URS

SAN DIEGO REGIONAL
WATER QUALITY
CONTROL BOARD

2014 DEC 22 PM 4 49

December 23, 2014

Mr. David Gibson
San Diego Regional Water Quality Control Board
2375 Northside Drive, Suite 100
San Diego, CA 92108-2700

Dear Mr. Gibson:

Attached please find one (1) electronic copy and two (2) hard copies of Section 3 of the Draft Tijuana River Watershed Management Area Water Quality Improvement Plan document and certification statements required by Provision B.3 in Resolution No. R9-2013-0001 prepared by URS with the City of Imperial Beach, the City of San Diego, and the County of San Diego. Please accept this submittal on behalf of the aforementioned responsible agencies.

If you have any questions, please contact Bob Scott, Project Manager, at (858) 812-2806.

Sincerely,

URS CORPORATION

Robert K. Scott, P.G., C.Hg
Vice President, Project Manager

Jeremy Bauer
Principal Scientist

cc: (with attachments) David Wampler, US Environmental Protection Agency
cc: (without attachments) Eric Becker, San Diego Regional Water Quality Control Board
Chris Helmer, City of Imperial Beach
Drew Kleis, City of San Diego
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STATEMENT OF CERTIFICATION

Draft Tijuana River Watershed Management Area Water Quality Improvement Plan
Second Deliverable for Permit Provision B.3, Goals, Strategies and Schedules

I certify, under penalty of law, that this Water Quality Improvement Plan submittal and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations.

Hank Levien

Hank Levien
Director of Public Works
Imperial Beach

12-11-2014
Date

THE CITY OF SAN DIEGO

STATEMENT OF CERTIFICATION

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Drew Kleis, Deputy Director
Transportation & Storm Water Department
City of San Diego

12/12/14
Date

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SARAH E. AGHASSI
DEPUTY CHIEF ADMINISTRATIVE OFFICER

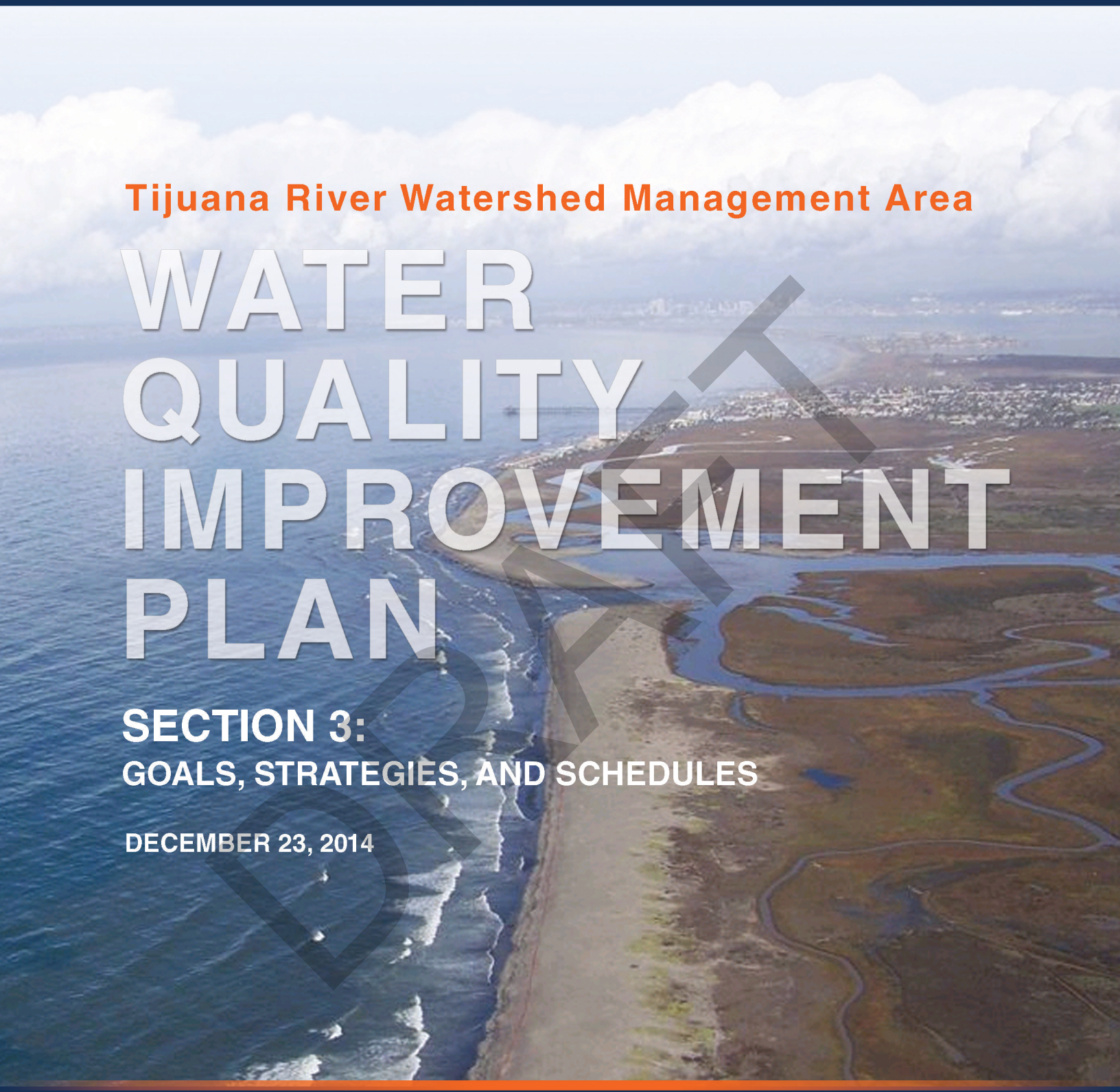
TIJUANA RIVER WATERSHED MANAGEMENT AREA, WATER QUALITY IMPROVEMENT PLAN PROVISION B.3 CHAPTER, STATEMENT OF CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sarah Aghassi

SARAH E. AGHASSI
Deputy Chief Administrative Officer
Land Use and Environment Group
County of San Diego

12/19/14
Date



Tijuana River Watershed Management Area

WATER QUALITY IMPROVEMENT PLAN

SECTION 3:
GOALS, STRATEGIES, AND SCHEDULES

DECEMBER 23, 2014

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SUBMITTED TO THE SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD BY:

City of Imperial Beach | City of San Diego | County of San Diego

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D R A F T

TIJUANA RIVER WATERSHED MANAGEMENT AREA WATER QUALITY IMPROVEMENT PLAN

DRAFT

Prepared for

City of Imperial Beach
City of San Diego
County of San Diego

URS Project No. 27671359

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ACKNOWLEDGEMENTS

The development of this Water Quality Improvement Plan was supported by the convening of a Consultation Panel that includes representatives from the San Diego Regional Water Quality Control Board (Regional Board), environmental groups, development groups, as well as members from the public. Special thanks to Eric Becker (Regional Board representative), Paloma Aguirre (representative of the environmental community affiliated with Wildcoast), Steve Gruber (development community representative affiliated with the Industrial Environmental Association and Burns & McDonnell), Luis Parra (development community representative affiliated with the Building Industry Association and TRW Engineering), Mark West (resident representative affiliated with Surfrider and member of U.S. IBWC Citizens Forum Board), Chris Peregrin (at-large representative affiliated with the Tijuana Estuary as Reserve Manager), and Oscar Romo (at-large representative affiliated with Alta Terra and the University of California San Diego), for serving on the Tijuana River Watershed Management Area Consultation Panel and providing valuable insight into the content of this document.

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TABLE OF CONTENTS

*Sections 1 and 2 submitted separately and will be compiled with Section 3 in future draft.

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TABLE OF CONTENTS

Note:
[1]Section to be developed and included in future draft of document.
*Sections 1 and 2 submitted separately and will be compiled with Section 3 in future draft.

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Tables*

Figures*

*Sections 1 and 2 and associated tables and figures submitted separately and will be compiled with Section 3 in future draft.

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Appendices*

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*Sections 1 and 2 and associated appendices submitted separately and will be compiled with Section 3 in future draft.

AGR	Agricultural Supply
AQUA	Aquaculture
BMPs	Best Management Practice(s)
BIOL	Preservation of Biological Habitats of Special Significance
BOD	Biochemical Oxygen Demand
BPJ	Best Professional Judgment
CalRecycle	California Department of Resources Recovery and Recycling
Caltrans	California Department of Transportation
CFR	Code of Federal Regulations
CGP	Construction General Permit
COD	Chemical Oxygen Demand
COLD	Cold Freshwater Habitat
COMM	Commercial and Sport Fishing
CRAM	California Rapid Assessment Method
CWA	Clean Water Act
CWC	California Water Code
DO	Dissolved Oxygen
EST	Estuarine Ecosystems
FRSH	Freshwater Replenishment
HA	Hydrologic Area
HSA	Hydrologic Sub-Area
IBI	Index of Biotic Integrity
IDDE	Illicit Discharge Detection and Elimination
IND	Industrial Service Supply
IRWM	Integrated Regional Water Management
IWTP	Industrial Wastewater Treatment Plant
JRMP	Jurisdictional Runoff Management Plan
LID	Low Impact Development
LTEA	Long Term Effectiveness Assessment
MAR	Marine Habitat
MBAS	Methylene Blue Activated Substances
MEP	Maximum Extent Practicable
MIGR	Migration of Aquatic Organisms
MLS	Mass Loading Station
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
MUN	Municipal and Domestic Supply
NGO	Non-governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NOLF	Naval Outlying Landing Field, Imperial Beach
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
NTU	Nephelometric Turbidity Unit
O/E	Observed to Effected Value Ratio
PDP	Priority Development Project

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PFC	Permeable Friction Course
PGA	Pollutant-Generating Activity
PROC	Industrial Process Supply
RA	Responsible Agency
RARE	Rare, Threatened, or Endangered Species
REC1	Contact Water Recreation
REC2	Non-Contact Water Recreation
Regional Board	San Diego Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SBIWTP	South Bay International Wastewater Treatment Plant
SBOO	South Bay Ocean Outfall
SCCWRP	Southern California Coastal Water Research Project
SDSU	San Diego State University
SHELL	Shellfish Harvesting
SMARTS	Storm Water Multiple Application and Report Tracking System
SMC	Storm Water Monitoring Coalition
SPWN	Spawning, Reproduction, and/or Early Development
State Board	State Water Resources Control Board
SUSMP	Standard Urban Storm Water Mitigation Plan
SWAMP	Surface Water Ambient Monitoring Program
TDS	Total Dissolved Solids
TRNERR	Tijuana River National Estuarine Research Reserve
TRVRT	Tijuana River Valley Recovery Team
TSS	Total Suspended Solids
TWAS	Temporary Watershed Assessment Station
U.S.	United States
U.S. EPA	United States Environmental Protection Agency
USIBWC	United States International Boundary and Water Commission
WARM	Warm Freshwater Habitat
WILD	Wildlife Habitat
WMA	Watershed Management Area
WMAA	Watershed Management Area Analysis
WQIP	Water Quality Improvement Plan
WURMP	Watershed Urban Runoff Management Program

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SECTION 3 WATER QUALITY IMPROVEMENT GOALS, STRATEGIES AND SCHEDULES

The San Diego Regional MS4 Permit requires RAs to develop specific water quality improvement goals, strategies, and schedules to address the highest priority water quality conditions identified within each WMA. As described in Section 2, the highest priority water quality conditions identified in the Tijuana River WMA to be addressed by this WQIP are:

- Sedimentation / siltation in the Tijuana River during wet weather
- Turbidity in the Tijuana River and Tijuana River Estuary during wet weather

Sedimentation, siltation and turbidity are interrelated. Turbidity, measured in nephelometric turbidity units (NTUs), is an optical characteristic of water expressing the degree to which light is scattered by suspended particles and molecules in water. Turbidity is affected by suspended solids. In general, turbidity increases as suspended solids concentration increases. Because reduction in TSS indicates a reduction in both sedimentation / siltation as well as a reduction in turbidity, the final numeric goals described in this Section propose TSS concentration as an indicator for both of the highest priority water quality conditions.

The WQIP addresses discharges to receiving waters originating from MS4s. Consequently, these highest priority water quality conditions were identified in the context of MS4 contributions and the goals and strategies described in this section to address contributions of sediment and turbidity originating from MS4 discharges.

It should be noted that the MS4 programs implemented by the RAs include multiple elements that address a range of pollutant sources and types including but not limited to sediment and turbidity. The strategies identified and described in this WQIP are a subset of WMA strategies. The complete programs will be described by RAs in their Jurisdictional Runoff Management Plans (JRMPs) in greater detail.

While this WQIP addresses the highest water quality conditions of sediment and turbidity, the benefits of the strategies described are not limited to addressing sediment and turbidity only. Reductions in other pollutants in addition to sediment and turbidity, such as trash, bacteria, nutrients, metals, and other pollutants are expected as a result of implementing the strategies described below.

3.1 WATER QUALITY IMPROVEMENT GOALS

The Permit requires the identification of numeric goals to help track milestones and demonstrate progress towards addressing the highest priority water quality conditions. These include both interim and final goals. The goals are focused on the highest priority water quality conditions, but also serve as general indicators of water quality. That is, reductions in sediment and turbidity generally result in reductions in other pollutants because the pollutants adhere to sediment or are captured through the same structural or non-structural means used to capture sediment.

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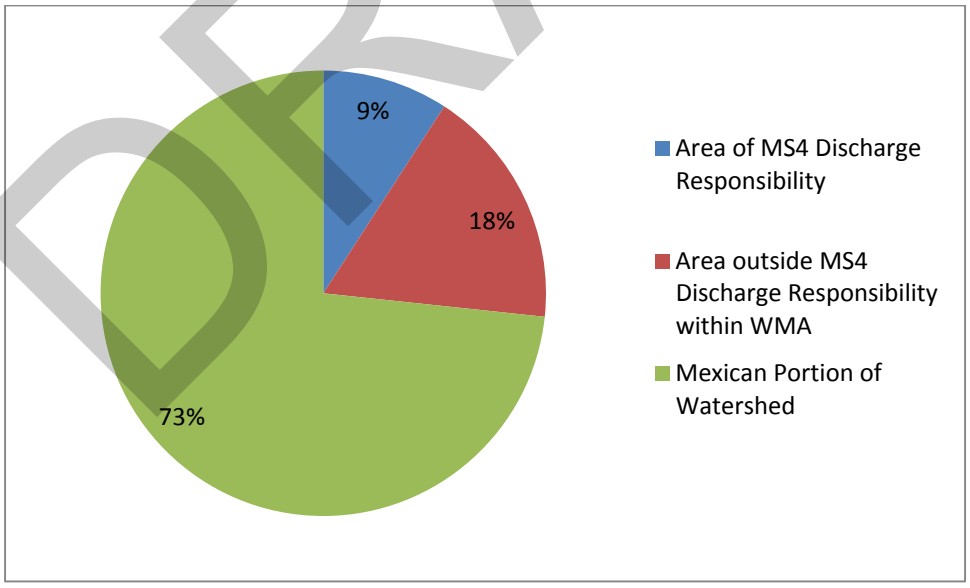
The Permit describes that interim and final numeric goals may take a variety of forms such as TMDL established WQBELs, action levels, pollutant concentration, load reductions, number of impaired water bodies delisted from the List of Water Quality Impaired Segments, Index of Biotic Integrity (IBI) scores, or other appropriate metrics (footnote under 6. B.3.a.(1)). The Permit allows flexibility in the identification of numeric goals, but they must be quantifiable so that progress toward and achievement of the goals is measurable. Each highest priority water quality condition may include multiple criteria or indicators. In accordance with the MS4 Permit, final goals and reasonable interim goals for each five-year period from WQIP approval to the anticipated final goal compliance date have been developed. In addition, interim goals for this MS4 Permit cycle must be identified.

Ultimately, restoration and protection of the receiving water is the desired outcome. As discussed in Sections 1 and 2, discharges from sources other than the Phase I MS4s are outside of the jurisdiction and regulatory discharge responsibility of the WQIP. These other discharges cause or contribute to impairments of receiving waters. Addressing non-MS4 sources, in particular, discharges from the Mexican side of the watershed, is beyond the scope of this WQIP. Therefore, to achieve the ultimate goal of restoring and maintaining the quality of receiving waters, all dischargers must participate and address their respective contributions. This is particularly true given that the area of discharge responsibility is limited to 9 percent of the watershed (Figure 3-1). The RAs will work to address discharges from their MS4s, however, discharges from non-MS4 sources must be addressed by their responsible parties. Only in this manner can the ultimate goal be achieved. Note that in some cases, no regulatory mechanism is in place to address certain discharges (e.g., cross border discharges).

Figure 3-1 Pie Chart of Areas within and outside of MS4 Discharge Responsibility



Note: Percentages based on entire watershed area.

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3.1.1 Final Goals for Discharges at MS4 Outfalls

Setting goals for the water quality of the storm water discharge as opposed to the receiving water quality focuses the goals and strategies on areas over which the RAs have greater control and more closely reflects the impacts of MS4s and the effectiveness of jurisdictional programs. Receiving water quality, on the other hand, is impacted by non-MS4 sources and, in the case of the Tijuana River WMA, includes commingled flow from the Mexican portion of the watershed. Therefore, establishing a final goal in receiving waters and measuring progress towards meeting that goal in receiving waters would not be appropriate in this WMA and would not accurately document pollution contributions by the MS4s and progress by the RAs to attain interim and final goals.

In order to establish a final goal, it is important to first understand the baseline. The RWQCB Order No. R9-2007-001 (2007 Permit) required MS4 programs to characterize constituent discharges from MS4 outfalls and to assess whether these discharges contribute to water quality impairments in receiving waters. The RAs conducted random sampling at MS4 outfalls during wet weather to characterize these discharges. Descriptive statistics for TSS analyzed as part of the Wet Weather MS4 Random Program are presented below in Table 3-1 and on Figure 3-2. In the Tijuana River WMA, the summary statistics are based on a population of 28 samples collected over the 5-year permit term throughout the Tijuana River WMA. The regional data include results from 256 samples collected from nine watersheds. The data informing this analysis are available in the annual reports submitted by the RAs to the Regional Water Board at the http://www.projectcleanwater.org (last viewed October 2014).

Table 3-1
Descriptive Statistics of TSS Measured at Random MS4 Sites during Wet Weather

Statistics (mg/L)	Tijuana River WMA[2] (n=28)	San Diego County WMAs[2] (n=256)
Minimum	10	10
Maximum	2730	2730
Mean	300	166
Standard Deviation	624	363
Median	44	46.5
5th percentile	10	10
95th percentile	1535	808
Truncated Mean[1]	294	158

[1]Based on central 95th percentile of values.
[2]WMA = Watershed Management Area

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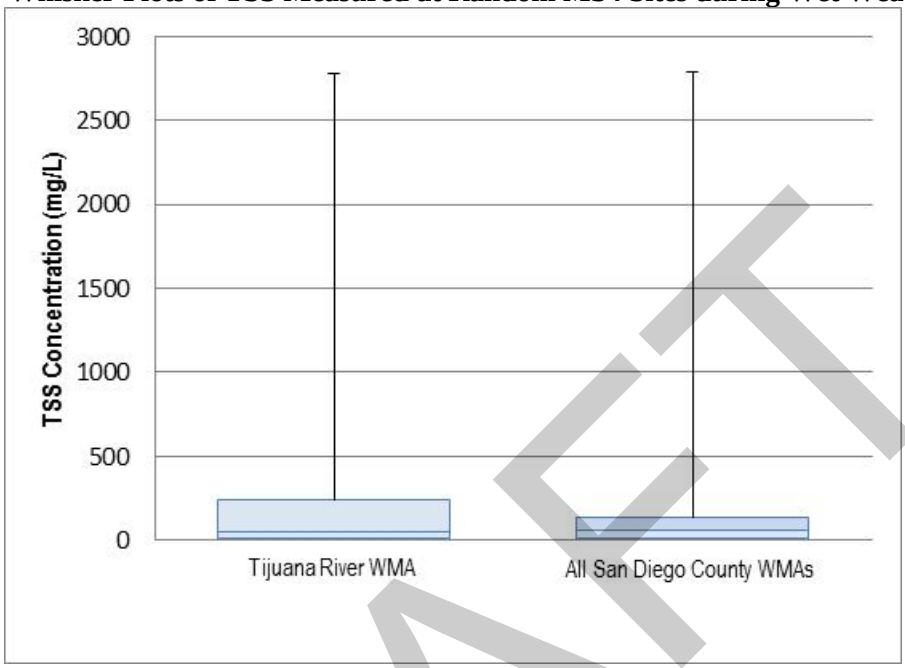
Figure 3-2
Box-Whisker Plots of TSS Measured at Random MS4 Sites during Wet Weather



Note: Boxes represent 1st and 3rd quartiles. Lines within boxes represent medians. Whiskers represent range.

These data help to inform the understanding of baseline concentration of TSS in stormwater discharges from MS4s in the San Diego region and specifically from MS4s in the Tijuana River WMA. On average, the TSS concentration in MS4 discharges during wet weather is 166 mg/L among all San Diego County WMAs and 300 mg/L in the Tijuana River WMA. However, as illustrated by Figure 3-1, the data include a maximum value that is significantly higher than the majority of the data points (i.e., 2,730 mg/L). The average is highly influenced by the outliers and skewed upward; therefore, truncated averages have also been calculated (158 mg/L for all WMAs and 294 mg/L for the Tijuana River WMA). The truncated average is based on the central 95th percentile of values, and therefore excludes outliers on the upper and lower end. The baseline and the assessment of progress towards meeting the final numeric goals should be based on the truncated mean to reduce the influence of outliers.

Baseline TSS levels in receiving waters were also considered. The Basin Plan explains that suspended sediment and turbidity shall not reach levels that cause nuisance or adversely affect Beneficial Uses (Regional Board, 2012). Under current conditions, the average of TSS concentrations measured at the Tijuana River Watershed MLS station is approximately 1,882 mg/L, as cited in the Tijuana River Watershed Technical Support Document for Solids, Turbidity, and Trash TMDLs (Tetra Tech 2010).

To establish a numeric goal for storm water discharges below which discharges will not cause or contribute to impairments, it is important to understand the natural levels of sedimentation and TSS in the receiving waters. This is a question that researches and stakeholders in the Valley continue to research. In the interim, this WQIP considers the MS4 and receiving water baselines and proposes final goals for TSS levels in storm water (wet weather) discharges at MS4 outfalls of 235 mg/L TSS, as illustrated on Figure

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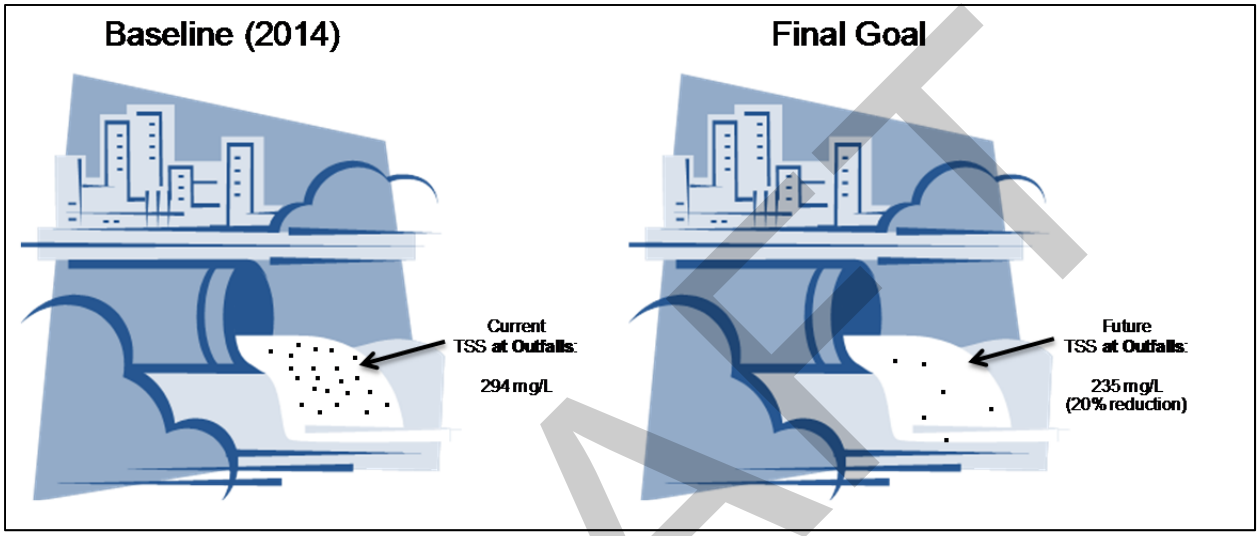
3-3 below. The proposed numeric goal for MS4 discharges is nearly 90 percent below the current average levels of TSS in receiving waters. Meeting this goal will help to demonstrate that discharges from MS4s are not causing or contributing to impacts of receiving waters.

Figure 3-3
Conceptual Illustration of Baseline and Final Numeric Goals



Note: based on truncated average of central 95th percentile values.

The types of impacts that will be addressed include impairments to natural warm water habitat and estuarine habitats. Suspended sediment in surface waters can cause harm to aquatic organisms by abrasion of surface membranes, interference with respiration, and sensory perception in aquatic fauna. This sediment can reduce photosynthesis in and survival of aquatic flora by limiting the transmittance of light and by hindering normal aquatic plant growth and development. It can be deleterious to benthic organisms, clog fish gills and interfere with respiration in aquatic fauna. It may cause the formation of anaerobic conditions. Similarly, high turbidity can adversely affect photosynthesis, which aquatic organisms depend upon for survival, by interfering with the penetration of light. High concentrations of particulate matter that produce turbidity can be directly lethal to aquatic life. Turbidity can adversely affect the use of water for drinking. By reducing sediment in MS4 discharges, the MS4s are doing their part to address causes and contributions to receiving water impacts.

The proposed numeric goals will be met through a combination of implementation of non-structural JRMP strategies as well as the use of enhanced/targeted strategies. It is assumed that implementation of JRMP strategies will reduce sediment loads by 10 percent according to research and analysis[1] completed by the City of San Diego. Implementation of enhanced strategies is also expected to reduce sediment loads. Estimating a reduction associated with enhanced and optional strategies will require additional investigation, but a goal of an additional 10 percent reduction in sediment loads attributable to the enhanced and optional strategies is included as a goal in this WQIP. By considering both the JRMP and

[1] HDR. Draft Nonstructural Non-Modeled Activity Pollutant Load Reduction Research. Memo to City of San Diego. November 13, 2014.

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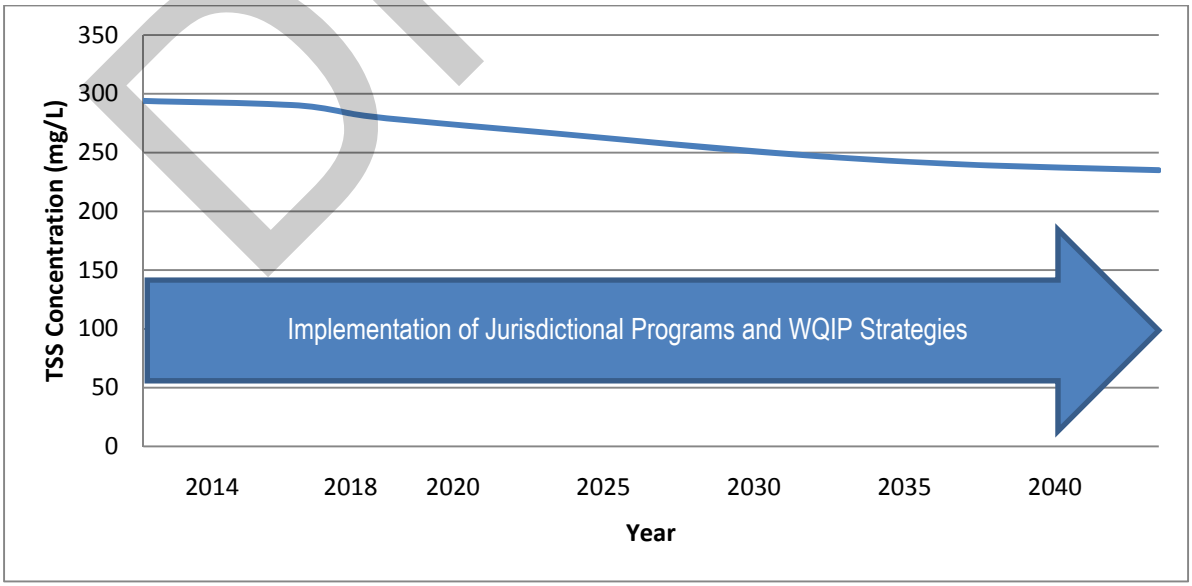
optional strategies, the goal is a reduction in sediment loads in MS4 discharges of 20 percent. The WQIP uses TSS as a surrogate or indicator for sediment loads and establishes a numeric goal of a 20 percent reduction in TSS concentrations in MS4 wet weather discharges, based on the expected 20 percent reduction in sediment load. While there is not a 1:1 relationship between sediment load and TSS, the two metrics are related, and a reduction in one is expected to be accompanied by a reduction in the other. Applying the expected reductions in sediment load to TSS translates to a final numeric goal of reducing TSS in storm water discharges from MS4s from an average of 294 mg/L to an average of 235 mg/L (a 20 percent reduction from the baseline) by the year 2040. Consistent with the estimate of baseline, the measurement of progress towards meeting the final goals should be based on truncated averages that exclude outlier values. As discussed later in Section 5, the estimate of baseline may change as additional information and data become available over time, as the sample population is not robust It should be noted that the understanding of what the baseline is may change as additional data become available over time including, for example, data collected in support of special studies.

The final water quality-based final goal (235 mg/L TSS) is accompanied by interim goals, as discussed in Section 3.1.2 (Interim Goals) and Section 3.3 (Schedules). Assessment of the progress towards meeting the final goal will be measured through evaluation of both the interim numeric goals as well as the schedule of strategies. Attainment of the water quality-based numeric interim goals and implementation of the WQIP and associated strategies demonstrate progress towards meeting the final goal as indicated on Figure 3-4 and Table 3-2. Both the goals and implementation of strategies help to demonstrate that progress is being made toward addressing the priority water quality conditions. Additional details for the strategies summarized in Table 3-2 are provided in Section 3.2 below. Detailed lists of jurisdictional strategies are provided in Appendix H.

Figure 3-4
Reduction in TSS Concentration in MS4 Wet Weather Discharges through Implementation of Jurisdictional Programs and WQIP Strategies



Notes: RAs define Year as Fiscal Year July 1, through June 30th.

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Table 3-2
Wet Weather Numeric Goals for Highest Priority Water Quality Conditions – Sediment (911.11 and 911.12)

Fiscal Years	TSS Concentration (mg/L)	Percent Reduction in TSS Relative to Baseline[1,2]	Strategies Contributing to Reduction: Implement WQIP with Focus on Programmatic BMPs and use of Adaptive Management to Update Strategies to Increase Effectiveness
Baseline	294	N/A	N/A
FY2013 to FY2018[3]	↓ 290	≤5%	• Implement programmatic (non-structural) BMPs to achieve source reduction of TSS loads from major storm drain outfalls; • More stringent permit requirements; and/or • New BMPs installed as redevelopment occurs.
FY2015 to FY2020	↓ 280	5%	• Nonstructural JRMP Strategies; • Programmatic BMPs; • Focus and enhance efforts where needed based on adaptive management; • Increased BMP compliance due to increased inspections and outreach; • Enhanced nonstructural strategies such as increased inspections and outreach, clean up events, targeted catch basin cleaning and street sweeping; and/or • Adaptive management to modify JRMP and enhanced strategies based on new data from monitoring and special studies.
FY2020 to FY2025	↓ 265	10%	• Nonstructural JRMP Strategies; • Programmatic BMPs; • Updated BMPs based on adaptive management; • Increased BMP compliance due to increased inspections and outreach; • Enhanced nonstructural strategies such as increased inspections and outreach, clean up events, targeted catch basin cleaning and street sweeping; and/or • Adaptive management to modify JRMP and enhanced strategies based on new data from monitoring and special studies.
FY2025 to FY2030	↓ 250	15%	• Nonstructural JRMP Strategies; • Programmatic BMPs; • Updated BMPs based on adaptive management; • Increased BMP compliance due to increased inspections and outreach; • Enhanced nonstructural strategies such as increased inspections and outreach, clean up events, targeted catch basin cleaning and street sweeping; • Adaptive management to modify JRMP and enhanced strategies based on new data from monitoring and special studies; and/or • If Interim goals are not met, identify and implement optional structural strategies (City of San Diego).

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Fiscal Years	TSS Concentration (mg/L)	Percent Reduction in TSS Relative to Baseline[1,2]	Strategies Contributing to Reduction: Implement WQIP with Focus on Programmatic BMPs and use of Adaptive Management to Update Strategies to Increase Effectiveness
Baseline	294	N/A	N/A
FY2030 to FY2035	↓ 240	18%	• Nonstructural JRMP Strategies; • Programmatic BMPs; • Updated BMPs based on adaptive management; • Increased BMP compliance due to increased inspections and outreach; • Enhanced nonstructural strategies such as increased inspections and outreach, clean up events, targeted catch basin cleaning and street sweeping; • Adaptive management to modify JRMP and enhanced strategies based on new data from monitoring and special studies; and/or • If Interim goals are not met, identify and implement optional structural strategies (City of San Diego).
FY2035 to FY2040	↓ 235	20%	• Nonstructural JRMP Strategies • Programmatic BMPs; • Updated BMPs based on adaptive management; and/or • Incremental improvements in program management.

[1]Percent reduction of Total Suspended Solids (TSS) relative to baseline. TSS is being used as a surrogate for sediment.
[2]Progress toward final goals will be monitored through a subset of storm events. The County of San Diego is concerned that a funding source to construct, operate and maintain structural controls is not identified if optional structural controls are needed to meet compliance.
[3]The City of San Diego is establishing two compliance pathways for the FY 2018 interim goal: (1) Meet water quality goal of 290 mg/L average TSS concentration in MS4 wet weather discharges or (2) Develop green infrastructure policy, attain City Council approval, and construct green infrastructure BMPs to improve water quality during wet weather (3.31 acres of drainage area treated through 1 green infrastructure BMP).

This WQIP establishes a final numeric goal for sediment that is based on TSS concentration. TSS is easily measured. It is correlated with sediment load and is a widely used as a surrogate for overall storm water quality. The numeric goal of 20 percent decrease in average (excluding outliers) TSS concentration used in this WQIP is based on the expected decrease of 10 percent of sediment load associated with implementation of JRMP strategies in addition to a goal of a decrease of an additional 10 percent in load associated with enhanced JRMP strategies. As discussed above, TSS is used in this WQIP as a surrogate for sediment load. The baseline average concentration of TSS is 294 mg/L. The goal is to achieve a 20 percent decrease to 235 mg/L by 2040. Note that these goals may be revised as strategies are implemented and additional information becomes available, as discussed in Section 5.

The Basin Plan establishes a narrative rather than numeric goal for TSS indicating that "waters shall not contain suspended and settleable solids in concentrations of solids that cause nuisance or adversely affect beneficial uses." The level at which TSS causes nuisance or adversely affects beneficial uses is not firmly established. Thus, while 235 mg/L of TSS is proposed as the final goal, in practice it will serve more as a benchmark. Exceedances will be investigated but should not be considered violations. TSS concentrations can be a reflection of natural sources; therefore, exceedances may not necessarily be indicative of water quality issues. As indicated above, the goal may be revised if additional information becomes available supporting the establishment of a revised goal (see Section 5).

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In any case, reducing TSS and sediment levels in MS4 discharges is an appropriate goal because TSS originating from urbanized, impervious surfaces co-occurs with other pollutants and reductions in TSS and sedimentation have additional benefits by reducing loads of other pollutants that adhere to sediment or are trapped by the mechanism/method to reduce TSS. These anthropogenic sources of sediment are distinct from natural sources that are part of natural fluvial systems and necessary for healthy streams.

The narrative goal is to reduce sediment load in discharges from MS4s to the Tijuana River to the maximum extent practicable by 2040. The numeric goal associated with the narrative goal is to reduce the average concentration of TSS in storm water discharges from MS4 outfalls to 235 mg/L.

An alternative metric for the final goal and interim goals could be developed based on reductions in sediment load that enters and discharges from the MS4 into the Tijuana River and Estuary rather than on the surrogate pollutant of TSS. Setting a goal based on sediment load requires an understanding of the baseline sediment loads. Quantifying the baseline and measuring reductions could be achieved by weighing catch basin contents, street sweeping contents, and modeling. A special study to inform the baseline and inventory of sources contributing sediment is being considered in the Tijuana River WMA.

3.1.2 Interim Goals

Progress towards meeting the final goals will be measured using interim water quality-based goals. For FY 2018, the City of San Diego will also use an interim goal The interim water-quality based goals are presented below in Table 3-3. Schedules for implementing strategies are RA-specific because they are based on implementation of the jurisdictional strategies. See Appendix H.

Table 3-3 Interim Goals by Fiscal Year

Goal by Fiscal Year (Average TSS concentration in MS4 wet weather discharge)						
Baseline	FY 2018[1]	FY 2020	FY 2025	FY 2030	FY 2035	FY 2040
294	290	280	265	250	240	235

[1]The City of San Diego is establishing two compliance pathways for the FY 2018 interim goal: (1) Meet water quality goal of 290 mg/L average TSS concentration in MS4 wet weather discharges or (2) Develop green infrastructure policy, attain City Council approval, and construct green infrastructure BMPs to improve water quality during wet weather (3.31 acres of drainage area treated through 1 green infrastructure BMP).

3.2 WATER QUALITY IMPROVEMENT STRATEGIES

The Permit requires RAs to identify water quality improvement strategies to address the highest priority water quality conditions. The strategies were selected based on their ability to effectively and efficiently eliminate non-storm water discharges to the MS4, reduce pollutants in storm water discharges in the MS4 to the maximum extent practicable (MEP), and strive to achieve the interim and final numeric goals identified in Section 3.1. Section 3.2.1 describes the strategy selection process. A general discussion of nonstructural strategies, such as administrative policies, enforcement of municipal ordinances, education and outreach programs, rebate and incentive programs, and collaboration with WMA partners, is presented in Section 3.2.2. Optional structural strategies, utilized as needed and if funding is identified, including those strategies that can improve water quality by removing pollutants through filtration and

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infiltration, are introduced in Section 3.2.3. The lists of nonstructural and structural strategies selected by each RA as best suited for its jurisdiction are presented in Section 3.2.4. The strategies are presented in RA-specific tables that describe the method of implementation for each strategy, the resources, and the watershed partners included in the effort. Strategies implemented on a WMA scale or through collaboration with WMA stakeholders are discussed in more detail in Section 3.2.5.

3.2.1 Strategy Selection

A list of potential strategies (nonstructural and structural) was developed by the RAs based on JRMP activities and enhancements augmented by public input and discussion (see Section 2). This list was used as a guide by RAs to identify strategies appropriate for their jurisdictions. Emphasis was given to strategies that target highest priority water quality conditions, and those that provide multiple benefits were favored. The RAs considered the triple bottom line, evaluating the environmental, economic, and social components of the strategies. Strategies that improve and promote cooperation and collaboration between the RAs and other governmental agencies (WMA groups, Caltrans, water districts, school districts) and other entities, such as NGOs, were also given high priority. RAs are also continually collaborating with internal jurisdictional departments, and these collaborating entities are presented in the jurisdictional strategies.

The RAs evaluated their existing programs, the potential for incorporating enhancements and new programs, and the types of optional structural BMPs that may be considered, if needed and if funding is identified. All aspects of their JRMPs were evaluated, which provided the necessary background for existing nonstructural solutions and suggested areas where enhanced or restructured activities might be more successful. It must be noted that implementation of structural BMPs is dependent on identification of funding sources and completion of environmental review. Efficiency in pollutant reduction is partly based on identifying the known and suspected areas or sources likely contributing to the highest priority water quality conditions and targeting those sources. Within the MS4, these sources include erosion from commercial, industrial, residential and other land uses; construction sites; unpaved/unmaintained roads, alleys, and trails; sediment deposition and accumulation on impervious surfaces; and erosion in and around MS4 outfalls. These sources are the focus of the strategies described below.

3.2.2 Nonstructural Strategy Development

Nonstructural reduction strategies are those actions and activities that are intended to reduce storm water pollution that do not involve construction or implementation of a physical structure to treat storm water. These strategies are also considered nonstructural by the nature of their programmatic implementation. Nonstructural strategies include: administrative policies, enacting and enforcing municipal ordinances, education and outreach programs, and incentive programs including rebates, and cooperation and collaboration with other WMA or regional stakeholders. Jurisdictions have implemented these types of programs for many years, either in response to previous MS4 Permit requirements or in response to jurisdiction- or WMA-specific needs (Regional Board, 2013).

The combination of existing efforts will be combined with new or enhanced strategies required under the new permit. The cumulative impact of these efforts will result in reduced pollutant loads over time (See

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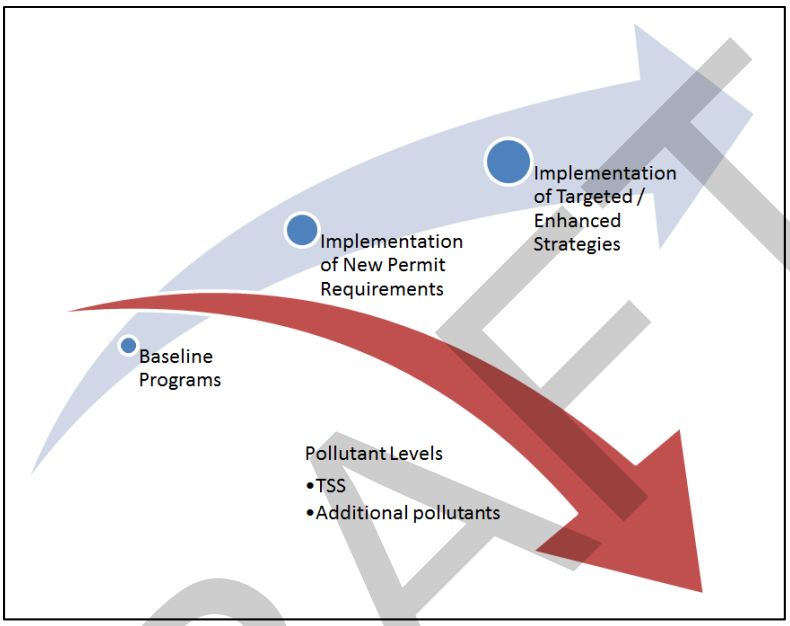
Figure 3-5.). Fundamentally, strategies were chosen on the basis of their expected effectiveness in reducing pollutant sources and targeting pollutant-generating activities (PGAs) of concern in the Tijuana River WMA and their suitability and potential to be implemented by the RAs.

Figure 3-5
Pollutant Level Reduction with Increased Efforts



The list of nonstructural strategies for each RA is based on the following:

- Existing programs or actions that the RAs are already implementing based on prior (2007) MS4 Permit requirements;
- Implementing significant new requirements in 2013 MS4 Permit;
- Enhancing and focusing existing programs or actions; and
- Identifying new optional actions or initiatives that are effective or potentially effective in other areas or programs.

It is challenging to accurately quantify most nonstructural strategy benefits in terms of pollutant load reductions, because it generally requires extensive survey and monitoring information or modelling. In addition, nonstructural strategies may target pollutants, land uses, or populations, resulting in different load reductions depending on the implementation technique.

Most nonstructural strategies implemented by the RAs are part of their JRMPs. The MS4 Permit requires RAs to control the contribution of pollutants to and discharges from the MS4 within their jurisdictions through JRMPs (MS4 Permit Provision E). The MS4 Permit requires the jurisdictions to identify the strategies being implemented by JRMP Provisions E.2 through E.7 as part of the WQIP for the highest

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priority water quality conditions. Strategies within JRMP categories may be broad, administrative programs or activities targeting specific sources. The MS4 Permit provides guidelines for RA implementation of each program; however, they are implemented differently depending on the unique characteristics of each jurisdiction. RAs implement strategies within their JRMPs with jurisdictional-specific approaches to best achieve the numeric goals and meet Permit requirements within their jurisdictions. Because the MS4 Permit provides flexibility in implementing strategies, each jurisdiction may not be implementing the same strategies within their JRMPs. A strategy identified as the most effective or efficient to achieve pollutant reductions in one jurisdiction may not be in other jurisdictions.

Table 3-4 describes the different categories of JRMP strategies. The relative benefit associated with water chemistry, physical, and biological improvements achieved by strategy implementation is presented in Table 3-5. The assumptions represent BPJ based on literature reviews, practical experience, and stakeholder input. The BMP benefits are dependent on site characteristics, degree or scope of implementation, and the target pollutant of the program or strategy. Although the benefits are variable, estimates of the relative pollutant reduction benefits are provided for comparative evaluation. Pollutant reductions identify the primary pollutants (●), the secondary pollutants (◗), and the pollutants that the strategy does not address (○). Estimated pollutant reductions assume typical design, land use, and geography, but can be modified to target pollutants or site-specific conditions. Additional information on JRMP implementation can be found in each RA's JRMP (to be submitted in June 2015).

