THE CITY OF SAN DIEGO

June 17, 2015

Executive Officer
California Regional Water Quality Control Board
San Diego Region
Attn: 401 Certification Section; Project 09C-077
2375 Northside Drive Ste. 100
San Diego, CA 92108

Subject: Clean Water Act Section 401 Water Quality Certification for Tijuana River Valley Channel Maintenance Project, 09C-077 (reference 745397: lhonma)

Dear Executive Officer:

Pursuant to the Tijuana River Valley Channel Maintenance Project 401 certification, Project No. 09C-077, section IV, the City submits the Tijuana River Valley Channel Maintenance Project Receiving Water Monitoring Report.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Please feel free to contact Jamie Kennedy, Associate Planner, by phone at (619) 527-3495 or e-mail at JMKennedy@sandiego.gov, with questions or comments.

Respectfully,

Gene Matter
Assistant Deputy Director

GM/jk

Enclosure: Tijuana River Valley Channel Maintenance Project Receiving Water Monitoring Report, June 2015, prepared by Amec Foster Wheeler Environment & Infrastructure, Inc

TIJUANA RIVER VALLEY CHANNEL MAINTENANCE PROJECT
RECEIVING WATER MONITORING REPORT - DRAFT

Year 2- 2015 MONITORING EVENT

Prepared for:

City of San Diego
Transportation and Storm Water Department
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10 June 2015

Project No. 5025141106

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ACRONYMS AND ABBREVIATIONS

Symbol	Description
%	percent
AA	assessment area(s)
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
°C	degrees Celsius
CDFW	California Department of Fish & Wildlife
cm	centimeter
City	City of San Diego
CRAM	California Rapid Assessment Method
DO	dissolved Oxygen
EPA	Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera, and Trichoptera
ID	identification
In-situ	Measurements taken at the station
HBI	Hilsenhoff Biotic Index
km	kilometers
L	liter
MDL	method detection limit
m	meter(s)
mg	milligrams
N	nitrogen
NOLF	Naval Outlying Landing Field
NTU	Nephelometric turbidity units
ppt	part(s) per thousand
Project	Tijuana River Valley Channel Maintenance Project 09C-077
RWQCB	Regional Water Quality Control Board
RL	reporting limit
SBIWTP	South Bay International Wastewater Treatment Plant
SD	San Diego
SM	standard method
SWAMP	Surface Water Ambient Monitoring Program

Symbol	Description
SWI	Shannon Weiner Index
SWRCB	State Water Resources Control Board
TJ-PC-D	Downstream Tijuana River Pilot Channel station
TJ-PC-U	Upstream Tijuana River Pilot Channel station
TJ-SG-U	Upstream Smuggler’s Gulch station
TKN	total Kjeldahl nitrogen
TSS	total suspended solids
TSWD	Transportation and Storm Water Department
µS	microSiemens

1.0 INTRODUCTION

The City of San Diego (City) has implemented a maintenance dredging program within the Tijuana River Valley to restore storm water conveyance capabilities of selected channels and reduce the potential for flooding of nearby properties. The dredging removes between 10,000 and 30,000 cubic yards of dredge material each maintenance event from the Tijuana River Pilot Channel (Pilot Channel) and Smuggler's Gulch. In addition, the City is eradicating non-native plant species (e.g., Arundo (*Arundo donax*), Castor Bean (*Ricinus communis*), and Tamarisk (*Tamarix aphylla*)) in an 8.62 acre area within and adjacent to the maintenance area footprint.

The San Diego Regional Water Quality Control Board (RWQCB) issued an amendment to the Clean Water Act Section 401 Water Quality Certification (Certification) and acknowledged enrollment under State Water Resources Control Board (SWRCB) Order No. 2003-17-DWQ for Statewide General Waste Discharge Requirements for Dredged or Fill Discharges for the Tijuana River Valley Channel Maintenance Project 09C-077 (Project). The Certification required the Project to include the following three monitoring components to help quantify the potential impacts to the Tijuana River from the maintenance dredging of the Pilot Channel and Smuggler's Gulch:

1. Benthic Biological Monitoring (Section VI.C.1): Assessment of the effects of the project on the biological integrity of the Pilot Channel and Smuggler's Gulch by analyzing the benthic macroinvertebrate community.
2. Water Quality Assessment (Section VI.C.2): Analysis of the water quality through the collection of grab samples, which are to be analyzed for the constituents listed in the Certification.
3. California Rapid Assessment Method (CRAM) (Section VI.C.3): Quantitative function-based health assessment of the wetland and riparian habitat.

Each of the three components are to be implemented before maintenance begins, during the five-year maintenance period (before/during/after each annual maintenance event), and after maintenance is concluded at the completion of the five-year permit cycle. To quantify impacts, results of the three monitoring components will be compared over time and between locations. The data will be reviewed to determine whether there are discernible differences between initial-maintenance assessment, during-maintenance assessments, and final-maintenance assessment results.

This current report documents water quality, CRAM, and benthic biological monitoring for the 2014-2015 season (July 2014 – June 2015) performed on May 12, 2015. No maintenance dredging was performed during the 2014-2015 season; therefore, this report describes ambient conditions surrounding the dredge footprint.

This current monitoring effort follows four previous monitoring events: one pre-project event on January 31, 2013, and three events in association with the first maintenance dredging which occurred between September 2013 and February 2014. These three maintenance dredging monitoring efforts took place September 16, 2013 (pre-dredge), October 17, 2013 (during-dredge), and February 25, 2014 (post-dredge).

2.0 METHODS

2.1 Monitoring Stations

The monitoring locations were based on requirements outlined in the Certification which state that monitoring must occur both upstream and downstream of the maintenance area. Three locations in the immediate vicinity of the maintenance footprint were selected for water quality and CRAM monitoring (Table 2-1, Figure 2-1). The upstream Pilot Channel location (TJ-PC-U) is located approximately 170 meters (m) upstream of the Hollister Street Bridge (Figure 2-2). The downstream Pilot Channel (TJ-PC-D) location is located approximately 1,000 m west of the intersection of Sunset Avenue and Saturn Boulevard (Figure 2-3). The upstream Smuggler's Gulch location (TJ-SG-U) is located approximately 70 m upstream of the Monument Road crossing (Figure 2-4).

An October 2012 pre-project reconnaissance of the three bioassessment monitoring stations detailed in the Certification concluded that the upstream and downstream locations immediately surrounding the Project area were not viable locations for standard freshwater bioassessment sampling using SWAMP bioassessment protocols due to the following site conditions:

- The area immediately upstream of the dredge footprint on the Pilot Channel presented unsafe sampling conditions with deep water and soft fine sediment.
- The downstream location on the Pilot Channel consisted of saline conditions due to tidal influence.
- The upstream location on Smuggler's Gulch is dry for the vast majority of the year, only flowing briefly after a rain event.

In an effort to remain within the parameters and intent outlined in the Certification, it was determined that the downstream Pilot Channel location (see Table 2-1, Figure 2-3) which appeared to remain wetted year-round would be solely utilized for biological collections, as this would represent the location most influenced by dredging activities. However, given that this location occurs in a tidally influenced area, standard freshwater bioassessment methods and metrics would no longer apply at the downstream Pilot Channel location. Thus, a sediment biota sampling method similar to the Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality promulgated by the SWRCB (SWRCB, 2009) and the Sediment Quality Objectives (SQO) Technical Support Manual (SCCWRP, 2014) used in estuarine and marine environments was employed for the benthic biota collections. This method is further outlined in Section 2.4.

Table 2-1. Locations of Monitoring Stations

Station	Location	Monitoring Type	Latitude[(a)]	Longitude[(a)]
TJ-PC-U	Pilot Channel upstream of dredge footprint	Water quality & CRAM	32.550664	-117.081135
TJ-SG-U	Smuggler's Gulch upstream of dredge footprint	Water quality & CRAM	32.542451	-117.088147
TJ-PC-D	Pilot Channel downstream of dredge footprint	Water quality, CRAM, & Benthic biology	32.557994	-117.103539

Notes:
- NAD_1983_StatePlane_California_V_FIPS_0405_Feet WKID: 2229 Authority: EPSG

2.2 Water Quality Monitoring

Water was observed and collected at the upstream and downstream Pilot Channel locations. Water was not observed at the TJ-SG-U; therefore, no samples were collected there. Pre-cleaned sample bottles were obtained from the analytical laboratory for collection of water quality samples. The following sample handling protocols were utilized when collecting samples to minimize the possibility of contamination:

4. When the analytical methods did not require a chemical preservative, the sample bottle was used directly to collect the sample.
5. If the analytical method required preservation, a pre-cleaned bottle was used as a secondary container to collect the sample which was then transferred to the laboratory-provided analytical container.

Manual grab samples were collected by inserting the pre-cleaned bottle upside-down into the channel and then inverting at the approximate midway point in the water column with the container opening facing upstream. A grab pole was used as necessary to collect water samples from as close to the horizontal center of the channel as site conditions allowed. Samples were analyzed for the constituents stipulated in the Certification (Table 2-2). Parameters measured in the field include: pH, temperature, dissolved oxygen (DO), turbidity, and specific conductance.

Sample containers were labeled with a unique sample ID, date, time, project, analyses, and collector's initials. The samples were then packed on ice and transported to Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler). Samples were held on ice until transferred to a laboratory-provided courier.

Table 2-2.
Summary of Water Quality Analytes

Analytical Parameter	Analytical Method	Container	Preservation	Maximum Holding Time (Days)	Amount Needed
Alkalinity, Total	SM 2320B	250 mL Poly	<6°C	14	250 mL
Ammonia as Nitrogen (N)	EPA 350.1	250 mL Poly	<6°C, H_2SO_4	28	250 mL
Chloride	EPA 300.0	250 mL Poly	<6°C	28	250 mL
Nitrate-Nitrogen as N	EPA 353.2	250 mL Poly	<6°C	2	250 mL
Nitrite-Nitrogen as N	EPA 353.2	250 mL Poly	<6°C	2	250 mL
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	250 mL Poly	<6°C, H_2SO_4	28	250 mL
Ortho-Phosphate Phosphorous	EPA 365.3/ EPA 365.1	250 mL Poly	<6°C, filtered	2	250 mL
Total Phosphorous	EPA 365.1	250 mL Poly	<6°C, H_2SO_4	28	250 mL
Total Suspended Solids (TSS)	SM 2540D	500 mL Poly	<6°C	7	500 mL
Chlorophyll a	SM 10200H	1 L Amber Poly	<6°C	2	100 mL

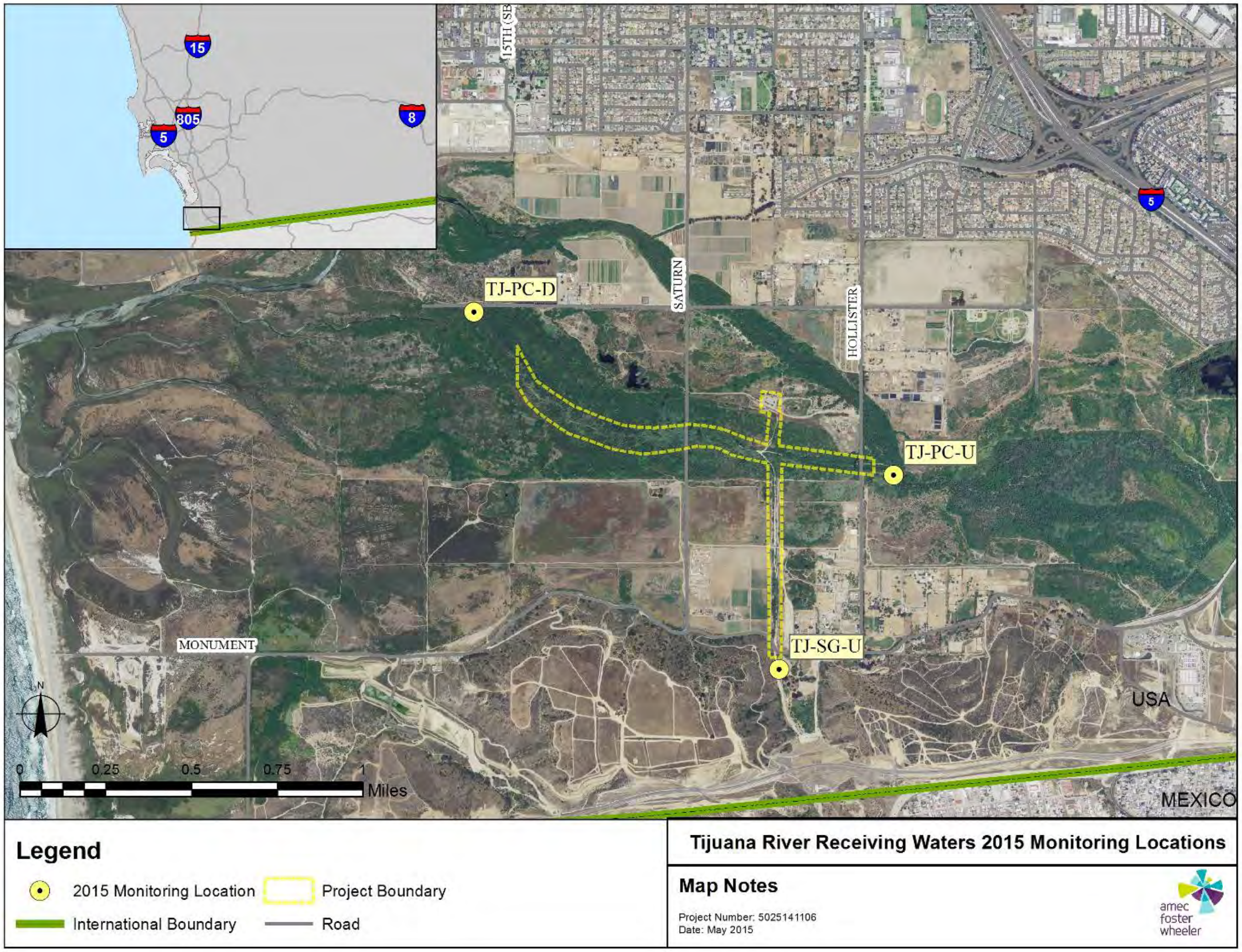

Figure 2-1. Overview of Tijuana River Receiving Water Monitoring Stations

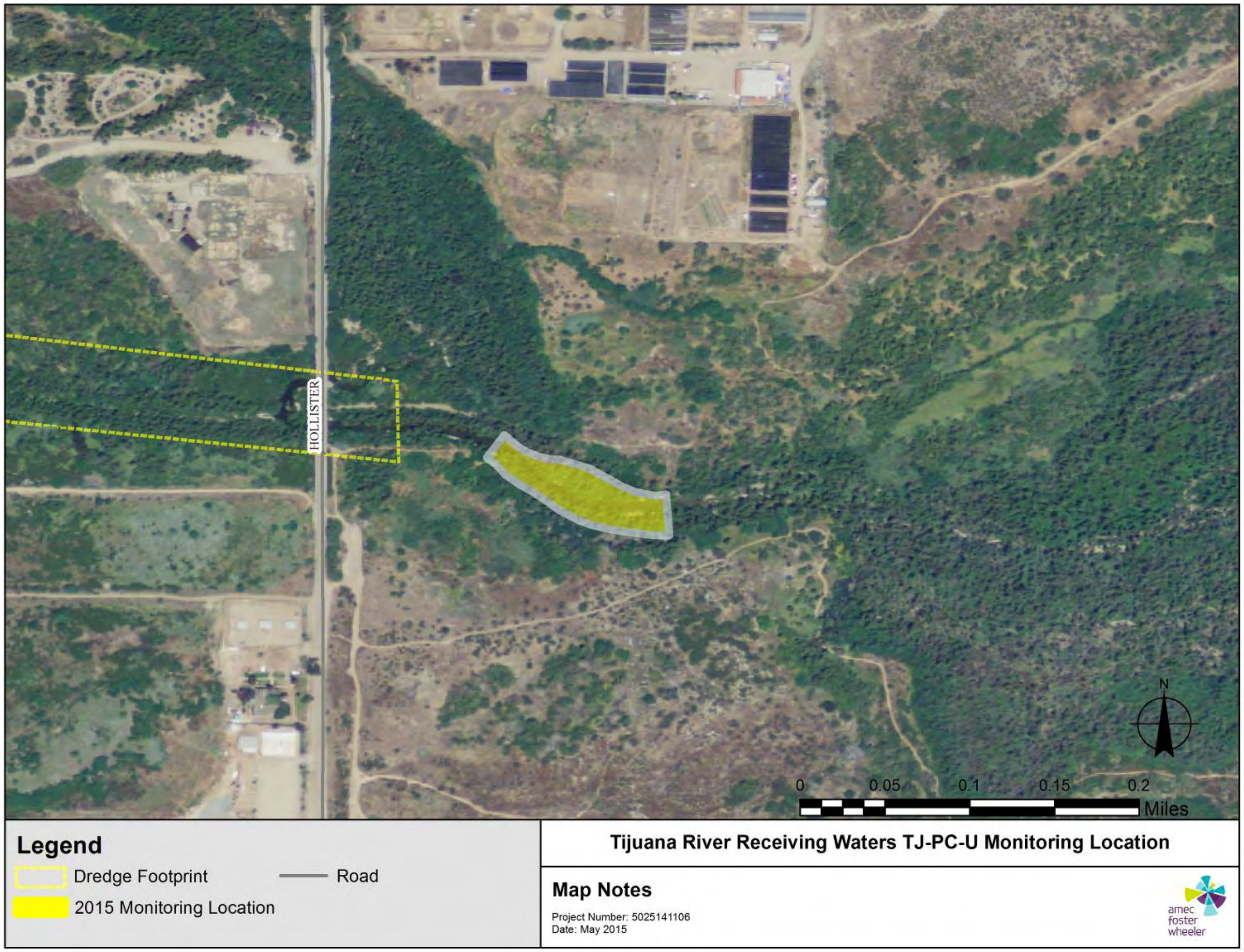

Figure 2-2. TJ-PC-U Monitoring Station
Water quality samples and CRAM data were collected at this location.

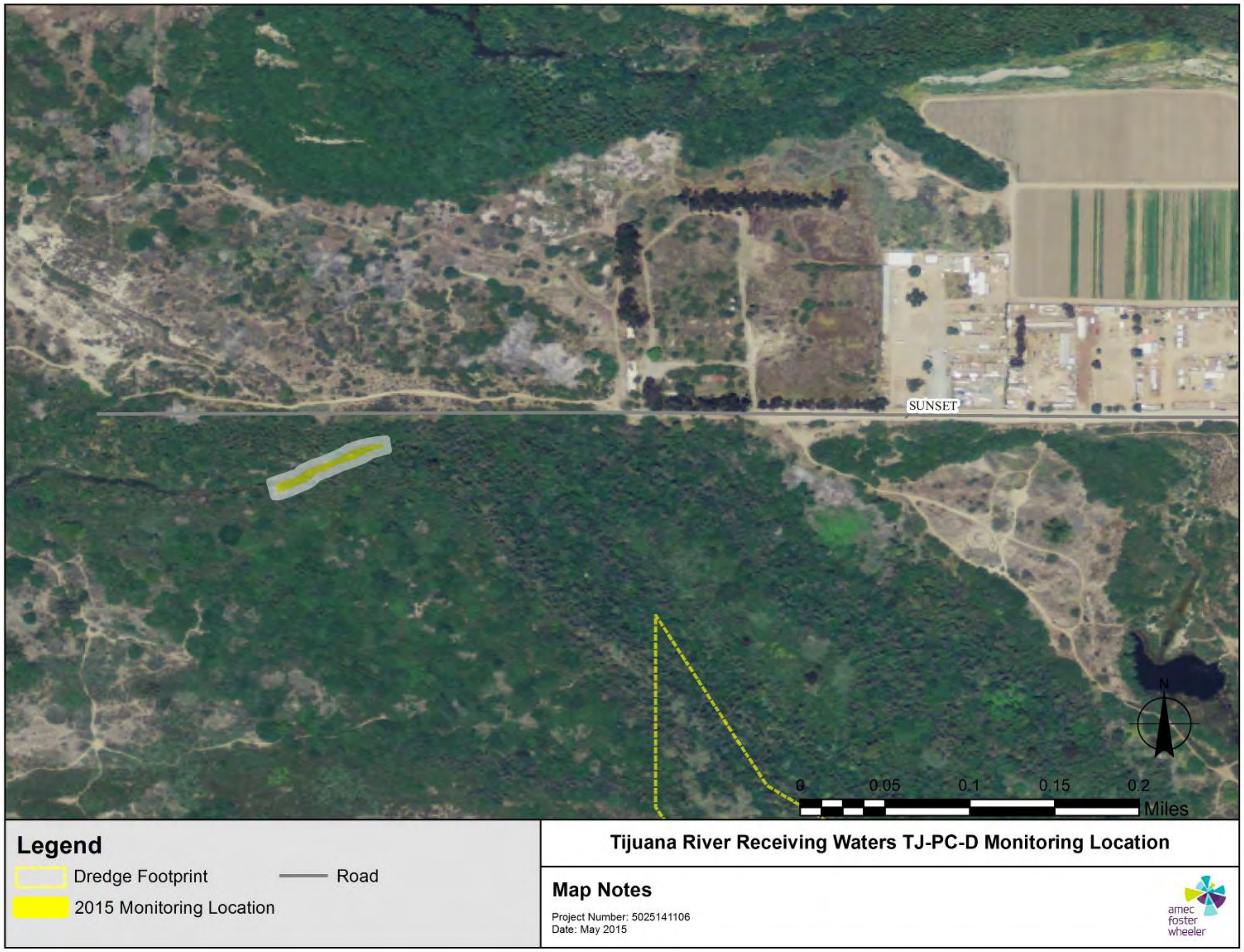

Figure 2-3. TJ-PC-D Monitoring Station

Water quality samples, benthic biological samples, and CRAM data were collected at this location.

