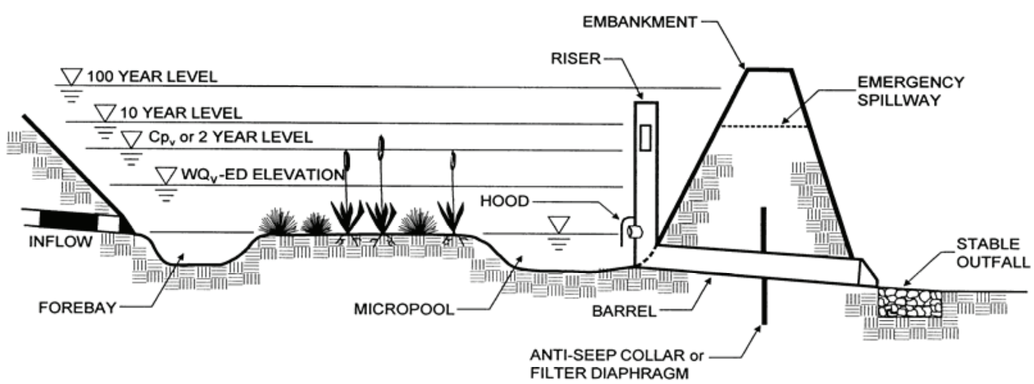
Dual-Purpose Water Quality Basin

A regional basin is also proposed within the Lowland Area of the property (see Figure 15). This basin will also serve as a diffuser basin to control the rate at which water drains from the development areas on top of the Mesa down to the Lowlands. The basin will also serve as the downstream water quality basin for Storm Drain Systems D & E, dependent upon how much treatment is required after accounting for the upstream LID facilities. The water quality basin has the capacity to accommodate approximately 6 acre-feet of treatment and without the use of any upstream LID features, approximately 2.3 acre-feet of treatment is required. Therefore, the combination of LID features and Lowlands water quality basin will provide sufficient water quality treatment of the design capture volume for the largest drainage area (Storm Drains D & E) of the proposed Project. Treated flows from this basin will remain on-site and will be discharged into the Lowlands for infiltration, evapotranspiration and habitat nourishment benefits.

Figure 17 provides a typical representation of a water quality extended detention basin for the proposed Project. Elements of the typical extended detention basin will be incorporated into the regional and community water quality basins.



PLAN VIEW



PROFILE

Schematic of an Extended Detention Basin (MDE, 2000)

SOURCE: CA STORMWATER BMP HANDBOOK; TC-22 (JANUARY 2003 - ERRATA 5-06)

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Figure 18: Typical Extended Detention Water Quality Basin

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<u>*Other Design & Maintenance Considerations*</u>

Similar to the LID features discussed previously, for areas with unsuitable soil or slope stability issues, the water quality basins would include sub-drains to collected treated flows within 48-72 hours to prevent vector issues. Field percolation tests will be performed to determine whether infiltration would be feasible or if sub-drains are required for areas throughout the site. To the maximum extent, all sub-drains will be perforated to promote infiltration into the sub-grade within the allowable amounts as specified by the geotechnical engineer.

Water quality basins left un-maintained can be a source of sediment containing concentrated pollutants from the residential areas and also a source for mosquito breeding. These can be considered an environmental impact if left unmanaged. Operation and maintenance (O&M) activities for the water quality basins to prohibit these impacts would include the following:

- Conducting frequent site inspections by qualified personnel to observe the integrity of the facility over time.
- Removal of any trash and debris removal on regularly scheduled intervals (monthly) and after all rain events.
- Irrigation system inspection and adjustment to ensure proper nourishment of plant palette without excessive watering.
- Minor vegetation removal/thinning and replanting when necessary.
- Integrated pest management (IPM) to reduce reliance on pesticides in accordance with City standards and guidelines.

5.4 WATER QUALITY IMPACT ASSESSMENT

Under existing conditions, the Newport Banning Ranch project site consists of former oil operations and open space areas. No project design features or BMPs for water quality exist under the current conditions for the site.

Under the proposed conditions, site design and LID features will be integrated throughout the development areas of the Project to address pollutants of concern from the project site. In addition, treatment control BMPs are proposed to assist with the treatment of runoff, as well as treating off-site runoff from upstream areas that drain towards the Southern Arroyo. Overall, the Project will provide water quality treatment that exceeds water quality regulations for the long-term protection against downstream impacts on adjacent habitat areas and downstream receiving waters.