Table 3-4
JRMP Categories

Strategy Category	Strategy Description
Development Planning	Uses Responsible Agencies' land use and planning authority to require implementation of BMPs (e.g., requiring BMPs for PDPs) to address effects from new development and redevelopment.
Construction Management	Addresses pollutant generation from construction activities associated with new development or redevelopment.
Existing Development	Addresses pollutant generation from existing development, including commercial, industrial, municipal, and residential land uses. Includes stream, channel, and habitat restoration and BMP retrofitting in areas of existing development.
Illicit Discharge, Detection, and Elimination (IDDE) Program	Actively detects and eliminates illicit discharges and improper disposal of wastes into the MS4.
Public Education and Participation	Promotes and encourages the development of programs, management practices, and behaviors that reduce the discharge of pollutants in storm water to the maximum extent practicable (MEP), prevent controllable non-storm water discharges from entering the MS4, and protect water quality standards in receiving waters.
Enforcement Response Plan	Describes enforcement requirements of each JRMP.

JRMP = Jurisdictional Runoff Management Program

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Table 3-5
JRMP Strategy Benefits

JRMP STRATEGY	Average Water Chemistry Benefit									Physical and Biological Benefit			
	Sediment[1]	Bacteria	Metals	Organics	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
Development Planning													
All Development Projects	*Benefit varies by source control or LID BMP type*												
Priority Development Projects (PDPs)	●	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
Construction Management	●	○	○	○	○	○	◗	○	◗	●	●	○	●
Existing Development													
Commercial, Industrial, Municipal, and Residential Facilities and Areas	●	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
MS4 Infrastructure	●	◗	○	○	◗	◗	○	○	○	○	○	○	◗
Roads, Streets, and Parking Lots	●	◗	●	◗	○	●	○	◗	●	○	○	○	◗
Pesticide, Herbicides, and Fertilizer Program	○	○	○	●	●	●	○	○	○	○	○	◗	●
Retrofit and Rehabilitation in Areas of Existing Development	*Varies by development area; potential benefit for all conditions.*												
IDDE Program	*Benefit varies; potential benefit for all conditions.*												
Public Education and Participation	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
Enforcement Response Plan	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗

1. Orange-shaded cells indicate highest priority water quality condition for the WMA.

BMP = best management practice; IDDE = Illicit Discharge, Detection, and Elimination (IDDE) Program;
JRMP = Jurisdictional Runoff Management Program; LID = low-impact development
Pollutant reductions identify the primary pollutants (●), the secondary pollutants (◗), and the pollutants that the strategy does not address (○).

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Additional strategies that fall outside a JRMP category have also been identified. These strategies are considered as optional as they are not required by MS4 Permit Provision E, but an RA has identified them as potentially effective in addressing priority water quality conditions within its jurisdiction. These strategies may not be appropriate or effective in each jurisdiction.

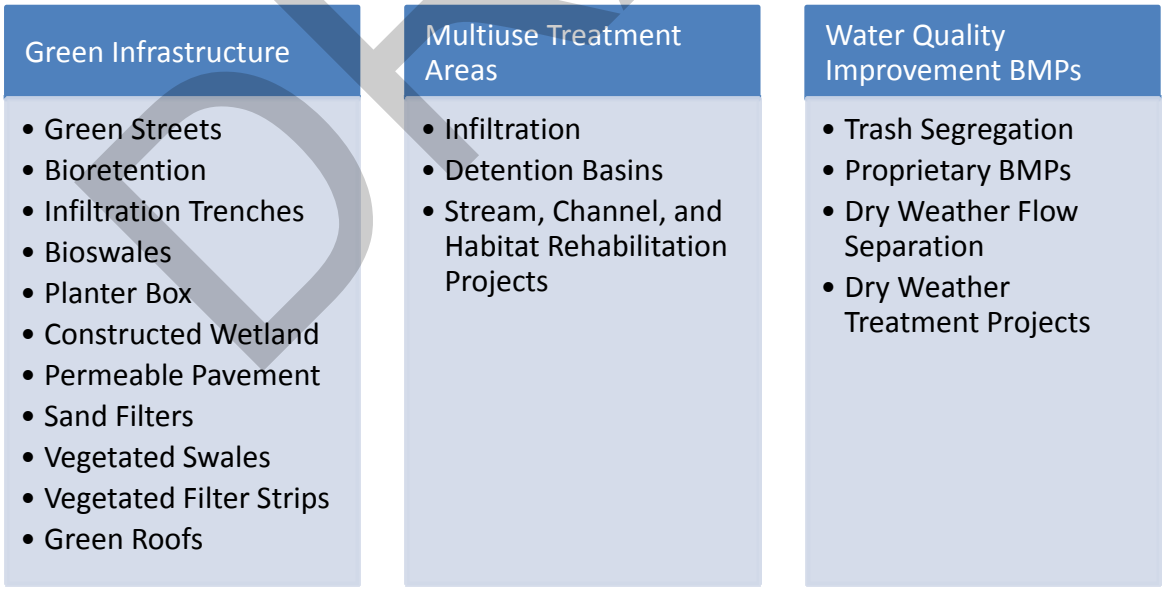
3.2.3 Structural Strategy Descriptions

Structural strategies, or structural BMPs, are optional strategies that can be used strategically throughout the contributing watershed to further improve water quality, if necessary, by removing pollutants through a variety of chemical, physical, and biological processes, including filtration and infiltration. These would be considered only it is shown in later permit cycles that additional strategies are required to meet goals and if funding is identified. The effectiveness and feasibility of implementing different types of structural BMPs should be carefully considered in regard to the BMP pollutant reductions and cost to implement, operate and maintain. Moreover, structural BMP siting, construction, and other logistics must be considered. These considerations are dependent on identifying funding mechanisms to support them. Long-term structural BMP effectiveness is often dependent on the successful construction and routine maintenance of each BMP.

Similar to nonstructural strategies, structural BMPs may be chosen on the basis of their expected effectiveness in reducing pollutant loads and targeting pollutant-generating activities of concern in the Tijuana River WMA and their suitability and potential to be implemented by the RAs.

Structural BMPs were broken into three categories based on scale and overall function: (1) green infrastructure, (2) multiuse treatment areas, and (3) water quality improvement BMPs (Figure 3-6). These categories and their respective levels of potential implementation in the Tijuana River WMA are discussed in detail in the following sections.

Figure 3-6
Categories of Structural BMPs



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3.2.3.1 Green Infrastructure

Green infrastructure uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green infrastructure refers to the patchwork of natural areas that provide habitat, flood protection, and cleaner water. At the scale of a neighborhood or site, green infrastructure refers to storm water management systems such as bioretention areas, permeable pavements, and green roofs that use natural processes to absorb, store, and treat water.

Green infrastructure typically incorporates multiple BMPs using the natural features of the site in conjunction with the goal of the site development. Multiple BMPs can be incorporated into the site development to complement and enhance the proposed layout, while also providing water quality treatment and volume reduction. Green infrastructure practices are those methods that provide control and treatment of storm water runoff on or near locations where the runoff initiates, thus providing water quality improvement and volume reduction. Rain barrels are covered programmatically as a nonstructural strategy, but are also commonly incorporated as multi-benefit components of green infrastructure systems.

Green infrastructure can provide benefits to water quality and the community at the site scale outside of the right-of-way or within the public street right-of-way (green streets). The following subsections discuss implementation of green infrastructure in these two settings.

3.2.3.1.1 Green Infrastructure Outside the Right-of-Way

Any single BMP or a combination of the BMPs can be applied at the site scale to capture and treat storm water runoff before it enters the MS4. These small-scale projects are important to the WMA as a whole because collectively they can provide an effective means toward pollutant load reduction while also attenuating peak flow, reducing discharge volume, and providing aesthetic value and improved habitat quality. These small-scale BMPs can be implemented on public parcels by municipalities and incorporated into Priority Development Projects (PDPs) or other projects such as redevelopment activities on private parcels. Examples of potential existing development retrofits for green infrastructure BMPs outside the right-of-way include converting parking lot medians into planter boxes and asphalt into permeable pavements.

Much of the impervious area on most parcels, regardless of land use type, consists of a combination of paved parking areas and roof tops. Those areas can often be treated using a system of green infrastructure implemented in landscape areas and replacing hardscape with comparable permeable materials. Other treatment options to be considered for areas outside the right-of-way are green roofs, infiltration trenches, sand filters, vegetated filter strips, and vegetated swales.

3.2.3.1.2 Green Infrastructure in the Right-of-Way (Green Streets)

Green streets can consist of multiple BMP types implemented in a linear fashion within the road right-of-way. Placing BMPs within the right-of-way provides an additional opportunity to treat urban storm water runoff, attenuate peak flow, and reduce discharge volume while improving community pride, land value, and habitat quality. Since green streets are located in the right-of-way, they have no land acquisition costs

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and are more conveniently accessed for maintenance activities. Green streets also provide the added benefit of treating runoff from both the roadway and adjacent contributing parcels.

The most common approaches for green streets include bioretention areas located between the edge of the pavement and the edge of the right-of-way with permeable pavement installed in the parking lanes. The configuration of the street, particularly the presence of curb and gutter, locations of underground utilities, road classifications, and sidewalk, parking, and right-of-way widths, often dictate the configuration of green streets. Options are presented below for streets with and without curb and gutter.

Curb and gutter is often used to provide a clear delineation between the travel lanes and the parkway area of the right-of-way. With this configuration, storm water is often treated through permeable pavement in the parking lanes and bioretention areas in the space between the back of the curb and the sidewalk.

Streets without curb and gutter provide direct connection for diffused runoff to be treated within the right-of-way. Often, without the delineation provided by curb and gutter, the right-of-way at the edge of the travel lane can become compacted and eventually cause erosion concerns. Implementing green street concepts could provide an opportunity to stabilize those areas.

3.2.3.2 Multiuse Treatment Areas

Large treatment structural BMPs, referred to as multiuse treatment areas, are regional facilities that receive flows from neighborhoods or larger areas and often serve dual purposes for flood control and groundwater recharge. These BMPs are often located in public spaces and can be co-located within parks or green spaces to provide excellent ecosystem services and aesthetic value to stakeholders. Bioretention areas can enhance biodiversity and beautify the urban environment with native vegetation. Large-scale facilities, such as infiltration basins or dry extended detention basis, can provide dual use as athletic fields or open spaces.

3.2.3.2.1 Infiltration and Detention Basins

Large multiuse BMPs considered in the WQIP focus on surface BMPs (on public parcels) that provide treatment through the detention and infiltration of runoff. Examples include infiltration and dry extended detention basins. These BMPs are designed to hold runoff for an extended period of time to allow water to evaporate into the atmosphere, infiltrate into native soils, or be transpired by vegetation, while accommodating for overflow and bypass during large storm events. These BMPs are well suited to public spaces such as active (soccer fields) and passive (parks) recreation areas and they raise public awareness of storm water management.

3.2.3.2.2 Stream, Channel, and Habitat Rehabilitation Projects

Natural streams, channels, and habitats serve hydrologic and ecological functions that can be compromised when these natural systems are degraded or altered. For instance, increased runoff volumes and velocities can cause erosion of stream banks or channels, which can result in mobilization of large quantities of sediment and sediment-binding pollutants into the drainage system. Degraded coastal

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habitats such as salt marshes, lagoons, and wetlands can disrupt biological productivity, which can lead to unhealthy or poor ecosystems.

The goal of rehabilitation projects is to improve stream or channel conditions or restore habitats through engineered enhancements. Stream or channel rehabilitation projects stabilize stream banks or enhance the stream setting to achieve water quality benefits. Stream or channel rehabilitation projects can include grading; construction of check structures, drop structures, and channel bed and bank protection measures; vegetation planting to protect channel area; and modified channel cross-sections to promote hydrologic connectivity. Habitat rehabilitation projects attempt to improve biological productivity or ecosystem functionality through the restoration of natural hydrologic processes, natural vegetation, and other baseline physical characteristics. Hydrologically-degraded systems can also encourage growth of invasive species and unwelcome changes to native habitat and species diversity. In addition to water quality and habitat improvements, other benefits of rehabilitation projects include restoration of benthic macroinvertebrates and terrestrial wildlife, which are indirect measures of water quality. These rehabilitation projects can lead to greater public understanding of water quality while serving as recreational opportunities.

3.2.3.3 Water Quality Improvement BMPs

The RAs will implement green infrastructure when feasible, but site constraints preclude use of green infrastructure in some areas. In such cases, water quality improvement BMPs may be required to protect water resources. Water quality improvement BMPs include trash capture, proprietary BMPs, and dry weather flow separation and treatment projects.

Trash segregation includes installation of inlet devices, such as trash guards or trash racks that are used to capture trash and debris before being transported into receiving waters. Proprietary BMPs are prefabricated commercial products such as hydrodynamic separators or catch basin filter inserts that typically attempt to provide storm water treatment in space-limited areas, often using patented and innovative technologies.

Proprietary BMPs typically use settling, filtration, absorptive/adsorptive materials, vortex separation, and sometimes vegetative components to remove pollutants from runoff.

Dry weather flow separation and treatment projects are those identified and planned by each respective RA to target non-storm water dry season flows and to divert these flows for treatment either onsite or to sanitary sewer systems and ultimately wastewater treatment plants. In the Tijuana River Watershed, all dry weather flows from the Tijuana River are currently diverted at the international border for subsequent treatment at the SBIWTP and/or the San Antonio de los Buenos Wastewater Treatment Plant in Mexico. Diversion structures are also in place at Goat Canyon and Smuggler's Gulch.

3.2.4 Jurisdictional Strategy Selection by RA

The types of strategies discussed in Sections 3.2.1 through 3.2.3 were considered by each RA in the development of RA-specific strategies. RAs considered their current programs, new MS4 Permit requirements, level of effort/costs, and available resources as well as the triple bottom line to develop a

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list of strategies and implementation approach. The following sections present strategies by individual RA and collaborative strategies that may be implemented between jurisdictions or among jurisdictions and interested stakeholders.

The information provided in the jurisdictional strategy tables (see Appendix H) provide context for when the strategy will be implemented, where, by whom, and how often. The tables also provide relative information on resource needs. For strategies that will not be implemented upon approval of the WQIP, a future implementation date or a trigger date for implementation is noted. Triggers include such circumstances as receiving grant funds, for example. RAs are continually collaborating with internal jurisdictional departments, other RAs, and WMA groups and NGOs, and these collaborating entities are presented in the tables.

3.2.5 Collaborative WMA Strategies

In addition to implementing strategies on a jurisdictional basis, RAs will collaboratively implement projects within the WMA that improve water quality. Each of the RAs serves on the Steering Committee of the Tijuana River Valley Recovery Team (Recovery Team) that has been addressing trash and sediment in this binational watershed. The Recovery Team was established in 2008, and includes over 30 stakeholders, landowners, municipalities, agencies, and NGOs on both sides of the international border. Since its formation, the Recovery Team has been the venue for stakeholder collaboration. It has prepared a Recovery Strategy that identifies priority action areas and projects to meet its vision of a valley free of trash and (anthropogenic) sediment WMA strategies and projects in the Tijuana River WMA are summarized in Table 3-6 below.

Table 3-6
Collaborative WMA Strategies

Strategy
Collaboration with U.S. IBWC, Binational Task Force
Collaboration with U.S EPA Border 2020
Collaboration with Good Neighbor Environmental Board (GNEB)
Collaboration with Recovery Team
Collaborate with research reserve advisory council
Collaborate with Regional Board.
Support non-governmental organization (NGO) efforts in the watershed (e.g., during Tijuana River Action Month) (e.g., trash clean-ups)
Special study to inventory and characterize sources of sediment in the watershed.
Collaboration among school districts, TRNERR, State Parks, and County Parks & Rec

3.2.5.1 Alternative Compliance Option for Onsite Treatment (WMAA)

The MS4 Permit allows for the implementation of offsite alternative compliance methods in lieu of meeting structural BMP design standards and/or hydromodification management criteria on the project site. To implement an alternative compliance program, a jurisdiction must first complete an optional Watershed Management Area Analysis (WMAA) as detailed in MS4 Permit Section B.3.b.(4). The San Diego County RAs have collectively funded and provided guidance for development of a regional

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WMAA. Findings of the regional WMAA, specific to the Tijuana River WMA, are described below and are provided in Appendix I. The full WMAA will be attached as an appendix to the forthcoming BMP Design Manual, currently in development under direction from the RAs.

The WMAA comprises the following three components as indicated in the Regional MS4 Permit:

1. Perform analysis and develop Geographic Information System (GIS) layers (maps) by gathering information pertaining to the physical characteristics of the WMA (referred to herein as WMA Characterization). This includes, for example, identifying potential areas of coarse sediment supply, present and anticipated future land uses, and locations of physical structures within receiving streams and upland areas that affect the watershed hydrology (such as bridges, culverts, and flood management basins).

2. Using the WMA Characterization results, compile a list of candidate projects that could potentially be used as alternative compliance options for Priority Development Projects. Such projects may include, for example, opportunities for stream or riparian area rehabilitation, opportunities for retrofitting existing infrastructure to incorporate storm water retention or treatment, or opportunities for regional BMPs, among others. Prior to implementing these candidate projects the Copermittees must demonstrate that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of the onsite structural BMPs. Note, compilation or evaluation of potential projects was not performed as part of this regional effort. Identification and listing of candidate projects will be performed for each WMA through the WQIP process for WMAs that elect to submit the optional WMAA as part of the WQIP.

3. Additionally, using the WMA Characterization maps, identify areas within the watershed management area where it is appropriate to allow for exemptions from hydromodification management requirements that are in addition to those already allowed by the Regional MS4 Permit for Priority Development Projects. The Copermittees shall identify such cases on a watershed basis and include them in the WMAA with supporting rationale to support claims for exemptions.

The following GIS map layers were developed to characterize the hydrological and geomorphological processes within the Tijuana River WMA:

- Dominant Hydrologic Processes: A description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates;

- Stream Characterization: A description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral;

- Land Uses: Current and anticipated future land uses;

- Potential Critical Coarse Sediment Yield Areas; and

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- Physical Structures: Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.

These GIS layers can be used to:

- Identify the nature and distribution of key macro-scale watershed processes;
- Identify potential opportunities and constraints for regional and sub-regional storm water management facilities that can play a critical role in meeting water quality, hydromodification, water supply, and/or habitat goals within the watershed;
- Assist with determining the most appropriate management actions for specific portions of the watershed; and
- Suggest where further study is appropriate.

Alternative compliance methods can be implemented at the watershed scale (e.g., multiuse treatment area BMPs) or as green infrastructure BMPs (e.g., green streets). Regardless of scale, offsite alternative compliance BMPs mitigate pollutants not reliably retained on the project site or hydromodification impacts not reliably mitigated onsite per requirements detailed in MS4 Permit Sections E.3.c.(1) and E.3.c.(2). In addition to meeting site-specific structural BMP and hydromodification management requirements, alternative compliance methods can provide multiple benefits for the Tijuana River WMA.

In addition to allowing for alternative compliance program development, the WMAA findings can also help determine the feasibility of candidate projects for alternative compliance implementation (MS4 Permit Section B.3.b.(4)(b)). Copermittees are currently compiling a list of candidate projects that consider the numeric goals of the Tijuana River WMA as well as projects previously identified in JRMPs and other regulatory documents. Appendix J and the Water Quality Improvement Plan will be updated to include the final candidate project list, as that list is made available. Appendix J provides further details regarding alternative compliance options and blank alternative compliance candidate project lists.

Alternative compliance methods can be implemented at the watershed scale (e.g., multiuse treatment area BMPs) or as green infrastructure BMPs (e.g., green streets). Regardless of scale, offsite alternative compliance BMPs mitigate pollutants not reliably retained on the project site or hydromodification impacts not reliably mitigated onsite per requirements detailed in MS4 Permit Sections E.3.c.(1) and E.3.c.(2). In addition to meeting site-specific structural BMP and hydromodification management requirements, alternative compliance methods can provide multiple benefits for the Tijuana River WMA.

In addition to allowing for alternative compliance program development, the WMAA findings can also help determine the feasibility of candidate projects for alternative compliance implementation (MS4 Permit Section B.3.b.(4)(b)). Copermittees are currently compiling a list of candidate projects that consider the numeric goals of the Tijuana River WMA as well as projects previously identified in JRMPs and other regulatory documents. Appendix J includes the alternative compliance template. The Water

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Quality Improvement Plan will be updated to include the final candidate project list, as that list is made available.

3.3 SCHEDULES

The schedule for interim and final goals is provided in Section 3.1 above. The schedules for implementing strategies are included with the lists of strategies in Appendix H.

The schedules for interim and final goals are informed by the schedules for strategies. The implementation of strategies will be associated with pollutant load reductions. Both water quality-based goals and strategy milestones provide meaningful data that will help RAs to manage their programs and continually improve. Sampling will be conducted and results will be compared to interim and final goals, and it will be important to also track implementation of strategies and performance-based metrics. New strategies above and beyond JRMP will require start-up time – thus the effects of those strategies are expected to be observed in future WQIP cycles. It is important to note that the new MS4 Permit includes significant new requirements which by themselves are expected to result in reductions in pollutants in MS4 discharges, such as more stringent non-stormwater discharge prohibitions, broader definition of PDP (e.g., driveways), and structural BMP performance standards.

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Appendix H.1 City of Imperial Beach Strategies and Schedules

Appendix H.2 City of San Diego Strategies and Schedules

Appendix H.3 County of San Diego Strategies and Schedules

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Appendix H.1 City of Imperial Beach Strategies and Schedules

ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
Jurisdictional Strategies											
Development Planning											
All Development Projects											
1	For all development projects, administer a program to ensure implementation of source control BMPs to minimize pollutant generation at each project and implement LID BMPs to maintain or restore hydrology of the area, where applicable and feasible.	Refer to JRMP	TBD	TBD	TBD	City-wide	FY16	Ongoing	Development Permit Fee and General Fund	Community Development and Public Works	
2	Update municipal code and ordinances to facilitate and encourage LID and source control BMPs.	Refer IBMC and BMP Design Manuel	TBD	TBD	TBD	City-wide	FY16	As needed	General Fund	Env Division and City Attorney	
3	Development and redevelopment projects (all projects) with greater than $50,000 of improvements get reviewed by the Public Works department for public improvement conditions which include enhanced storm water conditions.	Require source control and LID BMPs as conditions on standard development projects greater than $50,0000	TBD	TBD	TBD	City-wide	FY15	Ongoing	Development Permit Fee and General Fund	Public Works	Develop list of standard conditions for project review in JRMP
4	Develop standard project review conditions for non-priority development projects for storm water.	Refer to JRMP	TBD	TBD	TBD	City-wide	FY17	As needed	Env Division Budget	Env Division	Plan to develop standards during this permit cycle
5	Provide education opportunities to developers and project applicants on storm water requirements.	See education component	TBD	TBD	TBD	City-wide	FY15	Ongoing	Env Division Budget	Env Division	
6	Update education materials for developers (brochures, forms, website…)	See education component	TBD	TBD	TBD	City-wide	FY17	As needed	Env Division Budget	Env Division	Update at least once per permit cycle
7	Train staff on LID regulatory changes, BMP Design Manual, and MS4 Permit elements.	See education component	TBD	TBD	TBD	City-wide	FY15	Ongoing	Env Division Budget	Public Works	
8	Provide storm water conditions on Encroachment Permits.	Reinforce construction BMPs through encroachment permit process	TBD	TBD	TBD	City-wide	FY16	Ongoing	General Fund	Public Works	Encroachment permits get routed through PW

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
9	Develop GIS inventory of storm water BMPs required for conditions of approval on PDP and standard development projects.	Need to evaluate feasibility	Optional	TBD	TBD	City-wide	FY18	As needed	General Fund	Community Development, Public Works, and GIS	Will be challenging
Priority Development Projects (PDPs)											
10	For PDPs, administer a program requiring implementation of structural BMPs to control pollutants and manage hydromodification. Includes confirmation of design, construction, and maintenance of PDP structural BMPs.	Refer to JRMP	TBD	TBD	TBD	City-wide	FY16	Ongoing	Development Permit Fee and General Fund	Community Development and Public Works	
11	Maintain watershed database of PDP and BMPs and link to GIS	Need to evaluate feasibility	TBD	TBD	TBD	City-wide	FY18	As needed	General Fund	Env Division and GIS	Link PDP to watersheds and GIS during this permit cycle may be challenging
12	Update IBMC and BMP Design Manual procedures to determine nature and extent of storm water requirements applicable to development projects and to identify conditions of concern for selecting, designing, and maintaining appropriate structural BMPs.	Refer IBMC and BMP Design Manuel	TBD	TBD	TBD	City-wide	FY16	Ongoing	General Fund	Env Division and Community Development	Continue to work with Community Development
13	Review and update post construction BMP maintenance agreement for PDPs and review administrative process.	Provide a comprehensive review of BMP Maintenance agreement and aim for simplification.	Optional	TBD	TBD	City-wide	FY18	As needed	General Fund	Env Division, City Attorney, and Department Directors	Review and update post construction BMP maintenance during permit cycle
14	Collaborate with regional Copermittees on implementation of WMAAs and alternative compliance program.	Participate in regional groups on WMAA implementation and assessment and consider possible implementation in IB.	TBD	TBD	TBD	Regional	FY16	Ongoing	Env Division Budget	Env Division	Complicated
Green Streets											

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
15	Integrate LID and green street designs into CIP projects where applicable and feasible.	Integrate LIDs and green street concepts into CIPs and long term planning vision.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund and CIPs	Community Development and Public Works	Consider applicability of LID BMPs in the design of CIPs
Construction Management											
16	Administer a program to oversee implementation of BMPs during the construction phase of land development. Includes inspections at an appropriate frequency and enforcement of requirements.	Inspect before rain events and during any permit inspection	TBD	TBD	TBD	City-wide	FY 15	Ongoing	Development Permit Fee and General Fund	Public Works and Community Development	All construction projects are considered priorities
17	Maintain and update a quarterly watershed based inventory of active construction projects.	Construction inventory.	TBD	TBD	TBD	City-wide	FY15	Ongoing	Development Permit Fee and General Fund	Public Works and Community Development	
18	Maintain a watershed based inventory of construction inspections.	Construction inspections by Community Development for private projects and Public Works for public projects.	TBD	TBD	TBD	City-wide	FY 15	Ongoing	Development Permit Fee and General Fund	Public Works and Community Development	
19	Require the implementation of minimum BMPs at construction sites.	Refer to JRMP and IBMC	TBD	TBD	TBD	City-wide	FY 15	Ongoing	Development Permit Fee and General Fund	Public Works and Community Development	
Existing Development											
Commercial, Industrial, Municipal, and Residential Facilities and Areas											
20	Administer a program to require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types, and PGAs, as appropriate. Includes inspection of existing development at appropriate frequencies and using appropriate methods.	Provide onsite inspections at least once per permit cycle	TBD	TBD	TBD	City-wide	FY 15	Ongoing	General Fund	Public Works	
21	Maintain a watershed based inventory of existing development in GIS.	Develop inventory in Access and GIS	TBD	TBD	TBD	City-wide	FY 15	Ongoing	General Fund	Env Division and GIS	

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
22	Target residential inspections for sediment and irrigation runoff	Target residential inspections on a specific issue.	TBD	TBD	TBD	City-wide	FY17	As needed	Env Division Budget	Env Division	
23	Target commercial inspections for trash storage areas and FOG management	Target commercial inspections on specific BMPs.	TBD	TBD	TBD	City-wide	FY17	As needed	Env Division Budget	Env Division	
24	Target Municipal inspections on landscaping and maintenance of LID areas and existing BMPs.	Target municipal inspections for specific pollutant.	TBD	TBD	TBD	City-wide	FY17	As needed	Env Division Budget	Env Division and Parks and Facilities	
25	Update minimum BMPs for existing residential, commercial, and municipal facilities.	JRMP and IBMC	TBD	TBD	TBD	City-wide	FY16	As needed	Env Division Budget	Env Division and City Attorney	
26	Implement pet waste program. Includes the installation and maintenance of pet waste bag dispensers and trash bins, signage and education, physical removal of pet waste at parks, and enforcement.	Maintain pet waste bag program.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Env Division and Parks and Facilities	
27	Review and update City GIS database related to storm water.	Significant redevelopment over the past permit cycle requires an update to the City GIS database.	TBD	TBD	TBD	City-wide	FY19	As needed	General Fund	Env Division and GIS	
MS4 Infrastructure											
28	Implementation of operation and maintenance activities (inspection and cleaning) for MS4 and related structures (catch basins, storm drain inlets, detention basins, etc.) for water quality improvement.	Annually inspect and clean all MS4 catch basins and lines that have visual impairments of trash or debris.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Env Division and Sewer Division	Automation of data entry
29	Clean and maintain MS4 outfall locations (September-October)	Due to wildlife nesting concerns the City of IB coordinates its cleaning and maintenance of MS4 outfall locations with the FWS along SD Bay and Tijuana River National Estuarine Research Reserve along TJ River. Annual maintenance is provided for vegetation and debris removal.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Public Works	

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
30	Ensure operation and maintenance of Navy outfalls.	In the SD Bay watershed a portion of the City's MS4 drains to a detention basin on Navy property. Within the TJ watershed a portion of the City's MS4 drains to a Navy outfall. The City coordinates annual inspections of these locations and works with the Navy to ensure adequate operation and maintenance of these areas.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Env Division and Public Works	
31	Provide operation and maintenance of the 10th Street and IB Blvd CDS unit.	Inspect quarterly	TBD	TBD	TBD	Tijuana River	FY15	Ongoing	General Fund	Env Division and Sewer Division	
32	Provide operation and maintenance cleaning of MS4 catch basin filters.	Quarterly clean and inspect MS4 catch basin filters.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Env Division and Sewer Division	
33	Provide operation and maintenance of low flow and first flush storm drain divers at Palm Ave and Date Ave.	Inspect weekly	TBD	TBD	TBD	San Diego Bay	FY15	Ongoing	General Fund	Env Division and Sewer Division	
34	Provide operation and maintenance of LID infiltration areas.	Maintenance requirements vary but at a minimum each infiltration area receives maintenance annually.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Env Division, Streets Division, Parks and Facilities	
35	Provide operation of maintenance of wash out diverters at PW, Lifeguards, and fire station.	Inspect annually	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Sewer Division and Tidelands	
Roads, Streets, and Parking Lots											
36	Implement operation and maintenance activities for public streets, unpaved roads, paved roads, and paved highways	Refer to JRMP	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Public Works	

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
37	Provide street sweeping of residential areas, commercial areas, paved alleys, medians, and parking lots.	Weekly sweeping: Commercial areas including open stripped and raised curb medians; and municipal parking areas. Two times per month sweeping: Beachfront area (Seacoast residential area) Monthly sweeping: Residential areas including stripped and raised curb medians, and paved alleys.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Env Division and EDCO	
38	Evaluate street sweeping effectiveness for opportunities of enhancement.	Hold community meetings, present options to council, and evaluate options with street sweeping contract.	Optional	TBD	TBD	City-wide	FY18	As needed	General Fund	Env Division and EDCO	
39	Develop plan for unimproved alleys.	Develop plans with the community on how best to address unimproved alleys in the City. Any improvements will require community support and be conformant to EPA green streets standards.	Optional	TBD	TBD	City-wide	FY15	Ongoing	General Fund and CIP	Public Works and Community Development	
40	Daily Tidelands maintenance of beachfront property.	Tidelands division provides daily trash collection, sweeping, and maintenance of the beachfront and Seacoast Dr.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Tidelands	
41	Provide weekly bulky item pickup from alleys of illegally dumped material.	Illegally dumped materials in City alleys are cleaned up every week. Items get reported to PW and EDCO performs the cleanup every week.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Env Division and EDCO	
Pesticides, Herbicides, and Fertilizer BMP Program											
42	Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties. Includes education, permits, and certifications.	Integrated pest management	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Parks and Facilities	
Retrofit and Rehabilitation in Areas of Existing Development											
43	Consider the integration of LID retrofits where feasible as part of street CIP rehabilitation projects.	Make green streets a standard for future CIP projects	TBD	TBD	TBD	City-wide	FY18	As needed	General Fund	Public Works and Community Development	

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
44	Elimination of residential and commercial curb cuts	Non-permitted curb cuts are eliminated as the City implements street rehabilitation projects.	TBD	TBD	TBD	City-wide	FY15	Ongoing	General Fund	Streets Division and CIP	
45	Include storm water BMPs, LID, EPA green streets and other applicable storm water treatment systems into the long range planning and design of City projects.	Make green streets a standard for future CIP projects	TBD	TBD	TBD	City-wide	FY18	As needed	General Fund	Public Works and Community Development	
46	Continue to work with the FWS for rehabilitation and restoration projects along the SD Bay watershed and with the Tijuana National Estuarine Research Reserve for project in the TJ Watershed.	Actively participate and partner with multiple agencies in the restoration of South San Diego Bay and Tijuana River Estuary	TBD	TBD	TBD	City-wide	FY16	Ongoing	General Fund	Public Works and Community Development	
Illicit Discharge, Detection, and Elimination (IDDE) Program											
47	Implement Illicit Discharge, Detection, and Elimination (IDDE) Program per the JRMP. Requirements include: maintaining an MS4 map, using municipal personnel and contractors to identify and report illicit discharges, maintaining a hotline for public reporting of illicit discharges, monitoring MS4 outfalls, and investigating and addressing any illicit discharges.	Refer to JRMP	TBD	TBD	TBD	City-wide	FY16	Ongoing	General Fund	Public Works and Community Development	
48	Implement proactive enforcement of storm water violations.	All City employees in City vehicles are expected to report storm water violations to the Environmental Division. All Public Works employees are in constant communication through radio phones.	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	
49	Conduct frequent visual outfall monitoring to identify and eliminate illicit discharges.	Frequency? Vary by area or by sub watershed?	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	
Public Education and Participation											
50	Implement a public education and participation program to promote and encourage development of programs, management practices, and behaviors that reduce the discharge of pollutants in storm water prioritized by high-risk behaviors, pollutants of concern, and target audiences.	TBD	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
51	Provide education opportunities to commercial businesses	Education to businesses provided through storm water brochure provided during business license application and renewal. Education is also provided through inspections and enforcement actions.	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	
52	Provide education opportunities to development community	Contractors and developers are trained through face-to-face meetings with the Community Development Department and the Publics Works Department during the permitting process, through inspections, and trough investigations of illegal discharges. Educational brochures are used as part of the permitting process and web resources are available.	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	
53	Provide education to municipal departments and personnel	Multiple training opportunities provided to municipal staff. Annual training is provided to PW department. Monthly code enforcement working group, weekly Community Development department, and weekly staff meetings provide opportunities to discuss storm water issues. City also provides a weekly FYI that gets emailed to all City staff and City council.	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	
54	Provide education to residents, general public, and school children	The general public receives educational information in the City's website, quarterly EDCO newsletter, printed materials at offices, through community presentations, ILACSD school presentations, community events, regional events, and various other methods.	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
55	Provide education to underserved community.	Education materials are provided in both English and Spanish. The environmental division incorporates the underserved community in most education activities, which is particularly important to IB due to the large Spanish speaking community.	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	
56	Review printed storm water educational materials	Review printed materials such as brochures at least once per permit cycle.	TBD	TBD	TBD	TBD	FY17	Ongoing	Env Division Budget	Env Division	
57	Update electronic website information	Annually update storm water information on the City's website.	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	
58	Encourage public participation in community events.	The City provides or supports multiple community clean up and awareness events throughout the year. Examples include: Creek to Bay, Tijuana River Action Month, Homefront Cleanup, Citywide Garage Sale, Fiesta del Rio, Sun and Sea Festival…	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	
59	Collaborate with regional education and outreach efforts.	Continue in regional education efforts in the San Diego region	TBD	TBD	TBD	TBD	FY16	Ongoing	Env Division Budget	Env Division	TBD
60	Provide targeted education specific to each WQIP	Provide targeted education in collaboration with WMA partners and to address specific issues raised in the WQIP	TBD	TBD	TBD	TBD	FY18	Ongoing	Env Division Budget	Env Division	
Enforcement Response Plan											
61	Implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Enforcement Response Plan.	Refer to JRMP	TBD	TBD	TBD	TBD	FY16	As needed	Env Division Budget	Env Division	
Additional Nonstructural Strategies											

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
62	Address and clean up pollutants from homeless encampments	Continue to collaborate with FWS to cut back vegetation to discourage homeless encampments. Participate in regional actions to address the social issues related to homelessness	TBD	TBD	TBD	TBD	FY19	As needed	General Fund	Public Works	
63	Support source reduction initiatives.	Continue to provide support for source reduction, product stewardship, and extended producer responsibility initiatives. The City participates with the Regional Solid Waste TAC	TBD	TBD	TBD	TBD	FY19	As needed	General Fund	Env Division	
64	Conduct special studies for each WMA as needed to address storm water issues	Identify studies and develop plan.	TBD	TBD	TBD	TBD	FY18	As needed	General Fund	Env Division	
65	Participate in regional partnerships to address water quality issues outside the scope of the MS4 Permit.	Continue participation in the following: Tijuana River Recovery Team, Tijuana National Estuarine Research Reserve Advisory Council, IBWC Citizen's Forum, and EPA Border 2020 Program	TBD	TBD	TBD	TBD	FY15	Ongoing	General Fund	Env Division	
66	Collaborate/partner with school districts in City (South Bay Union and Sweetwater) on storm water.	Develop partnerships with schools and identify storm water opportunities for partnership.	TBD	TBD	TBD	TBD	FY15	Ongoing	General Fund	Env Division	
67	Collaborate/partner with Caltrans on storm water issues.	Develop partnerships with Caltrans and identify storm water opportunities for partnership along HWY 75.	TBD	TBD	TBD	TBD	FY15	Ongoing	General Fund	Env Division	
68	Collaborate/partner with Navy on storm water issues.	Develop partnerships with Navy and identify storm water opportunities for partnership.	TBD	TBD	TBD	TBD	FY15	Ongoing	General Fund	Env Division	
69	Collaborate/partner with Scripps Institute of Oceanography on coastal monitoring projects.	Continue working with SIO to support research activities and grant applications for work along the Imperial Beach shoreline	TBD	TBD	TBD	TBD	FY15	Ongoing	Env Division Budget	Env Division	
70	Collaborate/partner with NGOs on storm water issues.	Continue working with NGOs on for Tijuana River Actions Month, Creek to Bay, and School presentations	TBD	TBD	TBD	TBD	FY15	Ongoing	Env Division Budget	Env Division	

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ID	Strategy	Implementation Approach	Jurisdictional or Optional	Priority	Sources	Geographic Focus* (Location)	Timing	Frequency	Cost or Funding Strategy	Responsible Party and Other Collaborators	Notes
71	Collaborate/partner with on the City of San Diego Pure Water program	Support the development of a new local water supply for the region.	TBD	TBD	TBD	TBD	Fy15	Ongoing	General Fund	Env Division	
72	If a regional social services effort is established, support workgroup to provide sanitation and trash management for person experiencing homelessness and determine if the program is suitable and appropriate for jurisdictional needs to meet goals.	Support regional effort.	Optional	TBD	TBD	TBD	FY19	As needed	General Fund	Public Works	
Additional Structural Strategies											
73	Develop a program to address and capture trash and debris.	Study best option for trash capture devices in the City that does not contribute to flooding issues.	Optional	TBD	TBD	TBD	FY19	As needed	General Fund and Grants	Public Works	
74	Study options to capture trash and treat runoff for the E outfalls that drain primarily Mar Vista HS and Sports Park.	Study best option for BMP for 5th and Grove	Optional	TBD	TBD	TBD	FY19	As needed	General Fund and Grants	Public Works	
75	Work with FWS to continue evaluation of daylighting K outfall.	Work with FWS to prioritize projects and assist in grants.	Optional	TBD	TBD	TBD	FY19	As needed	General Fund and Grants	Public Works	
76	Study options to capture trash and treat runoff from the H-outfall.	Study best option for BMP for H-outfall	Optional	TBD	TBD	TBD	FY19	As needed	General Fund and Grants	Public Works	
77	Study trash capture options for retrofit of MS4 catch basins.	Study best option for trash capture devices in the City that does not contribute to flooding issues.	Optional	TBD	TBD	TBD	FY19	As needed	General Fund and Grants	Public Works	

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Appendix H.2 City of San Diego Strategies and Schedules

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Table 1. City of San Diego Jurisdictional Strategies

ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
	Jurisdictional Strategies						
	Development Planning						
	All Development Projects						
CSD-1	Establish guidelines and standards for all development projects; provide technical support related to implementation of source control BMPs to minimize pollutant generation at each project and implement LID BMPs to maintain or restore hydrology of the area or implement easements to protect water quality, where applicable and feasible.	Refer to JRMP (currently under development).	City-wide	Prior to FY16	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-1.1	Investigation and research of emerging technology.	Annually the Construction & Development Standards Group identifies new tasks to conduct literature review, communication with researchers outside of the City, physical testing and experimentation of new or emerging technologies, and other research with the goal of updating tools available for reducing pollutant loads from development and redevelopment sites.	City-wide	Prior to FY16	As needed	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-1.2	Approve and implement a green infrastructure policy.	The City will begin developing a policy in FY16 that will increase the green infrastructure requirements for City CIP projects. This policy will be coordinated with ongoing efforts to update City design manuals and LID design standards for public LID BMPs.	City-wide on public parcels	FY16 (Begin)	As needed	T&SW with DSD and PWD	TBD
CSD-1.3	Develop Design Standards for Public LID BMPs.	Improve quality of design to ensure efficiency and reliability in public designs.	City-wide	FY14-FY15	As needed	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-1.4	Outreach to impacted industry regarding minimum BMP requirement updates.	Affects commercial, industrial, and residential development.	City-wide	FY15	As needed	TBD	TBD
CSD-2	Train staff on LID regulatory changes and LID practices.	Formal training is required for all staff involved in development plan review to increase knowledge of LID BMPs. Goal of training associated with LID practices and regulations is to promote LID implementation and to avoid adverse conditions such as trees planted within swales, or planned drainage patterns which obstruct or inhibit LID performance.	City-wide	FY16	As needed	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-3	Amend municipal code and ordinances, including zoning ordinances, to facilitate and encourage LID opportunities. Ensure consistency with the City of San Diego's BMP Design Manual. Update the Storm Water Standards Manual accordingly.	Municipal codes and ordinances will be brought to City Council for consideration to encourage LID implementation (e.g., runoff detention and filtration using natural filters and stormwater retention for reuse). LID stormwater management will be encouraged in proposed codes and ordinances associated with development and redevelopment projects, which are brought to City Council for consideration.	City-wide	FY15	As needed	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-4	Create a manual that outlines right-of-way design standards.	Create a manual that includes flood control performance standards, permanent BMP elements design standards, design standards for green streets and other BMPs, and maintenance access. Provides drainage and streets design standards. Opportunity to merge various existing manuals and provide consistency.	City-wide	FY15	One time	T&SW with DSD and PWD	TBD
CSD-5	Provide technical education and outreach to the development community on the design and implementation requirements of the MS4 Permit and Water Quality Improvement Plan requirements.	Technical education and outreach to the development community includes outreach on design standards, City design manuals, and the WMAA.	City-wide	Prior to FY16	Ongoing	T&SW with DSD	TBD
	Priority Development Projects (PDPs)						
CSD-6	For PDPs, provide technical support to other City departments to ensure implementation of on-site structural BMPs to control pollutants and manage hydromodification by developing City wide storm water development standards and design guidelines.	Coordinate with other City departments to promote and confirm a thorough understanding of requirements for implementing structural BMPs that control pollutants and manage hydromodification. Included in that understanding are requirements to confirm proper design and construction through processes controlled by other City departments.	City-wide	FY16	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-6.1	Institute a program to verify and enforce maintenance and performance of treatment control BMPs.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-7	Update BMP Design Manual procedures to determine nature and extent of storm water requirements applicable to development projects and to identify conditions of concern for selecting, designing, and maintaining appropriate structural BMPs.	Refer to JRMP (currently under development).	City-wide	FY15	Every 5 years/ permit cycle	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-7.1	Amend BMP Design Manual for trash areas. Require full four-sided enclosure, siting away from storm drains and cover. Consider the retrofit requirement.	Amend BMP Design Manual and zoning standards/requirements which address reduction of pollutants for common areas of trash build-up (e.g. restaurants, supermarkets, "big box" retail stores with food, pet stores). Most effective method for source control of bacteria and trash is to employ four-sized trash enclosures with a cover over trash areas.	City-wide	FY15	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-7.2	Amend BMP Design Manual for animal-related facilities, such as such as animal shelters, "doggie day care" facilities, veterinary clinics, breeding, boarding and training facilities, groomers, and pet care stores.	Amend BMP Design Manual and zoning requirements (including retrofits) to provide supplemental standards for animal facilities (including animal shelters, dog daycares, veterinary clinics, groomers, pet car stores, and breeding, boarding, and training facilities). Supplemental standards may include requiring covered trash enclosures, identification of landscaped relief areas on site plans, ensuring drainage connections and treatment swales for areas that will not drain to the sanitary sewer, as well as inspection of grading, drainage, and landscaping for outdoor exercise areas.	City-wide	FY15	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-7.3	Amend BMP Design Manual for nurseries and garden centers.	Amend BMP Design Manual to provide supplemental standards for plant nurseries and garden centers. Standards will focus on reducing irrigation runoff, and loading of sediment, pesticides, and nutrients. Measures may include: covered outdoor storage, green waste management BMPs, improved irrigation efficiency to reduce dry-weather runoff, and containment of runoff from impervious areas where plants and materials are stored.	City-wide	FY15	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-7.4	Amend BMP Design Manual for auto-related uses.	Amend BMP Design Manual to provide supplemental standards for automotive-related uses to reduce loading of metals, oils, grease, and trash. Measures may include: four-sized covered trash enclosures, and careful review of auto-related usage areas (e.g. garage bays at repair shops) for grading, drainage, and drain connections to sanitary sewer systems.	City-wide	FY15	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-8	Develop and administer an alternative compliance program for on-site structural BMP implementation (includes identifying Watershed Management Area Analysis [WMAA] candidate projects). Refer to Section 4.2.5.	Refer to JRMP (currently under development).	City-wide	FY15	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-8.1	Create a fund that allows habitat acquisition, protection enhancement, and restoration in conjunction with other cooperating entities including community groups, academic institutions, state county, and federal agencies, etc.	This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	City-wide	Optional	TBD	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
	Construction Management						
CSD-9	Coordinate with other City departments to promote and confirm a thorough understanding of requirements for implementing temporary BMPs that control sediment and other pollutants during the construction phase of projects. Included in that understanding are requirements to inspect at appropriate frequencies and effectively enforce requirements through process controlled by other City departments.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
	Existing Development						
	Commercial, Industrial, Municipal, and Residential Facilities and Areas						
CSD-10	Administer a program to require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types, and PGAs, as appropriate. Includes inspection of existing development at appropriate frequencies and using appropriate methods.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with DSD, PUD, & PWD	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-10.1	Update minimum BMPs for existing residential, commercial, and industrial development. Specific updates to BMPs include required street sweeping, catch basin cleaning, and maintenance of private roads and parking lots in targeted areas.	Refer to JRMP (currently under development).	City-wide	FY15	Every 5 years	T&SW	TBD
CSD-10.2	Outreach to property managers and trash haulers to elevate the emphasis of power washing as a pollutant source.	Emphasis will be placed on non-compliant washing as an enforceable violation.	City-wide Residential, commercial and industrial areas	FY15	Ongoing	T&SW	TBD
CSD-10.3	Implement property based inspections.	Property-based inspections increase awareness and responsibility for individual properties to tackle issues associated with trash, landscapes, and parking areas. Expanding beyond the business-level inspections will achieve different and more effective opportunities for education, outreach, inspection, and enforcement to encourage water conservation strategies.	City-wide	Prior to FY16	Ongoing	T&SW	TBD
CSD-10.4	Review policies and procedures to ensure discharges from swimming pools meet permit requirements.	Verify and bring to City Council for consideration an update (as needed) for the City's Municipal Code (43.0301) to meet new permit requirements for swimming pool discharges.	City-wide	FY15	As needed	T&SW, City Attorney (Civil & Criminal)	TBD
CSD-11	Promote and encourage implementation of designated BMPs for residential and non-residential areas.	Landscape-based rebates are a "gateway" for adoption of other beneficial practices and are one of the nonstructural methods which address impacts from single-family residential areas (City of San Diego 2011 program development background study). Residential incentives can include: education and training (neighborhood watershed field days), and aggressive subsidies or rebates for grass replacement and rainwater harvesting. Existing programs will be expanded overall, and also have targeted expansion within specific subwatershed, particularly with highest water quality priority conditions.	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, MWD, CWA & local water agencies	TBD
CSD-11.1	Residential and Commercial BMP: Rain Barrel	The existing PUD rebate program will continue for residential properties and expand for commercial properties for water collection, conservation, and reuse with rain barrels.	City-wide Residential Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
CSD-11.2	Residential and Commercial BMP: Grass Replacement	The existing PUD grass replacement cash rebate program will continue and expand for residential and commercial properties. Program encourages a reduction in water use through the conversion of non-artificial grass to water wise plant material, while maintaining a high level of living landscape to benefit the environment.	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
CSD-11.3	Residential and Commercial BMP: Downspout Disconnect	Disconnecting downspouts provide alternate runoff pathways from rooftops, sidewalks, driveways, and roads. Disconnecting downspouts from residential areas to pervious land can allow for depression storage and infiltration.	City-wide Residential and Commercial Areas	FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-11.4	Residential and Commercial BMP: Microirrigation	The existing PUD micro-irrigation rebate program will continue and increase for residential and commercial properties. Application of microirrigation aims to improve the efficiency of landscape irrigation through the precise application of water.	City-wide Residential Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
CSD-11.5	Onsite Water Conservation Survey	Provide free outdoor water conservation surveys to commercial and residential customers to reduce overirrigation and to encourage water conservation.	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing	T&SW with DSD, PUD, PWD, & local water agencies	TBD
	MS4 Infrastructure						
CSD-12	Implementation of operation and maintenance activities (inspection and cleaning) for MS4 and related structures (catch basins, storm drain inlets, channels as allowed by resource agencies, detention basins, etc.) for water quality improvement and for flood control risk management.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW	TBD
CSD-12.1	Enhanced catch basin cleaning to increase pollutant removal (between 2-4 times per year in medium priority areas in the rainy season).	To increase pollutant load removal, catch basins will be cleaned between 2-4 times per year in medium priority areas in the rainy season. The City of San Diego's pilot study found that major pollutants may vary from neighborhood to neighborhood (yard waste versus trash and sediment). Implementation may be adapted based on catch basin record keeping and cleaning optimization. Increase in frequency will be phased over 4 Fiscal Years.	Tijuana River WMA: Medium priority areas identified in pilot study	FY16	Ongoing	T&SW	TBD
CSD-12.2	Increased frequency of catch basin inspection and as-needed cleaning.	Per settlement agreement, for every segment that is cleared, the City shall conduct an inspection and as-needed cleaning of every catch basin within 100 feet of the maintained stormwater channel facility. This additional inspection and as-needed cleaning will occur every three months for one year after facility maintenance.	Tijuana River WMA (15 open channel segments)	FY13	5 years (ends FY18)	T&SW	TBD
CSD-12.3	Proactively repair and replace MS4 components to provide source control from MS4 infrastructure.	In order to limit inflow of pollutants and reduce pollutant loads, proactive measures will be taken to improve, repair, and replace MS4 components. The City of San Diego will start a multi-year program of repairing and replacing storm drain pipes to reduce sediment loading to the MS4. Development of an assessment management program and bond issues will be addressed. Exploration of daylighting pipes will take place where feasible and appropriate.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-13	Coordinate with other City departments (PUD) to implement controls to prevent infiltration of sewage into the MS4 from leaking sanitary sewers.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with PUD	TBD
CSD-13.1	Identify sewer leaks and areas for sewer pipe replacement prioritization.	Risk assessment to include identifying targeted areas (age, location, proximity to MS4), coming up with methodology, pilot, desktop exercise/analysis.	City-wide	FY16	As needed	T&SW with PUD	TBD
	Roads, Street, and Parking Lots						

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-14	Implement operation and maintenance activities for public streets, unpaved roads, paved roads, and paved highways	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW	TBD
CSD-14.1	Initiate sweeping of medians on high-volume arterial roadways.	Medians of roadways are also a potential source of pollutants. Consider implementing or increasing sweeping of medians. Consider mechanical and hand sweeping techniques.	City-wide	FY17	Ongoing	T&SW	TBD
CSD-14.2	Implement additional street sweeping (Settlement Agreement).	City shall increase street sweeping frequency by prioritizing high traffic commercial routes adjacent to maintained channel with vacuum-assisted sweeper for every 400 linear feet of vegetation that is removed (except for removal of invasive species, e.g., Arundo) within a drainage area. Sweeping shall be conducted in median areas that are not subject to regular sweeping routes, and shall occur at a frequency of at least once per quarter for one calendar year after maintenance.	Tijuana River WMA	FY13	5 years (ends FY18)	T&SW	TBD
	Pesticide, Herbicides, and Fertilizer BMP Program						
CSD-15	Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties. Includes education, permits, and certifications.	Refer to JRMP (currently under development).	City-wide	FY16	Ongoing	T&SW with Parks and Rec	TBD
	Retrofit and Rehabilitation in Areas of Existing Development						
CSD-16	Develop and implement a strategy to identify candidate areas of existing development appropriate for retrofitting projects and facilitate the implementation of such projects.	Refer to JRMP (currently under development). The Offsite Alternative Compliance Program will include methods for identifying and assessing potential retrofit projects in existing development areas. Retrofit project selection will be based upon a variety of factors including proximity to high priority water quality conditions, potential pollutant load removal effectiveness, and feasibility of implementation. The program will include protocols related to funding mechanisms for project construction and long-term maintenance, payment and credit structures, and water quality equivalency standards.	City-wide	TBD	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-17	Develop and implement a strategy to identify candidate areas of existing development for stream, channel, or habitat rehabilitation projects and facilitate implementation of such projects.	Refer to JRMP (currently under development). The Offsite Alternative Compliance Program will include methods for identifying and assessing potential stream, channel, or habitat rehabilitation projects in existing development areas. Rehabilitation project selection will be based upon a variety of factors including existing stream or habitat degradation, potential future cumulative stream or habitat impacts, and feasibility of implementation. The program will include protocols related to funding mechanisms for project construction and long-term maintenance, payment and credit structures, and water quality equivalency standards.	City-wide	TBD	Ongoing	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
	Illicit Discharge, Detection, and Elimination (IDDE) Program						

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-18	Implement Illicit Discharge, Detection, and Elimination (IDDE) Program per the JRMP. Requirements include: maintaining an MS4 map, using municipal personnel and contractors to identify and report illicit discharges, maintaining a hotline for public reporting of illicit discharges, monitoring MS4 outfalls, and investigating and addressing any illicit discharges.	Refer to JRMP (currently under development).	City-wide	Prior to FY16	Ongoing	T&SW	TBD
	Public Education and Participation						
CSD-19	Implement a public education and participation program to promote and encourage development of programs, management practices, and behaviors that reduce the discharge of pollutants in storm water prioritized by high-risk behaviors, pollutants of concern, and target audiences.	Refer to JRMP (currently under development).	City-wide	Prior to FY16	Ongoing	T&SW	TBD
CSD-19.1	Continue implementation of a Pet Waste Program.	Pet Waste Program includes outreach on "Scoop the poop", installation of posts for dispensers, distribution of lawn signs, and attendance at dog-related community activities.	City-wide	Prior to FY16	Ongoing	T&SW with Parks and Rec	TBD
CSD-19.2	Promote and encourage implementation of designated BMPs in commercial and industrial areas.	Provide education and outreach on BMPs for commercial businesses and industrial facilities.	City-wide Non-residential Areas	Prior to FY16	Ongoing	T&SW with PUD; Funding: Prop 84 and water districts (MWD)	TBD
CSD-19.3	Expand outreach to homeowners' association (HOA) common lands and HOA incentives.	Approaches to consider include: offering incentives to HOAs and maintenance districts to adopt water-conserving/efficiency and stormwater-reduction changes to their landscapes, irrigation, and maintenance; conducting workshops with property managers; providing supplemental standards, inspection, or enforcement for HOA-managed properties.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-19.4	Develop an outreach and training program for property managers responsible for HOAs and maintenance districts.	Approaches to engage HOAs and property managers include: conducting workshops with property managers, providing supplemental standards, inspections or enforcement around HOA properties, and offering incentives to HOAs and maintenance districts to adopt changes to landscapes, irrigation, or maintenance which promote water conservation or stormwater reduction. Property managers are also a target for enhanced outreach.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-19.5	Enhance and expand trash cleanups through community-based organizations involving target audiences.	Increase effectiveness and reach of trash/beach cleanups and community based efforts by engaging community groups to self-define and carry-out trash clean-ups. Longstanding partnerships and sponsorships with I Love A Clean San Diego and others are recommended to be continued and enhanced. To effectively target stream clean-up efforts, focus on partnerships with community organizations which provide strong engagement with target audiences and communities.	City-wide	FY16	Ongoing	T&SW	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-19.6	Improve consistency and content of websites to highlight enforceable conditions and reporting methods.	Websites will be updated to provide a user-friendly format and clarity for stormwater violations, conditions which citizens can and should report, and how to make such reports. Examples of reports for common incidents will be developed and posted which may vary locally and regionally. Photographs of allowable practices as well as illegal practices should be shown for utmost clarity. Displaying hotline numbers prominently on the website and near the photographs of illegal practices will ensure that those seeking to report will be able to do so easily. Also ensure hotline number and website are searchable and can be retrieved by simple internet searches.	City-wide	Prior to FY16	Ongoing	T&SW	TBD
CSD-19.7	Develop a targeted education and outreach program for homeowners with orchards or other agricultural land uses on their property.	Educate residents on practices of small-scale or on-site composting to protect local water quality. May include targeted education of owners of chickens. Outreach can be coordinated through the San Diego County Agriculture, Weights, and Measures division. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	Tijuana River WMA	Optional	TBD	T&SW with County of San Diego Ag, Weights, and Measures	TBD
CSD-19.8	Enhance school and recreation-based education and outreach.	Develop curriculum and establish distribution in public schools. Includes education on water conservation.	City-wide	FY15	Ongoing	T&SW, PUD with community-based organization	TBD
CSD-19.9	Develop education and outreach to reduce irrigation runoff.	Example approaches to reduce or eliminate irrigation runoff may include: education and outreach, prohibition, enhanced enforcement of existing prohibitions, and pilot projects such as the City of Del Mar's pilot door hanger project.	City-wide	Prior to FY16	Ongoing	T&SW with PUD	TBD
CSD-19.10	Develop regional training for water-using mobile businesses.	Consider development of supplemental standards for mobile businesses including: covered trash enclosures, careful review of washing areas (grading, drainage, landscaping, sanitary sewer system connectivity), and appropriate signage (either through zoning for retrofits or "best fix" approaches, or through BMP Design Manual standards). Businesses may include carpet cleaners, tile installers, plumbers, etc.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-19.11	Enhance education and outreach based on results of effectiveness survey and changing regulatory requirements.	Use effectiveness surveys to enhance existing education and outreach programs while proactively keeping up with and incorporating changing regulatory requirements.	City-wide	FY16	Ongoing	T&SW	TBD
	Enforcement Response Plan						
CSD-20	Continue to implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Storm Water Code Enforcement Unit's Standard Operating Procedures (SOPs) - Enforcement Response Plan.	Refer to JRMP (currently under development).	City-wide	Prior to FY16	Ongoing	T&SW with PUD, other City enforcement compliance programs	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-20.1	Increase enforcement of irrigation runoff.	Increased enforcement policies against irrigation runoff will be established in tandem with the education and outreach programs on how these actions lead to pollutant loading. By shifting to property-based inspections irrigation runoff can be handled as enforceable violations once the public is well-informed.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-20.2	Increase enforcement of water-using mobile businesses.	In addition to education, pollution associated with mobile business sources can be handled through policy, code development, inspections of business practices, and enforcement.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-21	Increase enforcement of all minimum BMPs for existing residential, commercial, and industrial development.	Increased enforcement of existing development minimum BMPs.	City-wide	FY16	As needed	T&SW	TBD
CSD-22	Increase enforcement associated with property-based inspections.	Shifting inspections from businesses-specific to property-based will increase effectiveness and sense of responsibility and ownership. Education and outreach must be followed up with inspection and enforcement of regulations to encourage proper landscape and water conservation strategies.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-23	Increase enforcement of sweeping and maintenance of private roads and parking lots in targeted areas.	Refer to Minimum BMPs in JRMP.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-24	Increase identification and enforcement of actionable erosion and slope stabilization issues on private property and require stabilization and repair.	Eroding and unstable slope areas on private property (excluding construction sites) will be identified as potential sediment loading sources and subject to enforcement. In the short term, this will target enhanced inspection and enforcement programs to ensure inspectors address erosion and slope instability for the purpose of education.	City-wide	FY16	Ongoing	T&SW	TBD
	Additional Nonstructural Strategies						
CSD-25	Conduct a Comprehensive Benefits Analysis to identify benefits other than water quality that are applicable to each of the specific WQIP strategies.	The analysis identifies which other benefits apply to each strategy, and documents the assumptions making those linkages. The delineation of other benefits to strategies includes a general description of each benefit, and a listing of the assumptions that were made to link those benefits to strategies. In addition, the other benefits are characterized with respect to who is directly affected: the city, local residents, local businesses, or visitors. This analysis may be used as part of the adaptive management process to modify future strategies.	City-wide	FY15	One time	T&SW	TBD
CSD-26	Address and clean up trash from transient encampments with collaboration from the Homeless Outreach Team.	Coordinate with the Homeless Outreach Team to respond to transient encampment trash complaints.	City-wide	FY16	Ongoing	T&SW with Police, ESD, Urban Corps, Alpha Project	TBD
CSD-27	Continue participating in source reduction initiatives.	Source reduction initiatives are ultimately the most effective measure to remove pollutants from surface waters, where feasible. Bans or progressive phase-outs that may be considered include: leaf blowers, plastic bags, architectural copper (generally a legacy issue), as well as prohibiting or more aggressively regulating vehicle washing. Additional source reduction initiatives to consider include pesticide sales at hardware stores and irrigation supply stores.	City-wide	Prior to FY16	Ongoing	T&SW	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-27.1	Coordinate with Fleet Services to replace City-owned vehicle brake pads with copper-free brake pads as they become commercially available.	Consider legislative mandate and cooperative implementation of copper-free brake pads on city-owned vehicle to reduce pollutant deposition.	City-wide	FY18	Ongoing	T&SW, ESD with PWD (Fleet Services)	TBD
CSD-28	Proactively monitor for erosion, and complete minor repair and slope stabilization on municipal property.	Actively identify and repair eroding slopes that may be contributing to sediment loading. Prepare an inventory and assessment of eroding areas and their risk to surface waters. Follow assessment with a schedule for ongoing inspection and stabilization (potentially based on a number or percentage of sites annually). Consider Caltrans program as a template.	City-wide	FY16	Ongoing	T&SW	TBD
CSD-29	Lower Tijuana River WMA Sediment Source Characterization Study	The study will provide an inventory and descriptions of sediment sources in the lower Tijuana River Watershed Management Area. The study will utilize a combination of pre-and post-storm visual observations and sediment load measurements. The study will focus on municipal properties; unmaintained yards; dirt roads, trails, and unpaved alleys; large commercial areas; and other significant developed or impervious areas. The study will build upon the findings of the Tijuana River Watershed Technical Support Document for Solids, Turbidity and Trash TMDLs (2010).	Tijuana River WMA	FY16	One time	T&SW, TJ WMA Copermittees	TBD
CSD-29.1	Participate in Reference Watershed Study.	The San Diego Regional Reference Stream Study (currently being conducted by the Southern California Coastal Water Research Project). The study will develop numeric targets that account for “natural sources” to establish the concentrations or loads from streams in a minimally disturbed or “reference” condition. Refer to Section 5.1 for further details.	Region-wide	Prior to FY16	One time	T&SW, SCCWRP, Regional copermittees	TBD
CSD-29.2	Conduct a Cost of Service Study.	Conduct a Cost of Service Study that will examine the full cost of flood control and storm water strategies needed to comply with storm water regulations for the City of San Diego. The City of San Diego’s Watershed Asset Management Plan will be used as the basis for the study.	City-wide	FY16	One time	TBD	TBD
CSD-30	Conduct Sustainable Return on Investment (SROI) analysis to estimate strategies’ co-benefits and impacts to the public and the private sector on a common scale.	SROI is an economics-based framework for evaluating quantitative and qualitative performance metrics and monetizing them, if possible, along a triple bottom line (i.e. financial, societal, and environmental). This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	City-wide	Optional	TBD	T&SW and public participation	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-31	Collaborate with the County, if a County-led regional social services effort is established, to provide sanitation and trash management for individuals experiencing homelessness and determine if the program is suitable and appropriate for jurisdictional needs to meet goals.	Support a non-profit or consortium to provide sanitation services associated with hygiene as well as trash management for persons experiencing homelessness. Rented or purchased shower/sanitary trailers providing mobile showers may be organized at specifically scheduled locations and times. This provision has been proposed as a method for preventing surface water usage for sanitation and bathing, as well as opportunity for outreach and referral by social service agencies. The trash management services will include providing trash bags, trash collection areas, and shower/sanitary facilities at centers which provide daytime shelter to their clients, or on a mobile-basis for known transit camps. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) consensus and community support has been achieved.	City-wide	Optional	TBD	T&SW	TBD
CSD-32	Identify strategy, resources, and funding to support mapping and assessment of agricultural operations.	Prepare and maintain an inventory of the locations of agricultural operations. Identify agricultural land close to receiving waters and/or MS4 system and conducting a site reconnaissance to assess if discharges are likely to occur and develop a series of follow-up actions specific to those risks. Coordinate with other City of San Diego departments that own and lease land for agricultural uses. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	Tijuana River WMA	Optional	TBD	PUD with T&SW	TBD
CSD-33	Participate in an assessment to determine if implementation of an urban tree canopy (UTC) program would benefit water quality and other City goals, where feasible.	Perform a feasibility study to determine if implementing an UTC program would be beneficial to the City's goals. UTC intercepts rainfall through increased coverage of leaves, branches, and stems and reduces runoff from the storm drainage system. Benefits associated with enhancing an UTC include reducing heat island effects and air pollution in addition to aesthetics and community benefits. Where feasible, native trees will be utilized to prevent invasive trees from migrating to open spaces and to conserve water.This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	City-wide	Optional	TBD	Planning Dept. with T&SW, SANDAG, and Nature Conservancy	TBD

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-34	Conduct a feasibility study to test Permeable Friction Course (PFC), a porous asphalt that overlays impermeable asphalt.	Perform an assessment to determine the feasibility of implementing PFC on City streets. PFC, an overlay of porous asphalt, is an innovative roadway material that improves driving conditions in wet weather and water quality. Placed in a layer 25-50mm thick on top of regular impermeable pavement, PFC allows rainfall to drain within the porous layer rather than on top of the pavement. PFC has also been shown to reduce concentrations of pollutants commonly observed in highway runoff. PFC incorporates stormwater treatment into the roadway surface and does not require additional right-of-way. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	City-wide	Optional	One time	T&SW with DSD, PWD, BIA, NGOs, Copermittees, and Engineering Community	TBD
CSD-35	As opportunities arise and funding sources are identified, protect areas that are functioning naturally by avoiding impervious development and degradation on unpaved open space areas, creating permanent open space protections on undeveloped city-owned land, and accepting privately-owned undeveloped open areas.	This strategy may be implemented if there is interest in participation by the public or private entity with current control of the land. Conditions to be met also include 1) identification of partners, if needed (public, private, non-profit), 2) identification of costs and potential sources of funding, 3) final agreement by public or private entity with current control of the land, 4) final agreement by all other participating partners, 5) funding in place, and 6) if it can be determined that the benefit of preventing increased pollutant loads and minimizing impacts of future growth through land conservation is a more cost effective strategy to meet interim and final numeric goals than other recommended strategies included in this plan (Chesapeake Bay Commission, 2013).	City-wide	Optional	TBD	TBD	TBD
CSD-36	Participate in a watershed council or group if one is established.	This strategy may be triggered as 1) partners have been identified and formal MOUs have been developed and 2) consensus and community support has been achieved.	City-wide	Optional	TBD	TBD	TBD
CSD-37	Prohibit introduction of invasive plants in new development and redevelopment projects.	Coordinate with the City's Development Services Department to continue to prohibit introduction of invasive species such as Arundo donax and Cortaderia selloana for new development or redevelopment projects as specified in the City's municipal code for landscape.	City-wide	Prior to FY16	Ongoing	T&SW with DSD	TBD
	Green Infrastructure						
CSD-38	If interim load reduction goals are not met and green infrastructure is required, publicly-owned parcels will be identified as potential opportunities for green infrastructure implementation.	Construction, operation, and maintenance of bioretention and permeable pavement. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	Prioritized public parcels in Tijuana WMA	Optional	TBD	T&SW with PWD; Potential to collaborate with transit agencies, public school districts, and state and federal agencies	TBD
	Green Streets						

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-39	If interim load reduction goals are not met and green infrastructure is required, the additional acreage of bioretention and permeable pavement may be implemented through green streets if potential opportunities for green infrastructure implementation on public parcels are not available.	This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, and 3) staff resources are identified and secured.	Tijuana River WMA	Optional	TBD	T&SW with PWD	TBD
	Multiuse Treatment Areas						
	Infiltration and Detention Basins						
CSD-40	Cesar Chavez Community Center	Proposed retrofit for additional water quality mitigation. Addition of a hydromodification BMP in the grass and shrub area adjacent to the northwest corner of the parking lot extending west behind the baseball field and using the open space in the northwest corner of the park. Diverts storm water runoff from approximately 3.31 acres of drainage area. The retrofit will treat runoff from 144,184 square feet of impervious surface.	Tijuana River WMA	FY15	Ongoing	T&SW with PWD	TBD
CSD-41	Otay Mesa Drainage Improvements - Detention Basin	New detention basin per Otay Mesa Community Plan update EIR. Address recurrent roadway flooding problems by improving surface and/or subsurface drainage facilities in conjunction with private development or redevelopment projects. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, 4) partners have been identified and formal MOUs have been developed, and 5) permits required by regulatory agencies are secured.	Tijuana River WMA	Optional	TBD	T&SW with PWD	TBD
CSD-42	Otay Truck Route Widening Phase 3 - La Media Rd along border fence	New detention basin will be installed on La Media Rd along border fence.	Tijuana River WMA	Prior to FY16	Ongoing	T&SW with PWD	TBD
	Stream, Channel and Habitat Rehabilitation Projects						
CSD-43	If interim load reduction goals are not met and additional stream, channel, and habitat rehabilitation projects are required, implement as needed.	This strategy may be triggered as 1) funding to address MS4 discharges is identified and secured, 2) staff resources are identified and secured, 3) partners have been identified and formal MOUs have been developed, 4) permits required by regulatory agencies are secured, and 5) This strategy may be triggered as 1) funding to address MS4 discharges is identified and secured, 2) staff resources are identified and secured, 3) partners have been identified and formal MOUs have been developed, 4) permits required by regulatory agencies are secured, 5) consensus and community support has been achieved, and 6) it can be determined that the benefit of preventing increased pollutant loads and minimizing impacts of future growth through land conservation is a more cost effective strategy to meet interim and final numeric goals than other recommended strategies included in this plan (Chesapeake Bay Commission, 2013).	Areas identified during feasibility studies	Optional	TBD	T&SW	TBD
	Water Quality Improvement BMPs						
	Proprietary BMPs						

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ID	Strategy	Implementation Approach	Location	Implementation or Construction Year Start	Frequency of Implementation	Responsible City Department and Other Collaborating Departments or Agencies	Cost
CSD-44	Fire Station #29 - 198 West San Ysidro Blvd.	4 drainage inserts planned for implementation on San Ysidro Blvd.	Tijuana River WMA	Prior to FY16	Ongoing	T&SW with PWD	TBD
	Dry Weather Flow Separation and Treatment Projects						
CSD-45	If interim load reduction goals are not met and additional dry weather flow separation and treatment projects are required, implement as needed.	Construction of dry weather flow separation and treatment projects, where identified. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, and 4) permits required by regulatory agencies are secured.	Downstream reaches where persistent dry weather flows have been observed	Optional	TBD	T&SW with PWD	TBD
	Trash Segregation						
CSD-46	If interim load reduction goals are not met and additional trash segregation projects are required, implement as needed.	Construction of trash segregation (Trash Guards, etc.) projects, where identified. This strategy may be triggered as 1) interim goals are not met, 2) funding to address MS4 discharges is identified and secured, 3) staff resources are identified and secured, and 4) permits required by regulatory agencies are secured.	High-loading areas city-wide	Optional	TBD	T&SW with PWD	TBD

DSD= Development Services Department; PUD = Public Utilities Department; PWD = Public Works Department; T&SW = Transportation and Storm Water Division; WAMP = Watershed Asset Management Plan; "Refer to Section X" will be updated upon submittal of the City's JRMP in June 2015; TBD = will be determined during the next fiscal year.

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Table 2. City of San Diego Annual Schedule

Construction
Ongoing Implementation/ O&M
As needed/Design

ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
	Jurisdictional Strategies																												
	Development Planning																												
	All Development Projects																												
CSD-1	Establish guidelines and standards for all development projects; provide technical support related to implementation of source control BMPs to minimize pollutant generation at each project and implement LID BMPs to maintain or restore hydrology of the area or implement easements to protect water quality, where applicable and feasible.	City-wide	Prior to FY16	Ongoing																									
CSD-1.1	Investigation and research of emerging technology.	City-wide	Prior to FY16	As Needed																									
CSD-1.2	Approve and implement a green infrastructure policy.	City-wide on public parcels	FY16 (Begin)	As Needed																									
CSD-1.3	Develop Design Standards for Public LID BMPs.	City-wide	FY14-FY15	As Needed																									
CSD-1.4	Outreach to impacted industry regarding minimum BMP requirement updates.	City-wide	FY15	As Needed																									
CSD-2	Train staff on LID regulatory changes and LID practices.	City-wide	FY16		As Needed																								
CSD-3	Amend municipal code and ordinances, including zoning ordinances, to facilitate and encourage LID opportunities. Ensure consistency with the City of San Diego's BMP Design Manual. Update the Storm Water Standards Manual accordingly.	City-wide	FY15	As Needed																									
CSD-4	Create a manual that outlines right-of-way design standards.	City-wide	FY15	One time																									
CSD-5	Provide technical education and outreach to the development community on the design and implementation requirements of the MS4 Permit and Water Quality Improvement Plan requirements.	City-wide	Prior to FY16	Ongoing																									
	Priority Development Projects (PDPs)																												

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ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
CSD-6	For PDPs, provide technical support to other City departments to ensure implementation of on-site structural BMPs to control pollutants and manage hydromodification by developing City wide storm water development standards and design guidelines.	City-wide	FY16		Ongoing																								
CSD-6.1	Institute a program to verify and enforce maintenance and performance of treatment control BMPs.	City-wide	FY16		Ongoing																								
CSD-7	Update BMP Design Manual procedures to determine nature and extent of storm water requirements applicable to development projects and to identify conditions of concern for selecting, designing, and maintaining appropriate structural BMPs.	City-wide	FY15	Cycle																									
CSD-7.1	Amend BMP Design Manual for trash areas. Require full four-sided enclosure, siting away from storm drains and cover. Consider the retrofit requirement.	City-wide	FY15	One time																									
CSD-7.2	Amend BMP Design Manual for animal-related facilities, such as such as animal shelters, "doggie day care" facilities, veterinary clinics, breeding, boarding and training facilities, groomers, and pet care stores.	City-wide	FY15	One time																									
CSD-7.3	Amend BMP Design Manual for nurseries and garden centers.	City-wide	FY15	One time																									
CSD-7.4	Amend BMP Design Manual for auto-related uses.	City-wide	FY15	One time																									
CSD-8	Develop and administer an alternative compliance program for on-site structural BMP implementation (includes identifying Watershed Management Area Analysis [WMAA] candidate projects). Refer to Section 4.2.5.	City-wide	FY15	Ongoing																									
CSD-8.1	Create a fund that allows habitat acquisition, protection enhancement, and restoration in conjunction with other cooperating entities including community groups, academic institutions, state county, and federal agencies, etc.	City-wide	Optional											If triggered, begin planning, acquiring funding and resources														
	Construction Management																												
CSD-9	Coordinate with other City departments to promote and confirm a thorough understanding of requirements for implementing temporary BMPs that control sediment and other pollutants during the construction phase of projects. Included in that understanding are requirements to inspect at appropriate frequencies and effectively enforce requirements through process controlled by other City departments.	City-wide	FY16		Ongoing																									
	Existing Development																												

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ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40
	Commercial, Industrial, Municipal, and Residential Facilities and Areas																												
CSD-10	Administer a program to require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types, and PGAs, as appropriate. Includes inspection of existing development at appropriate frequencies and using appropriate methods.	City-wide	FY16		Ongoing																							
CSD-10.1	Update minimum BMPs for existing residential, commercial, and industrial development. Specific updates to BMPs include required street sweeping, catch basin cleaning, and maintenance of private roads and parking lots in targeted areas.	City-wide	FY15	Cycle																								
CSD-10.2	Outreach to property managers and trash haulers to elevate the emphasis of power washing as a pollutant source.	City-wide Residential, commercial and industrial areas	FY15	Ongoing																								
CSD-10.3	Implement property based inspections.	City-wide	Prior to FY16	Ongoing																								
CSD-10.4	Review policies and procedures to ensure discharges from swimming pools meet permit requirements.	City-wide	FY15	As Needed																								
CSD-11	Promote and encourage implementation of designated BMPs for residential and non-residential areas.	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing																								
CSD-11.1	Residential and Commercial BMP: Rain Barrel	City-wide Residential Areas	Prior to FY16	Ongoing																								
CSD-11.2	Residential and Commercial BMP: Grass Replacement	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing																								
CSD-11.3	Residential and Commercial BMP: Downspout Disconnect	City-wide Residential and Commercial Areas	FY16		Ongoing																							

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ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
CSD-11.4	Residential and Commercial BMP: Microirrigation	City-wide Residential Areas	Prior to FY16	Ongoing																									
CSD-11.5	Onsite Water Conservation Survey	City-wide Residential and Commercial Areas	Prior to FY16	Ongoing																									
	MS4 Infrastructure																												
CSD-12	Implementation of operation and maintenance activities (inspection and cleaning) for MS4 and related structures (catch basins, storm drain inlets, channels as allowed by resource agencies, detention basins, etc.) for water quality improvement and for flood control risk management.	City-wide	FY16		Ongoing																								
CSD-12.1	Enhanced catch basin cleaning to increase pollutant removal (between 2-4 times per year in medium priority areas in the rainy season).	Tijuana River WMA: Medium priority areas identified in pilot study	FY16		Ongoing																								
CSD-12.2	Increased frequency of catch basin inspection and as-needed cleaning.	Tijuana River WMA (15 open channel segments)	FY13																										
CSD-12.3	Proactively repair and replace MS4 components to provide source control from MS4 infrastructure.	City-wide	FY16		Ongoing																								
CSD-13	Coordinate with other City departments (PUD) to implement controls to prevent infiltration of sewage into the MS4 from leaking sanitary sewers.	City-wide	FY16		Ongoing																								
CSD-13.1	Identify sewer leaks and areas for sewer pipe replacement prioritization.	City-wide	FY16		As Needed																								
	Roads, Street, and Parking Lots																												
CSD-14	Implement operation and maintenance activities for public streets, unpaved roads, paved roads, and paved highways	City-wide	FY16		Ongoing																								
CSD-14.1	Initiate sweeping of medians on high-volume arterial roadways.	City-wide	FY17			Ongoing																							
CSD-14.2	Implement additional street sweeping (Settlement Agreement).	Tijuana River WMA	FY13																										
	Pesticide, Herbicides, and Fertilizer BMP Program																												

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ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
CSD-15	Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties. Includes education, permits, and certifications.	City-wide	FY16		Ongoing																								
	Retrofit and Rehabilitation in Areas of Existing Development																												
CSD-16	Develop and implement a strategy to identify candidate areas of existing development appropriate for retrofitting projects and facilitate the implementation of such projects.	City-wide	TBD																										
CSD-17	Develop and implement a strategy to identify candidate areas of existing development for stream, channel, or habitat rehabilitation projects and facilitate implementation of such projects.	City-wide	TBD																										
	Illicit Discharge, Detection, and Elimination (IDDE) Program																												
CSD-18	Implement Illicit Discharge, Detection, and Elimination (IDDE) Program per the JRMP. Requirements include: maintaining an MS4 map, using municipal personnel and contractors to identify and report illicit discharges, maintaining a hotline for public reporting of illicit discharges, monitoring MS4 outfalls, and investigating and addressing any illicit discharges.	City-wide	Prior to FY16	Ongoing																									
	Public Education and Participation																												
CSD-19	Implement a public education and participation program to promote and encourage development of programs, management practices, and behaviors that reduce the discharge of pollutants in storm water prioritized by high-risk behaviors, pollutants of concern, and target audiences.	City-wide	Prior to FY16	Ongoing																									
CSD-19.1	Continue implementation of a Pet Waste Program.	City-wide	Prior to FY16	Ongoing																									
CSD-19.2	Promote and encourage implementation of designated BMPs in commercial and industrial areas.	City-wide Non-residential Areas	Prior to FY16	Ongoing																									
CSD-19.3	Expand outreach to homeowners' association (HOA) common lands and HOA incentives.	City-wide	FY16		Ongoing																								
CSD-19.4	Develop an outreach and training program for property managers responsible for HOAs and maintenance districts.	City-wide	FY16		Ongoing																								
CSD-19.5	Enhance and expand trash cleanups through community-based organizations involving target audiences.	City-wide	FY16		Ongoing																								
CSD-19.6	Improve consistency and content of websites to highlight enforceable conditions and reporting methods.	City-wide	Prior to FY16	Ongoing																									

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ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
CSD-19.7	Develop a targeted education and outreach program for homeowners with orchards or other agricultural land uses on their property.	Tijuana River WMA	Optional												If triggered, begin planning, acquiring funding and resources													
CSD-19.8	Enhance school and recreation-based education and outreach.	City-wide	FY15	Ongoing																								
CSD-19.9	Develop education and outreach to reduce irrigation runoff.	City-wide	Prior to FY16	Ongoing																								
CSD-19.10	Develop regional training for water-using mobile businesses.	City-wide	FY16		Ongoing																							
CSD-19.11	Enhance education and outreach based on results of effectiveness survey and changing regulatory requirements.	City-wide	FY16		Ongoing																							
	Enforcement Response Plan																											
CSD-20	Continue to implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Storm Water Code Enforcement Unit's Standard Operating Procedures (SOPs) - Enforcement Response Plan.	City-wide	Prior to FY16	Ongoing																								
CSD-20.1	Increase enforcement of irrigation runoff.	City-wide	FY16		Ongoing																							
CSD-20.2	Increase enforcement of water-using mobile businesses.	City-wide	FY16		Ongoing																							
CSD-21	Increase enforcement of all minimum BMPs for existing residential, commercial, and industrial development.	City-wide	FY16		As needed																							
CSD-22	Increase enforcement associated with property-based inspections.	City-wide	FY16		Ongoing																							
CSD-23	Increase enforcement of sweeping and maintenance of private roads and parking lots in targeted areas.	City-wide	FY16		Ongoing																							
CSD-24	Increase identification and enforcement of actionable erosion and slope stabilization issues on private property and require stabilization and repair.	City-wide	FY16		Ongoing																							
	Additional Nonstructural Strategies																											
CSD-25	Conduct a Comprehensive Benefits Analysis to identify benefits other than water quality that are applicable to each of the specific WQIP strategies.	City-wide	FY15	One time																								
CSD-26	Address and clean up trash from transient encampments with collaboration from the Homeless Outreach Team.	City-wide	FY16		Ongoing																							
CSD-27	Continue participating in source reduction initiatives.	City-wide	Prior to FY16	Ongoing																								

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ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
CSD-27.1	Coordinate with Fleet Services to replace City-owned vehicle brake pads with copper-free brake pads as they become commercially available.	City-wide	FY18				Ongoing																						
CSD-28	Proactively monitor for erosion, and complete minor repair and slope stabilization on municipal property.	City-wide	FY16		Ongoing																								
CSD-29	Lower Tijuana River WMA Sediment Source Characterization Study	Tijuana River WMA	FY16		One time																								
CSD-29.1	Participate in Reference Watershed Study.	Region-wide	Prior to FY16	One time																									
CSD-29.2	Conduct a Cost of Service Study.	City-wide	FY16		One time																								
CSD-30	Conduct Sustainable Return on Investment (SROI) analysis to estimate strategies' co-benefits and impacts to the public and the private sector on a common scale.	City-wide	Optional												If triggered, begin planning, acquiring funding and resources														
CSD-31	Collaborate with the County, if a County-led regional social services effort is established, to provide sanitation and trash management for individuals experiencing homelessness and determine if the program is suitable and appropriate for jurisdictional needs to meet goals.	City-wide	Optional						If triggered, begin planning, acquiring funding and resources																				
CSD-32	Identify strategy, resources, and funding to support mapping and assessment of agricultural operations.	Tijuana River WMA	Optional						If triggered, begin planning, acquiring funding and resources																				
CSD-33	Participate in an assessment to determine if implementation of an urban tree canopy (UTC) program would benefit water quality and other City goals, where feasible.	City-wide	Optional						If triggered, begin planning, acquiring funding and resources																				
CSD-34	Conduct a feasibility study to test Permeable Friction Course (PFC), a porous asphalt that overlays impermeable asphalt.	City-wide	Optional						If triggered, begin planning, acquiring funding and resources																				
CSD-35	As opportunities arise and funding sources are identified, protect areas that are functioning naturally by avoiding impervious development and degradation on unpaved open space areas, creating permanent open space protections on undeveloped city-owned land, and accepting privately-owned undeveloped open areas.	City-wide	Optional						If triggered, begin planning, acquiring funding and resources																				
CSD-36	Participate in a watershed council or group if one is established.	City-wide	Optional						If triggered, begin planning, acquiring funding and resources																				
CSD-37	Prohibit introduction of invasive plants in new development and redevelopment projects.	City-wide	Prior to FY16	Ongoing																									
	Green Infrastructure																												
CSD-38	If interim load reduction goals are not met and green infrastructure is required, publicly-owned parcels will be identified as potential opportunities for green infrastructure implementation.	Prioritized public parcels in Tijuana WMA	Optional						If triggered, begin planning, acquiring funding and resources																				

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ID	Strategy	Location	Implementation or Construction Year Start	FY 15 and Earlier	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
	Green Streets																												
CSD-39	If interim load reduction goals are not met and green infrastructure is required, the additional acreage of bioretention and permeable pavement may be implemented through green streets if potential opportunities for green infrastructure implementation on public parcels are not available.	Tijuana River WMA	Optional												If triggered, begin planning (acquire funding and resources, conduct site feasibility analysis and site selection) to construct additional green streets projects.													
	Multiuse Treatment Areas																												
	Infiltration and Detention Basins																												
CSD-40	Cesar Chavez Community Center	Tijuana River WMA	FY15																										
CSD-41	Otay Mesa Drainage Improvements - Detention Basin	Tijuana River WMA	Optional												If triggered, begin planning, acquiring funding and resources														
CSD-42	Otay Truck Route Widening Phase 3 - La Media Rd along border fence	Tijuana River WMA	Prior to FY16																										
	Stream, Channel and Habitat Rehabilitation Projects																												
CSD-43	If interim load reduction goals are not met and additional stream, channel, and habitat rehabilitation projects are required, implement as needed.	Areas identified during feasibility studies	Optional												If triggered, begin planning (acquire funding and resources, conduct site feasibility analysis and site selection) to implement rehabilitation projects.													
	Water Quality Improvement BMPs																												
	Proprietary BMPs																												
CSD-44	Fire Station #29 - 198 West San Ysidro Blvd.	Tijuana River WMA	Prior to FY16																										
	Dry Weather Flow Separation and Treatment Projects																												
CSD-45	If interim load reduction goals are not met and additional dry weather flow separation and treatment projects are required, implement as needed.	Downstream reaches where persistent dry weather flows have been observed	Optional												If triggered, begin planning (acquire funding and resources, conduct site feasibility analysis and site selection) to implement dry weather flow separation projects.													
	Trash Segregation																												
CSD-46	If interim load reduction goals are not met and additional trash segregation projects are required, implement as needed.	High-loading areas city-wide	Optional												If triggered, begin planning (acquire funding and resources, conduct site feasibility analysis and site selection) to implement trash segregation projects.													

