Jurisdictional Wetlands/Waters Delineation Report

Harvard Avenue and Michelson Drive
Intersection Improvement Project

September 25, 2019

Prepared for:

City of Irvine
1 Civic Center Plaza
Irvine, CA 92606

Prepared by:

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Prepared by  (signature)

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Abbreviations

amsl	above mean sea level
BSA	Biological Study Area
CDFW	California Department of Fish and Wildlife
FAC	Facultative
FACW	Facultative-Wetland
FACU	Facultative-Upland
CWA	Clean Water Act
HUC	Hydrologic Unit Code
I-405	Interstate 405
MCVII	Manual of California Vegetation, Second Edition
NRCS	Natural Resources Conservation Service
OBL	Obligate
OHWM	Ordinary High Water Mark
Project	Harvard Avenue and Michelson Drive Road Widening Project
RWQCB	Regional Water Quality Control Board
Stantec	Stantec Consulting Services Inc.
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish & Wildlife Service

1.0 INTRODUCTION

1.1 PURPOSE OF THE REPORT

This report presents the findings of an investigation of potential jurisdictional features conducted by Stantec Consulting Services Inc. (Stantec) for the City of Irvine's Harvard Avenue and Michelson Drive Intersection Improvement Project (Project) in Irvine, California (refer to Appendix A, Figure 1). The assessment of jurisdictional wetlands, other "waters of the U.S.," waters of the State, and California Department of Fish and Wildlife (CDFW) jurisdictional waters was conducted on September 6, 2019 by Stantec biologists Rocky Brown and Sarah Toback. This assessment was conducted to determine the extent of resources under the jurisdiction of the U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and CDFW that occur within the Biological Survey Area (BSA), which includes the Project components and a surrounding 100-foot buffer zone.

1.2 PROJECT LOCATION

The Project site is located in central Orange County, California, within the U.S. Geological Survey Newport Beach 7.5-minute topographic quadrangle, in the City of Irvine. The Project encompasses the intersection of Harvard Avenue and Michelson Drive approximately 0.1 mile south of Interstate 405 (I-405). A photographic log for the survey is included in Appendix B.

1.3 PROJECT DESCRIPTION

Harvard Avenue and Michelson Drive are both two-lane primary arterials within the City of Irvine's roadway network. Both Harvard Avenue and Michelson Drive currently experience high combined morning (AM) and evening (PM) traffic volumes during weekdays. Because of these volumes, level of service along these roadways can be adversely affected during these periods, resulting in motorists experiencing considerable traffic delays, conditions that would be expected to further deteriorate as additional growth in the area occurs.

The proposed Project is intended to improve the operation of the intersection, relieve congestion during both AM and PM peak hours, and to alleviate existing queuing conditions to accommodate projected traffic in the area through 2035. To accomplish this, the Project will widen the northeast and northwest quadrants of Harvard Avenue to accommodate a new roadway design as well as implement the following ancillary improvements:

- Shared Use Path – An approximate 10 feet wide concrete shared use path extending approximately 700 feet in length along the west side of southbound Harvard Avenue, adjacent to the Irvine Lanes parking lot would be constructed and serve as a replacement to the existing sidewalk. An additional 10 feet wide concrete shared use path extending approximately 130 feet would also be constructed along south side of eastbound Michelson Drive, adjacent to the University Synagogue. These off-street concrete shared use paths would provide access to both pedestrians and bicyclists along these sections of the roadways.

- Sidewalks – With the exception of the two new shared use paths, all sidewalks associated with the project area and associated intersection would remain in their current condition and would be 5 feet in width.
- Class II On-Street Bike Lane – A new 6 feet wide Class II on-street bike lane would be constructed along the west side of southbound Harvard Avenue (immediate vicinity of the I-405 bridge) and would also provide a connection to the shared use path. A new 5 feet wide Class II on-street bike lane will also be provided along the east side of westbound Michelson Drive.
- Curb Returns – New curb returns along the southwest and northwest quadrants of Harvard Avenue would be constructed.
- "Pork Chop" – The existing "Pork Chop" along eastbound Michelson Drive at southbound Harvard Avenue would be eliminated in order to improve the intersection's operational characteristics and a standard right turn lane would be provided.
- Lane and Crosswalk Restriping – In order to accommodate the new intersection geometries and lane configurations, restriping of the roadway and intersection are needed and would include all through and turning lanes and crosswalks for all roadway quadrants.
- Parkway/Landscaping – Roadway improvements would require the removal and/or trimming of existing landscaping along the west side of southbound Harvard Avenue and the north and south sides of Michelson Drive west of the intersection and adjacent slope. A total of 0.956 acres pervious and impervious surfaces would be affected and 20 trees would potentially be removed, relocated, or replaced. To the extent practicable, replacement trees would be planted, based upon a City-approved landscaping plan. The particular specie of street/landscaping tree and its diameter at breast height for the replacement would be included in the landscaping plan during final design.
- Storm Drain/Catchment Basins – An existing drainage (earthen swale) catchment located within the landscaping of the west side of southbound Harvard Avenue would need to be moved westerly. In addition, an existing catchment basin located on the north side of Michelson Drive west of the intersection would need to be re-constructed and would tie-in to the existing storm drain system.
- Street Lighting – A total of four street lights associated with southbound Harvard Avenue would need to be removed and reinstalled along this section of the roadway. Two street lights on new traffic signal poles at the intersection, and two along the west side of southbound Harvard Avenue. An additional two street lights associated with northbound Harvard Avenue and located on traffic signal poles at the northeast and southeast quadrants of Michelson Drive will be removed and reinstalled.