The impact assessments are based on the significance criteria established in Section 1.4 for water quality. The impact assessments are based on the proposed drainage system inclusive of project design features and water quality BMPs within the Project areas.

Impact A *Would the Project violate any water quality standards or waste discharge requirements?*

Impact Analysis: Based on the proposed LID features and other source control and treatment control BMPs, the proposed Project will treat runoff prior to exiting the project site. As a result of the project design features, LID features, source control and selected treatment control BMPs, water quality exceedances are not anticipated, and pollutants are not expected in Project runoff that would adversely affect beneficial uses in downstream receiving waters. Individual assessments are provided below:

- Sediment: Sediments are typically characterized into two main categories: course sediment that includes large sand grains, pebbles, etc. and fine particulate sediments that include total suspended solids (TSS). Of concern to water quality are the fine particulate sediments that are more typically associated with sheet erosion. Due to the increase in impervious surfaces (buildings, roads, sidewalks), the proposed Project will result in a corresponding decrease in sheet erosion potential through less exposed areas, which is considered beneficial to water quality. However, during the construction of the proposed Project, sediment has the potential to move off-site due to the exposed condition of the site. In order to reduce the amount of sediment discharged off-site due to construction activities, the Project will implement and effective combination of erosion and sediment control BMPs in conformance with the General Construction Permit (GCP). During the post-development condition, any sediment and TSS generated from the development areas will be collected in the proposed LID features (such as vegetated parkway bioswales with enhanced biocells) and treatment control BMPs (regional and community water quality basins), all of which are considered effective for targeting pollutants typically associated with these impervious surfaces. Further, measures will be taken to stabilize the eroding tributaries entering the Southern Arroyo thereby controlling the amount of sediment available for transport to the Semeniuk Slough. Lastly, the diffuser basin at the downstream end of the Arroyo will also provide an additional measure to control sediment loading into the Semeniuk Slough. As a result, sediment impacts to water quality are considered less than significant.
- Trash & Debris: Urban development can generate significant amounts of trash and debris if not properly managed. The proposed Project is not expected to increase the amount of potential trash and debris generated on-site. However, the Project will implement additional measures, such as source control measures and treatment BMPs, to minimize the adverse impacts of trash and debris. Source control measures such as periodic sweeping, litter patrol, and storm drain stenciling will be effective in reducing the amount of trash and debris leaving the site. The proposed LID features and treatment BMPs also possesses moderate to high removal effectiveness for trash and debris. Based on these proposed features, impacts from trash and debris for the proposed Project are less than significant.
- Oil & Grease: The Project can implement several source control measures to reduce the amount of oil and grease in storm water from the project site. Maintenance activities, vehicle and equipment fueling and waste handling that have the potential to introduce oil and grease related compounds will be strictly prohibited in outdoor areas where they could potentially come into contact with rain. In addition, porous pavement is effective at removing oil and grease from storm water runoff. Based the incorporation of source control and treatment control measures, levels of oil and

grease or other hydrocarbons such as PAHs that could adversely affect beneficial uses of the Project's receiving waters or exceed water quality standards are not anticipated. Impacts on water quality, as a result of the proposed Project, are less than significant.