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Appendix H.3 County of San Diego Strategies and Schedules

ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
Jurisdictional Runoff Management Programs (JRMP) Strategies												
Illicit Discharge, Detection, and Elimination (IDDE) Program												
1	Maintain MS4 map to facilitate IDDE program	GIS	Base	GIS	N/A	N/A	None	FY15	Annually	Rolled-up TBD	County	ED
2a	Use municipal personnel/contractors to identify and report ICIDs	Field staff/training	Base	JRMP	IC/IDs	all IC/IDs	None	ongoing	ongoing	Rolled-up TBD	County	WPP
	updated focused training for County field staff	Internal updates to focus on HPWQC	Enhanced	JRMP	all pollutants	bacteria	None	FY16	Annually	Rolled-up TBD	County	ED
2b	Effluent on the ground (EOG), SSO data	Internal training	Base	JRMP	OWTS/SSO	bacteria, nutrients	None	ongoing	ongoing	Rolled-up TBD	County	DEH
	work with DEH to address septic system failures	Internal coordination	Base	JRMP	human sources	bacteria, nutrients	None	ongoing	ongoing	Rolled-up TBD	County, all Cities within W/S	ED and PS, Refer to DEH
3	Maintain a hotline and email address for public reporting of potential ICIDs.	Phone/email	Base	Database/ Annual Report	IC/IDs	all IC/IDs	None	ongoing	ongoing	Rolled-up TBD	All jurisdictions	ED
	Refer homeless issue complaints to Sheriff or appropriate jurisdictions	Complaint response	Base	JRMP	human sources	bacteria, nutrients, trash	SDR river bed	ongoing	ongoing	Rolled-up TBD	County	ED
	Bilingual hotline answered by I Love a Clean San Diego (ILACSD; live operator) with multiple avenues for online reporting	Hotline	Enhanced	JRMP	IC/IDs	all IC/IDs	None	FY16	ongoing	Rolled-up TBD	All jurisdictions	ED
	investigate the feasibility of developing a pilot program (including training) - volunteer surveillance program; develop public facing mobile phone application (2 years out)	Volunteer Program	Optional	JRMP/Annual Report	IC/IDs	all IC/IDs	low priority areas	FY16	TBD/in dev.	Rolled-up TBD	County	ED
4	Implement practices and procedures to address spills that may discharge into MS4	ICID Manual/Training	Base	JRMP	IC/IDs	all IC/IDs	None	ongoing	ongoing	Rolled-up TBD	County	Refer to DEH
	coordination with responsible sewer agencies	Internal/External Coordination	Base	JRMP	SSOs	all	None	FY16	ongoing	Rolled-up TBD	County, RMWD	ED
	coordination with internal County wastewater departments	Internal coordination	Base	JRMP	SSOs	all	None	ongoing	ongoing	Rolled-up TBD	County	ED

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
	septic system rebate program with availability of grant funding	Internal coordination	Optional	JRMP	OWTS	bacteria, nutrients	None	FY16	ongoing	Rolled-up TBD	County	ED
	develop a pilot online septic system maintenance outreach program in collaboration with DEH	External outreach via www	Optional committed	JRMP	OWTS	bacteria, nutrients	None	ongoing	ongoing	Rolled-up TBD	County	ED and DEH
5	Implement practices and procedures to prevent/limit infiltration of seepage from sanitary sewers	Internal/External Coordination	Base	JRMP/Annual Report	Sewer infrastructure	bacteria, nutrients	None	ongoing	ongoing	Rolled-up TBD	County, RMWD	ED and Wastewater
6	Coordinate with upstream Copermittees and/or entities to prevent ID from upstream sources into the MS4	External coordination	Base	JRMP	IC/IDs	all IC/IDs	None	ongoing	ongoing	Rolled-up TBD	County and upstream	ED and PS
7	Monitor MS4 outfalls for discharges of potential ICIDs	Monitoring and Surveillance	Base	Database/Annual Report	Persistent/ transient flows	bacteria, nutrients	Prioritized drainage areas	ongoing	Once per year	Rolled-up TBD	All jurisdictions	PS
8	Develop and implement a strategy for investigating and addressing ICIDs.	ICID Manual/Training	Base	JRMP	IC/IDs	all IC/IDs	None	FY15	One time	Rolled-up TBD	County	ED and PS
	Collaborate with watershed partners to evaluate feasibility of invasive plant and animal removal	External coordination	Optional	JRMP/Annual Report	encampments	bacteria, nutrients, trash	SDR river bed	ongoing	ongoing	Rolled-up TBD	County	PS
Development Planning												
9	All development projects: Implement source control BMPs to minimize pollutant generation at each project and implement LID BMPs to maintain or restore hydrology of the area, where applicable and feasible.	Internal plan review and approval	Base	JRMP/Annual Report	new and redevelopment	all pollutants; flow	None	ongoing	ongoing	Rolled-up TBD	County	DC
10	Priority Development Projects: In addition to requirement for all development projects, PDPs must implement onsite structural BMPs to control pollutants and manage hydromodification.	Internal plan review and approval	Base	JRMP/Annual Report	new and redevelopment	all pollutants; flow	None	ongoing	ongoing	Rolled-up TBD	County	DC

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
12	Update BMP Design Manual procedures to determine nature and extent of storm water requirements applicable to development projects and to identify conditions of concern for selecting, designing, and maintaining appropriate structural BMPs.	regional updates, jurisdictional updates	Base	BMP Design Manual	new and redevelopment	all pollutants; flow	None	FY16	in development	Rolled-up TBD	Regional and County	DC
	BMP Manual Training - Internal	staff training	Base	Annual Report	new and redevelopment	all pollutants; flow	None	FY16	one time	Rolled-up TBD	County	DC
	BMP Manual Training - External	LID and Watershed Planning for Community	Enhanced	Annual Report	new and redevelopment	all pollutants; flow	None	FY16	one time	Rolled-up TBD	County and/or Regional	DC
13	Implement a program that requires and confirms PDP structural BMPs are designed, constructed, and maintained to remove pollutants.	inspections and certification program	Base	JRMP/Annual Report	new and redevelopment	all pollutants; flow	None	ongoing	ongoing	Rolled-up TBD	County	DC
14	Enforce legal authority established for all development projects to achieve compliance.	inspections and certification program	Base	Enforcement Response Plan	new and redevelopment	all pollutants; flow	None	ongoing	ongoing	Rolled-up TBD	County	DC
	updates to county ordinance related to land development; reference to updated BMP manual	internal coordination with legal	Base	Ordinance/ Enforcement	new and redevelopment	all pollutants; flow	None	FY15	one time	Rolled-up TBD	County	DC
	Investigate feasibility of developing a Green Streets Program	TBD	Optional	JRMP/Annual Report	All	All	None	TBD	TBD	Rolled-up TBD	City	DC
Construction Management												
15	Maintain and update a watershed-based inventory of all construction projects issued a local permit that allows ground disturbance or soil disturbing	database (Accela)	Base	JRMP/Annual Report	Construction: waste	bacteria, trash	None	FY16	quarterly	Rolled-up TBD	County	DC
16	Implement or require implementation of BMPs that are site specific, seasonally appropriate and construction phase appropriate. Includes inspections at an	inspections program	Base	JRMP	Construction: waste	bacteria, trash	None	ongoing	TBD/in dev.	Rolled-up TBD	County	DC
17	Enforce legal authority established for all its inventoried construction sites to achieve compliance.	inspections program	Base	Enforcement Response Plan	Construction: waste	bacteria, trash	None	ongoing	as necessary	Rolled-up TBD	County	DC

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
	updates to county ordinance related to construction; reference to existing grading ordinance	Internal coordination with legal	Base	Ordinance/ Enforcement	Construction: waste	bacteria, trash	None	FY15	one time	Rolled-up TBD	County	DC
18	Internal Training on Construction Management	Internal training prior to rainy season	Base	JRMP	Construction: waste management, portable toilets	bacteria, trash	None	ongoing	Annual	Rolled-up TBD	County	DC
Existing Development												
19	Maintain and update a watershed-based inventory of all existing development within its jurisdiction that may discharge a pollutant load to and from the MS4.	GIS and database	Base	JRMP/Annual Report	ICMR	all	watershed based	on going	annual	Rolled-up TBD	County	ED
	improvements to tracking watershed based inventories via consolidated database	database	Optional committed	Database	ICMR	all	watershed based	FY16	one time	Rolled-up TBD	County	ED
20	Designate a minimum set of BMPs required for all inventories existing development, including special event venues. The designated minimum BMPs must be specific to facility or area types and pollutant generating activities, as appropriate.	BMP manual	Base	JRMP	ICMR	all	None	on going	one time	Rolled-up TBD	County	ED
	Equestrian BMP Handbook	develop new material	Optional Committed	Annual Report	equestrian land uses	bacteria, nutrients, sediment	equestrian areas	FY16	one time	Rolled-up TBD	County, Oceanside, Vista	ED
21	Require implementation of minimum BMPs for existing development (commercial, industrial, municipal, and residential) that are specific to the facility, area types and pollutant generating activities, as appropriate.	Inspections and outreach programs	Base	JRMP/Annual Report	ICMR	all	None	ongoing	ongoing	Rolled-up TBD	County	ED
	pet waste management and outreach in County Parks	Installation and maintenance of stations	Enhanced	JRMP/Annual Report	municipal parks	bacteria, nutrients	County parks	ongoing	ongoing	Rolled-up TBD	County	DPR
22	Implementation of operation and maintenance activities (inspection and cleaning) for MS4 and related structures (catch basins, storm drain inlets, detention basins, etc.).	MS4 inspections/ cleaning	Base	JRMP/Annual Report	MS4	bacteria, nutrients, sediment, trash	None	ongoing	Annual	Rolled-up TBD	County	ED Referral, FC and Roads

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
23	Implementation of operation and maintenance activities for County maintained streets, unpaved roads, paved roads, and paved highways	CIP/street sweeping	Base	JRMP/Annual Report	transportation corridors	bacteria, nutrients, sediment, trash	None	ongoing	per JRMP	Rolled-up TBD	County	Roads
24	Require implementation of BMPs to address application, storage, and disposal of pesticides, herbicides, and fertilizers on commercial, industrial, and municipal properties. Includes education, permits, and certifications.	outreach	Base	JRMP	ICMR	nutrients, pesticides	Parks, Residential	ongoing	ongoing	Rolled-up TBD	County	AWM
25	Promote and encourage implementation of designated BMPs at residential areas.	outreach and inspections	Base	JRMP	residential	all	Residential	FY16	ongoing	Rolled-up TBD	County	ED
26	Conduct inspections of inventoried existing development to ensure compliance	inspections program	Base	Annual Report	ICMR	all	None	FY16	20% per year, all within 5 years	Rolled-up TBD	County	ED
	focused residential inspections based on strategic assessments (modeling, MST, persistent flows, regulatory, monitoring data, SFR/MFR (112 RMAs based on HSA)	inspections program	Enhanced	JRMP/Annual Report	residential	bacteria, nutrients, pesticides	focused drainage areas	FY16	20% per year, all within 5 years	Rolled-up TBD	County	ED
	Investigating the feasibility of a residential inspections tracking program via mobile platform - miles, violations, etc.	database /electronic tracking	Optional Committed	JRMP/Annual Report	residential	bacteria, nutrients, pesticides	focused drainage areas	FY16	ongoing with inspections	Rolled-up TBD	County	ED
	Investigating the feasibility of improvements to inspections data tracking through mobile phone applications		Optional	Database	ICRM	all	None	FY16		Rolled-up TBD		ED
27	Enforce legal authority established for all inventoried existing development to achieve compliance	inspections program	Base	Enforcement Response Plan	ICMR	all	None	Ongoing	ongoing	Rolled-up TBD	County	ED
	updates to county ordinance related to existing development; reference to existing guidance documents	coordination with legal	Enhanced	Ordinance/ Enforcement	ICMR	all	None	FY15	one time	Rolled-up TBD	County	ED

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
28	Develop a strategy to identify candidate areas of existing development appropriate for retrofitting projects and facilitate the implementation of such projects.	WMAA and internal	Base	JRMP/WMAA	municipal areas	all	None	FY15	internal and WMAA	Rolled-up TBD	Regional and County	WPP
	promote rain barrel incentive programs	MET, CWA, City of SD	Enhanced	Annual Report	residential/ commercial	all	None	ongoing	ongoing	Rolled-up TBD	County and other CoP	ED
	collaborate with partner agencies to promote incentive programs for BMP retrofits	MET, CWA, City of SD	Enhanced	Annual Report	residential/ commercial	all	None	ongoing	ongoing	Rolled-up TBD	County and other CoP	ED
	Investigate the feasibility of developing and implementing an incentive program for BMP Retrofits		Optional committed				None					ED, PS
	Promote Live Turf Replacement Incentive Program as part of the public-private partnership	SLP and partner programs	Enhanced	Annual Report	residential/ commercial	bacteria, nutrients, pesticides	None	SLP - FY16; others ongoing	ongoing	Rolled-up TBD	County	ED
29	Develop a strategy to identify candidate areas of existing development for stream, channel, and/or habitat rehabilitation projects and facilitate implementation of such projects.	WMAA and internal	Base	JRMP/WMAA	municipal	all	dependent on WMAA results	FY15	internal and WMAA	Rolled-up TBD	Regional and County	WPP
Outreach and Public Participation												
	Promote Water Smart Incentive for Outdoor Water Efficiency as part of the public-private partnership	SLP and partner programs	Enhanced	Annual Report	residential/ commercial	bacteria, nutrients, pesticides	None	SLP - FY16; others ongoing	ongoing	Rolled-up TBD	ED	ED
	Develop Sustainable Landscapes Program based on available grant funding	program development and public outreach	Optional	JRMP/Annual Report	residential/ commercial	bacteria, nutrients, pesticides	Residential	FY16	ongoing	Rolled-up TBD	County	ED
	develop, improve, distribute outreach materials for existing development	updated material	Enhanced	JRMP/Annual Report	ICMR	all	None	ongoing	ongoing	Rolled-up TBD	County	ED
	outreach presentations to elementary, middle, and high school students	Coordinated with SDCOE, ILACSD	Enhanced	JRMP/Annual Report	ICMR	all	None	ongoing	ongoing	Rolled-up TBD	County	ED
	outreach to mobile landscaping service providers	via Ag Weights and Measures; special events	Enhanced	JRMP/Annual Report	ICMR	bacteria, nutrients, pesticides	None	ongoing	ongoing	Rolled-up TBD	County	AWM
	Sponsor Trash Collection Events	sponsorships and labor	Enhanced	JRMP/Annual Report	existing land use	trash, bacteria	SDR, SLR River Beds	ongoing	multiple	Rolled-up TBD	Coordinated w/SLRWC, SDRPF	ED
	Educational Workshops (e.g., IPM, manure management)	periodic workshops	Enhanced	JRMP/Annual Report	residential	bacteria, nutrients, sediment, pesticides		ongoing	ongoing	Rolled-up TBD	County	ED

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
	Education & Outreach Effectiveness Survey	surveys and assessment	Enhanced	JRMP/Annual Report	ICMR	all		ongoing	annual	Rolled-up TBD	County	ED
Enforcement Response Plan												
30	Implement escalating enforcement responses to compel compliance with statutes, ordinances, permits, contracts, orders, and other requirements for IDDE, development planning, construction management, and existing development in the Enforcement Response Plan.	inspections, code enforcement	Base	Annual Report, Enforcement Response Plan	All MS4 related sources	all pollutants flow	none	ongoing	ongoing	Rolled-up TBD	County	ED, DC
31	Notify the SDWB by email at Nonfilers_R9waterboards.ca.gov within five (5) calendar days of issuing escalated enforcement to a construction site that poses a significant threat to water quality as a result of violations or other noncompliance	Construction inspections	Base	Annual Report	construction	bacteria, trash	none	FY16	ongoing	Rolled-up TBD	County	DC
32	Notify the SDWB by email (Nonfilers_R9waterboards.ca.gov) any persons required to obtain coverage under the statewide Industrial General Permit and Construction General Permit and failing to do so, within five (5) calendar days from the time the Copermittee become aware of the circumstances.	industrial inspections	Base	Annual Report	industrial	all pollutants	none	FY16	ongoing	Rolled-up TBD	County	ED, DC
Public Education and Participation												
33	Implement a public education and participation program to promote and encourage development of programs, management practices and behaviors that reduce the discharge of pollutants in storm water prioritized by high risk behaviors, pollutants of concern, and target audiences.	Various	Base	JRMP/Annual Report	MS4 Sources	bacteria, nutrients, sediment, pesticides, trash	none	ongoing	ongoing	Rolled-up TBD	County	ED
Physical Strategies (Structural Controls from CLRP and others)												
35	Investigate feasibility of Incentives	TBD	Optional	JRMP/ Annual Report	Irrigation Runoff	Bacteria, Nutrients	none	existing development programs	TBD	Rolled-up TBD	County	DC
36	Investigate feasibility of Detention basins	TBD	Optional	JRMP/ Annual Report	TBD	All	none	land development programs	TBD	Rolled-up TBD	County	DC

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
37	Investigate feasibility of Treatment systems	TBD	Optional	JRMP/ Annual Report	TBD	Dependent on system	none	land development programs	TBD	Rolled-up TBD	County	DC
39	Investigate feasibility of Retrofitting projects in areas of existing development	TBD	Optional	JRMP/WMAA/ Annual Report	TBD	TBD	none	potential for implementation via alternative compliance program	TBD	Rolled-up TBD	County	DC
40	Investigate feasibility of Stream, channel, and/or habitat rehabilitation projects	TBD	Optional	JRMP/WMAA/ Annual Report	TBD	TBD	none	potential for implementation via alternative compliance program	TBD	Rolled-up TBD	County	DC
Optional Planning Strategies developed during WQIP Process												
42	Consider development of incentive programs for water conservation (turf replacement, smart irrigation controllers, irrigation modifications, sustainable landscapes, rain barrels), in collaboration with water agencies and others, to reduce priority pollutants.	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
43	Consider development of incentive programs for pumping septic systems in high risk areas adjacent to waterways (within 600 ft) or stormwater system	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
44	Consider partnerships with Master Gardeners to provide education opportunities on water use and practices for gardening	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
45	Consider collaboration with community groups to provide "boots on the ground" local information to focus implementation efforts on reducing bacteria and other pollutants, close to the source	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
46	Consider collaboration with COSD internal departments to leverage mutually beneficial projects to promote retrofits to include installation of controls to address priority pollutants, if feasible.	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
47	Consider collaboration with watershed partners to encourage consistent messaging to specific targeted audiences (commercial, residents, and others) to conserve water and mitigate dry weather flows	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
48	Consider collaboration with watershed partners on Round 4 of Proposition 84 IRWM grant opportunities to fund targeted educational programs, building of structural controls (brick and mortar projects), or incentive programs to reduce runoff	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
49	Consider collaboration with watershed partners and Regional Water Quality Control Board on effective measures to reduce potential impact of pollutant loads to waterways from unauthorized encampments	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
50	Consider collaboration with wastewater agencies to identify where sewer and stormwater infrastructure are in close proximity and confirm the absence of flow at nearby stormwater MS4 outfall during dry weather	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
53	Consider collaboration with watershed partners to apply for grants to provide septic system rebates or incentives	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
54	In collaboration with DEH, consider developing program for on-site wastewater treatment (septic) systems. May include mapping and risk assessment, inspection, or maintenance practices.	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
55	Implement full scale residential pet waste projects (commitments, large property, urban)	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS

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ID	Strategy	Methodology	Program Type	Reporting Method	Sources	Priorities	Geographic Focus* (Location)	Timing	Frequency	Cost (Resource Needs)	Jurisdiction / Collaboration	Responsible Group (see notes at bottom)
57	Consider investigating diverting persistent dry weather flows from storm drains to sanitary sewer, where feasible	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
58	Consider the design of structural controls for persistent unpermitted dry weather flows where outreach has been unsuccessful and groundwater has been ruled out	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS
59	Consider developing a strategy to evaluate opportunities to naturalize concrete stormwater conveyances, and identify potential funding sources (such as grants) for design and implementation	TBD	Optional	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	PS

Program Type Notes:
Base - Indicates requirements of the MS4 Permit that the County will implement.
Enhanced - Base program that has been enhanced beyond the MS4 Permit requirements. The enhanced portions of these strategies would be implemented if needed and if funding is available.
Optional - Strategies that are not required by the MS4 Permit. These strategies would be implemented if needed and if funding is available. Those that are "committed" are currently funded this fiscal year (FY14-15) and/or being undertaken or planned for undertaking.

Responsible party notes:
WPP = DPW Watershed Protection Program
ED = WPP, Existing Development
PS = WPP, Planning and Science
DC = WPP, Development and Construction
FC = DPW Flood Control
DEH = Department of Environmental Health
AWM = Department of Agriculture, Weights and Measures

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Tijuana River Watershed Management Area Analysis ATTACHMENTS

Lake Henshaw

September 8, 2014

Prepared for:
San Diego County Copermittees

Prepared by:

Geosyntec consultants
engineers | scientists | innovators

RICK ENGINEERING COMPANY

ATTACHMENT A
WATERSHED MANAGEMENT AREA CHARACTERIZATION

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ATTACHMENT A.1
DOMINANT HYDROLOGICAL PROCESS

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A.1 Dominant Hydrological Process

Table A.1.1: Runoff Coefficients versus Land Use, Hydrologic Soil Group (A, B, C, D), and Slope Range

	A			B			C			D		
Land Use	0–2%	2–6%	6%+	0–2%	2–6%	6%+	0–2%	2–6%	6%+	0–2%	2–6%	6%+
Cultivated land	0.08[a]	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
	0.14[b]	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Pasture	0.12	0.20	0.30	0.18	0.28	0.37	0.24	0.34	0.44	0.30	0.40	0.50
	0.15	0.25	0.37	0.23	0.34	0.45	0.30	0.42	0.52	0.37	0.50	0.62
Meadow	0.10	0.16	0.25	0.14	0.22	0.30	0.20	0.28	0.36	0.24	0.30	0.40
	0.14	0.22	0.30	0.20	0.28	0.37	0.26	0.35	0.44	0.30	0.40	0.50
Forest	0.05	0.08	0.11	0.08	0.11	0.14	0.10	0.13	0.16	0.12	0.16	0.20
	0.08	0.11	0.14	0.10	0.14	0.18	0.12	0.16	0.20	0.15	0.20	0.25
Residential lot size 1/8 acre	0.25	0.28	0.31	0.27	0.30	0.35	0.30	0.33	0.38	0.33	0.36	0.42
	0.33	0.37	0.40	0.35	0.39	0.44	0.38	0.42	0.49	0.41	0.45	0.54
Residential lot size 1/4 acre	0.22	0.26	0.29	0.24	0.29	0.33	0.27	0.31	0.36	0.30	0.34	0.40
	0.30	0.34	0.37	0.33	0.37	0.42	0.36	0.40	0.47	0.38	0.42	0.52
Residential lot size 1/3 acre	0.19	0.23	0.26	0.22	0.26	0.30	0.25	0.29	0.34	0.28	0.32	0.39
	0.28	0.32	0.35	0.30	0.35	0.39	0.33	0.38	0.45	0.36	0.40	0.50
Residential lot size 1/2 acre	0.16	0.20	0.24	0.19	0.23	0.28	0.22	0.27	0.32	0.26	0.30	0.37
	0.25	0.29	0.32	0.28	0.33	0.36	0.31	0.35	0.42	0.34	0.38	0.48
Residential lot size 1 acre	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.29	0.35
	0.22	0.26	0.29	0.24	0.28	0.34	0.28	0.32	0.40	0.31	0.35	0.46
Industrial	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.69	0.69	0.69	0.69	0.70
	0.85	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.86	0.88
Commercial	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
	0.88	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.89	0.89	0.90
Streets	0.70	0.71	0.72	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78
	0.76	0.77	0.79	0.80	0.82	0.84	0.84	0.85	0.89	0.89	0.91	0.95
Open space	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.15	0.21	0.28
	0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Parking	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87	0.85	0.86	0.87
	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97	0.95	0.96	0.97

[a] Runoff coefficients for storm recurrence intervals less than 25 years.

[b] Runoff coefficients for storm recurrence intervals of 25 years or longer.

Source: Table 7-9 in *Hydrologic Analysis and Design* (McCuen, 2005)

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Table A.1.2: Land Cover Grouping

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
1	42000 Valley and Foothill Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
2	42100 Native Grassland		Agricultural/Grass
3	42110 Valley Needlegrass Grassland		Agricultural/Grass
4	42120 Valley Sacaton Grassland		Agricultural/Grass

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
5	42200 Non-Native Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
6	42300 Wildflower Field		Agriculture/Grass
7	42400 Foothill/Mountain Perennial Grassland		Agriculture/Grass
8	42470 Transmontane Dropseed Grassland		Agriculture/Grass
9	45000 Meadow and Seep		Agriculture/Grass
10	45100 Montane Meadow		Agriculture/Grass
11	45110 Wet Montane Meadow		Agriculture/Grass
12	45120 Dry Montane Meadows		Agriculture/Grass
13	45300 Alkali Meadows and Seeps		Agriculture/Grass
14	45320 Alkali Seep		Agriculture/Grass
15	45400 Freshwater Seep		Agriculture/Grass
16	46000 Alkali Playa Community		Agriculture/Grass
17	46100 Badlands/Mudhill Forbs		Agriculture/Grass
18	Non-Native Grassland		Agriculture/Grass
19	18000 General Agriculture	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Agriculture/Grass
20	18100 Orchards and Vineyards		Agriculture/Grass
21	18200 Intensive Agriculture		Agriculture/Grass
22	18200 Intensive Agriculture - Dairies, Nurseries, Chicken Ranches		Agriculture/Grass
23	18300 Extensive Agriculture - Field/Pasture, Row Crops		Agriculture/Grass
24	18310 Field/Pasture		Agriculture/Grass
25	18310 Pasture		Agriculture/Grass
26	18320 Row Crops		Agriculture/Grass
27	12000 Urban/Developed		Developed
28	12000 Urban/Develpoed		Developed
29	81100 Mixed Evergreen Forest	Forest	Forest
30	81300 Oak Forest		Forest
31	81310 Coast Live Oak Forest		Forest
32	81320 Canyon Live Oak Forest		Forest
33	81340 Black Oak Forest		Forest
34	83140 Torrey Pine Forest		Forest
35	83230 Southern Interior Cypress Forest		Forest
36	84000 Lower Montane Coniferous Forest		Forest
37	84100 Coast Range, Klamath and Peninsular Coniferous Forest		Forest

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Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
38	84140 Coulter Pine Forest	Forest	Forest
39	84150 Bigcone Spruce (Bigcone Douglas Fir)-Canyon Oak Forest		Forest
40	84230 Sierran Mixed Coniferous Forest		Forest
41	84500 Mixed Oak/Coniferous/Bigcone/Coulter		Forest
42	85100 Jeffrey Pine Forest		Forest
43	11100 Eucalyptus Woodland	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Forest
44	60000 RIPARIAN AND BOTTOMLAND HABITAT	Riparian and Bottomland Habitat	Forest
45	61000 Riparian Forests		Forest
46	61300 Southern Riparian Forest		Forest
47	61310 Southern Coast Live Oak Riparian Forest		Forest
48	61320 Southern Arroyo Willow Riparian Forest		Forest
49	61330 Southern Cottonwood-willow Riparian Forest		Forest
50	61510 White Alder Riparian Forest		Forest
51	61810 Sonoran Cottonwood-willow Riparian Forest		Forest
52	61820 Mesquite Bosque		Forest
53	62000 Riparian Woodlands		Forest
54	62200 Desert Dry Wash Woodland		Forest
55	62300 Desert Fan Palm Oasis Woodland		Forest
56	62400 Southern Sycamore-alder Riparian Woodland		Forest
57	70000 WOODLAND	Woodland	Forest
58	71000 Cismontane Woodland		Forest
59	71100 Oak Woodland		Forest
60	71120 Black Oak Woodland		Forest
61	71160 Coast Live Oak Woodland		Forest
62	71161 Open Coast Live Oak Woodland		Forest
63	71162 Dense Coast Live Oak Woodland		Forest
64	71162 Dense Coast Love Oak Woodland		Forest

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Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
65	71180 Engelmann Oak Woodland	Woodland	Forest
66	71181 Open Engelmann Oak Woodland		Forest
67	71182 Dense Engelmann Oak Woodland		Forest
68	72300 Peninsular Pinon and Juniper Woodlands		Forest
69	72310 Peninsular Pinon Woodland		Forest
70	72320 Peninsular Juniper Woodland and Scrub		Forest
71	75100 Elephant Tree Woodland		Forest
72	77000 Mixed Oak Woodland		Forest
73	78000 Undifferentiated Open Woodland		Forest
74	79000 Undifferentiated Dense Woodland		Forest
75	Engelmann Oak Woodland		Forest
76	52120 Southern Coastal Salt Marsh	Bog and Marsh	Other
77	52300 Alkali Marsh		Other
78	52310 Cismontane Alkali Marsh		Other
79	52400 Freshwater Marsh		Other
80	52410 Coastal and Valley Freshwater Marsh		Other
81	52420 Transmontane Freshwater Marsh		Other
82	52440 Emergent Wetland		Other
83	44000 Vernal Pool	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Other
84	44320 San Diego Mesa Vernal Pool		Other
85	44322 San Diego Mesa Claypan Vernal Pool (southern mesas)		Other
86	13100 Open Water	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Other
87	13110 Marine		Other
88	13111 Subtidal		Other
89	13112 Intertidal		Other
90	13121 Deep Bay		Other
91	13122 Intermediate Bay		Other
92	13123 Shallow Bay		Other
93	13130 Estuarine		Other
94	13131 Subtidal		Other
95	13133 Brackishwater		Other

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Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
96	13140 Freshwater	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Other
97	13200 Non-Vegetated Channel, Floodway, Lakeshore Fringe		Other
98	13300 Saltpan/Mudflats		Other
99	13400 Beach		Other
100	21230 Southern Foredunes	Dune Community	Scrub/Shrub
101	22100 Active Desert Dunes		Scrub/Shrub
102	22300 Stabilized and Partially-Stabilized Desert Sand Field		Scrub/Shrub
103	24000 Stabilized Alkaline Dunes		Scrub/Shrub
104	29000 ACACIA SCRUB		Scrub/Shrub
105	63000 Riparian Scrubs	Riparian and Bottomland Habitat	Scrub/Shrub
106	63300 Southern Riparian Scrub		Scrub/Shrub
107	63310 Mule Fat Scrub		Scrub/Shrub
108	63310 Mulefat Scrub		Scrub/Shrub
109	63320 Southern Willow Scrub		Scrub/Shrub
110	63321 Arundo donnax Dominant/Southern Willow Scrub		Scrub/Shrub
111	63330 Southern Riparian Scrub		Scrub/Shrub
112	63400 Great Valley Scrub		Scrub/Shrub
113	63410 Great Valley Willow Scrub		Scrub/Shrub
114	63800 Colorado Riparian Scrub		Scrub/Shrub
115	63810 Tamarisk Scrub		Scrub/Shrub
116	63820 Arrowweed Scrub		Scrub/Shrub
117	31200 Southern Coastal Bluff Scrub	Scrub and Chaparral	Scrub/Shrub
118	32000 Coastal Scrub		Scrub/Shrub
119	32400 Maritime Succulent Scrub		Scrub/Shrub
120	32500 Diegan Coastal Sage Scrub		Scrub/Shrub
121	32510 Coastal form		Scrub/Shrub
122	32520 Inland form (> 1,000 ft. elevation)		Scrub/Shrub
123	32700 Riversidian Sage Scrub		Scrub/Shrub
124	32710 Riversidian Upland Sage Scrub		Scrub/Shrub
125	32720 Alluvial Fan Scrub		Scrub/Shrub
126	33000 Sonoran Desert Scrub		Scrub/Shrub
127	33100 Sonoran Creosote Bush Scrub		Scrub/Shrub
128	33200 Sonoran Desert Mixed Scrub		Scrub/Shrub
129	33210 Sonoran Mixed Woody Scrub		Scrub/Shrub

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Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
130	33220 Sonoran Mixed Woody and Succulent Scrub	Scrub and Chaparral	Scrub/Shrub
131	33230 Sonoran Wash Scrub		Scrub/Shrub
132	33300 Colorado Desert Wash Scrub		Scrub/Shrub
133	33600 Encelia Scrub		Scrub/Shrub
134	34000 Mojavean Desert Scrub		Scrub/Shrub
135	34300 Blackbush Scrub		Scrub/Shrub
136	35000 Great Basin Scrub		Scrub/Shrub
137	35200 Sagebrush Scrub		Scrub/Shrub
138	35210 Big Sagebrush Scrub		Scrub/Shrub
139	35210 Sagebrush Scrub		Scrub/Shrub
140	36110 Desert Saltbush Scrub		Scrub/Shrub
141	36120 Desert Sink Scrub		Scrub/Shrub
142	37000 Chaparral		Scrub/Shrub
143	37120 Southern Mixed Chaparral		Scrub/Shrub
144	37120 Southern Mixed Chapparal		Scrub/Shrub
145	37121 Granitic Southern Mixed Chaparral		Scrub/Shrub
146	37121 Southern Mixed Chaparral		Scrub/Shrub
147	37122 Mafic Southern Mixed Chaparral		Scrub/Shrub
148	37130 Northern Mixed Chaparral		Scrub/Shrub
149	37131 Granitic Northern Mixed Chaparral		Scrub/Shrub
150	37132 Mafic Northern Mixed Chaparral		Scrub/Shrub
151	37200 Chamise Chaparral		Scrub/Shrub
152	37210 Granitic Chamise Chaparral		Scrub/Shrub
153	37220 Mafic Chamise Chaparral		Scrub/Shrub
154	37300 Red Shank Chaparral		Scrub/Shrub
155	37400 Semi-Desert Chaparral		Scrub/Shrub
156	37500 Montane Chaparral		Scrub/Shrub
157	37510 Mixed Montane Chaparral		Scrub/Shrub
158	37520 Montane Manzanita Chaparral		Scrub/Shrub
159	37530 Montane Ceanothus Chaparral		Scrub/Shrub
160	37540 Montane Scrub Oak Chaparral		Scrub/Shrub
161	37800 Upper Sonoran Ceanothus Chaparral		Scrub/Shrub
162	37830 Ceanothus crassifolius Chaparral		Scrub/Shrub
163	37900 Scrub Oak Chaparral		Scrub/Shrub
164	37A00 Interior Live Oak Chaparral		Scrub/Shrub

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Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
165	37C30 Southern Maritime Chaparral	Scrub and Chaparral	Scrub/Shrub
166	37G00 Coastal Sage-Chaparral Scrub		Scrub/Shrub
167	37K00 Flat-topped Buckwheat		Scrub/Shrub
168	39000 Upper Sonoran Subshrub Scrub		Scrub/Shrub
169	Diegan Coastal Sage Scrub		Scrub/Shrub
170	Granitic Northern Mixed Chaparral		Scrub/Shrub
171	Southern Mixed Chaparral		Scrub/Shrub
172	11000 Non-Native Vegetation	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Unknown
173	11000 Non-Native VegetionVegetation		Unknown
174	11200 Disturbed Wetland		Unknown
175	11300 Disturbed Habitat		Unknown
176	13000 Unvegetated Habitat		Unknown
177	Disturbed Habitat		Unknown

Table A.1.3: Related Land Cover and Land Use Categories

Land Cover per San Diego County	Land Use per Table A.1.1
Agriculture/Grass	Meadow
Forest	Forest
Scrub/Shrub	Average (Meadow, Forest)
Unknown/Other	Meadow

Table A.1.4: Applicable Hydrologic Response Unit Calculations

Land Cover	Soil	Gradient	Runoff Coeff.	ET Coeff.	Infiltration Coeff.	Runoff/ Infiltration Ratio	Hydrologic Process Designation
Agriculture/Grass	A	0-2%	0.10	0.60	0.30	0.33	I
Agriculture/Grass	A	2-6%	0.16	0.60	0.24	0.67	U
Agriculture/Grass	A	6-10%	0.25	0.60	0.15	1.67	O
Agriculture/Grass	B	0-2%	0.14	0.60	0.26	0.54	I
Agriculture/Grass	B	2-6%	0.22	0.60	0.18	1.22	U
Agriculture/Grass	B	6-10%	0.30	0.60	0.10	3.00	O
Agriculture/Grass	C	0-2%	0.20	0.60	0.20	1.00	U
Agriculture/Grass	C	2-6%	0.28	0.60	0.12	2.33	O
Agriculture/Grass	C	6-10%	0.36	0.60	0.04	9.00	O
Agriculture/Grass	D	0-2%	0.24	0.60	0.16	1.50	U
Agriculture/Grass	D	2-6%	0.30	0.60	0.10	3.00	O
Agriculture/Grass	D	6-10%	0.40	0.60	0.00	infinite	O

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Land Cover	Soil	Gradient	Runoff Coeff.	ET Coeff.	Infiltration Coeff.	Runoff/ Infiltration Ratio	Hydrologic Process Designation
Forest	A	0-2%	0.05	0.80	0.15	0.33	I
Forest	A	2-6%	0.08	0.80	0.12	0.67	U
Forest	A	6-10%	0.11	0.80	0.09	1.22	U
Forest	B	0-2%	0.08	0.80	0.12	0.67	U
Forest	B	2-6%	0.11	0.80	0.09	1.22	U
Forest	B	6-10%	0.14	0.80	0.06	2.33	O
Forest	C	0-2%	0.10	0.80	0.10	1.00	U
Forest	C	2-6%	0.13	0.80	0.07	1.86	O
Forest	C	6-10%	0.16	0.80	0.04	4.00	O
Forest	D	0-2%	0.12	0.80	0.08	1.50	U
Forest	D	2-6%	0.16	0.80	0.04	4.00	O
Forest	D	6-10%	0.20	0.80	0.00	infinite	O
Scrub/Shrub	A	0-2%	0.08	0.70	0.23	0.33	I
Scrub/Shrub	A	2-6%	0.12	0.70	0.18	0.67	U
Scrub/Shrub	A	6-10%	0.18	0.70	0.12	1.50	U
Scrub/Shrub	B	0-2%	0.11	0.70	0.19	0.58	I
Scrub/Shrub	B	2-6%	0.17	0.70	0.14	1.22	U
Scrub/Shrub	B	6-10%	0.22	0.70	0.08	2.75	O
Scrub/Shrub	C	0-2%	0.15	0.70	0.15	1.00	U
Scrub/Shrub	C	2-6%	0.21	0.70	0.10	2.16	O
Scrub/Shrub	C	6-10%	0.26	0.70	0.04	6.50	O
Scrub/Shrub	D	0-2%	0.19	0.70	0.12	1.50	U
Scrub/Shrub	D	2-6%	0.23	0.70	0.07	3.29	O
Scrub/Shrub	D	6-10%	0.30	0.70	0.00	infinite	O

Hydrologic Process Designation: I = Interflow; O = Overland Flow; U = Uncertain

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Table A.1.5: Hydrologic Response Unit Designations

Land Cover	Slope	Soil Type				
		A	B	C	D	Other (fill/water)
Agriculture/ Grass/Unknown/ Other	0-2%	I	I	U	U	U
	2-6%	U	U	O	O	U
	6-10%	O	O	O	O	O
	>10%	O	O	O	O	O
Developed	0-2%	O	O	O	O	O
	2-6%	O	O	O	O	O
	6-10%	O	O	O	O	O
	>10%	O	O	O	O	O
Forest	0-2%	I	U	U	U	U
	2-6%	U	U	O	O	U
	6-10%	U	O	O	O	U
	>10%	O	O	O	O	O
Scrub/Shrub	0-2%	I	I	U	U	U
	2-6%	U	U	O	O	U
	6-10%	U	O	O	O	U
	>10%	O	O	O	O	O

Hydrologic Process Designation: I = Interflow; O = Overland Flow; U = Uncertain

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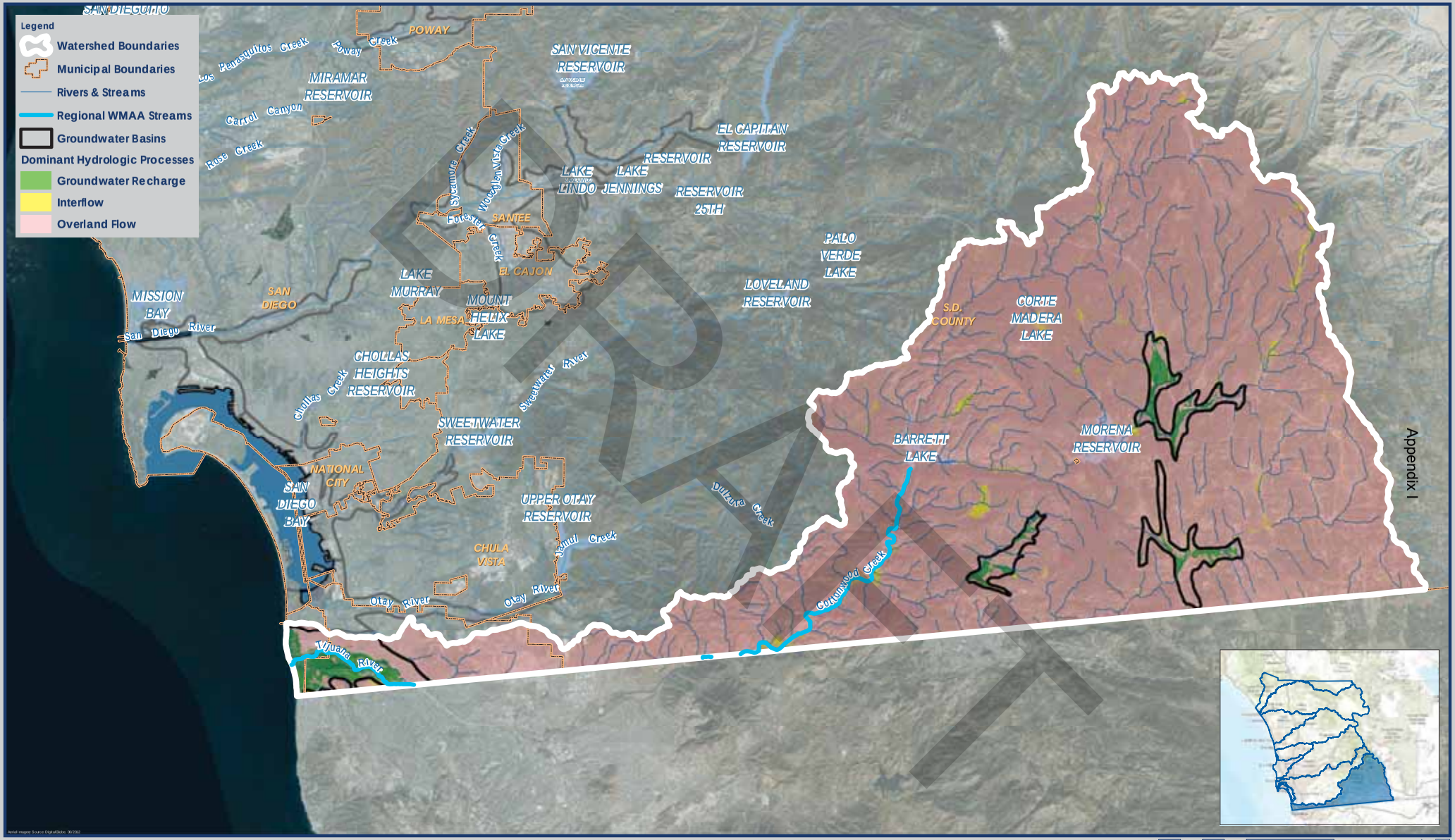

Exhibit Showing Dominant Hydrologic Processes

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

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ATTACHMENT A.2
STREAM CHARACTERIZATION

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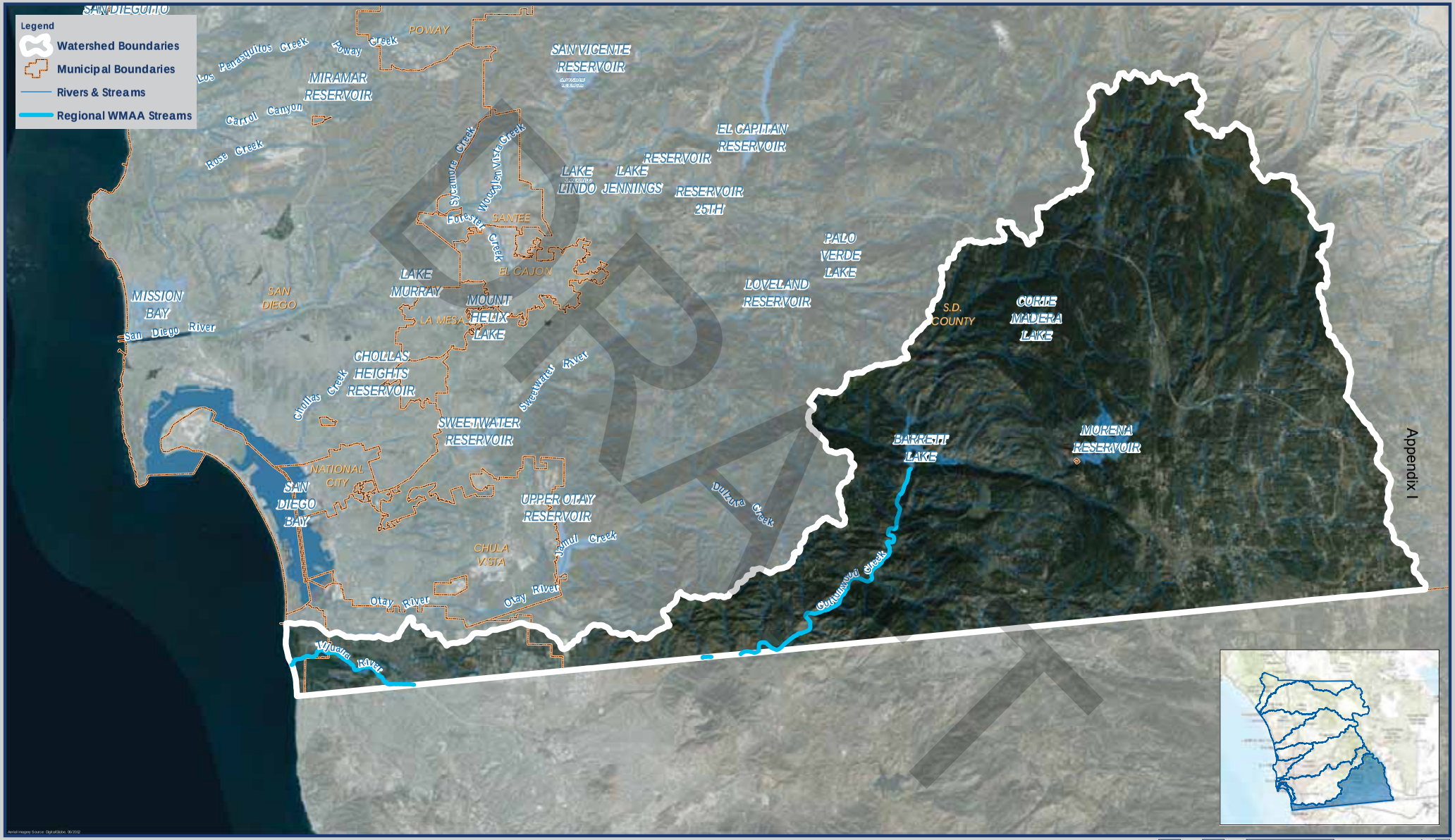