2.0 EXISTING SITE CONDITIONS

2.1 TOPOGRAPHY AND SURROUNDING LAND USES

Most of the BSA surrounding the Harvard/Michelson intersection is relatively flat at approximately 30 feet above mean sea level (amsl). However, Harvard Avenue slopes upward to approximately 60 feet amsl to the northeast of the intersection to pass over I-405 and the elevation dips to approximately 20 feet amsl along the section of the San Joaquin Wash running through the BSA, which parallels Harvard Avenue to the southeast. Land uses surrounding the intersection include a commercial recreational complex and associated parking to the northwest, a multi-family residential condominium complex to the northeast, a golf course to the southeast, and a synagogue and associated parking to the southwest.

2.2 VEGETATION COMMUNITIES AND LAND COVER TYPES

Generally, mapping and description of plant communities follows the classification system described in the second edition of A Manual of California Vegetation (MCVII) (Sawyer et al., 2009). Species scientific and common names correspond to those described in the second edition of The Jepson Manual (Baldwin et al., 2012). Vegetation communities and land uses are described below and depicted in Figure 2 in Appendix A.

All of the land within the BSA is developed. Ornamental landscaping is present throughout and dominates the vegetation composition where it exists, occupying islands in parking lots, median strips next to sidewalks, and spaces between Harvard Avenue and Michelson Drive and adjacent developments. Two such sections of ornamental landscaping, described below, are large enough and feature defining characteristics which allow for classification as their own vegetation community for the purposes of this report.

2.2.1 Vegetation Communities

ORNAMENTAL MYRTLE WATTLE (*ACACIA MYRTIFOLIA*)

In the northern portion of the BSA, on either side of Harvard Avenue, approximately 1.13 acres of sloped land built up to create the I-405 overcrossing are populated by a near monoculture of myrtle wattle (*Acacia myrtifolia*). The myrtle wattle shrubs form a contiguous canopy across the slopes that does not allow for the growth of other shrub or herb species, though a few ornamental trees to punctuate these areas.

EUCALYPTUS SPP. WOODLAND SEMI-NATURAL ALLIANCE (EUCALYPTUS GROVES)

To the south of the Harvard/Michelson intersection, approximately 0.87 acre of this habitat type occurs in the landscaped medians on either side of Harvard Avenue. They are dominated by lemon-scented gum trees (*Corymbia citriodora*) with an understory of pittosporum shrubs (*Pittosporum* spp.) along the east side of the road and St. Augustine grass (*Stenotaphrum secundatum*) on the west side.

2.2.2 Land Cover Types

DEVELOPED/DISTURBED LAND

This land cover type was mapped within the approximately 9.8 acres of the Survey Area that are developed, including built out areas, paved roadways and parking lots, and landscaped areas solely featuring ornamental species. In general, these areas are unvegetated or contain planters occupied by ornamental species such as bougainvillea (*Bougainvillea* spp.), lily of the Nile (*Agapathus praecox*), honeysuckle (*Lonicera* spp.), greater periwinkle (*Vinca major*), and silk floss tree (*Ceiba speciosa*). These areas are generally regularly maintained, precluding any significant growth of non-ornamental species, but may be sparsely interspersed with ruderal pioneer plant species that readily colonize open disturbed soil, including yellow sweetclover (*Melilotus indicus*), scarlet pimpernel (*Lysimachia arvensis*), and bristly ox tongue (*Helminthotheca echioides*), as well as other non-native grasses and forbs.

2.3 CLIMATE

The weather of inland Orange County is characteristic of the Mediterranean climate typical of southern California. It is characterized by warm, dry summers and wetter, cooler winter months with relatively low amounts of rainfall. According to data collected by the Santa Ana Fire Station weather station, the nearest active weather station to the BSA, the annual high temperature in the region averages 75.8 °F (degrees Fahrenheit) and the annual low temperature average is 52.0 °F. The region typically receives an average annual rainfall of 13.69 inches, with the majority of rainfall occurring November through April. This data was collected during the period of record of 1903 to 2016 (WRCC, 2019).

2.4 HYDROLOGY AND GEOMORPHOLOGY

The BSA is located within the Newport Bay Watershed (HUC 18070204). The Newport Bay Watershed is approximately 154 square miles and located in the central region of Orange County. There are nine cities that are located partially or fully within the watershed: Costa Mesa, Irvine, Lake Forest, Laguna Hills, Laguna Woods, Newport Beach, Orange, Santa Ana, and Tustin. The main tributary of the watershed is the San Diego Creek, which drains into the Upper Newport Bay (USEPA, 2019), of which the San Joaquin Wash is a tributary.

The Newport Bay Watershed is bordered by the Sana Ana Mountains in the north and east, the San Joaquin Hills to the west and southwest, and ends at the Pacific Ocean coast. Between the Santa Ana Mountains and the San Joaquin Hills lies the Tustin Plain, which is a flat, alluvial plain. Runoff that originates in the northern hills flows south through flood control channels, into the San Diego Creek channel, through the Tustin Plain, and into the Upper Newport Bay (Orange County Watersheds, 2018).

2.5 GEOLOGY

The BSA is located within the City of Irvine, California. This area is located within central Orange County, which is part of the Peninsular Range Natural Province of southern California, a system of northwesterly trending ridges that extend from the Transverse Ranges south into Baja California. The topography of this

province is characterized by irregular coastal plains in the west, as well as prominent ridges, peaks, valleys, and subdued upland areas as one moves south and east (Jahns, 1954).

2.6 SOILS

Prior to conducting the delineation, historic soils data from the Natural Resources Conservation Service (NRCS) was used to determine potential soil types that may occur within the BSA, including where hydric soils have historically occurred (refer to Appendix A, Figure 3). Table 1 identifies the soils historically known to occur within the BSA and characteristics of these soils are summarized in Appendix C. Only one of the soils listed in Table 1 appears on the NRCS hydric soils list: Omni clay, drained.