- Bacteria & Pathogens: Based on the existing literature and land use/pollutant categories, the existing and proposed Project may be a source of pathogens, especially during storm water runoff conditions. Since natural sources of pathogens are difficult to control (such as wild animal waste), the focus of the Project source control measures is on human-related (anthropogenic) and residential sources. In order to reduce the proposed pathogen contributions from the project site, the following source control measures are recommended for implementation:
  - Landscaping with efficient irrigation design to control runoff and allowing for maximum infiltration opportunities.
  - Proper monitoring and maintenance of landscaped areas to remove accumulated dead plant material and debris.
  - Landscape maintenance activities that include the removal of animal feces.
  - Activity restrictions on outdoor mat washing and equipment cleaning related to restaurant and dining activities, which potentially contribute bacteria entrained in storm water, as well as waste accumulation and disposal methods.
  - LID features (such as vegetated parkway bioswales and enhanced biocells) and treatment control BMPs (water quality basins) further treat bacteria in storm water runoff via filtration and infiltration.
- Nutrients: Nutrients, particularly nitrogen and phosphorous found within common fertilizers, can be of a concern based on the potential for over-application and over use. Low demand irrigation systems with slow release fertilizers are recommended to be used on-site to ensure minimal runoff from irrigation that has the potential to transport nutrients in runoff. Slow-release fertilizers are inorganic fertilizers that slowly release nutrients at a slower rate and are less susceptible to leaching and loss of fertilizer in runoff from rain events. In addition, source control measures such as provisions against applying fertilizers proximate to expected rain events are also recommended. Through the proper implementation of source control design measures, there is no expected increase of nutrients in runoff from the project site. Based on the water quality BMP plan and treatment of the entire design capture volume, nutrients are not anticipated in Project runoff at levels that could adversely affect water quality or beneficial uses in downstream receiving waters and potential nutrient impacts are less than significant.
- Pesticides: Pesticides can be of a concern based on potential uses as well as previous uses in the past. Under the proposed condition, the localized LID features and treatment control BMPs throughout the project site will assist in the removal of pesticides adsorbed to sediment. Low demand irrigation systems consistent with City standards will be used on-site ensuring minimal runoff from irrigation that has the potential to transport pesticides in runoff. In addition, source control measures such as provisions against applying pesticides prior to expected rain events and the use of properly certified pesticide workers will be required. This will be consistent with City standards and guidelines for Integrated Pest Management (IPM). As a result, it is

anticipated that water quality standards will not be exceeded, and potential pesticide impacts are less than significant.

- Metals: Copper, lead and zinc are the most common metals found in urban runoff. Other trace metals such as chromium, mercury and nickel are not usually detected in urban runoff or are measured at very low levels. The proposed Project will result in increases in metals due to the additional streets and parking lot land uses proposed for the site. The incorporation of the LID features throughout the project site will offset these increases and provide a means for the settling of metals attached to particulates as well as vegetative uptake of metals. Additional source control measures, such as street and parking lot sweeping, will also reduce the potential for metals to reach the storm drain system. As a result, it is anticipated that water quality standards will not be exceeded, and potential impacts from metals are less than significant.
- Oxygen Demanding Substances: Oxygen-demanding substances include all organic materials, which consume oxygen as they decompose. Animal droppings, sewage overflows, fallen leaves, and grass clippings are a few examples of oxygen-demanding substances. The combination of LID features, source control measures and treatment control BMPs are aimed at reducing the potential for these types of substances to be created on-site, and the structural measures including the LID features will provide a means to remove the potential for these substances to enter the downstream water bodies. Impacts of oxygen demanding substances are considered less than significant.
- Dry Weather Flow: Although the previous discussions have focused on wet weather flows, dry weather flows are also important. Dry weather flows due to anthropogenic sources have the potential to impact local receiving water bodies. Dry weather flows are typically low in course sediment due to the low-flow rates but pollutants associated with suspended solids (such as phosphorous, trace metals, pesticides) are typically found in low concentrations in dry weather flows. The project is not expected to generate significant amounts of dry weather flows due to the drought tolerant landscaping and the use of efficient irrigation systems consistent with City standards, the lack of high intensive water use activities on-site, and the use of integrated storm water landscaping features to collect, hold and treat these flows and eliminate dry flow discharges (LID features and treatment control BMPs). Therefore, there are no significant impacts anticipated with respect to water quality as a result of dry weather flows.
- Vector Control: The use of integrated storm water landscaping (e.g., parkway bioswales and enhanced biocells) for storm water treatment increases the potential for vector issues due to the potential for standing water in these features. The potential for mosquito breeding is considered a risk when ponding water exists greater than 72 hours. Thus, the estimated depths of ponding within the portions of the parkway bioswales containing the biocell enhancement features will range from 4-6 inches and will be designed to infiltrate and/or discharge from the facility within 24-36 hours. Similar vector control precautions will occur with the proposed water quality basin facilities. The ponding depth for these facilities will be 24-36 inches and will be designed to drain within 36-48 hours. In the event additional vector control is needed, a number of abatement measures will be used consistent with local standards, including habitat reduction (reconfiguring of plant palettes), temporary flooding and drying (draining) of the basins, trapping and killing pests, and

biochemical pesticides (i.e., the bacteria *Bacillus sphaericus* [Bs] and *Bacillus thuringiensis israeliensus* [Bti]).