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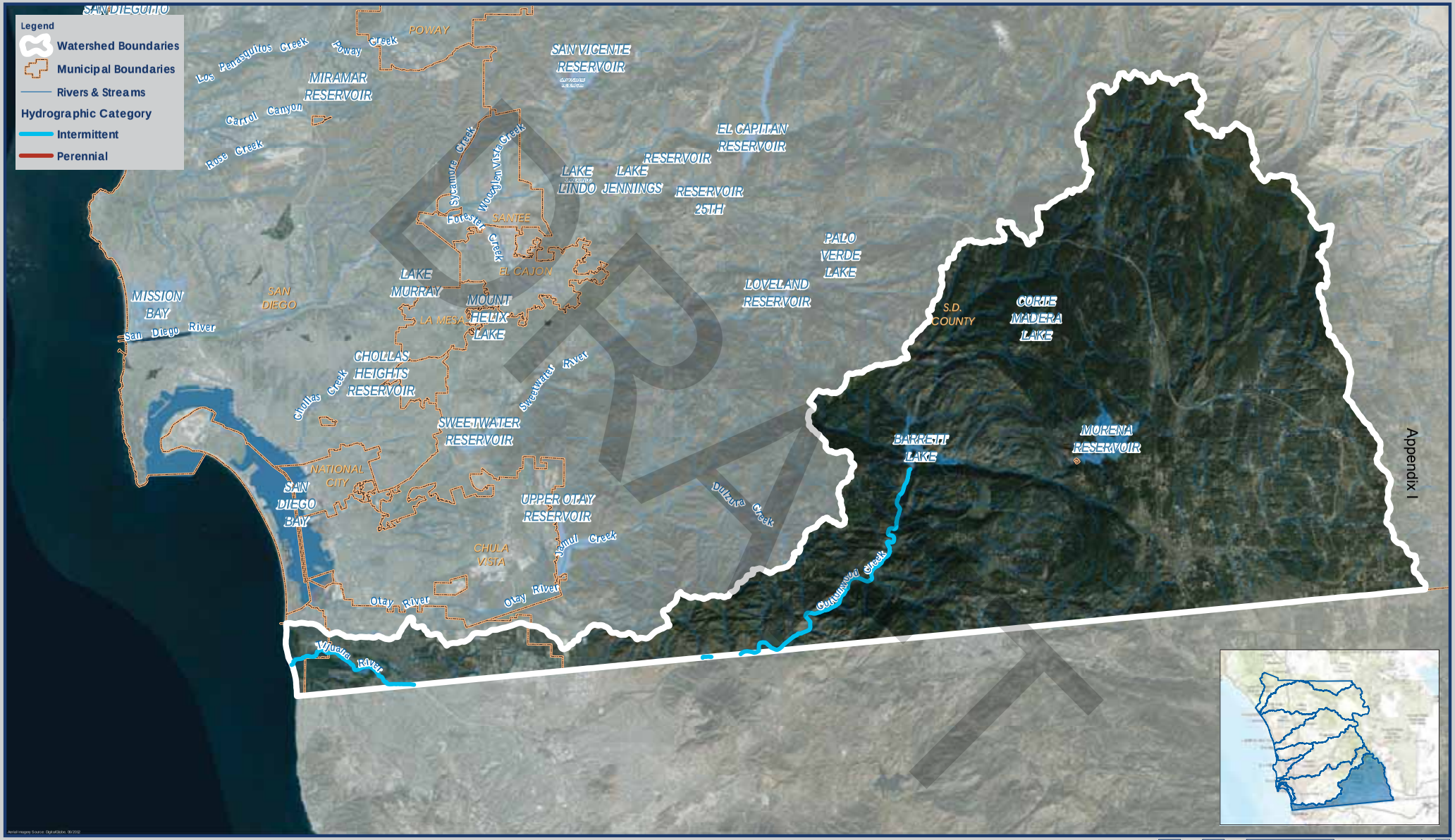
Watershed Management Area Streams

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

Appendix I



Watershed Management Area Streams by Hydrographic Category

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

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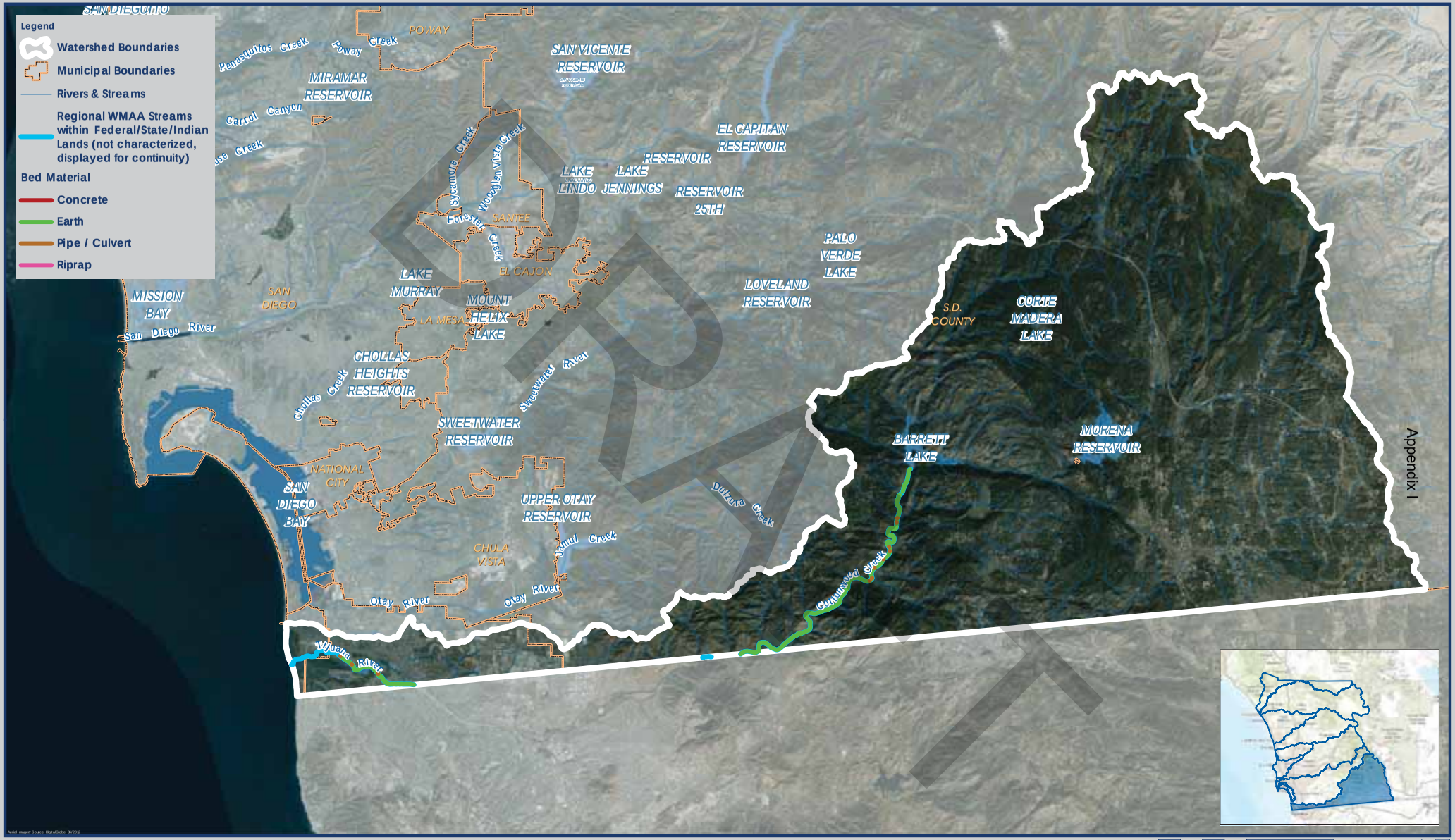

Watershed Management Area Streams by Bed Material

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

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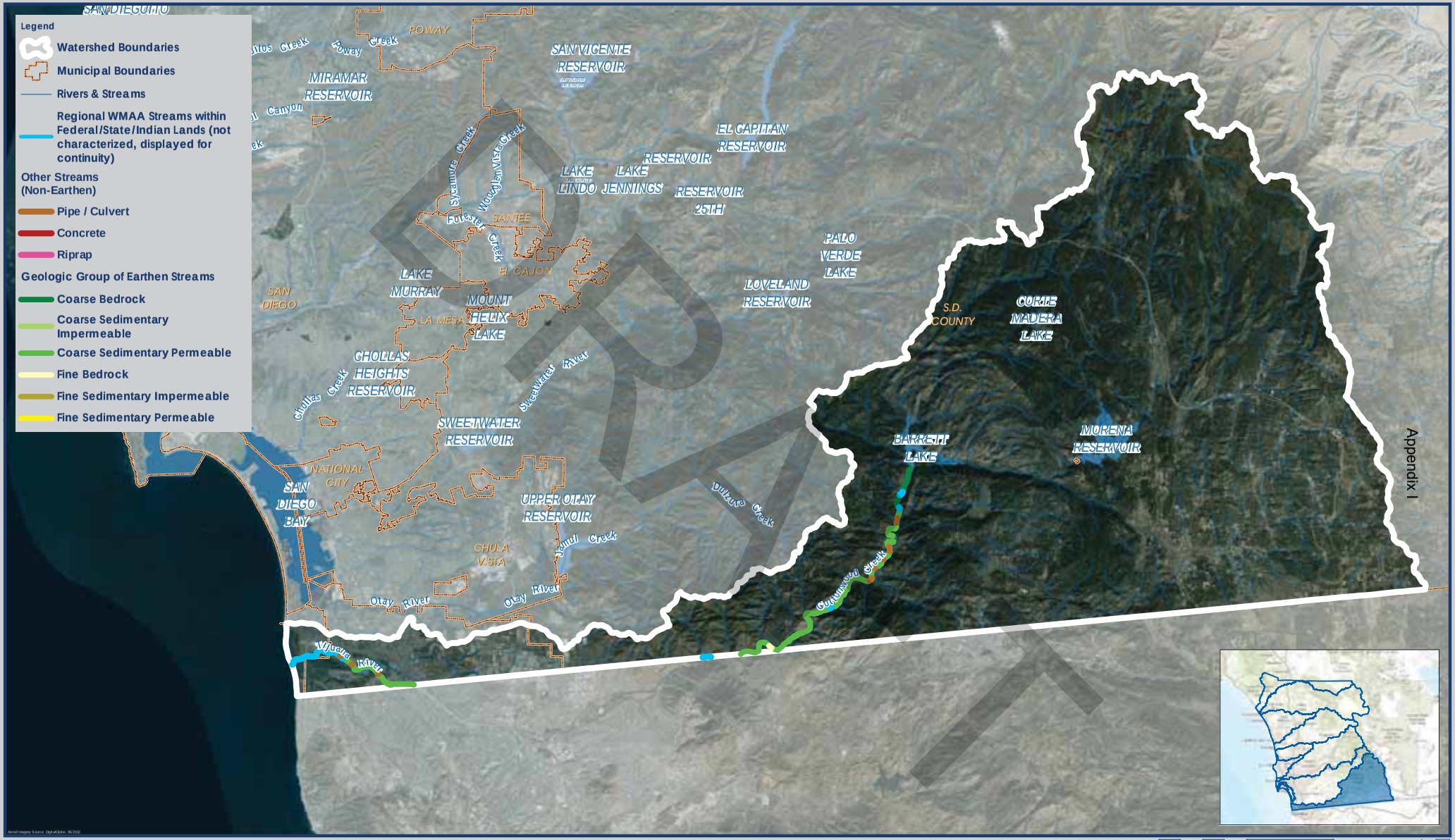

Watershed Management Area Streams by Geologic Group

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

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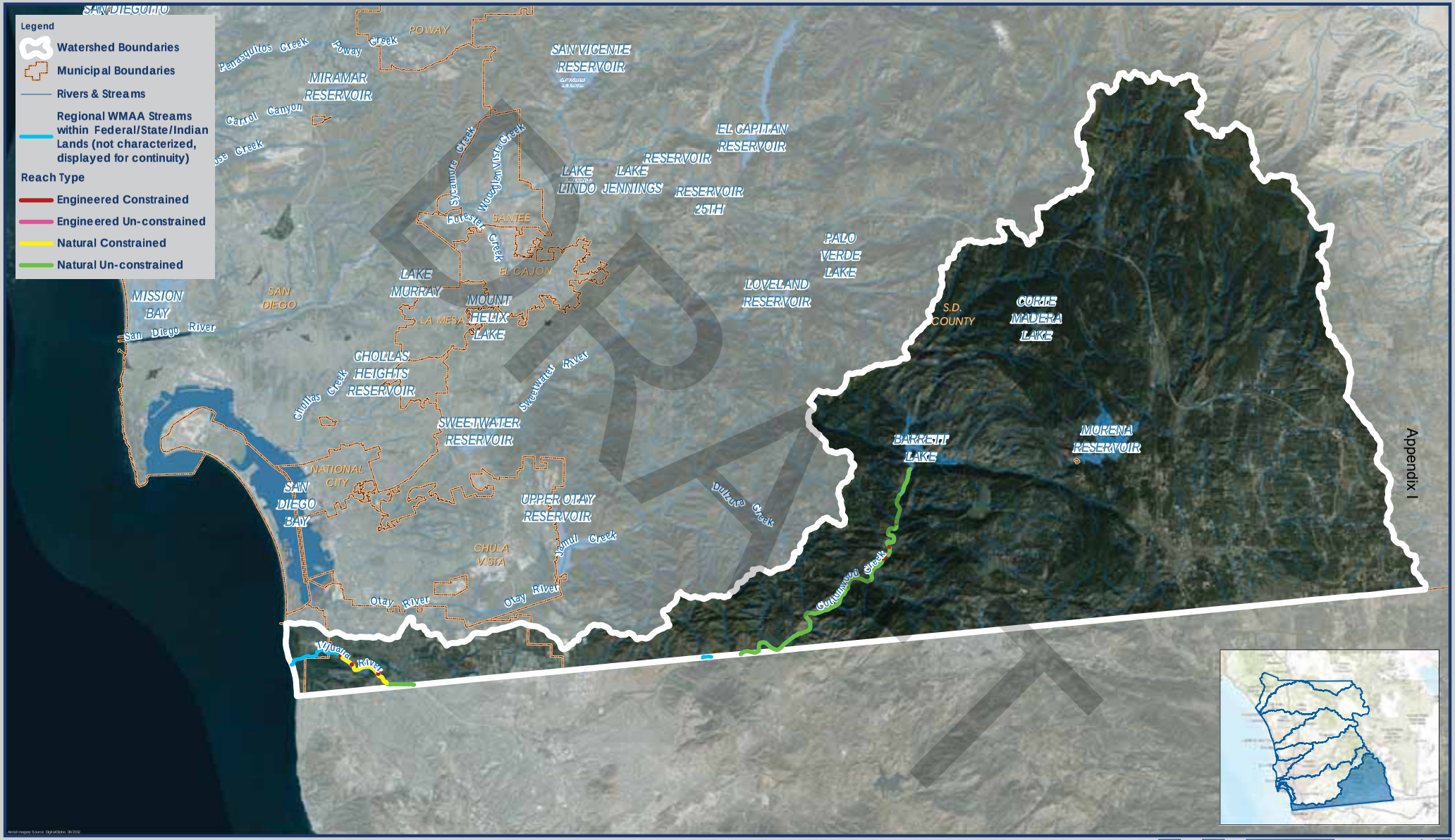

Watershed Management Area Streams by Reach Type

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

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ATTACHMENT A.3
LAND USES

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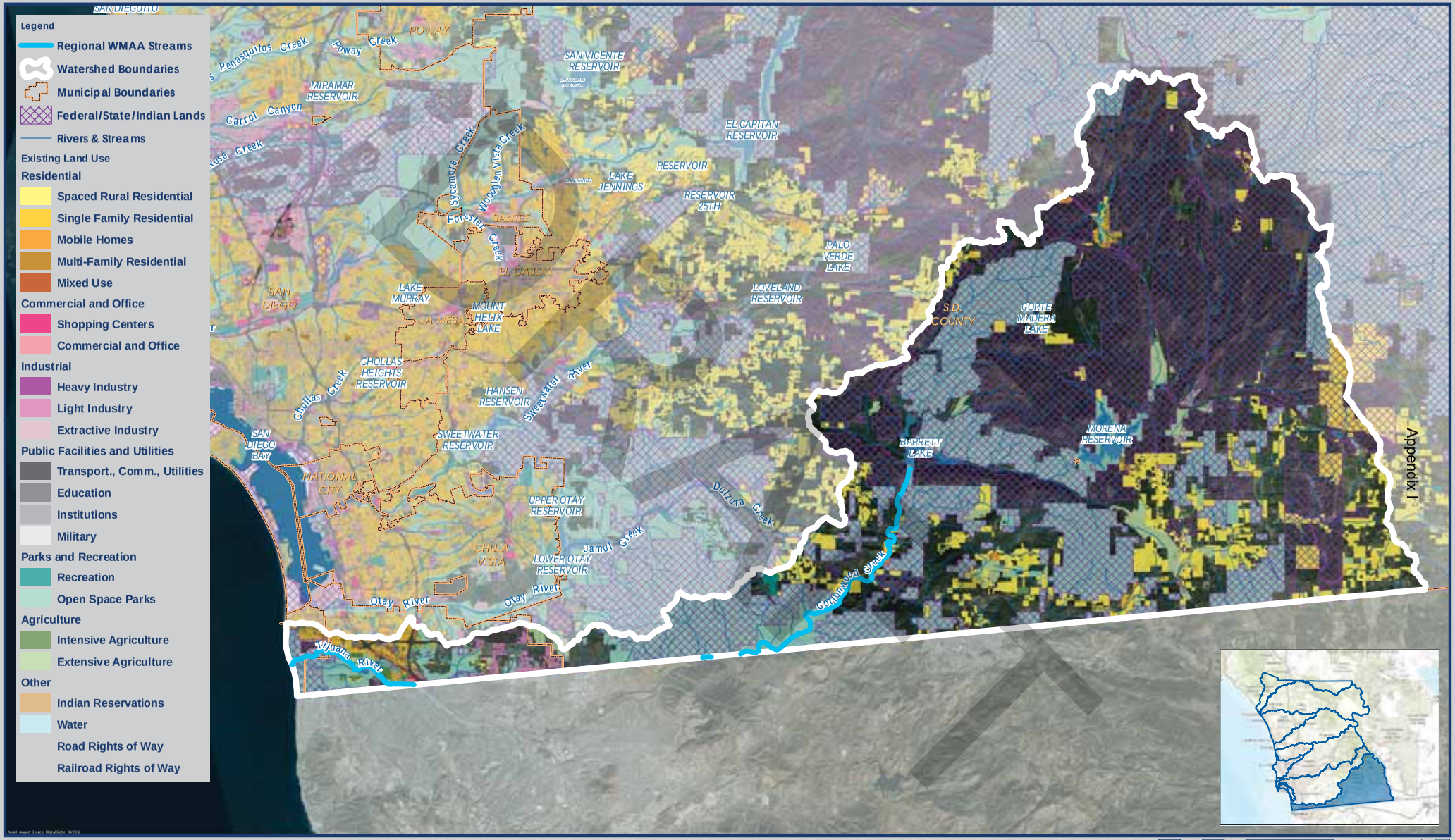

Existing Land Use

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

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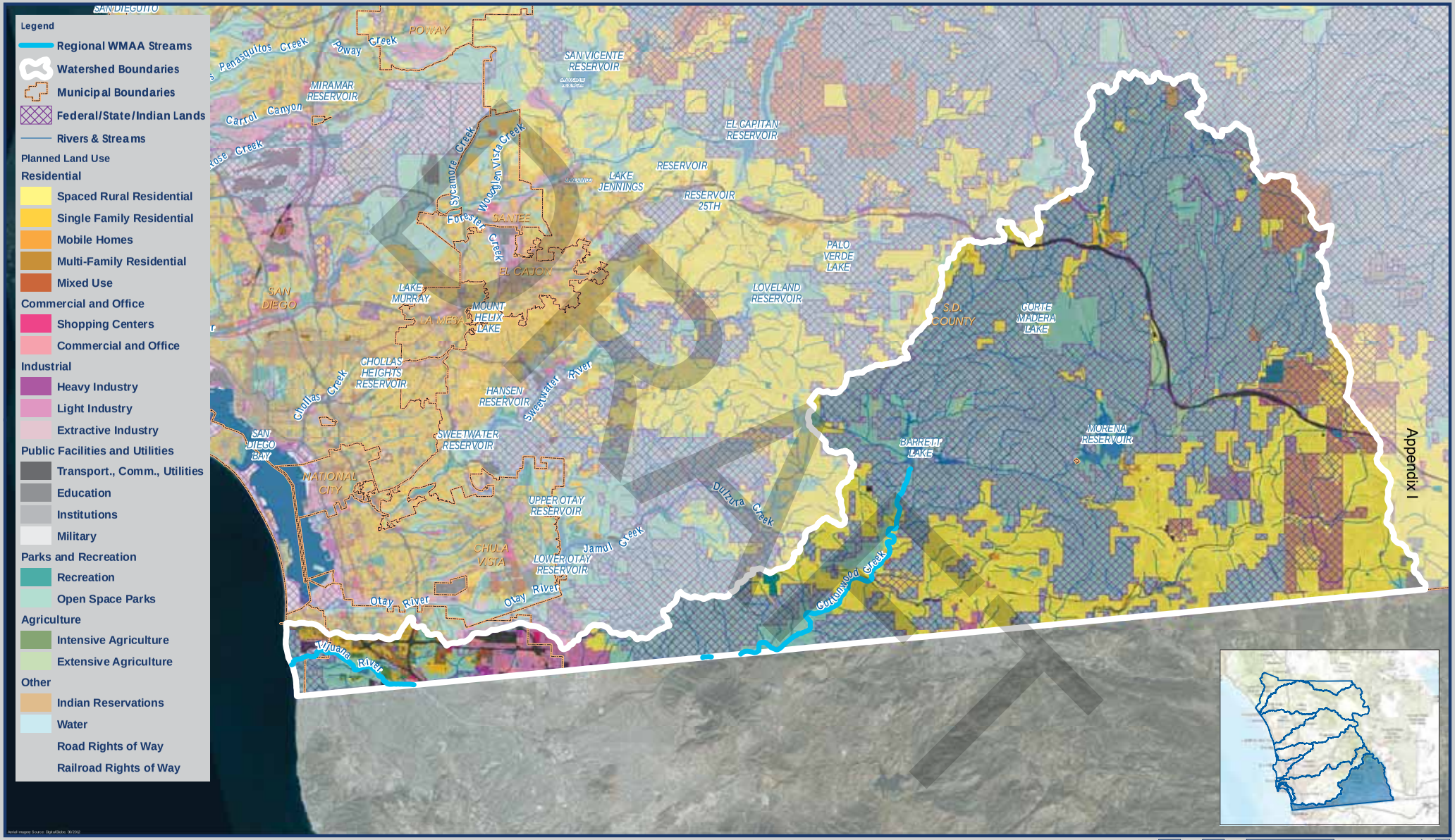

Appendix I

Planned Land Use

Tijuana Watershed - HU 911.00, 467 mi2

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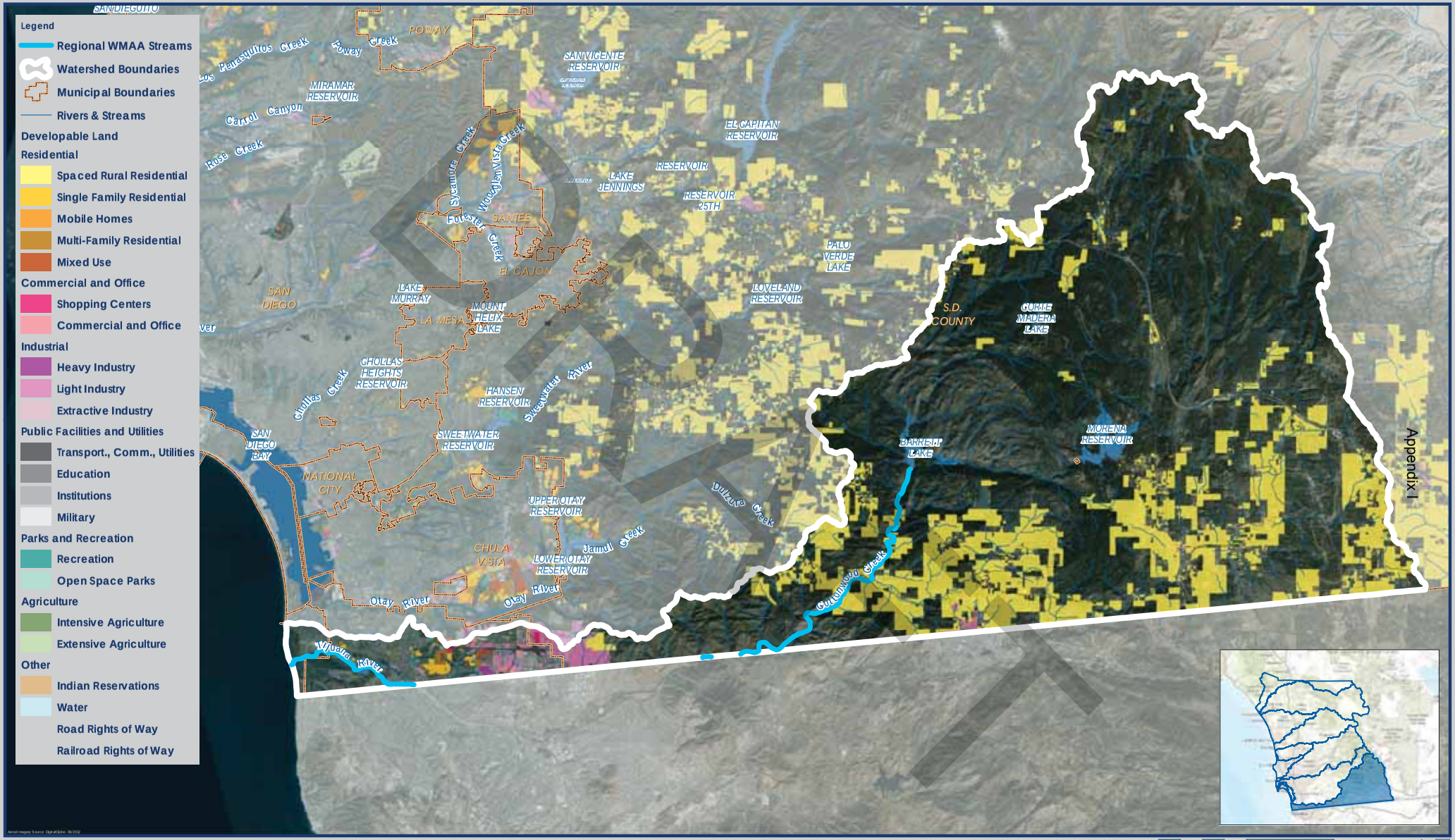

Developable Land

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

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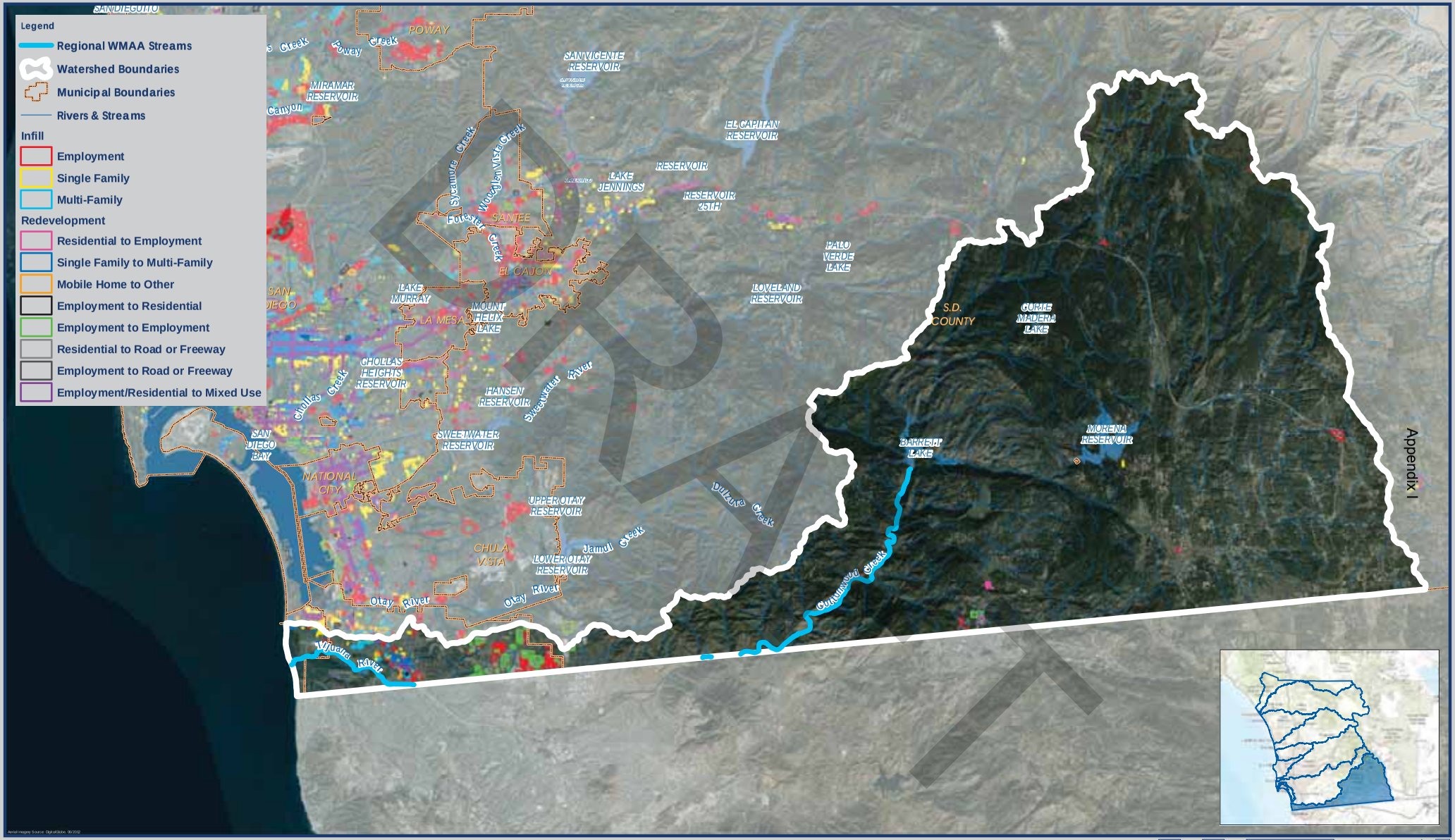

Appendix I

Redevelopment and Infill Areas

Tijuana Watershed - HU 911.00, 467 mi2

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ATTACHMENT A.4
POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS

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A.4.1 Geology Grouping

Geologic grouping was based on the mapped geologic unit as determined by published geologic mapping information. The following describes the methodology utilized to determine bedrock or sedimentary characteristics, anticipated grain size, and suitability for infiltration. A complete list of the various geologic maps used in this evaluation is listed in Chapter 6.

Due to the various mapped scales of the published data and differing mapped unit names, the geologic units were initially compiled into similar categories where possible. For example, the Lindavista Formation is mapped as unit Ql on geologic maps at a scale of 1:24,000 but correlates to the same unit Qvop8 on geologic maps at a scale of 1:100,000. Following the compilation of geologic unit names, the units were differentiated between crystalline bedrock and sedimentary formations based on geologic characterization and material behavior. The Point Loma Formation for example, is a Cretaceous-age sandstone, but it was classified as a "coarse bedrock" unit due to its indurated and resistant nature.

For each site location, the predominant geologic units were then described as "coarse" or "fine" based on typical weathering characteristics of the bedrock units, or primary grain size of the sedimentary units. For example, granodiorite or tonalite crystalline rock typically weathers to a coarse material such as a silty sand and therefore was classified as "coarse," compared to a gabbro which generally weathers to a sandy clay and was characterized as "fine." Sedimentary formations can be more variable, such as the Mission Valley Formation. In this case, the Mission Valley Formation was characterized as "coarse" since the unit is predominantly comprised of sandstone even if it does contain localities of siltstone and claystone within the unit.

To further characterize the sedimentary formations, these units were evaluated for suitability of infiltration. Since no field investigations were performed for this evaluation to determine permeability, the differentiation between impermeable and permeable were based on the age of the geologic unit with the assumption that relatively younger sedimentary units of Pleistocene-age or younger (<1.6 mya) would be more susceptible to surface water infiltration. Geology grouping of different map units is presented in Table A.4.1

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Table A.4.1 Geologic grouping for different map units

Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
gr-m	Jennings; CA	Coarse	Bedrock	Impermeable	CB
grMz	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Jcr	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Jhc	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Jsp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ka	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kbm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kbp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcc	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcm	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kcp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kd	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kdl	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgbf	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgd	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgdf	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgh	San Diego 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm1	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm2	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm3	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgm4	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgr	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kgu	San Diego 30' x 60'	Coarse	Bedrock	Impermeable	CB
Khg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ki	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kis	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kjd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
KJem	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
KJld	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kjv	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB

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Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Klb	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klh	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Klp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Km	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmgp	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kmm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kpa	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kpv	El Cajon 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kqbd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Krm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Krr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kt	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ktr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kvc	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwm	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwp	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Kwsr	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
m	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Mzd	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzg	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzq	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Mzs	Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
sch	Jennings; CA	Coarse	Bedrock	Impermeable	CB
Kp	San Diego & Oceanside 30' x 60'	Coarse	Bedrock	Impermeable	CB
Ql	El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
QTf	El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Ec	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI
K	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI
Kccg	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Kcs	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Kl	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Ku	Jennings; CA	Coarse	Sedimentary	Impermeable	CSI

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Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qvof	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop8a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop9a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmsc	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmss	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tp	San Diego & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tpm	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsc	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tscu	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsd	San Diego & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsdcg	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsdss	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsm	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tso	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tst	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tt	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tta	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tmv	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsi	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa11	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa12	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoa13	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvoc	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop1	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop10	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop10a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop11	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI

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Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qvop11a	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop12	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop13	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop2	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop3	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop4	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop5	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop6	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop7	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop8	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qvop9	San Diego 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Tsa	Oceanside 30' x 60'	Coarse	Sedimentary	Impermeable	CSI
Qof	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof1	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qof2	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Q	Jennings; CA	Coarse	Sedimentary	Permeable	CSP
Qa	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qd	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qf	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qmb	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qw	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qyf	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qt	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa1-2	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa2-6	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa5	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa6	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa7	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP

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Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
Qoc	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop1	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qc	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qu	El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qoa	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop2-4	San Diego 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop3	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop4	Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop6	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qop7	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qya	San Diego, Oceanside & El Cajon 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Qyc	San Diego & Oceanside 30' x 60'	Coarse	Sedimentary	Permeable	CSP
Mzu	San Diego & Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
gb	Jennings; CA	Fine	Bedrock	Impermeable	FB
JTRm	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kat	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kc	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kgb	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
KJvs	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kmv	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Ksp	El Cajon 30' x 60'	Fine	Bedrock	Impermeable	FB
Kvsp	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kwmt	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Qv	Jennings; CA	Fine	Bedrock	Impermeable	FB
Tba	San Diego 30' x 60'	Fine	Bedrock	Impermeable	FB
Tda	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Tv	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Tvsr	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Kgdfg	Oceanside 30' x 60'	Fine	Bedrock	Impermeable	FB
Ta	San Diego 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tcs	Oceanside 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Td	San Diego & Oceanside	Fine	Sedimentary	Impermeable	FSI

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Map Unit	Map Name	Anticipated Grain size of Weathered Material	Bedrock or Sedimentary	Impermeable/ Permeable	Geology Grouping
	30' x 60'				
Td+Tf	San Diego 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Qls	San Diego, Oceanside & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tm	Oceanside 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tf	San Diego, Oceanside & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Tfr	El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
To	San Diego & El Cajon 30' x 60'	Fine	Sedimentary	Impermeable	FSI
Qpe	San Diego & Oceanside 30' x 60'	Fine	Sedimentary	Permeable	FSP
Mexico	San Diego 30' x 60'	NA	NA	Permeable	Other
Kuo	San Diego 30' x 60'	NA (Offshore)	NA	Permeable	Other
Teo	San Diego & Oceanside 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
Tmo	Oceanside 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
Qmo	San Diego 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
QTso	San Diego 30' x 60'	NA (Offshore)	Sedimentary	Permeable	Other
af	San Diego & Oceanside 30' x 60'	Variable, dependent on source material	Sedimentary		Other

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A.4.2 Quantitative Analysis

Soil loss estimates for each Geomorphic Landscape Unit were estimated using the Revised Universal Soil Loss Equation (RUSLE; Renard et al. 1997) listed below:

$$A = R \times K \times LS \times C \times P$$

Where

A = estimated average soil loss in tons/acre/year

R = rainfall-runoff erosivity factor

K = soil erodibility factor

LS = slope length and steepness factor

C = cover-management factor

P = support practice factor; assumed 1 for this analysis

Regional datasets used to estimate the inputs required to estimate the soil loss from each GLU are listed in table below:

Dataset	Source	Download year	Description
RUSLE – R Factor	SWRCB	2014	Regional R factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_R_Factor/
RUSLE – K Factor	SWRCB	2014	Regional K factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_K_Factor/
RUSLE – LS Factor	SWRCB	2014	Regional LS factor map was downloaded from ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk/RUSLE/RUSLE_LS_Factor/
RUSLE – C Factor	USEPA	2014	Regional C factor map was downloaded from http://www.epa.gov/esd/land-sci/emap_west_browser/pages/wemap_mm_sl_rusle_c_qt.htm#mapnav

GIS analysis was used to calculate the area weighted estimate of R, K, LS and C factors using the regional datasets listed in the table above. For the developed land cover the C factor was then adjusted to 0 from the regional estimate to account for management actions implemented on developed sites (e.g. impervious surfaces). Soil loss estimates ranged from 0 to 15.2 tons/acre/year.

For evaluating the degree of relative risk to a stream solely arising from changes in sediment and/or water delivery SCCWRP Technical Report 605, 2010 states:

> *"The challenge in implementing this step is that presently we have insufficient basis to defensibly identify either low-risk or high-risk conditions using these metrics. For example, channels that are close to a threshold for geomorphic change may display significant morphological changes under nothing more than natural year-to-year variability in flow or sediment load.*

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- *Acknowledging this caveat, we nonetheless anticipate that changes of less than 10% in either driver are unlikely to instigate, on their own, significant channel changes. This value is a conservative estimate of the year-to-year variability in either discharge or sediment flux that can be accommodated by a channel system in a state of dynamic equilibrium. It does not "guarantee," however, that channel change may not occur—either in response to yet modest alterations in water or sediment delivery, or because of other urbanization impacts (e.g., point discharge of runoff or the trapping of the upstream sediment flux; see Booth 1990) that are not represented with this analysis.*
- *In contrast, recognizing a condition of undisputed "high risk" must await broader collection of regionally relevant data. We note that >60% reductions in predicted sediment production have resulted in both minimal (McGonigle) and dramatic (Agua Hedionda) channel changes, indicating that "more data" may never provide absolute guidance. At present, we suggest using predicted watershed changes of 50% or more in either runoff (as indexed by change in impervious area) or sediment production as provisional criteria for requiring a more detailed evaluation of both the drivers and the resisting factors for channel change, regardless of other screening-level assessments. Clearly, however, only more experience with the application of such "thresholds," and the actual channel conditions that accompany them, will provide a defensible basis for setting numeric standards."*

The following criterion was developed using the suggestions listed above and then used to assign relative sediment production rating to each GLU:

- Low: Soil Loss < 5.6 tons/acre/year [GLUs that have a soil loss of 0 to 5.6 tons/acre/year produces around 10% of the total coarse sediment soil loss from the study area]
- Medium: 5.6 tons/acre/year < Soil Loss < 8.4 tons/acre/year
- High: > 8.4 tons/acre/year [GLUs that have a soil loss greater than 8.4 tons/acre/year produces around 42% of the total coarse sediment soil loss from the study area]

Results from the quantitative analysis are summarized in Table A.4.2.