Table 1 Historic Soil Units Occurring within the BSA

Map Unit Symbol	Map Unit Name	Description	Acres Within BSA
111	Balcom clay loam, 9 to 15 percent slopes	A well-drained soil that occurs on hills; parent material consists of calcareous residuum weathered from sandstone and shale; clay loam (0-34”), weathered bedrock (34-59”).	0.52
140	Chino silty clay loam, drained	A somewhat poorly drained soil that occurs on alluvial fans at elevations between 30 and 750 feet; parent material consists of alluvium derived from sedimentary rock; low runoff; silty clay loam (0-60”).	1.15
184	Omni clay, drained*	A poorly drained soil that occurs on depressions at an elevation of 20 feet; parent material consists of mixed alluvium; clay (0-17”), silty clay, clay (17-60”).	9.18
196	San Emigdio fine sandy loam, moderately fine substratum, 0 to 2 percent slopes	A well-drained soil that occurs on alluvial fans at elevations between 10 and 700 feet; parent material consists of alluvium derived from sedimentary rock; very low runoff; fine sandy loam (0-7”), stratified gravelly loamy coarse sand to very fine sandy loam (7-40”), silty clay loam (40-44”), stratified gravelly loamy coarse sand to very fine sandy loam (44-61”).	0.94

* Indicates a NRCS-listed hydric soil

3.0 REGULATORY BACKGROUND

The USACE Regulatory Program regulates activities pursuant to Section 404 of the Federal Clean Water Act (CWA); the CDFW regulates activities under California Fish and Game Code Sections 1600-1607; and the RWQCB regulates activities under Section 401 of the CWA and the California Porter-Cologne Water Quality Control Act. Refer to Appendix D for additional details on regulatory authorities and background.

4.0 WATERS/WETLANDS DELIENATION

4.1 DELINEATION METHODOLOGY

This section describes the methods employed by Stantec during the surveys conducted on September 6, 2019, to determine the extent of potentially jurisdictional wetlands and/or waters that occur within the BSA. Prior to conducting the field assessment, Stantec reviewed current and historic aerial photographs, detailed topographic maps, and soil maps of the BSA (USDA, 2019), The National Wetlands Inventory (USFWS, 2019), and local and state hydric soil lists (NRCS, 2018) to evaluate the potential jurisdictional features that may occur in the BSA.

During the field assessment, hydrologic features were mapped over recent aerial photograph base maps using the ESRI® Collector for ArcGIS app on an Apple® iPad® coupled with a Bad Elf® GNSS Surveyor sub-meter external global positioning system unit (refer to Appendix A, Figure 4). Mapping was further refined in the office using ArcGIS (version 10.6) with aerial photograph base maps with an accuracy of one foot, and the total jurisdictional area for each regulatory jurisdiction was calculated.

Federal Wetlands/Waters and Waters of the State

Where present, jurisdictional non-wetland “waters of the U.S.” and “waters of the State” are delineated based on the limits of the ordinary high-water mark (OHWM) as determined by changes in physical and biological features, such as bank erosion, deposited vegetation or debris, and vegetative characteristics. Where present, jurisdictional wetlands are delineated using a routine determination in accordance with the methods outlined in the USACE Wetland Delineation Manual (Environmental Laboratory, 1987) and the Arid West Supplement (Environmental Laboratory, 2011) and based on three wetland parameters: dominant hydrophytic vegetation, wetland hydrology, and hydric soils. See Tables 1 and 2 in Appendix E (Potential Geomorphic and Vegetative Indicators of OHWM for the Arid West) for a list of key physical features used to determine the OHWM identified by the Arid West Manual.

CDFW Jurisdictional Waters

CDFW jurisdiction are delineated to the top of the banks of the channel and/or to the edge of contiguous riparian canopy/riparian habitat. Therefore, the total acreage of CDFW jurisdictional waters is often greater than the combined acreage of federal/state jurisdictional waters/wetlands. Top of bank is determined based on changes in slope (“hinge points”) and the uppermost point is used in order to conservatively estimate top of bank.

4.1.1 Wetland Vegetation

Vegetation percent cover is visually estimated for plant species in each of the four strata (tree, sapling/shrub, herb, and woody vine), and species in each stratum are ranked based on canopy dominance (USACE, 2016). Species with a total percent cover of at least 50 percent and species with 20 percent coverage within each stratum are recorded on the Field Data Sheets (50/20 Rule). Wetland

indicator status is assigned to each dominant species using the USACE Arid West Regional Wetland Plant List (2016), the California subregion of the National List of Vascular Plan Species that Occur in Wetlands: 1996 National Summary (USFWS, 1997); and Wetland Plants of Specialized Habitats in the Arid West (USACE, 2007). If greater than 50 percent of the dominant species from all strata are Obligate (OBL), Facultative-Wetland (FACW), or Facultative (FAC) species, the criteria for wetland vegetation is considered met (refer to Appendix E, Table 3, Summary of Wetland Indicator Status).

4.1.2 Wetland Hydrology

The presence of wetland hydrology is assessed by evaluating the presence of primary and secondary hydrology indicators (refer to Appendix E, Tables 4 and 5). Wetland hydrology indicators are tiered into two categories (primary and secondary indicators). The presence of one primary indicator from either group is indicative of sufficient wetland hydrology, while two or more secondary indicators must be present to indicate sufficient wetland hydrology. Indicators are intended to be one-time observations of site conditions representing evidence of wetland hydrology when hydrophytic vegetation and hydric soils are present (Environmental Laboratory, 2011). OHWM is estimated using the boundaries of in-stream channels or the change in slope at the toe of the bank, as appropriate. Surface water was present within the San Joaquin Wash during the September 6, 2019, survey.

4.1.3 Wetland Soils

Soils data from the NRCS are referenced to determine if hydric soils have been previously documented and/or historically occurred in or near the BSA (Appendix A, Figure 3). Based on this review, one hydric soil type (Omni clay, drained) was expected to occur, having been mapped throughout the majority of the BSA. However, based on the extensive development in the region, the historic characteristics of the soils are likely significantly compromised. Tables 6 and 7 in Appendix E include a complete list of hydric soils indicators.