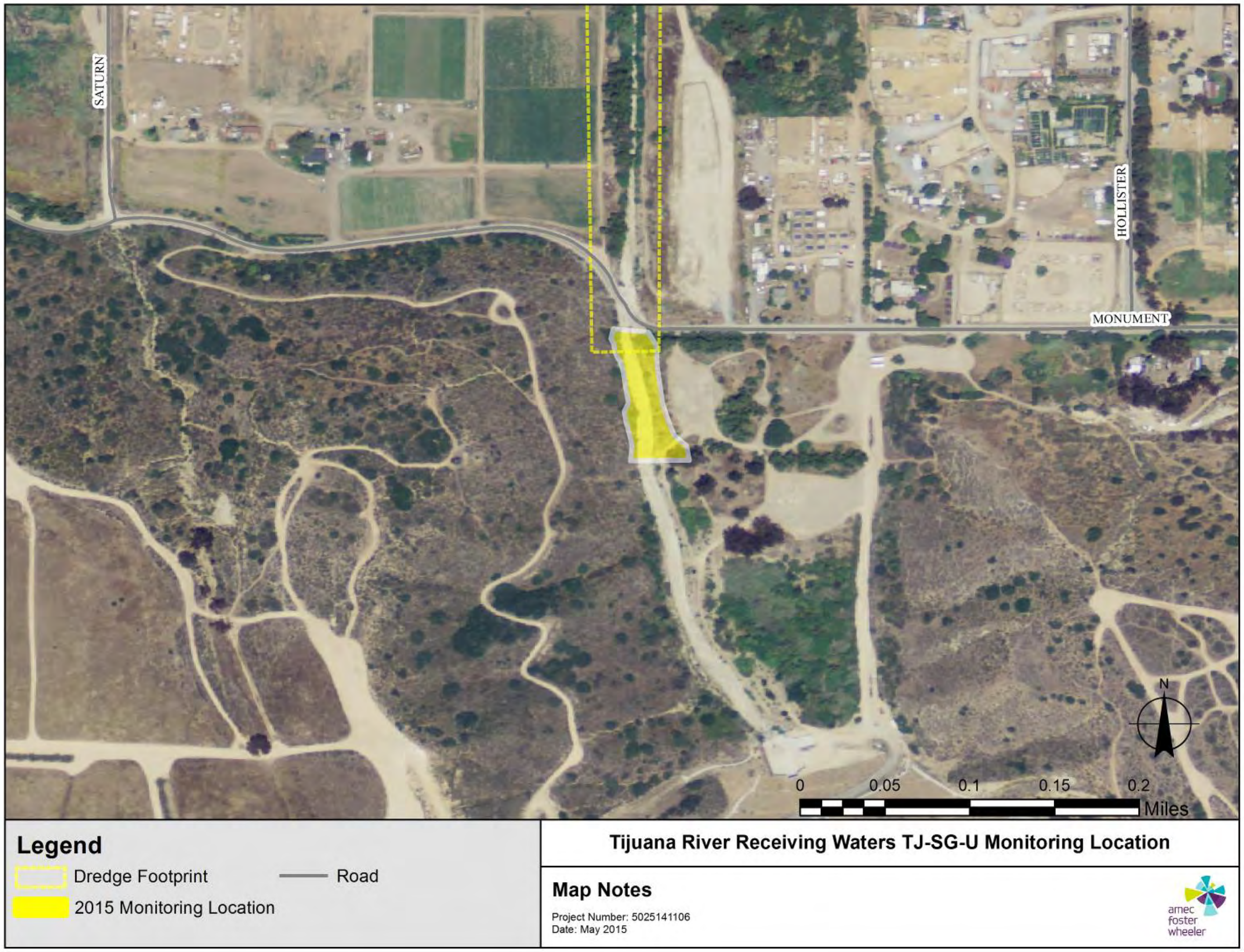

Figure 2-4. TJ-SG-U Monitoring Station
Only CRAM data were collected at this location

2.3 CRAM Monitoring

During CRAM analysis, an Assessment Area (AA) polygon is established around the wetland and the functionality of the wetland within is evaluated. An AA is established by starting at a hydrologic or geomorphic break in structure of the channel, and extends longitudinally ten times the average bankfull width or a minimum of 100 m and for a distance no longer than 200 m. If no break in structure is present, then the AA can begin at a selected point within the wetland area in order to accomplish project goals. The AA extends laterally to include the riparian zone and floodplain areas that receive direct input from the surrounding area (i.e., organic debris such as leaves, limbs, insects, etc.). For the purposes of this CRAM analysis, both sections of the Tijuana River (TJ-PC-U and TJ-PC-D) were classified as a perennial, non-confined riverine system, while TJ-SG-U was classified as an ephemeral, non-confined system. Although the Tijuana River is largely an ephemeral stream, the survey areas in the lower portion of the river, located near the estuary, appear to receive perennial flow, but this may be dependent upon the annual rainfall received in the current and previous years. All of the AA's established for this CRAM analysis were either upstream or downstream of the maintenance area, and do not necessarily include sections of the channel in which maintenance dredging occurred or invasive plants were removed as required in the 401 Certification as wetlands mitigation.

CRAM analysis requires the evaluation of the AAs on four attributes that include buffer and landscape context, hydrology, physical structure, and biotic structure. Each of these attributes is further described below:

- Buffer and landscape context – Assesses a riverine system in terms of the continuity of the buffer within 500 m upstream and downstream and the quality of the buffer immediately surrounding the AA. This attribute measures the ability of wildlife to enter the riparian corridor buffer and easily move within it along the wetland area within 500 m of the AA. Buffer is defined as an area in a natural or semi-natural state that is not currently dedicated to anthropogenic uses which would detract from its ability to protect the AA from stress or disturbance.
- Hydrology – Assesses the water source and quality, as well as the channel stability and its connection to the surrounding flood plain.
- Physical structure – Assesses the availability of various habitat patch types and topographical complexity of the channel that indicate the capacity of the riverine system to support characteristic flora and fauna.
- Biotic structure – Assesses horizontal and vertical plant structure, which measures the number of distinct plant zones in plan-view and the amount of vertical overlap of plant canopy layers. In addition, the species dominance and composition of the plant community within the AA is assessed.

Each attribute has sub-metrics that are scored with a letter that indicates its status, with an "A" score indicating good condition and a "D" score indicating poor condition. The letter score is then converted to a numerical value (i.e., A=12, B=9, C=6, and D=3) and a final attribute score is calculated. The final overall CRAM score is the average of the four individual attribute scores received. The purpose of using the CRAM scoring system is to provide a context for comparison of the Project efforts over a period of time.

Finally, a number of physical, hydrological, biotic and landscape scale stressors are evaluated to assess their potential for impacting the riverine ecological function. Each are assessed to be present or absent and their likelihood of significantly affecting the AA. These stressor assessments are based on visual site inspections, satellite imagery of nearby landscape, and publically information available for the water body or watershed in question. They are not based on analytical measurements or other samples taken at the time of the survey.

2.4 Benthic Biological Monitoring

Methods similar to the Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality promulgated by the SWRCB (SWRCB, 2009) and the Sediment Quality Objectives (SQO) Technical Support Manual (SCCWRP, 2014) were used to collect benthic macroinvertebrates at the downstream Pilot Channel location.

Three field replicates were collected approximately 8 m apart, starting downstream and moving upstream with each successive collection. A 0.2 m x 0.2 m Eckman grab was used for collection of the sediment samples. The grab was pushed by hand down into the undisturbed sediment approximately six to eight centimeters (cm). The grab jaws were then triggered and closed. The grab device was removed from the substrate and placed unopened into a large plastic tray. The depth of sediment penetration was measured and an assessment of the acceptability of the grab was made (i.e. >5cm penetration, >90% of the sediment surface intact, no washing or canting). Observations of sediment type, color, and odor were recorded. The entire contents of each sediment grab was then emptied into the plastic tray and systematically sieved through a 1.0-millimeter (mm) metal sieve. The material and organisms from each replicate retained on the sieve were placed separately into 1-liter (L) Nalgene bottles and preserved with 95% ethanol. These three samples were then analyzed for taxonomic identification.

3.0 RESULTS

3.1 Water Quality Results

The reported results from the water quality grab samples collected at the TJ-PC-U and the TJ-PC-D stations are presented in Table 3-1. TJ-SG-U was dry and therefore no water quality results are reported for that location during this sampling event. The water quality samples were collected on May 12, 2015.

A log containing representative photos of each sampling location is presented in Appendix A. Analytical MDLs and RLs are provided in Table 3-1 and Appendix B. Dilution factors required for several constituents are also included in Appendix B for reference. Copies of field data sheets are presented in Appendix C. Analytical laboratory reports are contained in Appendix D.

The reported water quality results are summarized as follows:

- Nutrient concentrations (i.e. ammonia, TKN, dissolved orthophosphate, nitrite, nitrate, and total phosphorus) at the upstream Pilot Channel station were all higher than measured at the downstream Pilot Channel station.
- Chlorophyll-a, alkalinity, and chloride concentrations were elevated at the downstream stream Pilot Channel. One might expect higher alkalinity and chloride concentrations at the downstream location due to the tidal influence.
- The TSS concentration at the upstream Pilot Channel was 2.8 times that of the downstream location.

Recorded *in-situ* water quality measurements are summarized in Table 3-1. TJ-SG-U was dry during the monitoring event and therefore could not be sampled. The *in-situ* water quality results are summarized as follows:

- pH measurements at the two sites with water were fairly similar and ranged from 7.62 to 8.07.
- Specific conductance was greater at TJ-PC-U. While this site has been shown to be tidally influenced, the field measurements at TJ-PC-D were taken at a low 0.2-foot tide when water at the site was more likely dominated by upstream groundwater sources.
- Turbidity was slightly greater at TJ-PC-U.
- DO was depressed at both Pilot Channel stations, with the upstream station having much lower values than the downstream station.

Table 3-1. Water Quality Results Summary for May 12, 2015 Field Survey

Analyte	Method	Units	MDL	RL	TJ-PC-U	TJ-PC-D	TJ-SG-U
Alkalinity as $CaCO_3$	SM 2320 B	milligrams per liter (mg/L)	0.56	10	360	550	NA
Ammonia as N[a]	EPA 350.1	mg/L	0.048-2.4	0.1-5.0	15	0.19	NA
Chloride[a]	EPA 300.0	mg/L	1.0-2.5	5.0-12	360	430	NA
Chlorophyll *a*	SM 10200 H-2b	micrograms per liter (µg/L)	8.3	10	<8.3	21	NA
Nitrate as N	EPA 353.2	mg/L	0.041	0.10	2.6	0.057[J]	NA
Nitrite as N	EPA 353.2	mg/L	0.010	0.10	0.93	0.010[J]	NA
Total Kjeldahl Nitrogen (TKN)[a]	EPA 351.2	mg/L	0.05-0.25	0.1-0.5	19	0.63	NA
Dissolved Orthophosphate as P (Reactive P)[a]	EPA 365.1M	mg/L	0.0002-0.011	0.002-0.01	5.4	0.76	NA
Total Phosphorus as P (Total P)[a]	EPA 365.3	mg/L	0.007-0.07	0.02-0.5	6.2	0.23	NA
Total Suspended Solids (TSS)	SM 2540 D	mg/L	5	5	22	8.0	NA
pH	Field Meter	pH units	NA	NA	8.07	7.62	NA
DO	Field Meter	mg/L	NA	NA	0.8	4.4	NA
Specific Conductance	Field Meter	microSiemens per centimeter (µS/cm)	NA	NA	2354	1491	NA
Temperature	Field Meter	degrees Celsius (°C)	NA	NA	18.2	18.9	NA
Turbidity	Field Meter	Nephelometric turbidity units (NTU)	NA	NA	9.05	4.28	NA

Notes:
RL - reporting limit
MDL - method detection limit
NA - Not applicable, or sampling location was dry and therefore could not be sampled.
SM - Standard Method
EPA - Environmental Protection Agency
< - Not detected above MDL. Concentration is reported as less than MDL.
J - Concentration detected below the reporting limit, but above method detection limit, and as such is an estimate.
[a] - Sample was diluted by laboratory and therefore has an elevated MDL and RL. These values are provided in Appendix B.

3.2 CRAM Results

Table 3-2 provides a summary of the CRAM scoring for the three AAs with extended details on each AA provided in Sections 3.2.1 through 3.2.3.

3.2.1 TJ-PC-U Site Assessment Area

The delineated AA for TJ-PC-U is depicted on Figure 2-2. This location was characterized by perennial flow in a non-confined setting. Very slow flowing deep water was present at the time of the survey. A summary of CRAM scores for TJ-PC-U is presented in Table 3-2. The western end of the AA begins approximately 170 m east of Hollister Street Bridge and extends 160 m upstream from that point. The AA includes the bankfull width of the Pilot Channel and the lateral floodplain benches present. The approximate width of the AA ranged from 25 m to 46 m, with an average bankfull width of approximately 17.3 m.

Buffer and Landscape Context

The riparian corridor continuity attribute extending 500 m upstream and downstream of AA is in good condition. Both upstream and downstream riparian corridors were uninterrupted, with the only exception being the Hollister Street bridge crossing providing a small break in the buffer on the downstream end. The buffer immediately surrounding the AA scored high in all three submetrics. The AA is surrounded by one-hundred percent riparian buffer, which is in fair to good condition, with an average width of 225 m. Small unpaved hiking trails are present, but do not appear to impede wildlife movement or to be heavily utilized.

Hydrology

The water source was in fair condition as defined in the CRAM guidance. The freshwater sources consist primarily of infiltrated local residential and agricultural irrigation rising as groundwater. The immediate drainage basin (i.e. within 2 km) is comprised of more than twenty percent residential and artificially irrigated land. The international Mexican border is approximately 4km upstream of the AA and is heavily urbanized beyond that point. However, dry season flows are diverted at the international border by South Bay International Wastewater Treatment Plant (SBIWTP) and do not reach the estuary. The majority of channel stability characteristics suggested equilibrium conditions with some limited evidence of degradation and aggradation, including some willow trees declining in stature with some leaning or falling into the channel (evidence of degradation) and fine sediment accumulated on the flood plain partially burying tree trunks (evidence of aggradation). Hydrologic connectivity to the surrounding landscape was in fair condition with an average entrenchment ratio of 1.6, indicating that the river is somewhat limited in its ability to spread laterally into its floodplain during times of high flow. The entrenchment ratio is calculated by dividing the flood prone width (the area water would laterally inundate during high storm flows) by the bankfull width (the area water typically inundates during base flow or small <0.3 inch storms). It measures how well the stream is connected to its riparian floodplain. Entrenchment ratios range from 1.0 at the low end (i.e. flood prone width = bankfull width), and do not have an upper bound. CRAM scoring criteria for entrenchment ratios in a non-confined wetland are divided into four categories: Excellent (>2.2), Good (2.2 - 1.9), Fair (1.8 – 1.5), and Poor (<1.5).

Table 3-2. Assessment Area CRAM Scoring Summary for May 12, 2015 Field Survey

		Site		
		TJ-PC-U	TJ-PC-D	TJ-SG-U
Approx. Length (m)		160	100	120
Average Bankfull Width (m)		17.3	5.3	5.7
Wetland Sub-type		Non-confined	Non-confined	Non-confined
Buffer Coverage (%)		100	100	100
Average Buffer Width (m)		225	250	188
CRAM Riverine Wetlands Scoring				
Landscape and Buffer Context	Riparian Continuity (Aquatic Area Abundance)	A	A	A
	Percent of AA with Buffer	A	A	A
	Average Buffer Width	A	A	B
	Buffer Condition	B	B	C
	Final Attribute Score	**91.7**	**91.7**	**83.3**
Hydrology	Water Source	C	C	C
	Channel Stability	B	B	C
	Hydrologic Connectivity	C	D	A
	Final Attribute Score	**58.3**	**50.0**	**66.7**
Physical Structure	Structural Patch Richness	D	D	D
	Topographic Complexity	C	C	B
	Final Attribute Score	**37.5**	**37.5**	**37.5**
Biotic Structure	Number of Plant Layers	A	A	A
	Number of Co-dominant Species	D	C	C
	Percent Invasion	C	C	D
	Horizontal Interspersion	C	B	B
	Vertical Biotic Structure	C	B	D
	Final Attribute Score	**52.8**	**72.2**	**61.1**
Overall AA Score		**60.1**	**62.9**	**65.3**

Notes:
% - percent
AA - assessment area
m - meter

Physical Structure
Low habitat patch diversity was observed within the river and its floodplain. The channel and its floodplain substrate consisted almost exclusively of fine-grained material (i.e. silt and sand). Of the seventeen patch types possible in a non-confined riverine wetland, two were present during the first two monitoring events (i.e., wrackline and large woody debris), for only twelve percent of the expected number of classes.

In terms of the cross sectional topographic complexity of the site, gently sloping banks were present on both sides of the river, with minimal benching and almost no micro-topography. The south side of the river yielded a single bench and had a much broader floodplain than the north side, allowing for high flows and floodwaters to extend out further laterally along the south side of the river channel.

Biotic Structure
The overall biotic structure was fair. The number of plant layers was good, with four of the five possible plant layers present: short (<0.5 m), medium (0.5-1.5 m), tall (1.5 m – 3.0 m) and very tall (>3.0m). However, the number of codominants was poor with only five present: Castor Bean (*Ricinus communis*), Arroyo Willow (*Salix lasiolepis*), Black Willow (*Salix gooddingii*), Mulefat (*Baccharis salicifolia*), and Nasturtium (*Tropaeolum majus*). Additionally, the percent of co-dominant species considered invasive was relatively high at 40 percent. The vertical biotic structure is fair with moderate overlap of two canopy layers, as the site is dominantly shaded with very tall tree canopy. The understory supports limited herbaceous plants, dominated by Castor Bean. The horizontal interspersion attribute score was rated as fair, due primarily to the relative homogeneous distribution of the plant groups.

Potential Stressors
There was one primary hydrological stressor that was identified for the TJ-PC-U AA; non-point source discharges may affect the riverine wetland, and it was determined that this impact could be a significant negative impact on the water quality of the AA. There were five water quality stressors that were identified for the AA; bacterial pathogens , nutrients , heavy metals, pesticides, and trash or refuse. While bacterial pathogens, heavy metals, and pesticides were not measured analytically as part of this study, the Tijuana River is considered impaired (303(d) listed) for all of these stressors, including nutrients and trash. These water quality stressors were present and may have a significant negative effect on the AA. Of the biotic stressors assessed as part of the CRAM protocol, only lack of treatment of invasive plant species was observed. This segment of the Tijuana River was upstream of the dredge area footprint where invasives were actively being removed, and contained a significant presence of Castor Bean (*Ricinus communis*). Land use stressors identified include urban residential development, orchards/nurseries, commercial feedlots, ranching (equestrian boarding lots), and passive recreation; however, none were determined likely to have a significant effect on the AA.

3.2.2 TJ-PC-D Site Assessment Area

The delineated area for the TJ-PC-D AA is depicted on Figure 2-3. The TJ-PC-D location was characterized as a perennial system in a non-confined setting. Flowing water was present at the time of the three surveys. A summary of CRAM scores for TJ-PC-D is presented in Table 3-2. The eastern end of the AA starts approximately 1,000 m west of the Sunset Avenue and Saturn Boulevard intersection and extends 100 m downstream from that point. The AA includes the bankfull width of the Pilot Channel and the lateral floodplain benches present. The approximate width of the AA ranged from 12 m to 16 m, with an average bankfull width of approximately 5.3 m.

Buffer and Landscape Context

The riparian corridor continuity attribute extending 500 meters upstream and downstream of AA was in good condition. Both upstream and downstream riparian corridors were uninterrupted, providing a continuous buffer for wildlife movement and protection from anthropogenic influences. The buffer immediately surrounding the AA scored high in all three submetrics. The AA was surrounded by one-hundred percent riparian buffer, which is in good condition, with an average width of 250 m. While the maximum buffer assessed as part of CRAM is 250 meters, the actual buffer for this location extended well beyond 250 meters. Small unpaved recreational hiking and horse trails are present to the north of the AA, but do not appear to impede wildlife movement or be heavily utilized.

Hydrology

The water source was in fair condition as defined in the CRAM guidance. Similar to the upstream location, the natural freshwater sources consist primarily of groundwater from local irrigation, with the immediate drainage basin (i.e. within 2km), being comprised of more than twenty percent residential and artificially irrigated land. The international Mexican border is approximately 6km upstream of the AA and is heavily urbanized beyond that point. However, dry season flows are diverted at the international border by SBIWTP and do not reach the estuary. During the survey, the TJ-PC-D sampling location was hydrologically disconnected from the TJ-PC-U location. Channel stability is characterized by a mixture of equilibrium and degradation conditions. Equilibrium conditions were characterized by a well-defined bankfull contour throughout most of the AA, with leaf litter, wrack, and woody debris consistent with that available in the surrounding riparian area. Perennial riparian vegetation was well established above the bankfull contour, but not below it. Degradation was evidenced by some riparian vegetation declining in stature and leaning into the channel. The lower banks were absent of vegetation and throughout a major portion of the AA, steep walled banks were present, with evidence of bank slumps. Some portions of the channel were undercut with roots being exposed. Overall the river bed was planar, with no observations of increased habitat complexity (e.g., pools, riffles). Due to the steep walled banks, the hydrologic connectivity to the surrounding landscape was in poor condition with an average entrenchment ratio of 1.4, indicating that the river has limited ability to spread laterally into its floodplain during times of high flow.

Physical Structure
Low habitat patch diversity was observed within the river and its floodplain. The channel and its floodplain substrate consisted primarily of fines. Of the seventeen patch types possible in a non-confined riverine wetland, only four were present (i.e., large woody debris, bank slumps, secondary channels, and organic debris on the floodplain), for only twenty-four percent of the expected number of classes. The cross sectional topographic complexity of the site identified steep banks present on both sides of the river, with minimal benching and some micro-topography on the downstream end of the AA.

Biotic Structure
The overall biotic structure at this location is of fair quality. The number of plant layers scored high, with four of the five possible plant layers present: short (<0.5 m), medium (0.5 m – 1.5 m), tall (1.5 m – 3.0 m), and very tall (>3.0 m). Eight co-dominant species were observed among all layers, including Mulefat (*Baccharis salicifolia*), California bulrush (*Scirpus californicus*), Arroyo willow (*Salix lasiolepis*), Black Willow (*Salix gooddingii*), Tamarisk (*Tamarix aphylla*), Giant Reed (*Arundo donax*), Nasturtium (*Tropaeolum majus*), and Elderberry (*Sambucus mexicana*). The tall and very tall strata dominated the site, with limited understory consisting primarily of small patches of Mulefat and Nasturtium. Of co-dominant species present, Salt Cedar, Giant Reed*, and* Nasturtium are considered invasive comprising thirty-eight percent of the plants present. The vertical biotic structure was fair, with approximately fifty percent overlap of two plant layers (Tall and Very Tall). The horizontal interspersion of plant zones is fair. The area was dominated by a homogeneous mixture of mulefat and willows, with no strong zoning pattern evident.

Potential Stressors
There was one hydrological stressor identified for TJ-PC-D AA: non-point source discharges; however, it was determined that this was not a significant negative impact on the water quality of the AA. The same five water quality stressors were identified as for the TJ-PC-U AA: bacterial pathogens, nutrients, heavy metals, and trash or refuse. While bacterial pathogens, heavy metals, and pesticides were not measured analytically as part of this study, the Tijuana River is considered impaired (303(d) listed) for all of these stressors, including nutrients and trash. Although these physical stressors were present, they were not considered to have a significant negative effect on the AA. The one biotic structure stressors identified was the lack of treatment of invasive plants. Potential landscape stressors within 500 m of the AA included helicopter traffic from the Naval Outlying Landing Field (NOLF) to the north, some horse paddocks to the northeast, nearby urban residential areas, dryland farming, and passive recreation in the form of hiking, none of which appeared likely to have a significant effect on the AA.