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Table A.4.2 Relative Sediment Production for different Geomorphic Landscape Units

Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CB-Agricultural/Grass-1	52883	0.20	4.67	0.14	50	6.5	Medium	No
CB-Agricultural/Grass-2	40633	0.21	5.19	0.14	56	8.3	Medium	No
CB-Agricultural/Grass-3	32617	0.22	6.04	0.14	57	10.6	High	Yes
CB-Agricultural/Grass-4	11066	0.23	7.38	0.14	57	13.5	High	Yes
CB-Developed-1	39746	0.22	3.77	0	49	0	Low	No
CB-Developed-2	32614	0.22	4.28	0	50	0	Low	No
CB-Developed-3	15841	0.22	4.86	0	49	0	Low	No
CB-Developed-4	1805	0.22	5.63	0	48	0	Low	No
CB-Forest-1	32231	0.20	6.38	0.14	39	6.8	Medium	No
CB-Forest-2	38507	0.20	7.20	0.13	45	8.8	High	Yes
CB-Forest-3	55303	0.20	8.14	0.13	48	10.6	High	Yes
CB-Forest-4	38217	0.20	9.95	0.14	50	13.6	High	Yes
CB-Other-1	1036	0.20	5.52	0.13	45	6.5	Medium	No
CB-Other-2	317	0.20	6.46	0.13	45	7.9	Medium	No
CB-Other-3	296	0.20	6.96	0.14	43	8.3	Medium	No
CB-Other-4	111	0.21	6.84	0.14	41	8.2	Medium	No
CB-Scrub/Shrub-1	88135	0.20	5.66	0.14	33	5.3	Low	No
CB-Scrub/Shrub-2	143694	0.20	6.51	0.14	37	6.8	Medium	No
CB-Scrub/Shrub-3	246703	0.21	7.33	0.14	41	8.4	Medium	No
CB-Scrub/Shrub-4	191150	0.21	8.28	0.14	42	9.8	High	No
CB-Unknown-1	1727	0.21	5.32	0.13	44	6.3	Medium	No
CB-Unknown-2	1935	0.21	5.95	0.13	44	7.1	Medium	No

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Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CB-Unknown-3	1539	0.22	6.21	0.13	44	7.7	Medium	No
CB-Unknown-4	278	0.22	6.61	0.13	44	8.4	High	Yes
CSI-Agricultural/Grass-1	14609	0.34	2.72	0.14	39	4.8	Low	No
CSI-Agricultural/Grass-2	9059	0.37	3.61	0.14	47	8.7	High	Yes
CSI-Agricultural/Grass-3	10096	0.38	3.99	0.14	47	9.8	High	Yes
CSI-Agricultural/Grass-4	2498	0.37	4.33	0.14	47	10.5	High	Yes
CSI-Developed-1	82371	0.28	2.51	0	39	0	Low	No
CSI-Developed-2	22570	0.30	2.66	0	41	0	Low	No
CSI-Developed-3	13675	0.30	2.89	0	40	0	Low	No
CSI-Developed-4	3064	0.27	3.20	0	39	0	Low	No
CSI-Forest-1	449	0.27	4.26	0.13	43	6.6	Medium	No
CSI-Forest-2	611	0.25	5.11	0.13	44	7.5	Medium	No
CSI-Forest-3	716	0.29	4.43	0.13	44	7.4	Medium	No
CSI-Forest-4	348	0.30	4.49	0.13	43	7.6	Medium	No
CSI-Other-1	319	0.31	2.50	0.13	32	3.2	Low	No
CSI-Other-2	83	0.27	3.01	0.13	39	4.3	Low	No
CSI-Other-3	45	0.28	3.03	0.13	39	4.5	Low	No
CSI-Other-4	13	0.24	4.01	0.14	39	5.2	Low	No
CSI-Scrub/Shrub-1	9051	0.26	3.53	0.13	39	4.7	Low	No
CSI-Scrub/Shrub-2	10802	0.27	4.36	0.13	41	6.3	Medium	No
CSI-Scrub/Shrub-3	28220	0.26	4.82	0.13	41	6.7	Medium	No
CSI-Scrub/Shrub-4	20510	0.26	5.52	0.13	41	7.8	Medium	No
CSI-Unknown-1	5292	0.28	2.38	0.13	36	3.1	Low	No

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Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CSI-Unknown-2	2074	0.29	2.98	0.13	40	4.5	Low	No
CSI-Unknown-3	2171	0.27	3.04	0.13	39	4.2	Low	No
CSI-Unknown-4	676	0.26	3.04	0.13	38	3.8	Low	No
CSP-Agricultural/Grass-1	59327	0.22	3.01	0.14	44	4.0	Low	No
CSP-Agricultural/Grass-2	8426	0.23	3.81	0.14	42	5.2	Low	No
CSP-Agricultural/Grass-3	2377	0.24	4.05	0.14	41	5.6	Low	No
CSP-Agricultural/Grass-4	291	0.22	6.28	0.14	52	10.1	High	Yes
CSP-Developed-1	85283	0.27	2.10	0	42	0	Low	No
CSP-Developed-2	7513	0.26	2.77	0	42	0	Low	No
CSP-Developed-3	2317	0.27	2.70	0	40	0	Low	No
CSP-Developed-4	272	0.27	2.76	0	38	0	Low	No
CSP-Forest-1	14738	0.22	4.52	0.14	44	6.0	Medium	No
CSP-Forest-2	3737	0.22	5.99	0.14	45	8.2	Medium	No
CSP-Forest-3	1858	0.21	6.42	0.14	45	8.5	High	Yes
CSP-Forest-4	484	0.21	7.62	0.14	48	10.2	High	Yes
CSP-Other-1	7404	0.23	2.61	0.14	39	3.2	Low	No
CSP-Other-2	343	0.24	3.68	0.13	40	4.8	Low	No
CSP-Other-3	126	0.24	3.76	0.13	40	4.9	Low	No
CSP-Other-4	17	0.24	4.19	0.13	39	5.3	Low	No
CSP-Scrub/Shrub-1	22583	0.23	3.75	0.14	41	4.8	Low	No
CSP-Scrub/Shrub-2	8938	0.24	5.63	0.14	40	7.1	Medium	No
CSP-Scrub/Shrub-3	7186	0.23	6.15	0.13	39	7.5	Medium	No
CSP-Scrub/Shrub-4	2609	0.22	7.16	0.14	43	9.3	High	Yes

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Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
CSP-Unknown-1	6186	0.25	2.63	0.13	40	3.4	Low	No
CSP-Unknown-2	744	0.27	3.49	0.13	39	4.8	Low	No
CSP-Unknown-3	350	0.28	3.32	0.13	38	4.5	Low	No
CSP-Unknown-4	78	0.28	3.26	0.13	40	4.5	Low	No
FB-Agricultural/Grass-1	6103	0.25	5.49	0.14	49	9.2	High	No
FB-Agricultural/Grass-2	7205	0.25	5.87	0.14	51	10.1	High	No
FB-Agricultural/Grass-3	6730	0.24	6.43	0.14	53	11.3	High	No
FB-Agricultural/Grass-4	2586	0.22	8.62	0.14	57	15.2	High	No
FB-Developed-1	10116	0.28	3.94	0	46	0	Low	No
FB-Developed-2	9075	0.28	4.41	0	45	0	Low	No
FB-Developed-3	5499	0.27	4.72	0	44	0	Low	No
FB-Developed-4	785	0.27	5.08	0	43	0	Low	No
FB-Forest-1	3780	0.21	7.24	0.13	39	8.0	Medium	No
FB-Forest-2	7059	0.21	7.53	0.13	43	8.8	High	No
FB-Forest-3	13753	0.22	8.02	0.13	43	9.7	High	No
FB-Forest-4	8899	0.26	9.63	0.13	35	11.5	High	No
FB-Other-1	172	0.26	5.72	0.13	44	8.6	High	No
FB-Other-2	75	0.26	5.97	0.13	38	7.7	Medium	No
FB-Other-3	76	0.28	6.27	0.13	34	7.6	Medium	No
FB-Other-4	36	0.31	6.70	0.13	33	8.6	High	No
FB-Scrub/Shrub-1	10297	0.24	6.94	0.14	36	8.3	Medium	No
FB-Scrub/Shrub-2	25150	0.25	7.24	0.14	38	9.0	High	No
FB-Scrub/Shrub-3	70895	0.25	7.89	0.13	38	10.0	High	No

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Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FB-Scrub/Shrub-4	70679	0.26	9.05	0.14	39	12.1	High	No
FB-Unknown-1	654	0.30	5.33	0.13	37	7.6	Medium	No
FB-Unknown-2	829	0.29	5.26	0.13	40	7.9	Medium	No
FB-Unknown-3	1062	0.29	5.54	0.13	39	8.2	Medium	No
FB-Unknown-4	299	0.28	6.02	0.13	38	8.4	High	No
FSI-Agricultural/Grass-1	8462	0.32	3.91	0.13	24	3.9	Low	No
FSI-Agricultural/Grass-2	4979	0.33	4.29	0.13	31	5.7	Medium	No
FSI-Agricultural/Grass-3	4808	0.34	4.26	0.13	34	6.3	Medium	No
FSI-Agricultural/Grass-4	1055	0.35	4.11	0.13	36	6.7	Medium	No
FSI-Developed-1	9953	0.29	3.09	0	34	0	Low	No
FSI-Developed-2	4972	0.31	3.22	0	37	0	Low	No
FSI-Developed-3	3350	0.29	3.30	0	36	0	Low	No
FSI-Developed-4	763	0.28	3.31	0	37	0	Low	No
FSI-Forest-1	186	0.33	4.62	0.13	37	7.2	Medium	No
FSI-Forest-2	217	0.35	4.47	0.13	39	7.9	Medium	No
FSI-Forest-3	262	0.37	4.71	0.13	40	9.2	High	No
FSI-Forest-4	111	0.36	4.73	0.13	40	9.2	High	No
FSI-Other-1	266	0.31	3.11	0.13	24	2.9	Low	No
FSI-Other-2	81	0.30	3.29	0.13	25	3.1	Low	No
FSI-Other-3	56	0.31	3.04	0.13	27	3.2	Low	No
FSI-Other-4	15	0.29	3.57	0.13	33	4.4	Low	No
FSI-Scrub/Shrub-1	2241	0.27	4.46	0.13	29	4.5	Low	No
FSI-Scrub/Shrub-2	3911	0.28	4.96	0.13	31	5.7	Medium	No

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Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FSI-Scrub/Shrub-3	7590	0.29	5.05	0.13	34	6.3	Medium	No
FSI-Scrub/Shrub-4	3502	0.30	5.14	0.13	37	7.5	Medium	No
FSI-Unknown-1	1117	0.29	2.83	0.13	27	3.0	Low	No
FSI-Unknown-2	780	0.30	3.44	0.13	32	4.3	Low	No
FSI-Unknown-3	855	0.29	3.41	0.13	31	4.0	Low	No
FSI-Unknown-4	285	0.28	3.21	0.13	32	3.7	Low	No
FSP-Agricultural/Grass-1	13	0.22	2.22	0.13	40	2.5	Low	No
FSP-Agricultural/Grass-2	3	0.22	2.59	0.13	40	3.0	Low	No
FSP-Agricultural/Grass-3	2	0.22	2.69	0.13	40	3.2	Low	No
FSP-Agricultural/Grass-4	0	0.20	2.94	0.12	40	2.9	Low	No
FSP-Developed-1	180	0.26	2.85	0	40	0	Low	No
FSP-Developed-2	13	0.25	2.69	0	40	0	Low	No
FSP-Developed-3	8	0.21	2.25	0	40	0	Low	No
FSP-Developed-4	0	0.21	2.29	0	40	0	Low	No
FSP-Forest-1	8	0.22	2.29	0.14	40	2.9	Low	No
FSP-Forest-2	5	0.20	2.22	0.14	40	2.5	Low	No
FSP-Forest-3	0	0.20	2.22	0.14	40	2.5	Low	No
FSP-Other-1	1307	0.20	2.38	0.14	40	2.7	Low	No
FSP-Other-2	34	0.21	2.36	0.14	40	2.7	Low	No
FSP-Other-3	8	0.22	2.56	0.13	40	3.0	Low	No
FSP-Other-4	0	0.43	4.35	0.12	40	9.3	High	No
FSP-Scrub/Shrub-1	147	0.23	2.68	0.14	40	3.3	Low	No
FSP-Scrub/Shrub-2	18	0.23	2.55	0.14	40	3.3	Low	No

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Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
FSP-Scrub/Shrub-3	4	0.20	2.23	0.14	40	2.6	Low	No
FSP-Scrub/Shrub-4	0	0.20	1.70	0.12	40	1.7	Low	No
FSP-Unknown-1	40	0.20	1.87	0.13	40	1.9	Low	No
FSP-Unknown-2	5	0.20	1.99	0.12	40	2.0	Low	No
FSP-Unknown-3	1	0.20	2.39	0.12	40	2.4	Low	No
O-Agricultural/Grass-1	2433	0.20	2.93	0.14	34	2.8	Low	No
O-Agricultural/Grass-2	112	0.21	3.44	0.14	32	3.2	Low	No
O-Agricultural/Grass-3	30	0.23	3.89	0.13	32	3.8	Low	No
O-Agricultural/Grass-4	1	0.26	6.47	0.13	37	7.9	Medium	No
O-Developed-1	8327	0.27	1.37	0	39	0	Low	No
O-Developed-2	474	0.25	2.12	0	40	0	Low	No
O-Developed-3	157	0.26	3.07	0	41	0	Low	No
O-Developed-4	26	0.24	3.89	0	41	0	Low	No
O-Forest-1	235	0.22	6.15	0.13	43	7.6	Medium	No
O-Forest-2	67	0.21	5.07	0.13	45	6.6	Medium	No
O-Forest-3	45	0.21	5.43	0.13	47	7.3	Medium	No
O-Forest-4	20	0.20	5.95	0.13	59	9.0	High	No
O-Other-1	9362	0.25	3.86	0.13	36	4.3	Low	No
O-Other-2	344	0.24	3.32	0.13	35	3.5	Low	No
O-Other-3	120	0.23	4.86	0.13	35	5.0	Low	No
O-Other-4	37	0.22	5.64	0.13	39	6.6	Medium	No
O-Scrub/Shrub-1	688	0.22	4.83	0.13	40	5.7	Medium	No
O-Scrub/Shrub-2	224	0.22	5.80	0.13	36	6.3	Medium	No

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Geomorphic Landscape Unit (GLU)	Area (acres)	K	LS	C	R	A	Relative Sediment Production	Critical Coarse Sediment
O-Scrub/Shrub-3	209	0.22	6.47	0.13	41	7.5	Medium	No
O-Scrub/Shrub-4	96	0.22	6.62	0.13	44	8.2	Medium	No
O-Unknown-1	1236	0.28	1.60	0.12	26	1.5	Low	No
O-Unknown-2	62	0.27	1.48	0.13	36	1.8	Low	No
O-Unknown-3	15	0.29	3.52	0.13	38	4.9	Low	No
O-Unknown-4	7	0.34	3.87	0.12	40	6.6	Medium	No

GLU Nomenclature: Geology – Land Cover – Slope Category

Geology Categories:

CB Coarse Bedrock

CSI Coarse Sedimentary Impermeable

CSP Coarse Sedimentary Permeable

FB Fine Bedrock

FSI Fine Sedimentary Impermeable

FSP Fine Sedimentary Permeable

O Other

Slope Categories:

1 0%-10%

2 10% - 20%

3 20% - 40%

4 > 40%

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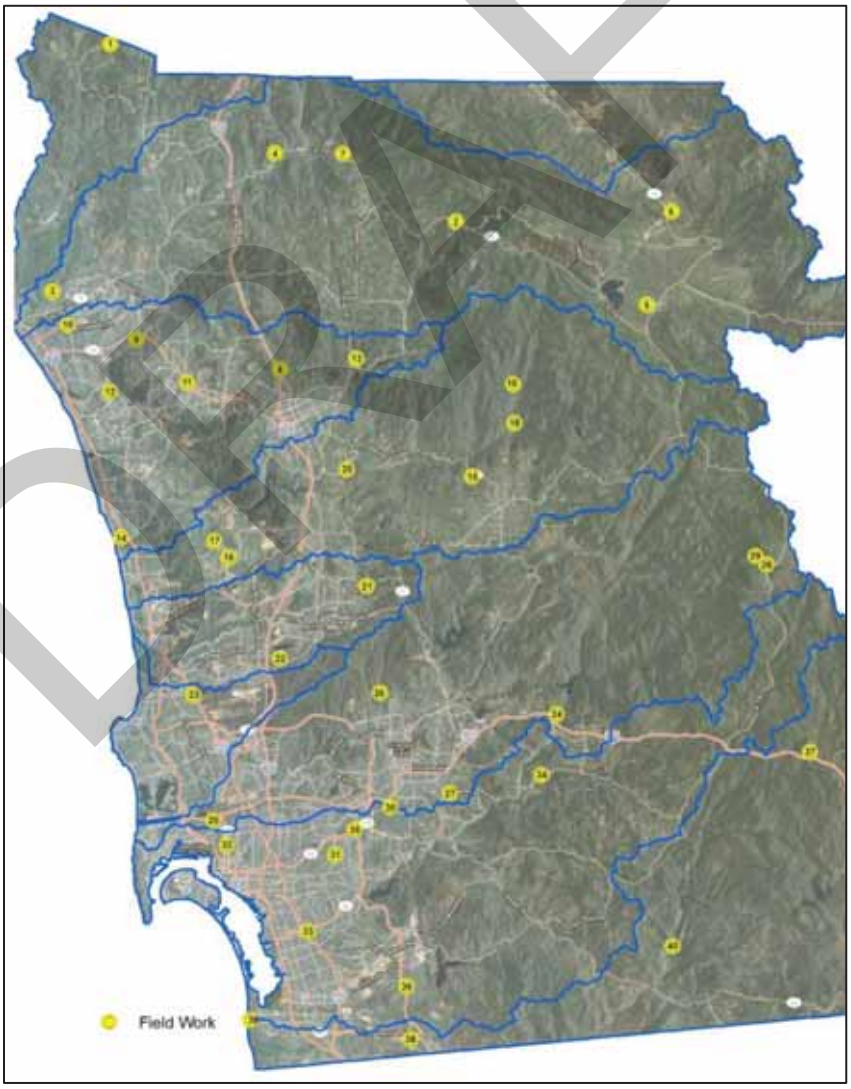
A4.3 Field Assessment

Site Selection:

Forty locations were selected from the study region for field assessment. Sites were selected such that they are accessible by existing road network based on review of satellite imagery and are uniformly distributed considering the following criteria:

- Geologic grouping
- Land cover
- Slope category
- WMA
- Jurisdiction

Yellow circles in the figure below shows the 40 locations for which field assessment was performed.



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Pre-Field Activities

Prior to conducting field activities, the consultant team reviewed available published geologic information at each site location and prepared satellite imagery of each site using Google Earth™. Pre-field activities consisted of evaluating site access at each location using aerial imagery and logistics were coordinated based on regional site location to maximize field efficiency.

Site Reconnaissance

Site reconnaissance was performed at forty locations between 22 January and 7 February 2014 by a team of geologists. The reconnaissance consisted of:

- Visual soil classification,
- Assessing existing vegetative cover (0-100%),
- Qualitative assignment of existing sediment production (low, medium, and high) [based on existing vegetative cover],
- Qualitative assignment of potential sediment production (low, medium, and high)[assuming there is 0% vegetative cover], and
- Identifying existing erosional features.

Descriptions and visual classifications of the surficial materials were based on the Unified Soil Classification System (USCS). Underlying geologic units were confirmed where exposed formations were observed within the individual site limits.

SITE AND GEOLOGIC CONDTIONS

Our knowledge of the site conditions has been developed from a review of available geologic literature, previous geologic and geotechnical investigations by the consultant team in the study region, professional experience, site reconnaissance, and field investigations performed for this study.

Surface Conditions

Site locations were sited in open space with the exception of sites ID-27, -30, and -31 which were situated within developed areas with paved streets and sidewalks. The surface conditions at the site locations were characterized by sloping terrain varying from relatively flat (< 5%) to very steep slopes (> 40%). At the time of our reconnaissance the natural hillsides along the areas of interest were covered by varying degrees of moderate to dense growth scrub brush, low grasses, and scattered trees.

Existing erosional and geomorphic features at each site location were identified where possible. The observed erosional features included notable drainages, rilling, scour, and sediment accumulation. Observed geomorphic features included areas of minor slope instability and surficial slumping. Several sources of ground disturbance were identified during the site reconnaissance included active grading operations and bioturbation.

An evaluation of the existing and potential sediment production for each site was determined based on surface conditions. Sediment production was assigned as “high, medium, or low” based on the existing conditions and consultant team’s professional experience.

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Surficial Deposits

Surficial deposits, including topsoil, alluvium, colluvium, slopewash, and residual soils are present in portions of the study area within the natural drainages and mantling the slope areas. The composition and grain size of these materials are variable depending on the age, parent sources, and mode of deposition.

Geologic Conditions

Our knowledge of the subsurface conditions at the site locations is based on a review of available published geologic information, professional experience, site reconnaissance, previous explorations and geotechnical investigations performed by the consultant team in the study region.

DRAFT

Field Assessment Photo Log

Field Visit ID-1

GLU: CB-Scrub/Shrub-4

View: Looking southwest

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 90%

Field Visit ID-2

GLU: CB-Forest-4

View: Looking north

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

DRAFT

Field Visit ID-3

GLU: CSI-Agricultural/ Grass-3

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover:

95-100%

Field Visit ID-4

GLU: CSI-Scrub/Shrub-2

View: Looking north

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 70%

DRAFT

Field Visit ID-5

GLU: CSP-Agricultural/ Grass-1

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 90%

Field Visit ID-6

GLU: CSP-Agricultural/ Grass-3

View: Looking east

Existing sediment production: Low to Med

Potential sediment production:

Low to Med

Existing veg. cover:
Southeast slope ~50%

Northeast slope ~70%

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Field Visit ID-7

GLU: CSP-Forest-3

View: Looking east

Existing sediment production: Med to High

Potential sediment production: High

Existing veg. cover: 75-80%

Field Visit ID-8

GLU: CB-Scrub/Shrub-3

View: Looking southeast

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 90-95%

DRAFT

Field Visit ID-9

GLU: CB-Agricultural/ Grass-2

View: Looking northwest

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 70%

Field Visit ID-10

GLU: CSI-Unknown-2

View: Looking north

Existing sediment production: Med to High

Potential sediment production: High

Existing veg. cover: 75%

DRAFT

Field Visit ID-11

GLU: CSI-Agricultural/ Grass-2

View: Looking east

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 85%

Field Visit ID-12

GLU: CSP-Unknown-2

View: Looking southwest

Existing sediment production: Low

Potential sediment production:

Low to Med

Existing veg. cover: 50%

DRAFT

Field Visit ID-13

GLU: CSP-Scrub/Shrub-2

View: Looking southeast

Existing sediment production: Med

Potential sediment production:

Med to High

Existing veg. cover: 80-85%

Field Visit ID-14

GLU: FSP-Scrub/Shrub-1

View: Looking northeast

Existing sediment production: Low

Potential sediment production:

Low to Med

Existing veg. cover:

95-100%

DRAFT

Field Visit ID-15

GLU: CB-Agricultural/ Grass-4

View: Looking west

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

.

Field Visit ID-16

GLU: CB-Agricultural/ Grass-3

View: Looking south

Existing sediment production: High*

Potential sediment production: High

Existing veg. cover: 90-95%

* Area was burned in 2014 fires after the field assessment so existing sediment production was adjusted to High (based on potential sediment production) from Medium

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Field Visit ID-17

GLU: CSI-Scrub/Shrub-4

View: Looking west

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 95%

Field Visit ID-18

GLU: CSP-Forest-1

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 80%

DRAFT

Field Visit ID-19

GLU: CSP-Scrub/Shrub-3

View: Looking southwest

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 60%

Field Visit ID-20

GLU: CSP-Unknown-1

View: Looking southeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 95%

DRAFT

Field Visit ID-21

GLU: CB-Unknown-3

View: Looking northwest

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 50-60%

Field Visit ID-22

GLU: CSI-Forest-3

View: Looking east

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 60%

DRAFT

Field Visit ID-23

GLU: CSI-Scrub/Shrub-1

View: Looking north

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 80%

Field Visit ID-24

GLU: CB-Unknown-4

View: Looking northeast

Existing sediment production: Low to Med

Potential sediment production: High

Existing veg. cover: 80%

DRAFT

Field Visit ID-25

GLU: CSI-Agricultural/ Grass-4

View: Looking east

Existing sediment production: Low

Potential sediment production: Med-High

Existing veg. cover: 95%

Field Visit ID-26

GLU: CSI-Scrub/Shrub-3

View: Looking east

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 100%

.

DRAFT

Field Visit ID-27

GLU: CSP-Developed-2

View: Looking north

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 30-35%

.

Field Visit ID-28

GLU: CSP-Agricultural/ Grass-2

View: Looking north

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 90-95%

.

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Field Visit ID-29

GLU: FB-Forest-3

View: Looking northwest

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 80-85%

Field Visit ID-30

GLU: CB-Developed-4

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 70%

.

DRAFT

Field Visit ID-31

GLU: CSI-Developed-3

View: Looking north

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 30-35%

Field Visit ID-32

GLU: CSI-Unknown-3

View: Looking west

Existing sediment production: Low to Med

Potential sediment production: Med

Existing veg. cover: 70-75%

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Field Visit ID-33

GLU: CSP-Scrub/Shrub-1

View: Looking northeast

Existing sediment production: Low to Med

Potential sediment production:

Med to High

Existing veg. cover: 70%

Field Visit ID-34

GLU: CSP-Developed-2

View: Looking south

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 95%

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Field Visit ID-35

GLU: FB-Scrub/Shrub-3

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 90-95%

Field Visit ID-36

GLU: FSI-Agricultural/ Grass-2

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 95%

DRAFT

Field Visit ID-37

GLU: CB-Forest-3

View: Looking southeast

Existing sediment production: Med-High

Potential sediment production: High

Existing veg. cover: 75-80%

Field Visit ID-38

GLU: CSI-Agricultural/ Grass-1

View: Looking northeast

Existing sediment production: Low

Potential sediment production: Med

Existing veg. cover: 85%

DRAFT

Field Visit ID-39

GLU: CSP-Developed-1

View: Looking west

Existing sediment production: Low

Potential sediment production: Low

Existing veg. cover: 30-35%

Field Visit ID-40

GLU: CSP-Scrub/Shrub-4

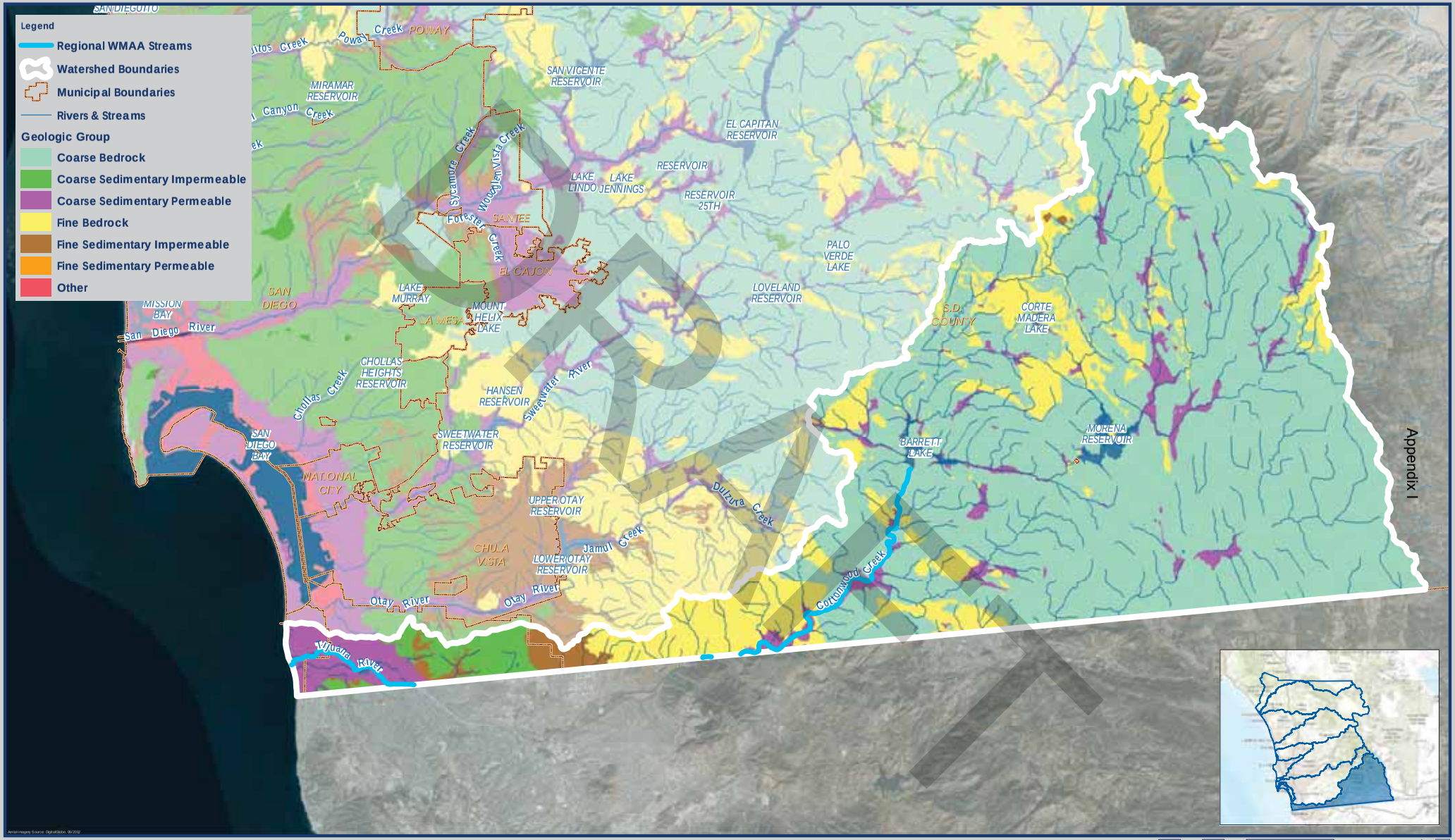
View: Looking south

Existing sediment production: Med

Potential sediment production: High

Existing veg. cover: 90-95%

DRAFT

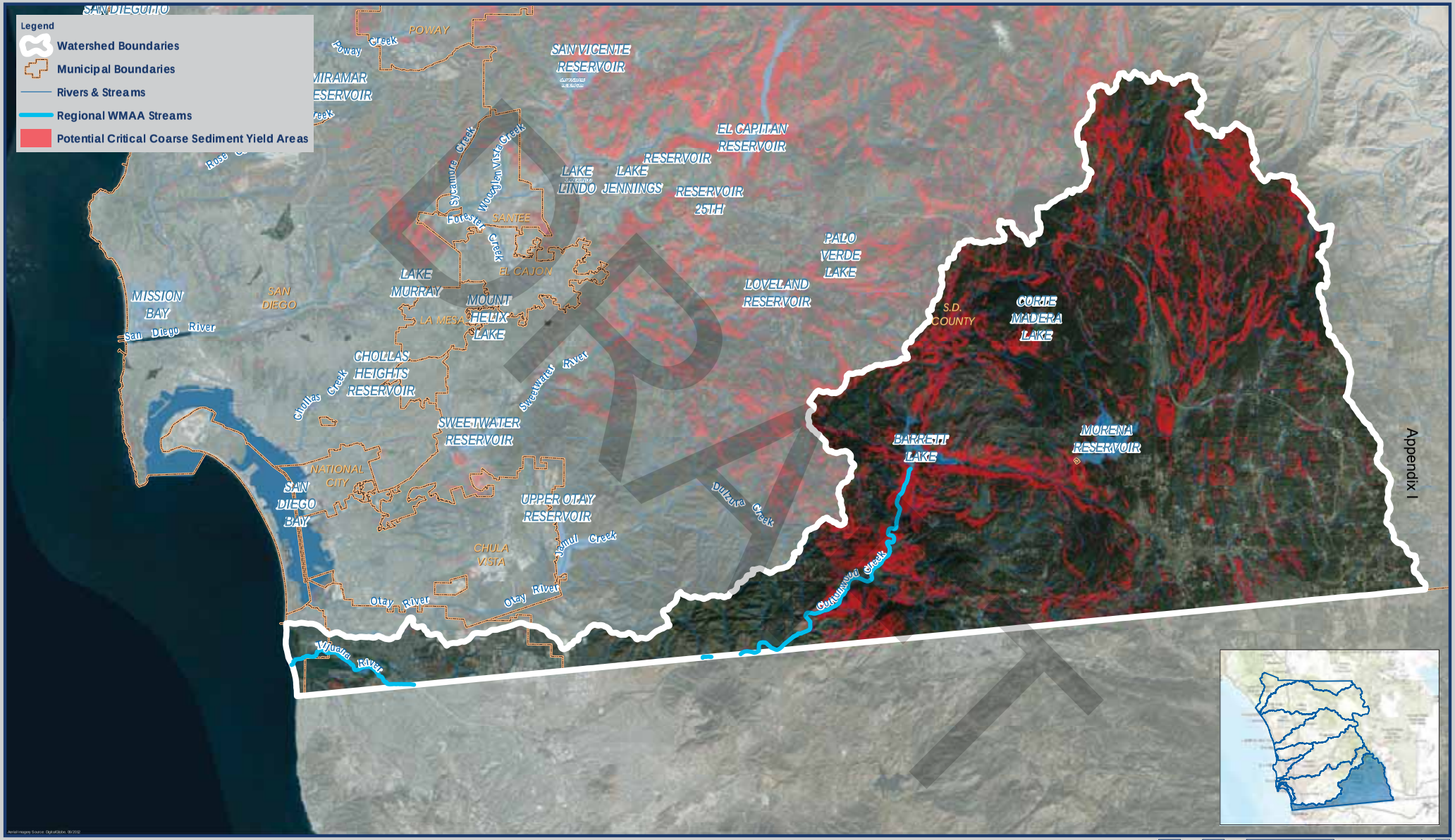


Geologic Group

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

Appendix I



Potential Critical Coarse Sediment Yield Areas

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

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ATTACHMENT A.5
PHYSICAL STRUCTURES

DRAFT

A.5 Physical Structures

The desktop-level analysis to identify existing physical structures within the nine watershed management areas within the San Diego region utilized the following GIS data sources:

- ESRI ArcMap, Google Earth, and Google Maps products
- Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) Flood Profiles and FEMA Flood Insurance Rate Map (FIRM)
- National Flood Hazard Layer (NFHL)
- Municipal master drainage plans (as provided)
- San Diego Geographic Information Source (SanGIS) Municipal Boundaries and Hydrologic Basins
- United States Geological Survey (USGS) National Hydrography Dataset (NHD) California data
- Stream data generated as indicated in Section 2.2

The following documents the process used to identify the physical structures along the reaches and the resulting GIS data:

- The process began by importing the data sources indicated above into a single ArcMap document that served as a master map file from which all further analysis proceeded.
- The data were screened and selected for inclusion as appropriate to the project scope.
- Point features were placed along river reach line segments to coincide with visually identified structures, utilizing different feature symbols according to the type of infrastructure.
- In the case of levees, the point was placed at the downstream-most end of the FEMA NFHL Shapefile. All point features generated in this task appear in the GIS shapefile.
- Municipal boundaries intersecting river reaches were identified to identify the applicable municipal drainage plan data.
- Point feature attributes and associated information for Physical Structures GIS shapefile is indicated in Table A.5.1 below.

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Table A.5.1: Structure Identification Point Feature Attribute Development and Information

Attribute	Description
Struct_ID	The Structure ID field provides a six-digit identification number based upon the structure's specific location within a watershed. The first three digits in the code reflect the structure's Hydrologic Unit (HU) Basin number (ranging between 902-911 for Region 9, as defined in the Water Quality Control Plan for the San Diego Basin). The subsequent three digits reflect the structure's location along the reach, ascending along the channel from the headwaters to tailwaters (ranging between 001-999, beginning at the confluence and increasing in the upstream direction).

Attribute	Description
WMA	The Watershed Management Area field provides the name of the watershed in which the structure exists. The WMA corresponds with the HU identified in the first three digits in the Struct_ID (e.g., 911, Tijuana Watershed).
Channel_ID	The Channel ID field provides the name of the channel in which the structure exists.
Struct_Typ	The Structure Type field classifies known structures as one of the following types:, Bridge, Culvert, Dam, Energy Dissipater, Flood Management Basin, Flood Wall, Grade Control, Levee, Pipeline, Weir.
Struct_Dtl	The Structure Detail field provides known quantitative information for multi-section culverts.
Struct_Mtl	The Structure Material field provides known qualitative information for structure material composition.
Struct_Shp	The Structure Shape field provides known geometric information for culvert shapes, and is classified as one of the following types: Arch, Box, Pipe.
Jurisd_ID	The Jurisdiction ID field, when applicable, provides the known separate structure identification number developed and utilized by the jurisdiction or entity responsible for creating and distributing the coinciding structure Shapefile data used for this analysis. This number was copied from the coinciding external Shapefile data attribute field best representing a unique jurisdiction or entity-based identification number (external Shapefile data received from regional WMAA data call; for jurisdictional information, see "Other" attribute field). Coinciding external Shapefile data was used to determine various structure attributes.
Plan_ID	The Plan ID field, when applicable, provides the known structure plan number corresponding with the Jurisdiction ID. This number was copied from the coinciding external Shapefile data attribute field best representing a unique plan number received from the regional WMAA data call (external Shapefile data received from regional WMAA data call; for jurisdictional information, see "Other" field). Coinciding external Shapefile data was used to determine various structure attributes.
Diameter	The Diameter field, when applicable, provides the known diameter (in US feet) for culverts.
Length	The Length field, when applicable, provides the known length (in US feet) for select structure types. When lengths were determined using FEMA FIS Flood Profiles, the scaled horizontal distances along the indicated roadway or channel slope were used.
Width	The Width field, when applicable, provides the known width (in US feet) for select structure types.
Height	The Height field, when applicable, provides the known height (in US feet) for select structure types. When heights were determined using FEMA FIS Flood Profiles, the scaled vertical distances from channel bed to indicated roadway bottom were used.
US_Invert	The Upstream Invert field, when applicable, provides the known upstream invert elevation (in US feet) for select structure types.
DS_Invert	The Downstream Invert field, when applicable, provides the known downstream invert elevation (in US feet) for select structure types.

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Attribute	Description
RD_EL_NAVD	The Roadway Elevation (NAVD) field, when applicable, provides the known roadway elevation (in US feet, NAVD) for select structure types. When roadway elevations were determined using FEMA FIS Flood Profiles, the horizontal projection onto the vertical grid scales were used.
Loc_Descr	The Location Description field, when applicable, provides information for structures crossing a known roadway. In nearly all cases, Google Earth imagery was used to determine the roadway name.
Other	The Other field is used to convey any information not present within the preceding fields. Typically, "other" information includes jurisdictional, plan, and supplemental dimensions for a given structure.

Example Structure Identification

The following example demonstrates the structure identification process for a discrete structure (ID 907029) along the San Diego River. The San Diego River is located in the San Diego River watershed (WMA 907). Scanning the river from lower to higher reached, a new point feature was placed at the road crossing over the San Diego River as indicated in Figure A.5.1. Select attributes of this particular structure were available from the FEMA NFHL as displayed in the highlighted boxes in Figure A.5.1. Additional attributes such as the culvert height, length, roadway elevation, and name were also determined from the FIS Flood Profile as indicated in Figure A.5.2. Satellite imagery (e.g., Google) was used to verify the existence of structure. In this case, the most current Google Map data indicated that the culvert still exists and that the roadway name has been changed to Qualcomm Way. When structures could not be verified with satellite imagery, the structure identification was based solely upon the information provided or readily available and was not physically verified in the field. Figure A.5.3 displays an example of imagery used to identify structures.

DRAFT

Figure A.5.1: Typical ArcMap Window

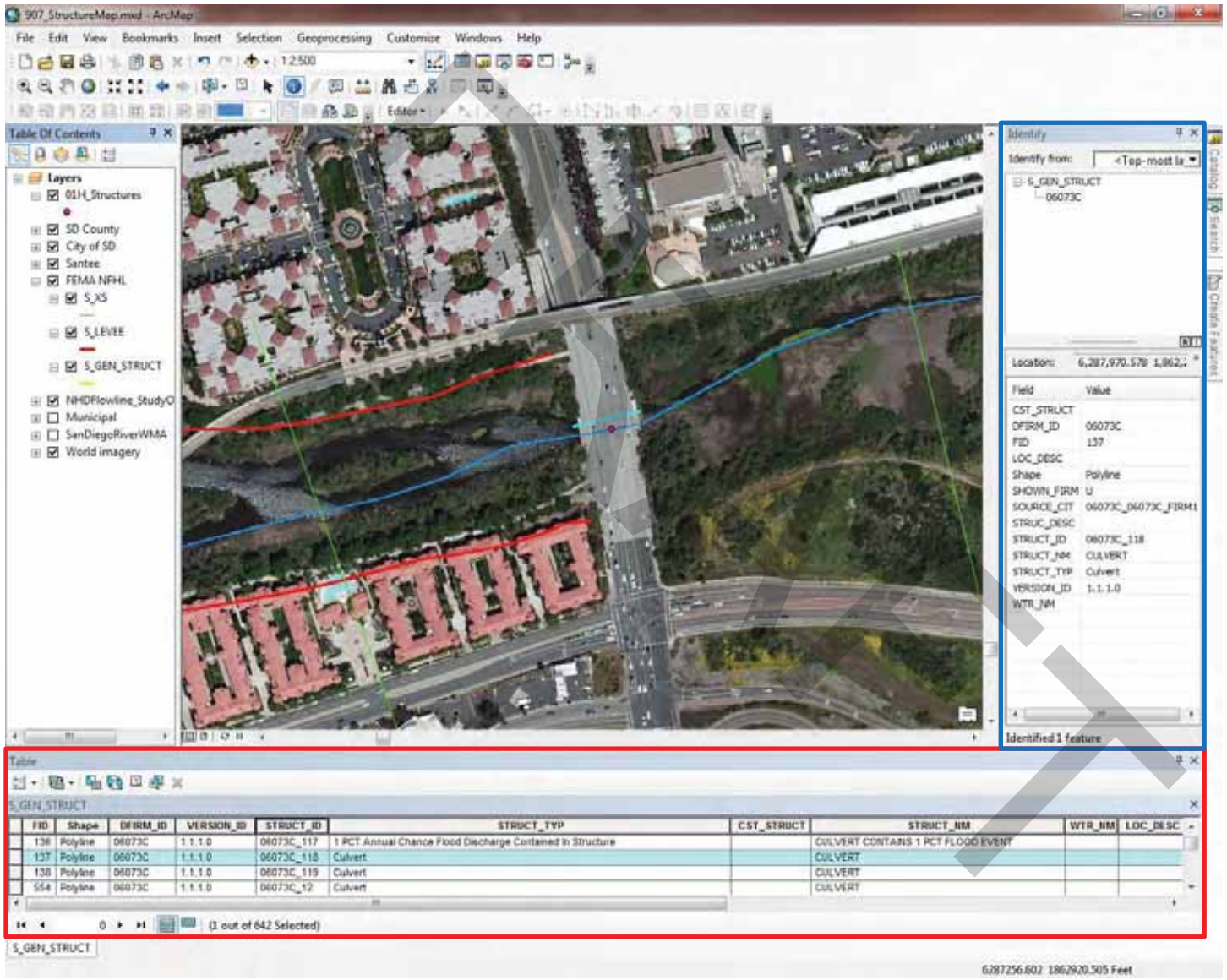
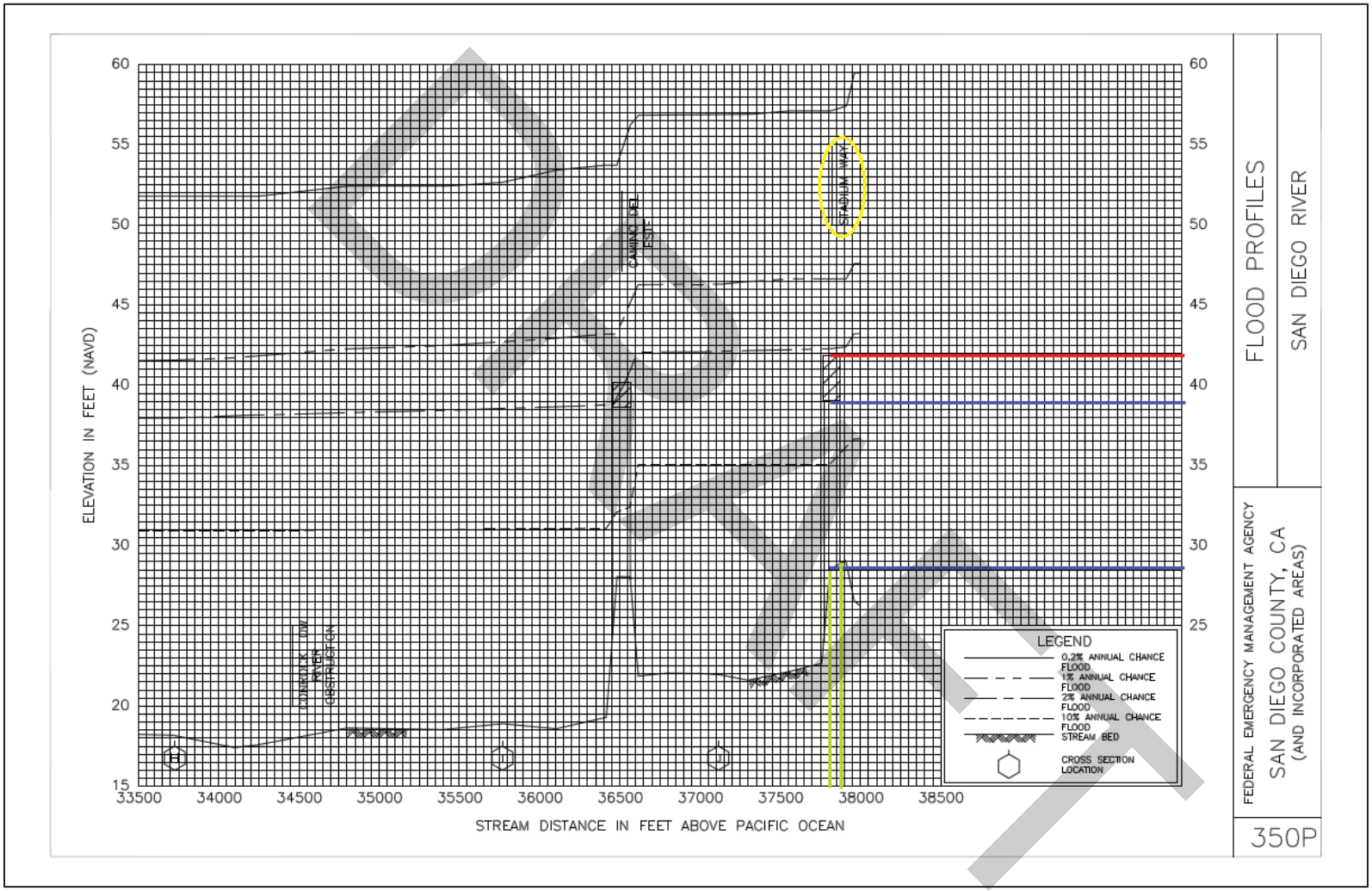


Figure A.5.2: Typical FEMA FIS Flood Profile



Legend: roadway elevation (red), roadway name (yellow), culvert height (blue), culvert width (green)

Figure A.5.3: Google Map Imagery for Structure Identification

The following bridge structure dimensional attributes were included in the point feature attributes:

- length 110 feet
- height 10 feet
- roadway elevation 41.9 feet

The attribute table associated with the identified structure included in the GIS shapefile is indicated in Table A.5.2.