Typically, routine delineation procedures require that at least one soil test pit be dug within each distinct habitat type in the area to be surveyed. However, the San Joaquin Wash is fenced off throughout the BSA and was not able to be accessed during Stantec's September 6, 2019, survey. Therefore, no soil test pits were explored for this assessment.

4.2 RESULTS

Plants observed within the BSA is listed in below in Table 2 along with their wetland indicator status.

Table 2 Plant Species Observed within the BSA

Scientific Name	Common Name	Wetland Indicator Status*
Acacia myrtifolia	myrtle wattle	--
Agapanthus praecox	lily of the Nile	--
Atriplex semibaccata	Australian saltbush	FAC
*Baccharis salicifolia***	mulefat	FAC
Bougainvillea sp.	bougainvillea	--
Ceiba speciosa	silk floss tree	--
Centaurea solstitialis	yellow star thistle	--
Citrus limon	lemon tree	--
Corymbia citriodora	lemon-scented gum	--
Cynodon dactylon	Bermuda grass	FACU
*Datura stramonium***	jimson weed	--
Encelia sp.**	encelia	--
Erigeron bonariensis	flax-leaved horseweed	FACU
*Erigeron canadensis***	Canada horseweed	FACU
Heliotropum sp.	heliotrope	--
Helminthotheca echioides	bristly ox tongue	--
*Heteromeles arbutifolia***	toyon	--
Jacaranda mimosifolia	blue jacaranda	--
Lonicera sp.	honeysuckle	--
Lysimachia arvensis	scarlet pimpernel	--
Malva parviflora	cheeseweed	--
Melilotus indicus	annual yellow sweetclover	FACU
Olea sp.	olive	--
Phoenix canariensis	Canary Island palm	--
Pinus sp.	pine	--
Pittosporum sp.	pittosporum	--
*Platanus racemosa***	California sycamore	FAC
Plumbago auriculata	cape leadwort	UPL
Plumeria sp.	plumeria	--
Portulacea oleracea	common purslane	FAC
Salsola australis	Russian thistle	--
Schinus terebinthifolius	Brazilian pepper tree	--
*Solanum nigrum***	black nightshade	FACU
Stenotaphrum secundatum	St. Augustine grass	--
Vinca major	greater periwinkle	--

Scientific Name	Common Name	Wetland Indicator Status*
Washingtonia robusta	Mexican fan palm	FACW

* Some species have not been assigned a Wetland Indicator Status by the resource agencies; therefore, one is not listed for those species. Wetland Indicator Status codes are defined below.

** Native species

Wetland Indicator Status Definitions

OBL – Obligate Wetland: Occurs almost always in wetlands under natural conditions

FACW – Facultative Wetland: Usually occurs in wetlands, but often found in non-wetlands

FAC – Facultative: Equally likely to occur in wetlands or non-wetlands

FACU – Facultative Upland: Usually occurs in non-wetlands, but often found in wetlands

UPL – Obligate Upland: Occurs almost always in non-wetlands under natural conditions

(+) or (-) with Facultative categories: positive (+) or negative (-) sign is used to more specifically define the regional frequency of occurrence in wetlands. The positive sign indicates a frequency towards the higher end of the category (more frequently found in wetlands). A negative sign indicates a frequency toward the lower end of the category (less frequently found in wetlands).

The National Wetlands Inventory has mapped the San Joaquin Wash as an R2ABFx feature (Riverine, Lower Perennial, Aquatic Bed, Semi-permanently Flooded, Excavated) (data is from 2006) (USFWS, 2019). Based on the data collected in the field, two types of jurisdictional waters occur within the BSA. These include USACE/RWQCB non-wetland waters of the U.S. and CDFW jurisdictional waters (Figure 4 in Appendix A).

4.2.1 Wetland Waters of the United States/State

Based on Stantec's professional opinion following an assessment of hydrology and vegetation, no portion of the San Joaquin Wash within the BSA would satisfy the three-criteria definition required to be considered federal or state wetlands (Environmental Laboratory, 1987 and 2011; USACE, 2008a and 2008b). While a detailed assessment of soils could not be conducted due to access restrictions, based on Stantec's experience and field observations, it does not appear that hydric soils would be present in the drainage channel within the BSA, nor would the vegetation satisfy the 50/20 rule.

4.2.2 Federal Non-Wetlands Waters

The San Joaquin Wash passes through the BSA, paralleling Harvard Avenue to the southeast. As described in Section 2.4, this drainage is a tributary to San Diego Creek, with their confluence approximately 335 feet to the southwest of the BSA. San Diego Creek ultimately enters into the Pacific Ocean through Upper Newport Bay. The Pacific Ocean is a Traditionally Navigable Water and, due to its direct connectivity via San Diego Creek, San Joaquin Wash would be also be considered non-wetland waters of the U.S./State.

Based on the limits of the OHWM through the section of the San Joaquin Wash that passes through the BSA, approximately 0.23 acre of waters of the U.S./State occur within the BSA, none of which is expected to be impacted by the Project.

4.2.3 CDFW Jurisdictional Waters

Based on Stantec's professional opinion following an assessment of hydrology and the presence of bed and bank, there is a total of approximately 0.49 acre of CDFW jurisdictional waters present within the section of the San Joaquin Wash which passes through the BSA, none of which is expected to be impacted by the Project.

5.0 SUMMARY AND CONCLUSIONS

The BSA supports non-wetland waters of the U.S./State and CDFW jurisdictional waters within the confines of the San Joaquin Wash. Surface water was present within the wash during the survey event. Based on Stantec's professional opinion following an assessment of hydrology, vegetation, and the limits of the OHWM, there is a total of approximately 0.23 acre of non-wetland waters of the U.S./State and 0.49 acre of CDFW jurisdictional waters within the Survey Area.

No CDFW jurisdictional waters or waters of the U.S./State are expected to be impacted by the Project. However, if Project-related impacts to jurisdictional areas are required, the Project proponent will need to secure regulatory permitting from the CDFW, USACE, and/or RWQCB.