- Construction-Related Impacts: Clearing, grading, excavation and construction activities associated with the proposed Project could impact water quality due to sheet erosion of exposed soils and subsequent deposition of particles and pollutants in drainage ways or introduction of construction-related pollutants. Based on the preliminary risk assessment, the proposed Project is considered a Risk Level 2 site. Risk Level 2 dischargers that pose a medium risk to water quality are subject to technology-based numeric action levels (NALs) for pH and turbidity. Should the Project exceed a pH range of 6.5-8.5 or turbidity of 250 NTU, the discharger is required to immediately determine the source associated with the exceedance and to implement corrective actions if necessary to mitigate the exceedance. It is not anticipated that ATS will be needed for the proposed Project; instead, traditional erosion and sediment control BMPs will be employed.

  Under the Statewide GCP (Order 2009-0009-DWQ), the Project proponents will submit a Notice of Intent (NOI) and associated PRDs to the SWRCB prior to commencement of construction activities. In addition, a SWPPP will be prepared and implemented at the project site, and revised as necessary as administrative or physical conditions change. The SWPPP will describe construction BMPs meeting the BAT/BCT standards required by the GCP and that addresses pollutant source reduction, and will ensure that water quality standards are not exceeded in downstream receiving waters due to construction activities. These include, but are not limited to erosion controls, sediment controls, tracking controls, non-storm water management, materials & waste management, and good housekeeping practices. The SWPPP shall be developed in accordance with the construction plans. The SWPPP shall provide construction BMPs that are to be maintained for the duration of the construction as well as measures that are specific to each phase of construction.

Impact F Would the Project otherwise substantially degrade water quality?

Impact Analysis: As a result of the construction-related, site design/LID, source control, and additional treatment control BMPs, water quality exceedances are not anticipated, and pollutants are not expected in Project runoff that would adversely affect beneficial uses in downstream receiving waters. Therefore, impacts to water quality are considered less than significant. See Impact Analysis to Impact A for additional details.

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6.0 EXHIBITS

EXHIBIT 1	Rational Method Hydrology Map for Proposed Condition
EXHIBIT 2	Rational Method Hydrology Map for Proposed Condition

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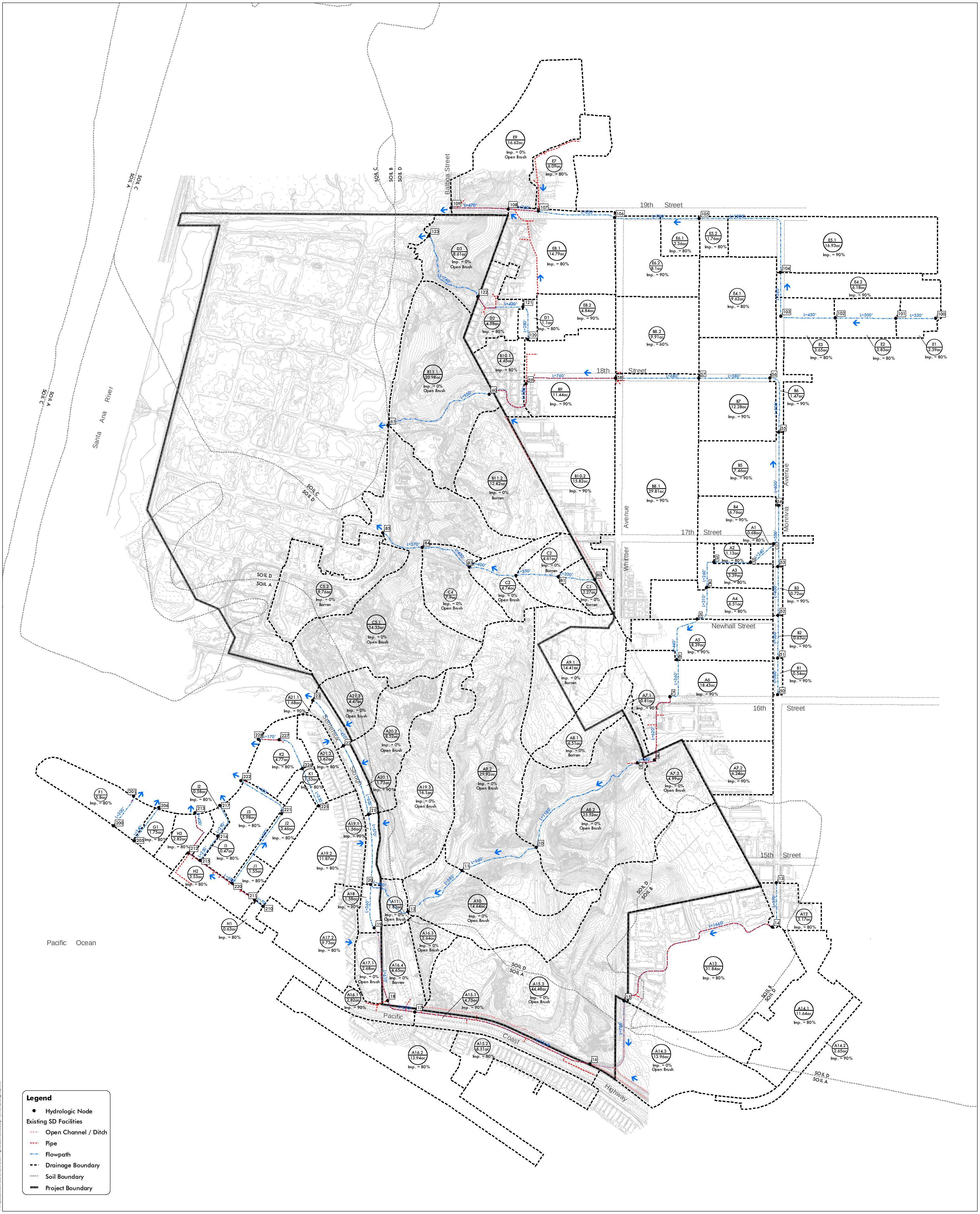