3.2.3 TJ-SG-U Site Assessment Area

The delineated area for the TJ-SG-U AA is depicted on Figure 2-4. A summary of CRAM scores for TJ-SG-U is presented in Table 3-2. The northern edge of the AA began approximately 10 m south of Monument Road and extended southward approximately 120 m. The location was characterized as an ephemeral stream in a non-confined setting. Water was not present within the AA at the time of the survey. The AA included the bankfull width of TJ-

SG-U and the lateral floodplain benches present. The approximate width of the AA ranged from 27 m to 44 m, with an average bankfull width of approximately 5.7 m.

Buffer and Landscape Context

The riparian continuity attribute extending 500 meters upstream and downstream of AA is in good condition. Both upstream and downstream riparian corridors provided good connectivity, with the only exception being Monument Road traversing the buffer downstream of the AA. There is a flow control structure 500 m south of the AA at the international border. The AA is bordered by one-hundred percent buffer, with the average buffer width being 188 m. The buffer condition was in poor to fair condition, primarily being driven by one side of the AA. The west side of the AA was bordered by undisturbed natural riparian scrub, while the buffer to the east consisted of a large open cleared and compacted lot. It appeared that this lot is not utilized often and wildlife would likely be able to move freely through it; however the quality of that habitat was subpar.

Hydrology

The water source was in fair to poor condition. The natural freshwater sources are substantially controlled by diversions upstream and a large portion of the watershed within 2 km upstream is in Mexico, dominated by commercial and residential land use. Channel stability was dominated by aggradation conditions, with the only sign of equilibrium being a well-defined bankfull contour. It appeared that large amounts of sediment likely inundate this area during storm events. The channel was filled with deep sand with the base of some vegetation covered along the bankfull contour. The overall stream bed is planar, with riparian vegetation encroaching into the channel, and the culvert at the downstream end of the AA is choked with sediment. Hydrologic connectivity to the surrounding landscape was good with an average entrenchment ratio of 2.3, indicating that the stream had some ability to access its surrounding floodplain during times of high flow.

Physical Structure

Habitat patch types were in poor condition. Of the seventeen habitat patch types possible in a non-confined riverine wetland, none were present within the channel or its floodplain. Topographic complexity of the site was fair with a flat stream channel, one bench, and some micro-topography present on the eastern floodplain in the form of vegetation and organic debris. Approximately 5 m beyond the eastern bank was a relatively steep sloping earthen berm (approx. 2.0 m high). The western bank consisted of a naturally steep hillside rising up to a mesa, with some micro-topography present.

Biotic Structure

The biotic structure at this location was mixed. The number of plant layers scored high with four of the five potential plant layers present: short (<0.5 m), medium (0.5 m – 1.5 m), tall (1.5 m – 3.0 m), and very tall (>3.0 m). Eight co-dominant species across the strata were observed, including Garland chrysanthemum (*Chrysanthemum coronarium*), Castor Bean (*Ricinis communis*), Black Willow (*Salix gooddingii*), Mulefat (*Baccharis salicifolia*), Giant Reed (*Arundo donax,* Eucalyptus (*Eucalyptus camaldulensis*), Tamarisk (*Tamarix aphylla*), and cocklebur (*Xanthium strumarium*). Of the eight co-dominant species identified, six (seventy-five percent) are considered invasives.

Horizontal interspersion was fair and vertical structure was poor. There was not much interspersion between the zones, and with the exception of Castor Bean which was found throughout, each generally occurred in only one area of the AA. Vertical biotic structure was considered poor. While four plant layers were present, there was little overlap among them.

Potential Stressors

There were three hydrological stressors identified for the TJ-SG-U AA; non-point source discharges, flow obstructions in the form of the culvert running underneath Monument Road, and the earthen berm on the right bank. There were four physical structure stressors that were identified for the AA: grading/compaction, excessive sediment or organic debris, excessive runoff from watershed, and trash or refuse. In addition, four water quality stressors (nutrients, heavy metals, pesticides or trace organics, and bacteria or pathogens) were presumed, as the primary water source for Smuggler's Gulch is runoff from Tijuana residential areas. ,These were all deemed to have a significant effect on the AA with the exception of grading/compaction. There was one biotic structure stressor identified; lack of treatment of invasive plants adjacent to AA or buffer and was determined to have a significant negative effect on the AA, due to the overwhelming presence of Castor Bean. Land use stressors include urban residential development, ranching (equestrian boarding lot), dryland farming, and active off-road vehicle usage (i.e., border patrol vehicles). Urban development was observed to likely have a significant effect due to the intense urbanization within the watershed south of the international border.

3.3 Benthic Biological Results

A list of taxa present in samples collected May 12, 2015 is presented in Table 3-3. Tables 3-4 and 3-5 present a summary of selected biological metrics.

3.3.1 BMI Community Composition

Total abundance of organisms among the three field replicates ranged from 370 to 405 individuals. In all three field replicates, *Chironomus* sp. was the dominant taxa observed, comprising 60 to 82 percent of the samples. This was followed by the gastropod *Tryonia* sp., Oligochaetes, and Ostracods. The top three taxa at each replicate were dominant, comprising 94 to 99 percent of the samples. The Chironomidae family is generally considered an insensitive group to anthropogenic influences (although a few species in this Family are considered sensitive), able to tolerate moderate to highly impacted locations. Some species within this group are able to tolerate high conductivity and can be found in estuarine locations (i.e. *Chironomus salinarius* and *Chironomus halophilus*). Dipteran Chironomids, or non-biting midge flies, are the most common aquatic insect and cover a range of feeding strategies from the construction of filtering nets, to simple grazing, to active predation. Most species are bottom-dwelling and many live within tubes or loosely constructed cases in the substrate. Some occur in highly polluted waters, others are restricted to cool clear water. Chironomidae are important indicator organisms, because the presence, absence, or quantities of various species within this Family can be a very good indicator of water quality. Oligochaetes are segmented aquatic worms, generally found in silty substrate and detritus of streams and rivers. While Oligochaetes can be found in both good quality and highly impacted streams, a stream population dominated by members of this Family is generally an indicator of poor conditions. An overabundance of

Oligochaeta can also be an indicator of sedimentation. Ostracods can be found in many different substrate types where they eat bacteria, mold, algae and detritus. Similar to Oligochaetes, Ostracods can be found across a full spectrum of water or habitat conditions; however, dominance by this group is generally an indicator of degraded conditions. These three taxa (*Chironomus*, Oligochaetes, and Ostracods) are generally considered tolerant taxa (Tolerance Value (TV) between 8 and 10), meaning they are relatively insensitive to anthropogenic stressors and are typically found in higher abundances at disturbed sites.

The genus *Tryonia* is a group of gastropods (snails) with a wide distribution. The genus contains 23 species and can be found across the southern United States. Although most *Tryonia* species are restricted to springs, which are generally thermal and highly mineralized, some also live in lakes (Thompson, 1968), and two species (*T. imitator* and *T. porrecta*) can be found in brackish, coastal waters (Kellogg, 1985; Hershler, 2007). Under SAFIT Level 2 standard taxonomic effort, *Tryonia* is generally left at the genus level, however further investigation was able to identify these individuals to *Tryonia imitator*, the California Brackish Water Snail. *Tryonia imitator* is a gastropod that inhabits coastal lagoons, estuaries and salt marshes, from Sonoma County south to San Diego County. While the California Natural Diversity Database (CNDDB) supported by the California Department of Fish & Wildlife (CDFW), does not list *Tryonia imitator* as a species of special concern, threatened, or endangered; it is designated as vulnerable due to its restricted range and relatively few populations.

Table 3-3. Raw Abundance of Individual Sorted Taxa for May 12, 2015 Field Survey

Taxonomic Group	Taxon	TJ-PC-D-051215-01	TJ-PC-D-051215-02	TJ-PC-D-051215-03
Diptera-Chironomidae	Chironomus sp.	239	320	244
Diptera-Tipuidae	*Molophilus* sp	1	1	1
	Ormosia sp	0	0	1
Mollusca-Cochliopidae	*Tryonia imitator*	70	64	142
Annelida-Oligochaeta	Oligochaeta	22	5	17
Crustacea-Ostracoda	Ostracoda	38	0	0
	TOTAL	370	390	405

Table 3-4. Select Biological Metrics for May 12, 2015 Field Survey

Biological Metric	TJ-PC-D-051215-01	TJ-PC-D-051215-02	TJ-PC-D-051215-03
# Organisms Sorted	370	390	405
# Organisms in the sample	370	390	405
Taxa Richness	5	4	5
1st Dominant Taxa	*Chironomus* sp.	*Chironomus* sp.	*Chironomus* sp.
% Top Dominant Taxa	64.6	82.1	60.2
% 3 Top Dominant Taxa	93.8	99.7	99.5
% Tolerant Individuals (TV = 8 to 10)	74.9	82.1	60.2
% Intolerant Individuals (TV = 0 to 2)	0.0	0.0	0.0
% Sensitive EPT Taxa	0.0	0.0	0.0
Dominant FFG	Collector-Gatherer	Collector-Gatherer	Collector-Gatherer
Shannon Weaver Diversity Index (log10)	1.01	0.53	0.84
Mean Hilsenhoff Biotic Index	9.36	9.90	9.63

3.3.2 Diversity Metrics

Diversity metrics provide information regarding the number of taxa observed and the evenness of the distribution of individuals among those taxa (Washington 1984). Pristine ecosystems are typically expected to have a high diversity of invertebrate species with a relatively even distribution of organisms between those species. In contrast, degraded systems may consist of high numbers of individuals, but few taxa. A summary of the diversity metrics is presented in Table 3-4. The Shannon-Weaver Index (SWI) is a measure of diversity that evaluates the number of taxa and the evenness of distribution among them. Typically this index score is used to compare differences in diversity between several sites along a condition gradient, a potentially impacted site versus reference location, or temporal changes at a single location. While somewhat less informative when evaluated without context, the SWI can range from 0 to 4.6, with a score greater than 2.0 typically indicating a more diverse community. Diversity index scores calculated for the TJ-PC-D monitoring station, ranging from 0.53 to 1.01, indicate a benthic community with very low diversity and dominance by few species.

3.3.3 Sensitivity Metrics

The tolerance of many BMI taxa to habitat impairment and water quality has been determined through prior studies (Hilsenhoff, 1987). The Hilsenhoff Biotic Index (HBI) ranks BMI taxa on a scale of 0 to 10 regarding their sensitivity to impairment, with a TV of 0 being given to taxa that are highly sensitive to habitat or water quality impairment and a TV of 10 to those that are very insensitive. While organisms with a high TV can be found in streams with good water and habitat quality, they tend to be a lesser proportion of the community. Conversely, taxa with low TVs (i.e. sensitive organisms) will very rarely be found at sites with poor water or habitat quality. Although originally developed to assess low DO caused by organic loading (Hilsenhoff 1977, 1982, 1987), the HBI may also be sensitive to the effects of impoundment, thermal pollution, and some types of chemical pollution (Hilsenhoff 1988, Hooper 1993).

The average HBI score for taxa within the three field replicates ranged from 9.36 to 9.90, indicating very tolerant, insensitive organisms (Table 3-4). A high percentage of the individuals (range = 60.2 to 82.1%) were considered tolerant organisms (TV score 8 to 10), while no individuals considered intolerant to disturbance (TV score 0 to 2) were collected at this site.

Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa comprise a group of sensitive organisms, commonly known as EPT taxa, which are found worldwide and provide a good estimate of the water and habitat quality in a stream. While some of the taxa from this group are moderately insensitive to impairment, the majority are good indicators of community health. No EPT taxa were found at this site (Table 3-4).

3.3.4 Functional Feeding Groups

BMI may be grouped according to mode of feeding, referred to as Functional Feeding Groups (FFG). A healthy assemblage will typically contain a variety of FFGs, while dominance of the community by few FFGs suggests the stream may not support a diversity of ecological niches and may be general indicator of poor community health. The type and relative abundance of groups present can provide valuable insight with regard to ecological integrity, especially when considered with other assessment data.

A summary of the various FFG distributions obtained is presented in Table 3-5. The distribution of FFGs at the TJ-PC-D location was rather disproportionate. The collector-gatherer FFG contained the majority of taxa present, ranging from 65 to 83 percent among replicates. The collector-gatherer FFG is a subset of a larger collector group, comprised of collector-gatherers and collector-filterers. The collector-gatherers typically acquire fine particulate organic matter from the bottom by ingesting fine sediments, while the collector-filterers use mucous nets or fans to filter out fine particulate organic matter suspended in the passing water column. Both of these collectors are typically found in higher numbers in streams containing a high proportion of fines and sands.

Table 3-5. Percentages of Functional Feeding Groups for May 12, 2015 Field Survey

FFG	Field Replicate		
	TJ-PC-D-051215-01	TJ-PC-D-051215-02	TJ-PC-D-051215-03
Collectors FFG	80.9	83.3	64.7
Collector-Filterers subgroup	0.0	0.0	0.0
Collector-Gatherers subgroup	80.9	83.3	64.7
Predators FFG	0.0	0.0	0.0
Scrapers FFG	0.0	0.0	0.0
Shredders FFG	<0.1	<0.1	<0.1
Piercer-Herbivores FFG	0.0	0.0	0.0
Unclassified FFG	18.9	16.5	35.2

4.0 QUALITY ASSURANCE/QUALITY CONTROL

The data presented has been reviewed in accordance with the Amec Foster Wheeler internal quality assurance program and are deemed acceptable for reporting. Identified deviations from the protocol are discussed below, or are otherwise considered minor with no likely effect upon the assessment.

4.1 Analytical Water Chemistry

Due to elevated concentrations of several chemical constituents observed at the Tijuana River Pilot Channel sampling locations, dilutions were performed by the analytical laboratory in several instances, which then increased the MDL and RL for the diluted analytes. The elevated MDLs and RLs for the diluted samples are provided in Table 3-1 and Appendix Table B-1.

4.2 CRAM Monitoring

No QA/QC issues were encountered.

4.3 Benthic Macroinvertebrate Identification

Taxonomic identification and biotic metric calculations were performed by Amec Foster Wheeler. Quality Assurance measures included re-sorting a minimum of 20 percent of each sample to determine sorting efficacy. In addition, 10 percent of samples were completely re-sorted. Surface Water Ambient Monitoring Program (SWAMP) methods under the Standard Taxonomic Effort Level 2 requires sorting random aliquots of a sample until a minimum of 600 ± 10% individuals are obtained, or sorting the entire sample if <600 individuals are acquired. None of the samples reached the 600 individuals goal, and therefore the entire sample was sorted for each replicate.

5.0 SUMMARY

5.1 Summary

This report summarizes water quality, CRAM, and benthic biological results at three riverine wetland areas surrounding the annual dredge maintenance footprint for the Tijuana River Valley Channel Maintenance Project 09C-077. Two of the AAs were located upstream (TJ-PC-U and TJ-SG-U) of the dredging impact area and one AA was located downstream (TJ-PC-D) of the dredging impact area. Sampling was conducted on May 12, 2015.

5.1.1 Water Quality Monitoring

Water quality samples were collected at the upstream and downstream Pilot Channel locations only, as TJ-SG-U was dry for this monitoring event. The reported water quality results are summarized as follows:

- Nutrient concentrations were consistently higher at the upstream Pilot Channel location.
- Alkalinity and chloride were higher at the downstream Pilot Channel location, likely due to the tidal influence in this area.
- The chlorophyll-a concentration was higher at the downstream Pilot Channel location.
- The TSS concentration and turbidity at the upstream Pilot Channel location were 2.8 and 2.1 times higher, relative to the downstream location, respectively.
- DO was depressed at both Pilot Channel stations, however the upstream station had a severely depressed concentration.

5.1.2 CRAM Monitoring

CRAM was performed at all three monitoring locations. While there was some slight variability (one letter grade difference) among the individual attributes between sites, the overall AA scores for all three AAs monitored were relatively similar. The largest discrepancy among attributes was related to hydrologic connectivity, the only attribute with greater than 1 letter grade difference between sites. This was largely due to the improved hydrologic connectivity score at TJ-SG-U (see historical comparison section below) relative to prior monitoring events.

5.1.3 Sediment Infauna Biological Monitoring

Results from the sediment biological monitoring event indicate a benthic community that is highly tolerant to disturbance. The low diversity, high HBI scores, and overwhelming dominance of a single FFG point to a biological community that may be responding to one or more stressors. A location on the Tijuana River in close proximity to the downstream Pilot Channel station (Tijuana River at Saturn Blvd.) and at approximately the same elevation was monitored for freshwater invertebrates in May 2010 and May 2012 by the County of San Diego's copermittee receiving waters monitoring program (County of San Diego, 2011 and 2013). Taxa collected at this site showed a similar community structure, with tolerant Chironomid and

Oligochaete taxa together comprising 99 and 95 percent of the community, for those two monitoring events respectively.

The tidal influence present at the downstream Pilot Channel location likely affects the types of organisms that can survive there. Increased TDS/Conductivity is one of the factors used in generating the Hilsenhoff Tolerance Values (HBI scores). The limited community, with few taxa, and high average HBI score observed at this station may be indicative of stress due to fluctuations in salinity known to occur at that location (0.4 to 18 ppt) (see AMEC 2013), anthropogenic stressors, or a combination of both. While it is difficult to tease apart natural versus anthropogenic impacts to ambient conditions at a station with physical characteristics such as this, continued biological monitoring at this location in association with dredging operations will provide an assessment of the biological community and how it is changing in response to the ongoing maintenance dredging.

5.2 Historical comparison to prior monitoring events

Due to the limited amount of data collected thus far, it is difficult to make clear determinations of representative mean biological metrics, CRAM characteristics, or analytical concentrations at each station, trends in data, or whether meaningful statistical differences exist between the monitoring stations over time. As more data is collected, statistical analyses will become more meaningful in identifying trends over the course of the project. The following figures present current data along with data from the previous monitoring events to provide some context with which to view the various lines of data over the course of the project thus far, but are not meant to identify definitive trends. Any observed tendencies in the data at this point are purely observational.

<u>Water Quality</u>

The concentration of nutrients TKN, ortho-phosphate, total phosphorus, ammonia, nitrate, and nitrite have all been consistently elevated at the upstream Pilot Channel location across all monitoring events (Figures 4-1 and 4-2). Similarly, total suspended solids concentrations were greater at the upstream Pilot Channel for each monitoring event (Figure 4-3). When detected at the upstream Pilot Channel location (MDL >8.3 mg/L), chlorophyll-a concentrations have also been higher than those observed in the lower Pilot Channel (Figure 4-4). The two instances in which the chlorophyll-a concentration was higher at the downstream Pilot Channel location, pre-project (1/31/13) and annual ambient (5/12/15), occurred when it was not detected at the upstream Pilot Channel. However, in both of these cases the highest chlorophyll-a concentration at the downstream site was lower than any detected instance at the upstream Pilot Channel site.

During the one instance when upstream Smuggler's Gulch had water present (1/31/13), this location had a higher concentration of all nutrients than any other downstream Pilot Channel monitoring event. The only exception to this was nitrate and nitrite, which were observed at similar concentrations to the downstream Pilot Channel location. Total suspended solids concentration at Smuggler's Gulch were greater than or equal to four of the five monitoring events at the downstream Pilot Channel location. Chlorophyll-a was not detected (MDL <8.3 mg/L) at Smuggler's Gulch.

For in-situ water quality parameters measured in the field, turbidity at both upstream Pilot Channel and Smuggler's Gulch were consistently elevated relative to that at the downstream Pilot Channel location (Figures 4-5 and 4-6). No other parameter exhibited any distinct pattern.

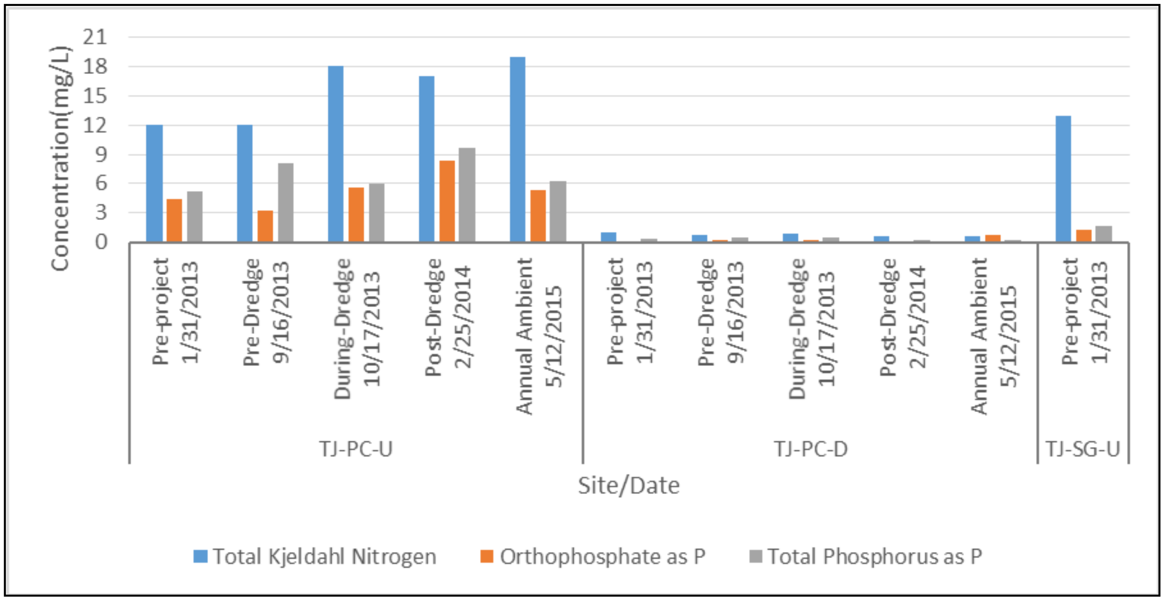

Figure 4-1. TKN, orthophosphate and total phosphorus concentrations across all stations and monitoring events.