The conclusions presented above represent Stantec's professional opinion based on our knowledge and experience with the applicable regulatory agencies, including their technical guidance documents and manuals. However, the USACE, CDFW, and RWQCB have final authority in determining the status and presence of jurisdictional wetlands/waters and the extent of their boundaries.

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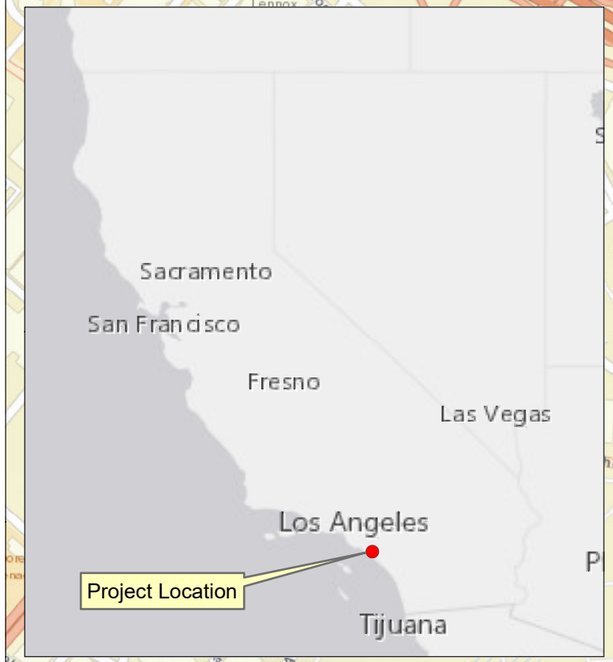
Appendix A FIGURES



Biological Study Area

0 170 340 metres

(At original document size of 11x17)
1:9,000

N

Notes
1. Coordinate System: NAD 1983 2011 StatePlane California VI FIPS 0406 Ft US
2. Data Sources:
3. Background: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Stantec

Project Location
Irvine, California

Prepared by DL on 2019-09-10
TR by RB on 2019-09-10
IR Review by JV on 2019-09-10

Client/Project
2042557300
Harvard Avenue and Michelson Drive Intersection Improvement Project

Figure No.
1

Title
Project Location

Biological Study Area

Vegetation Communities & Land Cover Types

- Disturbed/Developed
- *Eucalyptus* spp. Woodland Semi-Natural Alliance
- Ornamental (*Acacia myrtifolia*)

0 40 80 metres

(At original document size of 11x17)
1:2,391

N

Stantec

Project Location
Irvine, California

Prepared by DL on 2019-09-10
TR by RB on 2019-09-10
IR Review by JV on 2019-09-10

Client/Project
2042557300
Harvard Avenue and Michelson Drive Intersection Improvement Project

Figure No.
2

Title
Vegetation Communities & Land Cover Types

Notes
1. Coordinate System: NAD 1983 2011 StatePlane California VI FIPS 0406 Ft US
2. Data Sources:Stantec 2019
3. Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Biological Study Area

Map Unit Symbol

- 111
- 140
- 184
- 196

0 40 80 metres

(At original document size of 11x17)
1:2,388

N

Stantec

Project Location
Irvine, California

Prepared by DL on 2019-09-10
TR by RB on 2019-09-10
IR Review by JV on 2019-09-10

Client/Project
2042557300

Harvard Avenue and Michelson Drive Intersection Improvement Project

Figure No.
3

Title
Historical Soil Types

Notes
1. Coordinate System: NAD 1983 2011 StatePlane California VI FIPS 0406 Ft US
2. Data Sources: Stantec 2019, NRCS 2019.
3. Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
4. See section XXX in XXXX report

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Biological Study Area
Federal Non-Wetland Waters of the U.S./ Waters of the State
CDFW Jurisdictional Waters

0 40 80 metres
(At original document size of 11x17)
1:2,271

N

Stantec

Project Location
Irvine, California

Prepared by DL on 2019-09-10
TR by RB on 2019-09-10
IR Review by JV on 2019-09-10

Client/Project
2042557300
Harvard Avenue and Michelson Drive Intersection Improvement Project

Figure No.
4

Title
Potentially Jurisdictional Features

Notes
1. Coordinate System: NAD 1983 2011 StatePlane California VI FIPS 0406 Ft US
2. Data Sources: Stantec 2019
3. Background: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Appendix B SITE PHOTOGRAPHS

Stantec

Photographic Log

Client:	**City of Irvine**	**Project:**	**Harvard Avenue and Michelson Drive Road Widening Project**
Site Name:	**Harvard Avenue/Michelson Drive**	**Site Location:**	**Irvine, California**

Photograph ID: 1

Direction:
Northeast

Survey Date:
9/6/2019

Comments:
Looking down Harvard Avenue toward the Harvard Avenue/Michelson Drive intersection from the southern end of the BSA. San Joaquin Wash is beyond the eucalyptus trees on the right side of the photograph.

Photograph ID: 2

Direction:
Northeast

Survey Date:
9/6/2019

Comments:
San Joaquin Wash - looking upstream from Michelson Drive crossing.

Stantec

Photographic Log

Client:	**City of Irvine**	**Project:**	**Harvard Avenue and Michelson Drive Road Widening Project**
Site Name:	**Harvard Avenue/Michelson Drive**	**Site Location:**	**Irvine, California**

Photograph ID: 3

Direction:
Southwest

Survey Date:
9/6/2019

Comments:
San Joaquin Wash - looking downstream from Michelson Drive crossing.

Photograph ID: 4

Direction:
Northeast

Survey Date:
9/6/2019

Comments:
San Joaquin Wash - looking upstream from southern end of BSA.