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EXHIBIT 1: Rational Method Hydrology Map for Existing Condition

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Scale: 1" = 200'

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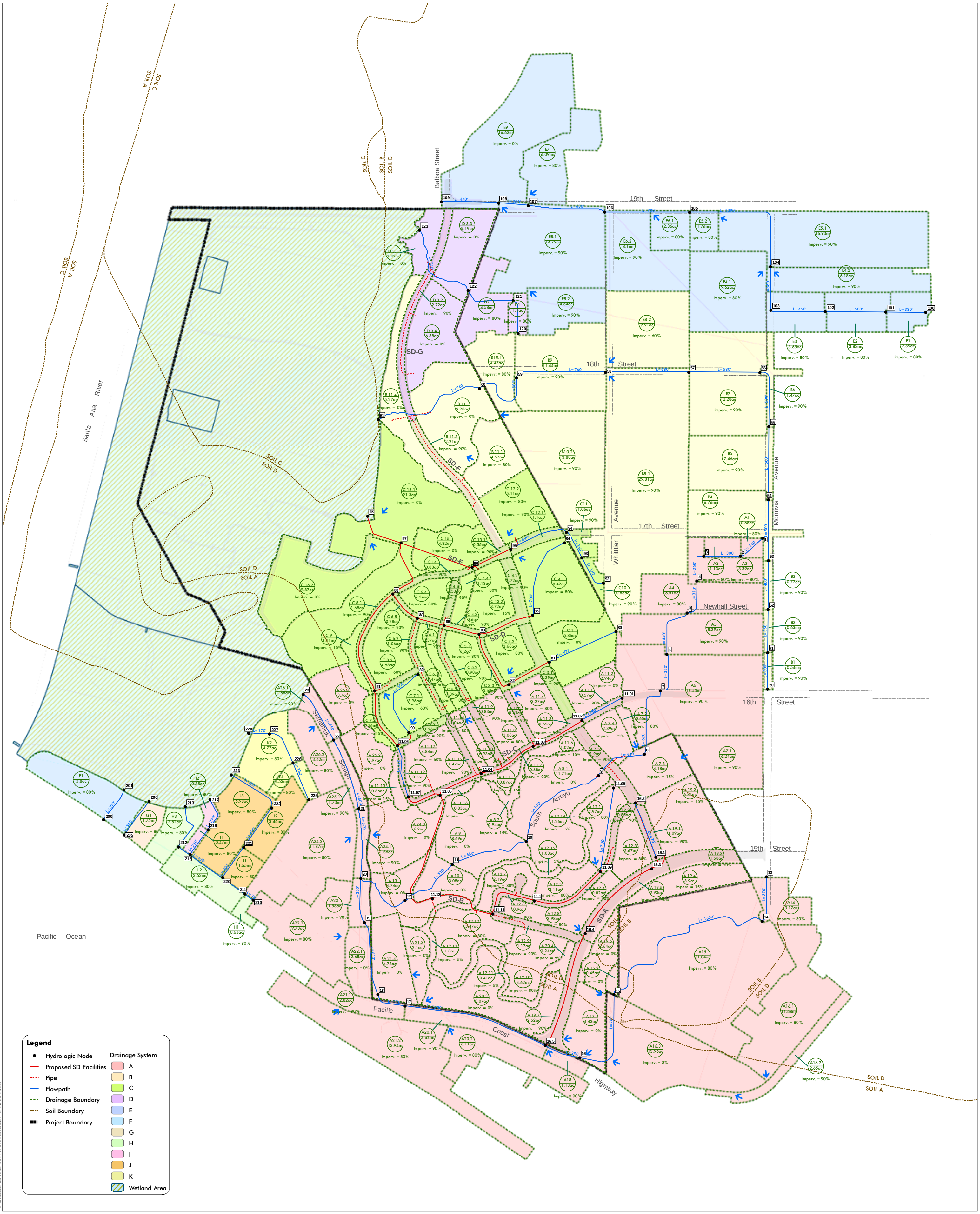

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EXHIBIT 2: Rational Method Hydrology Map for Proposed Condition

June 30, 2011

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7.0 TECHNICAL APPENDICES

(bound separately)

APPENDIX A STUDY RELATED DOCUMENTS

- A1 Salt Marsh Restoration Plan from USACOE
- A2 FEMA Map

APPENDIX B HYDROLOGY CALCULATIONS

- B1 Existing Condition Rational Method Calculations
  - a) High Confidence Events
    - i. HC 100-Year Storm Event
    - ii. HC 25-Year Storm Event
    - iii. HC 10-Year Storm Event
  - b) Expected Value (50% Confidence) Events
    - i. EV 100-Year Storm Event
    - ii. EV 2-Year Storm Event
- B2 Proposed Condition Rational Method Calculations
  - a) High Confidence Events
    - i. HC 100-Year Storm Event
    - ii. HC 25-Year Storm Event
    - iii. HC 10-Year Storm Event
  - b) Expected Value (50% Confidence) Events
    - i. EV 100-Year Storm Event
    - ii. EV 2-Year Storm Event
- B3 Existing Condition Small Area Unit Hydrograph Calculations
  - a) High Confidence Events
    - i. Infiltration Analysis
    - ii. HC 100-Year Storm Event
    - iii. HC 25-Year Storm Event
    - iv. HC 10-Year Storm Event
  - b) Expected Value (50% Confidence) Events
    - i. Infiltration Analysis
    - ii. EV 100-Year Storm Event
    - iii. EV 2-Year Storm Event
- B4 Proposed Condition Small Area Unit Hydrograph Calculations

a) High Confidence Events
   i. Infiltration Analysis
   ii. HC 100-Year Storm Event
   iii. HC 25-Year Storm Event
   iv. HC 10-Year Storm Event

b) Expected Value (50% Confidence) Events
   i. Infiltration Analysis
   ii. EV 100-Year Storm Event
   iii. EV 2-Year Storm Event

APPENDIX C HEC-RAS MODELING

C1 HEC-RAS Modeling Report for Northerly Arroyo Channel under Existing Condition

C2 HEC-RAS Modeling Report for Northerly Arroyo Channel under Proposed Condition

C2 HEC-RAS Modeling Report for Southerly Arroyo Channel under Existing Condition

C3 HEC-RAS Modeling Report for Southerly Arroyo Channel under Proposed Condition

APPENDIX D WATER BUDGET ANALYSIS

D1 Northerly Arroyo under Existing Condition

D2 Northerly Arroyo under Proposed Condition

D3 Southerly Arroyo under Existing Condition

D4 Southerly Arroyo under Proposed Condition

D5 ET Reference Material

APPENDIX E BEST MANAGEMENT PRACTICES

E1 Site Design/LID BMPs

E2 Source Control BMPs

E3 LID / Treatment Control BMP Calculations