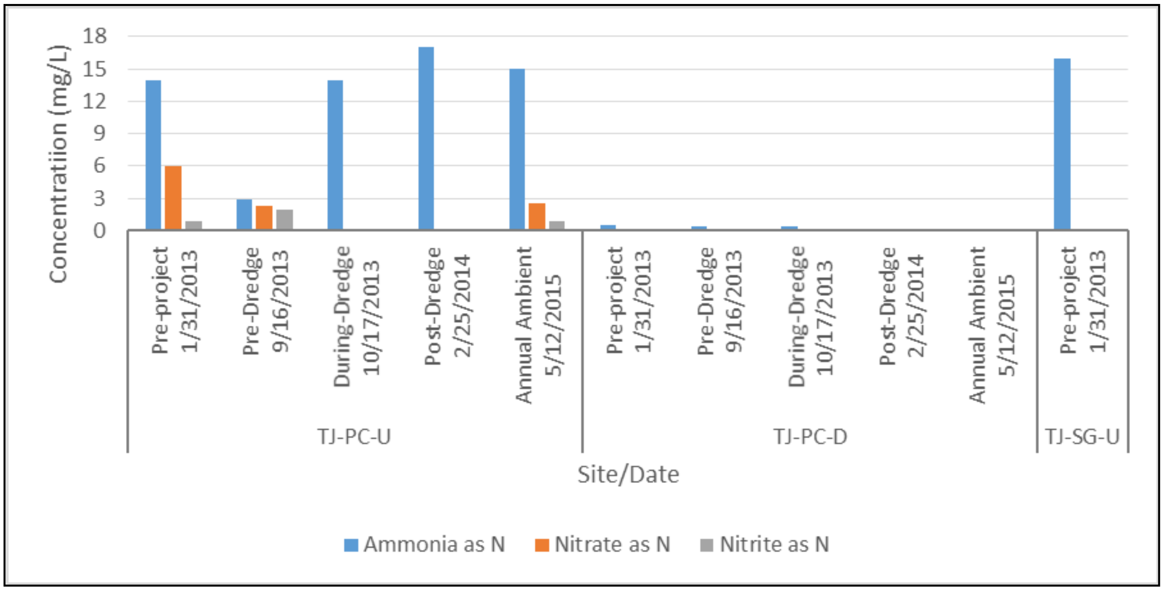

Figure 4-2. Ammonia, nitrate and nitrite concentrations across all stations and monitoring events.

Nitrite at TJ-SG-U (1/31/13) was non-detect. This was depicted as half of the method detection limit (i.e. 0.005 mg/L)

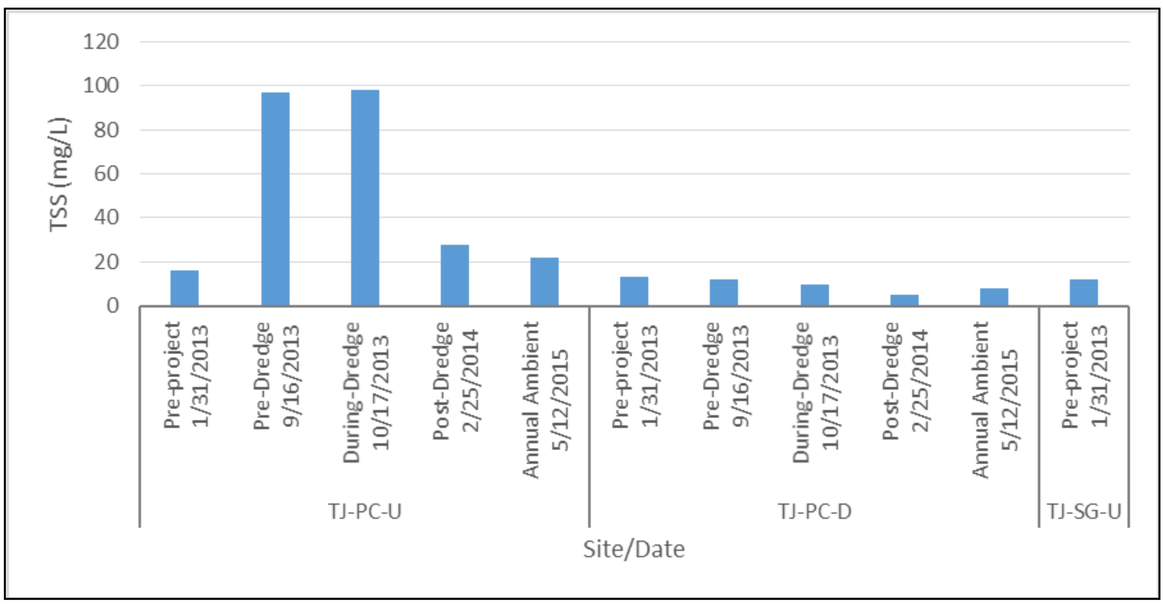

Figure 4-3. Total suspended solids concentrations across all stations and monitoring events.

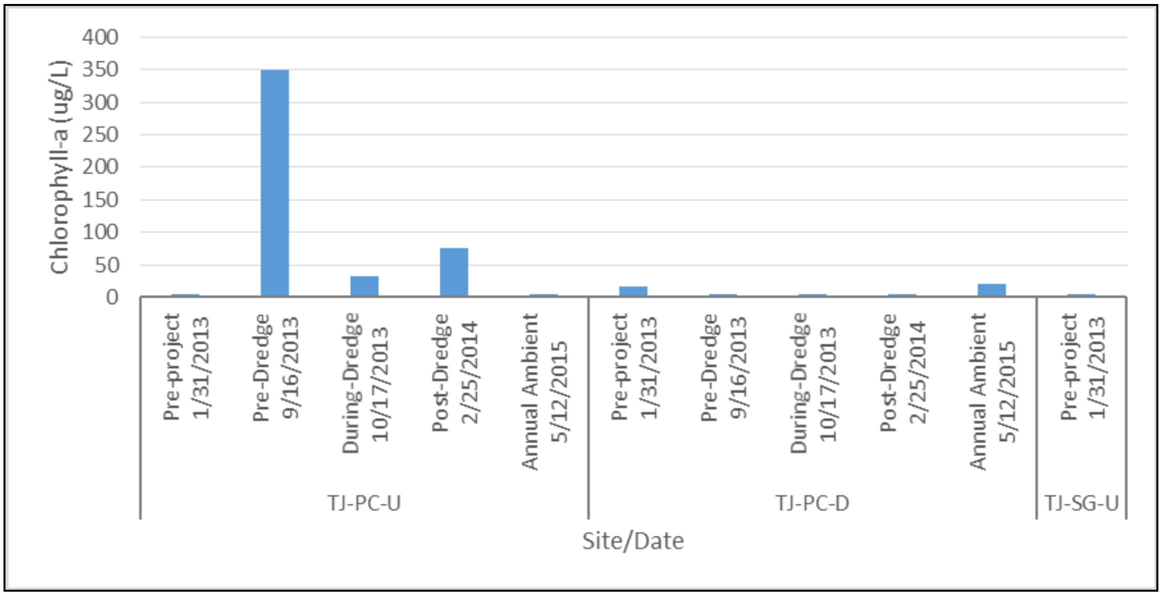

Figure 4-4. Chlorophyll-a concentrations across all stations and monitoring events.

TJ-PC-U (1/31/13, 5/12/15); TJ-PC-D (9/16/13, 10/17/13, 2/25/14); TJ-SG-U (1/31/13) were all non-detect. These are depicted as half of the method detection limit (i.e. 4.15 mg/L)

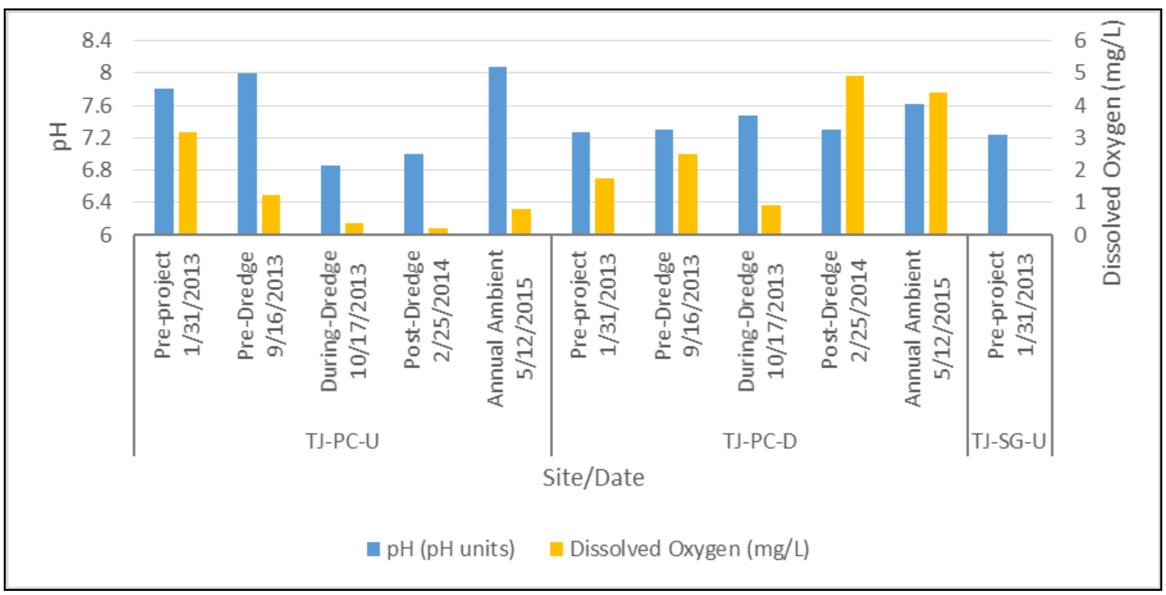

Figure 4-5. In-situ field water quality pH & DO measured across all stations and monitoring events.

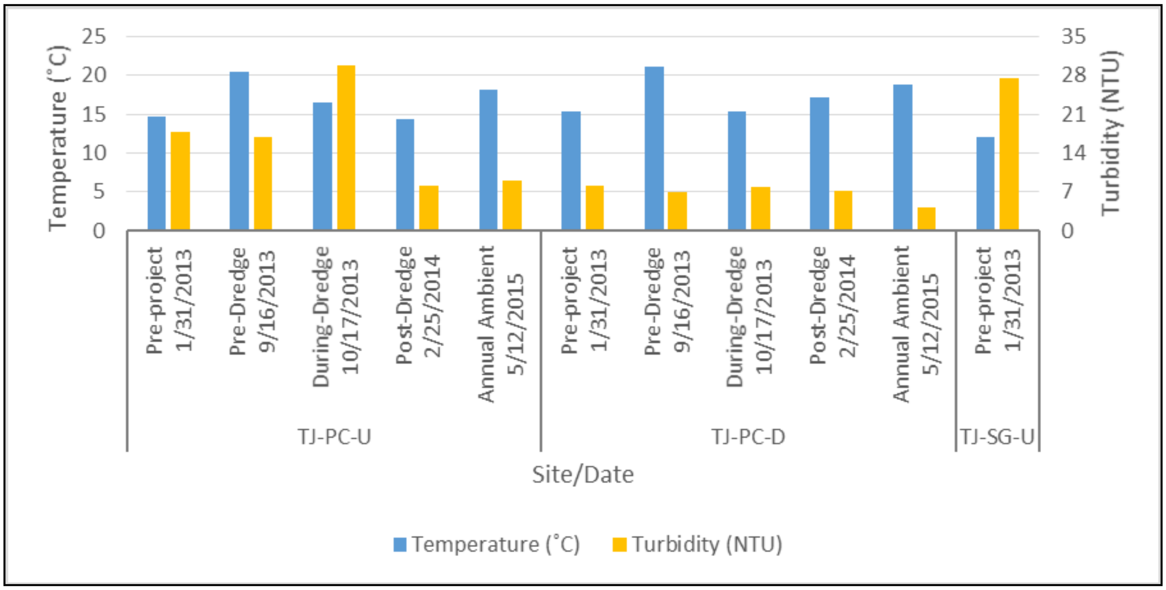

Figure 4-6. In-situ field water quality temperature & turbidity measured across all stations and monitoring events.

<u>CRAM</u>

The overall CRAM score at the upstream and downstream Pilot Channel locations were relatively similar across all monitoring events, and with the exception of the last event, were consistently elevated relative to that at the upstream Smuggler's Gulch location (Figure 4-7). The primary reason for the increased CRAM score at Smuggler's Gulch during the latest survey was an increase in the hydrology attribute score. This hydrology attribute score increased from a constant 41.7 over the previous four monitoring events, to 66.7 during the current survey. This increase in hydrology attribute score was primarily due to a larger entrenchment ratio, meaning the water had a greater ability to spread laterally outside of its bankfull width and into the floodplain than it had in previous events. The area for higher flows to spread laterally (i.e. the floodplain) is somewhat fixed at this site between a hillside to the west and an earthen berm to the east. The larger entrenchment ratio was a result of the bankfull width decreasing by over 50 percent from the previous three monitoring events, thereby increasing the entrenchment ratio.

<u>Biological Infaunal Community</u>

No discernable change in the benthic biological community was observed across monitoring events at the downstream Pilot Channel location (Figure 4-8). All events indicated low taxa richness and diversity scores, high HBI scores signifying a benthic community comprised of generally tolerant organisms, and no intolerant individuals present.

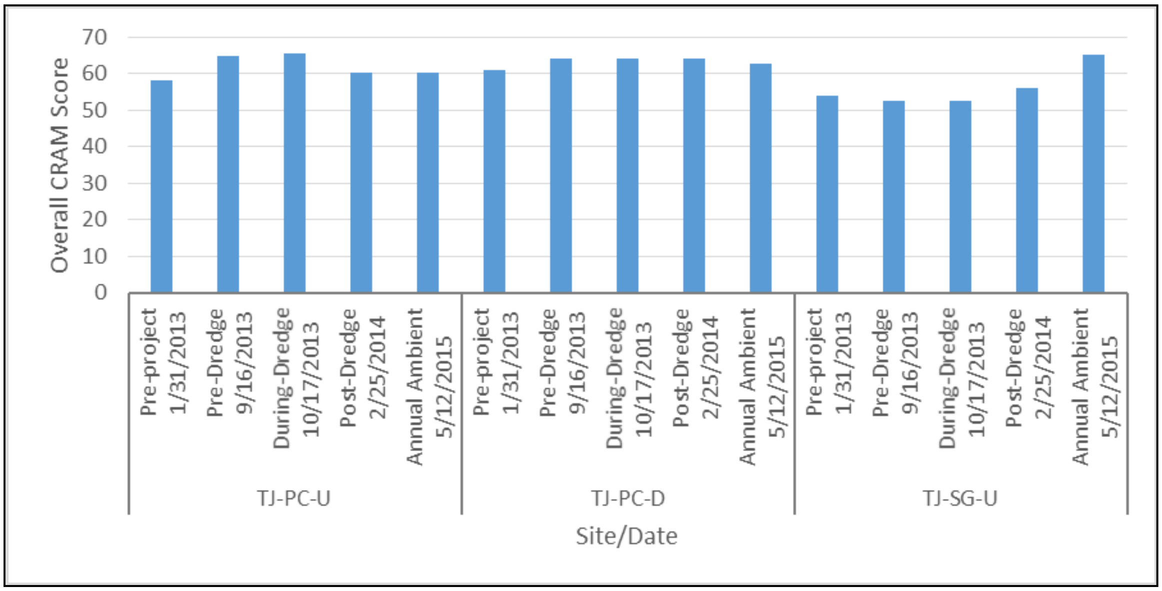

Figure 4-7. Overall CRAM scores across all stations and monitoring events.

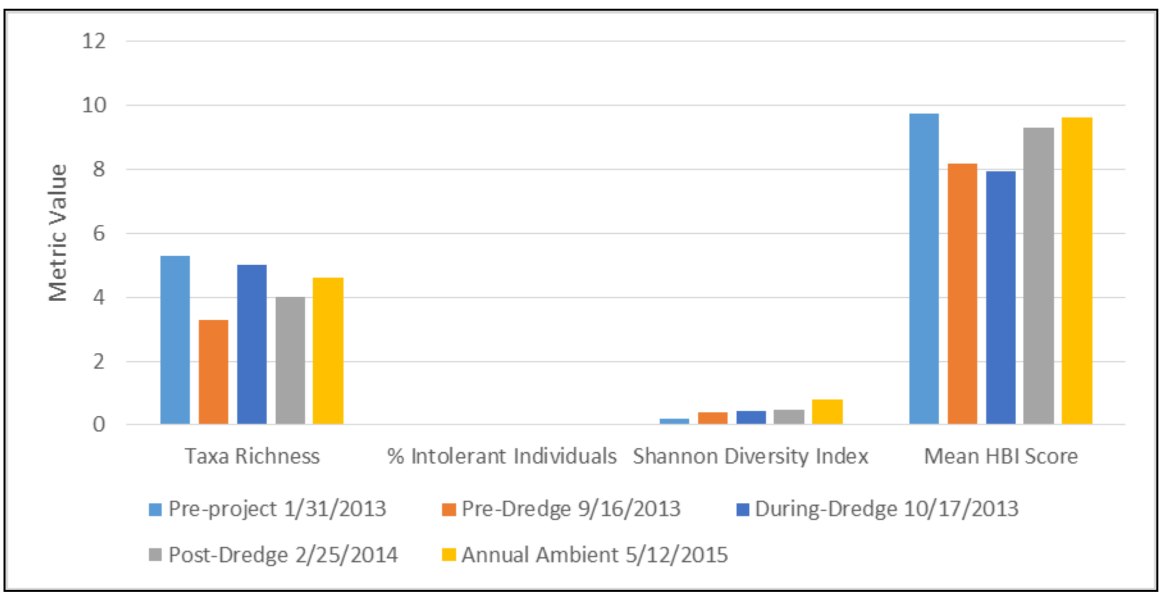

Figure 4-8. Selected biological metrics describing benthic the invertebrate community across all monitoring events of the downstream Pilot Channel location.

5.3 Next Steps

The monitoring program will begin again when the maintenance dredging program resumes, which is anticipated to occur in September 2015. Monitoring will continue to be performed in accordance with the provisions outlined in 401 Certification.

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APPENDIX A

PHOTO LOG

Photo 1

Tijuana River Pilot Channel Upstream Station – western end of AA looking downstream

Photo 2

Tijuana River Pilot Channel Upstream Station – western end of AA looking upstream

Photo 3

Tijuana River Pilot Channel Upstream Station – eastern end of AA looking upstream

Photo 4

Tijuana River Pilot Channel Upstream Station – eastern end of AA looking downstream

Photo 5

Tijuana River Pilot Channel Downstream Station – eastern end of AA looking upstream

Photo 6

Tijuana River Pilot Channel Downstream Station – eastern end of AA looking downstream

Photo 7

Tijuana River Pilot Channel Downstream Station – western end of AA looking downstream

Photo 8

Tijuana River Pilot Channel Downstream Station – western end of AA looking upstream

Photo 9

Smuggler's Gulch Upstream Station – northern end of AA looking upstream

Photo 10

Smuggler's Gulch Upstream Station – northern end of AA looking downstream

Photo 11

Smuggler's Gulch Upstream Station – southern end of AA looking downstream

Photo 12

Smuggler's Gulch Upstream Station – southern end of AA looking upstream

APPENDIX B

DILUTED SAMPLE METHOD DETECTION LIMITS AND REPORTING LIMITS

Table B-1. Ambient Monitoring Diluted Samples

Analyte	Units	Site							
		TJ-PC-U				TJ-PC-D			
		DF	MDL	RL	Result	DF	MDL	RL	Result
Chloride	mg/L	25	2.5	12	360	10	1.0	5.0	430
Ammonia as N	mg/L	50	2.4	5.0	15	-	-	-	-
OrthoPhosphate as P	µg/L	50	0.011	0.10	5.4	-	-	-	-
Nitrogen, Total Kjeldahl	mg/L	5	0.25	0.50	19	-	-	-	-
Total Phosphorus as P	mg/L	2	0.070	0.50	6.2	2	0.0028	0.020	0.23

Notes:
DF - dilution factor
RL - reporting limit
MDL - method detection limit
"-" - sample was not diluted

APPENDIX C

CRAM & FIELD SHEETS

May 12, 2015 SAMPLING EVENT

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: Smugglers Gulch Upstream	
Project Name: Tijuana River Dredge Monitoring	
Assessment Area ID #:	
Project ID #:	Date: 5/12/15
Assessment Team Members for This AA: JR, TH	

Average Bankfull Width: 5.7

Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 150m

Upstream Point Latitude: 32.5425 **Longitude:** -117.0882

Downstream Point Latitude: 32.5436 **Longitude:** -117.0884

Wetland Sub-type:

☐ Confined ☒ Non-confined

AA Category:

☐ Restoration ☐ Mitigation ☐ Impacted ☒ Ambient ☐ Reference ☐ Training

☒ Other: Dredge Material Monitoring

Did the river/stream have flowing water at the time of the assessment? ☐ yes ☒ no

What is the apparent hydrologic flow regime of the reach you are assessing?

The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source.

☐ perennial ☐ intermittent ☒ ephemeral

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	59 60	Upstream			
2	57 58	Middle Left			
3		Middle Right			
4	55 56	Downstream			
5	↓ ↓				
6	looking				
7	down looking				
8	up				
9					
10					

Site Location Description:

Comments:

Scoring Sheet: Riverine Wetlands

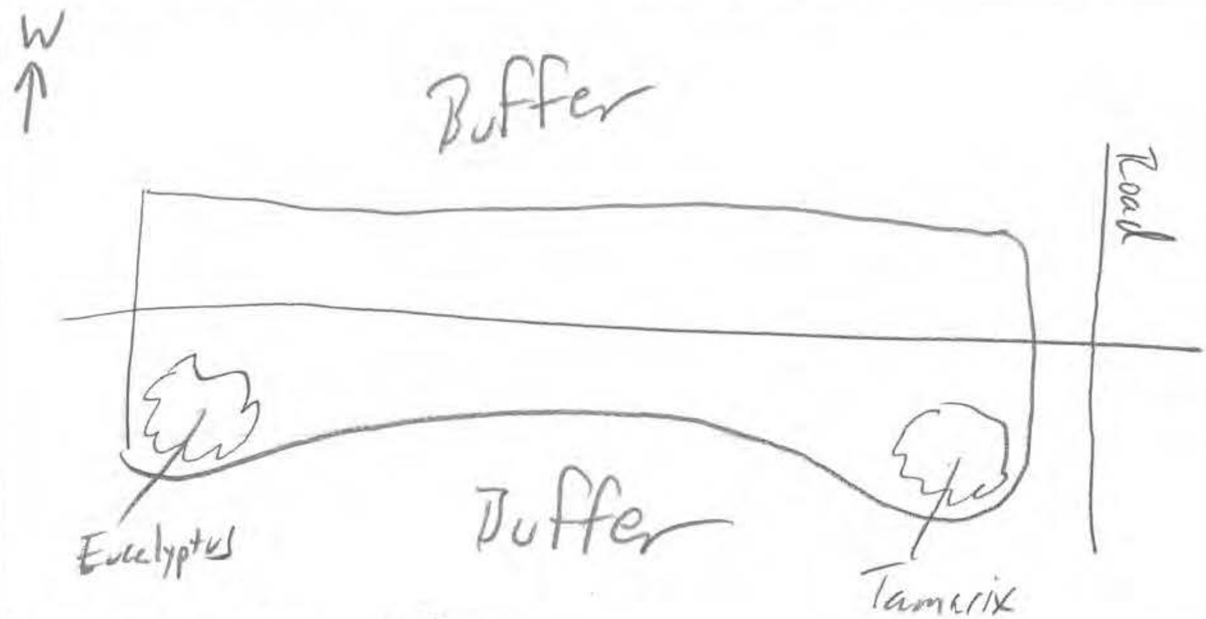
AA Name: Smugglers Gultch Upstream					Date: 5/12/15	
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**	
Stream Corridor Continuity (D)			Alpha. A	Numeric 12		
Buffer:						
Buffer submetric A: Percent of AA with Buffer	Alpha. A	Numeric 12				
Buffer submetric B: Average Buffer Width	B	9				
Buffer submetric C: Buffer Condition	C	6				
Raw Attribute Score = D+[C x (A x B)$^{1/2}$]$^{1/2}$				20.0	**Final Attribute Score = (Raw Score/24) x 100**	83.3
Attribute 2: Hydrology (pp. 20-26)						
			Alpha.	Numeric		
Water Source			C	6		
Channel Stability			C	6		
Hydrologic Connectivity			A	12		
Raw Attribute Score = sum of numeric scores				24	**Final Attribute Score = (Raw Score/36) x 100**	66.7
Attribute 3: Physical Structure (pp. 27-33)						
			Alpha.	Numeric		
Structural Patch Richness			D	3		
Topographic Complexity			B	9		
Raw Attribute Score = sum of numeric scores				12	**Final Attribute Score = (Raw Score/24) x 100**	50.0
Attribute 4: Biotic Structure (pp. 34-41)						
Plant Community Composition (based on sub-metrics A-C)						
Plant Community submetric A: Number of plant layers	Alpha. A	Numeric 12				
Plant Community submetric B: Number of Co-dominant species	C	6				
Plant Community submetric C: Percent Invasion	D	3				
Plant Community Composition Metric *(numeric average of submetrics A-C)*				7		
Horizontal Interspersion			B	9		
Vertical Biotic Structure			C	6		
Raw Attribute Score = sum of numeric scores				22	**Final Attribute Score = (Raw Score/36) x 100**	61.1
Overall AA Score (average of four final Attribute Scores)					65.3	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	10
2		2	10
3		3	
4		4	
5		5	
Upstream Total Length		Downstream Total Length	20

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	75
B	150
C	150
D	145
E	250
F	
G	
H	
Average Buffer Width *Round to the nearest integer*	188

Worksheet for Assessing Channel Stability for Riverine Wetlands

	Condition	Field Indicators (check all existing conditions)
1	Indicators of Channel Equilibrium	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
		☐ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
		☐ There is leaf litter, thatch, or wrack in most pools (if pools are present).
		☐ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
		☐ There is little or no active undercutting or burial of riparian vegetation.
		☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation.
		☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar).
		☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA
		☐ The larger bed material supports abundant mosses or periphyton.
0	Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
		☐ There are abundant bank slides or slumps.
		☐ The lower banks are uniformly scoured and not vegetated.
		☐ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
		☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
		☐ The channel bed appears scoured to bedrock or dense clay.
		☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided).
		☐ The channel has one or more knickpoints indicating headward erosion of the bed.
5	Indicators of Active Aggradation	☒ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year.
		☒ There are partially buried living tree trunks or shrubs along the banks.
		☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced.
		☒ There are partially buried, or sediment-choked, culverts.
		☒ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
		☐ There are avulsion channels on the floodplain or adjacent valley floor.
	Overall	☐ **Equilibrium** ☐ **Degradation** ☒ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.					
	Steps	**Replicate Cross-sections →**	**TOP**	**MID**	**BOT**
m	1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	4.5	6.5	6.0
cm	2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	50	50	50
cm	3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	100	100	100
m	4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	17.0	10.0	10.0
	5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	3.8	1.5	1.7
	6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			2.3

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

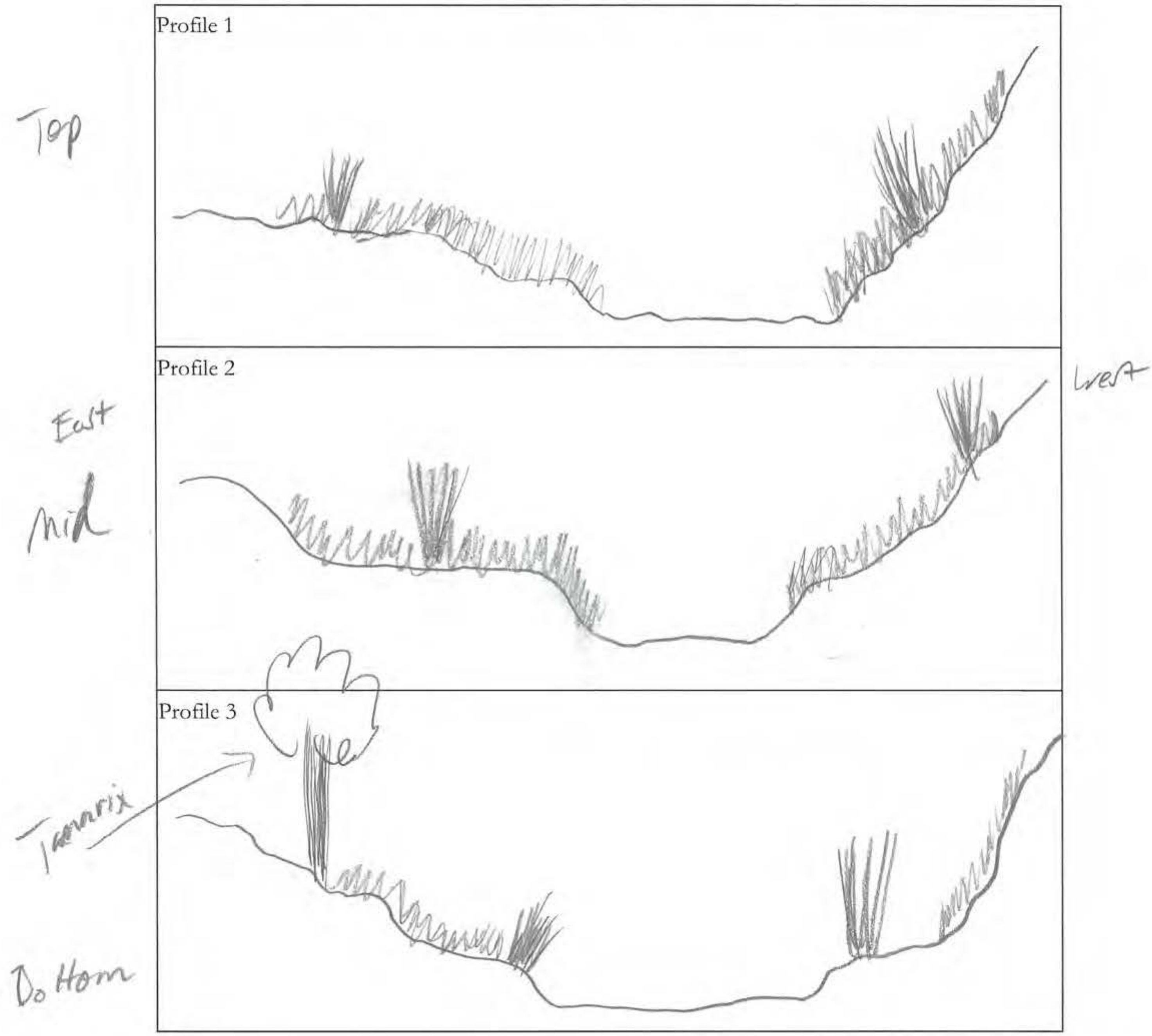
**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

STRUCTURAL PATCH TYPE (circle for presence)	**Riverine (Non-confined)**	**Riverine (Confined)**
Minimum Patch Size	**$3\ m^2$**	**$3\ m^2$**
Abundant wrackline or organic debris in channel, on floodplain	1	1
Bank slumps or undercut banks in channels or along shoreline	1	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	1	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)	0	

none present

Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.



Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

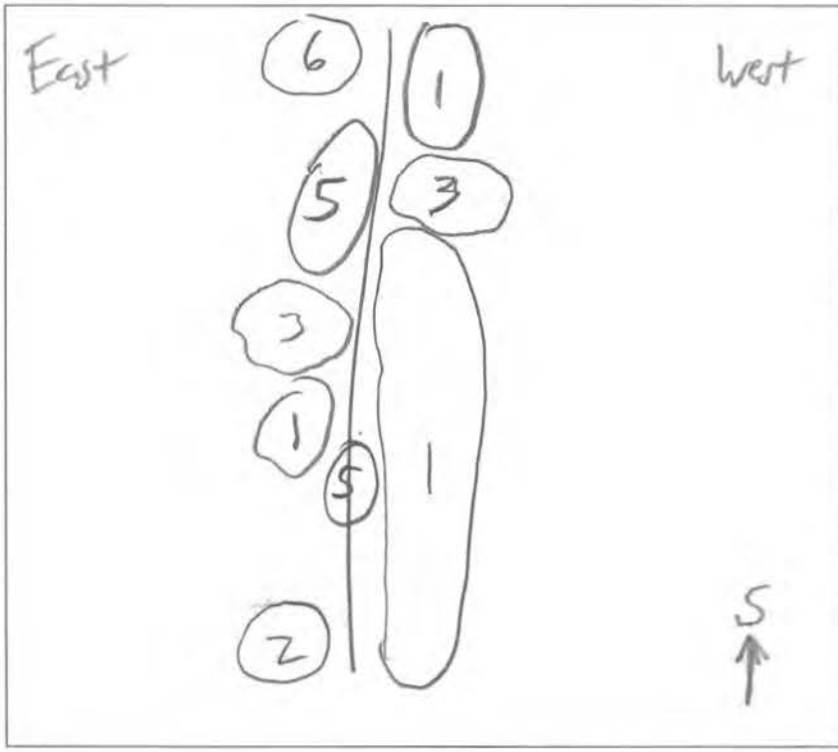
** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Bermuda Grass	Y
Medium (0.5-1.5 m)	**Invasive?**	**Tall (1.5-3.0 m)**	**Invasive?**
Cockleburr	N	Mulefat	N
Garland Chrysanthemum	Y		
Very Tall (>3.0 m)	**Invasive?**		
Castor Bean	Y	Total number of co-dominant species for all layers combined (enter here and use in Table 18)	8
Tamarix	Y		
Ecualyptus	Y	Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	75
Black Willow	N		
Arundo	Y		

Cynodon dactylon
Xanthium strumarium
Chrysanthemum coronarium
Baccharis salicifolia
Ricinis communis
Tamarix aphylla
Arundo donax
Salix [illegible] gooddingii
Eucalyptus camaldulensis

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Castor Bean

2) Tamarix

3) Willow

4) Chyrsanthemum

5) Arundo

6) Eucalyptus

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	X
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)	X	X
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees	X	X
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		

Comments

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**	X	
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed	X	X
Excessive runoff from watershed	X	X
Nutrient impaired (PS or Non-PS pollution)	X	X
Heavy metal impaired (PS or Non-PS pollution)	X	X
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	X
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	X
Trash or refuse	X	X

Comments

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	X
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture	X	
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		


Saturn Blvd
Monument Rd
Hollister St
TJ SG-U
©2013 Google
©2013 INEGI
Image U.S. Geological Survey
Google earth
150 m
Imagery Date: 6/25/2008
1994
lat 32.542960° lon -117.088564° elev 28 m
Eye alt 774 m

5/12/15

Saturn Blvd
Monument Rd
Hollister St
TJ-SG-U
N
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
251 m
Imagery Date: 6/25/2008
1994
lat 32.542642° lon -117.088502° elev 29 m
Eye alt 1.20 km


Saturn Blvd
TJ-PC-U
Tijuana River Valley
500m
Hollister St
TJ-SG-U
500m
Internacional
Esperanza
2 de Junio
Gral Ramon Arnaiz
Remigio Soler
Mazatlan
Padre Kino
Misión del Sol
Art. 27
Canon del Matadero Norte
Periférico
Via Isla Creta
Mirador
Los Laureles
Segunda
Pradera
Vista Hermosa
Canal
500 m
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
Culiacan
Imagery Date: 6/25/2008
1994
lat 32.542437° lon -117.088070° elev 14 m
Eye alt 2.43 km

TJ-SG-U
2 Km
Saturn Blvd
Hollister St
Monument Rd
Internacional
Segunda Benito Juarez
Segundo
Via Isla Cea
Esperanza
De la Rivera
Mazatlan
De Los Misioneros
Art. 123
Art. 27
Padre Kino
Remigio Soler
Gral Juan Carrasco
Gral Ramón Arnaiz
Braulio Maldonado
Sta Maria del Mar
Acueducto
Salvador Alvarado
Transpeninsular
Linda Vista
Vista Dorada
Manuel Flores
Pensador Mexicano
Emilio Zola
Sor Juana Inés de La Cruz
Rubén Darío
Jorge Isaac
Mar de Cortes
Periférico
Cuauhtémoc
Huitzilac
Paseo Coronado
Mirador
Av Bahía San Quintín
Paseo Costa del Pacífico
Paseo de La Montaña
5to. Batallón
Pradera
P. Vista Hermosa
Sánchez Tapia
Angela Peralta
Silva
Carlota Sosa
Rubén Amaya
Venustiano Carranza
Emiliano Zapata
Gildardo Magaña
Rafael Buelna
Manuel M. Dieguez
Canon Rubén Amaya
Agustín Pérez Rivero
Del Agua
Baja Mar
Av Bella Vista
18 de Marzo
Jazmines
Nueva Generación
Bahía Sta Ines
San Telmo
de La Paz
Escuela Pavo
Image U.S. Geological Survey
© 2013 INEGI
© 2013 Google
Google earth
Imagery Date: 6/25/2008
1994
729 m
lat 32.533782° lon -117.087917° elev 97 m
Eye alt 3.23 km

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: Tijuana River Upstream	
Project Name: TJ River Dredge	
Assessment Area ID #: AC - TJRLV - 051215	
Project ID #:	**Date:** 05/12/15
Assessment Team Members for This AA:	
JR, TH	
Average Bankfull Width: 17.3 m	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 160 m	
Upstream Point Latitude: 32.5507 **Longitude:** -117.0811	
Downstream Point Latitude: 32.5512 **Longitude:** -117.0826	
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☒ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Monitoring Impacts	
Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☒ perennial ☐ intermittent ☐ ephemeral	

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	53 54	Upstream			
2	51	Middle Left			
3	52	Middle Right			
4	49, 50	Downstream			
5	↓ ↓				
6	looking looking				
7	down up				
8					
9					
10					

Site Location Description:

Comments:

After small rain event, about 96 hrs.
Sewage smell.

Scoring Sheet: Riverine Wetlands

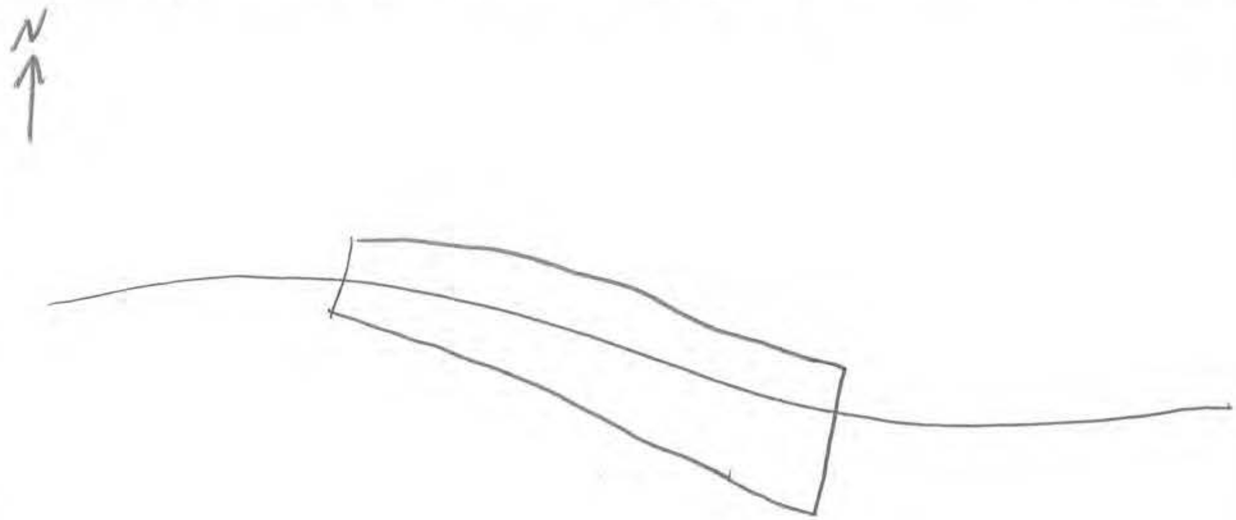
AA Name: TJ River Upstream					**Date:** 5/12/15	
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**	
Stream Corridor Continuity (D)			Alpha. A	Numeric 12		
Buffer:						
Buffer submetric A: Percent of AA with Buffer	Alpha. A	Numeric A				
Buffer submetric B: Average Buffer Width	A	12				
Buffer submetric C: Buffer Condition	B	9			Some trails, evidence of human visitation, trash	
Raw Attribute Score = D+[C x (A x B)$^{1/2}$]$^{1/2}$				22.0	**Final Attribute Score = (Raw Score/24) x 100**	91.7
Attribute 2: Hydrology (pp. 20-26)						
			Alpha.	Numeric		
Water Source			C	6		
Channel Stability			B	9		
Hydrologic Connectivity			C	6		
Raw Attribute Score = sum of numeric scores				21.0	**Final Attribute Score = (Raw Score/36) x 100**	58.3
Attribute 3: Physical Structure (pp. 27-33)						
			Alpha.	Numeric		
Structural Patch Richness			D	3		
Topographic Complexity			C	6		
Raw Attribute Score = sum of numeric scores				9.0	**Final Attribute Score = (Raw Score/24) x 100**	37.5
Attribute 4: Biotic Structure (pp. 34-41)						
Plant Community Composition (based on sub-metrics A-C)						
	Alpha.	Numeric				
Plant Community submetric A: Number of plant layers	A	12				
Plant Community submetric B: Number of Co-dominant species	D	3				
Plant Community submetric C: Percent Invasion	C	6				
Plant Community Composition Metric *(numeric average of submetrics A-C)*				7		
Horizontal Interspersion			C	6		
Vertical Biotic Structure			C	6		
Raw Attribute Score = sum of numeric scores				19	**Final Attribute Score = (Raw Score/36) x 100**	52.8
Overall AA Score (average of four final Attribute Scores)					60.1	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	10
2		2	10
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	20

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	250
C	250
D	250
E	180
F	195
G	200
H	225
Average Buffer Width *Round to the nearest integer*	225

Worksheet for Assessing Channel Stability for Riverine Wetlands

4

1

2

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA. ☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it. ☒ There is leaf litter, thatch, or wrack in most pools (if pools are present). ☒ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area. ☐ There is little or no active undercutting or burial of riparian vegetation. ☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation. ☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar). ☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA — One big pool ☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☐ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs. ☐ There are abundant bank slides or slumps. ☐ The lower banks are uniformly scoured and not vegetated. ☒ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel. → more trees down than previous effort ☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation. ☐ The channel bed appears scoured to bedrock or dense clay. ☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided). ☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year. ☒ There are partially buried living tree trunks or shrubs along the banks. ☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced. — one big pool ☐ There are partially buried, or sediment-choked, culverts. ☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour. ☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☒ **Equilibrium** ☐ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT	
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	18	17	17	m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	2.5	2.0	2.5	m estimate too deep and soft to see middle
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	5.0	4.0	5.0	m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	28	25	29	m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.6	1.5	1.7	
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.6	

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

**Please refer to the CRAM Photo Dictionary at www.cramwetlands.org for photos of each of the following patch types.*

STRUCTURAL PATCH TYPE (circle for presence)	**Riverine (Non-confined)**	**Riverine (Confined)**
Minimum Patch Size	**3 m^2**	**3 m^2**
Abundant wrackline or organic debris in channel, on floodplain	1 (circled)	1
Bank slumps or undercut banks in channels or along shoreline	1	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	1 (circled)	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	1	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)	2	

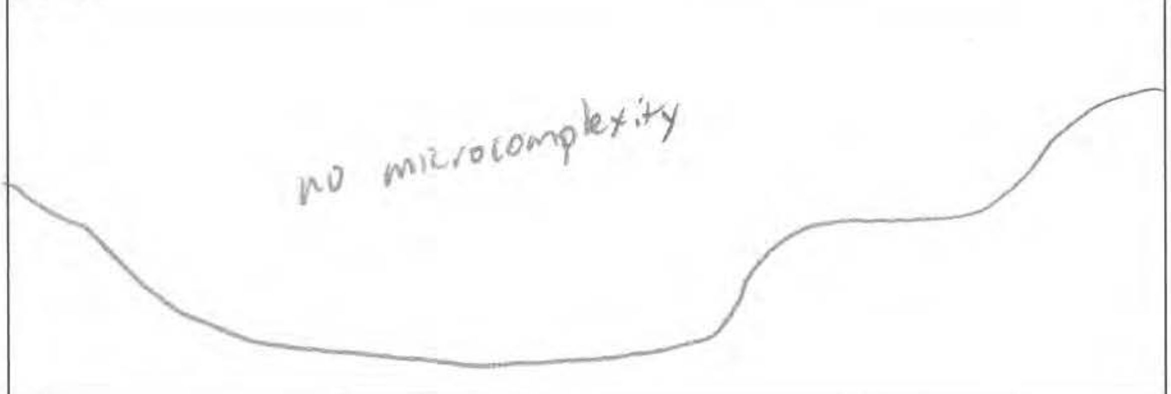
Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

North

Profile 1

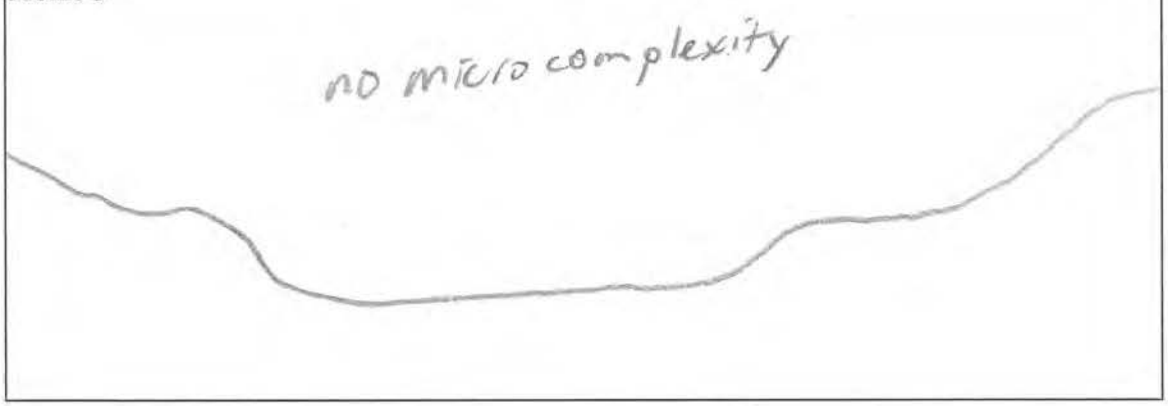
South



Top

Profile 2

Profile 3



Bottom

Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
		Nasturtium (Tropaeolum majus)	Y
		Castor Bean (Ricinus communis)	Y
none			

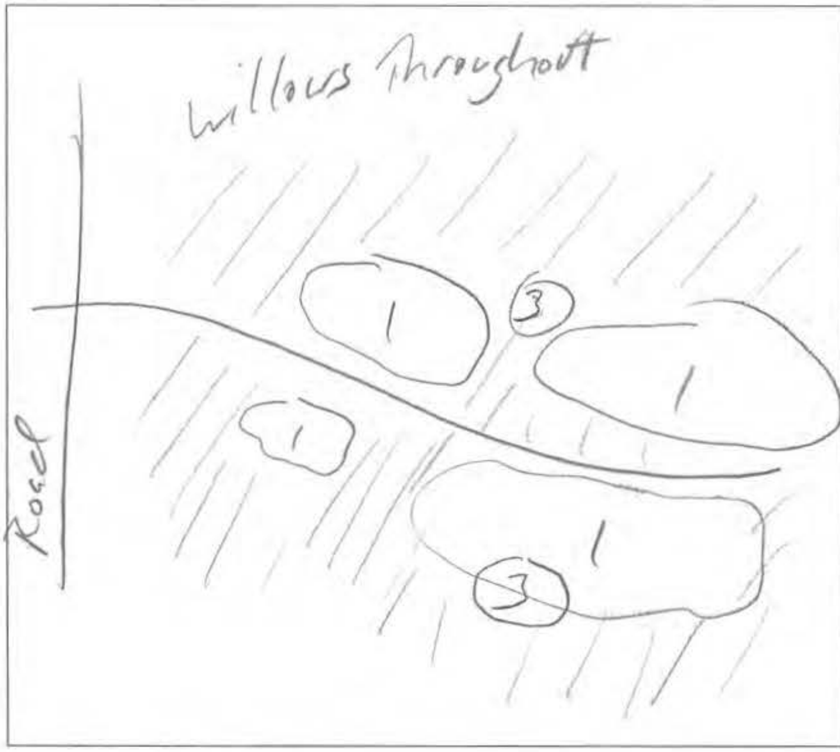
Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
Mulefat	N	Castor Bean	Y
		Mulefat (Baccharis salicifolia)	N

Very Tall (>3.0 m)	Invasive?		
Black Willow (Salix gooddingii)	N	Total number of co-dominant species for all layers combined (enter here and use in Table 18)	5
Arroyo Willow (Salix lasiolepis)	N		
Castor Bean	Y	Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	40

– lots of very young castor bean < 6"

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Castor Bean
2) Willows
3) Mulefat
4)
5)
6)

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	X
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	X	X
Heavy metal impaired (PS or Non-PS pollution)	X	X
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	X
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	X
Trash or refuse	X	X
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	X

Comments

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic		
Dams (or other major flow regulation or disruption)		
Dryland farming		
Intensive row-crop agriculture		
Orchards/nurseries	X	
Commercial feedlots	X	
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		

Comments


Saturn Blvd
TJ-PC-U
Hollister St
© 2013 Google
Image U.S. Geological Survey
© 2013 INEGI
Google earth
150 m
Imagery Date: 2/29/2008 1994
lat 32.551003 lon -117.082326 elev 6 m
Eye alt 664 m

5/12/15

Saturn Blvd
TJ-PC-U
Tijuana River Valley
250 m
© 2013 Google
Image U.S. Geological Survey
© 2013 INEGI
Google earth
Imagery Date 2/29/2008
1994
lat 32.551060 lon -117.082195 elev 6 m
Eye alt 1.11 km

Wardlow Ave
Chavez Rd
Arbodar Rd
Brando Dr
Sunset Ave
Saturn Blvd
TJ-PC-U
Tijuana River Valley
Hollister St
Old Dairy Mart Rd
TJ-SG-U
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
499 m
Google earth
Imagery Date: 6/25/2008
1994
lat 32.550924° lon -117.081387° elev 8 m
Eye alt 2.37 km


Alosta St
Dalisay St
Wardlow Ave
Valance St
Chavez Rd
Arbodar Rd
Brando Dr
Corte Amalia
Blackshaw Ln
Sunset Ln
Sunset Ave
Servando Ave
W San Ysidro Blvd
5
Camino De La Plaza
TJ-PC-U
Tijuana River Valley
2 Km
Old Dairy Mart Rd
Dairy Mart Rd
Hollister St
Monument Rd
1
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
593 m
Imagery Date: 6/25/2008
1994
lat 32.550515° lon -117.070384° elev 11 m
Eye alt 2.55 km
Google earth
Escobedo

Basic Information Sheet: Riverine Wetlands

Assessment Area Name: Tijuana River - Downstream	
Project Name: Tijuana River Dredge	
Assessment Area ID #: AC - TJPCD - 051215	
Project ID #:	**Date:** 5/12/15
Assessment Team Members for This AA: JR, TH	
Average Bankfull Width: 5.3 m	
Approximate Length of AA (10 times bankfull width, min 100 m, max 200 m): 100m	
Upstream Point Latitude: 32.5579	**Longitude:** -117.1035
Downstream Point Latitude: 32.5576	**Longitude:** -117.1045
Wetland Sub-type: ☐ Confined ☒ Non-confined	
AA Category: ☐ Restoration ☐ Mitigation ☐ Impacted ☒ Ambient ☐ Reference ☐ Training ☒ Other: Dredge Monitoring	
Did the river/stream have flowing water at the time of the assessment? ☒ yes ☐ no	
What is the apparent hydrologic flow regime of the reach you are assessing? The hydrologic flow regime of a stream describes the frequency with which the channel conducts water. *Perennial* streams conduct water all year long, whereas *ephemeral* streams conduct water only during and immediately following precipitation events. *Intermittent* streams are dry for part of the year, but conduct water for periods longer than ephemeral streams, as a function of watershed size and water source. ☒ perennial ☐ intermittent ☐ ephemeral	

Tidal Influence

Photo Identification Numbers and Description:

	Photo ID No.	Description	Latitude	Longitude	Datum
1	69 70	Upstream			
2		Middle Left			
3		Middle Right			
4	71 72	Downstream			
5					
6					
7					
8					
9					
10					

Site Location Description:

looking down looking up

Comments:

Falling tide

Scoring Sheet: Riverine Wetlands

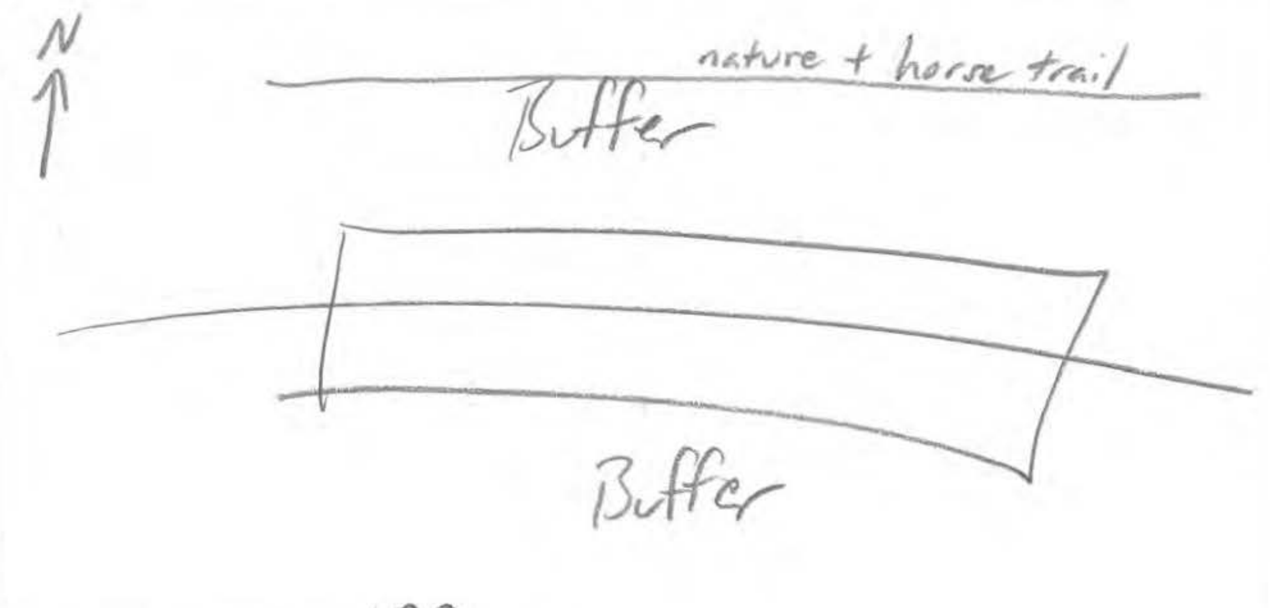
AA Name: TJ River downstream					Date: 5/12/15	
Attribute 1: Buffer and Landscape Context (pp. 11-19)					**Comments**	
Stream Corridor Continuity (D)			Alpha. A	Numeric 12		
Buffer:						
Buffer submetric A: Percent of AA with Buffer	Alpha. A	Numeric 12				
Buffer submetric B: Average Buffer Width	A	12				
Buffer submetric C: Buffer Condition	B	9				
Raw Attribute Score = $D+[C \times (A \times B)^{1/2}]^{1/2}$				22.0	**Final Attribute Score = (Raw Score/24) x 100**	91.7
Attribute 2: Hydrology (pp. 20-26)						
			Alpha.	Numeric		
Water Source			C	6		
Channel Stability			B	9		
Hydrologic Connectivity			D	3		
Raw Attribute Score = sum of numeric scores				18	**Final Attribute Score = (Raw Score/36) x 100**	50.0
Attribute 3: Physical Structure (pp. 27-33)						
			Alpha.	Numeric		
Structural Patch Richness			D	3		
Topographic Complexity			C	6		
Raw Attribute Score = sum of numeric scores				9	**Final Attribute Score = (Raw Score/24) x 100**	37.5
Attribute 4: Biotic Structure (pp. 34-41)						
Plant Community Composition (based on sub-metrics A-C)						
Plant Community submetric A: Number of plant layers	Alpha. A	Numeric 12				
Plant Community submetric B: Number of Co-dominant species	C	6				
Plant Community submetric C: Percent Invasion	C	6				
Plant Community Composition Metric *(numeric average of submetrics A-C)*				8		
Horizontal Interspersion			B	9		
Vertical Biotic Structure			B	9		
Raw Attribute Score = sum of numeric scores				26	**Final Attribute Score = (Raw Score/36) x 100**	72.2
Overall AA Score (average of four final Attribute Scores)					62.8	

Worksheet for Stream Corridor Continuity Metric for Riverine Wetlands

Lengths of Non-buffer Segments For Distance of 500 m Upstream of AA		Lengths of Non-buffer Segments For Distance of 500 m Downstream of AA	
Segment No.	Length (m)	Segment No.	Length (m)
1	0	1	0
2		2	
3		3	
4		4	
5		5	
Upstream Total Length	0	Downstream Total Length	0

Percent of AA with Buffer Worksheet

In the space provided below make a quick sketch of the AA, or perform the assessment directly on the aerial imagery; indicate where buffer is present, estimate the percentage of the AA perimeter providing buffer functions, and record the estimate amount in the space provided.



Percent of AA with Buffer: 100 %

Worksheet for calculating average buffer width of AA

Line	Buffer Width (m)
A	250
B	
C	
D	
E	
F	
G	
H	
Average Buffer Width *Round to the nearest integer*	250

Worksheet for Assessing Channel Stability for Riverine Wetlands

Condition	Field Indicators (check all existing conditions)
Indicators of Channel Equilibrium	☒ The channel (or multiple channels in braided systems) has a well-defined bankfull contour that clearly demarcates an obvious active floodplain in the cross-sectional profile of the channel throughout most of the AA.
	☒ Perennial riparian vegetation is abundant and well established along the bankfull contour, but not below it.
	☒ There is leaf litter, thatch, or wrack in most pools (if pools are present).
	☒ The channel contains embedded woody debris of the size and amount consistent with what is naturally available in the riparian area.
	☐ There is little or no active undercutting or burial of riparian vegetation.
	☐ If mid-channel bars and/or point bars are present, they are not densely vegetated with perennial vegetation.
	☐ Channel bars consist of well-sorted bed material (smaller grain size on the top and downstream end of the bar, larger grain size along the margins and upstream end of the bar).
	☐ There are channel pools, the spacing between pools tends to be regular and the bed is not planar throughout the AA
	☐ The larger bed material supports abundant mosses or periphyton.
Indicators of Active Degradation	☒ The channel is characterized by deeply undercut banks with exposed living roots of trees or shrubs.
	☒ There are abundant bank slides or slumps.
	☒ The lower banks are uniformly scoured and not vegetated.
	☒ Riparian vegetation is declining in stature or vigor, or many riparian trees and shrubs along the banks are leaning or falling into the channel.
	☐ An obvious historical floodplain has recently been abandoned, as indicated by the age structure of its riparian vegetation.
	☐ The channel bed appears scoured to bedrock or dense clay.
	☐ Recently active flow pathways appear to have coalesced into one channel (i.e. a previously braided system is no longer braided).
	☐ The channel has one or more knickpoints indicating headward erosion of the bed.
Indicators of Active Aggradation	☐ There is an active floodplain with fresh splays of coarse sediment (sand and larger that is not vegetated) deposited in the current or previous year.
	☐ There are partially buried living tree trunks or shrubs along the banks.
	☒ The bed is planar (flat or uniform gradient) overall; it lacks well-defined channel pools, or they are uncommon and irregularly spaced.
	☐ There are partially buried, or sediment-choked, culverts.
	☐ Perennial terrestrial or riparian vegetation is encroaching into the channel or onto channel bars below the bankfull contour.
	☐ There are avulsion channels on the floodplain or adjacent valley floor.
Overall	☒ **Equilibrium** ☒ **Degradation** ☐ **Aggradation**

Riverine Wetland Entrenchment Ratio Calculation Worksheet

The following 5 steps should be conducted for each of 3 cross-sections located in the AA at the approximate midpoints along straight riffles or glides, away from deep pools or meander bends. An attempt should be made to place them at the top, middle, and bottom of the AA.

Steps	Replicate Cross-sections ⟶	TOP	MID	BOT	
1 Estimate bankfull width.	This is a critical step requiring familiarity with field indicators of the bankfull contour. Estimate or measure the distance between the right and left bankfull contours.	3.0	7.0	6.0	m
2: Estimate max. bankfull depth.	Imagine a level line between the right and left bankfull contours; estimate or measure the height of the line above the thalweg (the deepest part of the channel).	0.6	08	0.8	m
3: Estimate flood prone depth.	Double the estimate of maximum bankfull depth from Step 2.	1.2	1.6	1.6	m
4: Estimate flood prone width.	Imagine a level line having a height equal to the flood prone depth from Step 3; note where the line intercepts the right and left banks; estimate or measure the length of this line.	5.2	8.5	8.0	m
5: Calculate entrenchment ratio.	Divide the flood prone width (Step 4) by the bankfull width (Step 1).	1.7	1.2	1.3	
6: Calculate average entrenchment ratio.	Calculate the average results for Step 5 for all 3 replicate cross-sections. Enter the average result here and use it in Table 13a or 13b.			1.4	

Structural Patch Type Worksheet for Riverine wetlands

Circle each type of patch that is observed in the AA and enter the total number of observed patches in Table below. In the case of riverine wetlands, their status as confined or non-confined must first be determined (see page 6) to determine with patches are expected in the system (indicated by a "1" in the table below). Any feature onsite should only be counted once as a patch type. If a feature appears to meet the definition of more than one patch type (i.e. swale and secondary channel) the practitioner should choose which patch type best illustrates the feature. Not all features at a site will be patch types.

****Please refer to the CRAM Photo Dictionary at* www.cramwetlands.org *for photos of each of the following patch types.***

STRUCTURAL PATCH TYPE (circle for presence)	**Riverine (Non-confined)**	**Riverine (Confined)**
Minimum Patch Size	**$3\ m^2$**	**$3\ m^2$**
Abundant wrackline or organic debris in channel, on floodplain	(1)	1
Bank slumps or undercut banks in channels or along shoreline	(1)	1
Cobbles and/or Boulders	1	1
Debris jams	1	1
Filamentous macroalgae or algal mats	1	1
Large woody debris	(1)	1
Pannes or pools on floodplain	1	N/A
Plant hummocks and/or sediment mounds	1	1
Point bars and in-channel bars	1	1
Pools or depressions in channels (wet or dry channels)	1	1
Riffles or rapids (wet or dry channels)	1	1
Secondary channels on floodplains or along shorelines	(1)	N/A
Standing snags (at least 3 m tall)	1	1
Submerged vegetation	1	N/A
Swales on floodplain or along shoreline	1	N/A
Variegated, convoluted, or crenulated foreshore (instead of broadly arcuate or mostly straight)	1	1
Vegetated islands (mostly above high-water)	1	N/A
Total Possible	**17**	**12**
No. Observed Patch Types (enter here and use in Table 14 below)	4	

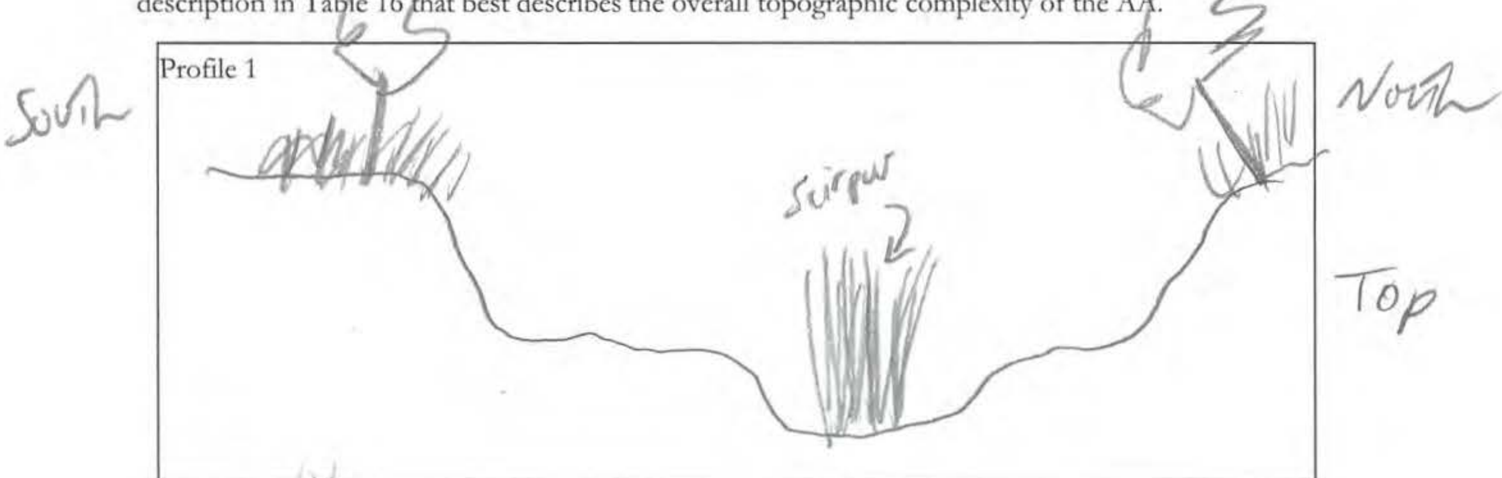
← new tree fall

← one large pool, whole thing

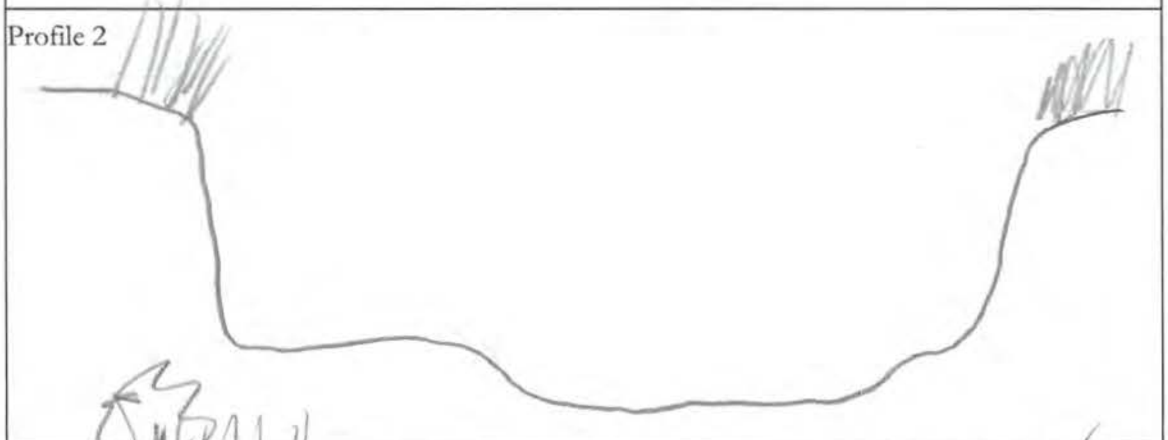
Worksheet for AA Topographic Complexity

At three locations along the AA, make a sketch of the profile of the stream from the AA boundary down to its deepest area then back out to the other AA boundary. Try to capture the benches and the intervening micro-topographic relief. To maintain consistency, make drawings at each of the stream hydrologic connectivity measurements, always facing downstream. Include the water level, an arrow at the bankfull contour, and label the benches. Based on these sketches and the profiles in Figure 10, choose a description in Table 16 that best describes the overall topographic complexity of the AA.

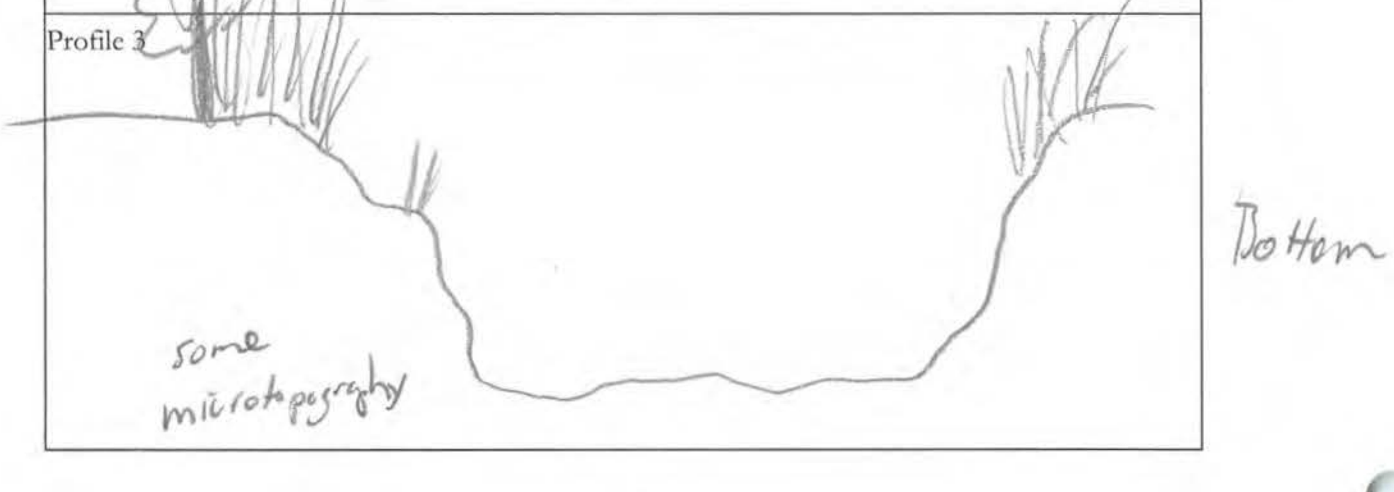
Profile 1



Profile 2



Profile 3



Plant Community Metric Worksheet: Co-dominant species richness for Riverine wetlands
(A dominant species represents ≥10% *relative* cover)

Special Note:

** Combine the counts of co-dominant species from all layers to identify the total species count. Each plant species is only counted once when calculating the Number of Co-dominant Species and Percent Invasion submetric scores, regardless of the numbers of layers in which it occurs.*

Floating or Canopy-forming (non-confined only)	Invasive?	Short (<0.5 m)	Invasive?
none		Nasturtium	Y

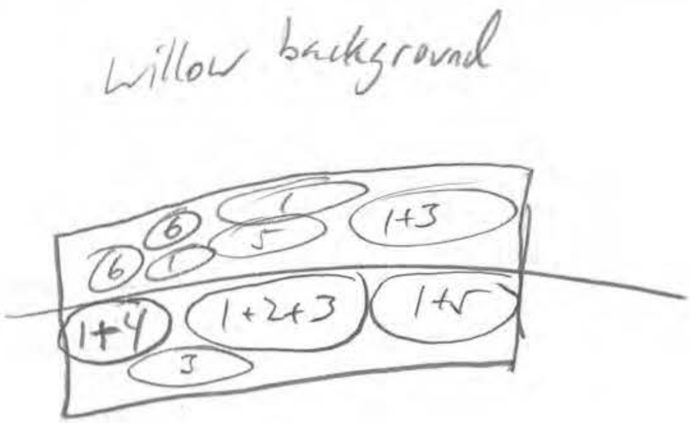
Medium (0.5-1.5 m)	Invasive?	Tall (1.5-3.0 m)	Invasive?
Mulefat	N	Scirpus californicus	N
		Mulefat	N

Very Tall (>3.0 m)	Invasive?		
Arroyo Willow	N	Total number of co-dominant species for all layers combined (enter here and use in Table 18)	8
Tamarix	Y		
Arrundo	Y	Percent Invasion *Round to the nearest integer* (enter here and use in Table 18)	38
Elderberry	N		
Black Willow	N		

Handwritten margin notes:
- Nasturtium – Tropaeolum majus
- Mulefat – Bacharis salicifolia
- Arroyo Willow – Salix lasiolepis
- Tamarix – Tamarix aphylla
- Arrundo – Arrundo donax
- Elderberry – Sambucus mexicana
- Black Willow – Salix gooddingii

Horizontal Interspersion Worksheet.

Use the spaces below to make a quick sketch of the AA in plan view, outlining the major plant zones (this should take no longer than 10 minutes). Assign the zones names and record them on the right. Based on the sketch, choose a single profile from Figure 12 that best represents the AA overall.



Assigned zones:

1) Willow
2) Tamarix
3) Mulfat
4) Arundo
5) Nasturtium
6) Elderberry

Worksheet for Wetland disturbances and conversions

Has a major disturbance occurred at this wetland?	Yes	No (circled)		
If yes, was it a flood, fire, landslide, or other?	flood	fire	landslide	other
If yes, then how severe is the disturbance?	likely to affect site next 5 or more years	likely to affect site next 3-5 years	likely to affect site next 1-2 years	
Has this wetland been converted from another type? If yes, then what was the previous type?	depressional	vernal pool	vernal pool system	
	non-confined riverine	confined riverine	seasonal estuarine	
	perennial saline estuarine	perennial non-saline estuarine	wet meadow	
	lacustrine	seep or spring	playa	

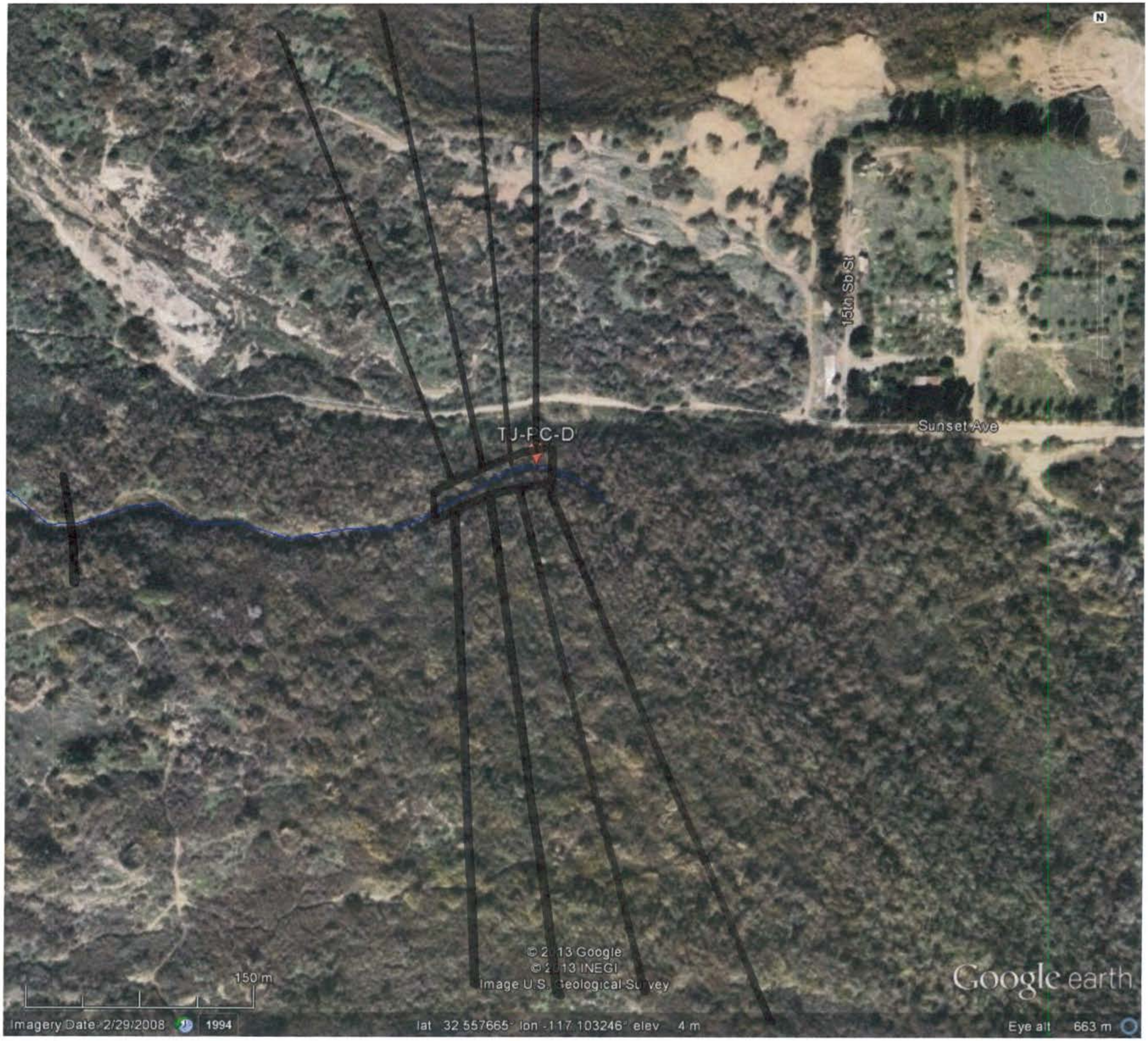
Stressor Checklist Worksheet

HYDROLOGY ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Point Source (PS) discharges (POTW, other non-stormwater discharge)		
Non-point Source (Non-PS) discharges (urban runoff, farm drainage)	X	
Flow diversions or unnatural inflows		
Dams (reservoirs, detention basins, recharge basins)		
Flow obstructions (culverts, paved stream crossings)		
Weir/drop structure, tide gates		
Dredged inlet/channel		
Engineered channel (riprap, armored channel bank, bed)		
Dike/levees		
Groundwater extraction		
Ditches (borrow, agricultural drainage, mosquito control, etc.)		
Actively managed hydrology		
Comments		

PHYSICAL STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Filling or dumping of sediment or soils **(N/A for restoration areas)**		
Grading/ compaction **(N/A for restoration areas)**		
Plowing/Discing **(N/A for restoration areas)**		
Resource extraction (sediment, gravel, oil and/or gas)		
Vegetation management		
Excessive sediment or organic debris from watershed		
Excessive runoff from watershed		
Nutrient impaired (PS or Non-PS pollution)	X	
Heavy metal impaired (PS or Non-PS pollution)	X	
Pesticides or trace organics impaired (PS or Non-PS pollution)	X	
Bacteria and pathogens impaired (PS or Non-PS pollution)	X	
Trash or refuse	X	
Comments		

BIOTIC STRUCTURE ATTRIBUTE (WITHIN 50 M OF AA)	Present	Significant negative effect on AA
Mowing, grazing, excessive herbivory (within AA)		
Excessive human visitation		
Predation and habitat destruction by non-native vertebrates (e.g., *Virginia opossum* and domestic predators, such as feral pets)		
Tree cutting/sapling removal		
Removal of woody debris		
Treatment of non-native and nuisance plant species		
Pesticide application or vector control		
Biological resource extraction or stocking (fisheries, aquaculture)		
Excessive organic debris in matrix (for vernal pools)		
Lack of vegetation management to conserve natural resources		
Lack of treatment of invasive plants adjacent to AA or buffer	X	
Comments		

BUFFER AND LANDSCAPE CONTEXT ATTRIBUTE (WITHIN 500 M OF AA)	Present	Significant negative effect on AA
Urban residential	X	
Industrial/commercial		
Military training/Air traffic	X	
Dams (or other major flow regulation or disruption)		
Dryland farming	X	
Intensive row-crop agriculture		
Orchards/nurseries		
Commercial feedlots		
Dairies		
Ranching (enclosed livestock grazing or horse paddock or feedlot)	X	
Transportation corridor		
Rangeland (livestock rangeland also managed for native vegetation)		
Sports fields and urban parklands (golf courses, soccer fields, etc.)		
Passive recreation (bird-watching, hiking, etc.)	X	
Active recreation (off-road vehicles, mountain biking, hunting, fishing)		
Physical resource extraction (rock, sediment, oil/gas)		
Biological resource extraction (aquaculture, commercial fisheries)		
Comments		

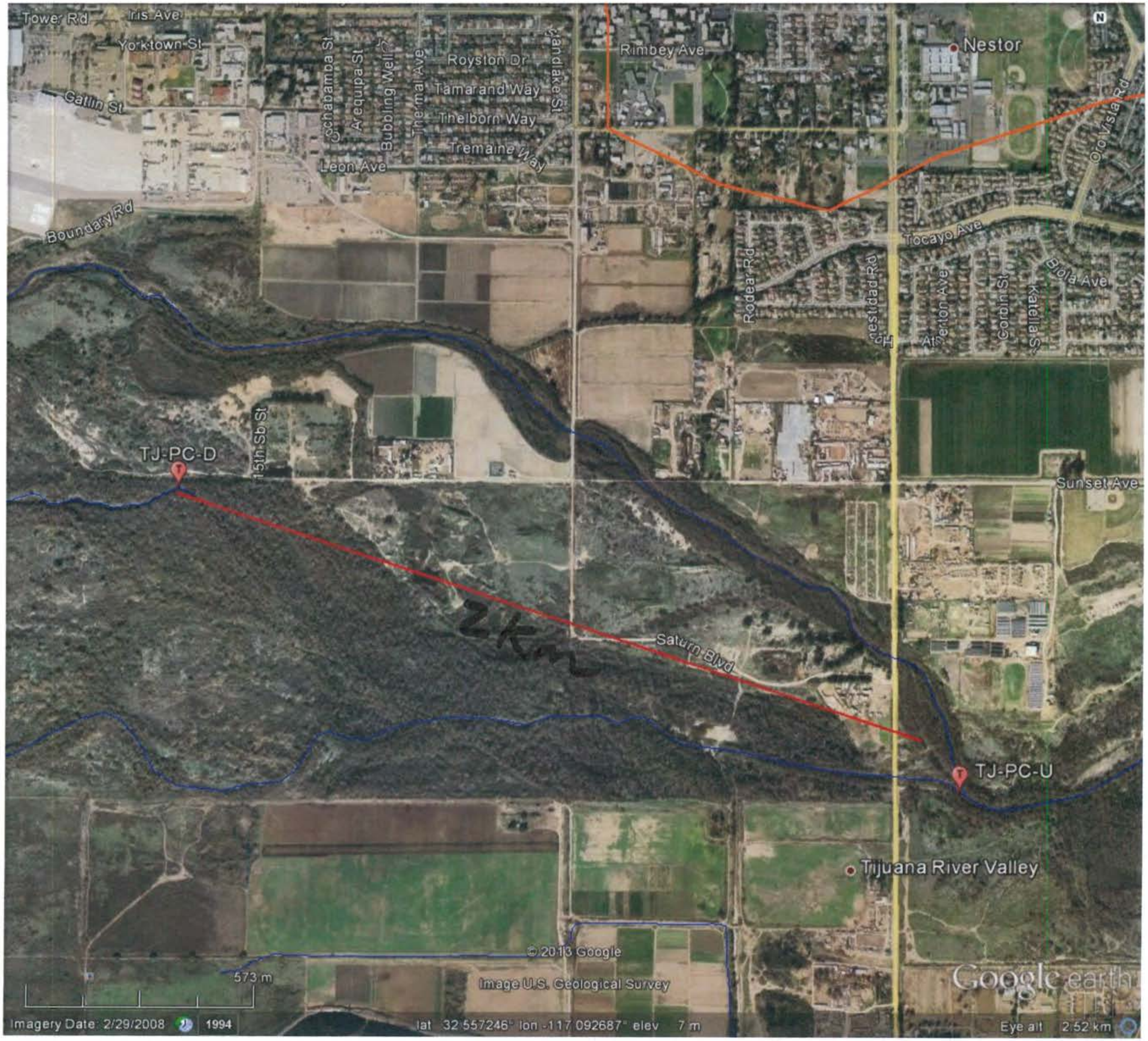


N
15th Sb St
Sunset Ave
TJ-FC-D
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
150 m
Imagery Date: 2/29/2008
1994
lat 32.557665° lon -117.103246° elev 4 m
Eye alt 663 m

5/12/15

N
TJ-PC-D
Sunset Ave
15th Sb St
500m
500m
253 m
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
Google earth
Imagery Date: 2/29/2008
1994
lat 32.557604° lon -117.103599° elev 5 m
Eye alt 1.12 km

Wolviston Way
Royston Dr
Tamarand Way
Thelborn Way
Tremaine Way
Standlake St
Bubbling Well Dr
Thermal Ave
Leon Ave
Yorktown St
Gatlin St
Lexington St
Saratoga St
Boundary Rd
15th St
TJ-PC-D
Sunset Ave
Saturn Blvd
© 2013 Google
© 2013 INEGI
Image U.S. Geological Survey
501 m
Google earth
Imagery Date: 2/29/2008
1994
lat 32.558347° lon -117.103440° elev 5 m
Eye alt 2.20 km


Tower Rd
Iris Ave
Yorktown St
Gatlin St
Boundary Rd
Cochabamba St
Arequipa St
Bubbling Well
Thermal Ave
Royston Dr
Tamarand Way
Thelborn Way
Tremaine Way
Leon Ave
Rimbey Ave
Nestor
Oro Vista Rd
Tocayo Ave
Biola Ave
Katella St
Corbin St
Rodear Rd
15th Sb St
TJ-PC-D
TJ-PC-U
Sunset Ave
Saturn Blvd
2km
Tijuana River Valley
© 2013 Google
Image U.S. Geological Survey
573 m
Imagery Date: 2/29/2008
1994
lat 32.557246° lon -117.092687° elev 7 m
Eye alt 2.52 km
Google earth

Field Data Log Sheet

Site ID TJPC-U **Watershed** Tijuana **Field Crew** JR, TH **Date** 5/12/15

Site-Specific Event # Wet Weather [ ] Dry Weather [X] **Time** 0815

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	Sunny	(Partly Cloudy)	Overcast	Fog	Raining	Drizzle	
Last Rain	(>72 Hours)	< 72 Hours	**Rainfall**	None	< 0.1"	> 0.1"	
Tide	High	(Mid)	Low	Rising ↑	(Falling ↓)		
Flow	(Flowing)	Ponded					

SAMPLE CHARACTERISTICS

Odor	None	Musty	Rotten Eggs	Chemical	(Sewage)	Other____	
Color	None	Yellow	(Brown)	White	Gray	Other____	
Clarity	Clear	Slightly Cloudy	(Opaque)	Other____			
Floatables	None	Trash	(Bubbles/Foam)	Sheen	Other____		
Deposits	None	Sediment/Gravel	(Fine Particles)	Stains	Oily Deposits	Other____	
Vegetation	None	Limited	(Normal)	Excessive	Other____		
Biology	(None)	Insects	Algae	Snail	Seaweed	Mollusk	Crustacean	Other____

FIELD MEASUREMENTS

Temp(°C) 18.2 **Sp Conduct (µS/cm)** 2354 **pH** 8.07

Turbidity (NTU) 9.05 **Salinity (ppt)** 1.2ppt **DO (mg/L)** 0.8

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water	5/12/15	0840	TJPCU-051215-01

NOTES/COMMENTS

Fallen trees on path in to site

Field Data Log Sheet

Site ID	TJPCD	**Watershed**	Tijuana	**Field Crew**	JR, TH	**Date**	5/12/15
Site-Specific Event #		Wet Weather		Dry Weather	X	**Time**	1150

ATMOSPHERIC & OCEANIC CONDITIONS

Weather	(Sunny)	Partly Cloudy	Overcast	Fog	Raining	Drizzle
Last Rain	(> 72 Hours)	< 72 Hours	**Rainfall**	None	< 0.1"	> 0.1"
Tide	High	(Mid)	Low	Rising ↑	(Falling ↓)	
Flow	(Flowing)	Ponded				

SAMPLE CHARACTERISTICS

Odor	None	(Musty)	Rotten Eggs	Chemical	Sewage	Other____		
Color	None	(Yellow)	Brown	White	Gray	Other____		
Clarity	Clear	(Slightly Cloudy)	Opaque	Other____				
Floatables	(None)	Trash	Bubbles/Foam	Sheen	Other____			
Deposits	None	Sediment/Gravel	(Fine Particles)	Stains	Oily Deposits	Other____		
Vegetation	(None)	Limited	Normal	Excessive	Other____			
Biology	(None)	Insects	Algae	Snail	Seaweed	Mollusk	Crustacean	Other____

FIELD MEASUREMENTS

Temp(°C)	18.9	**Sp Conduct (µS/cm)**	1491	**pH**	7.62
Turbidity (NTU)	4.28	**Salinity (ppt)**	0.75	**DO (mg/L)**	4.4

SAMPLE COLLECTION

Sample Type	Date	Time	Sample ID
Water	5/12/15	1200	TJPCD-051215-01
Water	5/12/15	1205	TJPCD-051215-02 Dup

NOTES/COMMENTS

Outgoing tide, high tide @ 4:41 am +4.4 ft

Sediment Sampling Fieldsheet for Tijuana River Estuary

amec

Date: 5/12/2015
Personnel: JR, TH
Weather: Clear
Time / Height low tide: 11:22am : +0.2 feet
Time / Height high tide: 04:41 am : +4.4 feet

Station ID	Time	Grab #	Water Depth (m)	Penetration Depth (cm)	% Surface Intact	Overlying Water (Y/N)?	Acceptable (Y/N)?*	Sed Type	Color	Odor	Photo ID
TJPCD	1213	1	0.08	7	100	Y	Y	Sand	Grey	Sulfide	61,62
TJRCD	1230	2	0.08m	6cm	100%	y	y	Sand	Grey	Sulfide	63, 64 65, 66
TJRCD	1245	3	0.08m	6cm	100%	y	y	Sand	~~Grey~~ Blk	sulfide	67, 68

* Acceptability criteria: minimum 5-cm penetration, even sample surface, minimal disturbance/high % surface intact, overlying water present

** Record all grab attempts

Notes: Eckman Box Core

Appendix D

Analytical Laboratory Report

CERTIFICATE OF ANALYSIS

Client:	AMEC Environment & Infrastructure 9177 Sky Park Court, Ste A San Diego CA, 92123	**Report Date:**	05/22/15 16:07
		Received Date:	05/13/15 11:10
		Turn Around:	Normal
Attention:	Kristina Schneider	**Client Project:**	Tijuana River Receiver WatersMonitoring
Phone:	(858) 278-3600		
Fax:	(858) 278-5300	**PO Number:**	5025121037
Work Order(s):	5E13023		

NELAP #04229CA ELAP#1132 NEVADA #CA211 HAWAII LACSD #10143

The results in this report apply to the samples analyzed in accordance with the Chain of Custody document. Weck Laboratories, Inc. certifies that the test results meet all NELAC requirements unless noted in the case narrative. This analytical report is confidential and is only intended for the use of Weck Laboratories, Inc. and its client. This report contains the Chain of Custody document, which is an integral part of it, and can only be reproduced in full with the authorization of Weck Laboratories, Inc.

Dear Kristina Schneider :

Enclosed are the results of analyses for samples received 05/13/ 15 11:10 with the Chain of Custody document. The samples were received in good condition, at 2.9 °C and on ice. All analysis met the method criteria except as noted below or in the report with data qualifiers.

Case Narrative:

Reviewed by:

hainguyen

Hai Van Nguyen
Project Manager

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Sampled by:	Lab ID	Matrix	Date Sampled
AC-TJPCD-051215-01	JR	5E13023-01	Water	05/12/15 12:00
AC-TJPCU-051215-01	JR	5E13023-02	Water	05/12/15 08:40
AC-TJPCD-051215-02	JR	5E13023-03	Water	05/12/15 12:05

ANALYSES

Anions by IC, EPA Method 300.0

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

5E13023-01 **AC-TJPCD-051215-01**

Sampled: 05/12/15 12:00 **Sampled By:** JR **Matrix:** Water

Anions by IC, EPA Method 300.0

Method: EPA 300.0 Batch: W5E0648 Prepared: 05/13/15 12:00 Analyst: Alice T. Lee

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chloride, Total	**430**	1.0	5.0	mg/l	10	05/13/15 16:06	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 Batch: W5E0815 Prepared: 05/15/15 08:19 Analyst: Rebecca Juea Song

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.19**	0.048	0.10	mg/l	1	05/15/15 16:06	

Method: EPA 351.2 Batch: W5E0941 Prepared: 05/18/15 10:35 Analyst: Nina Katrina Reyes Aranas

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**0.63**	0.050	0.10	mg/l	1	05/19/15 12:38	

Method: EPA 353.2 Batch: W5E0664 Prepared: 05/13/15 12:35 Analyst: Angela J Whittington

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**0.057**	0.041	0.10	mg/l	1	05/13/15 15:42	J
Nitrite as N	**0.010**	0.010	0.10	mg/l	1	05/13/15 20:31	J

Method: EPA 365.1 Batch: W5E0690 Prepared: 05/13/15 17:17 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.076**	0.00022	0.0020	mg/l	1	05/13/15 18:40	

Method: EPA 365.1 Batch: W5E1227 Prepared: 05/21/15 10:21 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.23**	0.0028	0.020	mg/l	2	05/22/15 10:47	

Method: SM 10200H Batch: W5E0660 Prepared: 05/13/15 11:56 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chlorophyll-A	**21**	8.3	10	ug/l	1	05/22/15 12:19	

Method: SM 2320B Batch: W5E0722 Prepared: 05/14/15 09:14 Analyst: Ashley J Partridge

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Alkalinity as CaCO3	**550**	0.56	10	mg/l	1	05/15/15 13:59	

Method: SM 2540D Batch: W5E0824 Prepared: 05/15/15 10:16 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**8**		5	mg/l	1	05/15/15 12:01	

Weck Laboratories, Inc 14859 East Clark Avenue, City of Industry, California 91745-1396 (626) 336-2139 FAX (626) 336-2634

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

5E13023-02 **AC-TJPCU-051215-01**

Sampled: 05/12/15 08:40 **Sampled By:** JR **Matrix:** Water

Anions by IC, EPA Method 300.0

Method: EPA 300.0 Batch: W5E0648 Prepared: 05/13/15 12:00 Analyst: Alice T. Lee

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chloride, Total	**360**	2.5	12	mg/l	25	05/13/15 16:24	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 Batch: W5E0815 Prepared: 05/15/15 08:19 Analyst: Rebecca Juea Song

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**15**	2.4	5.0	mg/l	50	05/15/15 16:18	

Method: EPA 351.2 Batch: W5E0941 Prepared: 05/18/15 10:35 Analyst: Nina Katrina Reyes Aranas

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**19**	0.25	0.50	mg/l	5	05/19/15 16:27	

Method: EPA 353.2 Batch: W5E0664 Prepared: 05/13/15 12:35 Analyst: Angela J Whittington

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**2.6**	0.041	0.10	mg/l	1	05/13/15 15:44	
Nitrite as N	**0.93**	0.010	0.10	mg/l	1	05/13/15 20:32	

Method: EPA 365.1 Batch: W5E0690 Prepared: 05/13/15 17:17 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**5.4**	0.011	0.10	mg/l	50	05/13/15 18:50	

Method: EPA 365.1 Batch: W5E1227 Prepared: 05/21/15 10:21 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**6.2**	0.070	0.50	mg/l	2	05/22/15 10:51	M-06

Method: SM 10200H Batch: W5E0660 Prepared: 05/13/15 11:56 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chlorophyll-A	ND	8.3	10	ug/l	1	05/22/15 12:19	

Method: SM 2320B Batch: W5E0722 Prepared: 05/14/15 09:14 Analyst: Ashley J Partridge

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Alkalinity as CaCO3	**360**	0.56	10	mg/l	1	05/15/15 13:59	

Method: SM 2540D Batch: W5E0824 Prepared: 05/15/15 10:16 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**22**		5	mg/l	1	05/15/15 12:01	

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

5E13023-03 **AC-TJPCD-051215-02**

Sampled: 05/12/15 12:05 **Sampled By:** JR **Matrix:** Water

Anions by IC, EPA Method 300.0

Method: EPA 300.0 Batch: W5E0648 Prepared: 05/13/15 12:00 Analyst: Alice T. Lee

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chloride, Total	**410**	2.5	12	mg/l	25	05/13/15 16:43	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 Batch: W5E0815 Prepared: 05/15/15 08:19 Analyst: Rebecca Juea Song

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.17**	0.048	0.10	mg/l	1	05/15/15 16:18	

Method: EPA 351.2 Batch: W5E0941 Prepared: 05/18/15 10:35 Analyst: Nina Katrina Reyes Aranas

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**0.74**	0.050	0.10	mg/l	1	05/19/15 12:42	

Method: EPA 353.2 Batch: W5E0664 Prepared: 05/13/15 12:35 Analyst: Angela J Whittington

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**0.050**	0.041	0.10	mg/l	1	05/13/15 15:46	J
Nitrite as N	**0.016**	0.010	0.10	mg/l	1	05/13/15 20:32	J

Method: EPA 365.1 Batch: W5E0690 Prepared: 05/13/15 17:17 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.076**	0.00022	0.0020	mg/l	1	05/13/15 18:46	

Method: EPA 365.1 Batch: W5E1227 Prepared: 05/21/15 10:21 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.37**	0.0070	0.050	mg/l	5	05/22/15 10:53	

Method: SM 10200H Batch: W5E0660 Prepared: 05/13/15 11:56 Analyst: Marilyn B Christian

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chlorophyll-A	**28**	8.3	10	ug/l	1	05/22/15 12:19	

Method: SM 2320B Batch: W5E0722 Prepared: 05/14/15 09:14 Analyst: Ashley J Partridge

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Alkalinity as CaCO3	**530**	0.56	10	mg/l	1	05/15/15 13:59	

Method: SM 2540D Batch: W5E0824 Prepared: 05/15/15 10:16 Analyst: Lin Chai

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**35**		5	mg/l	1	05/15/15 12:01	

AMEC Environment & Infrastructure
9177 Sky Park Court, Ste A
San Diego CA, 92123

Date Received: 05/13/15 11:10
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QUALITY CONTROL SECTION

AMEC Environment & Infrastructure
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San Diego CA, 92123

Date Received: 05/13/15 11:10
Date Reported: 05/22/15 16:07

Anions by IC, EPA Method 300.0 - Quality Control

Batch W5E0648 - EPA 300.0

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0648-BLK1)					Analyzed: 05/13/15 11:01						
Chloride, Total	ND	0.10	0.50	mg/l							
LCS (W5E0648-BS1)					Analyzed: 05/13/15 11:19						
Chloride, Total	3.83	0.10	0.50	mg/l	4.00		96	90-110			
Duplicate (W5E0648-DUP1)		**Source: 5E11004-02**			Analyzed: 05/13/15 12:17						
Chloride, Total	24.3	0.25	1.2	mg/l		24.1			0.7	20	
Duplicate (W5E0648-DUP2)		**Source: 5E11004-03**			Analyzed: 05/13/15 13:13						
Chloride, Total	21.2	0.50	2.5	mg/l		23.6			11	20	
Matrix Spike (W5E0648-MS1)		**Source: 5E11004-02**			Analyzed: 05/13/15 12:36						
Chloride, Total	62.0	1.0	5.0	mg/l	40.0	24.1	95	76-118			
Matrix Spike (W5E0648-MS2)		**Source: 5E11005-01**			Analyzed: 05/13/15 14:13						
Chloride, Total	5480	50	250	mg/l	2000	3750	86	76-118			
Matrix Spike Dup (W5E0648-MSD1)		**Source: 5E11004-02**			Analyzed: 05/13/15 12:54						
Chloride, Total	60.6	1.0	5.0	mg/l	40.0	24.1	91	76-118	2	20	
Matrix Spike Dup (W5E0648-MSD2)		**Source: 5E11005-01**			Analyzed: 05/13/15 14:32						
Chloride, Total	5480	50	250	mg/l	2000	3750	86	76-118	0.1	20	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods - Quality Control

Batch W5E0660 - SM 10200H

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0660-BLK1)					Analyzed: 05/22/15 12:19						
Chlorophyll-A	ND	8.3	10	ug/l							
LCS (W5E0660-BS1)					Analyzed: 05/22/15 12:19						
Chlorophyll-A	45.9	8.3	10	ug/l	50.0		92	70-112			

Batch W5E0664 - EPA 353.2

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0664-BLK1)					Analyzed: 05/13/15 15:27						
Nitrate as N	ND	0.041	0.10	mg/l							
Nitrite as N	ND	0.010	0.10	mg/l							
Blank (W5E0664-BLK2)					Analyzed: 05/13/15 15:27						
Nitrate as N	ND	0.041	0.10	mg/l							
Nitrite as N	ND	0.010	0.10	mg/l							
LCS (W5E0664-BS1)					Analyzed: 05/13/15 15:29						
Nitrate as N	0.985	0.041	0.10	mg/l	1.00		98	90-110			
Nitrite as N	1.04	0.010	0.10	mg/l	1.00		104	90-110			
LCS (W5E0664-BS2)					Analyzed: 05/13/15 15:29						
Nitrate as N	0.985	0.041	0.10	mg/l	1.00		98	90-110			
Nitrite as N	0.983	0.010	0.10	mg/l	1.00		98	90-110			

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Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods - Quality Control

Batch W5E0664 - EPA 353.2

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Matrix Spike (W5E0664-MS1)		**Source: 5E12067-07**			Analyzed: 05/13/15 15:34						
Nitrate as N	2.32	0.041	0.10	mg/l	2.00	0.393	96	90-110			
Nitrite as N	1.86	0.020	0.20	mg/l	2.00	ND	93	90-110			
Matrix Spike Dup (W5E0664-MSD1)		**Source: 5E12067-07**			Analyzed: 05/13/15 15:36						
Nitrate as N	2.36	0.041	0.10	mg/l	2.00	0.393	99	90-110	2	20	
Nitrite as N	1.92	0.020	0.20	mg/l	2.00	ND	96	90-110	3	20	

Batch W5E0690 - EPA 365.1

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0690-BLK1)					Analyzed: 05/13/15 18:36						
o-Phosphate as P	0.000685	0.00022	0.0020	mg/l							J
LCS (W5E0690-BS1)					Analyzed: 05/13/15 18:33						
o-Phosphate as P	0.0493	0.00022	0.0020	mg/l	0.0500		99	90-110			
Matrix Spike (W5E0690-MS1)		**Source: 5E13023-01**			Analyzed: 05/13/15 18:41						
o-Phosphate as P	0.126	0.00022	0.0020	mg/l	0.0500	0.0763	99	90-110			
Matrix Spike Dup (W5E0690-MSD1)		**Source: 5E13023-01**			Analyzed: 05/13/15 18:43						
o-Phosphate as P	0.128	0.00022	0.0020	mg/l	0.0500	0.0763	103	90-110	2	20	

Batch W5E0722 - SM 2320B

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0722-BLK1)					Analyzed: 05/15/15 13:59						
Alkalinity as CaCO3	4.31	0.56	10	mg/l							J
LCS (W5E0722-BS1)					Analyzed: 05/15/15 13:59						
Alkalinity as CaCO3	254	0.56	10	mg/l	250		102	94-108			
Duplicate (W5E0722-DUP1)		**Source: 5E11071-01**			Analyzed: 05/15/15 13:59						
Alkalinity as CaCO3	155	0.56	10	mg/l		155			0.2	15	

Batch W5E0815 - EPA 350.1

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0815-BLK1)					Analyzed: 05/15/15 17:03						
Ammonia as N	ND	0.048	0.10	mg/l							
LCS (W5E0815-BS1)					Analyzed: 05/15/15 17:03						
Ammonia as N	0.255	0.048	0.10	mg/l	0.250		102	90-110			
Matrix Spike (W5E0815-MS1)		**Source: 5E13023-02**			Analyzed: 05/15/15 17:03						
Ammonia as N	27.4	2.4	5.0	mg/l	12.5	14.9	100	90-110			
Matrix Spike Dup (W5E0815-MSD1)		**Source: 5E13023-02**			Analyzed: 05/15/15 17:03						
Ammonia as N	27.3	2.4	5.0	mg/l	12.5	14.9	99	90-110	0.4	15	

Batch W5E0824 - SM 2540D

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0824-BLK1)					Analyzed: 05/15/15 12:01						

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Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods - Quality Control

Batch W5E0824 - SM 2540D

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0824-BLK1)					Analyzed: 05/15/15 12:01						
Total Suspended Solids	ND		5	mg/l							
Duplicate (W5E0824-DUP1)		**Source: 5E13082-01**			Analyzed: 05/15/15 12:01						
Total Suspended Solids	11.0		5	mg/l		12.0			9	20	
Duplicate (W5E0824-DUP2)		**Source: 5E13086-01**			Analyzed: 05/15/15 12:01						
Total Suspended Solids	37.0		5	mg/l		37.0			NR	20	

Batch W5E0941 - EPA 351.2

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E0941-BLK1)					Analyzed: 05/19/15 14:30						
TKN	ND	0.050	0.10	mg/l							
Blank (W5E0941-BLK2)					Analyzed: 05/19/15 14:30						
TKN	ND	0.050	0.10	mg/l							
LCS (W5E0941-BS1)					Analyzed: 05/19/15 14:30						
TKN	1.02	0.050	0.10	mg/l	1.00		102	90-110			
LCS (W5E0941-BS2)					Analyzed: 05/19/15 14:30						
TKN	1.00	0.050	0.10	mg/l	1.00		100	90-110			
Duplicate (W5E0941-DUP1)		**Source: 5E11004-02**			Analyzed: 05/19/15 14:30						
TKN	1.85	0.050	0.10	mg/l		1.83			0.6	10	
Matrix Spike (W5E0941-MS1)		**Source: 5E11005-01**			Analyzed: 05/19/15 14:30						
TKN	3.13	0.050	0.10	mg/l	1.00	2.21	92	90-110			
Matrix Spike (W5E0941-MS2)		**Source: 5E15107-08**			Analyzed: 05/19/15 14:30						
TKN	1.34	0.050	0.10	mg/l	1.00	0.327	101	90-110			
Matrix Spike Dup (W5E0941-MSD1)		**Source: 5E11005-01**			Analyzed: 05/19/15 14:30						
TKN	3.19	0.050	0.10	mg/l	1.00	2.21	99	90-110	2	10	
Matrix Spike Dup (W5E0941-MSD2)		**Source: 5E15107-08**			Analyzed: 05/19/15 14:30						
TKN	1.36	0.050	0.10	mg/l	1.00	0.327	104	90-110	2	10	

Batch W5E1227 - EPA 365.1

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	% REC Limits	RPD	RPD Limit	Data Qualifiers
Blank (W5E1227-BLK1)					Analyzed: 05/22/15 10:37						
Phosphorus as P, Total	0.00225	0.0014	0.010	mg/l							J
LCS (W5E1227-BS1)					Analyzed: 05/22/15 10:38						
Phosphorus as P, Total	0.0515	0.0014	0.010	mg/l	0.0500		103	90-110			
Matrix Spike (W5E1227-MS1)		**Source: 5E13023-01**			Analyzed: 05/22/15 10:48						
Phosphorus as P, Total	0.276	0.0028	0.020	mg/l	0.0500	0.226	100	90-110			
Matrix Spike Dup (W5E1227-MSD1)		**Source: 5E13023-01**			Analyzed: 05/22/15 10:50						
Phosphorus as P, Total	0.280	0.0028	0.020	mg/l	0.0500	0.226	108	90-110	1	20	

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Notes and Definitions

M-06	Due to the high concentration of analyte inherent in the sample, sample was diluted prior to preparation. The MDL and MRL were raised due to this dilution.
J	Estimated conc. detected <MRL and >MDL.
ND	NOT DETECTED at or above the Reporting Limit. If J-value reported, then NOT DETECTED at or above the Method Detection Limit (MDL)
NR	Not Reportable
Dil	Dilution
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
% Rec	Percent Recovery
Sub	Subcontracted analysis, original report available upon request
MDL	Method Detection Limit
MDA	Minimum Detectable Activity
MRL	Method Reporting Limit

Any remaining sample(s) will be disposed of one month from the final report date unless other arrangements are made in advance.

An Absence of Total Coliform meets the drinking water standards as established by the California Department of Health Services.

The Reporting Limit (RL) is referenced as the Laboratory's Practical Quantitation Limit (PQL) or the Detection Limit for Reporting Purposes (DLR).

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Analysis Request and Chain of Custody

5E13023

From:
AMEC Environment & Infrastructure
Attn: Kristina Schneider
9177 Sky Park Court
San Diego, CA 92123
Phone: (858) 278-3600 Fax: (858) 278-5300

City of San Diego
Tijuana River Receiver Waters Monitoring 2012-2013
Project No.: 5025121037

To:
Weck Laboratories, Inc.
14859 East Clark Avenue
City of Industry, CA 91745
Phone: (626) 336-2139
Fax: (626) 336-2634

SampleID	Date	Time	Analyses	Bottle Type	Preservative	Bottle Count
AC-TJPCU-051215-01	5/12/15	0840	Alkalinity, Total [SM 2320B] Chloride [EPA 300.0] Nitrate-N [EPA 353.2] Nitrite-N [EPA 353.2]	2L - Polyethylene	6 °C	1
AC-TJPCU-051215-01	↓	↓	Ammonia-N [EPA 350.1] Total Kjedahl Nitrogen [EPA 351.2]	1L - Polyethylene	H2SO4	1
AC-TJPCU-051215-01	↓	↓	Chlorophyll a [SM 10200H]	1L - Amber Polyethylene	6 °C	1
AC-TJPCU-051215-01	↓	↓	Orthophosphate-P [EPA 365.3/365.1]	250mL - Polyethylene	6 °C, Filtered	1
AC-TJPCU-051215-01	↓	↓	Total Phosphorous [EPA 365.1]	500mL - Polyethylene	H2SO4	1
AC-TJPCU-051215-01	↓	↓	Total Suspended Solids [SM 2540D]	250mL - Polyethylene	6 °C	1

Sampler's Initials: JR

Relinquished By: Brenda Stevens BS Date/Time: 5/13/15 09:15 Received By: Hector Sanchez Date/Time: 5/13/15 0915

Relinquished By: Hector Sanchez Date/Time: 5/13/15 11:10AM Received By: James/mn Date/Time: 5/13/15 1110

2.9c

Analysis Request and Chain of Custody

City of San Diego

Tijuana River Receiver Waters Monitoring 2012-2013

Project No.: 5025121037

From:
AMEC Environment & Infrastructure
Attn: Kristina Schneider
9177 Sky Park Court
San Diego, CA 92123
Phone: (858) 278-3600 Fax: (858) 278-5300

To: 5E13023
Weck Laboratories, Inc.
14859 East Clark Avenue
City of Industry, CA 91745
Phone: (626) 336-2139
Fax: (626) 336-2634

SampleID	Date	Time	Analyses	Bottle Type	Preservative	Bottle Count
AC-TJPCD-051215-01	5/12/15	1200	Alkalinity, Total [SM 2320B] Chloride [EPA 300.0] Nitrate-N [EPA 353.2] Nitrite-N [EPA 353.2]	2L - Polyethylene	6 °C	1
AC-TJPCD-051215-01	↓	↓	Ammonia-N [EPA 350.1] Total Kjedahl Nitrogen [EPA 351.2]	1L - Polyethylene	H2SO4	1
AC-TJPCD-051215-01	↓	↓	Chlorophyll a [SM 10200H]	1L - Amber Polyethylene	6 °C	1
AC-TJPCD-051215-01	↓	↓	Orthophosphate-P [EPA 365.3/365.1]	250mL - Polyethylene	6 °C, Filtered	1
AC-TJPCD-051215-01	↓	↓	Total Phosphorous [EPA 365.1]	500mL - Polyethylene	H2SO4	1
AC-TJPCD-051215-01	↓	↓	Total Suspended Solids [SM 2540D]	250mL - Polyethylene	6 °C	1

Sampler's Initials: JTC

Relinquished By: Brenda Stevens Date/Time: 5/13/15 09:15 Received By: Hector Sanchez Date/Time: 5/13/15 0915

Relinquished By: Hector Sanchez Date/Time: 5/13/15 11:10 Received By: Tama [illegible] Date/Time: 5/13/15 1110

2.9°C

5E13023

From:
AMEC Environment & Infrastructure
Attn: Kristina Schneider
9177 Sky Park Court
San Diego, CA 92123
Phone: (858) 278-3600 Fax: (858) 278-5300

Analysis Request and Chain of Custody

City of San Diego
Tijuana River Receiver Waters Monitoring 2012-2013
Project No.: 5025121037

To:
Weck Laboratories, Inc.
14859 East Clark Avenue
City of Industry, CA 91745
Phone: (626) 336-2139
Fax: (626) 336-2634

SampleID	Date	Time	Analyses	Bottle Type	Preservative	Bottle Count
AC-TJPCD-051215-02	5/12/15	1205	Alkalinity, Total [SM 2320B] Chloride [EPA 300.0] Nitrate-N [EPA 353.2] Nitrite-N [EPA 353.2]	2L - Polyethylene	6 °C	1
AC-TJPCD-051215-02	↓	↓	Ammonia-N [EPA 350.1] Total Kjedahl Nitrogen [EPA 351.2]	1L - Polyethylene	H2SO4	1
AC-TJPCD-051215-02	↓	↓	Chlorophyll a [SM 10200H]	1L - Amber Polyethylene	6 °C	1
AC-TJPCD-051215-02	↓	↓	Orthophosphate-P [EPA 365.3/365.1]	250mL - Polyethylene	6 °C, Filtered	1
AC-TJPCD-051215-02	↓	↓	Total Phosphorous [EPA 365.1]	500mL - Polyethylene	H2SO4	1
AC-TJPCD-051215-02	↓	↓	Total Suspended Solids [SM 2540D]	250mL - Polyethylene	6 °C	1

Sampler's Initials: JR

Relinquished By: Brenda Stuens BS Date/Time: 5/13/15 09:15 Received By: Hector Sanchez Date/Time: 05/13/15 0915

Relinquished By: Hector Sanchez Date/Time: 5/13/15 11:10am Received By: Jamafmon Date/Time: 5/13/15 1110

2.9°c