Appendix C HISTORIC SOILS INFORMATION

Orange County and Part of Riverside County, California

111—Balcom clay loam, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcll
Mean annual air temperature: 61 to 63 degrees F
Frost-free period: 260 to 320 days
Farmland classification: Not prime farmland

Map Unit Composition

Balcom and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Balcom

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 34 inches: clay loam
H2 - 34 to 59 inches: weathered bedrock

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: 24 to 36 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: CLAYEY (1975) (R019XD001CA)
Hydric soil rating: No

Minor Components

Bosanko, clay

Percent of map unit: 5 percent
Hydric soil rating: No

Calleguas, clay loam
Percent of map unit: 4 percent
Hydric soil rating: No

San andreas, sandy loam
Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 2 percent
Hydric soil rating: No

140—Chino silty clay loam, drained

Map Unit Setting
National map unit symbol: hcmj
Elevation: 30 to 750 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 63 to 65 degrees F
Frost-free period: 320 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Chino and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chino

Setting
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile
A - 0 to 24 inches: silty clay loam
C1 - 24 to 37 inches: silty clay loam
C2 - 37 to 60 inches: silty clay loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None

Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Bolsa, silty clay loam

Percent of map unit: 10 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Omni, clay

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Mocho, loam

Percent of map unit: 3 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sorrento, clay loam

Percent of map unit: 2 percent
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

184—Omni clay, drained

Map Unit Setting

National map unit symbol: hcny
Elevation: 20 feet
Mean annual precipitation: 14 to 17 inches

Mean annual air temperature: 57 to 63 degrees F
Farmland classification: Farmland of statewide importance

Map Unit Composition

Omni and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Omni

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 17 inches: clay
H2 - 17 to 60 inches: silty clay, clay
H2 - 17 to 60 inches:

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 17.5 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Hydric soil rating: Yes

Minor Components

Chino, silty clay loam, drained

Percent of map unit: 10 percent
Hydric soil rating: No

Bolsa, silty clay loam, drained

Percent of map unit: 5 percent
Hydric soil rating: No

196—San Emigdio fine sandy loam, moderately fine substratum, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcpb
Elevation: 10 to 700 feet
Mean annual precipitation: 12 to 81 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

San emigdio and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of San Emigdio

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, flat
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

H1 - 0 to 7 inches: fine sandy loam
H2 - 7 to 40 inches: stratified gravelly loamy coarse sand to very fine sandy loam
H3 - 40 to 44 inches: silty clay loam
H4 - 44 to 61 inches: stratified gravelly loamy coarse sand to very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: A
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

Metz, loamy sand
Percent of map unit: 5 percent
Hydric soil rating: No

Hueneme, fine sandy loam
Percent of map unit: 5 percent
Hydric soil rating: No

Sorrento, sandy loam
Percent of map unit: 5 percent
Hydric soil rating: No

Appendix D REGULATORY BACKGROUND

Regulatory Background Information

Section 404 of the Clean Water Act (CWA)

Section 404 of the CWA regulates the discharge of dredged material, placement of fill material, or certain types of excavation within "waters of the U.S." (resulting in more than incidental fallback of material) and authorizes the Secretary of the Army, through the Chief of Engineers, to issue permits for such actions. Permits can be issued for individual projects (individual permits) or for general categories of projects (general permits). "Waters of the U.S." are defined by the CWA as "rivers, creeks, streams, and lakes extending to their headwaters and any associated wetlands." Wetlands are defined by the CWA as "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions." The USACE has adopted several revisions to their regulations in order to more clearly define "waters of the U.S." Until the beginning of 2001, "waters of the U.S." included, among other things, isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not part of a tributary system to interstate waters or to navigable "waters of the U.S."

The jurisdictional extent of USACE regulation changed with the 2001 SWANCC (Solid Waste Agency of Northern Cook County) ruling. The U.S. Supreme Court held that the USACE could not apply Section 404 of the CWA to extend their jurisdiction over an isolated quarry pit. The Court ruled that the CWA does not extend Federal regulatory jurisdiction over non-navigable, isolated, intra-state waters. However, the Court made it clear that non-navigable wetlands adjacent to navigable waters are still subject to USACE jurisdiction.

Section 401 of the CWA

Section 401 of the CWA requires that any applicant for a Federal permit for activities that involve a discharge to 'waters of the State,' shall provide the Federal permitting agency a certification from the State in which the discharge is proposed that states that the discharge will comply with the applicable provisions under the Federal Clean Water Act. Therefore, before the USACE will issue a Section 404 permit, applicants must apply for and receive a Section 401 Water Quality Certification from the RWQCB. Applications to the RWQCB must include a complete CEQA document (e.g., Initial Study/Mitigated Negative Declaration).

Section 1602 of the California Fish and Game Code

Section 1602 of the California Fish and Game Code requires any person, State or local governmental agency, or public utility which proposes a project that will substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake, or use materials from a streambed, or result in the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake, to first notify the CDFW of the proposed project. Notification is generally required for any project that will take place in or in the vicinity of a river, stream, lake, or their tributaries. This includes rivers or streams that flow at least periodically or permanently through a bed or channel with banks that support fish or other aquatic life and watercourses having a surface or subsurface flow that support or have supported riparian vegetation. Based on the notification materials

submitted, the CDFW will determine if the proposed project may impact fish or wildlife resources. If the CDFW determines that a proposed project may substantially adversely affect existing fish or wildlife resources, a Lake or Streambed Alteration Agreement (SAA) will be required. A completed CEQA document must be submitted to CDFW before a SAA will be issued.