Table A.5.2: Structure 907029 Attribute Table

Attribute	Description
Struct_ID	907029
WMA	San Diego
Channel_ID	San Diego River
Struct_Typ	Culvert
Struct_Dtl	
Struct_Mtl	
Struct_Shp	
Jurisd_ID	06073C_118
Plan_ID	06073C_06073C_FIRM1
Diameter	0
Length	110
Width	0
Height	10
US_Invert	0
DS_Invert	0
RD_EL_NAVD	41.9
Loc_Descr	Qualcomm Way
Other	Info from FEMA NFHL shapefile data/FIS FP V.9-350P

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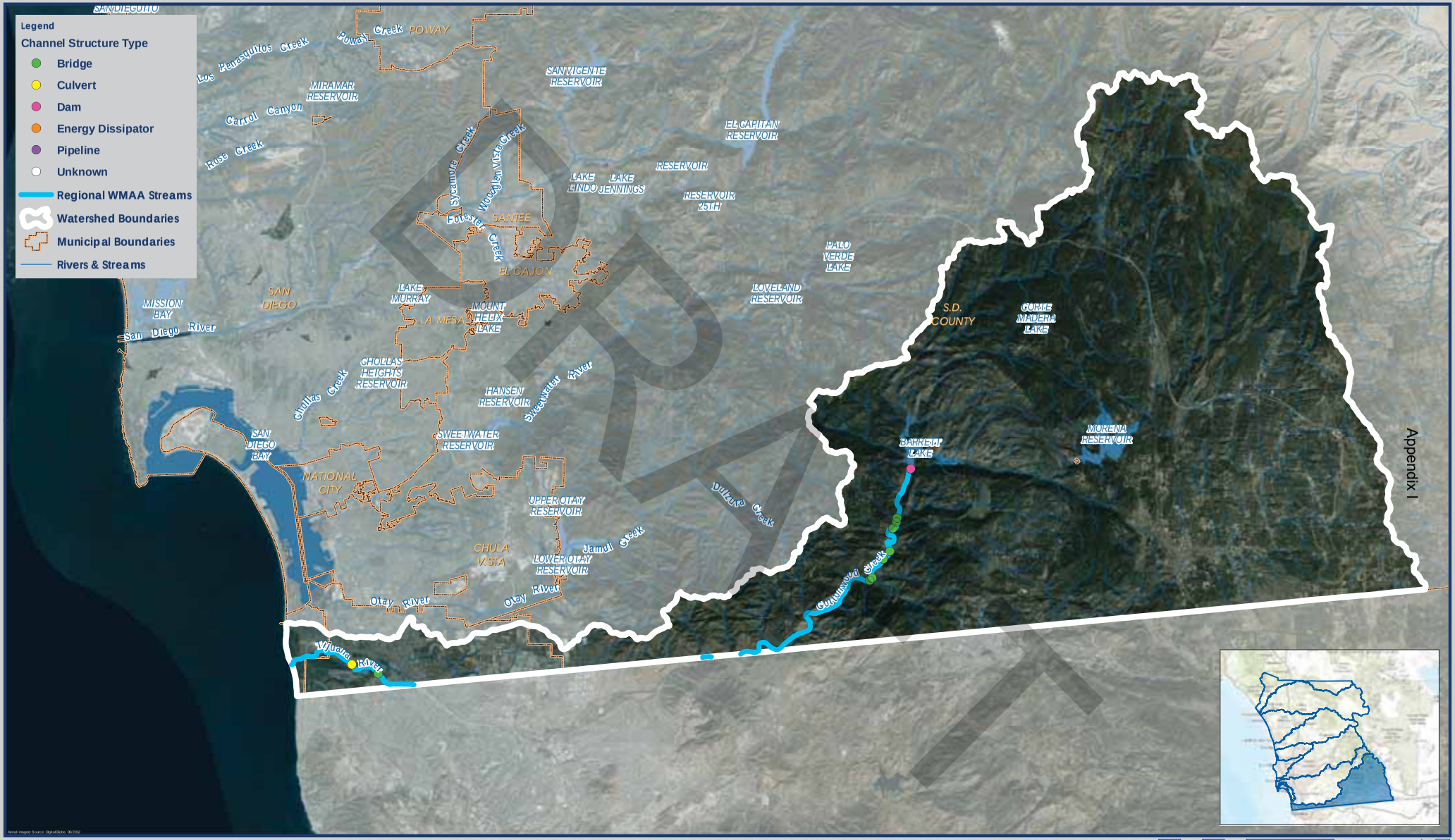

Watershed Management Area Streams with Channel Structures

Tijuana Watershed - HU 911.00, 467 mi2

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

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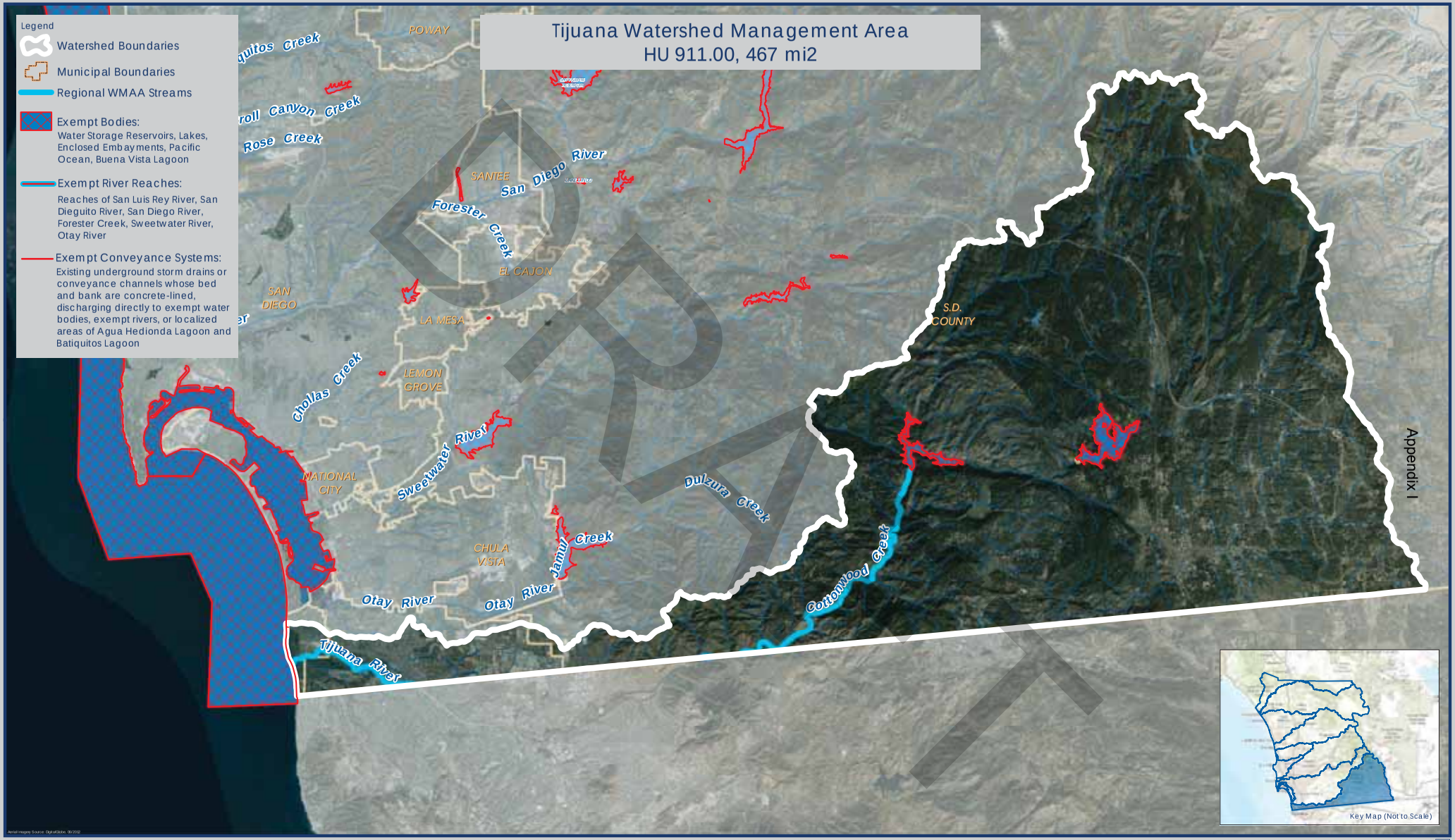
ATTACHMENT B
HYDROMODIFICATION MANAGEMENT EXEMPTION MAPPING

DRAFT



Appendix I

Receiving Waters and Conveyance Systems Exempt from Hydromodification Management Requirements

Exhibit Date: Sept. 8, 2014

Geosyntec consultants

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ATTACHMENT C
ELECTRONIC FILES

DRAFT

Electronic Folder titled "Tijuana_WMAA_Attachment C Electronic_Data.zip" Contents:

1. ArcMap 10.0 and 10.1 map files created for purpose of viewing Regional WMAA data
   - WMAA_09_Tijuana_Data_2014_0908_v10.mxd
   - WMAA_09_ Tijuana _Data_2014_0908_v101.mxd
2. ESRI Geodatabase titled " WMAA_09_ Tijuana _Data_2014_0908_v10.gdb" containing the following data:
   - WatershedBoundaries
     - Watershed_Boundaries
   - HydrologicProcesses
     - HRUAnalysis
   - Streams – description of existing streams in the watershed
     - SD_Regional_WMAA_Streams (streams selected for detailed analysis)
     - SD_NHD_Streams (portion of NHD dataset included for reference)
   - LandUsePlanning
     - SanGIS_ExistingLandUse
     - SanGIS_PlannedLandUse
     - SanGIS_DevelopableLands
     - SanGIS_RedevelopmentandInfill
     - SanGIS_MunicipalBoundaries
     - Federal_State_Indian_Lands
     - SanGIS_MHPA_SD
     - SanGIS_MSCP_CN
     - SanGIS_MSCP_EAST_DRAFT_CN
     - SanGIS_Draft_North_County_MSCP_Version_8_Categories
   - PotentialCoarseSedimentYield
     - GLUAnalysis
     - PotentialCoarseSedimentYieldAreas
     - MacroLevelPotentialCriticalAreas
     - PotentialCriticalCoarseSedimentYieldAreas
   - ChannelStructures
     - ChannelStructures
   - HydromodExemptions
     - Exempt_Systems
     - Exempt_Bodies
   - Floodplains: included for reference
     - FEMA_NFHL
   - Baselayers: included for reference
     - SanGIS_Lakes
     - link to ESRI World Imagery (internet connection is required to access ESRI World Imagery basemap)

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Electronic Folder titled "Mission Bay La Jolla _WMAA_Attachment C Electronic_Data.zip" Contents, continued:

3. Google Earth – KMZ file titled: "WMAA_09_ Tijuana _Data_2014_0908_GoogleEarth.kmz"**,** containing the following data:
   - WatershedBoundaries
   - Streams
     - SD Regional WMAA Streams (streams selected for detailed analysis)
     - SD NHD Streams (portion of NHD dataset included for reference)
   - LandUsePlanning
     - Municipal Boundaries
     - Federal/State/Indian Lands
   - ChannelStructures
   - HydromodExemptions
     - Exempt_Systems
     - Exempt_Bodies
   - Floodplains: included for reference
     - FEMA Floodplain
   - Dominant Hydrologic Processes
   - Potential Critical Coarse Sediment Yield Areas

Notes:

- Open a map file (with extension .mxd) using ArcMap to view the data.
- All data contained in the geodatabase is loaded into the map.

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ATTACHMENT D
REGIONAL MS4 PERMIT CROSSWALK

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Table below provides a linkage between the Regional MS4 Permit requirements for WMAA and this report.

Regional MS4 Permit Provision	Regional WMAA Report
B.3.b.(4)(a)	Chapter 2; Section 5.1; Attachment A and Attachment C
B.3.b.(4)(a)(i)	Section 2.1; Attachment A.1 and Attachment C
B.3.b.(4)(a)(ii)	Section 2.2; Attachment A.2 and Attachment C
B.3.b.(4)(a)(iii)	Section 2.3; Attachment A.3 and Attachment C
B.3.b.(4)(a)(iv)	Section 2.4; Attachment A.4 and Attachment C
B.3.b.(4)(a)(v)	Section 2.5; Attachment A.5 and Attachment C
B.3.b.(4)(b)	Chapter 3 and Section 5.2
B.3.b.(4)(c)	Chapter 4; Section 5.3; Attachment B and Attachment C

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Appendix I

Tijuana River Watershed Management Area Analysis

Lake Henshaw

September 8, 2014

Prepared for:
San Diego County Copermittees

Prepared by:

Geosyntec consultants
engineers | scientists | innovators

RICK ENGINEERING COMPANY

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ACRONYMS AND ABBREVIATIONS

%	percent
>	greater than
<	less than
BMP	Best Management Practice
CB	Coarse Bedrock
CEG	Certified Engineering Geologist
CIP	Capital Improvement Project
CLRP	Comprehensive Load Reduction Plan
CSI	Coarse Sedimentary Impermeable
CSP	Coarse Sedimentary Permeable
E_P	Erosion Potential
ET	Evapotranspiration
FB	Fine Bedrock
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FSI	Fine Sedimentary Impermeable
FSP	Fine Sedimentary Permeable
GIS	Geographic Information System
GLU	Geomorphic Landscape Unit
HA	Hydrologic Area
HCP	Hydromodification Control Plan
HMP	Hydromodification Management Plan
HRU	Hydrologic Response Unit
HSA	Hydrologic Sub Area
HSG	Hydrologic Soil Group
IRWM	Integrated Regional Water Management
JURMP	Jurisdictional Urban Runoff Management Plan
LDW	Land Development Workgroup
LID	Low Impact Development
MAP	Mean Annual Precipitation

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ACRONYMS AND ABBREVIATIONS continued

MHPA	Multiple Habitat Planning Area
MS4	Municipal Separate Storm Sewer System
MSCP	Multiple Species Conservation Program
NED	National Elevation Dataset
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
PDP	Priority Development Project
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe
SCAMP	Southern California Aerial Mapping Project
SCCWRP	Southern California Coastal Water Research Project
SD	San Diego
SDRWQCB	San Diego Regional Water Quality Control Board
S_P	Sediment Supply Potential
SSURGO	Soil Survey Geographic Database
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
WMA	Watershed Management Area
WMAA	Watershed Management Area Analysis
WQIP	Water Quality Improvement Plan
WURMP	Watershed Urban Runoff Management Plan

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1. Introduction

1.1. Background

On May 8, 2013 the California Regional Water Quality Control Board, San Diego Region adopted Order No. R9-2013-0001; NPDES No. CAS 0109266, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems (MS4s) Draining the Watersheds within the San Diego Region (Regional MS4 Permit). The Regional MS4 Permit, which became effective on June 27, 2013, replaces the previous MS4 Permits that covered portions of the Counties of San Diego, Orange, and Riverside within the San Diego Region. There were two main goals for the Regional MS4 Permit:

1. To have more consistent implementation, as well as improve inter-agency communication (particularly in the case of watersheds that cross jurisdictional boundaries), and minimize resources spent on the permit renewal process.
2. To establish requirements that focused on the achievement of water quality improvement goals and outcomes rather than completing specific actions, thereby giving the Copermittees more control over how their water quality programs are implemented.

To achieve the second goal, the Regional MS4 Permit requires that Water Quality Improvement Plans (WQIPs) be developed for each Watershed Management Area (WMA) within the San Diego Region. As part of the development of WQIPs, the Regional MS4 Permit provides Copermittees an option to perform a Watershed Management Area Analysis (WMAA) through which watershed-specific requirements for structural BMP implementation for Priority Development Projects can be developed for each WMA. This report presents the Copermittees' approach and results for the regional elements of the WMAA developed for the San Diego County area.

1.2. Watershed Management Area Analysis (WMAA)

The Regional MS4 Permit, through inclusion of the WMAA, provides an optional pathway for Copermittees to develop an integrated approach for their land development programs by promoting evaluation of multiple strategies for water quality improvement and development of watershed-scale solutions for improving overall water quality in the watershed. The WMAA comprises the following three components as indicated in the Regional MS4 Permit:

1. Perform analysis and develop Geographic Information System (GIS) layers (maps) by gathering information pertaining to the physical characteristics of the WMA (referred to herein as WMA Characterization). This includes, for example, identifying potential areas of coarse sediment supply, present and anticipated future land uses, and locations of physical structures within receiving streams and upland areas that affect the watershed hydrology (such as bridges, culverts, and flood management basins).
2. Using the WMA Characterization results, compile a list of candidate projects that could potentially be used as alternative compliance options for Priority Development Projects. Such projects may include, for example, opportunities for stream or riparian area

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rehabilitation, opportunities for retrofitting existing infrastructure to incorporate storm water retention or treatment, or opportunities for regional BMPs, among others. Prior to implementing these candidate projects the Copermittees must demonstrate that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of the onsite structural BMPs. Note, compilation or evaluation of potential projects was not performed as part of this regional effort. Identification and listing of candidate projects will be performed for each WMA through the WQIP process for WMAs that elect to submit the optional WMAA as part of the WQIP.

3. Additionally, using the WMA Characterization maps, identify areas within the watershed management area where it is appropriate to allow for exemptions from hydromodification management requirements that are in addition to those already allowed by the Regional MS4 Permit for Priority Development Projects. The Copermittees shall identify such cases on a watershed basis and include them in the WMAA with supporting rationale to support claims for exemptions.

1.3. Scope of Work for Regional WMAA

In July 2013, the Copermittees elected to fund a regional effort to develop elements of the regional WMAA for the 9 San Diego-area WMAs within the County of San Diego that are currently subject to the Regional MS4 Permit, which include:

- Santa Margarita River (for portion in San Diego County)
- San Luis Rey River
- Carlsbad
- San Dieguito River
- Los Peñasquitos
- Mission Bay & La Jolla Watershed
- San Diego River
- San Diego Bay
- Tijuana River (for portion in San Diego County)

The regional-level information developed through this effort is intended to provide consistency across WMAs and serve as the foundation for developing watershed-specific information for each WMA to be developed through the WQIP process. The regional effort scope of work included:

1. Development of GIS map layers that characterize the WMAs using data previously collected, readily available, and provided by the Copermittees, including:
    a. Description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates;
    b. Description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral;

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c. Current and anticipated future land uses;

d. Potential coarse sediment yield areas; and

e. Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.

2. Development of a Microsoft® Excel (Excel) template for use by Copermittees to compile lists of candidate projects for an optional alternative compliance program.
3. Development of additional criteria and analyses to support reinstating the following proposed exemptions that were originally developed in the approved 2011 Final Hydromodification Management Plan but not included in the Regional MS4 Permit unless provided by the Copermittees in the WMAA. In addition, development of the associated Hydromodification Applicability/Exemption Mapping.
    a. Exempt River Reaches including:
        i. San Diego River;
        ii. Otay River;
        iii. San Dieguito River;
        iv. San Luis Rey River; and
        v. Sweetwater River
    b. Stabilized Conveyance Systems Draining to Exempt Water Bodies
    c. Highly Impervious/Highly Urbanized Watersheds and Urban Infill, and
    d. Tidally Influenced Lagoons (where data/study provided)

The scope of work for the regional effort excluded performing analysis within the following areas unless data was readily available, as Copermittees do not have jurisdiction over these areas:

1. State Lands;
2. U.S. Departments of Defense land;
3. U.S. National Forest land;
4. U.S. Department of Interior land and
5. Tribal land

Additional description of excluded areas, for the purposes of the Regional WMAA, is indicated in Section 2.3 Land Uses.

1.4.Project Process

The process for developing the Regional WMAA included close coordination with the Land Development Workgroup (LDW) at key points during the project. The LDW is composed of the 21 San Diego-area Copermittees and serves to develop and implement regional land development plans and programs necessary to support the requirements of the Regional MS4 Permit. The consultant team (Geosyntec Consultants and Rick Engineering Company) presented

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preliminary project assumptions and methodologies proposed to be used to develop the Regional WMAA to meet the requirements of the Regional MS4 Permit in December 2013. The consultant team incorporated workgroup feedback from this meeting and subsequently presented the preliminary Regional WMAA project results to the LDW in March 2014, again to receive direction and incorporate input on the preliminary results. Subsequently, the draft report was released to the public in July 2014, by a public workshop that included Consultation Panel members from each of the WMAs on July 29, 2014. This version of the report including all of the input described above is being issued for optional inclusion into the respective WQIP Provision B.3 submittals to the SDRWQCB in December 2014.

1.5. Report Organization

This report is organized as follows:

- Chapter 1 provides the project background and purpose;
- Chapter 2 describes the technical basis for characterizing the WMA;
- Chapter 3 describes the template that can be used by Copermittees to compile the list of candidate projects;
- Chapter 4 summarizes the analyses performed to support reinstating select exemptions from hydromodification control requirements for PDPs;
- Chapter 5 presents the WMAA conclusions;
- Chapter 6 presents the references used for the WMAA;
- Attachment A presents the exhibits and additional supporting information for watershed management area characterization;
- Attachment B presents the exhibits and additional supporting information for hydromodification management applicability/exemptions;
- Attachment C expands on the structure of the geodatabase that hosts the GIS data developed by the WMAA; and
- Attachment D provides a crosswalk between the Regional MS4 Permit requirements for WMAA and this report.

1.6.Terms of Reference

The work described in this report was conducted by Geosyntec Consultants (Geosyntec) and Rick Engineering Company (RICK) on behalf of the County of San Diego and the regional Copermittees.

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2. Watershed Management Area Characterization

Watershed health and function are strongly influenced by hydrological and geomorphological processes occurring in the watershed. Both hydrological response and geomorphological response of the watershed are dependent on a variety of physical characteristics of the watershed. To this end, the Regional MS4 Permit specifies a set of data that is required to adequately characterize overall watershed processes as a foundation to enhancing integration and effectiveness of watershed management and water quality programs. The following GIS map layers were developed to characterize the hydrological and geomorphological processes within the Tijuana River WMA:

- Dominant Hydrologic Processes: A description of dominant hydrologic processes, such as areas where infiltration or overland flow likely dominates;
- Stream Characterization: A description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral;
- Land Uses: Current and anticipated future land uses;
- Potential Critical Coarse Sediment Yield Areas; and
- Physical Structures: Locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins.

These GIS layers can be used to:

- Identify the nature and distribution of key macro-scale watershed processes;
- Identify potential opportunities and constraints for regional and sub-regional storm water management facilities that can play a critical role in meeting water quality, hydromodification, water supply, and/or habitat goals within the watershed;
- Assist with determining the most appropriate management actions for specific portions of the watershed; and
- Suggest where further study is appropriate.

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2.1. Dominant Hydrologic Processes

The Regional MS4 Permit identifies in the provisions related to the WMAA that a description of dominant hydrologic processes within the watershed must be developed, with GIS layers (maps) as output. The Permit specifically calls for processes "*such as areas where infiltration or overland flow likely dominates*." These particular aspects of the hydrological mechanics of watersheds are particularly important when attempting to understand the macro-scale opportunities for locating projects that take advantage of either capturing overland flow for treatment or for infiltration.

Investigation of the dominant hydrologic processes in the San Diego-area watersheds indicates that evapotranspiration (ET) is the most dominant hydrologic process for the region based on review of a published study (Sanford and Selnick, 2013). ET is the sum of evaporation and plant transpiration in the hydrologic cycle that transports water from land surfaces to the atmosphere. This is conclusion is supported by comparing the 30-year average annual rainfall for the study area (San Diego County east of the peninsular divide) of between 15 and 18 inches per year (San Diego County, 2005) to the average annual ET rates. According to the California Irrigation Management Information System (CIMIS) Reference Evapotranspiration Map (CIMIS, 1999), the study area (within Zones 4, 6, and 9) experiences annual reference ET of 46.6, 49.7 and 59.9 inches, respectively. Therefore, theoretically, if all of the annual precipitation for the San Diego-area watersheds remained stationary where it fell and did not either infiltrate or runoff to local waterbodies where it would be conveyed downstream ultimately to the ocean, it all would be consumed by ET. As such, the effect of ET on the overall hydrologic processes within the San Diego watersheds is a function of the temporal scale over which it acts. Precipitation events often produce runoff in these watersheds, particularly in the urbanized portions, based on the topography and land cover that tend to accelerate the conveyance of runoff downstream rather than collecting, storing, or spreading out that then would maximize the effect of ET.

Because this study is focused on developing information and mapping for the portion of the hydrologic process that informs watershed management decisions, i.e., locating beneficial projects in areas of greatest opportunity, the next tier of dominant hydrologic processes are studied and mapped by this project. As such, the study area was characterized, based on the methodology described in the following section, according to the predicted fate of runoff within the watersheds being either overland flow or infiltration after considering the effects of ET (as well as an intermediate category of interflow). Areas that were mapped as overland flow do not necessarily preclude infiltration but rather indicate the dominant expected process that runoff would experience if not intercepted for the express purpose of infiltrating storm water runoff. The Model BMP Design Manual will provide more detailed guidance and procedures for determining the potential for infiltrating captured storm water at the project level irrespective of the mapping produced in the WMAA. To reiterate, the WMAA mapping is to provide macro-scale processes for high-level analysis and to inform decisions affecting regional scales. Furthermore, the Model BMP Design Manual will indicate the degree to which site-scale BMPs can expect to benefit from ET or how ET is considered in the sizing of BMPs. In brief, typical storm water BMPs only store water for a few days and therefore are not really capable of significant volume disposal through ET. However, pervious area dispersion (i.e., directing storm water runoff to flat areas for spreading and infiltration) has appreciable benefits with regard to ET and is a practice promoted in the BMP Design Manual.

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The processes of interest are further defined as follows:

Overland flow: This process can be thought of as the inverse of infiltration; precipitation reaching the ground surface that does not immediately soak in must run over the land surface (thus, "overland" flow). It reflects the relative rates of rainfall intensity and the soil's infiltration capacity: wherever and whenever the rainfall intensity exceeds the soil's infiltration capacity, some overland flow will occur. Most uncompacted, vegetated soils have infiltration capacities of one to several inches per hour at the ground surface, which exceeds the rainfall intensity of even unusually intense storms. In contrast, pavement and hard surfaces reduce the effective infiltration capacity of the ground surface to zero, ensuring overland flow regardless of the meteorological attributes of a storm, together with a much faster rate of runoff relative to vegetated surfaces.

Infiltration and groundwater recharge: These closely linked hydrologic processes are most apparent near ephemeral and perennial conveyances in the San Diego region. Their widespread occurrence is expressed by the common absence of surface-water channels on even steep (undisturbed) hillslopes. Thus, on virtually any geologic material on all but the steepest slopes (or bare rock), infiltration of rainfall into the soil is inferred to be widespread, if not ubiquitous. With urbanization, changes to the process of infiltration are also quite simple to characterize: some (typically large) fraction of that once infiltrating water is now converted to overland flow.

Interflow: Interflow takes place following storm events as shallow subsurface flow (usually within 3 to 6 feet of the surface) occurring in a more permeable soil layer above a less permeable substrate. In the storm response of a stream, interflow provides a transition between the rapid response from surface runoff and much slower stream discharge from deeper groundwater. In some geologic settings, the distinction between "interflow" and "deep groundwater" is artificial and largely meaningless; in others, however, there is a strong physical discrimination between "shallow" and "deep" groundwater movement. Development reduces infiltration and thus interflow as discussed previously, as well as reducing the footprint of the area supporting interflow volume.

The datasets used, methodology for creating the dominant hydrologic processes maps, and the results are described in the sections below.

2.1.1. Datasets Used for identifying dominant hydrologic processes

The following datasets were used in the analysis:

Dataset	Source	Year	Description
Elevation	USGS	2013	1/3rd Arc Second (~10 meter cells) digital elevation model for San Diego County
Soils Data	SanGIS	2013	NRCS (SSURGO) Database for San Diego County downloaded from SanGIS
Land Cover	SanGIS	2013	Ecology-Vegetation layer for San Diego County downloaded from SanGIS

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Dataset	Source	Year	Description
Geology	Kennedy, M.P., and Tan, S.S.	2002	Geologic Map of the Oceanside 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 2, 1:100,000 scale.
	Kennedy, M.P., and Tan, S.S.	2008	Geologic Map of the San Diego 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 3, 1:100,000 scale.
	Todd, V.R.	2004	Preliminary Geologic Map of the El Cajon 30'x60' Quadrangle, Southern California, United States Geological Survey, Southern California Aerial Mapping Project (SCAMP), Open File Report 2004-1361, 1:100,000 scale.
	Jennings et al.	2010	"Geologic Map of California," California Geological Survey, Map No. 2 – Geologic Map of California, 1:750,000 scale
Groundwater Basins	SanGIS	2013	Groundwater Basins in San Diego County downloaded from SanGIS

2.1.2. Methodology/Assumptions/Criteria for identifying dominant hydrologic processes

The methodology used to describe dominant hydrologic processes is based on recommendations included in the Southern California Coastal Water Research Project's (SCCWRP) Technical Report 605 titled "Hydromodification Screening Tools: GIS-Based Catchment Analyses of Potential Changes in Runoff and Sediment Discharge" (SCCWRP, 2010). The foundation for this analysis was to incorporate the Report's concept of grouping common hydrologic attributes into Hydrologic Response Units (HRUs). The report states the following:

> *"Grouping common hydrologic attributes across a watershed into a tractable number of Hydrologic Response Units (HRUs: a term first used by England and Holtan 1969) has become a well-established approach for condensing the near-infinite variability of a natural watershed into a tractable number of different elements. The normal procedure for developing HRUs is to identify presumptively similar rainfall–runoff characteristics across a watershed by combining spatially distributed climate, geology, soils, land use, and topographic data into areas that are approximately homogeneous in their hydrologic properties (Green and Cruise 1995, Becker and Braun 1999, Beven 2001, Haverkamp et al. 2005). As noted by Beighley et al (2005), this process of merging the landscape into discrete HRUs is a common and effective method for reducing model complexity and data requirements. Using watershed characteristics to predict runoff is the explicit task of hydrologic models, and there is a host of such models available for application to hydromodification evaluation. For purposes of "screening," however, the goal is simplicity and ease of application even if the precision of the resulting analysis is crude."*

The following process describes the methodology used to define Hydrologic Response Units (HRUs) and then relate the HRUs to the dominant hydrologic processes (i.e., overland flow, interflow, and groundwater recharge) in the Tijuana River WMA.

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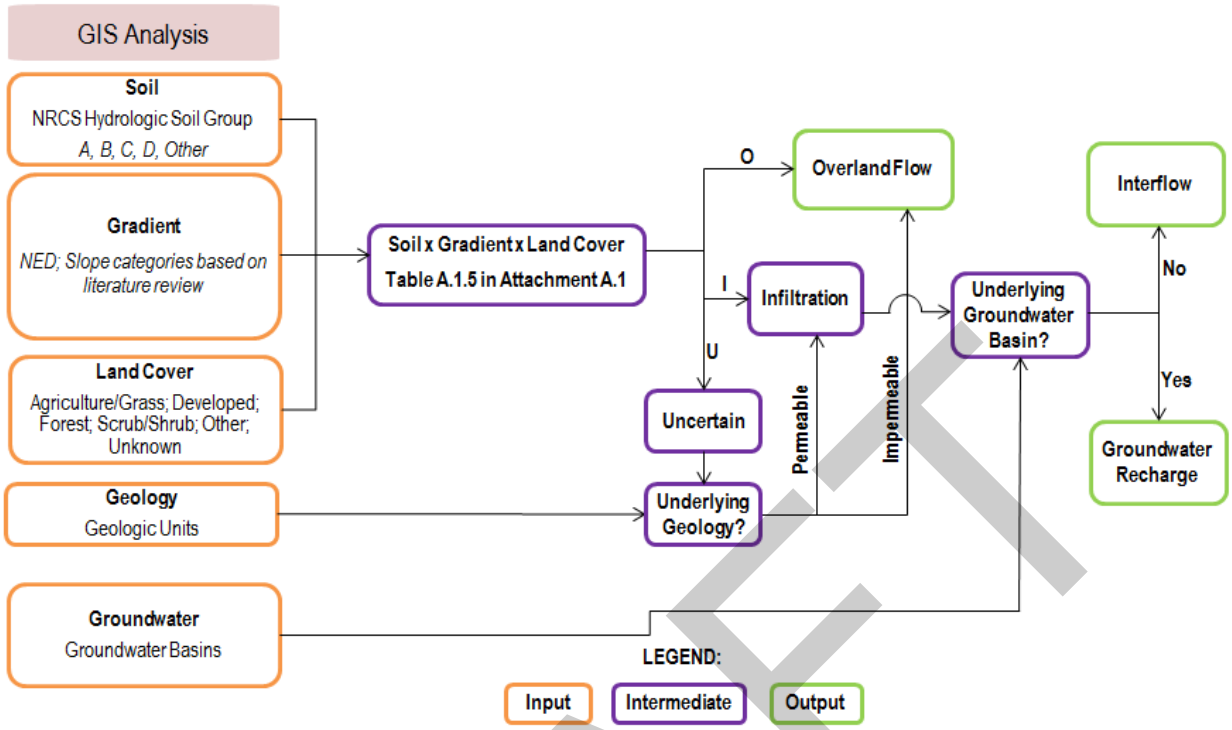

The first step is to define the HRUs. Once these are defined, the remaining steps determine the dominant hydrologic process.

1. **Integrate data sets used to determine HRU**: Categories for soil type, gradient, and land cover were defined based on readily available GIS datasets for the region and classifications found in relevant literature, as indicated below. The different combinations of these three categories comprise the distinct HRUs.

    - **Soil Categories**: based on National Resource Conservation Service (NRCS) Hydrologic Soil Group (HSG) classifications, which are commonly used to describe runoff/infiltration potential of soils on a regional scale. These categories include: A, B, C, and D. HSG A soils have the lowest runoff potential, while HSG D soils have the highest runoff potential.

    - **Gradient Categories**: based on slope ranges found in a review of relevant literature identified in Chapter 6. The spatial processing of the slope categories utilized the United States Geologic Survey (USGS) National Elevation Dataset (NED). Slopes were grouped (bins) into the following ranges: 0% to 2%; 2% to 6%; 6% to 10%; and greater than 10%. The 2% and 6% slope thresholds were based on slope ranges included in Table A.1.1 (McCuen, 2005) presented in Attachment A.1. This table provides runoff coefficients as a function of slope, soil group, land cover, and return period and was used for subsequent steps in the mapping effort. The 10% slope threshold was used in SCCWRP's Technical

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Report 605 (SCCWRP, 2010) and is a logical cutoff since slopes steeper than 10% are assumed to be dominated by overland flow.

- **Land Cover Categories**: were defined using the Ecology Vegetation GIS map layer developed by the City of San Diego, the County of San Diego and SANDAG and downloaded from SanGIS (2013). The vegetation categories in the GIS layer were grouped (Table A.1.2 in Attachment A.1) to match the following categories used in SCCWRP's Technical Report 605 (SCCWRP, 2010): Agriculture/Grass; Developed; Forest; Scrub/Shrub, Other (Water), and Unknown.

2. **Evaluate Land Cover**: Land cover categories for Agriculture/Grass, Forest, Scrub/Shrub and Other were related to land use categories defined in Table A.1.1 as shown in Table A.1.3 in Attachment A.1. Relating a land use category for the Developed land cover category was not necessary because all Developed cover was assumed to have overland flow as its dominant hydrologic process.
3. **Determine Hydrology Characteristics for Land Covers**: For each of the land cover/land use categories listed in Table A.1.3, the ratio of precipitation lost to evapotranspiration (i.e. an evapotranspiration coefficient) was estimated using Table A.1.1 using the process described below. Since precipitation is considered to be the sum of the resulting runoff, infiltration, and evapotranspiration, the coefficients for these three hydrologic pathways sum to one, as indicated below.

   Runoff Coefficient + Infiltration Coefficient + Evapotranspiration Coefficient = 1

   i) **Estimate Evapotranspiration**: To estimate the evapotranspiration (ET) coefficient for each land cover, first the runoff coefficient was identified in Table A.1.1 for the highest runoff potential (i.e., Group D soil and 6%+ slope) and most common storm conditions (i.e., storm recurrence intervals less than 25 years). The infiltration for these high runoff conditions was assumed to be negligible, resulting in an infiltration coefficient of zero. Since the sum of the three coefficients should sum to one, the ET coefficient was assumed to be the remaining difference (i.e., ET Coefficient = 1 – Runoff Coefficient). The ET coefficient calculated for the highest runoff potential was then applied to all soil types and slopes within that land use category. The calculated ET coefficient for each applicable HRU is provided in Table A.1.4 in Attachment A.1. The ET coefficient for HRUs that have a Developed land cover or a gradient greater than 10% were not calculated since these HRUs were assumed to have overland flow as the dominant hydrologic process.

   ii) **Estimate Infiltration**: The infiltration coefficient for each applicable HRU (i.e., combination of soil, gradient, and land cover) was estimated by subtracting both the runoff coefficient, provided in Table A.1.1, and the ET coefficient, calculated in step 3(i), from one (i.e., Infiltration Coefficient = 1 – Runoff Coefficient – ET Coefficient). The calculated infiltration coefficient for each applicable HRU is provided in Table A.1.4 in Attachment A.1.

   iii) **Estimate Runoff**: For each applicable HRU, the runoff coefficient was divided by

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the infiltration coefficient to obtain a ratio representing the potential for runoff or infiltration. The higher the ratio, the greater the potential for runoff to be a more dominant hydrologic process than infiltration. Similarly, the lower the ratio, the greater the potential for infiltration to be a more dominant hydrologic process than runoff. The calculated runoff to infiltration ratios are provided in Table A.1.4 in Attachment A.1.

4. **Associate Runoff and Infiltration to HRUs**: The following designations were assigned to each applicable HRU based on the runoff to infiltration ratio (i.e., runoff coefficient/infiltration coefficient). These designations were based on best engineering judgment with the underlying assumption that if a runoff or infiltration coefficient is more than 50% greater than its counterpart, then the prevailing process is considered dominant.

    - HRUs with runoff to infiltration ratios greater than 1.5 (3:2 ratio) were assumed to have relatively high runoff and overland flow was considered its dominant hydrologic process. These HRUs are designated by the letter "O" (Overland flow is dominant process) in Tables A.1.4 and A.1.5 in Attachment A.1.

    - HRUs with runoff to infiltration ratios less than 0.67 (2:3 ratio) were assumed to have relatively high infiltration and its dominant hydrologic process was either interflow or groundwater recharge, based on analysis described in subsequent steps. These HRUs are designated by the letter "I" (Interflow is dominant process) in Tables A.1.4 and A.1.5.

    - For HRUs with runoff to infiltration ratios between, and including, 1.5 and 0.67 it was uncertain whether it was dominated by overland flow or infiltration. These HRUs are designated by the letter "U" (Dominant process is uncertain) in Tables A.1.4 and A.1.5.

    - For HRUs that have a Developed land cover or a gradient greater than 10%, the runoff to infiltration ratios were not calculated because these HRUs were assumed to have overland flow as the dominant hydrologic process. These HRUs are designated by the letter "O" (Overland flow is dominant process) in Table A.1.5.

5. **Uncertain HRUs Assignment**: For HRUs with an uncertain designation ("U") in Table A.1.5 in Attachment A.1, the underlying regional geology (Kennedy and Tan, 2002 & 2008; Todd, 2004 and Jennings et al., 2010) was used to evaluate whether overland flow or infiltration were dominant. If the underlying geology was considered impermeable, then these uncertain areas were considered to have overland flow as its dominant hydrologic process. If the underlying geology was considered permeable, then these uncertain areas were considered to be dominated by infiltration. The determination of whether a geologic unit is impermeable or permeable was based on desktop evaluation and the best professional judgment of a Certified Engineering Geologist (CEG). This analysis was performed in GIS and is illustrated in the flowchart above.

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6. **Associate Infiltration HRUs with Known Groundwater Basins**: For HRUs with relatively high infiltration and have a designation of "I" in Table A.1.5 in Attachment A.1, the presence or absence of a regional groundwater basin (SanGIS, 2013) underlying these areas determined whether the dominant hydrologic process was designated as interflow or groundwater recharge. The groundwater recharge hydrologic process was assigned as dominant for those applicable areas which had an underlying groundwater basin. The interflow hydrologic process was assigned as dominant for those applicable areas which did not have an underlying groundwater basin directly below it. This analysis was performed in GIS and is illustrated in the flowchart above.
7. **Resulting HRU Data:** The resulting GIS map of dominant hydrologic processes was reviewed by engineering professionals familiar with the hydrology in the County of San Diego to confirm that the mapping is consistent with their experience working in the region.

2.1.3. Results for identifying dominant hydrologic processes

The resulting GIS map showing the spatial distribution of dominant hydrologic processes (i.e., overland flow, interflow, and groundwater recharge) within the Tijuana River WMA is provided in Attachment A.1. An ArcMap document file which presents the results from each step of the methodology is included in Attachment C, as well as a Google Earth KMZ file. Based on this analysis, overland flow is the predominant hydrologic process in all this WMA, which is consistent with the experience of engineering professionals familiar with the hydrology of the County of San Diego.

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Summary of Deliverables for Dominant Hydrologic Processes

Format	Item	Description	Location
Report	Figure	"Dominant Hydrologic Processes"	Attachment A.1
GIS	Map Group Title	Hydrologic Processes	Attachment C.1
	Map Layer Title	Soil Land Cover Slope Hydrologic Response Unit Initial Rating Permeability Groundwater Basin Dominant Hydrologic Processes	
	Geodatabase Feature Dataset	HydrologicProcesses	
	Geodatabase Feature Class	HRUAnalysis	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Dominant Hydrologic Processes	Attachment C.2

[1] To enhance the utilization of this data, the Dominant Hydrological Processes map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

2.1.4. Limitations for identifying dominant hydrologic processes

The resulting GIS map layer only lists the dominant hydrological process (i.e., an HRU assigned a dominant process of overland flow can also experience small amounts of infiltration) and provides a useful, rapid framework to perform screening-level analysis that is appropriate for watershed-scale planning studies. When more precise estimates are required for a particular site and subarea it is recommended that this analysis be augmented with site-specific analysis.

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2.2.Stream Characterization

For the purpose of WMAA, the Regional MS4 Permit requires a description of existing streams in the watershed, including bed material and composition, and if they are perennial or ephemeral. Under the Regional WMAA, this analysis was prepared for 27 streams throughout the San Diego Region agreed upon by the consultant team and Copermittees. Within the Tijuana River WMA, stream characterization and detailed mapping is provided for Tijuana River and Cottonwood Creek as shown on the exhibit titled "Watershed Management Area Streams" located in Attachment A.2.

2.2.1. Datasets Used for stream characterization

The following data were referenced for the purpose of stream characterization:

- USGS National Hydrography Dataset, downloaded from USGS November 2013
- USGS 7.5-minute quadrangles, compiled image of quadrangles covering San Diego County, various dates
- Floodplains: "National Flood Hazard Layer," provided by Federal Emergency Management Agency October 2012
- Various datasets provided by Copermittees depicting existing storm water conveyance infrastructure within their jurisdictions.
- Aerial photography by Digital Globe dated 2012

2.2.2. Methodology/Assumptions/Criteria for stream characterization

The analysis was prepared by digitizing each of the 27 streams based on review of data listed above. Within the pre-existing datasets depicting streams, floodplains, or infrastructure, no single dataset included a complete, accurate alignment of each stream. Digitizing the streams based on review of all of the data listed above allowed creation of GIS linework with a continuous corrected alignment for each stream. The following data were recorded as GIS attributes for each stream as the stream was digitized:

- River name
- Reach type (engineered or natural, constrained or un-constrained)
- Bed material
- Bank material
- Hydrographic category (perennial or intermittent)

The attributes listed above were collected manually based on interpretation of the reference data. Assumptions used in making the interpretations are listed below. The ***Hydrographic Category*** section below will provide the rationale as to why perennial and intermittent were the hydrographic categories chosen for this WMAA and not perennial and ephemeral.

Note that stream classification was not prepared within areas of Federal/State/Indian lands unless data was readily available. Stream lines were prepared within these areas for continuity, but some data fields were not populated within these areas.

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Reach Type

Streams were classified as either engineered or natural, and either constrained or un-constrained. See the exhibit titled, "Watershed Management Area Streams by Reach Type" in Attachment A.2. The purpose of this exercise was to identify whether the stream has been modified by human activity within the stream itself, which may include addition of crossing structures, stabilization of banks, dredging, or any other human activity. This aids the identification of physical structures including stream armoring, constrictions, grade control, and other modifications as required by the Regional MS4 Permit.

Classification of the streams as either "**engineered"** or **"natural"** was based on the following criteria:

Engineered

- A classification of "engineered" was assigned where the stream itself has been modified by human activity.
- All culvert/bridge/pipe crossings either provided in the Copermittes' storm water conveyance system data or clearly visible on the aerial photo have been assigned as engineered within the limits of the crossing.
- If the Copermittees did not provide storm water conveyance system data for the dirt road crossings/dip sections the streams have been assigned as engineered within the limits of the crossing. These crossings may or may not have culverts.
- If the Copermittees' storm water conveyance system data stated the facility is a detention or desilting basin, they were assigned as engineered.
- Golf courses have been assigned as engineered.
- If aerial photography showed large water bodies (lake, pond, irrigation pond, etc.) they were assigned as engineered.
- If the storm water conveyance system data provided by the Copermittees has identified the stream as "rockbs", the assumption has been made that these streams have rocks on their bottom and the sides ("bs"), and have been assigned as engineered.
- Sand mining operations have been assigned as engineered. Sand mining is an operation that is in continuous flux and does not typically result in a discrete, engineered geometry in any given channel cross section until restoration is implemented at the conclusion of the sand mining operation. It is assigned as engineered to acknowledge human alteration of the stream.

Natural

- Streams that have no apparent alteration within the stream itself by human activity have been assigned as natural.

Classification of the streams as either **"constrained"** or **"un-constrained"** was based on the following criteria:

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Constrained

- All culvers/bridge/pipe crossings either provided in the Copermittes' storm water conveyance system data or clearly visible on the aerial photo have been assigned as constrained.
- If the Copermittees did not provide storm water conveyance system data for the dirt road crossings/dip sections the streams have been assigned as constrained. These crossings may or may not have culverts.
- If the Copermittees' storm water conveyance system data stated the facility is a detention or desilting basin, they were assigned as constrained.
- Golf courses have been assigned as constrained if located within the Federal Emergency Management Agency (FEMA) floodway based on the "National Flood Hazard Layer" data.
- The USGS National Hydrographic Dataset in their hydrographic category had assigned some reaches as artificial paths. In these situations and if the aerial photography shows large water bodies (lake, pond, irrigation pond, etc.) these streams have been assigned as constrained.
- Sand mining operations located within the FEMA floodway based on the "National Flood Hazard Layer" have been assigned as constrained.

Un-constrained

- Golf courses have been assigned as un-constrained if not located within the FEMA floodway based on the "National Flood Hazard Layer" data.
- Sand mining operations not located within the FEMA floodway based on the "National Flood Hazard Layer" data have been assigned un-constrained.
- If the stream is located within the FEMA floodway based on the "National Flood Hazard Layer" and there is available land in the floodway fringe (the area between the floodway and the 100-yeaer floodplain) the area has been assigned un-constrained. Note that there may be only one side or both sides of the stream with available land in the floodway fringe therefore a note was added as to which side of the stream is constrained and un-constrained.
- If the stream is located within a FEMA 100-year floodplain based on the "National Flood Hazard Layer" data with no floodway and the FEMA floodplain width is not within an existing development or bordered by roads have been assigned as un-constrained.

Bed Material and Bank Material

The following bed and bank materials were identified:

- Concrete
- Riprap
- Pipe / culvert
- Earth

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The assumptions made to identify the streams bed and bank materials were based on the following criteria:

- If the data provided by the Copermittees provided information about the stream bed and bank material, the provided data was used for the bed and bank material.
- Generally the data provided by the Copermittees did not identify the crossing type (pipe, box culvert, bridge with or without piers, etc.) or the material (RCP, RCB, earth, riprap, concrete, etc.). In that case, all culvert/bridge/pipe crossings were assigned as pipe/culvert for the bed and bank material.
- If the Copermittees did not provide data for the dirt road crossings/dip sections the bed and bank material have been assigned as pipe/culvert. These crossings may or may not have culverts.
- If the Copermittees' storm water conveyance system data stated the facility is a detention or desilting basin, the bed and bank material have been assigned as earth.
- If aerial photography showed large water bodies (lake, pond, irrigation pond, etc.) they were assigned as earth bed and bank material. The USGS National Hydrographic Dataset in their hydrographic category had assigned some of these types of reaches as artificial paths.
- Sand mining operations within the stream have been assigned as earth for bed and bank material.
- If the Copermittees did not provide data for the stream material the bed and bank material have been assigned based on the aerial photography.

See exhibits titled, "Watershed Management Area Streams by Bed Material" in Attachment A.2.

After stream bed and bank material was classified, earthen reaches were further classified by geologic group. This was accomplished by intersecting the streams with the geologic group layer that had been prepared for use in the dominant hydrologic process and potential coarse sediment yield analyses. The result is displayed in exhibits titled, "Watershed Management Area Streams by Geologic Group" in Attachment A.2.

Hydrographic Category

Streams were classified as "perennial" or "intermittent." See exhibits titled, "Watershed Management Area Streams by Hydrographic Category" in Attachment A.2. Classification was obtained from the USGS National Hydrography Dataset (NHD). The definitions of these categories in the USGS National Hydrography Dataset are:

- **Perennial**: Contains water throughout the year, except for infrequent periods of severe drought.
- **Intermittent**: Contains water for only part of the year, but more than just after rainstorms and at snowmelt.

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While the specific Regional MS4 Permit language requested classification of perennial or ephemeral, rather than perennial or intermittent, the data that was referenced in order to classify streams did not include "ephemeral" streams. For reference, the USGS National Hydrography Dataset definition of "ephemeral" is: "contains water only during or after a local rainstorm or heavy snowmelt." None of the stream reaches in the study were classified as ephemeral in the NHD dataset, therefore none are classified as ephemeral in the WMAA product. The City of San Diego provided a map titled "City of San Diego Stream Survey" dated April 3, 2013 prepared by AMEC that shows streams that are "dry" and streams that are "flowing". This information in conjunction with the other parameters listed in this section was used to determine if a stream was perennial or intermittent.

USGS NHD includes hydrographic category classification for many of the streams. However data was not available for all reaches of all streams. In order to classify reaches of streams that did not already contain this data in NHD, these assumptions were made:

- The USGS NHD information for the stream hydrographic category has been used when available.
- When USGS NHD has "artificial paths" for portions of the stream, the hydrographic category of the upstream portion of the stream have been assigned to the stream unless other assumptions took precedence.
- If aerial photography shows large waterbody (lake, pond, irrigation pond, etc.) perennial has been assumed for the hydrographic category.
- For ponded areas shown on the aerial photography and if the USGS 7.5-minute quadrangles shows cross hatching for the area, intermittent has been assigned unless the upstream portion of the stream was assigned as perennial pursuant to the USGS National Hydrography Dataset then assigned perennial for the ponded area.
- USGS has a dashed line for intermittent streams. USGS has a solid line for perennial streams. In some situations this information was used to assist in the determination of assigning perennial or intermittent to a stream.

2.2.3. Results for stream characterization

The 27 streams and data are contained in a GIS file titled "SD_Regional_WMAA_Streams" located in Attachment C. The streams are shown in watershed maps included in Attachment A.2.

Summary of Deliverables for Stream Characterization

Format	Item	Description	Location
Report	Title of Figures	• "Watershed Management Area Streams" • "Watershed Management Area Streams by Hydrographic Category" • "Watershed Management Area Streams by Bed Material" • "Watershed Management Area Streams by Geologic Group" • "Watershed Management Area Streams by Reach	Attachment A.2

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Format	Item	Description	Location
		Type"	
GIS	Map Group Title	Not Grouped	Attachment C.1
	Map Layer Title	SD_Regional_WMAA_Streams	
	Geodatabase Feature Dataset	Streams	
	Geodatabase Feature Class	SD_Regional_WMAA_Streams	
	Geodatabase Geometry Type	Line	
KMZ [1]	KMZ File Name	SD_Regional_WMAA_Streams	Attachment C.2

[1] To enhance the utilization of this data, the Stream Characterization map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

In addition to the 27 streams that were subject of detailed analysis, NHD streams have been included on maps and within the geodatabase for reference. The NHD stream alignments have not been corrected and in some cases may be inconsistent with the existing infrastructure. The NHD streams are contained in a GIS file titled, "SD_NHD_Streams."

2.2.4. Limitations for stream characterization

- Only a desktop analysis was performed and no field verification was conducted.
- Infrastructure is only based on storm water conveyance system data provided by Copermittees or clearly visible on aerial photography. If the Copermittee used a numbering or lettering system for describing bed and bank material for example, since the metadata was not provided the bed and bank material could not be verified.
- In some instances concrete channels cannot be identified on aerial photography if it is filled with sediment and/ or vegetation.

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2.3.Land Uses

For the purpose of the WMAA, the Regional MS4 Permit requires a description of current and anticipated future land uses. This is presented in the final GIS deliverable as "Land Use Planning" and includes the following representations of land uses in the watersheds: existing land uses, planned land uses, developable lands, redevelopment and infill areas, floodplains, Multiple Species Conservation Program (MSCP) designated areas, and areas not within the Copermittees' jurisdictions (tribal lands, state lands, and federal lands).

2.3.1. Datasets Used for land uses

The following existing regional datasets were referenced to meet this requirement:

- Municipal boundaries: "Municipal_Boundaries" dated August 2012, available from SanGIS/SANDAG
- Ownership: "Parcels" dated December 2013, available from SanGIS/SANDAG
- Existing land use: "SANGIS.LANDUSE_CURRENT" dated December 2012, available from SanGIS/SANDAG (existing land use)
- Planned land use: "PLANLU" (Planned Land Use for the Series 12 Regional Growth Forecast (2050)), dated December 2010, available from SanGIS/SANDAG
- Developable land: "DEVABLE" (Land available for potential development for the Series 12 Regional Growth Forecast), dated December 2010, available from SanGIS/SANDAG
- Redevelopment and infill areas: "REDEVINF" (Redevelopment and infill areas for the Series 12 Regional Growth Forecast), dated December 2010, available from SanGIS/SANDAG
- Floodplains: "National Flood Hazard Layer" provided by Federal Emergency Management Agency October 2012
- Multiple Species Conservation Program (MSCP), total of four datasets available from SanGIS/SANDAG: "MHPA_SD," dated 2012, (Multiple Habitat Planning Areas for City of San Diego); "MSCP_CN," dated 2009 (designations of the County of San Diego's Multiple Species Conservation Program South County Subregional Plan); "MSCP_EAST_DRAFT_CN," dated 2009 (draft East County MSCP Plan); and "Draft_North_County_MSCP_Version_8.0_Categories," dated 2008 (draft North County MSCP Plan)

2.3.2. Methodology/Assumptions/Criteria for land uses

The existing regional datasets for existing land use, planned land use, developable land, redevelopment and infill areas, floodplains, and MSCP designated areas were referenced with no modifications. Areas not within the Copermittees' jurisdictions (tribal lands, state lands, and federal lands) were compiled from SanGIS parcel data (December 2013) based on the "ownership" value. The owners listed below were excluded from the Copermittees jurisdictions and represent the "Federal/State/Indian" layer, which is displayed on various maps included in Attachment A.2.

- Bureau of Land Management
- California Department of Fish and Game
- Indian Reservations
- Military Reservations

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- Other Federal
- State
- State of California Land Commission
- State Parks
- U.S. Fish and Wildlife Service
- U.S. Forest Service

When available, relevant data from these areas was included in analyses (e.g., developable land areas within Federal/State/Indian areas). Stream lines were prepared within these areas for continuity. However, stream classification (e.g., bed and bank material) was not prepared within these areas unless data was readily available (e.g., hydrographic category data available from NHD)

2.3.3. Results for land uses

The existing regional datasets are compiled into the Geodatabase in a group titled, "Land Use Planning." Current and anticipated future land uses are depicted in watershed maps included in Attachment C. Federal/State/Indian Lands are also referenced on all other map exhibits included in Attachment A.2.

Summary of Deliverables for Land Uses

Format	Item	Description	Location
Report	Title of Figures	• "Existing Land Use" • "Planned Land Use" • "Developable Land" • "Redevelopment and Infill Areas"	Attachment A.3
GIS	Map Group Title	Land Use Planning	Attachment C.1
	Map Layer Title	Municipal Boundaries Federal/State/Indian Lands SanGIS_ExistingLandUse SanGIS_PlannedLandUse SanGIS_DevelopableLand SanGIS_RedevelopmentandInfill FEMA Floodplain MHPA_SD MSCP_CN MSCP_EAST_DRAFT_CN Draft_North_County_MSCP_Version_8_Categories	
	Geodatabase Feature Dataset	LandUsePlanning	
	Geodatabase Feature Class	SanGIS_MunicipalBoundaries Federal_State_Indian_Lands SanGIS_ExistingLandUse SanGIS_PlannedLandUse	

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Format	Item	Description	Location
		SanGIS_DevelopableLand SanGIS_RedevelopmentandInfill FEMA_NFHL SanGIS_MHPA_SD SanGIS_MSCP_CN SanGIS_MSCP_EAST_DRAFT_CN SanGIS_Draft_North_County_MSCP_Version_8_Categories	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Municipal Boundaries Federal/State/Indian Lands Floodplains Due to file size limitations, SanGIS land use datasets were not converted to KMZ.	Attachment C.2

[1] To enhance the utilization of this data, the Land Uses map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

2.3.4. Limitations

Some jurisdictions may have compiled GIS land use layers that include more detailed or more current information than the regional datasets available from SanGIS. SanGIS layers were selected for the Regional WMAA to provide consistent land use characterization region-wide, and to provide for repeatability of GIS analyses when a land use layer is required for input data. The definition of non-Copermittee areas identified in this document as "Federal/State/Indian Lands" is for the Regional WMAA. Some WQIPs may define non-Copermittee areas differently.

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2.4.Potential Critical Coarse Sediment Yield Areas

The Regional MS4 Permit identifies in the provisions related to the WMAA that potential coarse sediment yield areas within the watershed be identified, with GIS layers (maps) as output. With regard to the function and importance of coarse sediment, SCCWRP Technical Report 667 titled "Hydromodification Assessment and Management in California" states the following:

"Coarse sediment functions to naturally armor the stream bed and reduce the erosive forces associated with high flows. Absence of coarse sediment often results in erosion of in-channel substrate during high flows. In addition, coarse sediment contributes to formation of in-channel habitats necessary to support native flora and fauna."

This report identifies the potential critical coarse sediment yield areas for the Tijuana River WMA in compliance with this permit provision. The applied datasets and methodologies for identifying the coarse sediment yield areas, along with their respective results, are described in the sections below.

2.4.1. Datasets Used for identifying potential critical coarse sediment yield areas

The following datasets were used in the analysis

Dataset	Source	Year	Description
Elevation	USGS	2013	1/3rd Arc Second (~10 meter cells) digital elevation model for San Diego County
Land Cover	SanGIS	2013	Ecology-Vegetation layer for San Diego County downloaded from SanGIS
Geology	Kennedy, M.P., and Tan, S.S.	2002	Geologic Map of the Oceanside 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 2, 1:100,000 scale.
	Kennedy, M.P., and Tan, S.S.	2008	Geologic Map of the San Diego 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 3, 1:100,000 scale.
	Todd, V.R.	2004	Preliminary Geologic Map of the El Cajon 30'x60' Quadrangle, Southern California, United States Geological Survey, Southern California Areal Mapping Project (SCAMP), Open File Report 2004-1361, 1:100,000 scale.
	Jennings et al.	2010	"Geologic Map of California," California Geological Survey, Map No. 2 – Geologic Map of California, 1:750,000 scale

2.4.2. Methodology/Assumptions/Criteria for identifying potential critical coarse sediment yield areas

The methodology used to identify coarse sediment yield areas is based on Geomorphic

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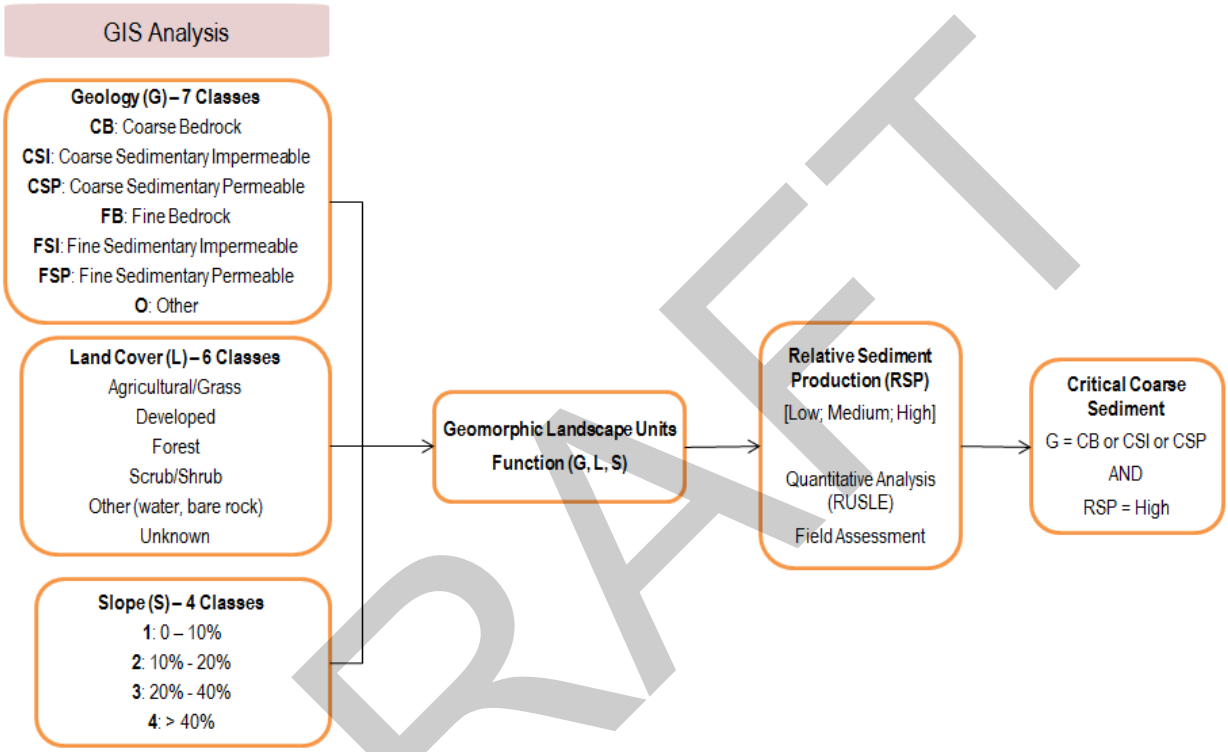
Landscape Unit (GLU) methodology presented in the SCCWRP Technical Report 605 titled "Hydromodification Screening Tools: GIS-Based Catchment Analyses of Potential Changes in Runoff and Sediment Discharge" (SCCWRP, 2010). Geomorphic Landscape Units characterize the magnitude of sediment production from areas through three factors judged to exert the greatest influence on the variability on sediment-production rates: geology types, hillslope gradient, and land cover. The GLU approach provides a useful, rapid framework to identify sediment-delivery attributes of the watershed. The process to integrate these factors into GLUs is indicated in the flow chart below.



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The following steps were used to define Geomorphic Landscape Units (GLUs), which were then related to the coarse sediment and critical coarse sediment yield areas in the Tijuana River WMA.

1. **Integrate data sets used to determine GLU:** Categories for geology, gradient, and land cover were defined based on readily available GIS datasets for the region and classifications found in relevant literature listed in Chapter 6. The different combinations of these categories make up distinct GLUs.

    - **Geologic Categories**: based on methodology listed in Attachment A.4.1 of Attachment A.4. Resulting geologic categories from this analysis are: Coarse Bedrock (CB), Coarse Sedimentary Impermeable (CSI), Coarse Sedimentary Permeable (CSP), Fine Bedrock (FB), Fine Sedimentary Impermeable (FSI), Fine Sedimentary Permeable (FSP), and Other (O). An exhibit showing the regional geology groupings is presented in Attachment A.4.

- **Land cover categories**: defined using the Ecology Vegetation GIS map layer developed by the City of San Diego, the County of San Diego and SANDAG which were downloaded from SanGIS (2013). The vegetation categories in the GIS layer were grouped (Table A.1.2 in Attachment A.1) to match the following categories used in SCCWRP's Technical Report 605 (SCCWRP, 2010): Agriculture/Grass; Developed; Forest; Scrub/Shrub, Other (Water) and Unknown.
- **Gradient Categories**: based on slope ranges found in a review of relevant literature (GLU methodology applied in California) listed in Chapter 6. The spatial processing of the slope categories utilized the USGS National Elevation Dataset (NED). Slope ranges used include: 0% to 10%, 10% to 20%, 20% to 40%, and greater than 40%.

2. **GLU Union Results**: GIS mapping exercise for the study area resulted in 166 GLUs within the 9 WMAs in San Diego County. Table A.4.2 in Attachment A.4 provides the list of the 166 GLUs.

For implementing hydromodification management performance standards in the Regional MS4 Permit, the Copermittees need to identify Critical Coarse Sediment Yield areas in the study region. To provide information on the identification of Critical Coarse Sediment yield, the study assumed that critical coarse sediment would be generated from GLUs that are composed of geologic units likely to generate coarse sediment (based on the methodology listed in Step 3) and have the potential for high relative sediment production (as estimated using the methodology listed in Step 4).

3. **Define Pertinent Geologic groups**: the geologic groups (Attachment A.4.1) considered in this study to have the potential to generate coarse sediment are Coarse Bedrock (CB), Coarse Sedimentary Impermeable (CSI), and Coarse Sedimentary Permeable (CSP). An exhibit showing the regional geologic grouping is presented in Attachment A.4.
4. **Relate GLU to Sediment Production**: For assigning GLUs with a relative sediment production, the following methodology was utilized:
    - Conducted quantitative analysis to assign relative sediment production. Analysis was performed based on the assumption that sediment production from an area is proportional to the soil loss from the area, as evaluated using standard soil loss equation. Detailed analysis steps are documented in Attachment A.4.2;
    - To validate the quantitative assignment above, a qualitative field assessment was conducted for 40 sites. Site selection and findings from the field assessment is documented in Attachment A.4.3.
    - The result of the field assessment indicated a 65% match between field conditions and the quantitative assignments. The mismatches are attributed to differences in percent land cover as assumed for the quantitative analysis and those observed in the field. As such, the quantitative assignments were considered to be valid for the purposes of assigning relative sediment production.

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2.4.3. Results for identifying potential critical coarse sediment yield areas

The resulting GIS maps showing the spatial distribution of geologic grouping and critical coarse sediment yield areas within the Tijuana River WMA are provided in Attachment A.4. An ArcMap document which presents the results from each step of the methodology is included in Attachment C. Based on this analysis it was estimated that 18 % of the study area is a potential critical coarse sediment yield area.

As a result of the regional-scale datasets, and commensurate data resolution, used to map the potential critical coarse sediment yield areas, some areas may have been mapped that in reality do not produce critical coarse sediment as they are existing developed areas. As such, an opportunity for jurisdictions to incorporate more refined data into the preliminary WMAA GIS dataset based on local knowledge and review of current aerial images was provided. The County of San Diego provided augmented data in the Tijuana River WMA for their respective jurisdictional area.

Summary of Deliverables for Potential Critical Coarse Sediment Yield Areas

Format	Item	Description	Location
Report	Figures	"Geologic Grouping" "Potential Critical Coarse Sediment Yield Areas"	Attachment A.4
GIS	Map Group Layer Name	Potential Coarse Sediment Yield	Attachment C.1
	Map Layer Title	Geologic Grouping Land Cover Slope Category Geomorphic Landscape Unit Potential Coarse Sediment Yield Area Relative Sediment Production Potential Critical Coarse Sediment Yield Area	
	Geodatabase Feature Dataset	PotentialCoarseSedimentYield	
	Geodatabase Feature Class	GLUAnalysis PotentialCoarseSedimentYieldAreas PotentialCriticalCoarseSedimentYieldAreas	
	Geodatabase Geometry Type	Polygon	
KMZ [1]	KMZ File Name	Potential Critical Coarse Sediment Yield Areas	Attachment C.2

[1] To enhance the utilization of this data, the Geomorphic Landscape Unit Analysis is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

2.4.4. Limitations for identifying potential critical coarse sediment yield areas

The resulting GIS layers were developed using regional datasets and provide a useful, rapid framework to perform screening-level analysis that is appropriate for watershed-scale planning studies. The methodology used to identify potential coarse sediment yield areas does not account for instream sediment supply and sediment production from mass failures like landslides which

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are difficult to estimate on a regional scale without performing extensive field investigation. This data set also does not account for potential existing impediments that may hinder delivery of coarse sediment to receiving waters or downstream locations within the watershed as this was beyond the scope of a regional study. Where more precise estimates are required for a particular site or subarea it is recommended that this analysis be augmented with site-specific analysis. It is also recognized that this regional data set is a function of the inherent data resolution and therefore may not conform to all site conditions, or does not reflect changes to particular areas that have occurred since the underlying data was developed. As such, the WMAA data for the potential critical coarse sediment yield areas should be verified in the field according to the procedures outlined in the Model BMP Design Manual and/or jurisdiction specific BMP Design Manual.

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2.5.Physical Structures

The Regional MS4 Permit requires the Copermittees to identify information regarding locations of existing flood control structures and channel structures, such as stream armoring, constrictions, grade control structures, and hydromodification or flood management basins with GIS layers (maps) as output, for each WMA being analyzed for the purpose of developing watershed-specific requirements for structural BMP implementation. This study identified the physical structures using a desktop-level analysis for the stream(s) identified in Section 2.2 in compliance with this permit provision.

2.5.1. Approach for identifying physical structures

The intent of this portion of the WMAA project was to provide an initial assessment of the structures of interest for the stream(s) identified in Section 2.2. This desktop-level analysis was conducted primarily as a visual survey of aerial imagery and FEMA flood insurance study (FIS) profiles where available. The collected information was entered into a GIS layer for inclusion into the overall WMAA geodatabase containing the characterization layers required by the Regional MS4 Permit. To support overall WMA characterization, the information derived in this task provides insight into water and sediment movement through the watershed (SCCWRP, 2012), the opportunities and limitations for infrastructure retrofits and also informs efforts to identify appropriate locations for habitat or riparian area rehabilitation in relation to proximate infrastructure. Specific information regarding how the survey was performed and the attributes of the generated data is presented in Attachment A.5. Note that concrete channels, pipes/culverts, riprap or other artificial stream armoring, and basins have also been identified in the linework generated for the streams (see Section 2.2).

2.5.2. Results for identifying physical structures

The resulting GIS mapping provided in Attachment A.5 shows the spatial locations of the physical structures within the mapped stream(s).

Summary of Deliverables for Physical Structures

Format	Item	Description	Location
Report	Figure	Watershed Management Area Streams by Reach Type with Channel Structures	Attachment A.5
GIS	Map Group Layer Name	Channel Structures	Attachment C.1
	Map Layer Title	Channel Structures	
	Geodatabase Feature Dataset	ChannelStructures	
	Geodatabase Feature Class	ChannelStructures	
	Geodatabase Geometry Type	Point	
KMZ [1]	Kmz File Name	ChannelStructures	Attachment C.2

[1] To enhance the utilization of this data, the Physical Structures map is provided in both traditional GIS file format (ESRI software license purchase required) and as a Google Earth KMZ (Keyhole Markup Language/Zipped) file that can be viewed with the free download version of Google Earth (http://www.google.com/earth/).

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3. Template for Candidate Project List

The Regional MS4 Permit requires each WMA to use the results from the WMA characterization to compile a list of candidate projects that could potentially be used as alternative compliance options for Priority Development Projects should an agency or jurisdiction opt to develop an alternative compliance program. Copermittees must first conclude that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of structural BMPs onsite prior to implementing these candidate projects as alternative compliance projects.

The Copermittees elected to identify potential candidate projects as a separate effort from this regional project, and therefore the process for identifying candidate projects is not documented in this report. Instead, this project only developed a template, in a spreadsheet format, for use by the Copermittees to compile lists of potential candidate projects. The template is intended to enhance regional consistency of the information that is gathered for candidate projects. The template spreadsheet file was distributed to the Copermittees on January 28, 2014. A table of the template components is indicated below:

Column	Primary Heading	Secondary Heading	Guidance for Completing the Project List
A	Project Identifier	-	Unique identifier for the project.
B	Watershed Management Area	-	Dropdown menu to select the watershed management area the project is located in
C	Hydrologic Area (HA)	-	Dropdown menu to select the hydrologic area the project is located in Select a WMA in column B for HA (Column C) dropdown menu to activate.
D	Hydrologic Subarea (HSA)	-	Dropdown menu to select the hydrologic subarea the project is located in. Select a HA in column C for HSA (Column D) dropdown menu to activate.
E	Jurisdiction	-	Dropdown menu to select the jurisdiction the project is located in. Select a HSA in column D for Jurisdiction (Column E) dropdown menu to activate.
F	Project Name	-	Indicate the name of the project.
G	Ownership	Type	Dropdown menu to select if the project is a public project, private project, or public-private partnership.
H	Ownership	Ownership Information	List the details for the owner.
I	Project Location	Address	List the address of the project site.
J	Project Location	APN	List the APN of the parcel.
K	Project Location	Latitude	List the latitude of the project site.
L	Project Location	Longitude	List the longitude of the project site.

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Column	Primary Heading	Secondary Heading	Guidance for Completing the Project List
M	Project Origination/ Originator	Name	List the name of the report/organization/individual that provided the idea for the project. Potential origination sources: WQIP, WMAA, JURMPs, WURMPs, CLRPs, IRWM, MSCP, MHPA, Other.
N	Project Origination/ Originator	Contact Information	Link or report title if the proposed project is from a report [or] contact information if from an organization/individual.
O	Project Category	-	Drop Down menu to select the project category; In addition to the 6 project categories explicitly listed in the Regional MS4 Permit, the drop down menu also has a category "Other project types allowed by the MS4 Permit". Example for "Other" project types are agency CIP programs such as Green Streets, LID conversions (medians, parks), agency filter installation, etc.
P	Specific Project Type	-	List the subcategory of the project; for example, list Regional BMP type (i.e. infiltration basin, wetland, etc.).
Q	Potential Pollutant	-	Identify the potential pollutant(s) that can be treated by the proposed project.
R	Project Size & Parameters	Contributing Drainage Area (acres)	List the contributing drainage area to the project.
S	Project Size & Parameters	Parcel Size (acres)	List the size of the parcel the project is located on.
T	Project Size & Parameters	Project Footprint (acres)	List the size of the project footprint.
U	Project Size & Parameters	Parameters (with units as necessary)	Parameters needed to quantify benefits from the project; i.e. for an infiltration basin, list the water quality volume, long-term infiltration rate, depth of the basin, etc.
V	Regulatory Requirement	-	Indicate if the project is proposed to meet particular regulatory requirement such as TMDL, etc.
W	Project Timeline	-	Indicate if a project must be implemented by certain date to meet a grant deadline or other time commitment.
X	Other Notes	-	List any other relevant notes; for example, when retrofitting existing infrastructure project category is selected, input parameters needed to quantify benefits from existing infrastructure into this column as these will be needed to estimate additional benefits that can be used for alternative compliance. If N/A is selected in any dropdown menus, add additional explanation in here

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4. Hydromodification Management Applicability/Exemptions

Hydromodification, which is caused by both altered storm water flow and altered sediment flow regimes, is largely responsible for degradation of creeks, streams, and associated habitats in the San Diego Region. The purpose of the hydromodification management requirements in the Regional MS4 Permit is to maintain or restore more natural hydrologic flow regimes to prevent accelerated, unnatural erosion in downstream receiving waters.

In some cases, priority development projects may be exempt from hydromodification management requirements if the project site discharges runoff to receiving waters that are not susceptible to erosion (e.g., a lake, bay, or the Pacific Ocean) either directly or via hardened systems including concrete-lined channels or existing underground storm drain systems.

The March 2011 Final HMP identified certain exemptions from hydromodification management requirements by presenting "HMP applicability criteria." The Regional MS4 Permit maintains some of these HMP applicability criteria. However, some of the applicability criteria are not included under the Regional MS4 Permit unless the area or receiving water is mapped in the WMAA. The intent of this Section is to provide mapping of areas exempt from hydromodification management requirements, and provide supporting technical analyses for exemptions that are recommended by the WMAA.

4.1.Additional Analysis for Hydromodification Management Exemptions

This section documents additional analysis performed to evaluate the following exemptions that were originally part of the approved 2011 Final Hydromodification Management Plan but were not included in the current Regional MS4 Permit and provides recommendation based on the results from the analysis performed if these exemptions should be reinstated through WMAA:

- Exempt River Reaches
- Stabilized Conveyance Systems Draining to Exempt Water Bodies
- Highly Impervious Watersheds and Urban Infill and
- Tidally Influenced Lagoons

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4.1.1. Exempt River Reaches

There are no river reaches currently recommended for exemption from hydromodification management requirements in the Tijuana River WMA. Potential river reach exemptions may be studied using the recommended approach documented in the Regional WMAA. Refer to the Regional WMAA for the criteria and an example exemption studies that were prepared for the five river reaches included in the San Diego County Final HMP dated March 2011.

4.1.2. Stabilized Conveyance Systems Draining to Exempt Water Bodies

There are no stabilized conveyance systems currently recommended for exemption from hydromodification management requirements in the Tijuana River WMA. If engineered conveyance systems that are stabilized with materials other than concrete, such as riprap, turf reinforcement mat, or vegetation, including rehabilitated stream systems, are identified as potential candidates for exemption, they may be studied and may be recommended exempt if they meet specific criteria presented in the Regional WMAA for this exemption. Refer to the Regional WMAA for the criteria and an example study that was prepared for Forester Creek in the San Diego River WMA.

4.1.3. Highly Impervious/Highly Urbanized Watersheds and Urban Infill

Based on evaluation of the highly impervious/highly urbanized watershed and urban infill exemptions presented in the March 2011 Final HMP, and comparison with more recent research prepared for the Ventura County Hydromodification Control Plan (Ventura County HCP) (Final Draft dated September 2013), resurrection of these exemptions from the March 2011 Final HMP was not recommended by the Regional WMAA. The research prepared in support of the Ventura County HCP determined lower thresholds of additional impervious area (ranging from 0.44% to 1.65%) than the limit presented in the San Diego County Final HMP dated March 2011 (3%). No areas within the Tijuana River WMA are currently recommended for highly impervious/highly urbanized watershed or urban infill exemption.

4.1.4. Tidally Influenced Lagoons

There are no areas recommended for exemption from hydromodification management requirements under the tidally influenced lagoons category in the Tijuana River WMA. Refer to the Regional WMAA for further information regarding this exemption.

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5. Conclusions

5.1. Watershed Management Area Characterization

The WMA Characterization data was developed using available regional data to further understand the macro-scale watershed characteristics and processes in the Tijuana River WMA. The Regional MS4 Permit allows for flexibility in complying with land development requirements when using the information developed in the WMAA to improve water quality planning and implementation associated with land development. This dataset will assist with identifying the opportunities and constraints for watershed-scale projects and management decisions based (as opposed to piecemeal project identification) and provides Copermittees the ability to exercise the option to create an alternative compliance program that offers the opportunity to develop watershed-specific alternatives to universal onsite structural BMP implementation. The characterization data includes:

Characterization Data	Utilization Potential
Dominant Hydrologic Process: • Overland flow • Infiltration • Interflow	• Identify areas for enhanced infiltration or collection of storm water for treatment • Implement management measures that correspond to pre-development conditions – promotes long-term channel stability and health • Increases understanding of the natural functioning of the watershed and what has been (or is at risk of being) altered by urbanization.
Stream Characterization: • Reach type • Bed material • Bank material • Hydrographic category • Channel Structures	• Preliminary dataset that can be used to conduct stream power evaluations • Identify channel systems for preservation or restoration • Identification of appropriate space for channel processes to occur (e.g., flood plain connectivity) • Insight to sensitivity of receiving stream reach • Indicates the features within channels that affect water and sediment

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Characterization Data	Utilization Potential
	movement through the watershed
Land Use: • Existing • Future	• Foresight (identifies relative risks, opportunities, or constraints) in comparing future to existing land uses, i.e., areas that may be more/less vulnerable to adverse impacts to changes in storm water runoff associated with development • Encourage infill development
Potential Critical Coarse Sediment Yield Areas	• Preservation of areas or function that contributes critical sediment within the watershed to stream armoring/stability • Assist with identifying potentially susceptible stream reaches that require uninterrupted coarse sediment supplies to remain stable • Dual goal of open space conservation

Regarding the identification of the potential critical coarse sediment yield areas in the WMAA using readily available regional datasets, it is anticipated that when more precise estimates for potential critical coarse sediment yield areas are required for a particular site or subarea that this regional study will be augmented with site-specific analysis. Development projects must avoid critical sediment yield areas or implement measures that allow critical coarse sediment to be discharged to receiving waters, such that there is no net impact to the receiving water to meet the requirements of the Regional MS4 permit. As such, projects should consult the Model BMP Design Manual and/or jurisdiction specific BMP Design manual for options to meet the Regional MS4 Permit requirements. It is anticipated that the data will not be static but will be enhanced over time through future studies or field assessments that will refine what is currently a macro-level data set.

5.2. Template for Candidate Project List

It is anticipated the Copermittees that elect to develop alternative compliance programs will conduct a separate exercise to nominate potential candidate projects for inclusion into the WQIPs using the template developed for this project.

5.3. Hydromodification Management Exemptions

Attachment B.2 presents hydromodification management applicability/exemption mapping for

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the Tijuana River WMA. The mapping includes receiving waters that are exempt based on the Regional MS4 Permit or recommended exempt based on studies.

Receiving waters that are **exempt** based on the Regional MS4 Permit include:

- The Pacific Ocean
- Lakes and Reservoirs
- Existing underground storm drains or concrete-lined channels draining directly to the ocean

There are no additional exemptions recommended based on studies in the Tijuana River WMA.

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Appendix J.1

Project Identifier	Watershed Management Area	Hydrologic Area (HA)	Hydrologic Subarea (HSA)	Jurisdiction	Project Name	Ownership		Project Location				Project Origination/Originator		Project Category	Specific Project Type	Potential Pollutant	Project Size & Parameters				Regulatory Requirement	Project Timeline	Other Notes
						Type	Owner Information	Address	APN	Latitude	Longitude	Name	Contact Information				Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)			
Example 1	San Diego River	Lower San Diego	Mission San Diego[907.11]	SAN DIEGO	Ocean Beach Athletic Area Robb Field	Public	City of San Diego	Ocean Beach Athletic Area Robb Field San Diego, CA, 92107	76002900	32.753	-117.242	CLRP Phase II	http://www.sandiego.gov/stormwater/pdf/sdrclrpupdate.pdf	Regional BMPs	Subsurface Detention Gallery	Multiple (Primary: Bacteria)	315	11.3	2.3	Treatment Volume: 6.8 acre-ft Ponding Depth: 3 ft Draw Down Time: 48 hrs (estimate)	TMDL	Future (Year to be determined)	
Example 2	San Luis Rey River	Lower San Luis	Mission[903.11]	OCEANSIDE	Talone Lake	Public-private partnership	Talone Conservancy Corp	Fraze Rd & Hwy 76 Oceanside, CA 92057	16155122	33.239	-117.294	CLRP	http://www.projectcleanwater.org/images/stories/Docs/San-Luis-Rey/SLR_CLRP_Final_Oct2012.pdf	Retrofitting existing infrastructure	Wetlands/Wet Pond	Multiple (Primary: Bacteria)	1096	37	8	Treatment Volume: 32 acre-ft Permanent Pool Depth: 4 ft Hydraulic Residence Time: 24 hrs	TMDL	Future (Year to be determined)	BMP under existing condition might not be properly functional
Example 3	San Diego River	N/A	N/A	N/A	SDR - County Green Streets	Public	San Diego County	N/A	N/A	N/A	N/A	CLRP	http://www.projectcleanwater.org/images/stories/Docs/San-Diego-River/SDR_CLRP_Final_Oct2012.pdf	Other project types allowed by MS4 Permit	Green Streets	Multiple (Primary: Bacteria)	N/A	N/A	N/A	Varies; Refer to the report	TMDL	Future (Year to be determined)	Green Streets are proposed for county roads within San Diego County jurisdicition in San Diego River

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Project Identifier	Watershed Management Area	Jurisdiction	Ownership	Project Location				Project Size & Parameters				Other Notes
			Owner Information	Address	APN	Latitude (X-Coordinate)	Longitude (Y-Coordinate)	Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)	
Public Parcels Identified as Suitable for Further Assessment to Determine Feasibility of Retrofitting with Green Infrastructure												
Parcels on this list that are 0.25 acres or greater have been assessed using broad assumptions necessary for computer modeling and were found to be potentially effective as an opportunity for contributing to load reduction goals. Considerable further assessment would be required before determining any of these sites to be viable retrofit sites for implementation of Green Infrastructure. That assessment includes verifying public ownership, determining if land use agreements and financing can be established, assessing feasibility based upon further investigation of physical site constraints at a project design level, and determining that construction and necessary approvals, including approvals from regulatory agencies other than the City of San Diego, can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.											
Public Parcels Identified as Suitable for Further Assessment to Determine Feasibility of Retrofitting												
Parcels on this list have been assessed using broad assumptions necessary for computer modeling and were found to be potentially effective as an opportunity for contributing to load reduction goals. Considerable further assessment would be required before determining any of these sites to be viable retrofit. That assessment includes verifying public ownership, determining if land use agreements and financing can be established, assessing feasibility based upon further investigation of physical site constraints at a project design level, and determining that construction and necessary approvals, including approvals from regulatory agencies other than the City of San Diego, can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.												
Project Concept for Green Streets Retrofits – Quantity and Location of Suitable City Streets To-Be-Determined												
The City of San Diego is in the process of identifying potential public street locations that could feasibly be retrofitted with Green Infrastructure and provide a meaningful contribution to pollutant load reduction goals. As locations become verified for feasibility and effectiveness, funding mechanisms under an Alternate Compliance program could potentially be used to fill gaps in construction and maintenance funding necessary for the project to go forward. This is pending the ability to establish suitable legal mechanisms and verify that approvals and construction can be completed within the time constraints in the Municipal Storm Water Permit that pertain to Alternative Compliance.												

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Appendix J.3

Project Identifier	Watershed Management Area	Hydrologic Area (HA)	Hydrologic Subarea (HSA)	Jurisdiction	Project Name	Ownership		Project Location				Project Origination/Originator		Project Category	Specific Project Type	Potential Pollutant	Project Size & Parameters				Regulatory Requirement	Project Timeline	Other Notes	Watershed Number	Secondary Category	Originating Report	E-Mail	Phone	Contact Address
						Type	Owner Information	Address	APN	Latitude	Longitude	Name	Contact Information				Contributing Drainage Area (acres)	Parcel Size (acres)	Project Footprint (acres)	Parameters (with units as necessary)									
TJ-1	Tijuana	Tijuana Valley	San Ysidro	SAN DIEGO	Tijuana River Valley Regional Park Proposed 60.2 AC Restoration Project	Public	COUNTY OF SAN DIEGO	N/A	6370107300	1783595.291	6308310.111	Rick Engineering Company		Stream or Riparian Rehabilitation	Habitat Restoration				60.2					911.11	Floodplain Preservation	Tijuana River Valley Regional Park, Area Specific Management Directives, June 22, 2007 (Final_TJ_ASMD_6_22_07.pdf	rcronquist@rickengineering.com	619-291-0707	
TJ-2	Tijuana	Tijuana Valley	San Ysidro	IMPERIAL BEACH	Tijuana River Nave/SD County/other		UNITED STATES OF AMERICA	N/A	6350800100	1784169.138	6299165.075	River Partners												911.11			info@riverpartners.org	(530) 894-5401	
TJ-6	Tijuana	Tijuana Valley	San Ysidro	SAN DIEGO	Tijuana River Valley Regional Park Proposed 60.2 AC Restoration Project	Public	COUNTY OF SAN DIEGO	HIGHWAY 94	6370107300	1783595.291	6308310.111	Rick Engineering Company		Stream or Riparian Rehabilitation	Habitat Restoration				60.2					911.11	Floodplain Preservation	Tijuana River Valley Regional Park, Area Specific Management Directives, June 22, 2007 (Final_TJ_ASMD_6_22_07.pdf	rcronquist@rickengineering.com	619-291-0707	
TJ-7	Tijuana	Morena	undefined	S.D. COUNTY	Bioretention Basin	Private	HALL TRUST 06-01-92	Quail Road and Morena View	6060820100	1827095.399	6483734.355	Miles Safa		retrofitting	Construction of bioretention basin	pollutants from street surface flow	0	0	0		2013 permit		May have potential to earn credit toward a CIP project that has problem meeting water quality/hydromodification requirements on site. This property has soil type "B" indicating that biorention is suitable for this site.	911.5	groundwater recharge		miles.Safa@sdcounty.ca.gov	858-694-3890	County of San Diego 5510 Overland Avenue San Diego, CA, 92123
TJ-3	Tijuana	Campo	Canyon City	S.D. COUNTY	highway run-off into creek that feeds to riparian area and Campo Creek		RYDBERG VICTORIA	N/A	6541001400	1795169.447	6476511.205	Billie Jo Jannen												911.82			jannen@inbox.com	619-415-6298	28736 Highway 94 -- this is also the address where CalTrans is directing this run-off.
TJ-4	Tijuana	Campo	Canyon City	S.D. COUNTY	Campo Valley reclamation	Private	Barry deVorzan	Unknown/several	6550902600	1805248.29	6492697.158	Billie Jo Jannen		Floodplain	wetland/creek	nitrates, road run-sewage, household	500			area shown on map	unknown	urgent	This area provides water for all of	911.82	Groundwater	community	jannen@inbox.com	619-415-6298	28736 Highway 94
TJ-5	Tijuana	Campo	Canyon City	S.D. COUNTY	possible sewage pollution	Private	Mountain Empire RV	29146 Highway 94,	6560600800	1795390.76	6480867.573	Billie Jo Jannen		Floodplain								urgent	The owners have dammed a	911.82	Water Supply		jannen@inbox.com	619-415-6298	28736 Highway 94, Campo

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