Appendix E ARID WEST INDICATOR TABLES

Table 1. Potential Geomorphic Indicators of Ordinary High Water Marks for the Arid West

(A) Below OHW	(B) At OHW	(C) Above OHW
1. In-stream dunes 2. Crested ripples 3. Flaser bedding 4. Harrow marks 5. Gravel sheets to rippled sands 6. Meander bars 7. Sand tongues 8. Muddy point bars 9. Long gravel bars 10. Cobble bars behind obstructions 11. Scour holes downstream of obstructions 12. Obstacle marks 13. Stepped-bed morphology in gravel 14. Narrow berms and levees 15. Streaming lineations 16. Desiccation/mud cracks 17. Armored mud balls 18. Knick Points	1. Valley flat 2. Active floodplain 3. Benches: low, mid, most prominent 4. Highest surface of channel bars 5. Top of point bars 6. Break in bank slope 7. Upper limit of sand-sized particles 8. Change in particle size distribution 9. Staining of rocks 10. Exposed root hairs below intact soil layer 11. Silt deposits 12. Litter (organic debris, small twigs and leaves) 13. Drift (organic debris, larger than twigs)	1. Desert pavement 2. Rock varnish 3. Clast weathering 4. Salt splitting 5. Carbonate etching 6. Depositional topography 7. Caliche rubble 8. Soil development 9. Surface color/tone 10. Drainage development 11. Surface relief 12. Surface rounding

Table 2. Potential Vegetation Indicators of Ordinary High Water Marks for the Arid West

	(D) Below OHW	(E) At OHW	(F) Above OHW
Hydroriparian indicators	1. Herbaceous marsh species 2. Pioneer tree seedlings 3. Sparse, low vegetation 4. Annual herbs, hydromesic ruderals 5. Perennial herbs, hydromesic clonals	1. Annual herbs, hydromesic ruderals 2. Perennial herbs, hydromesic clonals 3. Pioneer tree seedlings 4. Pioneer tree saplings	1. Annual herbs, xeric ruderals 2. Perennial herbs, non-clonal 3. Perennial herbs, clonal and non-clonal co-dominant 4. Mature pioneer trees, no young trees 5. Mature pioneer trees w/upland species 6. Late-successional species
Mesoriparian Indicators	6. Pioneer tree seedlings 7. Sparse, low vegetation 8. Pioneer tree saplings 9. Xeroriparian species	5. Sparse, low vegetation annual herbs, hydromesic 6. ruderals 7. Perennial herbs, hydromesic clonals 8. Pioneer tree seedlings 9. Pioneer tree saplings 10. Xeroriparian species 11. Annual herbs, xeric ruderals	7. Xeroriparian species 8. Annual herbs, xeric ruderals 9. Perennial herbs, non-clonal 10. Perennial herbs, clonal and non-clonal codominent 11. Mature pioneer trees, no young trees 12. Mature pioneer trees, xeric understory 13. Mature pioneer trees w/upland species 14. Late-successional species 15. Upland species
Xeroriparian indicators	10. Sparse, low vegetation 11. Xeroriparian species 12. Annual herbs, xeric ruderals	12. Sparse, low vegetation 13. Xeroriparian species 14. Annual herbs, xeric ruderals	16. Annual herbs, xeric ruderals 17. Mature pioneer trees w/upland species 18. Upland species

Table 3. Summary of Wetland Indicator Status

Category		Probability
Obligate Wetland	OBL	Almost always occur in wetlands (estimated probability >99%)
Facultative Wetland	FACW	Usually occur in wetlands (estimated probability of 67–99%)
Facultative	FAC	Equally likely to occur in wetlands/non-wetlands (estimated probability of 34–66%)
Facultative Upland	FACU	Usually occur in non-wetlands (estimated probability 67–99%)
Obligate Upland	UPL	Almost always occur in non-wetlands (estimated probability >99%)
Non-Indicator	NI	No indicator status has been assigned

Source: Reed, 1988; USFWS, 1997; USACE, 2012.

Table 4. Wetland Hydrology Indicators*

Primary Indicators	Secondary Indicators
Watermarks	Oxidized Rhizospheres Associated with Living Roots
Water-Borne Sediment Deposits	FAC-Neutral Test
Drift Lines	Water-Stained Leaves
Drainage Patterns Within Wetlands	Local Soil Survey Data

*Table adapted from 1987 USACE Manual and Related Guidance Documents.

Table 5. Wetland Hydrology Indicators for the Arid West*

	Primary Indicator (any one indicator is sufficient to make a determination that wetland hydrology is present)	Secondary Indicator (two or more indicators are required to make a determination that wetland hydrology is present)
Group A – Observation of Surface Water or Saturated Soils		
A1 – Surface Water	X	
A2 – High Water Table	X	
A3 – Saturation	X	
Group B – Evidence of Recent Inundation		
B1 – Water Marks	**X** (Non-riverine)	**X** (Riverine)
B2 – Sediment Deposits	**X** (Non-riverine)	**X** (Riverine)
B3 – Drift Deposits	**X** (Non-riverine)	**X** (Riverine)
B6 – Surface Soil Cracks	X	
B7 – Inundation Visible on Aerial Imagery	X	
B9 –Water-Stained Leaves	X	
B10 – Drainage	X	X
B11 – Salt Crust	X	
B12 – Biotic Crust	X	
B13 – Aquatic Invertebrates	X	

Table 5. Wetland Hydrology Indicators for the Arid West*		
	Primary Indicator (any one indicator is sufficient to make a determination that wetland hydrology is present)	**Secondary Indicator (two or more indicators are required to make a determination that wetland hydrology is present)**
Group C – Evidence of Current or Recent Soil Saturation		
C1 – Hydrogen Sulfide Odor	X	
C2 – Dry-Season Water Table		X
C3 – Oxidized Rhizospheres along Living Roots	X	

*Table adapted from Regional Supplement to the USACE of Engineers Wetland Delineation Manual: Arid West Region, Version 2.0.

Table 6. Field Indicators of Hydric Soil Conditions*	
1. Indicators of Historical Hydric Soil Conditions	**2. Indicators of Current Hydric Soil Conditions**
a. Histosols b. Histic epipedons; c. Soil colors (e.g., gleyed or low-chroma colors, soils with bright mottles (Redoximorphic features) and/or depleted soil matrix d. High organic content in surface of sandy soils e. Organic streaking in sandy soils f. Iron and manganese concretions g. Soil listed on county hydric soils list	a. Aquic or peraquic moisture regime (inundation and/or soil saturation for *7 continuous days) b. Reducing soil conditions (inundation and/or soil saturation for *7 continuous days) c. Sulfidic material (rotten egg smell)

*Table adapted from 1987 USACE Manual and Related Guidance Documents.

Table 7. Hydric Soil Indicators for the Arid West*			
Hydric Soil Indicators	**Hydric Soil Indicators**	**Hydric Soil Indicators**	**Hydric Soil Indicators**
A1 – Histosol	S1 – Sandy Mucky Mineral	F1 – Loamy Mucky Mineral	A9 – 1 cm Muck
A2 – Histic Epipedon	S4 – Sandy Gleyed Matrix	F2 – Loamy Gleyed Matrix	A10 – 2 cm Muck
A3 – Black Histic	S5 – Sandy Redox	F3 – Depleted Matrix	F18 – Reduced Verti
A4 – Hydrogen Sulfide	S6 – Stripped Matrix	F6 – Redox Dark Surface	TF2 – Red Parent Material
A5 – Stratified Layers	—	F7 – Depleted Dark Surface	Other (See Section 5 of Regional Supplement, Version 2.0)
A9 – 1 cm Muck	—	F8 – Redox Depressions	—
A11 – Depleted Below Dark Surface	—	F9 – Vernal Pools	—
A12 – Thick Dark Surface	—	—	—

* Table adapted from Regional Supplement to the USACE of Engineers Wetland Delineation Manual: Arid West Region, Version 2.0. ** Indicators of hydrophytic vegetation and wetland hydrology must be present

Appendix F FIELD DATA SHEETS

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Irvine - Harvard/Michelson Intersection **Date:** 9/6/19 **Time:** 09 30
Project Number: 2041255300 **Town:** Irvine **State:** CA
Stream: San Joaquin Wash **Photo begin file#:** **Photo end file#:**
Investigator(s): R. Brown / S. Toback

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☒ / N ☐ Is the site significantly disturbed?

Location Details:

Projection: **Datum:** NAD 83
Coordinates: 33.670583; -117.833406

Potential anthropogenic influences on the channel system:
Channelized drainage in the City of Irvine → heavily urbanized. Box culvert (NE of survey area) → trapezoidal ditch → box culvert (at DS extent of survey area) → San Diego Creek

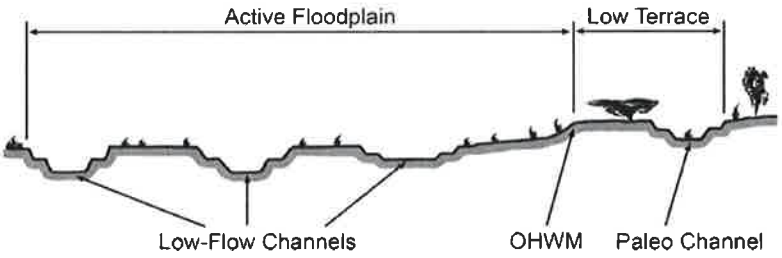
Brief site description:
Intersection of Harvard Ave & Michelson Dr.; surrounded by commercial, residential, golf course, & synagogue development. Creek banks are soil cement/cement debris rip-rap; soft bottom through survey area

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
- ☐ History of recent effective discharges
- ☐ Results of flood frequency analysis
- ☐ Most recent shift-adjusted rating
- ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

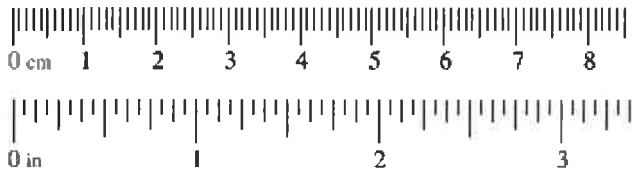


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☒ GPS
   - ☒ Digitized on computer
   - ☐ Other:

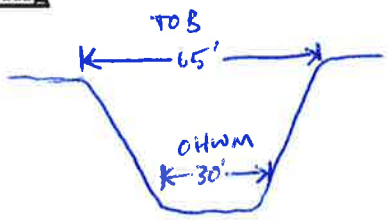
Wentworth Size Classes

Inches (in)	Millimeters (mm)	Wentworth size class	
10.08	256	Boulder	
2.56	64	Cobble	Gravel
0.157	4	Pebble	
0.079	2.00	Granule	
0.039	1.00	Very coarse sand	
0.020	0.50	Coarse sand	
1/2 0.0098	0.25	Medium sand	Sand
1/4 0.005	0.125	Fine sand	
1/8 0.0025	0.0625	Very fine sand	
1/16 0.0012	0.031	Coarse silt	
1/32 0.00061	0.0156	Medium silt	Silt
1/64 0.00031	0.0078	Fine silt	
1/128 0.00015	0.0039	Very fine silt	
		Clay	Mud



Project ID: Harvard/ Michelson **Cross section ID:** San Joaquin Wash **Date:** 9/6/19 **Time:** 0930

Cross section drawing:



OHWM

GPS point: _____

Indicators:

- [x] Change in average sediment texture
- [x] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Engineered channel w/ OHWM occupying bottom of trapezoidal drain. Soft bottom through survey area w/ surface water present. Emergent veg present at edges of OHWM & in shallow or exposed areas.

Floodplain unit: [ ] Low-Flow Channel [x] Active Floodplain [ ] Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: Bed = sand; banks = soil cement/riprap

Total veg cover: 5 % Tree: 0 % Shrub: 0 % Herb: 5 %

Community successional stage:

- [ ] NA
- [x] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [ ] Drift and/or debris
- [x] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

Single engineered trapezoidal channel.

Project ID: **Cross section ID:** **Date:** **Time:**

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____% Shrub: _____% Herb: _____%

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Comments: