Tijuana River Watershed Management Area

WATER QUALITY IMPROVEMENT PLAN

Final, March 8, 2016

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

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

City of Imperial Beach, California
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STATEMENT OF CERTIFICATION

Tijuana River Watershed Management Area, Water Quality Improvement Plan Final Document (Permit Provision F.1.b), Revised as of February 2016

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

Feb. 22, 2016

Date

THE CITY OF SAN DIEGO

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Tijuana River Watershed Management Area, Water Quality Improvement Plan Final Document (Permit Provision F.1.b), Revised as of February 2016

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2/22/16

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TIJUANA RIVER WATERSHED MANAGEMENT AREA, WATER QUALITY IMPROVEMENT PLAN (PERMIT PROVISION F.1.b SUBMITTAL), STATEMENT OF CERTIFICATION, REVISED AS OF FEBRUARY 2016

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
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Date 3/3/16

TIJUANA RIVER WATERSHED MANAGEMENT AREA FINAL WATER QUALITY IMPROVEMENT PLAN

Prepared for

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

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March 2016

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ACKNOWLEDGEMENTS

The development of this Water Quality Improvement Plan was supported by the convening of a Consultation Panel that included representatives from the San Diego Regional Water Quality Control Board (Regional Board), environmental groups, and development groups, as well as members from the public. Special thanks to the following individuals for serving on the Tijuana River Watershed Management Area Consultation Panel and providing valuable insight into the content of this document:

- Eric Becker (Regional Board representative),
- Paloma Aguirre and John Holder (representatives 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 the 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).

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µg/L	micrograms per liter
ABLM	Ambient Bay and Lagoon Monitoring
BIOL	Preservation of Biological Habitats of Special Significance
BMP	best management practice
BOD	biochemical oxygen demand
BPJ	best professional judgment
CalRecycle	California Department of Resources Recovery and Recycling
Caltrans	California Department of Transportation
CGP	Construction General Permit
COD	chemical oxygen demand
CWA	Clean Water Act
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
GIS	Geographic Information System
HA	Hydrologic Area
HSA	Hydrologic Subarea
IBI	Index of Biotic Integrity
IDDE	Illicit Discharge Detection and Elimination
JRMP	Jurisdictional Runoff Management Plan
LTEA	Long-Term Effectiveness Assessment
LW	Lower Watershed
MAR	marine habitat
MBAS	methylene blue activated substances
MEP	maximum extent practicable
mg/L	milligrams per liter
MLS	Mass Loading Station
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
NGO	non-governmental organization
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
PDP	priority development project
RA	Responsible Agency
REC-1	Contact Water Recreation
REC-2	Non-Contact Water Recreation
Regional Board	Regional Water Quality Control Board
ROWD	Report of Waste Discharge
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
State Board	State Water Resources Control Board
SUSMP	Standard Urban Stormwater Mitigation Plan
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load

TRVRT	Tijuana River Valley Recovery Team
TSS	total suspended solids
TWAS	Temporary Watershed Assessment Station
U.S.	United States
USIBWC	U.S. International Boundary and Water Commission
UW	Upper Watershed
WARM	warm freshwater habitat
WMA	Watershed Management Area
WMAA	Watershed Management Area Analysis
WQIP	Water Quality Improvement Plan
WQO	Water Quality Objective
WURMP	Watershed Urban Runoff Management Program

ES.1. OVERVIEW

The San Diego Regional Municipal Separate Storm Sewer System (MS4) Permit (MS4 Permit), adopted on May 8, 2013, includes a requirement for responsible agencies (RAs) to develop a Water Quality Improvement Plan (WQIP). This WQIP applies to the Tijuana River Watershed Management Area (WMA). In the Tijuana River WMA, the RAs include the City of Imperial Beach, the City of San Diego, and the County of San Diego.

The Tijuana River WMA is a subset of the Tijuana River Watershed. The Tijuana River Watershed encompasses a region of approximately 1,750 square miles (1.12 million acres or approximately 453,000 hectares) on both sides of the United States (U.S.)-Mexico international border between California and Mexico (County of San Diego et al., 2008).

The purpose of the WQIP is to guide jurisdictional runoff management programs toward achieving the outcome of improved water quality in receiving waters. According to the MS4 Permit, "the goal of the WQIP is to protect, preserve, and enhance the water quality and designated beneficial uses of waters of the State. This goal will be accomplished through an adaptive planning and management process that identifies the highest priority water quality conditions within a watershed and implements strategies on a jurisdictional basis to achieve improvements in the quality of discharges from the MS4s and receiving waters."

This document focuses on stormwater discharges from MS4s and the MS4 Permit requirements associated with addressing those discharges. Sources of pollutants or stressors may include non-point sources such as runoff from agriculture or natural areas; point sources such as treatment plants, industrial discharges, and stormwater discharges from MS4s or other point sources (e.g., construction sites, industrial sites, highways); and pollutants crossing the international border from the Mexican portion of the watershed. A variety of regulations, permits, policies, and programs exist to address these sources. However, this WQIP is specific to stormwater and non-stormwater discharges from MS4s only.

ES.2. Priority and Highest Priority Water Quality Conditions, Sources, and Potential Strategies

This WQIP has been developed in stages to identify priority and highest priority water quality conditions, sources of those conditions, and potential strategies to address them.

The first step in identifying the highest priority water quality conditions was to assess the state of the receiving waters in the WMA and develop a comprehensive list of the water quality conditions. An initial list of receiving water conditions and the potential priority water quality conditions were determined, and they are summarized in Tables 2-5 and 2-6.

The initial list of receiving water conditions was modified to consider only water quality conditions that may be attributable in part to discharges from MS4s and only includes those conditions for which data are available to demonstrate that discharges from MS4s may be causing or contributing to the water quality condition. The shorter, modified list constitutes the priority water quality conditions.

The priority water quality conditions were reviewed to identify those of highest priority. The selection of highest priority water quality conditions considered the weight of evidence for each priority condition and was based on a cumulative assessment of the criteria identified. This WQIP identifies several priority water quality conditions and considered multiple criteria to compare them side by side in Section 2.3. Based on this analysis, the following have been identified as the highest priority water quality conditions:

- Sedimentation and siltation in the Tijuana River (wet weather)
- Turbidity in the Tijuana River and Tijuana River Estuary (wet weather)

An inventory of potential pollutant-generating facilities within the Tijuana Valley Hydrologic Area (HA) that may cause or contribute to sedimentation/siltation and turbidity water quality conditions in the Tijuana River and Tijuana River Estuary in the Lower Watershed was considered. The Tijuana River Valley in the Lower Watershed has the highest acreage of urban land use, and therefore has the most MS4 structures. The Upper Watershed generally is undeveloped, and those areas located above the reservoirs are not contributors of sediment to the Lower Watershed. Because the Lower Watershed has the highest density of MS4 facilities, this WQIP prioritizes those sources.

Highest priority sources were identified based on an assessment of the sources. Highest priority sources (listed alphabetically) include the following:

Facilities

- Commercial facilities
- Industrial facilities
- Municipal facilities
- Waste treatment, storage, or disposal facilities

Land Areas

- Commercial
- Institutional
- Industrial
- Transportation (e.g., local roads, parking lots; excludes California Department of Transportation [Caltrans])
- Construction

MS4 Outfalls

- Lower Watershed – wet weather

The MS4 Permit requires the jurisdictions to work together to identify potential water quality improvement strategies that may be implemented to address the highest priority water quality conditions. Potential strategies that can provide improvements in water quality include nonstructural and structural strategies. The preliminary lists presented in the WQIP were developed through collaboration among the RAs and solicitation of input from the public (Appendix G). The lists of potential strategies presented were further evaluated, and a refined list of strategies was developed, as described in Section 3 and provided in Appendix H.

ES.3. Water Quality Improvement Goals, Strategies and Schedules

The WQIP establishes an outfall-based numeric goal based on total suspended solids (TSS) for both sedimentation and siltation in the Tijuana River (during wet weather) and turbidity in the Tijuana River and Tijuana River Estuary (during wet weather). TSS is a logical metric for both conditions because sedimentation, siltation, and turbidity are interrelated. Baseline conditions were considered in the development of the final goals.

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

The proposed numeric goals will be met by implementing non-structural Jurisdictional Runoff Management Plan (JRMP) strategies as well as enhanced/targeted strategies. Attaining the water quality-based numeric interim goals and implementing the WQIP and associated strategies will demonstrate progress toward meeting the final goals, as indicated in Figure ES-1. Both the goals and implementation of these strategies will help to demonstrate progress toward addressing priority water quality conditions. Additional details about the strategies are summarized in Section 3. Detailed lists of jurisdictional strategies are provided in Appendix H.

The MS4 Permit requires the 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-stormwater discharges to the MS4, reduce pollutants in stormwater discharges in the MS4 to the maximum extent practicable (MEP), and strive to achieve the interim and final numeric goals.

Section 3 presents 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, as well as describes optional structural strategies, to be used as needed, and if funding is identified, including those strategies that can improve water quality by removing pollutants through filtration and infiltration. As part of this step, the RAs have estimated the funding needs to implement the jurisdictional strategies required to achieve the goals identified (see Appendix H).

ES.4. Monitoring and Assessment Program

The MS4 Permit requires development of an integrated monitoring and assessment program that assesses progress towards achieving the numeric goals and schedules, measures progress toward addressing the highest priority water quality conditions, and evaluates each RA's overall efforts to implement the WQIP.

The monitoring program has three major components:

- Receiving water monitoring,
- MS4 outfall discharge monitoring, and
- Special studies.

The receiving water monitoring includes multiple components intended to assess whether the chemical, physical, and biological conditions in receiving waters are protective, or likely protective, of beneficial uses. Long-term monitoring locations are monitored during both wet and dry conditions for water quality, along with sediment quality monitoring and participation in regional monitoring.

Because of the binational nature of the watershed, flows generated in the upper reaches of the watershed within the U.S. comingle with flows generated in Mexico before returning to receiving waters within U.S. jurisdiction in the Lower Watershed and Tijuana River estuary. In addition, the watershed area within the U.S. contains federal, State, and tribal lands (Figure 1-5b) that are not subject to the Phase I MS4 Permit regulatory framework. Accordingly, sample results from the lower 6 miles of the Tijuana River and Tijuana River Estuary as part of the long-term receiving water monitoring program are representative of water quality conditions influenced by discharges from entities both within the U.S. and Mexico, with potentially only a minor influence of RA MS4 discharges.

The dry weather MS4 outfall monitoring component has two phases. For the first phase, the RAs have performed a field screening of a certain number of outfalls, based on the total number of outfalls in their jurisdictions. For the second phase, the highest priority dry weather MS4 outfalls then will be monitored, using water quality-based methods rather than those used in the field screening program. The RAs will monitor the highest priority, major MS4 outfalls with non-stormwater persistent flows at least semi-annually.

For the wet weather MS4 outfall discharge monitoring component, the RAs have identified five monitoring locations that are representative of the residential, commercial, industrial, and mixed-use land uses within the Tijuana River WMA. These five locations will be monitored at least once per year.

The special studies will include a regional special study and a special study specific to the Tijuana River WMA. The goal of the special studies is to further investigate the highest priority water quality conditions. The regional special study will be focused broadly on highest priority water quality conditions for the entire San Diego Region, while the special study specific to the Tijuana River WMA will be focused on the highest priority water quality conditions in the Tijuana River WMA, as discussed in Section 2.

The regional special study is the San Diego Regional Reference Stream Study, currently being conducted by the Southern California Coastal Water Research Project (SCCWRP). 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. The goal of this study is to collect the data necessary to derive reasonable and accurate numeric targets for bacteria, nutrients, sediment, and heavy metals, based on a reference approach.

The RAs will conduct a Sediment Source Identification and Prioritization Study in the Tijuana River WMA to identify and prioritize the MS4 and non-MS4 sources that are causing or contributing to the highest priority water quality conditions. The results of this special study will assist the RAs in focusing their strategies on sources of sediment within their jurisdictions and will help to document sources of sediment that must be addressed by non-MS4 entities (see Section 4.1.3).

ES.5. Water Quality Improvement Plan Assessment Program

The assessment portion of the monitoring and assessment program will evaluate the data collected under the monitoring programs (described in Section 4.1) as well as the information collected as part of each RA's JRMP. The data collected from these two programs will be used to assess the progress of the WQIP strategies toward achieving water quality improvement goals.

Each WMA must implement an iterative approach to adapt the WQIP, monitoring and assessment program, and JRMP programs to achieving their goals. Accordingly, this WQIP describes various program adaptation triggers, including exceedances of water quality standards in receiving waters, new information, San Diego Regional Water Quality Control Board (Regional Board) recommendations, and public participation. Effectiveness assessments of JRMP programs and strategies also may trigger adaptations to the WQIP. Each trigger will result in specific adaptive management processes or actions either annually or at the end of the MS4 Permit term.

ES.6. Public Involvement

The MS4 Permit requires that the RAs consider public input during development of the WQIP. The public process included multiple opportunities for the public to participate and comment on development of the WQIP. This participation included two public workshops to solicit information, convening a consultation panel made up of representatives from the Regional Board, environmental groups, development groups, and individuals from the public. Furthermore, the MS4 Permit requires three public review periods to solicit comments on development of and submittal of the draft final WQIP.

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SECTION 1 INTRODUCTION

The Tijuana River Watershed encompasses a region of approximately 1,750 square miles (1.12 million acres or approximately 453,000 hectares) on both sides of the United States (U.S.)–Mexico international border between California and Mexico (County of San Diego et al., 2008). The Mexican side of the watershed is significantly more urbanized than the U.S. portion, which is largely undeveloped. The Tijuana River Watershed Management Area (WMA), the portion under the jurisdiction of U.S., includes 467 square miles (122,300 hectares) of the watershed on the U.S. side of the border (about 27 percent of the watershed).

Because of the binational nature of the watershed, much of the overland water flow from the upper reaches of the watershed management area commingles with water that passes through the City of Tijuana before exiting through the estuary into the Pacific Ocean. As a result of this, pollutants from Mexico have a substantial effect on the water quality in the Tijuana River (TRVRT, 2012; Weston Solutions, 2012a). Although the major contribution of pollutants originates in Mexico, multiple land uses and pollutant generating activities also occur in the United States, which can contribute to water quality issues in the Tijuana River WMA. This section includes several figures, intended to provide geographic context for the watershed, its jurisdictional authorities, and the land uses that may be potential sources of pollutants.

Within the U.S. side, discharges from Municipal Separate Storm Sewer Systems (MS4s) also may cause or contribute to impairments in the Tijuana River WMA. Discharges specifically into and from MS4s are the focus of this document. As implied by the name, MS4s are municipal systems owned by a state, city, town, village, or other public entity that may discharge to waters of the U.S. These systems are distinct from combined sewer systems that exist in many older cities of the U.S., in which both stormwater and sanitary sewage are combined in one system and conveyed to a publicly owned treatment works. MS4s are drainage systems intended to convey stormwater away from developed areas and, unlike combined systems, generally do not provide treatment before discharge to receiving waters. As discussed in the following sections, discharges from MS4s are regulated by both federal and State requirements.

What is an MS4?

- **M**unicipal
- **S**eparate
- **S**torm
- **S**ewer
- **S**ystem

1.1 DOCUMENT ORGANIZATION

This document is divided into five sections that generally follow the organization of Provision B of the MS4 Permit. As applicable, corresponding permit provisions are included below.

- **Section 1 Introduction:** This section sets the context for the Water Quality Improvement Plan (WQIP), describing the regulatory framework, WQIP purpose, and WQIP development process. It also presents background information on the Tijuana River Watershed and WMA Area.
- **Section 2 Priority Water Quality Conditions (B.2):** This section identifies the priority water quality conditions to be addressed by the WQIP, the sources of those conditions, and potential

strategies for addressing them. It also describes in detail the process to identify the highest priority water quality conditions, consistent with permit requirements.

- **Section 3 Water Quality Improvement Goals, Strategies, and Schedules (B.3):** This section identifies and develops specific water quality improvement goals, strategies, and schedules to address the highest priority water quality condition identified within the Tijuana River WMA. As part of its plan, the RAs have estimated the funding needs to implement the jurisdictional strategies required to achieve these goals.
- **Section 4 Water Quality Improvement Monitoring and Assessment Program (B.4):** This section describes the monitoring and assessment program that will be used to monitor progress and evaluate results during implementation of the WQIP.
- **Section 5 Iterative Approach and Adaptive Management Process (B.5):** This section describes the iterative and adaptive management procedures that the Responsible Agencies (RAs) will use to modify the WQIP over time, as necessary.

1.2 REGULATORY FRAMEWORK

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act. The act was significantly reorganized and expanded in 1972, and became commonly known as the "Clean Water Act" (EPA, 2014c).

In 1987, Congress amended the CWA, establishing a framework for regulating stormwater discharges from municipal storm sewers under the National Pollutant Discharge Elimination System (NPDES). Through the amendments, Congress directed the U.S. Environmental Protection Agency (EPA) to develop regulations with requirements for stormwater discharges from MS4s, and required individual states to establish programs for writing permits and regulating stormwater discharges. In California, the State Water Resources Control Board (State Board) and nine Regional Water Quality Control Boards (Regional Boards) serve as the principal State agencies with primary responsibility for coordination and control of water quality. The San Diego Regional Board oversees the San Diego Region for all watersheds draining into the Pacific Ocean between the Santa Ana Region and U.S.–Mexico border.

Through the Basin Plan, the San Diego Regional Board (2012) designated beneficial uses for the region's surface and ground waters as well as water quality objectives for the reasonable protection of those uses; beneficial uses are the "uses of water necessary for the survival or well-being of man, plants, and wildlife." The waters of the Tijuana River WMA support a number of beneficial uses, including warm freshwater habitat (WARM), marine habitat (MAR), and several others (see Appendix A for the full list of beneficial uses in the Tijuana River WMA).

A primary responsibility of the Regional Board is to issue waste discharge requirements through permits for compliance with applicable provisions of the CWA. The Regional Board has issued a series of permits addressing stormwater discharges from MS4s. Prior permits have focused on prescriptive, mandated activities and actions, while the current permit, the fifth-term permit, "shifts focus of the permit

requirements from a minimum level of actions to be implemented by the RAs to identifying outcomes to be achieved by those actions" (Regional Board, 2013).

The Regional Board adopted the fifth-term permit, Order R9-2013-0001 (MS4 Permit), on May 8, 2013 (San Diego Regional Board, 2013a), specifying new requirements for discharges from Phase I MS4s draining to the watershed within the San Diego Region. The permit has been revised since its initial publication and is currently undergoing a second revision by the RWQCB. The RAs, as they generally are referred to in this document, are responsible for complying with the MS4 Permit requirements. In the Tijuana River WMA, the RAs include the City of Imperial Beach, the City of San Diego, and the County of San Diego.

Although this document focuses on stormwater discharges from MS4s and the MS4 Permit requirements associated with addressing those discharges, additional permits and regulatory constructs are in place to address stormwater discharges from other sources. For example, stormwater discharges from industrial sites are covered by the Industrial General Permit (State Board Order 2014-0057, effective July 1, 2015); stormwater discharges from construction sites are covered by the Construction General Permit (CGP) (State Board Order 2012-0006-DWQ), and stormwater discharges from small MS4s are covered by the small MS4 (Phase II) general permit (State Board Order 2013-0001-DWQ). Each is regulated by statewide general permits issued by the State Board. Owners or operators of these entities must apply for permit coverage and comply with MS4 Permit requirements to protect water quality. Both the State Board and Regional Board may also issue individual permits directly to dischargers specifying requirements for managing discharges. For example, the State Board has issued a state-wide individual permit for stormwater discharges from California Department of Transportation (Caltrans) sites (State Board Order99-06-DWQ), and the Regional Board has issued an individual permit to Naval Base Coronado (Regional Board Order R9-2009-0081) and to the U.S. International Boundary and Water Commission (USIBWC) (Regional Board Order R9-2014-0094, as amended by R9-2014-0009). Permitted entities have the primary responsibility for implementing permit requirements including the control of pollutant discharges, but the RAs require best management practices (BMPs) and do have inspection and have some regulatory oversight authority over some of these sites (e.g., industrial and construction) located within their jurisdiction.

Some sources are exempt from permit requirements. For example, conditional waivers that remove the need to file a Report of Waste Discharge (ROWD) and avoid the need for NPDES permit coverage are given to activities such as agriculture and nursery operations, on-site disposal systems, silvicultural operations, and animal operations. The U.S. Customs and Border Protection also received a waiver for stormwater discharges during construction of the border fence along the U.S.–Mexico border because of national security. Furthermore, discharges from the Mexican side of the watershed are regulated by Mexican authorities, which are outside the jurisdiction of the NPDES permits.

1.3 WATER QUALITY IMPROVEMENT PLAN

The MS4 Permit includes a requirement to develop a WQIP. The purpose of the WQIP is to guide jurisdictional runoff management programs toward achieving the outcome of improved water quality in receiving waters. According to the MS4 Permit, "the goal of the WQIP is to protect, preserve, and enhance the water quality and designated beneficial uses of waters of the State. This goal will be

accomplished through an adaptive planning and management process that identifies the highest priority water quality conditions within a watershed and implements strategies on a jurisdictional basis to achieve improvements in the quality of discharges from the MS4s and receiving waters."

1.4 WQIP DEVELOPMENT SCHEDULE AND PUBLIC PARTICIPATION

The WQIP was developed in stages over a multi-year period. The MS4 Permit requires that the RAs consider public input during the development of the WQIP. The public process included multiple opportunities for the public to participate and comment on the development of the WQIP. This participation included two public workshops to solicit information, two consultation panel meetings made up of representatives of the Regional Board, environmental groups, development groups, and individuals from the public; and three public review periods to solicit comments on the development of and submittal of the draft final WQIP.

The first public review of the WQIP, including the priority water quality conditions, MS4 sources of those conditions, and potential strategies, occurred from June 27, 2014 to July 28, 2014. The second public review period, including the WQIP water quality improvement goals, strategies, and schedules, occurred from December 25, 2014 to January 24, 2015. The final public comment period ended on June 27, 2015. Comments from each of these reviews will be considered and incorporated as needed prior to approval of the WQIP by the Regional Board (see Table 1-1).

Table 1-1
WQIP Development Milestones and Opportunities for Public Participation

Milestone	Date
Permit Effective Date	June 27, 2013
First Public Workshop	January 28, 2014
First Consultation Panel Meeting	May 12, 2014
Sections 1 and 2 of WQIP Submitted to Regional Board for Public Review	By June 27, 2014
Second Consultation Panel Meeting	October 30, 2014
Second Public Workshop	August 19, 2014
Section 3 of WQIP Submitted to Regional Board for Public Comment	December 25, 2014
Complete WQIP Submitted to Regional Board for Public Review	June 27, 2015

1.5 TIJUANA RIVER WATERSHED AND WATERSHED MANAGEMENT AREA

1.5.1 Tijuana River Watershed

The Tijuana River Watershed covers a range of natural ecosystems—from 6,000-foot pine forest-covered mountains in the east to the tidal saltwater estuary at the mouth of the Tijuana River and sandy beaches along the Pacific shoreline in the west (TRVRT, 2012). Annual rainfall ranges from more than 22.5 inches in the inland areas to approximately 10 inches or less along the coast (San Diego County Water Authority et al., 2013).

The major water features in the watershed include the Tijuana River Estuary, Tijuana River, Cottonwood Creek, Pine Valley Creek, Campo Creek, Barrett Reservoir, and Lake Morena on the U.S. side and the El Carrizo Reservoir, Abelardo L. Rodríguez Reservoir, and Río Las Palmas system on the Mexico side. The Rio Las Palmas system joins with the Cottonwood-Alamar system (primarily in the U.S.) to form the Tijuana River before crossing into the U.S. from Mexico (San Diego County Water Authority et al., 2013).

Four major dams control a majority of surface flow in the watershed (TRVRT, 2012): Barrett and Morena in the U.S., and Rodríguez and El Carrizo in Mexico. Water flows in the upper reaches of the Tijuana River WMA eventually are impounded in either Moreno Reservoir or Barrett Lake. Most outflows from Barrett Lake, which also includes outflow from Morena Reservoir, are diverted from the Tijuana River Watershed into Otay Lake, located in the Otay Hydrologic Unit (Weston Solutions, 2012a). The dams serve primarily to store and provide water, but they also trap pollutants, such as sediment originating upstream, thereby reducing their downstream movement through the watershed (TRVRT, 2012).

The border region experienced rapid urbanization in the late twentieth century, especially on the Mexican side (Paul, 1995). Although the total population of the watershed is approximately 2.8 million people, only 83,000 live on the U.S. side (San Diego County Water Authority et al., 2013). Urbanization is a principal contributor to water quality impairment (NRC, 2009), and most of the flow of the Tijuana River Watershed below the dams drains through highly urbanized areas before discharging into the Pacific Ocean (SDSU, 2005a). This includes the main channel of the Tijuana River as well as other major drainages from Mexico that flow into the lower Tijuana River Valley and Estuary, such as flows from Yogurt Canyon (Los Sauces), Goat Canyon (Los Laureles), and Smuggler's Gulch (Los Mataderos). Both the Tijuana River and major tributary drainages transport significant pollutants from the urbanized areas of Tijuana directly into the Tijuana River Valley (TRVRT, 2012).

Historically, the Tijuana River was an intermittent river (San Diego County Water Authority et al., 2013) that flowed primarily during the rainy season. However, the growth of the city of Tijuana brought significant non-stormwater sources to the river channel from Mexico into the U.S., including discharges contaminated with raw sewage (San Diego Regional Board, 1996a). As early as 1965, the City of San Diego proposed and signed an agreement to treat portions of Tijuana's sewage (Paul, 1995). More recently, the U.S. and Mexico built the South Bay International Wastewater Treatment Plant (SBIWTP), to treat wastewater and to minimize and prevent the contamination of the Tijuana River, the estuary, and ocean shoreline from sewage flows originating from Tijuana (San Diego County Water Authority et al.,

2013). The SBIWTP is owned and administered by the USIBWC, and operates under contract with a private consultant. The plant treats an average daily flow of 25 million gallons per day (San Diego Regional Board, 1996a). The USIBWC also maintains five small canyon diverters, located immediately north of the border at the Silva Drain, Cãnon del Sol, Stewarts Drain, Goat Canyon, and Smuggler's Gulch, to capture and direct cross-border flows to the plant for treatment. However, during storm or significant dry weather flow events, the river often overflows the diversion system, allowing sewage to discharge untreated into the United States.

1.5.2 Tijuana River WMA

Approximately 27 percent of the Tijuana River Watershed is on the U.S. side of the international border. This portion of the watershed is referred to as the Tijuana River WMA. Figure 1-1 shows the Tijuana River Watershed as well as the WMA. The MS4 Permit is limited to the WMA, and local responsibility is split among three jurisdictions: the City of Imperial Beach, the City of San Diego, and the County of San Diego (the RAs).

The Tijuana River WMA is subject to a range of sources that affect water quality. For example, the Tijuana River often is made up of commingled flow, with substantial discharges from the Mexican portion of the watershed that can cause significant impacts on water quality in the Tijuana River WMA (TRVRT, 2012; Weston Solutions, 2012c). Figure 1-2 shows the relative levels of urbanization in the watershed and indicates more urbanization on the Mexican side of the border.

This WQIP refers to two areas of the Tijuana River WMA, the Lower Watershed and Upper Watershed, because of their unique attributes and position in the watershed. Although this document considers the entire WMA, the analysis of water quality data and potential MS4 pollutant sources documented in Section 2 note that the Lower Watershed includes most of the urbanization and MS4 infrastructure in the WMA. The Lower Watershed includes the Tijuana Valley Hydrologic Area (HA) (HA Code 911.1), which has two Hydrologic Subareas (HSAs): the San Ysidro (911.11), and Water Tanks (911.12). The Lower Watershed is subject to commingled flows from both Mexico and the U.S. Unlike the Lower Watershed, the Upper Watershed is rural. The Upper Watershed includes the remaining portion of the Tijuana River WMA upstream from the Tijuana Valley, namely the Potrero (911.2), Barrett Lake (911.3), Monument (911.4), Morena (911.5), Cottonwood (911.6), Cameron (911.7), and Campo (911.8) HAs (Figure 1-3).

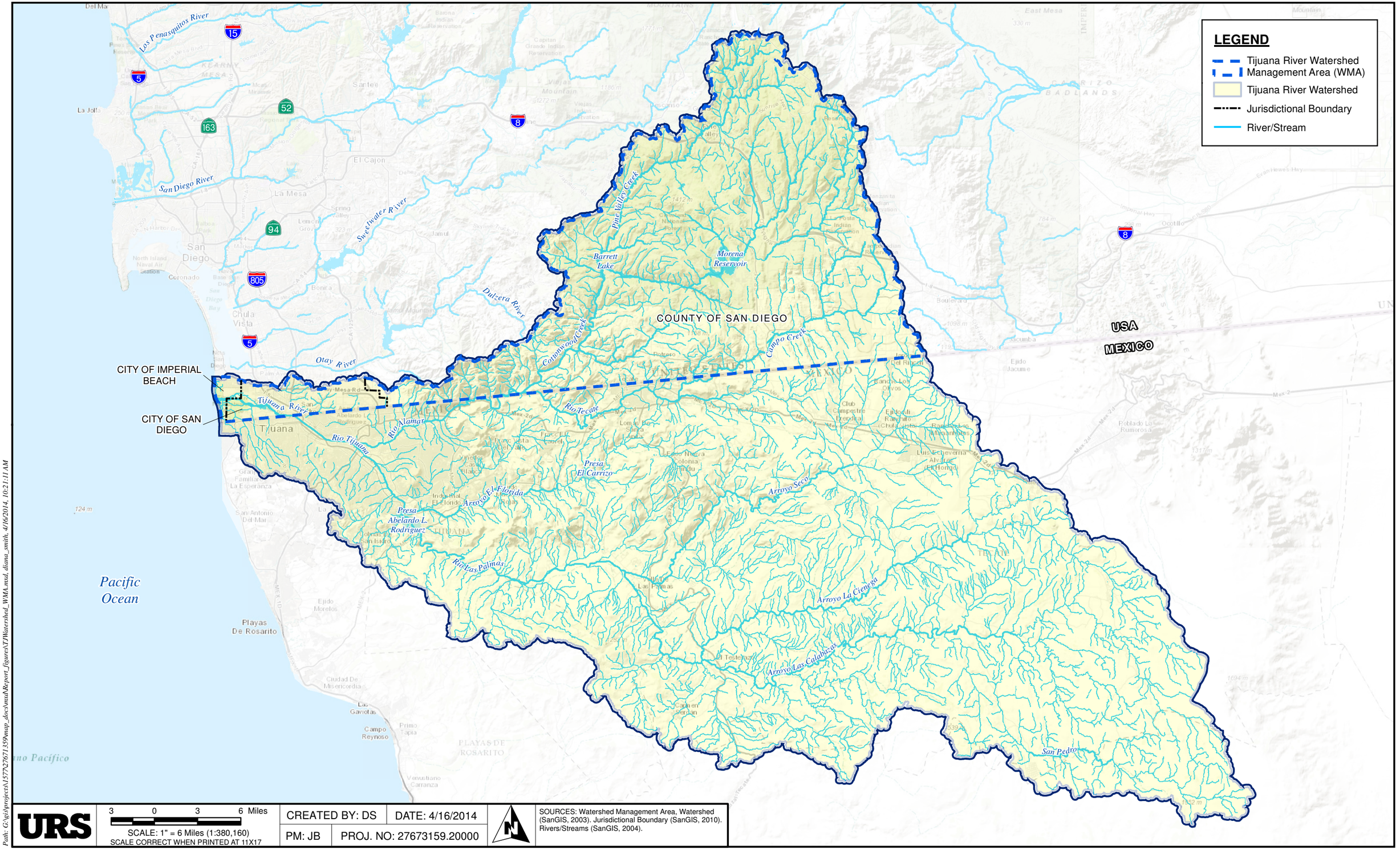

FIGURE 1-1 TIJUANA RIVER WATERSHED AND WATERSHED MANAGEMENT AREA (WMA)

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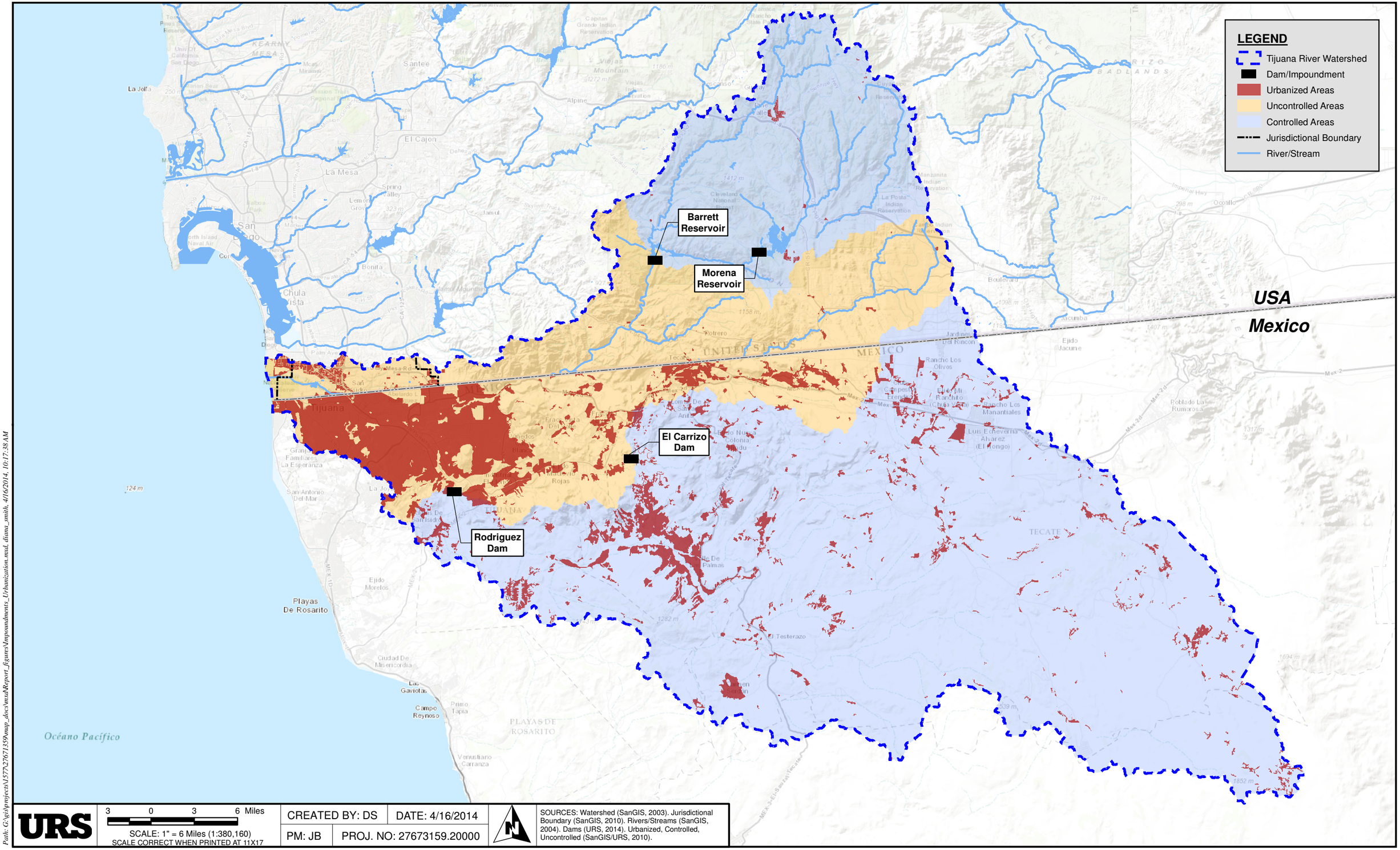

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FIGURE 1-2 RELATIVE LOCATIONS OF URBANIZED AREAS

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LEGEND

- Tijuana River Watershed Management Area (WMA)
- Jurisdictional Boundary
- River/Stream
- Dam

Upper Watershed

- Barrett Lake
- Cameron
- Campo
- Cottonwood
- Monument
- Morena
- Potrero

Lower Watershed

- Tijuana Valley

Monument (911.4)

Cottonwood (911.6)

Cameron (911.7)

Morena (911.5)

Barrett Lake (911.3)

Potrero (911.2)

Campo (911.8)

Tijuana Valley (911.1)

CITY OF IMPERIAL BEACH

CITY OF SAN DIEGO

COUNTY OF SAN DIEGO

USA

MEXICO

URS

1.75 0 1.75 3.5 Miles

SCALE: 1" = 3.5 Miles (1:221,760)

SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: DS | DATE: 4/16/2014

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SOURCES: Watershed Management Area, Hydrologic Areas (SanGIS, 2003). Jurisdictional Boundary (SanGIS, 2010). Rivers/Streams (SanGIS, 2004). Dams (URS, 2014)

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FIGURE 1-3 TIJUANA RIVER WATERSHED MANAGEMENT AREA (WMA) AND HYDROLOGIC AREAS

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Within the Tijuana River WMA, the range of land uses can have different impacts on water quality. Most of the land within the Tijuana River WMA is undeveloped or vacant (58 percent). Other land uses include open space parks or preserve areas (26 percent), residential (10 percent), agriculture (2 percent), freeway (1 percent), and other transportation (2 percent). The remaining uses (e.g., commercial, industrial, military) make up approximately 1 percent (SANDAG, 2012). Table 1-2 shows land uses by HA. Figure 1-4 shows the land uses in the Tijuana River WMA and the land use differences between the Upper and Lower Watersheds. The Upper Watershed is nearly 90 percent vacant undeveloped land, open space park or preserve or other park, open space, or recreation. This compares to 55 percent for the Lower Watershed, which still is relatively undeveloped compared to other watersheds in the San Diego Region. In general, the land uses in the Tijuana River WMA that typically would drain to MS4 systems and would be subject to MS4 requirements include residential and commercial uses. These land uses make up a total of approximately 12 percent of the WMA and are located primarily in the Lower Watershed. Both the Upper and Lower Watersheds are relatively undeveloped, but the Lower Watershed encompasses approximately four times as much of urbanized land uses as the Upper Watershed, on a percentage basis.

Discharge responsibility is another factor to consider. As defined in the MS4 Permit, a permittee to an NPDES permit is only responsible for permit conditions relating to the discharge for which it is an operator. In the case of the MS4 Permit, this includes discharges from large MS4s in the San Diego Region. The San Diego County RAs are listed in Table 1a of the MS4 Permit. Each RA must achieve compliance with the MS4 discharge prohibitions outlined in the MS4 Permit through timely implementation of control measures, other actions specified in the MS4 Permit, and implementation of strategies presented in this WQIP.

The goal of this WQIP is to develop a framework to improve the surface water quality in the Tijuana River WMA by identifying and addressing impairments related to urban runoff discharges from MS4s, owned and operated by the RAs within the watershed, thereby furthering the CWA's objective to protect, preserve, enhance, and restore water quality.

Surface water quality is affected by many other sources in addition to MS4s. Discharges into receiving waters from non-municipal sources and activities (e.g., runoff from agriculture and industrial land uses; federal/State facilities; and Phase II permittees) have been found to adversely affect water quality in southern California. These sources are regulated separately. Although discharges from these sources and activities may be considered under portions of this WQIP as inputs to the MS4, the RAs do not have jurisdictional authority over these agencies and activities. Therefore, the MS4 Permit does not specifically require that control of non-municipal sources be addressed as part of the WQIP.

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LEGEND

- Tijuana River Watershed Management Area (WMA)
- Hydrologic Area
- Jurisdictional Boundary
- River/Stream
- Dam

Land Uses

- Agriculture
- Commercial
- Freeway
- High-Density Residential
- Industrial
- Institutional, Public and Semi-Public Facilities
- Junkyard/Dump/Landfill
- Low-Density Residential
- School
- Transportation
- Vacant and Undeveloped Land
- Water Bodies

Monument (911.4)
Cottonwood (911.6)
Cameron (911.7)
Morena (911.5)
Barrett Lake (911.3)
Campo (911.8)
Potrero (911.2)
Tijuana Valley (911.1)

CITY OF IMPERIAL BEACH
CITY OF SAN DIEGO
COUNTY OF SAN DIEGO
USA
MEXICO

URS

1.75 0 1.75 3.5 Miles
SCALE: 1" = 3.5 Miles (1:221,760)
SCALE CORRECT WHEN PRINTED AT 11X17

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SOURCES: Watershed Management Area, Hydrologic Areas (SanGIS, 2003). Jurisdictional Boundary (SanGIS, 2010). Rivers/Streams (SanGIS, 2004). Dams (URS, 2014)

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FIGURE 1-4 TIJUANA RIVER WATERSHED MANAGEMENT AREA (WMA) LAND USES

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Table 1-2
Land Uses in the Hydrologic Areas of the Tijuana River WMA

Hydrologic Area	Land Uses and Area (acres[1])													Total[2]
	Agriculture	Vacant and Undeveloped Land	Open Space Park or Preserve	Other Park, Open Space and Recreation	Low-Density Residential	High-Density Residential	School	Institutional, Public and Semi-Public Facilities	Commercial	Industrial	Junkyard/Dump/Landfill	Transportation	Freeway	
Lower Watershed (LW)														
Tijuana Valley (911.1)	1,109	3,630	7,075	139	1,373	605	368	375	340	1,058	20	2,646	964	19,700
Percent (%) of Lower Watershed	6%	18%	36%	1%	7%	3%	2%	2%	2%	5%	<1%	13%	5%	
Upper Watershed (UW)														
Potrero (911.2)	1,185	19,237	26,230	419	5,924	218	6	13	3	-	21	324	-	53,579
Barrett Lake (911.3)	768	34,191	21,572	44	1,224	20	-	10	-	-	-	121	398	58,349
Monument (911.4)	158	20,744	1,348	251	1,136	0	2	12	17	-	-	179	197	24,044
Morena (911.5)	-	11,069	1,419	18	779	72	-	2	1	-	-	48	-	13,408
Cottonwood (911.6)	801	26,290	239	38	291	-	30	34	-	-	-	196	585	28,503
Cameron (911.7)	816	23,338	2,860	60	2,261	0	-	18	5	-	-	135	574	30,067
Campo (911.8)	2,498	34,632	14,854	12	14,873	77	30	89	109	41	29	1,216	260	68,719
% of Upper Watershed	2%	60%	26%	1%	8%	<1%	<1%	<1%	<1%	<1%	<1%	1%	1%	
WMA Total Acreage	7,335	173,130	75,596	981	27,861	993	435	552	475	1,099	69	4,866	2,979	296,370

Source: SANDAG, 2012
[1] Excludes water bodies
[2] To convert acres to hectares, divide values by 2.47.

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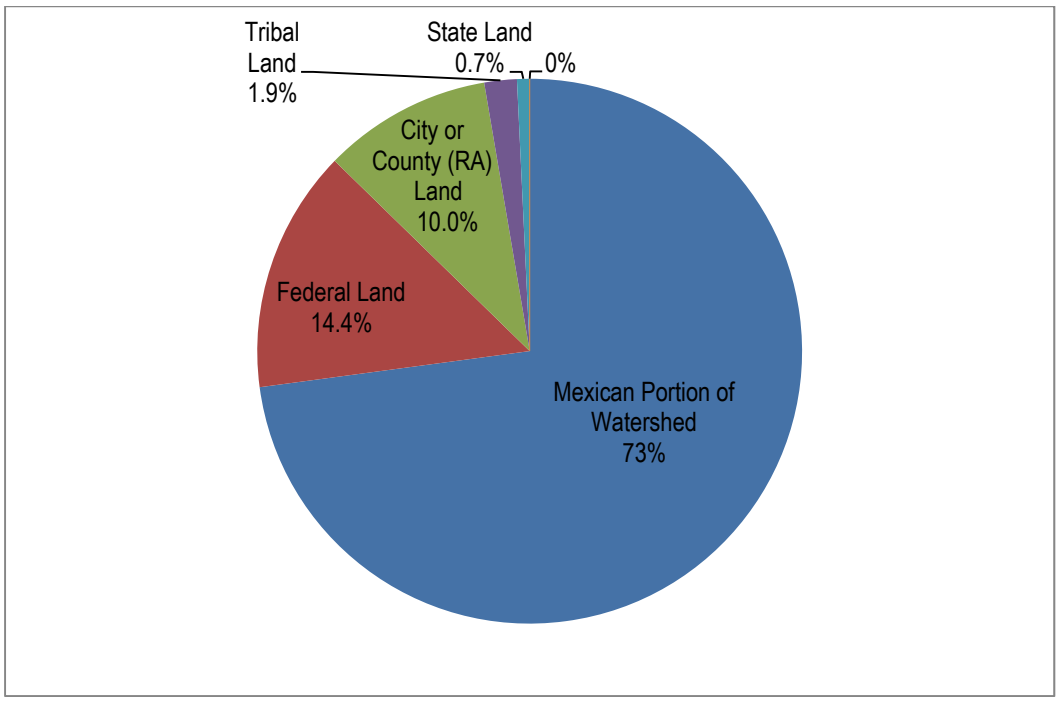
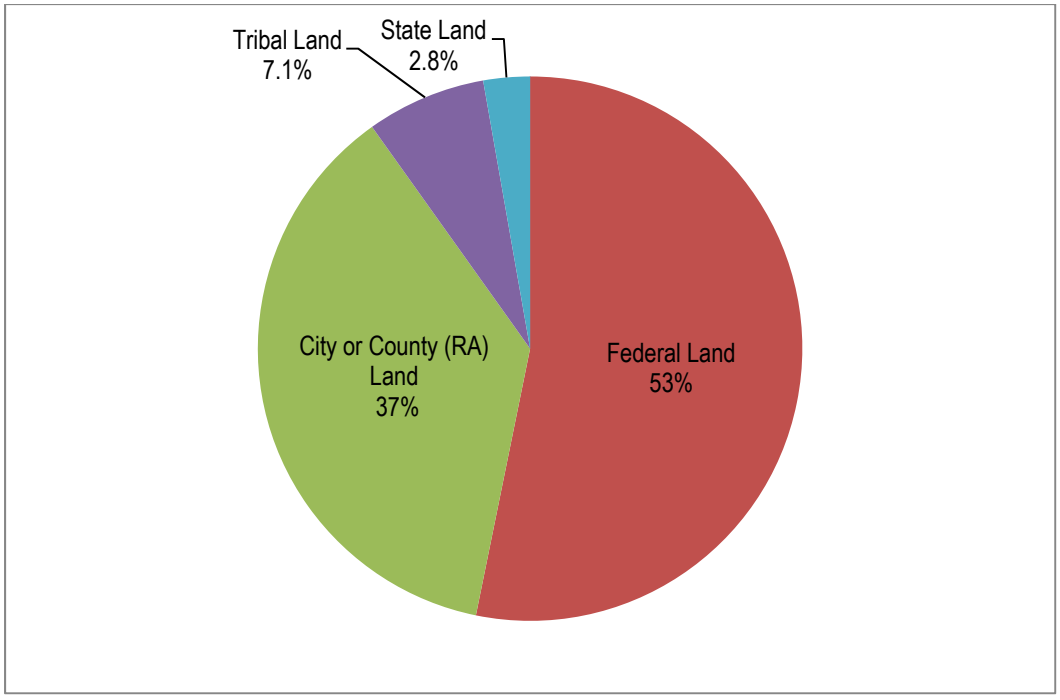
Figures 1-5a and 1-5b present the percentages of jurisdictional responsibility in the watershed and WMA. Figure 1-6a shows the portions of the WMA that are within and outside the jurisdictions of the responsible agencies in the WMA. The hatched area corresponds to federal, State, tribal, and other areas where the RAs do not have oversight or discharge authority. This portion makes up approximately 90 percent of the WMA. The remaining 10 percent (shown in Figure 1-5a) falls under the jurisdiction of the RAs, but the figure does not account for land uses over which the RAs have limited responsibilities or authorities (e.g., agricultural, industrial, or school land). The scope of the WQIP is limited to improvements that can be achieved by the RAs, and thus this plan may not address all water quality issues in the Tijuana River WMA. Although the focus is on those issues that can be addressed, the RAs' jurisdictional programs do address other priority pollutants. The RAs recognize the need for collaboration and improved communication with non-municipal sources to improve water quality throughout the watershed.



Source: SANDAG, 2012

Figure 1-5a
Land Area in the Tijuana River Watershed



Source: SANDAG, 2012
Total WMA land area (excluding water bodies): 296,370 acres

Figure 1-5b
Jurisdictional Area in the Tijuana River Watershed Management Area

LEGEND

- Tijuana River Watershed Management Area (WMA)
- Areas outside the Discharge Responsibility of Responsible Agencies

Areas within the Discharge Responsibility of Responsible Agencies

- City of Imperial Beach
- City of San Diego
- County of San Diego
- Hydrologic Area
- Jurisdictional Boundary
- River/Stream
- Dam

Monument (911.4)

Cottonwood (911.6)

Cameron (911.7)

Morena (911.5)

Barrett Lake (911.3)

Campo (911.8)

Potrero (911.2)

Tijuana Valley (911.1)

COUNTY OF SAN DIEGO

CITY OF IMPERIAL BEACH

CITY OF SAN DIEGO

USA

MEXICO

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SCALE CORRECT WHEN PRINTED AT 11X17

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SOURCES: Watershed Management Area, Hydrologic Areas (SanGIS, 2003). Jurisdictional Boundary (SanGIS, 2010). Rivers/Streams (SanGIS, 2004). Dams (URS, 2014)

FIGURE 1-6A AREAS OUTSIDE THE DISCHARGE RESPONSIBILITY OF THE RESPONSIBLE AGENCIES IN THE TIJUANA RIVER WATERSHED MANAGEMENT AREA

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LEGEND

- Tijuana River Watershed Management Area (WMA)
- Areas outside the Discharge Responsibility of Responsible Agencies

Areas within the Discharge Responsibility of Responsible Agencies

- City of Imperial Beach
- City of San Diego
- County of San Diego
- Hydrologic Area
- Jurisdictional Boundary
- River/Stream

CITY OF IMPERIAL BEACH

CITY OF SAN DIEGO

COUNTY OF SAN DIEGO

Tijuana Valley (911.1)

Tijuana River

Otay River

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URS

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SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: DS | DATE: 6/13/2014

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SOURCES: Watershed Management Area, Hydrologic Areas (SanGIS, 2003). Jurisdictional Boundary (SanGIS, 2010). Rivers/Streams (SanGIS, 2004). Dams (URS, 2014)

FIGURE 1-6B AREAS OUTSIDE THE DISCHARGE RESPONSIBILITY OF THE RESPONSIBLE AGENCIES IN THE TIJUANA RIVER WATERSHED MANAGEMENT AREA (TIJUANA VALLEY)

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SECTION 2 PRIORITY AND HIGHEST PRIORITY WATER QUALITY CONDITIONS, SOURCES, AND POTENTIAL STRATEGIES

This section documents the identification of receiving water quality conditions in the Tijuana River WMA as well as the subset of those conditions identified as priority and highest priority water quality conditions. In addition, this section identifies and prioritizes potential pollutant sources and/or stressors that may be contributing to the highest priority water quality conditions and potential strategies for addressing them. Table 2-1 describes the primary data and information sources that were used to develop this section.

Table 2-1
Primary Data and Information Sources

Primary Source	Description
2010 Clean Water Act Section 303(d) List	Section 303(d) of the Federal Clean Water Act and 40 Code of Federal Regulations (CFR) Section 130.7 require states to identify water bodies that do not meet water quality standards and are not supporting their beneficial uses. Such waters are placed on the Section 303(d) List of Water Quality Limited Segments, generally referred to as the 303(d) List. California last published its 303(d) list of impaired waters in 2010. This list was reviewed as part of the assessment of receiving water conditions, and all impairments in the Tijuana River WMA listed on the 303(d) list were included in the initial comprehensive list of water quality conditions.
Long-Term Effectiveness Assessment (LTEA) (Weston Solutions, 2011)	The LTEA was required by the previous San Diego Municipal Storm Water Permit (NPDES Order R9-2007-0001) and directed Regional RAs to evaluate the effectiveness of jurisdictional program implementation including multiple years of water quality sampling results. The data presented in the LTEA are based on dry weather and wet weather receiving waters and urban runoff data collected from the 2005–2006 through the 2009–2010 monitoring season.
Receiving Waters and Urban Runoff Monitoring Reports (Weston Solutions, 2012a,c, 2013a,b)	This report summarizes and presents the findings of the annual watershed-based receiving waters monitoring program required by NPDES Order R9-2007-0001). This annual report summarizes dry weather and wet weather receiving waters and urban runoff data for a given reporting year. Monitoring alternates between the northern and southern watersheds and occurs in the Tijuana River WMA every other year. These reports also provided results from the Ambient Bay and Lagoon Monitoring Program as well as receiving water data collected by the Stormwater Monitoring Coalition (SMC) and the San Diego Coastkeeper.
Tijuana River Bacterial Source Identification Study – Final Report (Weston Solutions, 2012b)	This report documents a study managed by the City of Imperial Beach to assess the potential sources of indicator bacteria on the U.S. side of the Tijuana River Watershed that may be affecting the Tijuana River Estuary and adjacent beaches. The study found that 99 percent of indicator bacteria loads entering the estuary and ocean during wet weather originate from undiverted flows from the Tijuana River main channel and tributary channels from Mexico. During dry weather, semi-natural best management practices (BMPs) such as soft-bottom sediments and ponds at the base of major sub-drainages prevent the large majority of dry weather flows from entering the estuary. The study also found very little hydrologic connection between watershed surface waters and the estuary.

Table 2-1
Primary Data and Information Sources

Primary Source	Description
Tijuana River Watershed Technical Support Document for Solids, Turbidity and Trash, Total Maximum Daily Loads (TMDLs) (Tetra Tech, 2010):	This draft technical report was written to support the development of solids, turbidity, and trash TMDLs for the Tijuana River and Estuary. The document was not formally adopted following public review and comment, but the preliminary estimates help to inform the understanding of solids, turbidity, and trash in the WMA. The report calculates the pollutant loads from the range of sources in the watershed and includes estimates of Total Suspended Solids (TSS) concentrations in runoff by land use, based on data compiled by Ackerman and Schiff (2003) from land use monitoring programs throughout Southern California, and estimates of trash accumulation rates by land use developed by the City of Los Angeles (2002). The document source was used to develop the relative magnitudes of sediment and trash in stormwater discharges by land use and the relative contributions from the MS4.

2.1 IDENTIFICATION OF RECEIVING WATER CONDITIONS

The MS4 Permit requires the RAs to assess receiving waters and potential contributing impacts from the MS4s in their WMAs, and then develop a comprehensive list of priority water quality conditions as "pollutants, stressors and/or receiving water conditions that are the highest threat to receiving water quality or that most adversely affect the quality of receiving waters" (Provision B.2.c). The list of priority water quality conditions must be evaluated and then the highest priority water quality conditions to be addressed by the WQIP must be identified along with rationale for their selection. The discussion that follows describes the approach to evaluate the water quality conditions in the Tijuana River WMA consistent with permit requirements and to identify and assess the priority and highest priority water quality conditions appearing in this WQIP. Figure 2-1 shows an overview of the process used to identify the highest priority water quality conditions. The relevant permit section for each step is referenced. The steps are described in greater detail below.

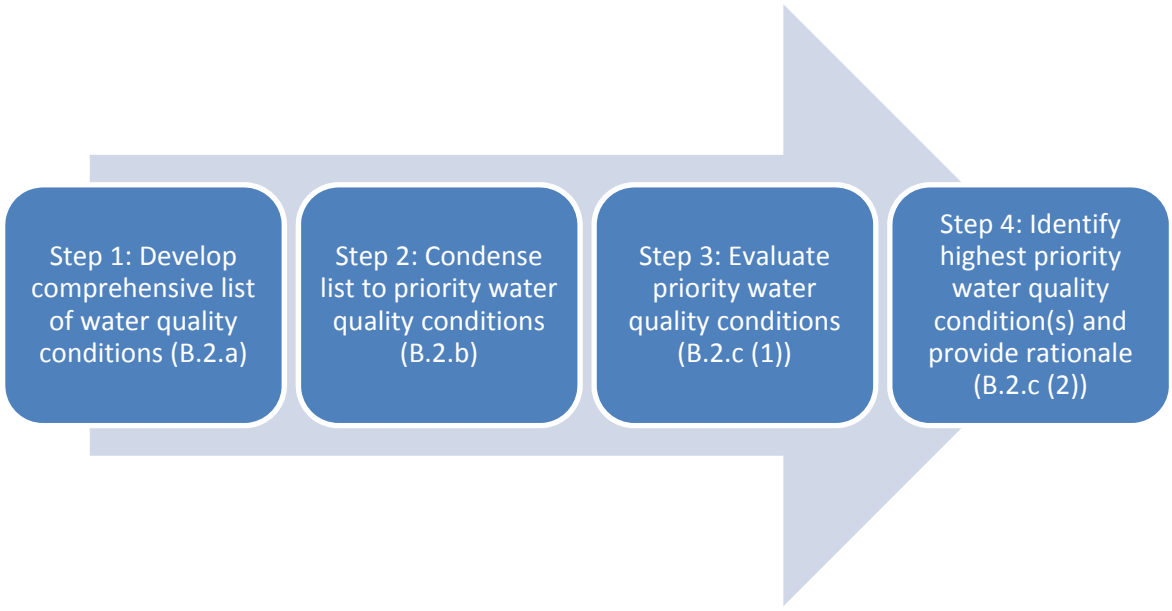

Figure 2-1
Conceptual Process to Identify Highest Priority Water Quality Conditions

The first step in identifying the highest priority water quality conditions is to assess the state of the receiving waters in the WMA and develop a comprehensive list of the water quality conditions. Provision B.2.a of the MS4 Permit provides a list of nine factors that must be considered, as follows:

1. Receiving waters listed as impaired on the CWA Section 303(d) List of Water Quality Limited Segments;
2. Total Maximum Daily Loads (TMDLs) adopted and under development by the Regional Board;
3. Receiving waters recognized as sensitive or highly valued by the RAs;
4. The receiving water limitations of Provision A.2;
5. Known historical versus current physical, chemical, and biological water quality conditions;
6. Available, relevant, and appropriately collected and analyzed physical, chemical, and biological receiving water monitoring data;
7. Available evidence of erosional impacts on receiving waters because of accelerated flows (i.e., hydromodification);
8. Available evidence of adverse impacts on the chemical, physical, and biological integrity of receiving waters; and
9. The potential improvements in the overall condition of the WMA that can be achieved.

Receiving water conditions were assessed through the stepwise process detailed in the next section. Table 2-2 summarizes the results of the assessment.

2.1.1 Receiving Waters Listed as Impaired on the CWA Section 303(d) List of Water Quality Limited Segments

The 2010 303(d) list includes 12 impaired water body segments affecting eight different beneficial uses designated in the Tijuana River WMA. The beneficial designations identified the waters of the Tijuana River WMA are described in the Basin Plan and are provided in Appendix A. The affected beneficial uses are considered again during identification of highest priority water quality condition.

Table 2-2 lists the names and locations of the impaired water body segments in the Tijuana River WMA, the beneficial use(s) impaired, and the pollutant or pollutants responsible for impairment. Figure 2-2 shows the geographical extent of the impaired water bodies. The number of impairments has increased since issuance of the previous list, specifically the Pacific Ocean listing, which was further refined to characterize smaller segments of the same receiving water. The five new listings are for bacteria. The 303(d) list indicates the estimated size of the area affected by the impairment and the potential source(s) causing the impairment, if known or suspected.

Table 2-2
303(d)-Listed Impaired Waters in the Tijuana River Watershed Management Area

Receiving Water Segment	Pollutant																										Beneficial Uses Impacted
	Indicator Bacteria	Total Coliform	Fecal Coliform	Enterococcus	Turbidity	Solids	Sedimentation/Siltation	Trash	Total Nitrogen as N	Ammonia as Nitrogen	Phosphorus	Eutrophic	Low Dissolved Oxygen	Pesticides	Surfactants (MBAS)	Lead	Manganese	Nickel	Selenium	Thallium	Trace Elements	Synthetic Organics	Perchlorate	Color	pH	Toxicity	
Pacific Ocean Shoreline, Tijuana HU, at 3/4 mile North of Tijuana River		•	•	•																							REC-1
Pacific Ocean Shoreline, Tijuana HU, at end of Seacoast Drive		•	•	•																							REC-1 SHELL
Pacific Ocean Shoreline, Tijuana HU, at Monument Road		•	•																								REC-1
Pacific Ocean Shoreline, Tijuana HU, at the US Border		•	•	•																							REC-1 SHELL
Pacific Ocean Shoreline, Tijuana HU, at Tijuana River mouth		•	•	•																							REC-1
Tijuana River (6 miles afffected)	•					•	•	•	•		•	•	•	•	•				•		•	•				•	REC-1 and 2 MUN WARM
Tijuana River Estuary (1320 acres affected)	•				•			•				•	•	•		•		•		•							REC-1 and 2 COMM EST MAR
Tecate Creek (1 mile affected)																			•								WARM
Barrett Lake (125 acres affected)									•								•						•	•	•		MUN WARM
Pine Valley Creek (Upper) (3 miles affected)					•																						MUN
Morena Reservoir (104 acres affected)										•	•						•							•	•		MUN WARM
Cottonwood Creek (53 miles affected)																			•								WARM

REC-1: Contact Water Recreation – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible.
REC-2: Non-Contact Water Recreation – Includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water.
SHELL: Shellfish Harvesting – Includes uses of water that support habitats suitable for the collection of filter-feeding shellfish for human consumption.
COMM: Commercial and Sport Fishing – Includes the uses of water for commercial or recreational collection of fish, shellfish, or other organisms.
MUN: Includes uses of water for community, military, or individual water supply.
EST: Includes uses of water that support estuarine ecosystems.
MAR: Marine Habitat – Includes uses of water that support marine ecosystems.
WARM: Warm Freshwater Habitat – Includes uses that support warm water ecosystems including preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

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LEGEND

- Tijuana Watershed Management Area (WMA)
- Hydrologic Area
- 303(d) Impaired Waters
- Jurisdictional Boundary
- River/Stream
- Dam

Monument (911.4)

Pine Valley Creek (Upper)

Cottonwood (911.6)

Cameron (911.7)

Morena (911.5)

Barrett Lake (911.3)

Barrett Lake

Morena Reservoir

Campo (911.8)

Potrero (911.2)

Cottonwood Creek

Tecate Creek

Tijuana Valley (911.1)

Tijuana River

Tijuana River Estuary

Pacific Ocean Shoreline

CITY OF IMPERIAL BEACH

CITY OF SAN DIEGO

COUNTY OF SAN DIEGO

USA

MEXICO

CUYAMACA MOUNTAINS

Poway

Santee

El Cajon

La Mesa

Spring Valley

Lemon Grove

San Diego

Coronado

Chula Vista

Bonita

Jamul

Descanso

Pine Valley

Potrero

Tecate

San Diego River

Sweetwater River

Otay River

Dulzura River

Pine Valley Creek

Barona Indian Reservation

Capitan Grande Indian Reservation

Viejas Indian Reservation

Cuyamaca Rancho State Park

Campo Indian Reservation

Manzanita Indian Reservation

La Posta Indian Reservation

Viejas Mountain

Jamul Mountains

1771 m

1186 m

1272 m

1412 m

927 m

323 m

1061 m

URS	1.75 0 1.75 3.5 Miles SCALE: 1" = 3.5 Miles (1:221,760) SCALE CORRECT WHEN PRINTED AT 11X17	CREATED BY: DS	DATE: 5/29/2014
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SOURCES: Watershed Management Area, Hydrologic Areas (SanGIS, 2003). Jurisdictional Boundary (SanGIS, 2010).Rivers/Streams (SanGIS, 2004). Dams (URS, 2014). Impaired Waters (SWRCB, 2010).

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FIGURE 2-2 TIJUANA RIVER WATERSHED MANAGEMENT AREA (WMA) 303(D)-LISTED IMPAIRED WATERS

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2.1.2 TMDLs Adopted and under Development by the Regional Board

Provision B.2.a.(2) requires consideration of any TMDLs that have been adopted or are under development by the Regional Board as it identifies priority and highest priority water conditions. Currently, no TMDLs have been adopted by the Regional Board. The 303(d) list indicates expected completion dates for TMDLs. Although the list indicates that a TMDL for indicator bacteria for the Tijuana River and Tijuana River Estuary was to be developed and implemented by 2010, no indicator bacteria TMDL has been developed. The list also indicates that other TMDLs for the WMA are expected to be developed and implemented between 2019 and 2020. TMDLs were under development by EPA and the Regional Board in 2010, specific to turbidity, sediment, and trash. In 2008, the Regional Board (in partnership with landowners and other stakeholders in the WMA) formed the Tijuana River Valley Recovery Team (TRVRT), with the goal of a Tijuana River Valley with sediment managed and trash eliminated. The Regional Board continues to support this collaborative approach to addressing these impairments to the Tijuana River WMA and has developed a 5-year plan that encompasses projects to attain these goals. The 5-year plan was endorsed by the Regional Board in March 2015. The Sediment and Trash TMDL has been deferred, while the Regional Board continues to take a stakeholder cooperation approach through the collective effort of the TRVRT (San Diego Regional Board, 2013b). The San Diego Regional Board will continue to support this collaborative approach, provided that continued progress is made in addressing trash and sediment impairments to the water bodies in the WMA.

2.1.3 Sensitive or Highly Valued Receiving Waters

Provision B.2.a.(3) requires for receiving waters recognized as sensitive or highly valued to be included in this category. These include “Waters having the Preservation of Biological Habitats of Special Significance (BIOL)” beneficial use designation. Waters in the Tijuana River WMA that have this designation include the following portions of the Tijuana River Estuary (San Diego Regional Board, 2012):

- Tijuana Estuary Natural Preserve (designated as a Natural Preserve by the State Park and Recreation Commission);
- Tijuana River National Estuarine Research Reserve, designated a National Estuarine Research Reserve by the National Oceanic and Atmospheric Administration, including Border Field State Park; and
- Tijuana Slough National Wildlife Refuge (managed by the U.S. Fish and Wildlife Service as part of the National Wildlife Refuge System).

Because the Tijuana River Estuary is included on the list of impaired waters, it already was included on the list of water quality conditions. The “highly valued” status of the Tijuana River Estuary is considered again as a filter in the identification of highest priority water quality condition in Section 2.4.

2.1.4 Receiving Water Limitations

Provision B.2.a.(4) requires the RAs to consider Receiving Water Limitations in Provision A.2 as part of the assessment of receiving water conditions. These limitations are analyzed by reviewing available receiving water monitoring data, visual assessments, and other information on receiving water integrity, as described in the following subsections, and by comparing the results of those assessments to receiving water limitations. Sampling results were compared to water quality benchmarks (e.g., from the Basin Plan), to identify the frequency (as a percentage) that water quality parameters were above benchmarks. The applicable receiving water limitations are listed with the receiving water conditions identified in the next section.

2.1.5 Available, Relevant, and Appropriately Collected and Analyzed Physical, Chemical, and Biological Receiving Water Monitoring Data

Multiple sources of receiving water monitoring data were available to further evaluate receiving water conditions in the Tijuana River WMA. The locations of these sampling stations are shown in Figure 2-3. These stations serve as the primary sources of receiving water monitoring data in the Tijuana River WMA and provide information representative of receiving water quality in the upper and lower portions of the Tijuana River WMA. These include two Temporary Water Assessment Stations (TWAS-1 and TWAS-2) and one Mass Loading Station (MLS), established in the Tijuana WMA. The MLS and TWAS-2 stations are located in the Lower Watershed, where land is more developed than in Upper Watershed and flow may be influenced by contributions from the Mexican portion of the Watershed. The TWAS-1 station is located in the less urbanized Upper Watershed and monitors water quality uninfluenced by flows from Mexico. During the 2010–2011 monitoring season, no sampling occurred at the MLS, TWAS-1, or TWAS-2 station, but sampling occurred at Stormwater Monitoring Coalition stations.

Several additional sources of data also were available to provide information on receiving water quality in the WMA, including data from Ambient Bay and Lagoon Monitoring (ABLM); San Diego Coastkeeper, and the Tijuana River Bacterial Source Identification Study (Weston Solutions, 2012b). Table 2-3 summarizes the receiving water sampling locations.

The receiving water monitoring data described in this subsection were reviewed and compared to receiving water limitations, to identify additional receiving water conditions in the Tijuana River WMA. Receiving water conditions were identified in this WQIP when more than 25 percent of samples exceeded water quality benchmarks for a given constituent. This is consistent with the model used in the Weston Reports to identify priority constituents in which medium priority constituents were identified when more than 25 percent of samples exceeded water quality benchmarks, and high priority constituents were identified when more than 50 percent of samples exceeded benchmarks.

Table 2-4 summarizes the results of this analysis. The table presents the additional receiving water conditions identified and supporting information, including source of sampling data, temporal extent, and applicable receiving water limitation. Actual monitoring results, including numbers of samples and water quality benchmarks, are provided in Appendix B.

LEGEND

- Tijuana Watershed Management Area (WMA)

Hydrologic Areas

- Barrett Lake
- Cameron
- Campo
- Cottonwood
- Monument
- Morena
- Potrero
- Tijuana Valley
- Jurisdictional Boundary
- River/Stream
- Dam
- Receiving Water Monitoring Locations

MLS: Mass Loading Station
TWAS: Temporary Watershed Assessment Station
SMC: Storm Water Monitoring Coalition

Monument (911.4)
Cottonwood (911.6)
Cameron (911.7)
Morena (911.5)
Barrett Lake (911.3)
Potrero (911.2)
Campo (911.8)
Tijuana Valley (911.1)

SMC05402
SMC03510
TJR-MLS
TJR-TWAS-1
TJR-TWAS-2

CITY OF IMPERIAL BEACH
CITY OF SAN DIEGO
COUNTY OF SAN DIEGO
USA
MEXICO

URS

1.75 0 1.75 3.5 Miles
SCALE: 1" = 3.5 Miles (1:221,760)
SCALE CORRECT WHEN PRINTED AT 11X17

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SOURCES: Watershed Management Area, Hydrologic Areas (SanGIS, 2003). Jurisdictional Boundary (SanGIS, 2010). Rivers/Streams (SanGIS, 2004). Dams, Receiving Waters Monitoring Locations (URS, 2014).

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FIGURE 2-3 PRIMARY RECEIVING WATER SAMPLING LOCATIONS

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Table 2-3
Description of Receiving Water Sampling Locations

Sampling Point	Overview	Constituents Sampled
TWAS-1	Station is located in Campo Creek along Forest Gate Road (911.80) and provides information on the Upper Watershed. It is representative of the composition of flows not commingled with flows originating in Mexico. Station was sampled during the 2009-2010 and 2011-2012 seasons during wet and dry weather.	• chemistry • bacteria • toxicity • synthetic pyrethroids in sediment
TWAS-2 and MLS	Both the TWAS-2 and MLS stations are located on the Tijuana River (TWAS-2 at Dairy Mart Road and MLS at Hollister Street). They provide monitoring data on flows in the Lower Watershed. Water quality at both of these sites reflects contributions of pollutants from discharges derived from sources that are located in Mexico. MLS was sampled during the 2005-2006, 2006-2007, 2008-2009, 2009-2010, and 2011-2012 seasons during wet and dry weather. TWAS-2 was sampled during the 2009-2010 season during wet and dry weather. The TWAS-2 station is no longer sampled and has not been sampled since 2010.	• chemistry • bacteria • toxicity testing • synthetic pyrethroids in sediment
SMC03510	Station is located on Tecate Creek in the Potrero HA (911.2). Sampling occurred during 2010-2011 season during dry weather.	• chemistry • toxicity • bacteria were not analyzed
SMC05402	Station is located on Pine Valley Creek (HA 911.3). Sampling occurred during 2010-2011 season during dry weather.	• chemistry • toxicity • bacteria were not analyzed
ABLM (2008)[1]	Program involved sampling at multiple locations in the Tijuana River Estuary 2008 (often referred to as Bight '08) and again in 2011-2012.	• sediment chemistry • benthic analysis • toxicity during dry weather
San Diego Coastkeeper[1]	Sampling was conducted at 6 locations in the Tijuana River and Tijuana River Estuary during dry weather during the 2010-2011 and 2011-2012 seasons.	• chemistry • bacteria
Tijuana River Bacterial Source Identification Study[1]	Program involved sampling and surveys at multiple locations along the Tijuana River, in the Tijuana River Estuary, and in the surrounding areas and storm drains between 2008 and 2011, during dry weather and during three storm events.	• chemistry • bacteria • human-specific bacteroides and enterovirus

Table 2-3
Description of Receiving Water Sampling Locations

Sampling Point	Overview	Constituents Sampled
National Estuarine Research Reserve System Data	Multiple years of water quality data sampled in the Tijuana River Estuary and main channel are available. Data set includes multi-year real time data for the estuary.	• temperature • specific conductivity • salinity • dissolved oxygen (DO) • depth • pH • turbidity • nutrients

Note:
[1] Programs involved multiple sampling points.

Table 2-4
Additional Receiving Water Conditions Identified

Receiving Water	Receiving Water Condition	Supporting Information[1]				Temporal Extent	
		2011 LTEA	2012 Weston Report[2]	2013 Weston Report[3]	WURMP	Wet	Dry
Lower Watershed							
Tijuana River	Fair to poor stream substrate	MLS/TWAS-2 stations[4]	none	none	none		x
	Elevated TSS	MLS/TWAS-2 stations[4]	none	MLS station[6]	none	x	x
	Elevated Turbidity	MLS/TWAS-2 stations[4]	none	MLS station[6]	none	x	x
	Trash	none	Multiple marginal sites in 911.1	none	none		x
	Elevated Ammonia as N	MLS/TWAS-2 stations[4]	none	MLS station[6]	none	x	x
	Elevated Nitrite as N	none	none	MLS station[6]	none	x	
	Benthic algae	MLS/TWAS-2 stations[4]	none	none	none		x
	Elevated Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD)	MLS/TWAS-2 stations[4]	none	MLS station[6]	none	x	x
	Benthic Alterations (poor to very poor Index of Biotic Integrity [IBI] scores)	MLS/TWAS-2 stations[4]	none	MLS station[6]	none	x	x
	Elevated oil and grease	TWAS-2 station	none	none	none	x	

Table 2-4
Additional Receiving Water Conditions Identified

Receiving Water	Receiving Water Condition	Supporting Information[1]				Temporal Extent	
		2011 LTEA	2012 Weston Report[2]	2013 Weston Report[3]	WURMP	Wet	Dry
Upper Watershed							
Tecate Creek	Elevated chloride	none	SMC03510 station[3]	none	none		x
	Elevated sulfate	none	SMC03510 station[4]	none	none		x
	Benthic Alterations (poor to very poor IBI scores)	none	SMC03510 station[4]	none	none		x
	Elevated Total Nitrogen as N	none	SMC03510 station[4]	none	none		x
	Elevated Phosphorus	none	SMC03510 station[4]	none	none		x
	Elevated Total Dissolved Solids (TDS)	none	SMC03510 station[4]	none	none		x
	Trash	none	SMC03510 station[4]	none	Pilot Trash Assessment site at Tecate Creek.		x
Campo Creek	Benthic Alterations (poor to very poor IBI scores)	TWAS-1 station[6]	none	TWAS-1 station[6]	none	x	x
	Benthic algae	TWAS-1 station[6]	none	none	none		x
	Elevated fecal coliforms	TWAS-1 station[6]	none	TWAS-1 station[6]	none	x	x
	Elevated *Enterococcus*	TWAS-1 station[6]	none	TWAS-1 station[6]	none		x
	Elevated TSS	TWAS-1 station[6]	none	none	none	x	
	Elevated Turbidity	TWAS-1 station[6]	none	TWAS-1 station[6]	none	x	

Table 2-4
Additional Receiving Water Conditions Identified

Receiving Water	Receiving Water Condition	Supporting Information[1]				Temporal Extent	
		2011 LTEA	2012 Weston Report[2]	2013 Weston Report[3]	WURMP	Wet	Dry
Campo Creek	Elevated Surfactants, Methylene Blue Activated Substances (MBAS)	TWAS-1 station[6]	none	none	none	x	
	Elevated Pesticides	TWAS-1 station[6]	none	none	none	x	
	Elevated TDS	TWAS-1 station[6]	none	TWAS-1 station[6]	none	x	x
	Elevated Phosphorus	none	none	TWAS-1 station[6]	none		x
	Toxicity	TWAS-1 station	none	TWAS-1 station	none		x
	Trash	none	none	none	Pilot Trash Assessment site at Tecate Creek.		x

Notes:

[1] Sample results and receiving water limitations provided in Appendix B.

[2] Weston Solutions, 2012a.

[3] Weston Solutions, 2013a.

[4] MLS and TWAS-2 stations combined here because of their close proximity. TWAS-2 station is no longer monitoring and has not been sampled since 2010. Results based on two samples during dry weather and nine samples during wet weather.

[5] Results based on single sample during dry weather.

[6] Results based on two samples during dry weather and two samples during wet weather.

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2.1.6 Known Historical Versus Current Physical, Chemical, and Biological Water Quality Conditions

Changes to the water quality conditions in the Tijuana River WMA go back at least 100 years to the early 1900s, following the development of agriculture and sand and gravel mining in the Tijuana River Valley (Rempel, 1992). These activities generally eliminated previously widespread riparian vegetation. Levees were constructed and fill was placed in many parts of the Valley to raise bottomlands out of the flood plain, in an attempt to protect these areas from flooding. These hydromodifications are likely to have resulted in increased erosion, sediment and turbidity. Despite the change in land uses in the Tijuana River Valley from agriculture and sand and gravel mining to residential and parkland, water quality conditions continue to challenge the WMA in the Lower Watershed, particularly because of external stressors from rapid urbanization upstream that has occurred in Mexico with the growth of the Tijuana metropolitan area over the past several decades.

More than 2.7 million people currently reside in the City of Tijuana (TRVRT, 2012). This urbanization has resulted in increased flows of water, including untreated sewage, from Mexico that transforms the Tijuana River from an intermittent to a perennial stream (Rempel, 1992). These increased flows that have impaired water quality in the Lower Watershed have led to collaborative efforts between the U.S. and Mexico to eliminate them. The two countries, through the USIBWC (represented by both U.S. and Mexican sections) enacted a 1944 Water Treaty that entrusted it with preferential attention to developing solutions to border sanitation problems. Treaty Minute No. 283, adopted in 1990, formalized the agreement between the U.S. and Mexico to construct a water treatment plant and outfall to address the sewage discharges to the Tijuana River and its tributaries in Mexico.

Construction of the SBIWTP and outfall began in 1997, and the plant began operations in January 1999. The wastewater underwent advanced primary treatment and discharged through the South Bay Ocean Outfall (SBOO) 3 miles (4.8 kilometers) offshore from Imperial Beach, under an NPDES permit with the Regional Board. USIBWC began performing an ocean monitoring program to comply with its NPDES permit before operation of the SBIWTP started. Construction and operation of the SBIWTP substantially reduced dry weather flows in the Tijuana River and those tributaries that drain directly into the Lower Watershed on the U.S. side of the international border. The SBIWTP was upgraded to secondary treatment; construction began in 2009, and it started operation in 2011.

In addition, the City of Tijuana has improved its sewers and sewage treatment capabilities in recent years; however, many households still are not connected to the municipal sewer system. Trash, sediment, and less frequent sewage flows continue to discharge into the Tijuana River WMA from Mexico (San Diego County Water Authority et al., 2013).

2.1.7 Available Evidence of Erosional Impacts in Receiving Waters from Accelerated Flows

Evidence of erosional impacts was assessed using the Weston reports (Weston Solutions, 2008; 2011; 2012a, b, c; 2013a, b). Each of these reports included reference to stream bioassessments that had occurred in the Tijuana River WMA. Stream bioassessment monitoring includes a physical habitat assessment component. The results of these assessments can serve as indicators of hydromodification

because bioassessments include consideration of channel stability and physical structure. The last three Weston Reports presented stream bioassessment results. For purposes of this document, sites whose physical habitat and stream substrate were identified as "fair" or "poor" were considered to have potential erosional impacts, as described below.

The 2009–2010 Weston Report (Weston Solutions, 2011) presented results of observations that occurred at the TWAS-1, TWAS-2, and MLS sites. At the MLS site, the stream substrate was observed to be of poor to fair quality with mostly silt and consolidated clay. The TWAS-2 site was observed to be slightly worse with stream bed and banks of unconsolidated sand and silt and a riparian buffer lacking an upper canopy. In contrast, the TWAS-1 site was observed to be very healthy with a complex physical stream structure (i.e., mix of rocks, woody debris). The poor to fair stream substrate at both the MLS and TWAS-2 sites were identified as receiving water conditions.

In the 2010–2011 Weston Report (Weston Solutions, 2012a), the Tijuana River downstream from Barrett Junction (Station ID SMC0315) was assessed to be fair. Observers noted that the monitoring reach had a low gradient and a substrate dominated by fine particulate sediment. In contrast, the site observed in Pine Valley Creek downstream from Interstate Highway 8 (Site ID SMC05402) was observed to be in good condition. The fair stream substrate at the SMC0315 site was identified as a receiving water condition.

In the 2011-12 Weston Report (Weston Solutions, 2013a), four sites were observed. The physical habitat of the Tijuana River site near the MLS station was observed to be fair with a low gradient and substrate dominated by fine particulate sediment. The physical habitat of the Campo Creek site near the TWAS-1 station was observed to be in good condition with a high gradient streambed, complex substrate and flow regime, and undisturbed riparian zone. Two reference sites also were observed, one in Cottonwood Creek (Site ID REF-California Water Code) and another in Kitchen Creek (Site ID REF-KCR). The physical habitat of both was observed to be good with a variety of rocky substrates and natural flow regimes. Consistent with the 2009–2010 assessment, the fair physical habitat at the MLS station was identified as a receiving water condition.

2.1.8 Trash Impacts

Provision B.2.a.(6)(d) requires the RAs to consider available data describing trash impacts on receiving waters. Several primary data sources were used to complete this assessment including the 303(d) list, the Long-Term Effectiveness Assessment (LTEA) (Weston Solutions, 2011), the two most recent Regional Monitoring Reports (Weston Solutions, 2012c, 2013b), and the Watershed Urban Runoff Management Program (WURMP) annual reports (Weston Solutions, 2012a, 2013a). Third-party data also was considered including the results of trash clean-up efforts that have been conducted by stakeholders and non-governmental organizations (NGOs), the Tijuana River Watershed Technical Support Document for Solids, Turbidity and Trash TMDLs (Tetra Tech, 2010), as well as a 2012 Transborder Trash Tracking Study (Romo and Leonard, 2012) and a trash, sediment and waste tire study conducted for the TRVRT through a grant from the California Department of Resources Recovery and Recycling (CalRecycle) (URS, 2010). Based on available information, trash in the Tijuana River and the Tijuana River Estuary are considered to be receiving water conditions. Trash is further considered as a priority water quality condition in Section 2.2.

2.1.9 Available Evidence of Adverse Impacts to the Chemical, Physical, and Biological Integrity of Receiving Waters

The monitoring reports discussed above have served as the primary documentation and evidence of adverse impacts on receiving waters. In addition to these sources, public input was considered to identify other possible water quality conditions during a public workshop held on January 28, 2014. This public data request suggested the addition of another concern that was not identified previously (i.e., the presence of viruses and other pathogens, and specifically Hepatitis A) at the mouth of the Tijuana River at the Pacific Ocean. This additional water quality condition has been evaluated along with the others identified through this process. Viruses and specific pathogens generally are not sampled directly. Instead, indicator bacteria are sampled as surrogates. Data were not available to attribute pathogens to MS4 discharges, and thus they were not included as a priority water quality condition.

2.1.10 Potential Improvements in the Overall Condition of the Watershed Management Area that Can Be Achieved

Potential improvements in the overall condition of the WMA that can be achieved were considered later in the analysis, as discussed in Section 2.4. This was done by considering the significance of MS4 contributions to each water quality condition, the extent to which each condition is considered controllable through MS4 management strategies, and whether the control of each condition results in simultaneous water quality benefits in the WMA.

2.1.11 Initial Comprehensive List of Receiving Water Conditions

Through the process described above, an initial list of receiving water conditions and the potential priority water quality conditions were identified and are summarized in Table 2-5 and Table 2-6. This list was modified to consider only water quality conditions that may be attributable in part to discharges from MS4s and only includes those conditions for which data are available to demonstrate that discharges from MS4s may be causing or contributing to the water quality condition.

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Table 2-5
Receiving Water Conditions in the Tijuana River WMA

Receiving Water Segmen	Condition																																					Beneficial Uses Impacted
	Indicator Bacteria	Total Coliform	Fecal Coliform	Enterococcus	Viruses	Turbidity	Solids/TSS	Sedimentation/Siltation	Stream Substrate	Benthic Alterations	Trash	Total Nitrogen as N	Ammonia as Nitrogen	Nitrite	Phosphorus	Eutrophic	Algae	Low DO/BOD/COD	Pesticides	Surfactants (MBAS)	Lead	Manganese	Nickel	Selenium	Thallium	Trace Elements	Chloride	Sulfate	Total Dissolved Solids	Synthetic Organics	Perchlorate	Oil and Grease	Color	pH	Toxicity	
Pacific Ocean Shoreline, Tijuana HU, at 3/4 mile North of Tijuana River		W,D	W,D	W,D																																	REC-1
Pacific Ocean Shoreline, Tijuana HU, at end of Seacoast Drive		W,D	W,D	W,D																																	REC-1 SHELL
Pacific Ocean Shoreline, Tijuana HU, at Monument Road		W,D	W,D																																		REC-1
Pacific Ocean Shoreline, Tijuana HU, at the US Border		W,D	W,D	W,D																																	REC-1 SHELL
Pacific Ocean Shoreline, Tijuana HU, at Tijuana River mouth		W,D	W,D	W,D	D																																REC-1
Tijuana River	W,D		W,D	W,D		W,D	W,D	W,D	D	W,D	W,D	W,D		W	W,D	W,D	D	W,D	W,D	W,D				W,D		W,D				W,D		W			W,D	REC-1 and 2 MUN WARM
Tijuana River Estuary	W,D					W,D					W,D					W,D		W,D	W,D		W,D		W,D		W,D												REC-1 and 2 COMM EST MAR
Tecate Creek										D	D	D			D									W,D			D	D	D								WARM
Barrett Lake												W,D										W,D									W,D			W,D	W,D		MUN WARM
Pine Valley Creek (Upper)						W,D																															MUN
Morena Reservoir													W,D		W,D							W,D												W,D	W,D		MUN WARM
Cottonwood Creek																								W,D													WARM
Campo Creek			W,D	D		W	W			W,D	D				D		D			W									W,D						D	WARM

Notes:
W: Wet Weather Temporal Extent; D: Dry Weather Temporal Extent; Shading: Impairment on 303(d) List
REC-1: Contact Water Recreation – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible.
REC-2: Non-Contact Water Recreation – Includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water.
SHELL: Shellfish Harvesting – Includes uses of water that support habitats suitable for the collection of filter-feeding shellfish for human consumption.
COMM: Commercial and Sport Fishing – Includes the uses of water for commercial or recreational collection of fish, shellfish, or other organisms.
MUN: Includes uses of water for community, military, or individual water supply.
EST: Includes uses of water that support estuarine ecosystems.
MAR: Marine Habitat – Includes uses of water that support marine ecosystems.
WARM: Warm Freshwater Habitat – Includes uses that support warm water ecosystems including preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.

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2.2 IDENTIFICATION OF PRIORITY WATER QUALITY CONDITIONS

A range of water quality conditions have been documented in the Tijuana River WMA, as described in previous sections. Sources of pollutants or stressors may include non-point sources such as runoff from agriculture or natural areas; point sources such as treatment plants, industrial discharges and stormwater discharges from MS4s or other point sources, such as construction sites, industrial sites, and highways, and pollutants crossing the international border from the Mexican portion of the watershed. A variety of regulations, permits, policies, and programs are in place to address these sources. However, this WQIP is specific to stormwater and non-stormwater discharges from MS4s only. Provision B.2.b requires consideration of several factors to identify the potential impacts on receiving waters for which discharges from MS4s may be responsible. These factors include:

1. The discharge prohibitions of Provision A.1 and the effluent limitations of Provision A.3;
2. Available, relevant, and appropriately collected and analyzed stormwater and non-stormwater monitoring data from the RAs' MS4 outfalls;
3. Locations of each RA's MS4 outfalls that discharge to receiving waters;
4. Locations of MS4 outfalls that are known to persistently discharge non-stormwater to receiving waters likely causing or contributing to impacts on receiving water beneficial uses;
5. Locations of MS4 outfalls that are known to discharge pollutants in stormwater causing or contributing to impacts on receiving water beneficial uses; and
6. The potential improvements in the quality of discharges from the MS4 that can be achieved.

A detailed discussion of the evaluation of these six factors is presented next.

2.2.1 Discharge Prohibitions

Provision B.2.b.(1) requires consideration of the discharge prohibitions of Provision A.1 and effluent limitations of Provision A.3 as part of the assessment of impacts from MS4 discharges. These limitations are analyzed by reviewing available MS4 discharge data and comparing the monitoring results to discharge prohibitions. The applicable discharge prohibitions are provided in Appendix D with the corresponding MS4 discharge data.

2.2.2 Available, Relevant, and Appropriately Collected and Analyzed Stormwater and Non-Stormwater Monitoring Data from the RAs' Outfalls

Similar to the receiving water data, results of MS4 outfall sampling were available in the primary data and information sources shown in Table 2-1, including the 2010 303(d) List, the LTEA (Weston Solutions, 2011), the two most recent Weston Reports (Weston Solutions, 2012a, 2013a), and the Tijuana River Bacterial Source Identification Study (Weston Solutions, 2012b). These sources were reviewed to identify the subset of receiving water conditions to which MS4 discharges may be causing or contributing. The subset of receiving waters is defined in this WQIP as the priority water quality conditions.

MS4 water quality analytical results are provided in Appendix D, including location, numbers of samples taken, and numbers of samples exceeding benchmarks. A summary of water quality conditions to which the MS4 discharges may be causing or contributing is presented next.

MS4 Sampling in San Ysidro (911.11)

- Wet Weather: TSS and fecal coliform were identified as high priority in the 2011 LTEA. Elevated bacterial indicator and turbidity levels entering MS4 discharging to the Tijuana River and Estuary documented in the Tijuana River Bacterial Source Identification Study (Weston Solutions, 2012b).
- Dry Weather: Total nitrogen (calculated), total phosphorus, *Enterococcus*, methylene blue activated substances (MBAS), and dissolved oxygen (DO) were identified as high priority, and TSS was identified as medium priority in the LTEA. Total dissolved solids (TDS), *Enterococcus*, and dissolved copper were identified as high priority in the 2010–2011 Weston Report (2012a). Total nitrogen (calculated), total phosphorus, *Enterococcus*, and DO were identified as high priority in the 2011–2012 Weston Report (2013b). Elevated bacterial indicator and turbidity levels entering MS4 discharging to the Tijuana River and Estuary documented in the Tijuana River Bacterial Source Identification Study (Weston Solutions, 2012b).

MS4 Sampling in Water Tanks (911.12)

- Wet Weather: TSS, turbidity, and dissolved copper were identified as high priority in the 2011–2012 Weston Report (2013a).
- Dry Weather: Total nitrogen (calculated), total phosphorus, *Enterococcus*, and DO were identified as high priority in the LTEA (Weston Solutions, 2011).

MS4 Sampling in Barrett Lake (911.30)

- Wet Weather: Fecal Coliform was identified as high priority in the 2011–2012 Weston Report (2013a).
- Dry Weather: Total nitrogen (calculated) and *Enterococcus* were identified as high priority, and total phosphorus were identified as medium priority in the LTEA (Weston Solutions, 2011). Total nitrogen (calculated), total phosphorus, and dissolved phosphorus were identified as high priority in the 2010–2011 Weston Report (2012a).

MS4 Sampling in Pine (911.41)

- Wet Weather: TSS was identified as high priority, and fecal coliform was identified as medium priority in the 2011–2012 Weston Report (2013a).
- Dry Weather: No dry weather MS4 sample data were available.

MS4 Sampling in Cottonwood (911.60)

- Wet Weather: TSS and fecal coliform were identified as high priority in the 2010–2011 Weston Report (2012a).
- Dry Weather: Total nitrogen (calculated), TDS, and *Enterococcus* were identified as high priority in the 2011–2012 Weston Report (2013a).

MS4 Sampling in Canyon City (911.82)

- Wet Weather: No wet weather MS4 sample results were available.
- Dry Weather: Dissolved phosphorus, total phosphorus, TDS, and *Enterococcus* were identified as high priority in the 2011–2012 Weston Report (2013a).

MS4 Sampling in Hill (911.84)

- Wet Weather: TSS was identified as high priority in the 2010–2011 Weston Report (2012a).
- Dry Weather: No dry weather MS4 samples were available.

Impairments potentially attributable to urban runoff/storm sewers according to the 303(d) list include the following:

- Total coliform, fecal coliform, and *Enterococcus* at the Pacific Ocean Shoreline.
- Trash and low DO in the Tijuana River Estuary.
- Indicator bacteria, solids, total nitrogen as N, eutrophic conditions, low DO, pesticides, synthetic organics, and toxicity in the Tijuana River.
- Total nitrogen as N in Barrett Lake.
- Phosphorus in Morena Reservoir.

A summary of the priority water quality conditions is shown in Table 2-6.

2.2.3 Locations of MS4 Outfalls

The locations of MS4 outfalls in relation to HAs and receiving waters were considered to identify whether discharges have the potential to cause or contribute to each receiving water condition in the analysis of MS4 sampling results, presented in Section 2.2.2. Figures 2-4 and 2-5 show the locations of the RA's MS4 major outfalls. The vast majority of the MS4 infrastructure in the WMA is located in the Lower Watershed, as shown in the figure.

The MS4 Permit has adopted the definition of "outfall" from the federal CWA regulations as "a point source as defined by 40 Code of Federal Regulations 122.2 at the point where a municipal separate storm sewer discharges to waters of the US and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other waters of the U.S. and are used to convey waters of the U.S."

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LEGEND

- Major Outfalls
- Tijuana River Watershed Management Area (WMA)
- Hydrologic Area
- Jurisdictional Boundary
- River/Stream
- Dam

Monument (911.4)

Cottonwood (911.6)

Cameron (911.7)

Morena (911.5)

Barrett Lake (911.3)

Campo (911.8)

Potrero (911.2)

Tijuana Valley (911.1)

CITY OF IMPERIAL BEACH

CITY OF SAN DIEGO

COUNTY OF SAN DIEGO

USA

MEXICO

Poway
Santee
El Cajon
La Mesa
Spring Valley
Lemon Grove
San Diego
Coronado
Bonita
Chula Vista
Otay River
Tijuana River
San Diego River
Sweetwater River
Dulzura River
Cottonwood Creek
Tecate Creek
Pine Valley Creek
Barrett Lake
Morena Reservoir
Jamul
Pine Valley
Descanso
Tecate
Campo
Jamul Mountains
Viejas Mountain
CUYAMACA MOUNTAINS
Capitan Grande Indian Reservation
Barona Indian Reservation
Viejas Indian Reservation
Manzanita Indian Reservation
Los Laureles
Franc Vista
Aleman
Santa Margarita

URS

1.75 0 1.75 3.5 Miles

SCALE: 1" = 3.5 Miles (1:221,760)
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: DS | DATE: 1/22/2015

PM: JB | PROJ. NO: 27673159.20000

SOURCES: MS4 Structures (SanGIS, 2010; City of IB, 2013). Watershed Management Area, Hydrologic Areas (SanGIS, 2003). Jurisdictional Boundary (SanGIS, 2010). Rivers/Streams (SanGIS, 2004). Dams (URS, 2014).

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FIGURE 2-4 MS4 STRUCTURES IN THE TIJUANA RIVER WATERSHED MANAGEMENT AREA (WMA)

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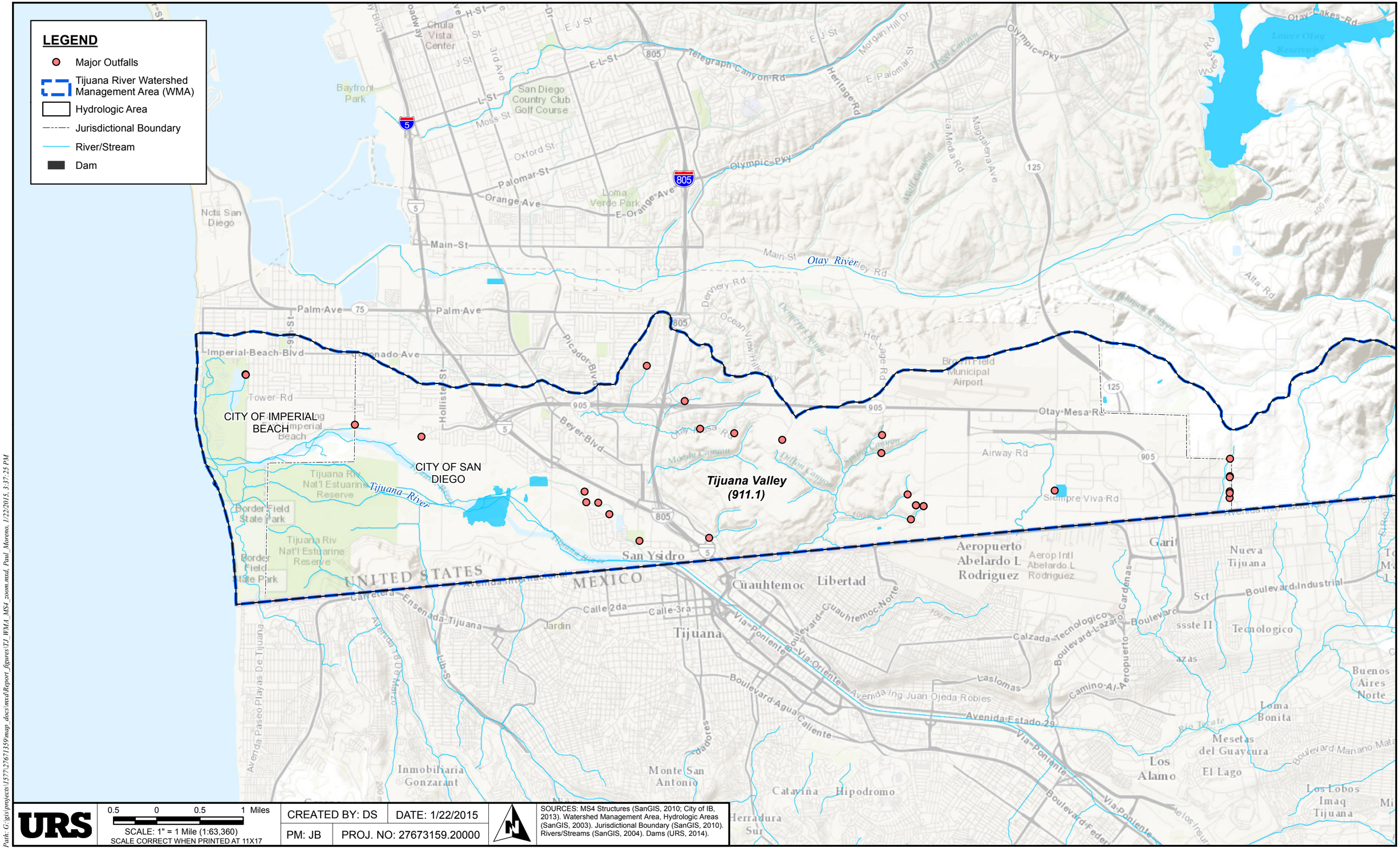

FIGURE 2-5 MS4 MAJOR OUTFALLS IN THE TIJUANA RIVER VALLEY HYDROLOGIC AREA (HA)

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To identify the locations of MS4 outfalls with possible illicit discharges, dry weather illicit detection inspections were conducted. Section 2.5.1.3.1 summarizes results from these inspections. As discussed in that section, it appears that dry weather flows are not a substantial cause or contributor to water quality conditions in the WMA.

2.2.4 Potential Improvements in the Quality of Discharges from the MS4 that Can Be Achieved

Potential improvements in the quality of discharges from the MS4 that can be achieved were considered later in the analysis, as described in Section 2.4. This was done by considering the extent to which each condition is considered controllable through MS4 management strategies and whether the control of each condition results in simultaneous water quality benefits in the WMA.

2.2.5 Priority Water Quality Conditions (Water Quality Conditions Potentially Attributed in Part to MS4s)

The RAs reviewed the above information in consideration of the locations of the MS4 outfalls described in Section 2.2.3, to develop a list of water quality conditions potentially attributed in part to MS4s. A summary list of the priority water quality conditions is shown in Table 2-6. A detailed list is provided in Appendix E.

2.3 EVALUATION OF PRIORITY WATER QUALITY CONDITIONS AND SELECTION OF HIGHEST PRIORITY

Provision B.2.c(1) requires the RAs to develop a list of "priority water quality conditions as pollutants, stressors and/or receiving water conditions that are the highest threat to receiving water quality or that most adversely affect the quality of receiving waters." This list was developed through the process detailed in Sections 2.1 and 2.2. First, a list of receiving water conditions was identified (Table 2-5). Second, that list was reviewed and reduced to include only those receiving water conditions potentially attributed to discharges from MS4s. The shorter list constitutes the priority water quality conditions. In this section, the list of priority water quality conditions is evaluated to identify the highest priority water quality condition.

Table 2-6
Priority Water Quality Conditions in the Tijuana River WMA

Lower Watershed	
Tijuana River	Impairment of WARM because of Sedimentation/Siltation/Solids/TSS (wet and dry weather)
	Elevated turbidity (wet and dry weather)
	Impairment of REC-1 because of indicator bacteria (wet and dry weather)
	Impairment of WARM because of low DO (wet and dry weather)
	Impairment of WARM because of nutrients (wet and dry weather)
	Impairment of REC-1 because of surfactants (MBAS) (dry weather)
	Impairment of REC-2 because of trash (wet and dry weather)
	Impairment of WARM because of pesticides (dry weather)
	Impairment of MUN because of synthetic organics (dry weather)
	Impairment of WARM because of toxicity (dry weather)
Tijuana River Estuary	Impairment of MAR because of turbidity (wet and dry weather)
	Impairment of REC-1 because of indicator bacteria (wet and dry weather)
	Impairment of MAR because of low DO (wet and dry weather)
	Impairment of REC-2 because of trash (wet and dry weather)
Pacific Ocean Shoreline	Impairment of REC-1 because of indicator bacteria (wet and dry weather)
Upper Watershed	
Campo Creek	Elevated indicator bacteria (dry weather)
	Elevated nutrients (dry weather)
	Elevated TDS (dry weather)
Barrett Lake	Impairment of WARM because of nutrients (wet and dry weather)
Morena Reservoir	Impairment of WARM because of nutrients (wet weather)

2.3.1 Summary of Available Information on Priority Water Quality Conditions

The MS4 Permit requires the RAs to provide information on the priority water quality conditions for the following five criteria (this information is summarized in Table 2-8):

(a) The beneficial use(s) associated with the priority water quality condition;

(b) The geographic extent of the priority water quality condition within the WMA, if known;

(c) The temporal extent of the priority water quality condition (e.g., dry weather and/or wet weather);

(d) The RAs with MS4 discharges that may cause or contribute to the priority water quality condition; and

(e) An assessment of the adequacy of and data gaps in the monitoring data to characterize the conditions causing or contributing to the priority water quality condition, including a consideration of spatial and temporal variation.

For criteria (a) and (b), the 303(d) list indicates the beneficial uses and geographic extent of water quality priorities for impaired waters. For geographic extent, the length of the impaired water body segment is provided if the water body is impaired. Otherwise, the sampling location is provided.

For criterion (c), the temporal extent was based on the timing of the sampling (i.e., whether sampling occurred during wet weather or dry weather). For this criterion, it is important to note when elevated sampling results were observed on multiple occasions.

For criterion (d), a determination was made whether a given jurisdiction has MS4 outfalls discharges that may contribute to the downstream water quality conditions. For example, Campo Creek and Barrett Lake are located in the County of San Diego, upstream from the City of Imperial Beach and the City of San Diego. Therefore, MS4s located the County of San Diego only have the potential to discharge to these waters. However, other non-MS4 sources can and do discharge to these waters (e.g., runoff from freeways or agriculture). Conversely, the Tijuana River and Estuary are downstream from MS4 discharges of each jurisdiction, so it is assumed that the discharges from each may ultimately reach the downstream waters where they may potentially cause or contribute to the given water quality condition. However, identifying the actual contribution from the Upper Watershed may require additional sampling. For example, water in HAs 911.2 through 911.7 generally is diverted out of the watershed to Otay Lake, and thus generally would not reach the Tijuana River and Estuary unless dams are overtopped. Water in HA 911.8 flows into Mexico first before returning to HA 911.1 in the Lower Watershed.

For criterion (e), a qualitative scoring system was used to compare the range of data availability for the identified list of water quality conditions. For each water quality condition, the RAs assigned a score of low, medium, or high to describe data availability for the water quality conditions appearing in Table 2-7. The assessment of data showed a range of data availability for the priority water quality conditions described in Table 2-8. In each case, some gaps remain. The monitoring and assessment program, discussed in Section 4, provides additional information.

Table 2-7
Data Adequacy

Data Availability Score	Definition
Low	Limited MS4 and receiving water data to characterize (e.g., data are available but may be limited to one sampling event and/or one season).
Moderate	Available data/information includes moderate amount of MS4 and receiving water data for either wet and dry seasons and/or special studies or reports specific to the water quality condition.
High	Available data/information include significant MS4 and receiving water data for both wet and dry seasons and/or special studies or reports specific to the water quality condition.

Table 2-8
Consideration of Factors (a) through (e) for Priority Water Quality Conditions

Pollutant	Affected Water Bodies	Affected Beneficial Uses (a)	Geographic Extent (b)	Temporal Extent (c) [1]		MS4 Discharge Contributions (d)			Adequacy of Data to Characterize (e)
				Wet	Dry	City of IB	City of SD	County of SD	
Lower Watershed									
Sedimentation/Siltation/Solids/ TSS	Tijuana River	WARM	6 miles (9.6 kilometers)	x	x	x	x	x	High
Turbidity	Tijuana River Estuary	MAR	125 acres (50 hectares)	x	x	x	x	x	High
	Tijuana River	N/A	MLS and TWAS-2 sites	x	x	x	x	x	High
Indicator Bacteria	Pacific Ocean Shoreline	REC-1	Along shoreline from the U.S. border to the end of Seacoast Drive	x	x	x	x	x	High
	Tijuana River Estuary	REC-1	1320 acres (530 hectares)	x	x	x	x	x	High
	Tijuana River	REC-1	6 miles (9.6 kilometers)	x	x	x	x	x	High
Low DO	Tijuana River Estuary	MAR	125 acres (50 hectares)	x	x	x	x	x	Moderate
	Tijuana River	WARM	6 miles (9.6 kilometers)	x	x	x	x	x	Moderate
Nutrients	Tijuana River	WARM	6 miles (9.6 kilometers)	x	x	x	x	x	Moderate
Surfactants (MBAS)	Tijuana River	REC-1	6 miles (9.6 kilometers)	x	x	x	x	x	Moderate

Table 2-8
Consideration of Factors (a) through (e) for Priority Water Quality Conditions

Pollutant	Affected Water Bodies	Affected Beneficial Uses (a)	Geographic Extent (b)	Temporal Extent (c) [1]		MS4 Discharge Contributions (d)			Adequacy of Data to Characterize (e)
				Wet	Dry	City of IB	City of SD	County of SD	
Trash	Tijuana River	REC-2	6 miles (9.6 kilometers)	x	x	x	x	x	High
	Tijuana River Estuary	REC-2	1320 acres (530 hectares)	x	x	x	x	x	High
Pesticides	Tijuana River	WARM	6 miles (9.6 kilometers)	x		x	x	x	Moderate
Synthetic Organics	Tijuana River	MUN	6 miles (9.6 kilometers	x	x	x	x	x	Moderate
Toxicity	Tijuana River	WARM	6 miles (9.6 kilometers)	x	x	x	x	x	Moderate
Upper Watershed									
Indicator Bacteria	Campo Creek	N/A	TWAS-1 site	x	x			x	Low
Nutrients	Barrett Lake	WARM	125 acres (50 hectares)	x	x			x	Medium
	Morena Reservoir	WARM	104 acres (42 hectares)	x	x			x	Low
	Campo Creek	N/A	TWAS-1 site	x	x			x	Low
TDS	Campo Creek	N/A	TWAS-1 site	x	x			x	Low

Notes:
[1] Extent of receiving water condition indicated with "x." Data or information attributing condition in part to MS4 discharge indicated with shading.

2.3.2 Methodology for Selecting Highest Priority Condition

Provision B.2.c.(2) requires the RAs to identify the highest priority water quality condition(s) to be addressed by the WQIP and provide a rationale for their selection. The highest priority water quality conditions were selected by reviewing the information summarized in Table 2-8 and by considering the following five additional criteria using a streamlined scoring system. A more complex approach was not employed because of limited data availability across priority conditions. The criteria are described below and the results of their consideration are summarized in Table 2-10.

1. Relative Magnitude of Pollutant/Stressor from MS4 Sources
2. Estimated percentage of MS4 Sources in HA with Relatively "High" Magnitude Pollutant Load
3. Estimated percentage of Pollutant/Stressor Attributed to the MS4
4. Controllability at Sites Discharging to MS4
5. Ability to Address Other Pollutants Simultaneously

Criterion 1

For criterion 1, an assessment was completed to calculate a score for each water quality condition. This score represents the expected relative magnitude of each pollutant from each land use type. The scores are based on the areal distribution of existing land uses within the subwatershed that is likely to contribute to the MS4 (e.g., residential, commercial, industrial, roads, transportation) and the likely relative magnitude of pollutant load derived from each of those land uses. For transportation, Caltrans was excluded from the analysis. Transportation land uses include roads, parking lots, and airports within the jurisdictions of the City of Imperial Beach, City of San Diego, and County of San Diego. A weighted average was calculated for each land use. Land uses and acreages were derived from San Diego Association of Governments (SANDAG) (2012) data.

For the relative pollutant loading, a host of literature is available that presents measured or estimated pollutant loading from various urban land uses and transportation facilities. Three primary sources were used in this analysis. Table 2-9 summarizes the relative magnitude of pollutant loads in stormwater discharges by land use adapted from these sources.

- **Final Technical Report Bacteria TMDLs for Beaches and Creeks (San Diego Regional Board, 2010):** This document includes estimates of fecal indicator bacteria build-up rates developed in Southern California by land use, based on a study performed by the Southern California Coastal Water Research Project (SCCWRP) to support bacteria TMDL development of Santa Monica Bay (Los Angeles Regional Board, 2002; Ackerman and Weisberg, 2006). This source was used to develop the relative magnitude of bacteria in stormwater discharges by land use.
- **Tijuana River Watershed Technical Support Document for Solids, Turbidity and Trash TMDLs (Tetra Tech, 2010)**: This document includes estimates of TSS concentrations in runoff by land use, based on data compiled by Ackerman and Schiff (2003) from land use monitoring programs throughout Southern California, and estimates of trash accumulation rates by land use

developed by the City of Los Angeles (2002). The document was not formally adopted following public review and comment, but the preliminary estimates help to inform the understanding of solids, turbidity, and trash in the WMA.

- **Urban Stormwater Management in the United States. National Academy of Sciences (NRC, 2009):** This report includes a table summarizing relative sources of pollutants of concern for different land uses in urban areas summarized from Burton and Pitt (2002), Pitt et al. (2008), and Center for Watershed Protection and Pitt (2008). This source was used to develop the relative magnitude of the remaining pollutants in stormwater discharge by land use.

To estimate an overall score for MS4 discharges in a given HA, a weighted average was calculated based on the land uses present in the HA that are likely to contribute runoff to the MS4 and the relative magnitude of pollutant loads in stormwater from those land uses. The magnitudes are assigned scores of 3 for high, 2 for moderate, and 1 for low. An example calculation for sediment in the Tijuana River is provided below.

A total of 460 acres of commercial (including institutional) land, 1,053 acres of industrial land, 2,291 acres of transportation land, 1,373 acres of low density residential land use, and 577 acres of high density residential land use are in the Tijuana River HA (911.1).

As shown in Table 2-9, commercial and residential land uses are considered moderate sources of sediments (scores of 2); industrial and transportation land uses are considered high sources of sediment (scores of 3).

The weighted average is calculated by multiplying the acreage of each land use by the score for that land use, summing the results for each land use, and dividing the sum by total acreage. The result is rounded to 1, 2, or 3 for low, moderate, or high, respectively. Analysis excludes federal, State, tribal, and other land outside MS4 jurisdiction.

[(460 acres of commercial * 2) + (1,053 acres of industrial * 3) + (2,291 acres of transportation * 3) + (1,373 acres of low density residential * 2) + (577 acres of high density residential * 2)]/5,755 acres = 2.6

Notes:
Values in example exclude federal, State, tribal, or other land outside jurisdictions or RAs.
To convert acres to hectares, divide values by 2.47.

In the example above, a score of approximately 2.6 is calculated. This score is rounded up to 3 (high) indicating that the distribution of land uses that may be contributing stormwater runoff to the MS4 is made up of a relatively high proportion of land uses with relatively high TSS concentrations, while a score closer to 1 (low) would indicate that the distribution is made of up more minor contributors. This scorning was based on acreages of land uses that may discharge to MS4s and could not account for site-specific conditions that may be contributing high sediment to MS4 discharges (e.g., exposed soils or steep slopes at a site, unpaved alleys, construction sites, erosion), and thus may underestimate the actual magnitude of pollutant load entering the MS4.

Table 2-9
Relative Magnitude of Pollutant Load in Stormwater Discharges by Land Use

Pollutant	Commercial[1]	Industrial	Transportation[2]	Low Density Residential	High Density Residential
Sedimentation/Siltation/Solids/TSS	Moderate	High	High	Moderate	Moderate
Turbidity	Moderate	High	High	Moderate	Moderate
Indicator Bacteria	High	Low	Low	Moderate	High
Low DO	Low	Low	Low	High	High
Nutrients	Moderate	Low	Low	Moderate	Moderate
Surfactants (MBAS)	High	Moderate	Low	Moderate	Moderate
TDS	Moderate	High	Moderate	Low	Low
Trash	High	High	Moderate	Low	Moderate
Pesticides	Moderate	Low	Low	Moderate	Moderate
Synthetic Organics	Moderate	High	High	Low	Low
Toxicity	Moderate	High	High	Low	Low

Notes:

Sources of relative magnitudes: Sediment and turbidity adapted from Ackerman and Schiff (2003). Trash adapted from City of Los Angeles (2002). Indicator Bacteria adapted from the San Diego Regional Board (2010). All other pollutants adapted from the National Research Council (NRC, 2009).

For scoring calculations, high is assigned a value of 3, moderate a value of 2, and low a value of 1.

[1]Commercial includes municipal and institutional land uses.

[2]Transportation includes local transportation facilities such as parking lots. Excludes Caltrans.

Criterion 2

Criterion 2 simply calculates the areal percentage of land uses in the Tijuana Valley HA that contribute to the MS4 categorized as "high" in Table 2-9. For example, for indicator bacteria, both commercial and high-density residential are considered relatively high contributors of bacteria. Thus, this criterion calculates the percentage of the land uses that are commercial or high-density residential. The calculation includes only land uses that are expected to contribute to the MS4.

For example, for sediment in the Tijuana River (HA 911.1), industrial and transportation land uses are considered high sources of sediment (scores of 3). The percentage of "high" sources is calculated by dividing the sum of industrial and transportation land area by the sum of all MS4 land areas.

(1,053 acres of industrial + 2,291 acres of transportation)/5,755 acres = 58 percent

Criterion 3

For criterion 3, available data were considered to estimate the percentage of a given pollutant that may be attributed to the MS4. Estimates for this criterion were available only for sediment, bacteria, and trash. This criterion allows the RAs to consider (where information is available) the relative magnitude of discharges from the MS4 related to U.S. sources exclusive of those related to the Mexican portion of the watershed. Data for these pollutants were also available to assess the relative contribution from the U.S. side of the watershed. Commingled flow is a significant factor for the presence of each of these pollutants and the contribution of these by the Mexican portion of the watershed is significant. The contribution from the Mexican side of the watershed, where information is available, is discussed in Section 2.4.

Criterion 4

For criterion 4, the controllability of each priority water quality condition was assessed. The assessment considered the ability to control the pollutant through the use of BMPs. For example, sediment and turbidity are relatively controllable at individual sites through stabilizing exposed soils and slopes; street sweeping; installation of catch basins; filtration, and by minimizing runoff volume through the use of green infrastructure practices. Trash is considered moderately controllable through BMPs. Although some control can be achieved through street sweeping or catch basins, trash management is challenging because of underlying social issues related to littering and dumping. The remaining pollutants are moderately controllable through combination of education and outreach; pollution prevention; filtration; and runoff reduction.

Criterion 5

For criterion 5, the ability to simultaneously address multiple pollutants was considered. The assessment considered whether, while managing a given pollutant, other pollutants are also reduced. For example, bacteria, nutrients, and pesticides may adsorb to sediment particles or trash. Thus, treating for sediment or trash may lead to simultaneous reductions in these pollutants. The remaining pollutants are addressed through a range of BMPs, some of which (e.g., filtration and runoff reduction) would address multiple pollutants simultaneously.

Table 2-10 summarizes the results of the assessment of the priority water quality conditions by pollutant category. The subsections that follow discuss the assessment in detail.

Table 2-10
Criteria Used to Identify Highest Priority Water Quality Condition

Pollutant	Water Bodies Affected	Relative Magnitude of Pollutant/ Stressor from MS4 Sources Based on Land Use[1]	Percentage of MS4 Sources in HA with Relatively "High" Pollutant Load Based on Land Use[1]	Percentage of Pollutant/ Stressor Coming From MS4[5]	Controllability through BMPs[4]	Ability to Address other Pollutants Simultaneously[4]
Lower Watershed						
Sedimentation/Siltation/Solids/TSS	Tijuana River	High	58%	Up to 4%[2]	High	High
Turbidity	Tijuana River Estuary	High	58%	-	High	High
	Tijuana River	High	58%	-	High	High
Indicator Bacteria	Pacific Ocean Shoreline	Moderate	18%	<1%[3]	Moderate	Moderate
	Tijuana River Estuary	Moderate	18%	<1%[3]	Moderate	Moderate
	Tijuana River	Moderate	18%	<1%[3]	Moderate	Moderate
Low DO	Tijuana River Estuary	Moderate	34%	-	Moderate	Moderate
	Tijuana River	Moderate	34%	-	Moderate	Moderate
Nutrients	Tijuana River	Low	0%	-	Moderate	Moderate
Surfactants (MBAS)	Tijuana River	Moderate	8%	-	Moderate	Moderate
Trash	Tijuana River	Moderate	26%	11%[2]	Moderate	Moderate
	Tijuana River Estuary	Moderate	26%	11%[2]	Moderate	Moderate
Pesticides	Tijuana River	Low	0%	-	Moderate	Moderate
Synthetic Organics	Tijuana River	Moderate	58%	-	Moderate	Moderate
Toxicity	Tijuana River	Moderate	58%	-	Low	Moderate

Table 2-10
Criteria Used to Identify Highest Priority Water Quality Condition

Pollutant	Water Bodies Affected	Relative Magnitude of Pollutant/ Stressor from MS4 Sources Based on Land Use[1]	Percentage of MS4 Sources in HA with Relatively "High" Pollutant Load Based on Land Use[1]	Percentage of Pollutant/ Stressor Coming From MS4[5]	Controllability through BMPs[4]	Ability to Address other Pollutants Simultaneously[4]
Upper Watershed						
Indicator Bacteria	Campo Creek	Moderate	1%	-	Moderate	Moderate
Nutrients	Barrett Lake	Moderate	0%	-	Moderate	Moderate
	Morena	Moderate	0%	-	Moderate	Moderate
	Campo Creek	Moderate	0%	-	Moderate	Moderate
TDS	Campo Creek	Moderate	1%	-	Moderate	Moderate

Notes:

Percentages are estimates.

[1]Scoring excludes federal, State (e.g., Caltrans), tribal, and other land uses outside MS4 jurisdiction in the Tijuana River WMA. See Appendix F.

[2]Based on Tetra Tech (2012).

[3]Based on Weston Solutions (2012b).

[4]Rationale for assigned values provided in Section 2.4.1 for Sediment and Turbidity and Section 2.4.2 for Remaining Conditions. Refers to controllability of pollutant loads conveyed through MS4.

[5]"-" Indicates no estimate is available.

The selection of highest priority water quality condition considers the weight of evidence for each priority conditions and is based on a cumulative assessment of the criteria shown in Table 2-10. The detailed rationale for the selection of highest priority condition is provided in the next section. This is followed by a discussion on the remaining priority water quality conditions.

2.4 IDENTIFICATION OF HIGHEST PRIORITY WATER QUALITY CONDITIONS AND RATIONALE

The WQIP has identified several priority water quality conditions and considered multiple criteria to compare them side by side in Section 2.3. Based on this analysis, the following have been identified as the highest priority water quality conditions:

- Sedimentation and siltation in the Tijuana River (wet weather); and
- Turbidity in the Tijuana River and Tijuana River Estuary (wet weather).

Section 2.4.1 discusses the rationale for the selection of these priority water quality conditions as the highest priority. Section 2.4.2 discusses the remaining priority water quality conditions. The highest priority conditions identified above focus on wet weather discharges. This is because dry weather data suggest that no illicit discharges from the MS4s occur, directly discharging to receiving waters. Water generally remains standing at the outfalls or infiltrates into the ground surface.

2.4.1 Discussion of Highest Priority Water Quality Conditions

Anthropogenic sources of sediment are considered to affect water quality. Anthropogenic sources of sediment can include construction sites, erosion of disturbed or unstabilized surfaces, wind and aerial deposition, vehicle and pedestrian tracking, and dumping. This sediment can collect on paved or other surfaces in the urban environment and subsequently be re-suspended during storm events and delivered through the MS4 to receiving waters. Such sediment often is associated with other pollutants, such as bacteria, nutrients, pesticides, and trash. Addressing this sediment simultaneously addresses these other pollutants.

Natural sources of sediment are not the focus of this document. Rather, the focus is on anthropogenic sources of sediment originating from urbanized areas that enter the MS4. Erosion and deposition do occur naturally in streams, and bed-load sediment transport is a natural part of stream processes. Moreover, as a terminal delta of the Tijuana River system, the Tijuana River Valley naturally is a depositional area. However, when stormwater runoff rates exceed natural levels, as is the case in urbanized areas, increased stream bank erosion can occur. In this case, the source of sediment can be considered anthropogenic.

The Basin Plan explains the need to manage sediment and turbidity in receiving waters. 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 on 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. The Basin Plan states that suspended sediment and turbidity shall not reach levels that cause nuisance or adversely affect beneficial uses (San Diego Regional Board, 2012).

Segments of both the Tijuana River and the Tijuana River Estuary are identified on the 303(d) list as impaired by sedimentation/siltation or the associated constituents solids, TSS, and turbidity. Specifically, 6 miles (9.7 kilometers) of the Tijuana River in HSA 911.11 are impaired by solids and sedimentation/siltation, affecting the WARM designated beneficial use; and 125 acres (50 hectares) of the Tijuana River Estuary are impaired by turbidity, affecting the MAR designated beneficial use. The 303(d) list includes “Urban Runoff/Storm Sewers” as potential sources of the impairment of WARM because of solids. Portions of the Tijuana River Estuary also are designated with the beneficial use of BIOL, as noted in Section 2.1.3. These receiving waters segments are “sensitive or highly valued,” as defined by the MS4 Permit, providing additional rationale for focus on the Tijuana River Estuary.

Assessment of sediment and turbidity impacts can be performed by measuring either TSS or turbidity in water samples. TSS, expressed in milligrams per liter (mg/L), indicates the concentration of solids in water that can be trapped by a filter, such as mineral and organic sediment. Turbidity, expressed in nephelometric turbidity units (NTUs), is a measurement of water clarity and indicates how much the material suspended in water decreases the passage of light through the water. Suspended materials may include soil particles (i.e., clay, silt, and sand), algae, plankton, microbes, and other substances (EPA, 2014b). Sediment load into the MS4 also may be measured by cleaning outfalls and MS4 lines.

The following benchmarks have historically been used to evaluate water quality monitoring results for TSS and turbidity. Although natural levels of TSS and turbidity may exceed these values, they are useful for evaluating stormwater in developed areas and provide a common reference point for comparing analytical results:

- TSS: 58 mg/L (dry weather) and 100 mg/L (wet weather); and
- Turbidity: 20 NTU.

The 20 NTU benchmark for turbidity is identified as a regulatory benchmark in the Basin Plan. The 100 mg/L wet weather benchmark is based on EPA guidance for the Multi-Sector General Permit (MSGP) for "stormwater discharges associated with industrial activity." Given the potential land use, pollutant source and discharge characteristic differences between industrial facility and MS4 discharges, application of the 100 mg/L benchmark to municipal stormwater discharges may not be appropriate. Accordingly, it should be noted that the 100 mg/L benchmark value should be for reference purposes only in evaluation of existing data.

Receiving water monitoring results presented in the LTEA and Weston Reports (Weston Solutions, 2011; 2012a,c; 2013a,b) document the sediment and turbidity receiving water conditions in the Tijuana River and Tijuana River Estuary, as summarized below. Monitoring results are provided in Appendix B.

Dry Weather Receiving Water Sampling

- TSS and turbidity identified as high priority at MLS/TWAS-2 station in Tijuana River (LTEA)
- TSS identified as medium priority at MLS in Tijuana River (Weston Solutions, 2013a)
- Turbidity identified as medium priority at MLS in Tijuana River (Weston Solutions, 2013a)
- Two turbidity samples above water quality benchmarks in Tijuana River Estuary (San Diego Coastkeeper data, as presented in Weston Solutions, 2013a)

Wet Weather Receiving Water Sampling

- TSS and turbidity identified as high priority at MLS/TWAS-2 station in Tijuana River, in the LTEA (Weston Solutions, 2011)
- TSS and turbidity identified as high priority at MLS in Tijuana River (Weston Solutions, 2013a)

The LTEA also identified benthic alterations as a high priority and identified hydromodification and associated high sediment loads as contributing factors. The effects of hydromodification within a watershed can cause increased sediment loads which can lead to benthic alterations resulting in low Index of Biotic Integrity (IBI) scores. The 2013 Weston Report (Weston Solutions, 2013a) identified both TSS and turbidity as having an upward trend at the MLS station.

Monitoring at MS4 outfalls and at areas draining to MS4s support the conclusion that MS4 discharges are contributing, in part, to the sedimentation/siltation and turbidity receiving water conditions in the Tijuana River and Tijuana River Estuary. Each jurisdiction includes MS4 outfalls that may contribute, in part, to the highest priority water quality conditions. Sampling results are summarized below. Dry weather samples generally were taken in ponded water within the outfall and may not be indicative of actual discharges. Monitoring results are provided in Appendix D.

Dry Weather MS4 Sampling

- Two TSS samples above water quality benchmark at MS4 outfalls in HA 911.11, identified in the LTEA (Weston Solutions, 2011)
- Multiple turbidity samples above water quality benchmark in areas or MS4 outfalls that drain to Tijuana River and Tijuana River Estuary during dry weather, identified in the Tijuana River Bacterial Source Identification Study (Weston Solutions, 2012b)

Wet Weather MS4 Sampling

- TSS identified as medium priority in the LTEA (Weston Solutions, 2011) and 2013 Weston Report (Weston Solutions, 2013b), and high priority in the 2011–2012 Weston Report (Weston Solutions 2013a)
- Turbidity identified as high priority in 2013 Weston Report (Weston Solutions, 2013a)
- Multiple turbidity samples above water quality benchmark in areas or MS4 outfalls draining to Tijuana River and Tijuana River Estuary, identified in the Tijuana River Bacterial Source Identification Study (Weston Solutions 2012b)

The adequacy of the data available to characterize this condition is considered "high" (see Table 2-7). In addition to receiving water and MS4 outfall monitoring data, special studies, and reports specific to the water quality condition also were available to help characterize the conditions (e.g., Tijuana River Watershed Technical Support Document for Solids, Turbidity, and Trash TMDLs [Tetra Tech 2010]).

Five additional criteria were considered to select the highest priority water quality condition, as discussed in Section 2.3.2. Results of this assessment are summarized in Table 2-10 and are discussed below.

As shown in Table 2-10, most of the land uses that contribute runoff into the MS4 in HA 911.1 (the HA in which the priority water quality conditions are located) generally have a relatively high magnitude of sediment and TSS load including industrial and transportation land uses. Typical facilities associated with these land uses include industrial facilities, roads, and transportation facilities (excludes Caltrans). Among the types of land uses in HA 911.1 that typically drain to MS4s (i.e., commercial, industrial,

transportation, and residential), 58 percent are categorized as industrial or transportation land uses that may have relatively high sediment or turbidity pollutant loads.

Sediment and turbidity may originate from a range of sources including regulated and unregulated; point- and non-point; and natural and anthropogenic sources. This document is focused on anthropogenic sources of sediment from urbanized areas conveyed through the MS4 rather than natural sources of sediment originating from pristine areas conveyed through the watershed. The Tijuana River Watershed Technical Support Document for Solids, Turbidity, and Trash TMDLs (Tetra Tech, 2010) developed estimates for the annual loads of sediment to the Tijuana River and Estuary originating from sources in the U.S. and Mexico. The report found that up to approximately 4 percent of sediment load may be originating from commercial, industrial, residential, and road land uses in the U.S. These land uses may contribute to discharge from the MS4. Although the report was not formally adopted following public review and comment, the preliminary estimates help to inform the understanding of solids, turbidity, and trash in the WMA.

The ability to control sediment and turbidity at facilities within these land uses that drain to the MS4 is considered high. This is because sediment control can be accomplished through the implementation of a range of BMPs, including: stabilizing exposed soils and slopes; street sweeping; installation of catch basins; filtration, and by minimizing runoff volume through the use of green infrastructure practices.

The ability to address other pollutants simultaneously also was considered high. This is because a range of pollutants can co-occur with sediment. For example, bacteria, nutrients, and pesticides may adsorb to sediment particles or trash. Thus, treating for sediment or turbidity may lead to simultaneous reductions in these pollutants.

Based on the evaluation of the information and criteria summarized and described above, sedimentation and siltation in the Tijuana River (wet weather) and turbidity in the Tijuana River and Tijuana River Estuary (wet weather) have been identified as the highest priority water quality conditions in the Tijuana River WMA.

As discussed in Section 1, the MS4 makes up a small portion of the overall watershed and is one of many sources of sediment discharging to receiving waters. Collaboration among stakeholders will help to address the remaining sources. The binational nature of anthropogenic sediment issues in the Tijuana River WMA is well documented (Tetra Tech, 2010; TRVRT, 2012). Rapid urbanization, construction design standards, and socioeconomic conditions in Mexico present significant challenges to watershed-based sediment management strategies. TRVRT was developed in part to address the binational challenge of anthropogenic sediment accumulation in the Lower Watershed. Actions by landowners have already provided some sediment load reduction benefits. Recent TRVRT accomplishments include the formation of a “Recovery Team” of agencies in Mexico to address sediment and trash issues, collaborative workshops with Mexican agency representatives, and coordination among legislative representatives in the U.S. and Mexico aimed to prioritize sediment and trash as an issue of international importance across the U.S.–Mexico border.

2.4.2 Discussion of Remaining Priority Water Quality Conditions

This section documents the assessment of the remaining priority water quality conditions that were not selected to be addressed through this WQIP. Although these priority water quality conditions were not selected in this analysis, these are being addressed through the Jurisdictional Runoff Management Plan (JRMP) programs. In addition, by addressing sediment, these pollutants often associated with sediment load, will be addressed concurrently. Appendix D provides detailed information on MS4 monitoring results, including location, numbers of samples taken, and numbers of samples exceeding benchmarks.

2.4.2.1 Indicator Bacteria

Three water bodies are 303(d) listed as impaired for indicator bacteria (fecal, total coliform, and *Enterococcus*) in the Tijuana River WMA:

- Pacific Ocean Shoreline (four segments)
- Tijuana River Estuary (1,320 acres or 534 hectares)
- Tijuana River (6 miles or 9.7 kilometers)

In addition to the 303(d) listed segments, monitoring data from TWAS-1 indicates that Campo Creek water samples exceeded water quality benchmarks for indicator bacteria. The benchmarks for bacteria are:

- 10,000 Most Probable Number (MPN)/100 mL for total coliform;
- 4,000 MPN/100 mL for fecal coliform; and
- 151 MPN/100 mL for *Enterococcus*.

Receiving water monitoring results presented in the LTEA (2011) and Weston Reports (Weston Solutions, 2012c, 2013b) also were reviewed to identify indicator bacteria water conditions in the Tijuana River and Tijuana River Estuary, as summarized below. Monitoring results are provided in Appendix B. As a result of this review, the presence of indicator bacteria also was identified as a receiving water condition at Campo Creek. However, this site is not listed as impaired on the 303(d) list. During the public workshop on January 28, 2013, concerns also were raised about pathogens, including viruses (Hepatitis A), along the Pacific Ocean shoreline of the Tijuana River WMA. However, no pathogen-specific data were available to further assess this condition.

Dry Weather Receiving Water Sampling

- *Enterococcus* and fecal coliform identified as high priority at MLS/TWAS-2 station in Tijuana River (LTEA)
- *E. coli* and *Enterococcus* detected above water quality benchmarks in Tijuana River and Estuary (San Diego Coastkeeper data, as presented in Weston Solutions 2012a and 2013a reports)
- *Enterococcus* identified as high priority at MLS in Tijuana River (Weston Solutions 2013a)

- Multiple indicator bacteria samples above water quality benchmark in areas or MS4 outfalls that drain to Tijuana River and Tijuana River Estuary during wet weather (Tijuana River Bacterial Source Identification Study, Weston Solutions, 2012b)
- *Enterococcus* identified as medium priority at TWAS-1 site in Campo Creek (LTEA) (1 out of 2 samples)
- *Enterococcus* identified as high priority (2 out of 2 samples) and fecal coliform as medium priority (1 out of 2 samples) at TWAS-1 site in Campo Creek (Weston Solutions 2013a)

Wet Weather Receiving Water Sampling

- Fecal coliform identified as high priority at MLS/TWAS-2 station in Tijuana River (Weston Solutions, 2011 and 2013a)
- Multiple indicator bacteria samples above water quality benchmark in areas or MS4 outfalls draining to Tijuana River and Tijuana River Estuary (Tijuana River Bacterial Source Identification Study, Weston Solutions 2012b)
- Fecal coliform identified as high priority at TWAS-1 site in Campo Creek (LTEA) (2 out of 2 samples)
- Fecal Coliform identified as medium priority at TWAS-1 site in Campo Creek (Weston Solutions 2013a) (1 out of 2 samples)

Monitoring at MS4 outfalls and at areas draining to MS4s demonstrate that MS4 discharges are contributing, in part, to the indicator bacteria receiving water conditions in the Tijuana River, Tijuana River Estuary, Pacific Ocean shoreline, and Campo Creek. The sampling results are summarized below and are provided in Appendix D. Dry weather samples generally were taken in ponded water within the outfall and may not be indicative of actual discharges to receiving waters.

Dry Weather MS4 Sampling

- *Enterococci* identified as high priority in MS4 outfalls upstream from Tijuana River (LTEA and Weston Solutions 2012b report)
- Multiple fecal indicator samples above water quality benchmark in areas or MS4 outfalls that drain to Tijuana River and Tijuana River Estuary during wet weather (Tijuana River Bacterial Source Identification Study, Weston Solutions 2012b)
- Single positive *Enterococcus* sample in MS4 outfall in 911.82 upstream from Campo Creek.

Wet Weather MS4 Sampling

- Fecal coliform identified as medium priority in MS4 outfalls upstream from Tijuana River (LTEA)

- Multiple turbidity samples above water quality benchmark in areas or MS4 outfalls draining to Tijuana River and Tijuana River Estuary (Tijuana River Bacterial Source Identification Study, Weston Solutions 2012b)

The adequacy of the data available to characterize this condition is considered "high" for the Lower Watershed and "moderate" for the Upper Watershed. Data for the Lower Watershed includes significant receiving water and MS4 outfall monitoring data as well a special study, the Tijuana River Bacterial Source Identification Study (Weston Solutions 2012b). Less monitoring data are available to characterize the condition in the Upper Watershed. Also, as noted above, only a single positive *Enterococcus* sample was reported in MS4 outfall monitoring in 911.82 upstream from Campo Creek.

As shown in Table 2-10, less than 20 percent of the land uses that contribute runoff into the MS4 in HA 911.1 (the HA that contains the Tijuana River, Tijuana River Estuary, and Pacific Ocean shoreline) generally have a high magnitude of indicator bacteria (e.g., commercial and high density residential). In HA 911.8, the percentage of such land uses is less than 1 percent. MS4 discharges in these HAs may generally have moderate levels of indicator bacteria.

Like other pollutants, indicator bacteria may originate from a variety of sources. The analysis of land uses in the Tijuana River WMA indicates that MS4s are not a significant bacteria contributor to the impairment of contact water recreation (REC-1) uses in the river, estuary and beach. This conclusion is also supported by the Tijuana River Bacterial Source Identification Study (Weston Solutions, 2012b), which concluded that the vast majority of the pollutant loading originates outside the U.S. (99 percent) and not the MS4 (less than 1 percent). The Weston study was conducted to help identify sources of microbial contamination affecting area beaches. The study concluded that approximately 99 percent of the indicator bacterial loads entering the Pacific Ocean originate from flows from the main channel of the Tijuana River and tributary channels from Mexico and identified only two minor sources in the U.S. during dry weather. The study further concluded that less than 1 percent of the *Enterococcus* and fecal coliform loads entering the Tijuana River Estuary originate from the entire U.S. urbanized portion of the watershed. Moreover, nearly all of the samples originating from Mexico were positive for human-specific *Bacteroides* marker (indicating human fecal matter), while none of those from the U.S. drainage were positive for the marker.

The ability to control indicator bacteria at sites discharging to MS4s is considered moderate. Strategies such as pet waste control, bird control, good housekeeping, and volume reduction may reduce bacterial loads, but will have limited effect on natural levels of bacteria or bacterial regrowth in the MS4.

The ability to address other pollutants simultaneously is considered moderate. Although some of the strategies used to control bacteria (e.g., good housekeeping and volume reduction) also would reduce in simultaneous reductions in co-occurring pollutants, other strategies (e.g., pet waste control, bird control, sanitary sewer leak repair) would reduce bacteria loads but would result in little or no simultaneous reductions in other pollutants.

Based on the above analysis and because of the relative small contribution of bacterial indicators from MS4s to this water quality condition in the watershed, indicator bacteria has not been elevated to a highest priority water quality condition for the WQIP.

2.4.2.2 Low Dissolved Oxygen

Two water bodies are 303(d) listed as impaired for low DO in the Tijuana River WMA:

- Tijuana River Estuary (125 acres)
- Tijuana River (6 miles or 9.7 kilometers)

As previously noted, the Tijuana River Estuary is impaired for MAR, and the Tijuana River is impaired for WARM. The water quality benchmarks for DO are as follows:

- Biochemical Oxygen Demand (BOD): 30 mg/L
- Chemical Oxygen Demand (COD): 120 mg/L
- Low DO: less than 5 mg/L

DO levels naturally fluctuate on a diurnal and seasonal basis in the Tijuana River Estuary, and these fluctuations should be considered when interpreting the significance of analytical results. For example, DO levels range between 0.5 to 8 mg/L from May to October and from 4 to 12 mg/L from October to May. Discharges of pollutants and excess BOD/COD can lead to low DO beyond the natural range. Adequate DO is vital for aquatic life. Depression of DO levels can lead to fish kills and odors resulting from anaerobic decomposition. DO content in water is a function of water temperature and salinity (San Diego Regional Board, 2012). BOD and COD are measurements that indicate the depletion of DO in water.

Receiving water monitoring results presented in the LTEA and Weston Reports document the DO conditions in the Tijuana River and Tijuana River Estuary, as summarized below. Monitoring results are provided in Appendix B.

Dry Weather Receiving Water Sampling

- BOD and COD were identified as medium to high priority in the Tijuana River (LTEA)
- Samples with low DO in Tijuana River and Estuary (San Diego Coastkeeper, reported in the Weston Solutions 2012a and Weston Solutions 2012b reports)

Wet Weather Receiving Water Sampling

- BOD and COD were identified as medium to high priority in the Tijuana River (LTEA and Weston Solutions 2012b report)

Data summarizing potential MS4 contributions of low DO water quality condition are summarized below. Monitoring results are provided in Appendix D.

Dry Weather MS4 Sampling

- Low DO reported at MS4 outfalls in HA 911.11 and 911.12 (LTEA)
- Low DO reported at MS4 outfalls in HA 911.11 (Weston Solutions 2012b report)

Wet Weather MS4 Sampling

- No MS4 sample results identified
- 303(d) list identifies "urban runoff/storm sewers" as potential source of low DO for both the Tijuana River and Tijuana River Estuary

Adequacy of data to characterize the DO condition is considered moderate. Both receiving water and MS4 analytical data were available to review, but special studies were not. The data confirm that low DO is a priority condition in the HA 911.1 but additional data may be needed to identify the most significant contributors through the MS4.

As shown in Table 2-9, approximately 34 percent of the land uses in HA 911.1 that contribute runoff into the MS4 are considered high magnitude sources of BOD and COD (residential land uses). Based on the areal distribution of all land uses that contribute runoff to the MS4, stormwater discharges from MS4s in HA 911.1 are expected to have relatively moderate BOD and COD loads on average.

Controllability is considered moderate because multiple sources may be contributing to low DO and the source may be unknown. Potential sources may include the presence of high nutrients in receiving waters, high BOD/COD contributions, organic sediment, illicit discharges, and natural variations. To address the low DO, the most significant sources contributing to the water quality condition would have to be identified and addressed.

The ability to address other pollutants simultaneously is considered moderate. Opportunities for simultaneous reductions may exist depending on whether the source of the low DO can be identified and addressed. Addressing some sources may result in simultaneous reductions. For example, if organic debris is a primary cause, BMPs designed to trap organic debris would also likely trap sediment. If the source of the low DO is a sanitary sewer leak with high BOD, then addressing the leak would likely also reduce bacterial loads.

Because of the limited data available to directly correlate low DO to MS4 discharges and to identify priority MS4 sources of low DO, low DO has not been elevated to a highest priority water quality condition.

2.4.2.3 Nutrients

Two water bodies are 303(d) listed as impaired for nutrients in the Tijuana River WMA:

- Tijuana River (6 miles or 9.7 kilometers)
- Barrett Lake (125 acres or 51 hectares)
- Morena Reservoir (104 acres or 42 hectares)

Each is impaired for the WARM beneficial use. The water quality benchmarks for nutrients are as follows:

- Total Nitrogen: 1 mg/L
- Total Phosphorus: 0.1 mg/L

According to the current and historic monitoring data nutrients were considered a high priority including:

- Wet Weather – Total Phosphorus (MLS/TWAS-2)
- Dry Weather – Total Nitrogen, total phosphorus, and dissolved phosphorus (MLS/TWAS-2)

Elevated concentrations of nitrogen and phosphorus, individually or in combination with other nutrients, can lead to stimulated algae and plant growth (San Diego Regional Board, 2012).

Receiving water monitoring results presented in the LTEA and Weston Reports document the nutrient conditions in the Tijuana River, Campo Creek, Barrett Lake, and Morena Reservoir, as summarized below. Monitoring results are provided in Appendix B.

Dry Weather Receiving Water Sampling

- Dissolved/total phosphorus and total nitrogen were identified as high priority at the MLS/TWAS-2 stations in the Tijuana River (LTEA and Weston Solutions 2012b report)
- Benthic algae (surrogate for nutrients) was identified as a high priority condition at the TWAS-1 station in Campo Creek (LTEA)
- Dissolved/total phosphorus was identified as high priority at the TWAS-1 station in Campo Creek (Weston Solutions 2012a report)
- Data sets did not include dry weather monitoring data for Barrett Lake or Moreno Reservoir.

Wet Weather Receiving Water Sampling

- Total phosphorus was identified as a high priority and dissolved phosphorus as a medium priority at the MLS/TWAS-2 stations in the Tijuana River (LTEA)
- Dissolved phosphorus and total phosphorus were identified as high priority at the MLS station in the Tijuana River (Weston Solutions 2012 b report).
- Data sets did not include wet weather monitoring data for Barrett Lake or Moreno Reservoir.

Data summarizing potential MS4 contributions of nutrients are summarized below. Monitoring results are provided in Appendix D.

Dry Weather MS4 Sampling

- 8/9 MS4 samples in HSA 911.11 and 3/3 MS4 samples in HSA 911.12 exceeded water quality benchmarks for total phosphorus and nitrogen (LTEA)
- 8/9 MS4 samples in HSA 911.11 and 3/3 MS4 samples in HSA 911.12 exceeded water quality benchmarks for total nitrogen (LTEA)
- 1/3 MS4 samples in HA 911.30 (Barrett Lake HA) exceeded water quality benchmarks for total phosphorus (LTEA)
- 2/3 MS4 samples in HA 911.30 (Barrett Lake HA) exceeded water quality benchmarks for total nitrogen (LTEA)
- 1/1 MS4 sample in HA 911.60 (Cottonwood HA) exceeded water quality benchmarks for total nitrogen (Weston Solutions 2012b report)
- 1/1 MS4 sample in HSA 911.82 (Canyon City HSA) exceeded water quality benchmarks for total phosphorus (Weston Solutions 2012b report)

Wet Weather MS4 Sampling

- No MS4 sample results were identified

Adequacy of data to characterize the nutrient condition is considered moderate. Both receiving water and MS4 analytical data were available to review, but special studies were not. The data confirm that the presence of elevated levels of nutrients is a priority condition in the WMA, but additional data may be needed to confirm whether the MS4 contribution of nutrients is significant and to determine the significance of the MS4 contribution.

As shown in Table 2-9, MS4 land uses listed are not considered as significant contributors of nutrients to receiving waters, and the expected contribution is expected to be low across the WMA from MS4 sources. Nutrients generally originate from agricultural sources. Although agricultural land uses exist in the WMA, they often do not contribute runoff to the MS4 because of their rural locations. Agricultural sources can reduce nutrient discharges by avoiding over-application of fertilizers and over-irrigation.

Controllability of nutrients is considered moderate. Some nutrient reduction may be achieved through infiltration BMPs, but results vary. Reductions can also be achieved through minimizing or elimination the over-application of fertilizer and over-irrigation.

The ability to address other pollutants simultaneously also is considered moderate. Education programs designed to reduce overuse of fertilizers could be designed to also include discussion on pesticides, resulting in simultaneous reductions of both. Also, because of the direct relationship between nutrients and low DO, successes in controlling nutrients should result in simultaneous reductions in low DO conditions.

Because of the limited data to directly correlate nutrients to MS4 sources and to identify priority MS4 sources of nutrients, nutrients have not been elevated to a highest priority water quality condition.

2.4.2.4 Surfactants (MBAS)

The Tijuana River is listed as impaired for surfactants (MBAS) affecting REC-1 beneficial use. The size of the impairment is 6 miles (9.7 kilometers). The water quality benchmark for surfactants is 0.5 mg/L.

MBAS test measures the presence of anionic surfactant (commercial detergent) in water. Positive test results can be used to indicate the presence of domestic wastewater (San Diego Regional Board, 2012).

Receiving water monitoring results presented in the LTEA and Weston Reports document the surfactants condition in the Tijuana River.

Dry Weather Receiving Water Sampling

- Surfactants were identified as high priority at the MLS/TWAS-2 in the Tijuana River (LTEA)
- Surfactants were identified as medium priority at the MLS in the Tijuana River (Weston Solutions 2012b report)

Wet Weather Receiving Water Sampling

- Surfactants were identified as medium priority at the MLS and high priority at the TWAS-2 in the Tijuana River (LTEA)
- Surfactants were identified as medium priority at the MLS in the Tijuana River (Weston Solutions 2012a report)

Data summarizing potential MS4 contributions of surfactants are summarized below. Monitoring results are provided in Appendix D.

Dry Weather MS4 Sampling

- 1/1 MS4 sample in HSA 911.11 exceeded water quality benchmarks for surfactants (LTEA).
- 22/30 dry weather samples collected as part of the Tijuana River Microbial Source Identification study detected MBAS in MS4s above benchmark values.

Wet Weather MS4 Sampling

- No MS4 sample results are available.

Adequacy of data to characterize surfactants is considered moderate. Both receiving water and MS4 analytical data were available to review, but special studies were not. The data confirm that the presence of surfactants is a priority condition in the WMA, but additional data may be needed to determine the significance of the MS4 contribution.

Although the presence of surfactants may indicate the presence of domestic wastewater, it also may suggest illicit discharges, for example, from commercial, industrial, or residential sites. The presence of such land uses in HA 911.1 suggests the possibility that these sources may be contributors of MBAS, as shown in Table 2-9. Surfactants are moderately controllable in MS4s, through better education, training, and illicit discharge detection. Success in such efforts may result in simultaneous reductions of other pollutants.

Limited data exist to correlate MS4 outfall data with receiving waters, and significant data gaps exist. Because of the limited data available to directly correlate MBAS to MS4 discharges, particularly during wet weather, and the status of MBAS as a medium priority constituent in receiving waters, MBAS has not been elevated to a highest priority water quality condition.

2.4.2.5 TDS

TDS in natural waters may consist of carbonates, bicarbonates, chlorides, sulfates, phosphates, nitrates, calcium, magnesium, sodium, potassium, iron, manganese and other substances. High total dissolved solids concentrations in irrigation waters can be deleterious to plants directly or indirectly through adverse effects on soil permeability (San Diego Regional Board, 2012).

The water quality benchmark for TDS is 500 mg/L. No receiving waters in the Tijuana River WMA are impaired for TDS. However, TDS was identified as a medium priority constituent at the TWAS-1 site in Campo in the LTEA and a high priority constituent in the 2013 Weston Report. Receiving water monitoring results presented in the LTEA and Weston Reports document the TDS condition in the Tijuana River.

Dry Weather Receiving Water Sampling

- TDS was identified as high priority at the TWAS-1 station in Campo Creek (LTEA and Weston Solutions 2012b report) (2/2 samples for each)

Wet Weather Receiving Water Sampling

- TDS was identified as medium priority at the TWAS-1 station in Campo Creek (LTEA) (1/2 samples)
- TDS was identified as a high priority at the TWAS-1 station in Campo Creek (2011–2012 Weston Report) (2/2)

Data summarizing potential MS4 contributions of TDS are summarized below. Monitoring results are provided in Appendix D.

Dry Weather MS4 Sampling

- 1/1 MS4 sample exceeded water quality benchmarks for TDS in HSA 911.82.

Wet Weather MS4 Sampling

- No MS4 sample results exceeded water quality benchmarks.

Controllability of TDS through BMPs is considered moderate. Some reductions in filtration BMPs may be achieved, but results vary. Pollutant load reductions can also be achieved through source control, good housekeeping, and stormwater retention. The ability to control multiple pollutants is also considered moderate. Simultaneous reductions in multiple pollutants may be achieved depending on the source or type of TDS of concern and the control method employed. For example, filtration BMPs or stormwater retention may result in simultaneous reductions in other pollutants, while source control for a specific pollutant would be more focused on that pollutant.

Adequacy of data to characterize TDS is considered low. Limited MS4 analytical data (1 positive sample) were available to review. Because of the limited data available to correlate TDS to MS4 discharges, TDS has not been elevated to a highest priority water quality condition.

2.4.2.6 Trash

Both the Tijuana River and Tijuana River Estuary are listed as impaired for trash affecting non-contact water recreation (REC-2) beneficial use.

The Weston Reports summarize the results of dry weather trash assessments conducted annually. Sites are ranked as optimal, suboptimal, marginal, submarginal, or poor. Overall these assessments determined that trash is not an issue in many of the surveyed areas. Results from 2009 through 2012 are as follows:

- In 2009-2010, out of 44 sites, three were identified as poor and 11 as marginal, all within HA 911.1 (LTEA)
- In 2010–2011, out of 66 sites, eight were identified as marginal, all within HA 911.1.
- In 2011–2012, out of 58 sites, four sites were identified as marginal or submarginal, all within HA 911.1.

San Diego County also has conducted a trash survey for the Upper Watershed, as reported in the Tijuana River WURMP annual reports. The trash assessment was conducted over 2 fiscal years, including FY 2010–2011 and FY 2011–2012. The County used a trash assessment method that was developed for the San Francisco Bay Region; see Surface Water Ambient Monitoring Program (State Board, 2008). A total of 30 site visits were conducted at 10 sampling locations in the Upper Watershed.

- None of the sites were considered to be in a poor condition.
- 23 of the sites received an optimal trash assessment score.
- Seven sites scored just below at sub-optimal.

Another indicator of trash impacts is the results of trash clean-up projects. The WURMP annual report summarizes the results of all of the trash clean-up projects completed in the lower portion of the watershed documenting the cleanup of hundreds of pounds of trash per event. For example:

- "Coastal Cleanup Day" in Imperial Beach resulted in the clean-up of 570 pounds of trash in 2011.
- "Creek to Bay Clean-up" resulted in the clean-up of 187 pounds of trash in 2012.

These events document trash as a receiving water condition but do not necessarily establish MS4s as a source of the trash. Trash may be transported to receiving waters through wind, non-point source runoff, littering, or cross-border flows.

The results from several additional studies also help to characterize trash in the WMA:

- **Tijuana River Watershed Technical Support Document for Solids, Turbidity and Trash TMDLs (Tetra Tech, 2010):** The report concluded that major storms are the most significant form of trash transport into the Tijuana River and Estuary. Major sources included canyon settlements in Mexican portion of watershed. Sources in U.S. included urbanized areas (e.g., commercial and residential areas), high winds, and littering.
- **Report of Trash, Waste Tire and Sediment Characterization Tijuana River Valley (URS, 2010):** The study identified the nature and occurrence of trash, sediment, and waste tires on the ground surface in the Tijuana River Valley north of the international border and in the subsurface in the Lower Watershed. The study noted that volumes of materials observed in the valley have accumulated over an unknown period of time. A recommendation of the study was to conduct future studies to estimate the current rate of annual trash and sediment loading.
- **Los Laureles Canyon Trans-border Trash Tracking Study (Romo and Leonard, 2012):** The study focused on drainage originating from the Los Laureles Canyon and provided evidence of transborder flow of trash from Mexico to the Tijuana River WMA. The study noted that all streams in Los Laureles Canyon drain into the Tijuana River Estuary. This flow facilitates the transport of solid waste originating in the canyon to drain to the Tijuana River and flow across the U.S. border toward the Pacific Ocean. The report recommended addressing the 100 unmanaged dump sites to help control the flow of solid waste northward.

Trash is considered moderately controllable through BMPs. Although some control can be achieved through street sweeping or catch basins, trash management is challenging because of underlying social issues related to littering and dumping. The ability to control other pollutants simultaneously also is considered moderate. For example, litter control would result in simultaneous reductions in pollutants if they are attached to trash (e.g., bacteria or solids). Catch basins designed to catch trash also may trap solids, but other pollutants (e.g., TDS, nutrients) would not be addressed.

Although trash is a priority water quality condition and will continue to be addressed through the RAs' JRMPs, it has not been elevated to a highest priority water quality condition for the WQIP. However, the BMPs employed to treat sediment will result in simultaneous reductions in trash. Moreover, the State Board is developing amendments to statewide water quality control plans for trash (Trash Amendments). The proposed Trash Amendments will include five elements: (1) Water Quality Objective, (2) Prohibition of Discharge, (3) Implementation, (4) Compliance Schedule, and (5) Monitoring. Future iterations of the WQIP may be updated to include requirements in conformance with that policy, as appropriate.

2.4.2.7 Pesticides

The Tijuana River is listed as impaired for pesticides affecting the WARM beneficial use. The size of the impairment is 6 miles (9.7 kilometers). Water quality benchmarks vary by pesticide, but generally fall within the range of 0.01-0.4 micrograms per liter (µg/L). Pesticides can enter receiving waters through direct discharges or through surface and ground water indirectly by drifting away from areas where pesticides are being sprayed, through surface runoff from treated fields, and by leaching or return flows from irrigation. Pesticides can concentrate in plant or animal tissues, and many are considered to be carcinogenic to humans (San Diego Regional Board, 2012). The Tijuana River is impaired for pesticides affecting the WARM beneficial use.

Receiving water data indicate that the Tijuana River is affected during wet weather, as summarized below.

Wet Weather Receiving Water Sampling

- Malathion and Permethrin were identified as medium priorities at the MLS/TWAS-2 sites in the Tijuana River during wet weather (LTEA).
- Diazinon, Bifenthrin, and Permethrin were identified as high priority at the MLS site in the Tijuana River (2011–2012 Weston Report).

Although the 303(d) list identified "urban runoff/storm sewers" as potential sources of pesticides in the Tijuana River, available MS4 outfall sampling data have not identified pesticides as a priority constituent in MS4 discharges.

Controllability of pesticides is considered moderate. Some reductions can be achieved through minimizing or elimination the over-application of pesticides and over-irrigation. Further reductions may require banning of certain pesticides. Reductions from cross-border flows will require international outreach because many pesticides that have been banned in the U.S. still are available in Mexico. The ability to address other pollutants simultaneously also is considered moderate. Existing education programs help to reduce overuse of pesticides and fertilizers, resulting in simultaneous reductions of both. Also, because of the direct relationship between pesticides and toxicity, successes in controlling pesticides should result in simultaneous reductions in toxic conditions.

Adequacy of data to characterize pesticides is considered moderate. Because of the limited data available to correlate pesticides to MS4 discharges, pesticides have not been elevated to a highest priority water quality condition.

2.4.2.8 Synthetic Organics

The Tijuana River is impaired for synthetic organics affecting Municipal and Domestic Supply beneficial use. Although the 303(d) List includes "Urban Runoff/Storm Sewers" as a potential source of the synthetic organics impairment, available MS4 outfall sampling data have not identified synthetic organics as a priority constituent in MS4 discharges.

Controllability of synthetic organics through BMPs is considered moderate. Some reductions in filtration BMPs may be achieved, but results will vary. Pollutant load reductions also can be achieved through source control, good housekeeping, and stormwater retention. The ability to control multiple pollutants is considered moderate. Simultaneous reductions in multiple pollutants may be achieved, depending on the source or type of synthetic organic of concern and the control method employed. For example, filtration BMPs or stormwater retention may result in simultaneous reductions in other pollutants, while source control for a specific pollutant would be more focused on that pollutant.

Because of the limited data available to directly correlate synthetic organics to MS4 discharges, synthetic organics has not been elevated as a highest priority water quality condition.

2.4.2.9 Toxicity

The Tijuana River is impaired for toxicity affecting WARM beneficial use. Although the 303(d) List includes "Urban Runoff/Storm Sewers" as a potential source of the toxicity impairment, available MS4 outfall sampling data have not identified toxicity as a priority constituent in MS4 discharges.

Controllability is considered moderate because multiple sources may be contributing to toxicity and the source may be unknown. Potential sources may include pesticides presently used, legacy pesticides remaining in the environment, high dissolved metals, or other sources. To address toxicity, the most significant sources contributing to the water quality condition will have to be identified and addressed.

The ability to address other pollutants simultaneously is considered moderate. Opportunities for simultaneous reductions may exist depending on whether the source of the toxicity can be identified and addressed. Addressing some sources may result in simultaneous reductions. For example, if pesticides are the primary cause, BMPs designed to reduce over-application of pesticides and over-irrigation may result in simultaneous reductions in nutrients.

Because of the limited data available to directly correlate toxicity to MS4 discharges, toxicity has not been elevated as a highest priority water quality condition.

2.5 IDENTIFICATION AND PRIORITIZATION OF SOURCES OR STRESSORS

As outlined in the discussions above, by following the process described in the MS4 Permit, sedimentation and siltation in Tijuana River and turbidity in Tijuana River and Tijuana Estuary within the Lower Watershed have been identified as the highest priority water quality conditions to be addressed by this WQIP. For ease of discussion, these conditions are referred to collectively as "sediment." Although the intent of the WQIP is to focus on the highest priority water quality conditions, other pollutants will continue to be addressed as part of each RA's JRMP. Moreover, practices that manage sediment will result in simultaneous reductions of other pollutants that co-occur with sediment (e.g., nutrients, pesticides, bacteria).

After identifying the highest priority water quality conditions, the next step required by the MS4 Permit is to identify and prioritize known and suspected sources of stormwater and non-stormwater pollutants and/or other stressors associated with MS4 discharges that cause or contribute to the highest priority water quality conditions. Consistent with MS4 Permit requirements, sources or stressors were identified following the process outlined in the permit, by considering the following elements. Sources that were identified through the solicitation of public input also were considered.

1. Pollutant generating facilities, areas, and/or activities within the WMA;
2. Locations of the RAs' MS4s;
3. Other known and suspected sources of non-stormwater or pollutants in stormwater discharges to receiving waters with the WMA;
4. Available data on dry weather screening, inspections, and complaint investigations; and
5. The adequacy of the available data to identify and prioritize sources and/or stressors associated with MS4 discharges that cause or contribute to the highest priority water quality conditions identified under Provision B.2.c.

Table 2-11 summarizes the general process for identifying and prioritizing the sources.

Table 2-11
Identifying and Prioritizing Sources

Sources of Pollutants and/or Stressors	Criteria for Prioritizing
• Facilities known or suspected to discharge sediment to receiving waters via MS4s • MS4 outfalls • Other permitted discharges to receiving waters • Non-point sources • International sources	• Origin of source: Is the source anthropogenic or natural? • Potential magnitude: What is the relative pollutant load for source type? • Controllable: Are the sources controllable by the RAs?

2.5.1 Identification Sources of Pollutants and/or Stressors

The subsections that follow describe the stepwise process used to identify potential sources of pollutants and/or stressors that may contribute to the highest priority water quality conditions. This is followed by a discussion on prioritization of sources.

2.5.1.1 Pollutant-Generating Facilities, Areas, and/or Activities

Table 2-12 lists the inventory of potential pollutant-generating facilities within the Tijuana Valley HA (911.1) that may cause or contribute to sedimentation/siltation and turbidity water quality condition in Tijuana River and Tijuana River Estuary in the Lower Watershed. Table 2-13 shows a similar inventory for land uses in the Tijuana Valley HA (911.1). Counts of facilities were available in the RAs' JRMP annual reports. Land use acreages were available through SANDAG (2012).

Table 2-12
Potential Pollutant-Generating Facilities that may Contribute to the Highest Priority Water Quality Condition

Facility Type	City of Imperial Beach	City of San Diego	County of San Diego	Total
Construction Sites	69	66	1	136
Commercial Facilities	100	1,342	2	1,444
Industrial Facilities	0	99	0	99
Municipal Facilities	14	22	2	38
Treatment, Storage, or Disposal Facilities	1	19	0	20

Notes:
Includes only sites within HA 911.1 in the Lower Watershed.
Source: 2011-12 JRMP Annual Report

Table 2-13
Potential Pollutant-Generating Areas that may Contribute to the Highest Priority Water Quality Condition

Area Type	City of Imperial Beach (acres)	City of San Diego (acres)	County of San Diego (acres)	Total
Areas where the RAs have Oversight and Discharge Responsibility				
Commercial	5	302	13	321
Institutional	14	90	35	139
Low Density Residential	237	1,124	12	1,373
High Density Residential	143	434	0	577
Transportation[1]	176	2,023	92	2,291
Vacant and Undeveloped Land	2	1,739	1,662	3,403
Open Space Park or Preserve	9	3,246	637	3,892
Other Park, Open Space and Recreation	15	111	0	126
Areas where the RAs have Oversight Responsibility Only				
Industrial	0	1,018	35	1,053
Areas where the RAs do not have Oversight or Discharge Responsibility				
Federal Lands[2]	1,215	1,372	575	3,162
Caltrans	0	1,023	34	1,057
Other State Lands[3]	269	683	0	952
School Land	59	309	0	368
Agricultural	0	638	471	1,109

Notes:
Includes only sites within HA 911.1.
[1] Includes local streets and parking lots. Excludes Caltrans.
[2] Includes California Department of Fish and Game, State Parks, and other state lands.
[3] Includes Bureau of Land Management, U.S. Fish and Wildlife, military, and other federal lands
Source: SANDAG, 2012

2.5.1.2 Locations of Responsible Agencies' MS4s

The MS4 maps provided in Figures 1-1 through 1-6 and Figures 2-4 and 2-5 were reviewed as part of the source identification process. The Tijuana River Valley in the Lower Watershed has the highest acreage of urban land use, and therefore has the most MS4 structures. The Upper Watershed is largely undeveloped, and those areas located above the reservoirs are not contributors of sediment to the Lower Watershed. Because the Lower Watershed has the highest density of MS4 facilities, the WQIP prioritizes these sources.

2.5.1.3 Other Known and Suspected Sources of Highest Priority Condition

A number of potential sources that are not associated with the RA MS4 discharges also may contribute to sediment load within the Tijuana River WMA. Potential sources include discharges from NPDES permitted discharges and other point sources and non-point sources. NPDES permitted discharges include industrial facilities subject to the Industrial Storm Water General Permit (Order 2014-0057-DWQ, effective July 1, 2015); commonly referred to as the Industrial General Permit), construction sites subject to the General Permit for Discharges of Storm Water Associated with Construction Activity (Order 2009-0009-DWQ; commonly referred to as the Construction General Permit), and other permitted discharges. The downstream portions of the Tijuana River WMA also receive commingled flows from Mexico that are known contributors to sediment and other pollutant issues. A detailed discussion of these potential sources is presented next.

2.5.1.3.1 NPDES Permitted Discharges

NPDES permitted discharges, such as discharges covered under the State's Industrial General Permit and CGP, may contribute to the Tijuana River WMA highest priority water quality condition. Industrial facilities can discharge sediment resulting from on-site processes, depending on discharge outfall characteristics. Construction sites permitted under the CGP are relatively large (greater than 1 acre) and can contribute sediment during ground disturbance and construction activities. Discharges from industrial and construction sites can be conveyed to receiving waters through the RAs' MS4s. Three types of NPDES permits have been identified in the Tijuana River WMA. NPDES permits regulating discharges within the Tijuana River WMA are shown in Table 2-14.

Table 2-14
NPDES Permitted Discharges that may Contribute to Highest Priority Water Quality Condition

Permit Type	Number of Permits in Tijuana River WMA[2]
Industrial	47
Construction	19
Individual permits[1]	2

Notes:
[1] Includes NPDES permits that may be relevant to sediment: Individual NPDES permit for discharges from Naval Base Coronado, specifically, Naval Outlying Field (NOLF) and discharges from Caltrans sites.
[2] Includes permittees in the Lower Watershed only.
Sources: State Board, 2014; San Diego Regional Board, 2015

Construction sites typically are transient, and the number of active, permitted construction sites will vary over time. The numbers of sites shown in Table 2-14 were generated in early 2014 from the Storm Water Multiple Application and Report Tracking System database, maintained by the State Board. Moreover, construction sites have relatively brief periods of ground surface disturbance activities that may present threats to water quality and/or sediment discharges. Accordingly, the currently active NPDES-permitted construction activity sites identified may not be representative of areas with heightened potential to discharge sediment to the MS4. Coverage under these NPDES permits overlaps with the MS4 Permit. The

RAs have some limited regulatory oversight authority, and can and do conduct inspections of these permitted sites.

2.5.1.3.2 Other Point Sources

A point source can be classified as a discrete conveyance that discharges to a receiving water. Point source discharges can be structures such as pipes, culverts, or ditches. Non-MS4 or private outfalls are point sources that may discharge sediment and/or pollutants to the MS4 or receiving waters. The RAs have performed a field evaluation to assess the physical asset characteristics and downstream channel condition of a portion of the MS4 outfalls in the Tijuana River WMA. Several potential non-municipal and/or private point source discharges were identified in HA 911.1 in the City of San Diego during asset management field investigations that may contribute sediment and other pollutants to receiving waters. Follow-up investigation and analysis are needed to confirm the presence and locations of these discharges. Non-stormwater sources of runoff such as water main breaks, over-irrigation, or broken sprinklers also may contribute flow that can transport sediment to receiving waters through the MS4.

2.5.1.3.3 Other Non-point Sources

Non-point sources typically flow over land and discharge to receiving waters over a broad area, which make them more difficult to manage than point sources. Potential non-point source discharges include:

- Agricultural operations: During wet weather, stormwater runoff may carry sediment and other pollutants from agricultural lands to roads, storm drains, other municipal infrastructure, or directly to receiving waters. Runoff from over-irrigation during dry weather may also transport nutrients, pesticides, and sediment. Agricultural sites may operate under a discharge waiver from the Regional Board that exempts them from the discharge requirements of the current permit. However, no such waivers are in place in the Tijuana River WMA.
- Erosion related to unimproved roadways in rural areas: A number of unimproved roadways exist along the U.S.–Mexico border and in the eastern portion of the Tijuana River WMA. The U.S. Customs and Border Protection conduct operations to support its border protection mission using a number of trails and unimproved roadways. These trails and unimproved roads can serve to concentrate stormwater flows that result in erosion that may contribute to sediment and other pollutants that affect downstream water quality conditions. However, such areas in the Upper Watershed would not be likely to affect conditions in the Lower Watershed.
- Homeless encampments: The exposed soils and dirt trails often associated with homeless encampments leave the ground vulnerable to erosion, which may result in sediment delivery to water bodies.
- Natural sources: Natural sources of sediment include the sediment produced through erosion processes of slopes and canyons in the WMA. Aerial deposition (i.e., particulates blown and redeposited by wind) also has been identified as both a natural source and a source influenced by anthropogenic activities.

2.5.1.3.4 Commingled Flows from Mexico

The Tijuana River main stem and tributary drainages of Yogurt Canyon, Goat Canyon, and Smuggler's Gulch transport anthropogenic-derived sediment and other pollutants generated in Mexico to receiving waters. Both point and non-point sources of pollutants are present in the Mexican portion of the watershed. In Mexico, water quality is regulated by various local, state and federal agencies, depending on channel location and construction; however, requirements are generally less stringent or not enforced compared to those in the U.S. Control of sediment and pollutant discharges originating in Mexico is outside the jurisdictional authority of governmental organizations in the U.S., including the RAs.

2.5.1.4 Review of Available Data on Dry Weather Screening, Inspections, and Complaint Investigations

The most recent JRMP annual reports prepared by the RAs were reviewed to consider available data on dry weather screening, inspections, complaint investigations as well as follow up to these activities. The information helps to inform the potential magnitude of non-compliance, in particular with respect to non-stormwater discharges, in the WMA. In general, non-stormwater discharges were not identified as a significant issue in the WMA. The reports also demonstrate that issues identified through other inspections and investigations were addressed in timely manner.

2.5.1.4.1 Dry Weather Field Screening and Persistent Flow

The MS4 Permit requires each jurisdiction to identify persistent dry weather flows from their MS4 (Provision D.2.a.2). It defines persistent flow as, "the presence of flowing, pooled, or ponded water more than 72 hours after a measurable rainfall event of 0.1 inch or greater during three consecutive monitoring and/or inspection events. All other flowing, pooled, or ponded water is considered transient."

Dry weather field screening data were available in the WMA for the City of Imperial Beach and the City of San Diego in the 2011-2012 JRMP annual reports (City of Imperial Beach, 2011, 2012; City of San Diego, 2011b, 2012a). These data were reviewed to identify sources of sediment entering receiving waters through the MS4 during dry weather. In some cases, dry weather discharges may originate from permitted sources. In other cases, these are illicit discharges. Table 2-15 summarizes the results of these screenings.

Table 2-15
Summary of Dry Weather Field Screening and Persistent Flow

Jurisdiction	Summary of Results
City of Imperial Beach	The City of Imperial Beach inspected five stations within the Tijuana River WMA and identified one outfall requiring further investigation. After extensive sampling, visual monitoring, and upstream investigation, the City of Imperial Beach concluded that no persistent anthropomorphic flow was likely to occur at this location. This site continues to be included in the RAs outfall monitoring so that any future problems will be detected through other monitoring programs.
City of San Diego	The City of San Diego inspected 36 structures within the Tijuana River Valley (the City does not have any outfalls in other areas of the WMA). All instances of flow or ponding (with the exception of one) were limited to a single monitoring event, and therefore are considered transient. One site was identified with ponded water on two separate occasions. The ponded water was attributed to over-irrigation, and the outfall is located in a large detention basin.
County of San Diego	The County of San Diego has four major outfalls in the WMA, one of which is located in the Lower Watershed. None of the County outfalls had dry weather flow. Based on this preliminary data, it has been determined that dry weather flows are not significant sources of the sediment water quality condition for the Tijuana River WMA.

Sources: City of Imperial Beach (2011, 2012); City of San Diego (2011b, 2012a)

2.5.1.4.2 Facility Inspections and Complaint Investigations

Facility inspections complement the Illicit Discharge Detection and Elimination (IDDE) program and consist of informing the public about stormwater and dry weather runoff. Inspections also detect potential dry weather flows discharging from facilities. Inspections may confirm whether specific types of facilities are significant sources of sediment. Facility inspections were reported based on the previous MS4 Permit JRMP annual reporting requirements.

In addition to facility inspections, the RAs have implemented regional and jurisdictional stormwater telephone hotlines since the issuance of the previous permit. Members of the public may report complaints to the regional hotline, which is maintained by the County of San Diego and managed in collaboration with "I Love a Clean San Diego." The County contacts the appropriate jurisdiction for follow-up on complaints received by the hotline. The jurisdictions also maintain separate hotlines and respond to complaints received. This public feedback helps the RAs to identify and eliminate illicit discharges. Each jurisdiction addressed complaints received by the public.

The JRMPs demonstrate that issues identified by the facility inspections and hotline messages were resolved in a timely manner. Although the JRMPs demonstrate BMP compliance in general, they also confirm the need to continue inspections and outreach to construction, commercial, industrial sites, and the public to address potential sources of sediment. Recommendations are presented in Section 4 and Section 5 on adjusting and refining JRMP report requirements to answer water quality-related questions.

2.5.1.5 Sources Identified with Public Input

The RAs held a public workshop on January 28, 2014. During the workshop, the RAs provided background information and preliminary findings (e.g., potential water quality conditions, sources, and strategies). The public was invited to provide input during the meeting. The public identified the following additional potential pollutant sources for sediment:

- Unpaved alleys
- Bare/unvegetated yards
- Illegal dumping

Appendix G provides a complete list of pollutant sources for water quality conditions identified by the public.

2.5.2 Prioritization of Sources of Sediment

In this section, potential pollutant sources of sediment are prioritized. Four criteria were used to prioritize these sources to facilitate the development of strategies to address the condition: 1) Adequacy of Data; 2) Origin of Source (anthropogenic or natural); 3) Potential magnitude of source; and 4) Controllability. Table 2-16 summarizes the results of the prioritization.

2.5.2.1 Adequacy of Data

In general, data were adequate to prioritize sources. The jurisdictional monitoring and inspection programs along with the MS4 inventory provide sufficient data to develop and prioritize a provisional list of known or suspected sources of sediment within the Tijuana River WMA. In addition, sufficient data exists to characterize other sources, including: contributions from other permitted sources (e.g., Phase II, Caltrans, military operations); non-point source contribution; and contributions from across the international border. In general, sources with significant quantitative data (e.g., inventory information) were characterized as high. Sources with mostly anecdotal evidence were characterized as moderate.

2.5.2.2 Origin of Sources

Sources were categorized based on whether they were natural or anthropogenic. Sources identified as anthropogenic (i.e., those associated with human activity) were ranked higher, while sources identified with a potential natural origin were ranked lower and may be excluded from priority strategies.

2.5.2.3 Potential Magnitude of Source

Although almost all of the sources identified above may contribute sediment through the MS4 to receiving waters, it is important to understand that the magnitude of the sediment discharge from the different sources varies. For example, the Tijuana River Watershed Technical Support Document for Solids, Turbidity and Trash TMDLs (Tetra Tech, 2010) summarized the magnitude of TSS load from different land uses and sources. Although the report was not formally adopted following public review

and comment, the preliminary estimates help to inform the understanding of solids, turbidity, and trash in the WMA. Sediment from Mexico was considered to be the most significant single source of anthropomorphic sediment. Within the U.S., agriculture was identified as the most significant non-point source. Freeways, transportation, and industrial land uses were identified as relatively high magnitude sources, and residential and commercial land uses were identified as moderate sources. Construction was identified as a moderate to high magnitude source. Although construction sites may present one of the highest threats of sediment production, these sites are the most inspected and regulated, thereby mitigating their associated risk. The Tijuana River WURMP (County of San Diego et al., 2008) also identified agriculture, grading/construction, and slope erosion as major sources of sediment. The sources identified above were categorized based on their expected magnitude (shown in Table 2-4) and best professional judgment (BPJ).

2.5.2.4 Source Controllability

Sources were evaluated for controllability in two ways. First, sources were ranked on how controllable they are through the implementation of BMPs. BMPs include both structural BMPs as well as nonstructural BMPs, including source control. In general, controllability was considered high for discrete sites or facilities with centralized management (e.g., construction sites, commercial facilities, industrial facilities), moderate for sprawling sites or areas without centralized management (e.g., residential areas), and low for natural non-point sources or international sources (e.g., natural sources or flows from Mexican portion of watershed).

Second, sources were evaluated for the RAs' responsibility. For some discharges, the RAs have oversight responsibility only. They may inspect these discharges but are not responsible for them. For others, they have both discharge and oversight responsibility. The RAs may inspect these discharges and are responsible for them. For some discharges, the RAs have neither oversight responsibility nor discharge responsibility. Discharges for which the RAs have neither oversight nor discharge responsibility have an overall low priority ranking. Despite situations where RAs have no oversight or responsibility, they recognize the importance of coordinating with the Regional Board and non-MS4 dischargers (e.g., the agricultural industry) to reduce potential pollutant discharges into the MS4.

Table 2-16
Summary of Source Prioritization

Source	Origin of Source	Adequacy of Data[1]	Potential Magnitude of Source[2]	Controllability of Source[3]			Overall Priority[4]
				General Controllability through BMPs	Oversight Responsibility	Discharge Responsibility	
Facilities							
Construction Sites	Anthropogenic	High	Moderate to High	High	Yes	No	High
Commercial Facilities	Anthropogenic	High	Moderate	High	Yes	Yes	High
Industrial Facilities	Anthropogenic	High	High	High	Yes	No	High
Municipal Facilities	Anthropogenic	High	Moderate	High	Yes	Yes	High
Waste Treatment, Storage, or Disposal	Anthropogenic	High	High	High	Yes	No	High
Areas							
Commercial	Anthropogenic	High	Moderate	High	Yes	Yes	High
Institutional	Anthropogenic	High	Moderate	High	Yes	Yes	High
Industrial	Anthropogenic	High	High	High	Yes	No	High
Residential	Anthropogenic	High	Moderate	Moderate	Yes	Yes	Moderate
Transportation	Anthropogenic	High	High	High	Yes	Yes	High
Vacant and Undeveloped Land	Anthropogenic or Natural	Moderate	High	Low	Yes	Yes	Moderate
Open Space Park or Preserve	Natural	Moderate	High	Low	Yes	Yes/No	Low to Moderate
Other Park, Open Space and Recreation	Anthropogenic or Natural	Moderate	Moderate to High	Moderate	Yes	Yes/No	Moderate
Federal Lands	Anthropogenic or Natural	High	Moderate to High	Moderate to High	No	No	Low
Caltrans	Anthropogenic	High	High	Moderate	No	No	Low

Table 2-16
Summary of Source Prioritization

Source	Origin of Source	Adequacy of Data[1]	Potential Magnitude of Source[2]	Controllability of Source[3]			Overall Priority[4]
				General Controllability through BMPs	Oversight Responsibility	Discharge Responsibility	
Other State Lands	Anthropogenic or Natural	High	Moderate to High	Moderate to High	No	No	Low
School Land	Anthropogenic	High	Moderate	Moderate to High	No	No	Low
MS4 Outfalls							
Lower Watershed - Dry Weather	Anthropogenic	Moderate to High	Low	High	Yes	Yes	Moderate
Lower Watershed - Wet Weather	Anthropogenic	Moderate to High	Moderate to High	Moderate	Yes	Yes	Moderate to High
Other NPDES Permitted Discharges							
Industrial	Anthropogenic	High	High	High	Yes	No	High
Construction Sites	Anthropogenic	High	Moderate to High	High	Yes	No	High
Individual	Anthropogenic	High	Moderate to High	High	Yes	No	Low
Other Point Sources							
Private outfalls	Anthropogenic	Moderate	Moderate to High	Moderate	Yes	No	Moderate
water main breaks	Anthropogenic	High	Low	Moderate	Yes	Yes	Moderate
over-irrigation	Anthropogenic	Moderate	Low	Moderate	Yes	Yes	Moderate
Other Non-Point Sources							
Agricultural operations	Anthropogenic	Moderate	Very High	Moderate	No	No	Low
Erosion of unimproved roadways	Anthropogenic	Moderate	High	Moderate	Yes	Yes	Moderate
Homeless encampments	Anthropogenic	Moderate	High	Moderate	Yes	No	Moderate

Table 2-16
Summary of Source Prioritization

Source	Origin of Source	Adequacy of Data[1]	Potential Magnitude of Source[2]	Controllability of Source[3]			Overall Priority[4]
				General Controllability through BMPs	Oversight Responsibility	Discharge Responsibility	
Natural sources	Natural	Moderate	High	Low	No	No	Low
Additional Sources Identified by the Public							
Unpaved alleys	Anthropogenic	Moderate	High	Moderate to High	Yes	Yes	Moderate
Bare/unvegetated yards	Anthropogenic	Moderate	High	Moderate	Yes	Yes	Moderate
Illegal dumping	Anthropogenic	Moderate	High	Moderate	Yes	Yes	Moderate
Other							
Commingled flows from Mexico	Anthropogenic	High	Very High	Low	No	No	Low

Notes:

[1]See Section 2.5.2.1.

[2]See Section 2.5.2.3.

[3]See Section 2.5.2.4.

[4]Overall priority based on overall assessment of adequacy of data, potential magnitude of source, and controllability of source.

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2.5.2.5 Summary of Highest Priority Sources

Highest priority sources were identified based on a cumulative assessment of the criteria shown in Table 2-16. The following sources that contribute to the highest priority water quality condition (sediment) have been prioritized as high priority based on the analysis described in Section 2.5. The RAs may further refine this list as they conduct special studies and implement the WQIP monitoring and assessment program. Highest priority sources (listed in order of priority) include:

Facilities

- Construction
- Commercial Facilities
- Municipal Facilities
- Industrial Facilities
- Waste Treatment, Storage, or Disposal

Land Areas

- Transportation (e.g., local roads and parking lots; excludes Caltrans)
- Commercial
- Institutional
- Industrial

MS4 Outfalls

- Lower Watershed – wet weather

2.6 PRELIMINARY LIST OF POTENTIAL WATER QUALITY IMPROVEMENT STRATEGIES

Provision B.2.e of the MS4 Permit requires the RAs to evaluate the findings of their evaluation of receiving water conditions, assess the impacts from MS4 discharges, identify priority water quality conditions, and identify MS4 sources of pollutants and/or stressors for potential strategies that can result in improvements to water quality in MS4 discharges and/or receiving waters within the WMA. The highest priority water quality conditions, as identified in Section 2, are as follows:

- Sedimentation and siltation in the Tijuana River (wet weather); and
- Turbidity in the Tijuana River and Tijuana Estuary (wet weather).

To address highest priority water quality conditions, the MS4 Permit requires a multi-faceted urban runoff management program. The urban runoff management program is based on an integrated BMP approach. The BMP approach includes both nonstructural and structural components, with the goal of using available resources to maximize the effectiveness of water quality improvement strategies in reducing

sediment and other pollutant loads. Both structural and nonstructural BMP categories are defined as follows:

- Nonstructural BMPs are source control and pollution prevention activities intended to reduce stormwater pollution that do not involve the construction of a physical component or structure to filter or treat stormwater. A wide range of actions may be considered nonstructural BMPs including: education, public outreach, product bans, basic pollution-prevention retrofits, and pilot studies.
- Structural BMPs are engineered and/or constructed landscape features, permeable areas and treatment areas intended to reduce stormwater pollution by filtration or treatment. Engineered and/or constructed retrofits would be considered structural.

The specific activities, geographic location and application frequency of nonstructural and structural water quality improvement strategies are subject to the adaptive management process, discussed in Section 5.

The MS4 Permit requires the jurisdictions to work together to identify potential water quality improvement strategies that may be implemented to address the highest priority water quality condition(s). Potential strategies that can provide improvements in water quality include nonstructural and structural strategies. The preliminary lists presented below were developed through collaboration among the RAs and solicitation of input from the public. The lists of strategies (provided below) are preliminary and are subject to revision. Identification of potential improvement strategies was intended to create a list of activities that may or may not be implemented by each RA; and no commitment has been made with regard to each strategy. All potential improvement strategies may not be implemented. The lists were further reviewed and refined since their initial development. Updated lists of strategies are discussed in Section 4 and are provided in Appendix H.

The following two sections describe these two BMP strategy categories and present preliminary lists of options within each category that may be implemented to address the highest priority water quality conditions and other priority pollutants and stressors within the Tijuana River WMA. Flood control is a priority for some of the jurisdictions within the Tijuana River WMA, and the ability of nonstructural and structural BMPs to also provide these benefits will be considered as water quality improvement strategies.

2.6.1 Preliminary List of Nonstructural Strategies

Nonstructural reduction strategies are those actions and activities intended to reduce stormwater pollution that do not include construction or implementation of a physical structure to treat stormwater. These strategies also are 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 (San Diego Regional Board, 2013a).

The MS4 Permit requires jurisdictions to control the contribution of pollutants to the MS4 and the discharges from the MS4 within their jurisdictions through JRMPs (Provision E). It also requires the jurisdictions to identify the strategies selected for implementation under JRMP Provisions E.2 through E.7 as part of the WQIP. Therefore, the potential WQIP strategies are grouped within these six JRMP provisions. Potential strategies outside these programs are considered optional strategies, per permit Section B.3.b(1)(b). Table 2-17 describes the nonstructural strategy categories.

Table 2-17
Nonstructural Strategy Categories

Strategy Category	Strategy Description
Development Planning	Program uses the RAs land use and planning authority to require implementation of BMPs to address effects from new development and redevelopment.
Construction Management	Program addresses pollutant generation from construction activities associated with new development or redevelopment.
Existing Development	Program addresses pollutant generation from existing development including commercial, industrial, municipal, and residential land uses.
IDDE Program	Program proactively 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 stormwater to the maximum extent practicable (MEP), prevent controllable non-stormwater discharges from entering the MS4, and protect water quality standards in receiving waters.
Enforcement Response Plan	Enforcement of each JRMP is required.
Non-JRMP Strategies	Strategies that are outside the JRMPs, but are designed to effectively prohibit non-stormwater discharges to the MS4, protect the beneficial uses of receiving waters from MS4 discharges, or achieve the interim and final numeric goals identified in the WQIP.

The list of potential nonstructural strategies within each category is based on the following:

- Existing programs or actions the RAs are already implementing or must implement based on MS4 Permit requirements;
- Opportunities for enhancements and refinement of JRMPs; and
- New actions or initiatives identified to be effective or potentially effective in other areas or programs.

The list of potential nonstructural strategies is intended to be broad and flexible, to allow jurisdictional- and watershed-appropriate variation. Table 2-18 lists potential nonstructural strategies for each category identified in Table 2-17. Table 2-18 also presents pollutant reduction assumptions for each strategy and the associated water chemistry, physical, and biological benefits achieved from implementation. The

assumptions are based on literature reviews, practical experience, and stakeholder input. The BMP benefits shown in Table 2-18 are dependent on site characteristics, 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 reference. 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 needs.

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
JRMP Strategies															
Development Planning															
	All Development Projects														
A.	For all development projects, administer a program to ensure implementation of source control BMPs to minimize pollutant generation at each project and implement low-impact development (LID) BMPs to maintain or restore hydrology of the area, where applicable and feasible.	MS4 Permit Section E.3.a	*Benefit varies by source control or LID BMP type.*												
B.	Provide additional BMP conditions on discretionary permits (non-priority development projects)	MS4 Permit Section E.3.a	*Benefit varies by source control or LID BMP type.*												

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
C.	Amend municipal code and ordinances, including zoning ordinances, to facilitate and encourage LID opportunities.	WQIP[3] Input, Enhancement	*Benefit varies by source control or LID BMP type.*												
D.	Train staff on LID regulatory changes and LID Design Manual.	WQIP Input, Enhancement													
Priority Development Projects (PDPs)															
E.	For PDPs, administer a program requiring implementation of on-site structural BMPs to control pollutants and manage hydromodification. Includes confirmation of design, construction, and maintenance of PDP structural BMPs.	MS4 Permit Sections E.3.b & E.3.c	*Benefit varies by source control or LID BMP type.*												

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
F.	Update BMP Design Manual procedures to determine nature and extent of stormwater requirements applicable to development projects and to identify conditions of concern for selecting, designing, and maintaining appropriate structural BMPs.	MS4 Permit Section E.3.d	*Benefit varies by Pollutant-Generating Activity (PGA) and BMP Design Manual update.*												
	1. Amend BMP Design Manual for animal-related facilities.	WQIP Input, MS4 permit Section E.3.d	●	○	○	●	●	●	○	○	○	◗	◗	○	◗
	2. Amend BMP Design Manual for nurseries and garden centers.	WQIP Input, MS4 permit Section E.3.d	◗	○	●	●	●	●	○	○	○	◗	◗	○	◗
	3. Amend BMP Design Manual for auto-related uses.	WQIP Input, MS4 permit Section E.3.d	◗	◗	◗	◗	○	○	●	○	●	◗	◗	○	◗
	4. Amend BMP Design Manual for trash areas. Require full four-sided enclosure, siting away from drains and cover. Consider retrofit requirements.	WQIP Input, MS4 permit Section E.3.d	●	◗	◗	◗	○	●	●	◗	●	○	○	●	●

Table 2-18
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			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
G.	Administer an alternative compliance program to on-site structural BMP implementation (includes identifying Watershed Management Area Analysis [WMAA] candidate projects).	MS4 permit Section E.3.c(3)	*Benefit varies by watershed project; potential benefit for all conditions.*												
	1. Create in-lieu fee program.	MS4 permit Section E.3.c(3)	*Benefit varies by watershed project; potential benefit for all conditions.*												
Construction Management															
H.	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.	MS4 permit Sections E.4.c & E.4.d(1)	○	○	○	●	○	○	◗	○	◗	●	●	○	●

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
Existing Development															
	Commercial, Industrial, Municipal, and Residential Facilities and Areas														
I.	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.	MS4 permit Section E.5.c	*Benefit varies by facility, area type, and PGA.*												
	1. Update minimum BMPs for existing residential, commercial, and industrial development and enforce them.	WQIP Input, MS4 permit Section E.5.b	*Benefit varies by land use and PGA.*												
	2. Design, implement, and enforce property- and PGA-based inspections.	WQIP Input, MS4 permit Section E.5.c	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
	3. Develop a self-reporting inspection option for select industrial and commercial facilities.	WQIP Input, Enhancement	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
J.	Proactive enforcement of stormwater code violations	MS4 permit Section E.6	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
K.	Promote and encourage implementation of designated BMPs at residential areas.	MS4 permit Section E.5.b(2)	◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	◗	◗
	1. Expand residential BMP (irrigation control, rainwater harvesting, and turf conversion) rebate programs to multi-family housing in target areas.	WQIP Input, Enhancement	◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	◗	◗
	2. Residential BMP: Rainwater Harvesting (e.g. Rain Barrels)	WQIP Input, Enhancement	◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	○	◗
	3. Residential BMP: Irrigation Control (Turf Conversion)	WQIP Input, Enhancement	◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	◗	◗

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
L.	Disconnection of Impervious Areas (e.g., downspout disconnection)	WQIP Input, Enhancement	◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	◗	◗
M.	Develop pilot project to identify and carry out site disconnections in targeted areas.	WQIP Input, Enhancement	◗	◗	◗	◗	○	◗	○	◗	○	●	◗	◗	◗
N.	Identify and reduce incidents of power washing discharges from nonresidential sites.	WQIP Input, Enhancement	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
O.	Promote and encourage implementation of designated BMPs in nonresidential areas.		◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	◗	◗
	MS4 Infrastructure														
P.	Implement operation and maintenance activities (inspection and cleaning) for MS4 and related structures (e.g., catch basins, storm drain inlets, detention basins).	MS4 permit Section E.5.b(1)	*Benefit varies by strategy.*												
	1. Optimize catch basin cleaning to maximize pollutant removal.	WQIP Input, Enhancement	◗	●	○	●	○	○	○	○	●	○	○	○	◗

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
	2. Proactively repair and replace MS4 components to provide source control from MS4 infrastructure.	WQIP Input, Enhancement	◗	●	○	●	○	◗	○	○	○	○	○	○	◗
	3. Increase frequency of open-channel cleaning and scour pond repair to reduce pollutant loads.	WQIP Input, Enhancement	◗	●	○	●	○	◗	○	○	○	○	○	○	◗
	4. Increase frequency of MS4 cleaning and O&M	WQIP Input, Enhancement	◗	●	○	●	○	◗	○	○	○	○	○	○	◗
Q.	Implement controls to prevent infiltration of sewage into the MS4 from leaking sanitary sewers and septic tanks.	MS4 permit Section E.5.b(1)(c)(iv)	◗	○	○	●	◗	◗	○	○	○	○	○	○	◗
	1. Identify sewer leaks and areas for sewer pipe replacement prioritization including septic and private lateral issues.	WQIP Input, MS4 permit Section E.5.b(1)(c)(iv)	◗	○	○	●	◗	◗	○	○	○	○	○	○	◗

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
Roads, Streets, and Parking Lots															
R.	Implement operation and maintenance activities for public streets, unpaved roads, paved roads, and paved highways.	MS4 permit Section E.5.b	◗	●	◗	●	○	●	○	◗	●	○	○	○	◗
	1. Enhance street sweeping through equipment replacement and route optimization.	WQIP Input, MS4 permit Section E.5.b	◗	●	◗	●	○	●	○	◗	●	○	○	○	◗
	2. Initiate sweeping of medians on high-volume arterial roadways.	WQIP Input, MS4 permit Section E.5.b	◗	●	◗	●	○	●	○	◗	●	○	○	○	◗
	3. Increase maintenance on dirt access roads and trails.	WQIP Input, Enhancement	○	○	○	●	○	○	○	○	◗	○	○	○	◗
S.	Require sweeping and maintenance of private roads and parking lots in targeted areas.	WQIP Input, Enhancement	◗	●	◗	●	○	●	○	◗	●	○	○	○	◗
T.	Street sweeping efficiency study	WQIP Input, Enhancement	◗	●	◗	●	○	●	○	◗	●	○	○	○	◗

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
U.	Identify sites for pilot study to test Permeable Friction Course (PFC), a porous asphalt that overlays impermeable asphalt.	WQIP Input, Enhancement	◗	●	◗	●	●	◗	◗	◗	◗	●	●	○	◗
V.	Integrate LID into capital improvement and street rehabilitation projects	MS4 permit Section E.3	◗	◗	◗	◗	◗	◗	◗	◗	○	●	◗	◗	◗
Retrofit and Rehabilitation in Areas of Existing Development															
W.	Develop and implement a strategy to identify candidate areas of existing development appropriate for retrofitting projects and facilitate the implementation of such projects.	WQIP Input, MS4 permit Section E.5.e(1)	*Varies by development area; potential benefit for all conditions.*												
X.	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.	WQIP Input, MS4 permit Section E.5.e(2)	*Varies by development area; potential benefit for all conditions.*												

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
IDDE Program															
Y.	Implement 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.	MS4 permit Section E.2	*Benefit varies; potential benefit for all conditions.*												
Z.	Proactive enforcement of residential areas.	MS4 permit Section E.2	◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	◗	◗

Table 2-18
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ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
Public Education and Participation															
AA.	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 stormwater prioritized by high-risk behaviors, pollutants of concern, and target audiences.	MS4 permit Section E.7	*Varies by program.*												
	1. Expand outreach to homeowners' association common lands and HOA rebates.	WQIP Input, MS4 permit Section E.7.a	◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	○	◗
	2. Develop an outreach and training program for property managers responsible for HOAs and maintenance districts.	WQIP Input, MS4 permit Section E.7.a	◗	◗	◗	◗	●	●	◗	◗	◗	◗	◗	○	◗

Table 2-18
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ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
	3. Improve consistency and content of websites to highlight enforceable conditions and reporting methods.	WQIP Input, MS4 permit Section E.7.a	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
	4. Contribute to San Diego County-led effort through regional education group for outreach, education, and policy measures for the equestrian community and property owners.	WQIP Input, MS4 permit Section E.7.a	●	○	○	◗	○	◗	○	○	○	○	○	○	◗
	5. Develop a targeted education and outreach program for homeowners with orchards or other agricultural land uses on their property.	WQIP Input, Enhancement	◗	○	○	●	●	●	○	◗	◗	◗	◗	○	◗
	6. Develop regional training for water-using mobile businesses.	WQIP Input, Enhancement	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗

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			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
	7. Conduct trash cleanups through community-based organizations involving target audiences.	MS4 permit Section E.7.b	●	●	●	●	○	○	◗	◗	●	○	○	●	●
	8. Develop education and outreach to reduce over-irrigation.	MS4 permit Section E.7.a	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
	9. Enhance school and recreation-based education and outreach.	MS4 permit Section E.7.a	*Benefit varies; potential benefit for all conditions.*												
BB.	Enhance education and outreach based on results of effectiveness survey and changing regulatory requirements.	WQIP Input, Enhancement	*Varies by program.*												
CC.	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.	WQIP Input, Enhancement	*Benefit varies; potential benefit for all conditions.*												

Table 2-18
Nonstructural Strategies for Pollutants

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			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
	1. Translate guidance materials with focus on both language and culture.	WQIP Input, Enhancement	*Varies by program.*												
DD.	Support NGO efforts in the watershed (e.g., during Tijuana River Action Month)	MS4 permit Section E.7.b	*Varies by program.*												
Enforcement Response Plan															
EE.	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.	MS4 permit Section E.6	*Varies by program.*												
	1. Increase enforcement of over-irrigation.	WQIP Input, MS4 permit Section E.6	◗	◗	◗	◗	●	●	◗	◗	◗	●	●	◗	◗
	2. Focus locally on enforcement of water-using mobile businesses.	WQIP Input, MS4 permit Section E.6	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗

Table 2-18
Nonstructural Strategies for Pollutants

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			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
	3. Focus on poorly-maintained residential neighborhoods or high density residential areas.	WQIP Input, MS4 permit E.6	◗	◗	◗	◗	●	●	◗	◗	◗	●	●	◗	◗
FF.	Increase identification and enforcement of actionable erosion and slope stabilization issues on private property and require stabilization and repair.	WQIP Input, Enhancement	◗	○	○	●	○	◗	○	◗	○	○	○	◗	◗
Optional Strategies															
GG.	Continue participating in source-reduction initiatives.	WQIP Input, Enhancement	*Varies by initiative. For example, the Brake Pad Partnership specifically targets copper in brake pads and is therefore a source-reduction initiative for metals.*												
HH.	Identify and address private sewer lateral leaks		●	○	●	◗	○	●	◗	◗	○	◗	◗	◗	◗
II.	Retrofit MS4s and outfall areas to increase infiltration and slow flow to allow sediment to settle out.	MS4 permit Section B.3.b.(1)(b)	◗	◗	◗	●	◗	●	◗	◗	◗	◗	◗	◗	◗
JJ.	Proactively monitor for erosion, and complete minor repair and slope stabilization on municipal property.	WQIP Input, Enhancement	◗	○	○	●	○	◗	○	◗	○	○	○	◗	◗

Table 2-18
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ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
KK.	Protect areas that are functioning naturally.	WQIP Input, MS4 permit Section B.3.b.(1)(b)	◗	◗	◗	●	◗	◗	◗	◗	◗	●	●	●	●
LL.	Mapping and risk assessment of agricultural operations.	WQIP Input, Enhancement	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
MM.	Implement a program to target on-site wastewater treatment (septic) systems. May include mapping and risk assessment, inspection, or maintenance practices.	WQIP Input, Enhancement	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗
NN.	Conduct a feasibility study to determine if implementing an urban tree canopy program would benefit water quality and other RA goals.	WQIP Input, Enhancement	*To be determined.*												

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ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
OO.	Conduct special studies to gather additional monitoring information about priority conditions or beneficial uses. Monitoring may include investigative measures such as geomorphic studies for sediment sources or processes.	WQIP Input, Enhancement	*Varies by initiative and project.*												
PP.	Outreach and incentive programs to encourage low maintenance and stable residential and non-residential ground covering (e.g., xeriscaping)	WQIP Input, Enhancement	*Varies by initiative and project.*												

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
QQ.	Collaborate with entities potentially including: • Departments within the same RA; • Governmental agencies (e.g., water, public health, or transportation); • Federal dischargers (e.g., Navy or Border Patrol); • NGOs including environmental and community groups; • Private corporations; • TRNERR Advisory Council; • TRVRT; • Dischargers regulated under other permits (e.g., Phase II NPDES Permit, Industrial General Permit, and CGP)	WQIP Input, Enhancement	*Varies by initiative and project.*												

Table 2-18
Nonstructural Strategies for Pollutants

ID	Nonstructural Strategy	Reference[1]	Water Chemistry Benefit									Physical and Biological Benefit			
			Bacteria	Metals	Organics	Sediment[2]	Pesticides	Nutrients	Oil and Grease	Dissolved Solids	Trash	Flow Rate	Volume Reduction	Habitat/ Wildlife	Aquatic Life
RR.	Form joint development or participation of a study or BMP; monitoring; restoration efforts; forming watershed or subwatershed groups, including Watershed Councils; or participating in existing groups, such as Integrated Regional Water Management (IRWM) groups.	WQIP Input, Enhancement	*Varies by initiative and project.*												
SS.	Funding for collaborative strategies may include providing in-kind services, shared costs through agreements, and preparation and competition for grant funding.	WQIP Input, Enhancement	*Varies by initiative and project.*												

Notes:

[1] Reference indicates the source of the strategy. Strategies are from the MS4 permit or the WQIP development process, including Consultation Committee and public input. Strategies identified as part of the JRMP requirements in MS4 permit Section E.2 through E.7 are identified in the table with the appropriate MS4 permit section. Strategies that may be implemented as part of the JRMPs, but are not specifically required in the MS4 permit are designated as "Enhancements."

[2] Orange indicates the highest priority water quality condition for the WMA.

2.6.2 Preliminary List of Structural Strategies

Structural BMPs can be placed strategically throughout the watershed to collectively improve water quality by removing pollutants through filtration and infiltration. The effectiveness and feasibility of implementing different types of structural BMPs should be carefully considered because of the BMP impact and cost to implement and maintain. Structural BMP effectiveness often is dependent on routine maintenance of each BMP. The County of San Diego is concerned specific funding sources have not been identified for the implementation of structural BMPs.

For convenience, structural water quality improvement strategies are presented according to three categories, based on scale and overall function: (1) green infrastructure, (2) multi-use treatment areas, and (3) water quality improvement BMPs, as shown in Table 2-19. This classification is for the purposes of discussion only and is not intended to imply specific RA approaches or commitments.

Each of the three categories of structural BMPs serve important purposes, and a combination of these BMPs will be considered to evaluate their optimal level of implementation as part of this WQIP. BMPs within the three structural categories also can be designed as retrofits to both pervious and impervious areas. Accordingly, retrofitting is discussed below. These BMPs also may be identified within the alternative compliance option to on-site BMPs for development projects. Future drafts of the WQIP will discuss alternative compliance options in more detail.

The list of strategies provided in this document is intended to be broad and provide flexibility in selection and implementation. The next phase of WQIP development includes the selection of jurisdictional and watershed-specific BMPs, which will provide more detail on the strategies selected. Strategies that target the highest priority conditions will be emphasized, and any strategies with multiple benefits will be favored. Consideration will be given to a comprehensive and strategic selection of structural BMPs that provide optimal effectiveness and target the highest priority water quality conditions, without resulting in unintended negative downstream impacts on sensitive habitats and other water quality conditions.

Table 2-19
Structural BMP Categories

Green Infrastructure	Multiuse Treatment Areas	Water Quality Improvement BMPs
• Bioretention • Infiltration Trench • Bioswale • Planter Box • Constructed Wetland • Permeable Pavement • Sand Filter • Vegetated Swale • Vegetated Filter Strip • Green Roof • Disconnection of Impervious Areas • Disconnection of Non-Stormwater Discharge • On-site treatment • Green Streets	• Infiltration and detention ponds • Stream, channel, and habitat rehabilitation projects • Other opportunities, including private parcel acquisition and public/private partnerships and alternative compliance programs.	• Dry weather flow separation and treatment projects. • Proprietary BMPs

2.6.2.1 Green Infrastructure

EPA defines green infrastructure as "an approach that communities can choose to maintain healthy waters, provide multiple environmental benefits, and support sustainable communities." Green infrastructure uses vegetation and soil to manage stormwater at the source and seeks to weave natural processes into the built environment (EPA, 2014b), complemented with engineering and structural components such as underdrains and permeable pavement. Green infrastructure BMPs typically are integrated into site designs to remove pollutants and often have multiple uses, such as planter boxes also serving as landscaping or permeable pavement also serving as a driving surface. Green infrastructure can be implemented at the site scale (on-site treatment) or street right-of-way scale (green streets), as further discussed next. The list of potential green infrastructure BMPs includes 12 BMP types, as shown in Table 2-20.

Table 2-20
Green Infrastructure Descriptions

BMP	BMP Description
Bioretention	Shallow vegetated features designed to detain runoff, filter through plant roots and a biologically active soil mix, and infiltrate into the ground (or treated prior to draining via underdrain). Bioretention can be configured in nearly any shape, reservoir or bioswale, or configured as in-ground or above ground planter boxes.
Infiltration Trenches	Narrow, linear BMPs that have similar functions as bioretention areas with variable surface materials, including rock or decorative stone, designed to allow stormwater to infiltrate into subsurface soils. May also include French drains.
Bioswales	Shallow, open channels designed to reduce runoff volume through infiltration and pollutant removal by filtering water through vegetation within the channel and infiltration into bioretention specific soil media. Bioswales can serve as stormwater conveyance, but the primary objective is water quality enhancement (often referred to as *linear bioretention*).
Planter Box	Fully contained systems containing soil media and vegetation that function similarly to a small bioretention BMP, but include an impermeable liner and underdrain.
Constructed Wetland	Engineered, shallow marsh systems designed to control and treat stormwater runoff. Particle-bound pollutants are removed through settling and other pollutants are removed through biogeochemical activity.
Permeable Pavement	Allows streets, parking lots, sidewalks, bike paths, and other impervious covers to retain their natural infiltration capacity while maintaining the structural and functional features of the materials they replace. Roads such as highways can include PFC overlays, which provide water quality benefits when traditional permeable pavement is not suitable.
Sand Filters	Treatment system that removes particulates and solids from stormwater runoff by facilitating physical filtration.
Vegetated Swales	Shallow, open channels that are designed primarily for stormwater conveyance. Pollutants such as trash and debris are removed by physically straining/filtering water through vegetation in the channel.
Vegetated Filter Strips	Bands of dense, permanent vegetation with a uniform slope, designed to provide pretreatment of runoff generated from impervious areas before flowing into another BMP as part of a treatment train.
Green Roofs	Roofing systems that layer a soil/vegetative cover over a waterproofing membrane and can reduce runoff through interception and evapotranspiration.
Disconnection of Impervious Areas	Reduces volume of runoff entering the MS4 by intercepting, infiltrating, filtering, treating or reusing it as it moves from the impervious surface to the drainage system. Through this practice, runoff is directed from rooftops or other impervious surfaces to pervious areas or conservation areas or to a BMP designed to infiltrate, evapotranspirate, and/or harvest the runoff.
Disconnection of non-stormwater discharges	Reduces volume of non-stormwater discharges entering the MS4. Similar to disconnection of impervious areas, through this practice, non-stormwater discharges may be redirected to areas of infiltration (e.g., directing drainage from sumps to French drains), evapotranspiration, or harvesting.

Table 2-21 lists the water quality conditions and the potential green infrastructure BMPs that can best address those conditions. Pollutant reduction assumptions were adapted from the Model Standard Urban Stormwater Mitigation Plan (SUSMP) (County of San Diego, 2012) and literature reviews. The future benefits shown in Table 2-21 assume ongoing BMP maintenance.

Table 2-21
Green Infrastructure Best Management Practices

BMP	Water Chemistry Benefit									Physical and Biological Benefits			
	Bacteria	Metals	Organics	Sediment[1]	Pesticides	Nutrients	Oil and Grease	Dissolved Minerals	Trash	Flow Rate	Volume Reduction	Habitat or Wildlife	Aquatic Life
Bioretention	●	●	●	●	●	◗	●	◗	●	●	●	○	◗
Infiltration Trenches	●	●	●	●	●	●	●	●	●	●	●	○	●
Bioswales	●	●	●	●	●	◗	●	◗	●	●	●	○	◗
Planter Boxes	●	●	●	●	●	◗	●	◗	●	◗	◗	○	◗
Permeable Pavement	◗	●	◗	●	●	◗	◗	◗	◗	●	●	○	◗
Constructed Wetlands	●	●	◗	●	●	●	◗	◗	●	●	◗	●	◗
Sand Filters	●	●	●	●	●	◗	●	○	●	◗	◗	○	◗
Vegetated Swales	◗	◗	◗	●	◗	◗	◗	○	●	◗	◗	○	◗
Vegetated Filter Strips	◗	◗	◗	●	◗	◗	◗	○	●	◗	◗	○	◗
Green Roofs	◗	◗	○	●	○	○	○	○	○	●	◗	○	◗
Disconnection of Impervious Areas	●	●	●	●	●	◗	●	◗	●	●	●	○	◗
Disconnection of Non-stormwater	◗	●	●	●	●	●	●	●	◗	◗	◗	○	◗

Notes:

[1] Orange indicates highest priority water quality condition for the WMA.

● Provides primary pollutant reduction.

◗ Provides secondary pollutant reduction.

○ Provides minimal or no pollutant reduction.

2.6.2.1.1 On-site Treatment

Any or a combination of the structural BMPs listed in Tables 2-19 and 2-20 can be applied at the site scale to capture and treat stormwater runoff at the source. These small-scale projects are important to the Tijuana River WMA as a whole, because collectively they can provide an effective means towards pollutant load reduction while also attenuating peak flow, reducing discharge volume, and providing aesthetic value and improved habitat quality. These small-scale BMPs also can be retrofitted into existing developments, such as through converting parking lot medians into planter boxes or curb cutouts or asphalt into permeable pavement.

2.6.2.1.2 Green Streets

Green streets can consist of multiple BMP types, including permeable pavement and bioretention. Green streets provide an opportunity to locate BMPs in the right-of-way of streets and, similar to on-site treatment, can be an effective method of treating urban stormwater runoff, attenuating peak flow, and reducing discharge volume while improving community pride, land value, and habitat quality. Green streets are efficient in removing pollutants because of their proximity to pollutant-generating surfaces and the existing stormwater collection system. Because green streets are predominantly in the right-of-way, these BMPs often do not have land acquisition costs and can be more conveniently accessed for maintenance activities. Attention to the location of underground utilities, however, is required when considering green streets.

2.6.2.2 Multiuse Treatment Areas

Large-scale, multi-use, structural BMP treatment areas, such as multi-use basins and stream, riparian area, channel, and habitat rehabilitation projects can include regional BMPs that receive flows from neighborhoods or larger areas. These structural BMPs can provide multiple benefits for the purposes of flood control, ground water recharge, restoration, habitat enhancement, floodplain preservation, and recreation. These BMPs are well suited in public spaces, such as active (soccer fields) and passive (parks) recreation areas.

2.6.2.2.1 Infiltration and Detention Basins

Large multi-use BMPs considered while developing the WQIP should focus on surface BMPs that provide treatment through runoff detention and infiltration. Examples include infiltration basins and dry extended detention basins. These BMPs are designed to hold runoff, allowing it to evaporate into the atmosphere, infiltrate into native soils, or be transpired by vegetation, while accommodating for overflow and bypass during large storm events.

2.6.2.2.2 Stream, Channel, and Habitat Rehabilitation Projects

Stream, channel, habitat restoration or enhancement projects and floodplain preservation projects can help sustain habitat for wildlife and provide water quality benefits downstream from these activities. Each RA can identify and implement these projects based on the availability of land and need for restoration or enhancement locally.

2.6.2.2.3 Stormwater Harvesting

Rain barrels/cisterns were covered programmatically above as a nonstructural strategy, although very large "permanent" cisterns providing water supply augmentation also can be considered and categorized as structural.

2.6.2.2.4 Other Opportunities

In the event that the combination of structural and nonstructural BMPs listed above are not sufficient to meet pollutant reduction targets, additional land may need to be acquired to construct multi-use treatment areas, to achieve sufficient load reductions. These structural BMPs are considered a lower priority for implementation because of the high cost of land acquisition. Therefore, multi-use treatment areas on acquired private land likely will not be an initial priority for each RA. However, multi-use treatment areas on private properties as part of public/private partnerships may be possible through the alternative compliance option for priority development projects (PDPs). Those agencies or watersheds that conduct a WMA analysis will identify opportunities for these types of projects, as is further discussed in Section 3.

2.6.2.3 Water Quality Improvement BMPs

Water quality improvement BMPs include sediment and trash capture devices, proprietary BMPs, and dry weather flow separation and treatment projects. Trash segregation includes inlet devices, such as trash guards or trash racks, which are installed to capture trash and debris before conveyance into local water bodies. Proprietary BMPs are prefabricated commercial products, such as hydrodynamic separators or catch basin filter inserts that typically aim to provide stormwater 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-stormwater dry-season flows and divert these flows for treatment, either on-site or to sanitary sewer systems, and ultimately to wastewater treatment plants.

These BMPs may have an immediate impact on water quality in some cases, for example, if placed into existing storm drains that do not have BMPs. Establishing maintenance agreements for these BMPs will be important for their long-term effectiveness as well as to avoid unintended consequences, such as flooding.

SECTION 3 WATER QUALITY IMPROVEMENT GOALS, STRATEGIES AND SCHEDULES

The San Diego Regional MS4 permit requires the 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 and siltation in the Tijuana River during wet weather; and
- Turbidity in the Tijuana River and Tijuana River Estuary during wet weather.

Sedimentation, siltation, and turbidity are interrelated. Turbidity, measured in NTUs, is an optical characteristic of water expressing the degree to which light is scattered (and affected) by suspended particles in water. In general, turbidity increases as suspended solids concentration increases. Because reduction in TSS indicates a reduction in both sedimentation and siltation as well as a reduction in turbidity, the numeric goals for the Tijuana River WMA are TSS-based load reductions such that both of these highest priority water quality conditions can be gauged. Improvement in receiving water quality will be evaluated in part by characterizing pollutant reduction and related stormwater quality improvement trends from MS4 discharges.

Although this WQIP addresses suspended sediment and turbidity as the highest priority water quality conditions, the strategies described to address sediment also target other pollutants such as trash, bacteria, nutrients, and metals. As implementation of non-structural and structural water quality strategies to address sediment move forward, corresponding reductions in other types of pollutants are anticipated at varying levels. However, as the highest priority water quality condition, specific goals for reducing suspended solids in the WMA have been developed as described below.

3.1 WATER QUALITY IMPROVEMENT GOALS

The MS4 permit requires identification of interim and final numeric goals to help track water quality milestones and demonstrate progress towards reducing the highest priority water quality conditions. It states that interim and final numeric goals may take a variety of forms, such as TMDL-established water quality-based effluent limitations, action levels, pollutant concentrations, load reductions, number of impaired water bodies delisted from the List of Water Quality Impaired Segments, IBI scores, or other appropriate metrics (§B.3.a.(1)). The permit allows flexibility in identifying numeric goals, but requires that they be both measureable and quantifiable, to gauge progress and to determine achievement of the goals. 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 5-year period (from WQIP approval to the anticipated final goal compliance date) have been developed, with an ultimate desired outcome of restoring and protecting receiving waters. The key factors in developing the interim and final sediment load-reduction numeric goals for the Tijuana River WMA WQIP include:

- MS4 outfall discharges used to evaluate sediment loading

- Total Suspended Solids (TSS) concentrations for baseline (193 mg/L) and final benchmark (120 mg/L) conditions used to develop annual sediment load estimates
- Final numeric goal based on methodology incorporating benchmark value of representative regional data supported by EPA
- WQIP includes 13-year timeline to achieve final numeric goal

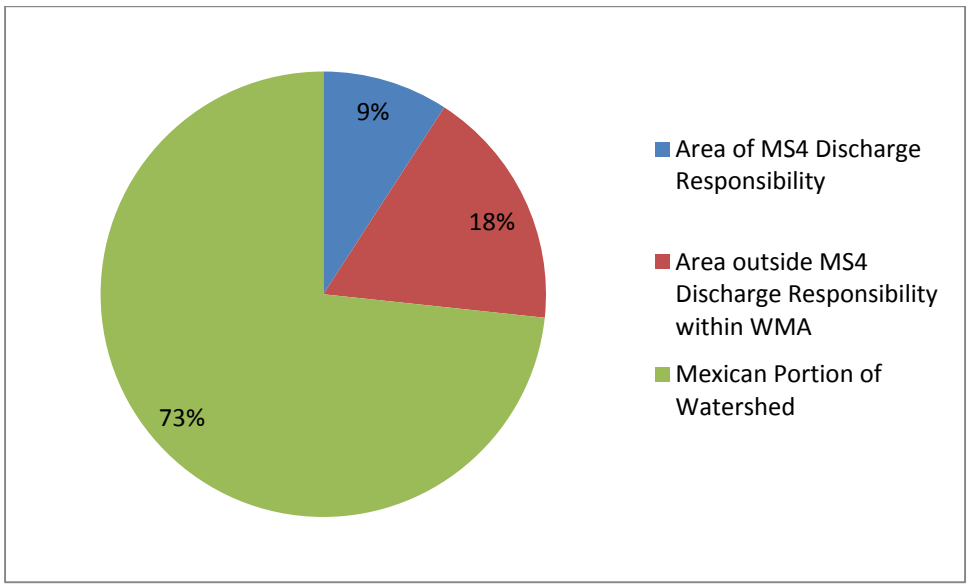
The interim and final goals are summarized in Table 3-1, and are discussed in greater detail in Section 3.1.1.

Table 3-1
Numeric Goal Summary, Tijuana River WMA

Year	Annual Sediment Load (tons)	Numeric Goal (Percent Load Reduction)
2015	546	--
2018	514	6%
2023	365	33%
2028	340	38%

Details of sediment load evaluations include:
- Loading averaged across measured MS4 outfalls
- Large storm events (> 85th percentile storm) excluded from average annual sediment load calculations

As discussed in Sections 1 and 2, discharges from sources other than the Phase I MS4s that cause or contribute to impairments of receiving waters outside the jurisdiction (i.e., non-MS4 sources from the Mexican portion of the watershed) are not the regulatory discharge responsibility of this WQIP. To achieve the ultimate goal of restoring and maintaining the quality of receiving waters in the Tijuana River Watershed, international cooperation for properly controlling discharges to receiving waters would be required for 73 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 those parties responsible. Only in this manner can the ultimate goal be achieved. In some cases, current regulatory and/or functional mechanism(s) may not be adequate to address certain types of discharges (e.g., cross-border discharges) that are known to negatively affect Tijuana River water quality. This WQIP includes a suite of WMA strategies to engage in collaborative efforts to supplement jurisdictional and watershed-based programs within the US and aim to address water quality issues on both sides of the international border that impact receiving waters.



Notes:

(1) Percentages based on entire watershed area.

(2) The "Area outside MS4 Discharge Responsibility within WMA" (18 percent) consists primarily of federal, state, or tribal lands over which the RAs have neither oversight nor discharge authority. However, it also includes such land uses as industrial over which the RAs have oversight authority (approximately 2 percent of watershed area). Oversight authority activities such as inspections are expected to contribute to overall pollutant load reductions.

Figure 3-1
Percentage of Responsibility for MS4 Discharges in the Tijuana River Watershed

3.1.1 Final and Interim Goals for Discharges at MS4 Outfalls

As summarized earlier, final and interim goals have been established for the Tijuana River WMA at the MS4 discharge outfalls. Setting water quality goals for stormwater discharges (as opposed to the receiving water) allows for assessment of water quality improvement strategy implementation in areas where the RAs have greater control within the footprint of the jurisdictional MS4 programs. Receiving water quality, on the other hand, is affected 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 and measuring progress towards meeting the final goal in receiving waters is not appropriate for this WMA until there is:

- a broader regulatory framework and enforcement from the binational community, and/or
- watershed-specific data become available that may be used to establish habitat- or beneficial use-based goals for the Tijuana River WMA.

For the Tijuana River WMA, interim and final numeric goals are represented as watershed-based sediment load reductions. Determination of the sediment load reduction goals considered background sediment contributions from the MS4, selection of an appropriate TSS concentration benchmark, conversion of TSS baseline and benchmark concentrations to sediment loads and related interim sediment load reduction targets, and other considerations related to final goals. Progress toward meeting the interim

and final numeric goals will be evaluated by calculating the average wet weather sediment load from the MS4 outfalls monitored as part of the WQIP monitoring and assessment program. The average MS4 outfall load provides a representative compliance point to evaluate RAs collaborative progress towards the watershed–based load reduction targets and accounts for variations in storm size and intensity, natural sediment transport processes within specific drainage areas and other factors that may impact storm- or season-specific sediment discharges at a particular outfall location.

3.1.1.1 MS4 Sediment Contribution Baseline

This section describes the process used to evaluate existing stormwater monitoring data, modeling techniques, and other environmental information to determine current sediment contributions from MS4 outfalls. To establish the baseline sediment contributions from RA-responsible MS4 discharges, available TSS concentration data and land use-based modeling methods were used to estimate current sediment loads related to MS4 discharges. Recent TSS data from the Tijuana River WMA Transitional Monitoring and Assessment Report (Weston 2015) was compiled to develop an understanding of baseline water quality for suspended solids. This dataset consists of wet weather MS4 water quality data collected under Order R9-2007-001 (2007 permit) and Order R9-2015-0001, and was used to estimate current TSS loads from the RAs stormwater conveyance. Descriptive statistics for the TSS data set analyzed are shown in Table 3-2 and Figure 3-2.

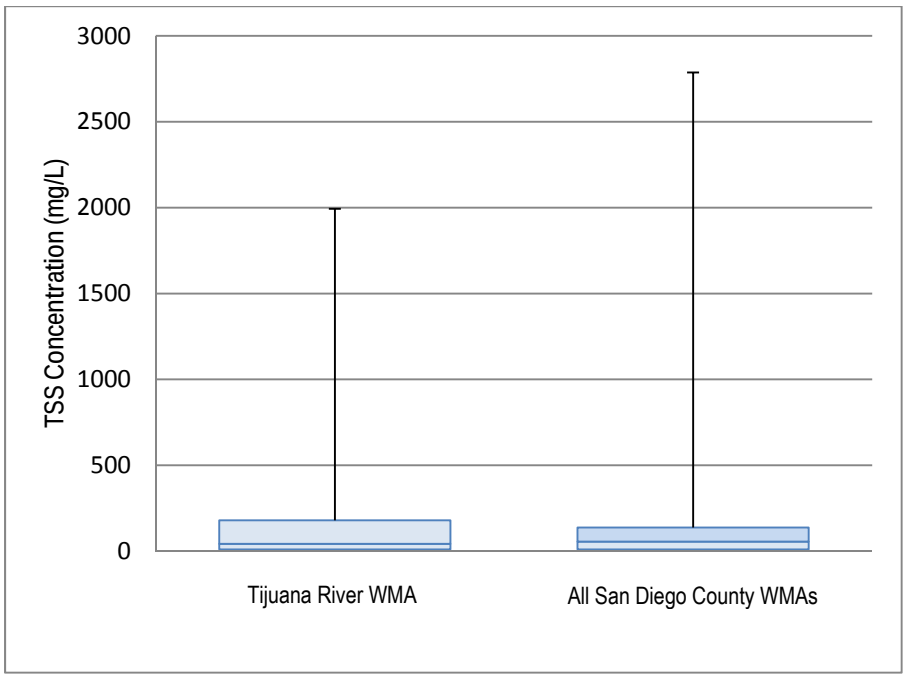
Table 3-2
Descriptive Statistics of TSS Data Measured at Random and Transitional MS4 Sites during Wet Weather

Statistics[1] (mg/L)	Tijuana River WMA[2] (n=25)	San Diego County WMAs[2] (n=256)
Minimum	10	10
Maximum	1950	2730
Mean	193	166
Standard Deviation	407	363
Median	33	46.5
5th percentile	10	10
95th percentile	689	808

Notes:

[1] The data informing this analysis are available online in annual reports submitted by the RAs to the Regional Board at http://www.projectcleanwater.org.

[2]WMA = Watershed Management Area



Notes:
Boxes represent first and third quartiles. Lines within boxes represent medians. Whiskers represent range.

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

The summary statistics for the Tijuana River WMA in Table 3-2 are based on a population of 25 samples collected between 2008 and 2013, which resulted in a calculated mean TSS concentration of 193 mg/L for wet-weather MS4 discharges. The San Diego County WMAs regional data mean value of 166 mg/L was derived from the results of 256 samples collected from the nine watersheds representing all regional San Diego County WMAs. Descriptive statistics illustrate the relative magnitude of the range of TSS concentrations between the Tijuana River and the combined San Diego County WMAs. The relatively large standard deviations indicate the data vary widely across the range, which can be attributed to watershed-specific factors such as the predominant soils and erodibility, size and intensity of measured storms, and natural sediment transport processes.

MS4 discharges to the Tijuana River and Tijuana Estuary on average have TSS concentrations approximately 10 times lower than background TSS concentrations in the receiving water. Review of historic TSS data collected within the receiving water at the Tijuana River mass loading station indicates the average TSS concentration approximates 1,882 mg/L (Tetra Tech, 2010).

3.1.1.2 Determination of Final Numeric TSS Benchmark

This section describes the process and rationale for determining the final numeric TSS benchmark used to calculate the final sediment load reduction goal. In the Tijuana River WMA, development of a final numeric goal for MS4 sediment discharges considered several factors. In some sediment-impaired watersheds (SDRWQCB, 2012 and USEPA Region IX, 2012), receiving water- and/or beneficial use-

based metrics have been used to develop long-term goals and/or compliance targets. These metrics can provide an approach for evaluating sediment impairments that account for influence of watershed topography, soils and other factors affecting natural sediment transport processes. Generally, metrics such as historic sediment accumulation have been compared to current sediment accretion rates and reference conditions (i.e., periods of previous minimal water quality impacts). However, given the impacts to receiving waters and beneficial uses in the Tijuana River WMA associated with sediment-laden discharges from Mexico, available long-term receiving water and habitat monitoring data do not currently provide an adequate basis to develop these types of interim and final numeric goals for MS4 discharges. As such, a benchmark numeric TSS concentration, determined to be protective of water quality, was used to develop a load reduction-based numeric final goal.

The National Stormwater Quality Database (NSQD), developed under the direction of Dr. Robert Pitt, P.E., of the University of Alabama and the Center for Watershed Protection under support from the EPA (Pitt et al, 2004), characterizes Phase I MS4 stormwater discharges from samples collected across land uses throughout the country. This dataset includes monitoring data from urban areas such as residential, commercial, industrial, freeway, institutional, and mixed land use from 1979-2002, and was updated in February 2008. Publicly available NSQD TSS data from the arid southwest region (EPA Rain Zone 6) was used to establish an appropriate TSS concentration value for development of the final numeric goal. The dataset includes MS4 discharge data from Orange, San Diego, Los Angeles, Ventura, Riverside and San Bernardino counties, and is consistent with the dataset referenced for development of Storm Water Action Levels (SALs) in the MS4 permit (http://rpitt.eng.ua.edu/Research/ms4/mainms4.shtml).

EPA has determined that the median TSS concentration of a national stormwater dataset represents a benchmark concentration that is equivalent to a level protective of water quality. EPA determined that the median concentration (where half the samples are above this level and half are below) represents a benchmark above which water quality concerns may result, and stormwater discharge concentrations could potentially impair, or contribute to impairing water quality or affect human health from ingestion of water or fish (Federal Register, 1995). Accordingly, consistent with EPA's position, the median TSS value for EPA Rain Zone 6 from the NSQD dataset was selected as the appropriate metric to establish the final numeric load reduction goal. The median TSS concentration for the referenced dataset is 120 mg/L.

3.1.1.3 Sediment Load Calculations

The baseline TSS concentration (193 mg/L) and the benchmark TSS concentration (120 mg/L) were converted to sediment loads, and related interim sediment load reduction targets were calculated, using the simplified model of Burton and Pitt (2002) and the following characteristics:

- Current land usage in Tijuana Estuary WMA
- Land use runoff coefficients from San Diego County Hydrology Manual (2003)
- An average annual precipitation of 9 inches
- Soil Group D characteristics for worst-case runoff estimate (i.e., clayey soils)

The benchmark TSS concentration was converted to an annual average MS4 outfall sediment load by multiplying the TSS concentration by the annual average runoff volume, resulting in sediment loads in

tons of sediment discharge per year (after unit conversion). This load represents the final goal sediment load target.

3.1.1.4 Interim and Final Sediment Load Reduction Goals

For the Tijuana River WMA, progress toward achieving interim and final numeric goals will be based on calculating the average wet weather sediment load from the MS4 outfalls monitored as part of the WQIP monitoring and assessment program. Baseline, final and interim sediment loads were calculated using the methodology outline in Section 3.1.1.3, and are presented in Table 3-3 below.

The final watershed-based load reduction goal is a 38 percent reduction in sediment loads from the current baseline load to the final benchmark-based load (i.e., based on TSS benchmark of 120 mg/L). In working to achieve the ultimate final 38 percent load reduction goal averaged among the RA's MS4 outfalls, interim numeric load reduction goals have been estimated. RA strategies involve a combination of implementing JRMP jurisdictional strategies as well as using optional strategies, including structural strategies. By considering both the JRMP jurisdictional and optional strategies, the 38 percent load reduction goal for sediment loads in MS4 discharges will be met.

Estimating a TSS load reductions associated with JRMP jurisdictional and optional strategies will require stormwater outfall monitoring, strategy effectiveness assessment and other evaluations to assess progress towards interim and final goals. As additional data is collected, the methodology and data used to estimate baseline and current sediment loads may be adjusted to reflect updated information and additional data collected in support of special studies, regional studies or watershed-specific investigations conducted by RAs or others.

Assessment of the progress towards meeting the final goal will be measured through evaluation of progress towards interim numeric goals as well as the implementation of the WQIP and its associated strategies (Table 3-3). By targeting sediment loading from MS4 discharges, other pollutants that adhere to sediment or are trapped by the mechanism/method to reduce TSS will also be reduced. Additional details for the general strategies to be implemented by the RAs are presented in Section 3.2. Detailed lists of jurisdictional strategies are provided in Appendix H.

Table 3-3
Wet Weather Interim and Final Numeric Goals
for Highest Priority Water Quality Conditions as Measured at MS4 Outfalls–
Sediment (911.11 and 911.12)

Fiscal Years	TSS Concentration (mg/L)	Sediment Load (tons/year)	Percent TSS Load Reduction Goal [1,2]
Baseline	193	546	0
FY2013 to FY2018[3]	↓	514	7%
FY2018 to FY2023	↓	365	12%
FY2023 to FY2028	120	340	38%

Notes:
[1] Percent reduction of 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 7% reduction in TSS 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 one green infrastructure BMP).

It should be noted, larger storm events have a greater potential to induce sediment transport through the watershed, which is an important natural geological cycle for sustaining coastal resources and beach replenishment. Current data suggests large storm events have played a key role in sediment transport events in the Tijuana River watershed (City of San Diego, 2012a). This natural sediment transport mechanism is particularly important because local beaches (i.e., Imperial Beach) have recently suffered substantial coastal erosion and have paid millions of dollars for beach sand replenishment dredging (which also has water quality impacts of its own). Therefore, in judging the progress toward achievement of interim goals and the final goal for sediment levels in MS4 discharges, the concentrations measured and associated sediment loads need to address storm size and accommodate allowances for natural sediment transport that occurs during storms above the 85th percentile, 24-hour BMP design standard. For the San Diego region (i.e., in accordance with Order R9-2013-0001), storms of approximately 0.5 to 0.6 inches of total rainfall (85th percentile, 24-hour storm event) and smaller are targeted for water quality improvement via a number of design-based standards. This helps to separate anthropogenic sources of sediment from sources attributed to storm-driven sediment transport processes.

Consistent with the understanding that the natural Tijuana River system can contribute an estimated 60 to 75 percent of the total sediment load as part of large storm events (City of San Diego 2012b), the Storm Water Blue Ribbon Panel recommended that numeric goals not apply to storms of unusual event size and/or pattern (e.g., flood or extreme events), and further acknowledged that the runoff volume or flow rate from a given storm will exceed the design volume or rate capacity of a BMP several times each year (SWRCB, 2006). The Panel added that "Stormwater agencies should not be held accountable for pollutant

removal from storms beyond the size for which a BMP is designed." (SWRCB, 2006). Other load-based sediment (USEPA, 2013) and land use studies (Ackerman and Schiff, 2003) have similarly excluded larger storm events. Based on these factors, the RAs intend to limit the application of the load-reduction targets to storm events less than the 85th percentile event, consistent with the MEP standard (design capture volume) contained in the San Diego MS4 and other permits.

Further, current data suggests large storm events have played a key role in sediment transport events in the Tijuana River watershed (City of San Diego, 2012a). Therefore, in judging the progress toward achievement of interim goals and the final goal for sediment levels in MS4 discharges, annual average sediment load calculations will incorporate storm size to accommodate allowances for natural sediment transport that occurs during storms above the 85th percentile, 24-hour BMP design standard. Accordingly, the average annual load calculation will include monitoring data for only storm events that fall within the 85th percentile, 24-hour event.

Final Goal Adaptive Management Considerations

This section discusses the considerations and key factors that may be evaluated to potentially refine or modify the final numeric goal. Such factors may include characterization of natural background levels of TSS, and evaluation of incorporating habitat- and beneficial use-based metrics. The WQIP adaptive management process may be used to guide the verification and/or revision of the final numeric goal over time based on a number factors including: uncertainty related to natural background levels of sediment transport in the watershed, potential habitat- and/or beneficial use-based alternatives to establishing a final numeric goal, and storm size and intensity impacts related to sediment loading from MS4 discharges.

Natural background levels of sediment transport (and associated sediment loading from MS4 discharges) in the watershed will need to be studied in order to refine the numeric goals in the future. A significant portion of the land within RA jurisdiction in the Tijuana River WMA is classified as vacant, open space, park or undeveloped. In general, these areas contain relatively erosive fine-grained soils that may be prone to natural erosion process that result in measurable sediment loading. The Storm Water Blue Ribbon Panel acknowledged that "an important consideration in setting Numeric Limits or Action Levels is that in many locations in California the natural background turbidity and/or TSS levels in stormwater runoff are quite high. This is particularly true in semi-arid or arid regions, which tend to have less vegetative cover" (SWRCB, 2006). As supporting data from MS4 outfall discharge monitoring (i.e., Section 4.1) is collected, an adaptive management approach will be used to guide the verification and/or revision of the final numeric goal over time.

Data and information from the long-term receiving water monitoring program will also be evaluated to assess alternatives to the MS4 outfall discharge-based final numeric goal. Receiving water- and/or beneficial use-based metrics may provide a more appropriate basis for developing final numeric goals related to sediment discharges. Habitat- and beneficial use-based metrics have been used both locally (SDRWQCB, 2012) and regionally (USEPA Region IX, 2012) to set the long-term goal and/or compliance target in watersheds with sediment-impaired waterbodies/TMDLs. Habitat- and beneficial use-based metrics are likely to provide a more appropriate approach for evaluating sediment impairments given the influence of watershed topography, soils and other factors affecting natural sediment transport processes. However, given the impacts associated with sediment-laden discharges from Mexico, long-

term receiving water and habitat monitoring data may be required to adequately evaluate alternative goal scenarios.

3.2 WATER QUALITY IMPROVEMENT STRATEGIES

The permit requires the 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-stormwater discharges to the MS4, reduce pollutants in stormwater discharges in the MS4 to the 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, used as needed and if funding is identified, including those strategies that can improve water quality by removing pollutants through filtration and 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 shown 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 the 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 (i.e., WMA groups, Caltrans, water districts, school districts) and other entities, such as NGOs, also were given high priority. The RAs also are 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 may be more successful. 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 intended to reduce stormwater pollution that do not include construction or implementation of a physical structure to treat stormwater. These strategies also are 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 (San Diego Regional Board, 2013a).

The existing efforts will be combined with new or enhanced strategies required under the new MS4 permit. The cumulative impact of these efforts will result in reduced pollutant loads over time (see Figure 3-3). Fundamentally, strategies were chosen on the basis of their expected effectiveness in reducing pollutant sources and targeting pollutant-generating activities of concern in the Tijuana River WMA, and their suitability and potential to be implemented by the RAs. It is anticipated that the implementation of the nonstructural strategies within the Tijuana River WMA will address sources of sediment prioritized as Moderate and High contributors to the watershed.

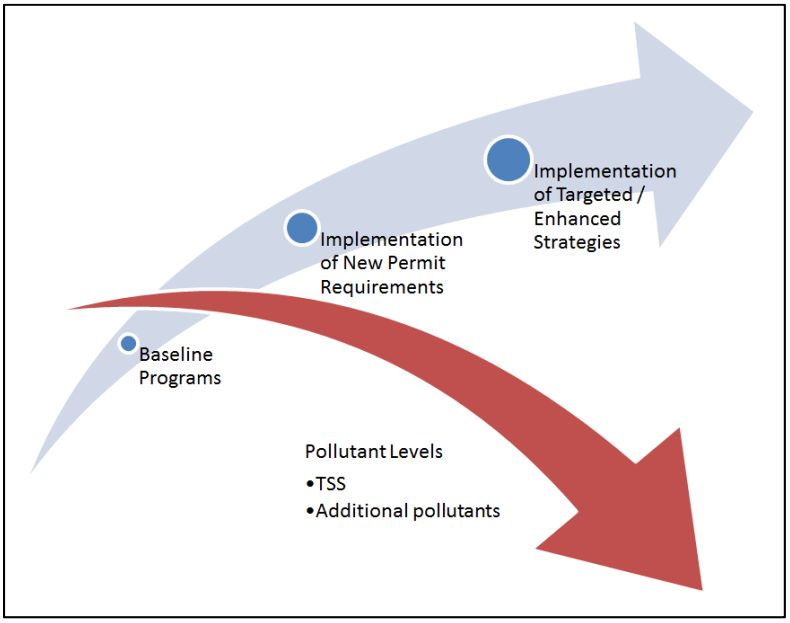


Figure 3-3
Pollutant Level Reduction with Increased Efforts

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

- Continuing existing programs or actions, based on prior (2007) MS4 permit requirements;
- Implementing significant new requirements in the 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.

The WQIP monitoring program will be used to assess the efficacy of non-structural strategies in progress towards meeting interim and final numeric goals. Pre- and post-strategy implementation data for TSS, SSC, turbidity, and flow, may be compared on an annual basis and over several monitoring seasons, to assess the effect of sediment reduction efforts on a subwatershed-level. Total suspended solids concentration and MS4 outfall runoff volumes may be used to calculate sediment loads for comparison within and between subwatersheds to assess strategy effectiveness, while TSS and runoff volume estimates from the entire MS4 may be utilized for comparison to interim sediment level reduction goals. Monitoring results will be evaluated to determine whether more focused strategy-specific monitoring may be needed to provide information to optimize existing jurisdictional and optional strategies to address sediment. Based on the monitoring and assessment results, the strategy implementation frequency and/or geographic implementation area may be increased to improve sediment and other pollutant load reductions, and future monitoring could include such investigations as land use-based water quality monitoring to more accurately estimate program-driven load reductions.

Most nonstructural strategies implemented by the RAs are part of their JRMPs. The permit requires the RAs to control the contribution of pollutants to and discharges from the MS4 within their jurisdictions through JRMPs (Provision E). The permit requires the jurisdictions to identify the strategies being implemented by Provisions E.2 through E.7 as part of the WQIP for the highest priority water quality conditions. Strategies within JRMP categories may be broad, administrative programs or activities targeting specific sources. The permit provides guidelines for RA implementation of each program, however, they are implemented differently depending on the unique characteristics of each jurisdiction. The 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 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 the most effective or efficient in other jurisdictions.

Table 3-4 shows the different categories of JRMP strategies. The relative benefit associated with water chemistry, physical, and biological improvements achieved by strategy implementation is shown in Table 3-5. The assumptions represent BPJ, based on literature reviews, practical experience, and stakeholder input. The strategy 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. The JRMP strategy benefits listed in Table 3-5 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 is presented in each RA's JRMP, 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.
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 stormwater to the MEP, prevent controllable non-stormwater discharges from entering the MS4, and protect water quality standards in receiving waters.
Enforcement Response Plan	Describes enforcement requirements of each JRMP.

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*												
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	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗	◗

Notes:

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

BMP = best management practice; IDDE = Illicit Discharge, Detection, and Elimination 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 (○).

Additional strategies that fall outside a JRMP category also have been identified. These strategies are considered as optional because they are not required by 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 every 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 if 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 often is 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 subdivided into three categories, based on scale and overall function: (1) green infrastructure, (2) multi-use treatment areas, and (3) water quality improvement BMPs (Figure 3-4). These categories and their respective levels of potential implementation in the Tijuana River WMA are discussed in detail in the following sections.

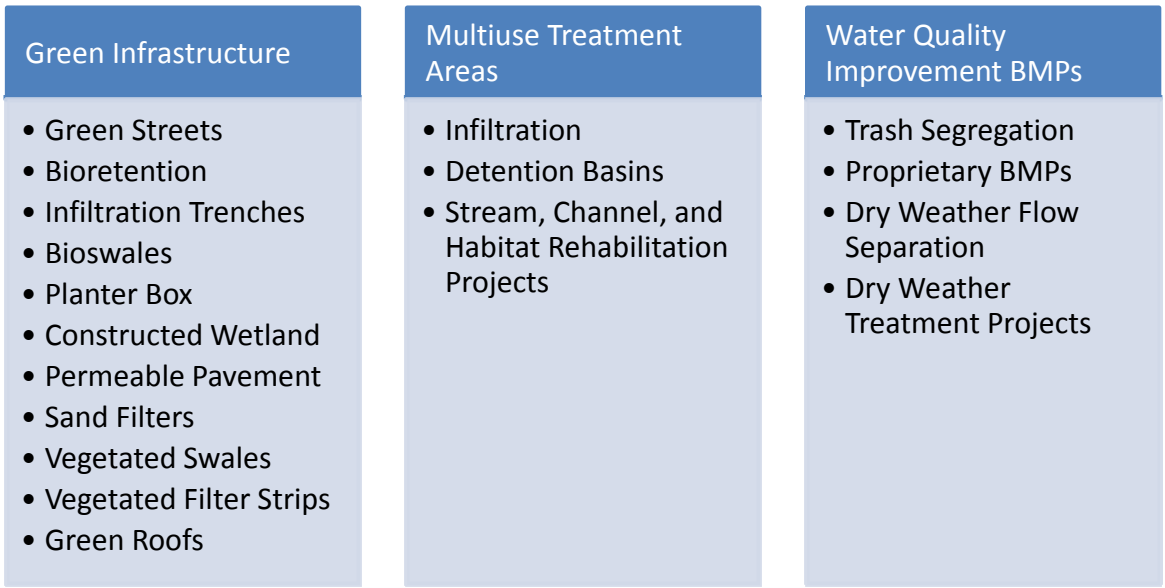


Figure 3-4
Categories of Structural BMPs

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 stormwater 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 stormwater 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 also commonly are 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 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 stormwater 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 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 often can 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 include 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 stormwater runoff, attenuate peak flow, and reduce discharge volume while improving community pride, land value, and habitat quality. Because green streets are located in the right-of-way, they have no land acquisition

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

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 can provide an opportunity to stabilize those areas.

3.2.3.2 Multiuse Treatment Areas

Large treatment structural BMPs, referred to as multi-use 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 often are 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 basins, can provide dual use as athletic fields or open spaces.

3.2.3.2.1 Infiltration and Detention Basins

Large multi-use 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 stormwater 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

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 also can 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 providing 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 stormwater 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-stormwater dry season flows and divert these flows for treatment either on-site or to sanitary sewer systems, and ultimately to wastewater treatment plants. In the Tijuana River Watershed, dry weather flows from the Tijuana River are 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 for dry weather flows are also in place at Goat Canyon and Smuggler's Gulch.

3.2.4 Jurisdictional Strategy Selection by Responsible Agency

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. The RAs considered their current programs, new permit requirements, level of effort/costs, and available resources as well as other environmental, economic and societal factors to develop a list of applicable strategies and implementation approaches.

The information provided in the jurisdictional strategy tables (see Appendix H) provide context for the strategy implementation including approach, schedule, pollutants and sources addressed and responsible implementation agency and/or department. The tables also provide relative information on resource needs, as necessary. As part of this step, the City of San Diego has estimated the funding needs to implement the jurisdictional strategies that will be required to achieve the goals identified (see Appendix H.2). For strategies that will not be implemented on approval of the WQIP, a future implementation date or a trigger date for implementation is noted. Triggers include such circumstances as receiving grant funds. The RAs continually are collaborating with internal jurisdictional departments, other RAs, and WMA groups and NGOs, and these collaborating entities are noted in the tables. As part of the adaptive management process, strategies will be evaluated based on the number of additional benefits they provide, and may guide future updates to the WQIP.

Strategies are presented within three categories: 1) jurisdictional strategies, 2) non-JRMP strategies (identified as "optional strategies" in the MS4 Permit), and 3) WMA strategies. The MS4 Permit requires the jurisdictions to identify the strategies being implemented as a part of JRMP Provisions E.2 through E.7. These "jurisdictional strategies" are required, but may be tailored to address the priority sources of sediment, contributing to the highest priority water quality condition as appropriate. Responsible Agencies have also identified additional strategies that fall outside of a JRMP category. These "optional strategies" are not required by MS4 Permit Provision E, but are either already being implemented, planned for implementation, or may be triggered for implementation in the future to address the highest priority water quality conditions. WMA strategies are those strategies that are implemented regionally or by multiple jurisdictions within the WMA.

3.2.4.1 Select Optional Strategy Detail

Appendices H.1 through H.3 provide summaries of the RA's jurisdictional and optional strategies as they relate to the highest priority watershed condition and ancillary priority pollutants. In general, there are multi-pollutant and quantifiable load reduction benefits to RA jurisdictional strategies. A subset of the jurisdictional (optional) strategies is designed to be implemented to address the sediment-related highest priority water quality condition. These specific strategies will be evaluated using specific monitoring and assessment techniques to determine effectiveness and allow for the adaptive management process to revise, modify and/or adjust implementation frequency to improve sediment management controls over time as additional data is collected. This process is intended to inform both RA jurisdictional (JRMP) strategy implementation techniques as well as allow for enhanced (or optional) strategy improvements to address highest priority pollutants. Below are summaries of selected key RA strategy implementation details, that provide examples of the integrated watershed management approach planned to address sediment in the Tijuana River WMA. Each focal strategy description provides information including

estimated strategy implementation frequency, schedule, and potential strategy resource needs that will be used to direct pollutant reduction benefits linkage between the RA's strategies.

Enhanced Proactive Storm Water Violation Enforcement (IB-02, CoSD-38/39)

This program will provide neighborhood-based targeted inspection and enforcement through drive-by inspections and follow up activities. The focal neighborhood areas are anticipated to include residential, industrial, and commercial mixed land uses which have been characterized as moderate to high priority sources of sediment in the Tijuana River WMA (Table 2-16). Initial implementation frequency, beginning in FY 2016, will include monthly drive-by inspections of targeted neighborhoods. Quantifiable sediment load reduction benefits from this initial phase program are estimated at 0.5-2%. Ancillary pollutant load reduction benefits may also be realized. The Tijuana River WQIP monitoring and assessment program will include a numeric-based evaluation process to evaluate the efficacy of the program, implementation frequency and, depending on evaluation of operational capacity, estimated program effectiveness and available resources, may include future land use-based water quality monitoring to more accurately estimate program-driven load reductions. Based on the monitoring and assessment results, the program implementation frequency and/or geographic area may be increased to improve sediment and/or other pollutant load reductions.

Collaboration with Regional Board Related to Non-MS4 Enforcement Efforts (CoSD, CSD-WMA-3)

This program will involve collaboration between the RA's and the Regional Board to identify solutions and address sources of potential water quality impairments within the Tijuana River WMA, where non-MS4 dischargers have been identified as potential priority sources of sediment. The RA's will work with the Regional Board to identify sources and help engage non-MS4 stakeholders. Strategy program priorities will focus on 1) enforcement to enroll and comply with the Agricultural (Ag) Waiver and 2) enforcement of other non-MS4 dischargers. Discussions with the Regional Board regarding this strategy were initiated in FY 2015. Potential load reduction benefits for sediment are unknown at this time, however both of these sources have been characterized as very high (agricultural operations) or moderate to high (other non-MS4) priority sources of sediment in the Tijuana River WMA (Table 2-16). Collaboration efforts will continue in FY 2016 and will involve development of a plan for future work, and detailed schedule/timeline. Funding and resources have been secured for FY 2016. Funding for future fiscal years is contingent on annual budget approval by each RA. Specific quantification of load reduction benefits from this program, as enforcement activities are implemented, will be incorporated into the Tijuana River WQIP monitoring and assessment program. The numeric-based assessment process will evaluate the efficacy of the program, and will evaluate pre- and post-enforcement action load reductions.

Proactively Monitor, Repair and Stabilize Eroded Slopes on Municipal Property (CSD-38)

This program will actively identify and repair eroding slopes that may be contributing to sediment loading from municipal property. The program will prepare an inventory and assessment of eroding, sediment-generating areas and their risk to surface waters. After the inventory and assessment are performed, a plan and schedule will be developed for ongoing inspection and stabilization of eroding slopes (potentially based on a number or percentage of sites annually). A similar program implemented by

Caltrans, may be utilized as a template. Quantifiable load reduction benefits from this program are estimated at 5-10%. Funding and resources for this strategy have been secured for FY 2016. Funding for future fiscal years is contingent on annual budget approval by City Council. The Tijuana River WQIP monitoring program will include a water quality-based sample collection and data assessment process to evaluate the efficacy of the program to more accurately estimate program-driven load reductions.

MS4 Outfall Inspection and Maintenance (IB-04b)

This program will provide regular inspection and, as-needed, potential follow up activities to address identified conditions that may contribute to sediment loading in the Tijuana River WMA. It is anticipated inspection of the outfall area locations may provide indications of illicit sediment, trash, and other pollutant discharges, evidence of outfall configuration and structural issues, and the presence of biological and/or geomorphic conditions that contribute to highest priority water quality conditions. Drainage areas upstream of the MS4 inspected outfalls are anticipated to include mixed residential, industrial, commercial, transportation and open space land uses which have been characterized as moderate to high priority sources of sediment in the Tijuana River WMA (Table 2-16). As-needed and/or as staff and funding resources become available, the RAs will work to schedule follow-up investigation, maintenance, and/or repair of problem areas. Initial implementation frequency, beginning in FY 2016, will generally include annual inspections of targeted outfalls. Quantifiable load reduction benefits from this initial phase program are estimated at 0.1 to 2 percent. The Tijuana River WQIP monitoring program will include a numeric-based assessment process to evaluate the efficacy of the program, implementation frequency and, depending on evaluation of operational capacity, estimated program effectiveness and available resources, may include future land use-based water quality monitoring to more accurately estimate program-driven load reductions. Based on the monitoring and assessment results, the program implementation frequency and/or geographic area may be increased to improve sediment and/or other pollutant load reductions.

Strategic Capital Improvement Project Retrofit Designs (IB-13, IB-65, CoSD-Opt8, CSD-25)

This program will provide impervious area retrofit BMPs, LID, and Green Street opportunities as part of the design phase for municipal capital improvement projects, which includes the Imperial Beach Green Streets Program. The design phase review will include consideration of local, regional and EPA guidance for LID and Green Street projects to evaluate site-specific applicability, potential water quality benefits and cost of potential retrofits. It is anticipated the strategic implementation retrofit BMPs, LID and Green Street principals in municipal capital improvement projects may provide significant sediment, trash, and other pollutant discharge reductions, depending on site configuration, upstream land use within the drainage area, and BMP sizing. Sediment removal efficiencies for structural/LID BMPs are estimated to range from 40 to 90 percent, and are variable for other pollutants depending on several factors. Depending on site-specific conditions including land use within the project drainage area, moderate to high priority sources of sediment and other pollutant sources may be addressed in the Tijuana River WMA. As-needed and/or as project implementation opportunities become available, the RAs will work to incorporate strategic retrofit designs into capital improvement projects. Initial implementation frequency, beginning in FY 2016, will include evaluation of all capital improvement projects. Specific quantification of load reduction benefits from this program, as projects are implemented, will be incorporated into the Tijuana River WQIP monitoring and assessment program. The numeric-based assessment process will evaluate the efficacy of the program, implementation frequency and, depending on evaluation of

operational capacity, estimated program effectiveness and available resources, may include future land use-based water quality monitoring to more accurately estimate program-driven load reductions. Based on the monitoring and assessment results, the retrofit design effort process may include increased implementation frequency and/or geographic area focus to improve sediment and/or other pollutant load reductions.

Infrastructure Improvements to Dirt Alleys (IB-53)

This program will provide improvements to approximately 2 miles of unimproved dirt alleys that contribute sediment and other pollutants during rain events. The initial phase of this program is funded for the design and construction of alley improvements using permeable pavers that allow for storm water retention in 14 alley segments. Post-construction, the City will conduct regular inspection and as-needed maintenance. It is anticipated that the conversion of unpaved alleys to permeable pavers may provide reductions of sediment, trash, and other pollutant discharges that contribute to highest priority water quality conditions. Drainage areas adjacent to the unimproved alley areas include mixed residential and commercial land uses which have been characterized as moderate to high priority sources of sediment in the Tijuana River WMA (Table 2-16). Initial implementation, beginning in FY 2016, will include conversion of over one mile of unimproved alleys to permeable pavers. Quantifiable load reduction benefits from this initial phase program are estimated at 5 to 10 percent. The Tijuana River WQIP monitoring program will include a water quality-based sample collection and data assessment process to evaluate the efficacy of the program to more accurately estimate program-driven load reductions. The monitoring and assessment results and active community prioritization may provide the basis for grant funding applications, special assessment districts or other funding sources for additional phases of the program to improve sediment and/or other pollutant load reductions in the remaining unimproved alley areas.

3.2.5 Collaborative Watershed Management Area Strategies and Alternative Compliance Option for Onsite Treatment

The geographic configuration and binational structure of the Tijuana River WMA present unique challenges in developing collaborative strategies to address watershed highest priority water quality conditions. Within the US, the RAs have developed a suite of collaborative WMA strategies intended to address highest priority water quality conditions where sources can be controlled by BMPs, where RAs have oversight and/or discharge responsibility. A suite of collaborative WMA strategies for each RA are presented in Appendix H.

Other collaborative WMA strategies, including TRVRT projects identified in various associated planning documents, projects involving collaboration with the Regional Board and additional projects requiring collaboration with federal, state and local agencies with interest in the Tijuana River WMA each provide opportunities for collaborative WMA strategies to support jurisdiction-based strategies assist in developing broad-based water quality improvements. A summary of TRVRT strategies are presented below.

3.2.5.1 TRVRT Strategies

The TRVRT was established in 2008, and includes over 30 stakeholders, landowners, municipalities, agencies, and NGOs on both sides of the international border. Each of the RAs serves on the Steering Committee of the TRVRT Since its formation, the TRVRT has been the venue for stakeholder collaboration through monthly meetings and preparation of the Recovery Strategy[1] in 2012 (TRVRT, 2012). The Recovery Strategy identifies a series of priority action areas and projects to meet the TRVRT's vision of a valley free of trash and (anthropogenic) sediment. The priority action areas are as follows:

- Partner with Mexico to Implement Optimum, Watershed-based Solutions
- Understand How Water, Sediment and Trash Flow
- Reduce Sources of Sediment and Trash
- Implement Sediment and Trash Capture Devices in the Watershed
- Fund and Perform Ongoing Operations and Maintenance
- Involve and Inform Community in Mexico and U.S.
- Protect and Enhance Natural Resources

Within each of the priority action areas, a suite of projects were identified within the Recovery Strategy that aim to link the TRVRT goals for sediment and trash management with ongoing needs for flood control, ecosystem restoration, and recreation and education needs. Concept-level project descriptions are presented in the Recovery Strategy with associated descriptions of planning-level resource needs and implementation schedule information.

In 2015, the Recovery Team finalized a Five-Year Action Plan (TRVRT, 2015). The objective of the Five-Year Action Plan is to maintain collaborative momentum and implement priority projects that advance TRVRT goals as described in the Recovery Strategy. The Five-Year Action Plan is intended to outline what the Recovery Team aspires to accomplish over the next five years to continue advancing the Recovery Strategy goals. As described in the Regional Board resolution to endorse the Five-Year Action Plan, the steps described to reach the action plan accomplishments are not binding commitments but a potential path to implement projects that address priority water quality improvements.

The Five-Year Action Plan projects are organized into two tiers. Tier 1 projects include all the following criteria, while Tier 2 projects include at least one:

- Identified as a high priority in the Recovery Strategy;
- Involve relatively straightforward paths of completion;
- Can be controlled by agencies within the U.S.; and
- Are expected to produce long-term benefits to managing trash and/or sediment.

[1] Electronic copies of the Recovery Strategy are available on the Regional Board website: http://www.waterboards.ca.gov/rwqcb9/water_issues/tijuana_river_valley_strategy/index.shtml

Five Tier I projects are included in the Five-Year Action Plan and are deemed the highest priority by the TRVRT. Following are a summary of the identified Tier I projects:

- Reclamation of the Nelson Sloan Quarry
- Brown Property Restoration
- Preparation of a Sediment Management Plan for the Tijuana River Valley
- Tijuana River Valley Recovery Team Mission Support
- Targeted Sediment and Trash Removal Projects

Detailed summaries for the Tier I projects are included in the Tijuana River Valley Recovery Team Five-year Action Plan. March 2015[2] (RWQCB 2015).

Tier II Projects

In addition to the Tier I projects identified above, the Five-Year Action Plan includes a suite of additional projects considered lower priority than the Tier I projects. Project-specific resources such as funding and planning and implementation schedules are generally still to be determined for certain Tier II projects. As funding becomes available, the TRVRT member agencies may implement the Tier II projects including: Binational Tijuana River, Estuary, Offshore, and Watershed Monitoring and Assessment Project, Partnering with Mexico on Source Reduction of Sediment and Trash, Channel Improvement and Trash Interception in Stewart's (Puerta Blanca) Drain, Climate Change and Adaptation Plan for the Estuary and River Valley, Tijuana River Watershed Education/Outreach Program. Aspects of Tier II projects may align with individual jurisdictional strategies planned or employed by RAs and/or other planned collaborative WMA strategies.

3.2.5.2 Alternative Compliance Option for Onsite Treatment

The MS4 permit allows for the implementation of off-site 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 first must complete an optional Watershed Management Area Analysis (WMAA), as detailed in Section B.3.b.(4) of the permit. The San Diego County RAs collectively have funded and provided guidance for development of a regional WMAA. Findings of the regional WMAA, specific to the Tijuana River WMA, are described next, and a further description is 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 includes 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

[2] Electronic copies of the Five-Year Action Plan are available on the Regional Board website: http://www.waterboards.ca.gov/rwqcb9/board_decisions/adopted_orders/2015/R9-2015-0035.pdf

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 (e.g., 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 stormwater retention or treatment, or opportunities for regional BMPs, among others. Before implementing these candidate projects, the RAs must demonstrate that implementing such a candidate project would provide greater overall benefit to the watershed than requiring implementation of the on-site structural BMPs. 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. In addition, using the WMA characterization maps, identify areas within the WMA 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 RAs 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
- 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 stormwater management facilities that can play a critical role in meeting water quality, hydromodification, water supply, and/or habitat goals within the watershed;
- Assist with identifying 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., multi-use treatment area BMPs) or as green infrastructure BMPs (e.g., green streets). Regardless of scale, off-site alternative compliance BMPs will mitigate pollutants not reliably retained on the project site or hydromodification impacts not reliably mitigated on-site per requirements detailed in Sections E.3.c.(1) and E.3.c.(2) of the permit. 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 alternative compliance program development, the WMAA findings also can help determine the feasibility of candidate projects for alternative compliance implementation (Section B.3.b.[4][b] of the permit). The RAs currently are 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. The alternative compliance template is provided in Appendix J. The WQIP will be updated to include the final candidate project list when that list is made available.

3.3 SCHEDULES

The schedule for interim and final goals is graphically depicted in Figure 3-5 below and reflected in the tentative timeline presented in Table 3-3 (Section 3.1.1.4). The 13-year schedule for attaining the final sediment-reduction goal has been developed to coincide with the trash TMDL adoption in 2028. The schedules for implementing the multitude of multi-jurisdictional strategies to attain this goal are included 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 measured pollutant load reductions. Both water quality-based goals and strategy milestones provide meaningful data that will help the RAs to manage their programs and continually improve. Sampling will be conducted and results will be compared to interim and final goals, and implementation of strategies and performance-based metrics also will be tracked. 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. The new permit includes significant new requirements that, 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.

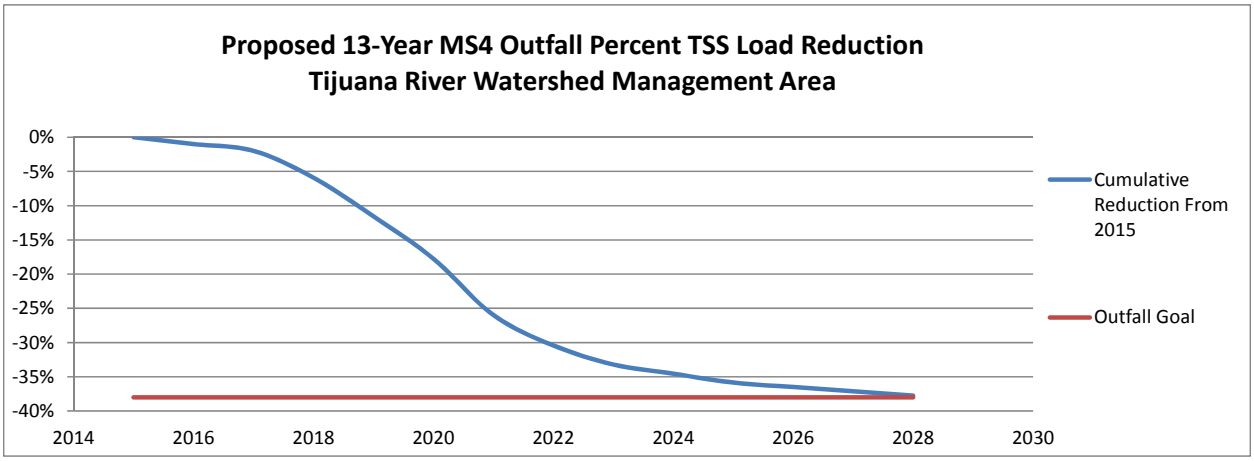


Figure 3-5
Schedule for Achieving Final Numeric Goal in Tijuana River Watershed Management Area

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SECTION 4 WATER QUALITY IMPROVEMENT PLAN MONITORING AND ASSESSMENT PROGRAM

The permit requires development of an integrated Monitoring and Assessment Program that assesses:

- Progress toward achieving the numeric goals and schedules, as discussed in Section 3;
- Progress toward addressing the highest priority water quality conditions, as presented in Section 2; and
- Each RA's overall efforts to implement the WQIP.

The Monitoring and Assessment Program will incorporate the requirements of Provision D of the permit that state: "The purpose of this provision is for the RAs to monitor and assess the impact on the conditions of receiving waters caused by discharges from the RAs' MS4s under wet weather and dry weather conditions. The goal of the Monitoring and Assessment Program is to inform the RAs about the nexus between the health of receiving waters and the water quality condition of the discharges from their MS4s. This goal will be accomplished through monitoring and assessing the conditions of the receiving waters, discharges from the MS4s, pollutant sources and/or stressors, and effectiveness of the water quality improvement strategies implemented as part of the Water Quality Improvement Plans."

The Monitoring and Assessment Program will provide tools to evaluate the priority and highest priority water quality conditions and strategies, presented in Sections 2 and 3 of the WQIP. In particular, the Monitoring and Assessment Program will evaluate progress towards the numeric goals, presented in Section 4. Table 4-1 summarizes the main components of the Tijuana River WMA Monitoring and Assessment Program, which are further described below.

Table 4-1
Monitoring and Assessment Program Components
for the Tijuana River Watershed Management Area

Monitoring Program	Assessment Program
A. Receiving Water Monitoring (Permit Prov. D.1): 1. Long-Term Receiving Water Monitoring: Dry Weather Wet Weather 2. Regional Monitoring Participation, Permit Prov. D.1.e.(1) 3. Sediment Quality Monitoring, Permit Prov. D.1.e.(2)	A. Receiving Water Assessments
B. MS4 Outfall Discharge Monitoring (Permit Prov. D.2): 1. Dry Weather MS4 Outfall Discharge Field Screening, Permit Prov. D.2.b.(1) 2. Non-Stormwater Persistent Flow MS4 Outfall Discharge Monitoring, Permit Prov. D.2.b.(2) 3. Wet Weather MS4 Outfall Discharge Monitoring, Permit Prov. D.2.c	B. MS4 Outfall Discharge Assessments: 1. Dry Weather Outfall Assessments and Illicit Discharges 2. Wet Weather Outfall Assessments and Illicit Discharges
C. Special Studies (Permit Prov. D.3)	C. Special Studies Assessments
	D. Integrated Assessment

4.1 WATER QUALITY IMPROVEMENT PLAN MONITORING PROGRAM

The components of the WQIP Monitoring Program are shown in Table 4-2. A detailed description of the monitoring program is provided in Appendix K. Appendix K also incorporates the associated monitoring plans for each of the elements described below.

The Monitoring Program has three major components:

- Receiving water monitoring,
- MS4 outfall discharge monitoring, and
- Special studies.

Receiving water monitoring includes multiple components, intended to assess whether the chemical, physical, and biological conditions in these waters are protective, or likely protective, of beneficial uses. Long-term monitoring locations are monitored for water quality during both wet and dry conditions. The program also includes monitoring for sediment quality monitoring and participation in regional monitoring programs.

Receiving water monitoring seeks to answer the following questions:

- Long-Term Receiving Water Monitoring
    - What is the extent and magnitude of the current or potential receiving water problems?
    - Are the receiving water conditions improving or deteriorating?
- Regional Monitoring Participation
    - Are conditions in the receiving water protective, or likely protective, of beneficial uses?
    - What is the extent and magnitude of the current or potential receiving water problems?
- Sediment Quality Monitoring
    - What is the condition of sediments in enclosed bays or estuaries with respect to statewide sediment quality objectives?

Because of the binational nature of the watershed, flows generated in the upper reaches of the watershed within the U.S. commingle with flows generated in Mexico before returning to receiving waters within U.S. jurisdiction in the Lower Watershed and Tijuana River Estuary. In addition, the watershed area in the U.S. contains federal, State, and tribal lands (Figure 1-5b) that are not subject to the Phase I MS4 permit regulatory framework. Accordingly, sample results from the lower 6 miles of the Tijuana River and Tijuana River Estuary as part of the long-term receiving water monitoring are representative of water quality conditions influenced by discharges from entities in both the U.S. and Mexico, with potentially only a minor influence from RA MS4 discharges. The MS4 outfall discharge monitoring also has both dry and wet weather monitoring components to identify whether non-stormwater or stormwater discharges from the MS4 affect receiving water quality.

In addition to the questions outlined above, data and information from the long-term receiving water monitoring program will be evaluated to assess alternatives to the MS4 outfall discharge-based final numeric goal identified in Section 3. Receiving water- and/or beneficial use-based metrics may provide a more appropriate basis for developing final numeric goals related to sediment discharges. However, given the relative influence of sediment discharge from flows generated in Mexico, a long timeframe and/or specifically focused long-term receiving water and habitat monitoring data may be required to adequately evaluate alternative goal scenarios. Sediment, turbidity and flow data collected from receiving water monitoring may be used along with data from MS4 outfall monitoring to evaluate the relative effectiveness of reductions in sediment levels towards improvement of water quality and related beneficial uses.

The dry weather MS4 outfall discharge monitoring component has two phases. For the first phase, the RAs have performed a field screening of a certain number of outfalls, based on the total number of outfalls in their jurisdictions. Using this outfall review, the City of San Diego has prioritized the persistently flowing outfalls, based on their potential to affect receiving water quality. The County of San Diego and City of Imperial Beach each have fewer than five major outfalls within the Tijuana River WMA. Accordingly, the County of San Diego and City of Imperial Beach will include each of the major outfalls in the dry weather MS4 outfall discharge monitoring. Within City of San Diego jurisdiction for the second phase, the highest priority dry weather MS4 outfall discharges then will be monitored, using water quality-based methods as identified in the MS4 outfall discharge monitoring program. The RAs will monitor the highest priority major MS4 outfall discharges (generally defined as those greater than 36 inches in diameter) with non-stormwater persistent flows at least semi-annually.

For wet weather MS4 outfall discharges, the RAs have identified five monitoring locations representative of the residential, commercial, industrial, and mixed land uses within the Tijuana River WMA. The selected locations include land uses which have been characterized as moderate to high priority sources of sediment in the Tijuana River WMA (Table 2-16). These five locations will be monitored at least once per year.

The MS4 outfall discharge monitoring program will address the following:

- Dry Weather MS4 Outfall Discharge Field Screening
    - Which non-stormwater discharges are transient and which are persistent?
    - Which discharges should be investigated as potential illicit connection/illicit discharges?
- Non-Stormwater Persistent Flow MS4 Outfall Discharge Monitoring
    - Do dry weather discharge pollutant concentrations at MS4 outfalls meet permit action levels?
    - What is the relative contribution of discharges from MS4 outfalls to priority water quality conditions during dry weather?
    - What are the sources of persistent non-stormwater flows?

- Wet Weather MS4 Outfall Discharge Monitoring
    - Do wet weather discharge pollutant concentrations at MS4 outfalls meet permit action levels?
    - What is the relative contribution of discharges from MS4 outfalls to priority water quality conditions during wet weather?
    - How do representative MS4 outfalls discharge concentrations, loads, and flows change over time?

The MS4 outfall discharge monitoring program may be modified/refined to focus efforts on identification and quantification of high priority sources of sediment, as needed. Modifications such as increased monitoring frequency, expansion of upstream investigations, and/or specialized monitoring events that focus on measuring effectiveness of specific water quality improvement strategies to reduce sediment levels, may be necessary to adapt the MS4 monitoring program.

Specific data and information from the MS4 outfall discharge monitoring program will be evaluated to assess progress toward meeting the interim and final numeric goals for the highest priority water quality condition (sediment). Total suspended solids, SSC, turbidity and flow data from MS4 outfall locations will be used to characterize sediment contributions in both dry and wet weather. Over time, this data can be evaluated to determine the overall effectiveness of water quality improvement strategy implementation in different areas/subwatersheds of the MS4. In addition to the questions outlined above, specific data and information from the MS4 outfall discharge monitoring program will be evaluated to assess progress toward meeting the interim and final numeric goals for the highest priority water quality condition (sediment). Total suspended solids, SSC, turbidity and flow data from MS4 outfall locations will be used to characterize sediment contributions in both dry and wet weather. Over time, this data can be evaluated to determine the overall effectiveness of water quality improvement strategy implementation in different areas/subwatersheds of the MS4. In addition, watershed-specific total suspended solids, SSC, and turbidity data may be evaluated to determine if an appropriate ratio/relationship between these constituents may be established to improve monitoring efficiency, cost-effectiveness and/or allow for improved monitoring techniques to assess strategy implementation efficacy and progress towards interim and final numeric goals for MS4 discharges.

Pre- and post-strategy implementation data for TSS, SSC, turbidity, and flow, may be compared on an annual basis and over several monitoring seasons, to assess the effect of sediment reduction efforts on a subwatershed-level. Total suspended solids concentration and MS4 outfall runoff volumes may be used to calculate sediment loads for comparison within and between subwatersheds to assess strategy effectiveness, while TSS and runoff volume estimates from the entire MS4 may be utilized for comparison to interim sediment level reduction goals. Results from the MS4 monitoring component will be evaluated to determine whether more focused strategy-specific monitoring may be needed to provide information to optimize existing jurisdictional and optional strategies to address sediment. A numeric-based assessment process will be utilized to evaluate the efficacy of strategy implementation incorporating pre- and post-strategy monitoring data to estimate reductions in sediment levels. Based on the monitoring and assessment results, the strategy implementation frequency and/or geographic implementation area may be increased to improve sediment and other pollutant load reductions, and

future monitoring could include such investigations as land use-based water quality monitoring to more accurately estimate program-driven load reductions.

The special studies will include a regional study and a study specific to the Tijuana River WMA. The goal of the special studies is to further investigate the highest priority water quality conditions. The regional special study is focused broadly on highest priority water quality conditions for the entire San Diego Region, while the special study specific to the Tijuana River WMA is focused on the highest priority water quality conditions in the Tijuana River WMA, as discussed in Section 2.

The regional special study is the San Diego Regional Reference Stream Study, currently being conducted by the SCCWRP. 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. The goal of this study is to collect the data necessary to derive reasonable and accurate numeric targets for bacteria, nutrients, sediments, and heavy metals, based on a reference approach. This study was designed to answer the following questions (SCCWRP, 2013):

- How does the Water Quality Objective (WQO) exceedance frequency vary between summer dry weather, winter dry weather, and wet weather?
- How does the WQO exceedance frequency vary by hydrologic factors, including:
    - Size of storm (wet weather only)?
    - Discharge flow rate and volume (wet and dry weather)?
    - Beginning versus end of storm season (wet weather only)?
- How does the WQO exceedance frequency vary by input factors such as:
    - Size of catchment?
    - Geology?
- How does the WQO exceedance frequency vary by biotic and abiotic factors, including:
    - Algal cover and/or biofilms?
    - Water quality (e.g., temperature, DO, TSS concentration)?

Results from the San Diego Regional Reference Stream Study may be useful to evaluate the appropriateness of the sediment numeric target and related final numeric goal. As discussed in Section 3, natural background levels of sediment in the Tijuana WMA are not well-characterized, and methodologies utilized in the regional study to develop numeric targets for sediment may inform the approach for refining the target in the Tijuana WMA.

The Sediment Source Identification and Prioritization special study will be conducted by the RAs, and will identify and prioritize the MS4 and non-MS4 sources causing or contributing to the highest priority water quality conditions. The results of the special study will assist the RAs to identify sources of sediment within their jurisdictions and develop control strategies. The special study also will document sources of sediment generated by non-MS4 entities. Results of the special study may also provide information to help refine and adapt the MS4 outfall discharge monitoring program. Data and information

collected during the special study may be used to focus outfall monitoring locations and frequencies on the highest priority sources of sediment.

Phase I of the special study will use available data to perform an integrated assessment of:

- Hydrological and geomorphological conditions and processes,
- MS4 outfall and other infrastructure configuration and conditions, and
- Water quality monitoring and sediment loading estimates,

because these conditions relate to sediment contributions to MS4 discharges. The goal of the study will be to generate a prioritized inventory of point sources that contribute sediment and/or other pollutants to MS4 discharges in the Tijuana River WMA. Criteria to prioritize may include magnitude of source, ability to manage, and jurisdictional authority.

The Sediment Source Identification and Prioritization is designed to answer the following:

- What types of sediment sources are present in the subwatershed areas draining to MS4 discharge outfalls?
- Can potential sediment sources be attributed to specific land use types, geographic areas or topographic features?
- What are the estimated sediment loads originating from potential sediment source locations?
- Do the sediment load estimates correlate with specific land use types, geographic areas or topographic features?
- What types of sediment source reduction BMPs for the sources identified are available to be implemented on municipal property?
- What types of sediment source reduction BMPs can be encouraged by the RAs on private property?
- What is the estimated total annual sediment load reduction that will result in achieving interim and final numeric goals at MS4 discharge points?

The Tijuana River WMA Sediment Source Identification and Prioritization special study will be conducted in three phases during the current permit term. A summary of monitoring activities for the Tijuana River WMA is shown in Table 4-2.

Finally, a separate special monitoring study will be implemented by the City of Imperial Beach related to the City's optional Infrastructure Improvements to Dirt Alleys (IB-53) strategy. The Infrastructure Improvements to Dirt Alleys program will complete the design and construction of alley improvements using permeable pavers that allow for storm water retention in 14 alley segments. Select alley segments will be monitored based on site representativeness and the ability to collect representative samples. Pre-construction flow estimates and grab samples will be collected and analyzed to characterize initial baseline sediment and other pollutant contributions of unimproved alleys. Post-construction flow estimates and grab samples will be collected and analyzed and compared to the baseline samples to estimate sediment and other pollutant load reduction benefits of strategy implementation. Pre- and post-strategy implementation data for TSS, SSC, turbidity, and flow, may be compared on an annual basis and

over several monitoring seasons, to assess the effect of alley improvement on reducing runoff volume and associated pollutant loads.

Ultimately, data collected as part of the various Monitoring Program components will be evaluated to demonstrate progress toward meeting the numeric goals for the highest priority water quality condition (sediment). Specifically, TSS, SSC, turbidity and flow data collected from the receiving water monitoring, MS4 outfall discharge monitoring, and special studies components may be used to inform the effectiveness of water quality improvement strategies toward meeting interim numeric sediment load reduction goals.

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

RECEIVING WATER MONITORING	
Permit Prov./ Specific Activity	Monitoring and Assessment Program Element
D.1	Long-Term Receiving Water Monitoring *Overview:* Two stations: TJR-MLS and TJR-TWAS1 Three wet weather and 3 dry weather events during permit term Monitoring methods details: Interim Receiving Water Monitoring Plan – Appendix K
D.1.c	Long-Term Dry Weather Receiving Water Monitoring Required analyses include: Field Parameters: pH; Temperature; Specific Conductance; DO; Turbidity Analytical Parameters: *Conventional Parameters*: Total Dissolved Solids; Total Suspended Solids; Turbidity; Total Hardness; Total Organic Carbon; Dissolved Organic Carbon; Sulfate; Methylene Blue Active Substances (MBAS); Suspended Sediment Concentration (SSC) *Nutrients:* *Total Phosphorus; Dissolved Phosphorus; Orthophosphate; Nitrite; Nitrate; Total Kjeldahl Nitrogen; Ammonia* *Metals (Total and Dissolved):* *Antimony Arsenic; Cadmium; Chromium III; Chromium VI; Copper; Iron; Lead; Mercury; Nickel; Selenium; Silver; Thallium; Zinc* *Pesticides:* *Organophosphate Pesticides; Pyrethroid Pesticides* *Indicator Bacteria:* *Total Coliform; Enterococcus; Fecal Coliform* *Organics* *Trace elements, Synthetic organics*

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

RECEIVING WATER MONITORING	
Permit Prov./ Specific Activity	Monitoring and Assessment Program Element
D.1.c (cont)	Chronic Toxicity Testing: *Pimephales promelas (Fathead Minnow) Larval Survival and Growth* *Ceriodaphnia dubia (Daphnid) Survival and Reproduction* *Selenastrum capricornutum (Green Algae) Growth* Grab samples for field parameters and other constituents as required by protocol Flow-weighted composites for other constituents Toxicity samples by flow-weighted composite Three dry weather events during permit term: 1. During dry season (May 1 - Sept. 30) – Event 1 2. During wet season (Oct. 1 - April 30); ≥72 hours antecedent dry period following rainfall event of >0.1" – Event 2 3. At-large dry weather event – Event 3
D.1.d	Long-Term Wet Weather Receiving Water Monitoring Required analyses include: Field Parameters: pH; Temperature; Specific Conductance; DO; Turbidity Analytical Parameters: *Conventional Parameters*: Total Dissolved Solids; Total Suspended Solids; Turbidity; Total Hardness; Total Organic Carbon; Dissolved Organic Carbon; Sulfate; Methylene Blue Active Substances (MBAS); Suspended Sediment Concentration (SSC) *Nutrients:* Total Phosphorus; Orthophosphate; Dissolved Phosphorus; Nitrite; Nitrate; Total Kjeldahl Nitrogen; Ammonia *Metals (Total and Dissolved):* Arsenic; Cadmium; Chromium; Copper; Iron; Lead; Mercury; Nickel; Selenium; Thallium; Zinc *Pesticides:* Organophosphate Pesticides; Pyrethroid Pesticides

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

RECEIVING WATER MONITORING	
Permit Prov./ Specific Activity	Monitoring and Assessment Program Element
D.1.d (cont)	*Indicator Bacteria:* Total Coliform; *Enterococcus;* Fecal Coliform *Organics* Trace elements, Synthetic organics Chronic Toxicity Testing*:* *Pimephales promelas* (Fathead Minnow) Larval Survival and Growth *Ceriodaphnia dubia* (Daphnid) Survival and Reproduction *Selenastrum capricornutum* (Green Algae) Growth Grab samples for field parameters and other constituents as required by protocol: Total Coliform; *Enterococcus;* Fecal Coliform Flow-weighted (24-hour or storm-length) composites for other constituents Toxicity samples by flow-weighted composite Three wet weather events during permit term: 1. First wet weather event of the wet season (October 1 – April 30) – Event 1 2. Event that occurs after February 1 – Event 2 3. At-large wet weather event – Event 3
D.1.e.(1)	Regional Monitoring Participation *Stormwater Monitoring Coalition Regional Monitoring* Twenty-one proposed projects over 5 years (2014–2019) within four study categories: *Ecosystem Characterization and Assessment* 1) Standardizing Monitoring Approaches for Wet and Dry Weather Monitoring 2) Improving Stormwater Agency Reporting and Communication 3) Characterization of Stormwater Effects 4) Contaminants of Emerging Concern 5) Characterization of Stormwater Impacts on Marine Protected Areas

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

RECEIVING WATER MONITORING	
Permit Prov./ Specific Activity	Monitoring and Assessment Program Element
D.1.e.(1) (cont)	*Method Development and Tool Evaluation* 6) Adapt Biological Assessment Tools for non-Perennial Streams 7) Develop New Tools for Causal Assessment 8) Standardize Hydrologic Methods 9) Hydromodification Guidance of Urban Streams 10) Evaluating Potential of Remote Sensing Technology *Optimizing Management Effectiveness* 11) Optimizing Best Management Practices for Southern California 12) Flood Control Detention Retrofit to Improve water Quality Performance 13) Evaluating the Potential Benefits and Negative Impacts of On-Site Stormwater Retention 14) Improving Trash Controls and Tools to Assess Progress 15) Development of a Model Framework for a Stormwater Control Offset/Trading Program 16) Use Attainability Analysis Case Study for an Engineered Channel 17) Optimizing retrofit of Existing Urban Areas with Green Infrastructure *Foundational Scientific Understanding* 18) Improved quantification of Linkages between Nutrient Concentrations and Indicators of Beneficial Uses 19) Stormwater Effects on Ocean Acidification and Hypoxia 20) Effect of Climate Change on Stormwater Quality 21) Interaction Between Stormwater Runoff and Cyanotoxins Monitoring methods are to be developed as projects are implemented. Project implementation is to be based on collective need and availability of funding

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

RECEIVING WATER MONITORING	
Permit Prov./ Specific Activity	Monitoring and Assessment Program Element
D.1.e.(1) (cont)	*Southern California Bight Regional Monitoring* Sampling of 397 randomly selected sites in the Southern California Bight Sample each site one (1) time between July 1 and September 30, 2013 Indicators: *Contaminant exposure* Sediment chemistry (as outlined below) *Conventional Parameters*: Total Organic Carbon; *Nutrients:* Total Nitrogen; Total Phosphorus *Metals (Trace):* Aluminum; Antimony; Arsenic; Barium; Beryllium; Cadmium; Chromium; Copper; Iron; Lead; Mercury; Nickel; Selenium; Silver; Zinc *Organics:* PCB Congeners; Chlorinated Hydrocarbons; PAHs; Polybrominated Diphenyl Ethers (BDEs) Grain Size Debris *Biological response* Benthic infauna Fish assemblage Fish pathology Macroinvertebrate assemblage Sediment toxicity *Habitat* Grain size Sediment organic carbon

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

RECEIVING WATER MONITORING	
Permit Prov./ Specific Activity	Monitoring and Assessment Program Element
D.1.e.(1) (cont)	Planned Bight '13 Special Studies Analysis of Contaminants of Emerging Concern in Sediment Bioanalytical Screening of Sediment Extracts Sediment Toxicity Identification Evaluation in Embayments Gene Microarray Analysis of Sediment Toxicity Samples Alternative Toxicity Test Species Comparison *In situ* Toxicity Testing Using the Sediment Ecotoxicity Assessment (SEA) Ring Effects of Macrobenthic Preservation Techniques on Efficacy of Molecular and Morphological Taxonomy Adaptation to Hypoxic, High CO, Environments – Phenotypic Plasticity in Echinoderms
	Monitoring methods details: Bight '13 Contaminant Impact Assessment Work Plan –Appendix K Participants include the City of San Diego *2013 Regional Harbor Monitoring Program* Sampling activities include: Water Quality Monitoring; Sediment Sampling; and Trawls Nine Water Quality and Sediment monitoring locations in Tijuana River; one Trawl location Analyses include:
	Field Parameters Specific Conductance; Temperature; pH; DO; Light Transmittance; Salinity *Water Chemistry* *Conventional Parameters* Oil & Grease; Total Organic Carbon; Dissolved Organic Carbon; MBAS *Nutrients:* Ammonia; Nitrate; Orthophosphate

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

RECEIVING WATER MONITORING	
Permit Prov./ Specific Activity	Monitoring and Assessment Program Element
D.1.e.(1) (cont)	*Metals (Trace):* Aluminum; Antimony; Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Iron; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Silver; Thallium; Tin; Titanium; Vanadium; Zinc *Organics:* PAHs; Methyl-t-butyl Ether (MTBE) *Sediment Analyses* *Benthic Community* *Conventional Parameters* Total Solids; Total Organic Carbon; Sediment Grain Size *Nutrients:* Total Nitrogen; Total Phosphorus; Ammonia; Nitrate; Orthophosphate *Metals (Trace):* Aluminum; Antimony; Arsenic; Barium; Beryllium; Cadmium; Chromium; Copper; Iron; Lead; Mercury; Nickel; Selenium; Silver; Zinc *Other:* PAHs; Chlorinated Pesticides; Pyrethroid Pesticides; PCB Congeners; PBDEs; Alkylphenol; Perfluorinated Compounds Acid Volatile Sulfides *Sediment Toxicity* *Eohaustorius estuaries* (amphipod) *Mytilus galloprovinvialis* (mussel) Monitoring methods details: 2013 Final Work Plan Regional Harbor Monitoring Program – Appendix K

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

<table>
<tr><th colspan="2">RECEIVING WATER MONITORING</th></tr>
<tr><td>Permit Prov./ Specific Activity</td><td>Monitoring and Assessment Program Element</td></tr>
<tr><td>D.1.e.(2)</td><td>Sediment Quality Monitoring
Overview:
The Southern California Bight Regional Monitoring Program is an integrated assessment of the Southern California Bight that occurs every 5 years from Point Conception to the Mexican border. The program assesses the ecological health of nearshore and offshore MARs as well as coastal embayments by measuring indicators of environmental condition (e.g., habitat quality, sediment contamination, toxicity, infaunal communities, and fish communities) at nearly 400 sites distributed throughout 12 different types of strata. The RAs participated in Bight ’13 to comply with the requirements of the 2013 permit. Two stations were assessed within the Tijuana River Estuary in the Tijuana River WMA:
<table>
<tr><th rowspan="2">Lagoon/Estuary</th><th rowspan="2">Number of Sites</th><th rowspan="2">Site ID</th><th colspan="4">Sediment Sampling</th></tr>
<tr><th>Date Sampled</th><th>Latitude</th><th>Longitude</th><th>Sample Depth (meters)</th></tr>
<tr><td rowspan="2">Tijuana River Estuary</td><td rowspan="2">2</td><td>8002</td><td>8/5/2013</td><td>32.5566</td><td>-117.1283</td><td>0.4</td></tr>
<tr><td>8008</td><td>8/5/2013</td><td>32.5583</td><td>-117.1206</td><td>0.8</td></tr>
</table>
Monitoring was conducted in accordance with the San Diego County Municipal Co-permittees Bight 2013 Workplan, provided by SCCWRP (available: http://www.sccwrp.org/documents/BightDocuments/Bight13Documents.aspx).
Specific monitoring methods and constituents are presented in the San Diego County Municipal Co-permittees Bight 2013 Workplan (Appendix M).</td></tr>
</table>

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

MS4 OUTFALL DISCHARGE MONITORING	
Permit Prov./Specific Activity	Monitoring and Assessment Program Element
D.2.b.(1)	Dry Weather MS4 Outfall Discharge Field Screening *Objectives:* Identify non-stormwater and illicit discharges within jurisdiction per Provision E.2.c Determine which discharges are transient vs. persistent flows Prioritize persistent dry weather MS4 discharges to investigate/eliminate per Provision E.2.d Visual Inspections/Observations: Number of Outfalls to Be Inspected Annually City of Imperial Beach: 3 Number of Outfalls to Be Inspected Annually City of San Diego: 30 Number of Outfalls to Be Inspected Annually County of San Diego: 4 *Requirements for Inspections:* Antecedent dry period ≥ 72 hours following rainfall event >0.1" prior to field screening Include elements below of Table 5-2 and complete field form provided in the 2015-2016 Tijuana River WMA Dry and Wet Weather MS4 Outfall Monitoring Plan – Appendix K
	□ Station identification and location □ Presence of flow, or pooled or ponded water □ If flow is present: • Flow estimation (i.e., width of water surface, approximate depth of water, approximate flow velocity, flow rate) • Flow characteristics (i.e., presence of floatables, surface scum, sheens, odor, color) • Flow source(s) suspected or identified from non-stormwater source investigation • Flow source(s) eliminated during non-stormwater source identification □ If pooled or ponded water is present:

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

MS4 OUTFALL DISCHARGE MONITORING	
Permit Prov./Specific Activity	Monitoring and Assessment Program Element
D.2.b.(1) (cont	• Characteristics of pooled or ponded water (i.e., presence of floatables, surface scum, sheens, odor, color) • Known or suspected source(s) of pooled or ponded water □ Station description (i.e., deposits or stains, vegetation condition, structural condition, observable biology)
	□ Presence and assessment of trash in and around station □ Evidence or signs of illicit connections or illegal dumping
	Based on Results of Inspections: a. Identify persistent non-stormwater discharges b. Prioritize persistent non-stormwater discharges to investigate/eliminate per Provision E.2.d [Persistent flow is defined as the presence of flowing, pooled, or ponded water more than 72 hours after a measureable rainfall event of 0.1 inch or greater during three consecutive monitoring and/or inspection events. All other flowing, pooled, or ponded water is considered transient.]
D.2.b.(2)	Non-Stormwater Persistent Flow MS4 Outfall Discharge Monitoring *Objectives:* Determine which persistent non-stormwater discharges contain concentrations of pollutants below NALs and which persistent non-stormwater discharges affect receiving water quality during dry weather Prioritize outfalls with persistent dry weather flows within each RA's jurisdiction (coordinate with permit requirements to investigate/eliminate discharges per Provision E.2.d.) *Overview:* Minimum of five highest priority major outfalls per jurisdiction (or all major outfalls if less than five) Two events/year during dry weather conditions Monitoring methods details: 2015-2016 Tijuana River WMA Dry and Wet Weather MS4 Outfall Discharge Monitoring Plan – Appendix J *Prepare Map:* Identify locations of highest priority non-stormwater persistent flow MS4 outfall monitoring stations on map per Provision E.2.b.(1).

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

MS4 OUTFALL DISCHARGE MONITORING	
Permit Prov./Specific Activity	Monitoring and Assessment Program Element
D.2.b.(2) (cont)	*Monitoring Approach:* Required analyses for grab samples (field parameters) and analytical parameters include: Field Parameters: pH; Temperature; Specific Conductance; DO; Turbidity Analytical Parameters: *Conventional Parameters*: Total Dissolved Solids; Total Suspended Solids; Total Hardness; Methylene Blue Active Substances (MBAS); Turbidity; Suspended Sediment Concentration (SSC) *Nutrients:* Ammonia; Total Phosphorus; Orthophosphate; Dissolved Phosphorus Nitrite; Nitrate; Total Kjeldahl Nitrogen; Total Nitrogen *Metals (Total and Dissolved):* Cadmium; Copper; Chromium III, Chromium IV; Iron; Lead; Manganese; Nickel; Selenium; Silver; Thallium; Zinc *Indicator Bacteria:* Total Coliform; *Enterococcus;* Fecal Coliform *Pesticides:* Organophosphate Pesticides; Pyrethroid Pesticides *Organics* Trace Elements, Synthetic Organics See Event Summary Table in Appendix J.
D.2.c	Wet Weather MS4 Outfall Discharge Monitoring *Overview:* Five stations representative of residential, commercial, industrial, and mixed-use land uses within the WMA At least one of these stations for each RA within the WMA[1] At least one event per station *per year* during the wet season (October 1 – April 30).

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

MS4 OUTFALL DISCHARGE MONITORING	
Permit Prov./Specific Activity	Monitoring and Assessment Program Element
D.2.c (cont)	*Monitoring Approach:* Required analyses include: Field Parameters: pH; Temperature; Specific Conductance; DO; Turbidity Analytical Parameters: *Conventional Parameters*: TSS; Total Hardness, Turbidity, Surfactants (MBAS); Suspended Sediment Concentration (SSC) *Nutrients:* Total Phosphorus; Dissolved Phosphorus; Nitrite; Nitrate; Total Kjeldahl Nitrogen; Ammonia; Total Nitrogen *Metals (Total and Dissolved):* Cadmium; Copper; Lead; Selenium; Nickel; Thallium; Zinc; *Pesticides:* Organophosphate Pesticides; Pyrethroid Pesticides *Organics* Trace Elements, Synthetic Organics *Indicator Bacteria:* Total Coliform; *Enterococcus;* Fecal Coliform Grab samples for field parameters and indicator bacteria Time-weighted or flow-weighted (24-hour or storm-length, whichever is shorter) composites at the discretion of the RAs for other constituents Three wet weather events within the permit term See Event Summary Table in Appendix J.

[1] Only four MS4 major outfalls that met the MS4 Permit selection criteria were identified within the County of San Diego's jurisdiction. All four County monitoring locations were deemed unsuitable to monitoring data that would inform progress towards WQIP goals. RWQCB staff approved changes to the monitoring program to substitute a City of San Diego outfall monitoring location in lieu of a County station in the WMA in January 2016.

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

SPECIAL STUDIES	
Permit Prov./Specific Activity	Monitoring and Assessment Program Element
D.3	Special Studies *San Diego Regional Stream Reference Study Monitoring Program – See Appendix J* *Overview:* Wet weather monitoring - three events at six sites Dry weather monitoring – up to 52 weeks at eight to ten sites *Monitoring Approach:* Required analyses include: Field Parameters: pH; Temperature; Specific Conductance; Turbidity; DO (only during dry weather) Analytical Parameters: *Conventional Parameters*: Total Dissolved Solids; Total Suspended Solids; Total Hardness; Alkalinity (Total Alkalinity as CaCO3); Chloride; Sulfate *Nutrients:* Nitrate + Nitrite(as N); Total Kjeldahl Nitrogen; Ammonia; Total Dissolved Nitrogen; Orthophosphate (dissolved; Soluble Reactive Phosphorus); Total Phosphorus (as P) or TDP; Particulate Nitrogen & Carbon (PN, POC); Particulate Phosphorus (PP); Dissolved Organic Content *Metals (Total and Dissolved):* Cadmium; Chromium; Copper; Iron; Lead; Manganese; Nickel; Selenium; Zinc *Indicator Bacteria:* Total Coliform; *Enterococcus;* Fecal Coliform; *E.coli; Bacteroides; M. smitthii* *Toxicity*

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

SPECIAL STUDIES	
Permit Prov./Specific Activity	Monitoring and Assessment Program Element
D.3 (cont)	Wet weather monitoring: Time course pollutograph sampling (sampling of concentrations at multiple periods over the course of the storm) over the duration of the storm event and once per day on the following 3 days. *In-situ* field measurements will be recorded at each site to coincide with each pollutograph grab sample. Flow and precipitation will be measured throughout the duration of the storm event at each reference site, when feasible. During one wet event per site, composite sample taken over a whole day. Dry weather monitoring: Weekly grab sampling. Bacteria samples will be collected so that five samples will be taken within each 30-day period. Biweekly nutrient sampling, including observation of stream condition parameters (physical habitat and benthic algal chlorophyll a). Flow will be calculated weekly at each site using a hand-held Marsh-McBirney flow meter. The meter measures instantaneous velocity, which will be used with cross-sectional area measurements to calculate flow. *In-situ* field measurements to coincide with each grab sample.

Table 4-2
Summary of Monitoring Activities for the Tijuana River Watershed Management Area

SPECIAL STUDIES	
Permit Prov./Specific Activity	Monitoring and Assessment Program Element
D.3 (cont)	*Sediment Source Identification and Prioritization Study* *Overview:* Identify and prioritize potential sediment sources draining to MS4 discharge points, perform field verification of potential sources, and coordinate sediment load reduction efforts with responsible parties within RA jurisdictions. *Monitoring Approach:* This special study includes a three-phase approach to evaluate potential sediment sources within subwatershed areas contributing to MS4 discharges. Phase I of the study will use desktop assessment of existing data as well as aerial surveys and photos to identify potential anthropogenic sources of sediment, using available data. Phase I will include a study plan and report identifying potential sources. The Phase I study will use available data to perform an integrated assessment of: • Hydrological and geomorphological conditions and processes, • MS4 outfall and other infrastructure configuration and condition, and • Water quality monitoring and sediment loading estimates, because these conditions relate to sediment contributions to MS4 discharges. The targeted outcome of the integrated existing physical conditions, infrastructure, and water quality assessment is the development of a prioritized inventory of point sources that contribute sediment and/or other pollutants to MS4 discharges in the Tijuana River WMA. Data compiled as part of the Phase I identification process for the potential anthropogenic sources of sediment will be used to inform Phase II actions. Phase II actions will include field verification potential problem areas and watershed stakeholder/discharger coordination to facilitate appropriate access and authority processes for identified sediment load reduction priority areas. Phase II will include up to 8 weeks of field work to gather field information and develop an inventory of sources and associated attribute data. Phase II also will include a study plan and report with GIS layer(s). Phase III activities will include collection of field samples to measure sediment loads originating from sources identified in Phase II. Data collected as part of Phase III will be designed to quantify sediment loads from various sources and contribute to future model development. Data from Phases I-III will be used for sediment load reduction project development to be implemented in the Tijuana River watershed.

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4.2 WATER QUALITY IMPROVEMENT PLAN ASSESSMENT PROGRAM

The assessment portion of the Monitoring and Assessment Program will evaluate the data collected under the monitoring programs described in Section 4.1, as well as the information collected as part of each RA's JRMP. The data collected from these two programs will be used to assess the progress of the WQIP strategies toward achieving water quality improvement goals. This section summarizes the requirements of the four assessments listed in Table 4-1. Depending on permit requirements, reporting will occur either annually, as part of the WQIP Annual Report, or will be provided in the ROWD that the RAs must submit before the issuance of the next MS4 permit.

The four primary assessments (Table 4-1) will consider the programmatic questions (detailed in Section 4.1) that are subsets of the general Monitoring and Assessment Program goals, to inform the RAs, the Regional Board, and the public with respect to:

- Progress of RA programs to effectively prohibit non-stormwater discharges to the MS4 and reduce pollutants to the MEP;
- Condition of receiving waters that receiving MS4 discharges and the progress of RAs programs toward improving water quality; and
- Effectiveness of the WQIP toward achieving these goals.

Table 4-3 shows the time frame for each of the assessments. Detailed descriptions of the assessment parameters are presented in Section 4.1.1.

Table 4-3
Water Quality Improvement Plan Assessment Timeframes

	Assessment	Timeframe
1	Receiving Water Assessment • Long Term Dry and Wet Weather Monitoring Data • Sediment Quality Monitoring • Regional Monitoring Programs	Annual Reporting
2	MS4 Outfall Discharge Assessment • Dry Weather Outfall Assessment and Illicit Discharges • Wet Weather Outfall Assessment and Illicit Discharges	Annual Reporting
3	Special Studies Assessment	Annual Reporting
4a	Integrated Assessment • Strategies	Annual Reporting
4b	Integrated Assessment • Priority Water Quality Conditions • Goals and Schedules	MS4 Permit Reporting as part of the ROWD

4.1.1 Receiving Water Assessments

The assessment of receiving waters includes evaluating the physical, chemical, and biological conditions of these waters and the condition of the sediment. The RAs will assess the status and trends of receiving water quality conditions in coastal waters, estuaries, rivers, and streams in the Tijuana River WMA. This assessment includes evaluation of both dry and wet weather conditions. To the extent feasible, the receiving water assessment to be presented in the WQIP Annual Report will:

- Assess whether the conditions of the receiving waters with respect to the MS4 outfall-based discharge progress towards numeric goals;
- Identify the most critical beneficial uses to be protected to ensure the overall health of the receiving water;
- Evaluate whether those critical beneficial uses are being protected;
- Identify short-term and/or long-term improvements or degradation of those critical beneficial uses;
- Consider whether the strategies in the WQIP contribute toward achieving the interim and final numeric goals of the WQIP; and
- Identify gaps in the monitoring data needed to assess Provisions D.4.a.(2)(a)-(e).

The binational nature of the Tijuana River WMA presents a unique challenge to evaluating the physical, chemical, and biological conditions of receiving waters because of the commingled nature of flow derived from both sides of the international border. These commingled flows contribute to both water quality and the condition of the sediment with respect to assessment of progress towards numeric water quality goals, protection of beneficial uses, and the efficacy of WQIP-based strategy contributions towards interim and final numeric goals. RA MS4s draining highly urbanized areas discharge to the lower watershed, where commingled flows from Mexico complicate receiving water assessments, including the identification of sources. Accordingly, assessment of receiving water quality using sample results collected in the lower 6 miles of the Tijuana River and Tijuana River Estuary must consider the relative contribution of pollutants originating in both the U.S. and Mexico.

In addition, the WQIP Annual Report will incorporate a Sediment Quality Monitoring Report, in accordance with the schedule included in the Sediment Quality Monitoring Plan. The Sediment Quality Monitoring Report will contain the following information:

- Analysis: evaluation, interpretation, and tabulation of the water and sediment quality monitoring data;
- Sample Location Map: identification of the locations, types, and number of samples on a site map; and
- California Environmental Data Exchange Network: a statement certifying that the monitoring data and results have been uploaded into this network.

A human health risk assessment may be conducted, based on the analytical results provided in the Sediment Quality Monitoring Report, at the direction of the Regional Board. Such an assessment can identify the extent to which the human health objective contained in the Receiving Water Limitations is attained at each monitoring station.

Data and information from the long-term receiving water monitoring program will be evaluated to assess how progress toward meeting numeric goals for the highest priority water quality conditions, i.e., sediment level reductions in the MS4, affect receiving water conditions in the Tijuana River WMA. Sediment, turbidity and flow data collected from receiving water monitoring may be used along with data from MS4 outfall monitoring to evaluate the relative effectiveness of reductions in sediment levels towards improvement of water quality and related beneficial uses. In addition, trends in receiving water quality from the Tijuana River WMA during both dry and wet weather can be evaluated within the context of regional and State-wide monitoring efforts to determine whether reductions in sediment levels resulting from implementation of water quality improvement strategies results in improved ambient water quality conditions. In addition, data and information from the long-term receiving water monitoring program will be evaluated to assess alternatives to the MS4 outfall discharge-based final numeric goal identified in Section 3. Receiving water- and/or beneficial use-based metrics may provide a more appropriate basis for developing final numeric goals related to sediment discharges. However, given the relative influence of sediment discharge from flows generated in Mexico, a long timeframe and/or specifically focused long-term receiving water and habitat monitoring data may be required to adequately evaluate alternative goal scenarios.

4.1.2 MS4 Outfall Discharge Assessments

The MS4 outfall discharge assessments include evaluating both the dry weather monitoring associated with the IDDE program and the wet weather monitoring data collected by the RAs. Details of these two separate assessments are provided next. Each RA will assess its MS4 programs individually and will compile its reports as part of the Tijuana River WMA WQIP Annual Report.

Dry Weather Outfall Assessments and Illicit Discharges

Each RA must assess and report the progress of its IDDE program (required pursuant to Provision E.2) toward effectively prohibiting non-stormwater and illicit discharges into the MS4s within its jurisdiction, including the following elements:

- **Identify sources of non-stormwater discharges.**

  Based on the dry weather MS4 outfall discharge field screening monitoring provided in Appendix J, each RA must assess and report as follows (Provision D.4.b[1][b]):

  - Identify the known and suspected controllable sources (e.g., facilities, areas, land uses, and pollutant-generating activities) of transient and persistent flows within the RA's jurisdiction in the Tijuana River WMA;
  - Identify sources of transient and persistent flows within the RA's jurisdiction in the Tijuana River WMA that have been reduced or eliminated; and

- Identify modifications of the field screening monitoring locations and frequencies for the MS4 outfalls in the RA's inventory necessary to identify and eliminate sources of persistent flow non-stormwater discharges.

- **Rank and prioritize non-stormwater discharges.**

  Based on the data collected and applicable numeric action levels as described in Section 2 and provided in detail in Appendix J, each RA must rank the MS4 outfalls under its jurisdiction, according to the potential threat to receiving water quality, and produce a prioritized list of major MS4 outfalls. The WQIP will be updated, based on these findings and with the goal of implementing (in the order of the ranked priority list) targeted programmatic actions and source investigations to eliminate persistent non-stormwater discharges and/or pollutant loads.

- **Identify sources contributing to numeric action level exceedances.**

  For the highest priority major MS4 outfalls with persistent flows that exceed numeric action limits, the known and suspected sources under its jurisdiction in the Tijuana River WMA that may cause or contribute to the numeric action level exceedances will be identified.

- **Estimate volumes and loads of non-stormwater discharges.**

  Annually, an analysis of the data collected as part of the Non-Stormwater Persistent Flow MS4 Outfall Discharge Monitoring Program from the highest priority major MS4 outfalls and a calculation or estimation of the non-stormwater volumes and pollutant loads collectively discharged from all the major MS4s outfalls under its jurisdiction that have persistent dry weather flows during the monitoring year will be conducted. These calculations or estimates will include:

  - The percent contribution from each known source for each MS4 outfall;
  - The annual non-stormwater volumes and pollutant loads collectively discharged from the RA's major MS4 outfalls to receiving waters under the RA's jurisdiction; and
  - The annual volumes and pollutant loads for sources of non-stormwater not subject to the RA's legal authority that are discharged from the RA's major MS4 outfalls to downstream receiving waters.

- **Evaluate non-stormwater discharge monitoring locations.**

  Based on an evaluation of the data collected from the highest priority non-stormwater persistent flow MS4 outfall monitoring locations, the outfall monitoring locations may be reviewed and the list reprioritized according to one or more of the following criteria (Provision D.2.b.[2][b][ii]):

  - The non-stormwater discharges have been effectively eliminated (i.e., no flowing, pooled, or ponded water occurs) for three consecutive dry weather monitoring events;
  - The sources of the persistent flows have been identified as a category of non-stormwater discharges that do not require an NPDES permit and do not have to be addressed as an illicit discharge because they were not identified as sources of pollutants (i.e., the

constituents in the non-stormwater discharge do not exceed numeric action limits) and the persistent flow can be reprioritized to a lower priority;

- The constituents in the persistent flow non-stormwater discharge do not exceed numeric action limits; and/or
- The source(s) of the persistent flows has (have) been identified as a non-stormwater discharge authorized by a separate NPDES permit.

Where these criteria have not been met but the threat to water quality has been reduced by the RAs, the highest priority persistent flow MS4 outfall monitoring stations may be reprioritized accordingly for continued dry weather MS4 outfall discharge field screening monitoring as part of the Dry Weather MS4 Outfall Discharge Field Screening Program.

Each RA must document removal or reprioritization of the highest priority persistent flow MS4 outfall monitoring stations identified under the Non-Stormwater Persistent Flow MS4 Outfall Discharge Monitoring Program in the WQIP Annual Report. When an RA removes a persistent flow MS4 outfall monitoring station, it will be replaced with the next highest prioritized major MS4 outfall of priority designated by that jurisdiction in the Tijuana River WMA. If no remaining qualifying major MS4 outfalls are under its jurisdiction, the number of major MS4 outfalls monitored will be reduced.

- **Evaluate the effectiveness of the water quality improvement strategies.**

  As part of the ROWD, each RA will review the data collected as part of the Dry Weather MS4 Outfall Discharge Monitoring Program and findings from annual dry weather MS4 discharge monitoring assessments described above (Provisions D.4.b.[1][c][i]-[iv]). The evaluation will incorporate the following:

  - Identification of reductions and progress in achieving reductions in non-stormwater and illicit discharges to the RAs MS4s in the Tijuana River WMA;
  - Assessment of the effectiveness of the water quality improvement strategies being implemented by the RA within the Tijuana River WMA toward reducing or eliminating non-stormwater and pollutant loads discharging from the MS4s to receiving waters, and, if possible, estimation of the non-stormwater volume and/or pollutant load reductions attributable to specific water quality strategies;
  - Identification of modifications necessary to increase the effectiveness of the water quality improvement strategies implemented by the RA toward reducing or eliminating non-stormwater and pollutant loads discharging from the MS4s to receiving waters under its jurisdiction; and
  - Identification of data gaps in the monitoring data necessary to develop the above assessments.

Wet Weather Outfall Assessments

The RAs will assess and report the progress of the water quality improvement strategies implemented as part of the WQIP and the JRMP toward reducing pollutants in stormwater discharges from the MS4s. This is designated as the Wet Weather MS4 Outfall Discharge Monitoring Program. The assessment of this program will:

- **Estimate volumes and loads of stormwater discharges.**

  As part of the WQIP Annual Report, the RAs must analyze the monitoring data collected as part of the Wet Weather MS4 Outfall Discharge Monitoring Program. This includes using a watershed model or another method to calculate or estimate the following for each monitoring year:

  - The average stormwater runoff coefficient for each land use type within the Tijuana River WMA;
  - For each storm event with measurable rainfall greater than 0.1 inch, the volume of stormwater and pollutant loads discharged from each of the monitored MS4 outfalls to receiving waters within the Tijuana River WMA;
  - The total flow volume and pollutant loadings discharged from each RA's jurisdiction within the Tijuana River WMA over the course of the wet season, extrapolated from the data produced from the monitored MS4 outfalls; and
  - For each storm event with measurable rainfall greater than 0.1 inch, the percent contribution of stormwater volumes and pollutant loads discharged from each land use type within: (1) each hydrologic subarea with a major MS4 outfall to receiving waters, or (2) each major MS4 outfall to receiving waters.

- **Evaluate temporal trends.**

  The RAs will evaluate the data collected as part of the Wet Weather MS4 Outfall Discharge Monitoring Program and will:

  - Incorporate new outfall monitoring data into time series plots for each long-term monitoring constituent for the Tijuana River WMA; and
  - Analyze statistical trends on the cumulative long-term wet weather MS4 outfall discharge water quality data set.

- **Evaluate stormwater discharge monitoring locations and frequency.**

  The RAs may identify modifications to the wet weather MS4 outfall discharge monitoring locations and frequencies, to identify pollutants in stormwater discharges from the MS4s in the WMA (Provision D.2.c.[1]). The two methods available per the permit to modify the Wet Weather MS4 Discharge Outfall Program are the following:

  - The RAs may adjust the wet weather MS4 outfall discharge monitoring locations in the Tijuana River WMA, as needed, to: (1) identify pollutants in stormwater discharges from

MS4s and (2) guide pollutant source identification. The number of stations will be at least equivalent to the number of stations required under the MS4 permit (Provision D.2.a.[3][a]).

- The RAs may adjust the analytical monitoring required for the Tijuana River WMA if historical data or other supporting information demonstrate or justify that analysis of a constituent is not necessary.

- **Evaluate Water Quality Improvement Plan assumptions.**

  The RAs will evaluate the WQIP assumptions based on the wet weather MS4 outfall monitoring data collected and the applicable stormwater action limits. This evaluation will include analyzing and comparing the monitoring data used to perform the analyses and the assumptions used to develop the WQIP, particularly the strategies presented in Section 3. In addition, the RAs will evaluate whether those analyses and assumptions should be updated as a component of the adaptive management described in Section 5.

- **Evaluate effectiveness of water quality improvement strategies.**

  As part of the ROWD, the RAs will review the data collected pursuant to Wet Weather MS4 Outfall Discharge Monitoring Program and findings from the annual wet weather MS4 discharge monitoring assessments described above (Provisions D.4.b.[2][c][i]-[ii]). The evaluation will:

  - Identify reductions or progress in achieving reductions in pollutant concentrations and/or pollutant loads from different land uses and/or drainage areas discharging from the RAs MS4s in the Tijuana River WMA;
  - Assess the effectiveness of water quality improvement strategies being implemented by the RAs within the Tijuana River WMA toward reducing pollutants in stormwater discharges from the MS4s to receiving waters within the WMA to the maximum extent practicable (if possible, including the pollutant load reductions attributable to specific water quality strategies implemented by the RAs);
  - Identify modifications that will increase the effectiveness of the water quality improvement strategies implemented by the RAs in the Tijuana River WMA toward reducing pollutants in stormwater discharges from the MS4s to receiving waters in the WMA to the maximum extent practicable; and
  - Identify data gaps in the monitoring data necessary to assess the evaluations identified above.

  As described above and in Section 4.1, data and information from the MS4 outfall discharge monitoring program will be evaluated to assess progress toward meeting the interim and final numeric goals for the highest priority water quality condition (sediment). Specifically, total suspended solids, SSC, turbidity and flow data from MS4 outfall locations will be used to characterize sediment contributions and estimate pollutant loads in both dry and wet weather. Over time, this data can be evaluated to determine the overall effectiveness of water quality improvement strategy implementation in different subwatersheds of the MS4 system. Pre- and post-strategy implementation data for TSS, SSC, turbidity, and flow, may be compared on an

annual basis and over several monitoring seasons, to assess the effect of sediment reduction efforts on a subwatershed-level. Total suspended solids concentration and MS4 outfall runoff volumes may be used to calculate sediment loads for comparison within and between subwatersheds to assess strategy effectiveness, while TSS and runoff volume estimates from the entire MS4 may be utilized for comparison to interim sediment level reduction goals.

Results from the MS4 monitoring component will be evaluated to determine whether more focused strategy-specific monitoring may be needed to provide information to optimize existing jurisdictional and optional strategies to address sediment. A numeric-based assessment process will be utilized to evaluate the efficacy of strategy implementation incorporating pre- and post-strategy monitoring data (to estimate effectiveness in sediment load reduction), operational capacity, and available resources. Based on the monitoring and assessment results, factors such as implementation frequency, geographic implementation area, and operational procedures, may be modified to optimize strategy implementation to improve sediment and other pollutant load reductions.

4.1.3 Special Studies Assessments

As part of the WQIP Annual Report, the Tijuana River WMA RAs will evaluate the results and findings from the special studies provided in Appendix J. They will use the resulting data to: (1) assess their relevance to the RAs characterization of receiving water conditions, (2) understand sources of pollutants and/or stressors, and (3) control and reduce the discharges of pollutants from the MS4 outfalls to receiving waters. As with the other monitoring programs, the results of the special studies assessments may warrant modifications of or updates to the WQIP. For example, results of the special studies may provide information to help refine and adapt the MS4 outfall discharge monitoring program, to focus outfall monitoring locations and frequencies on the highest priority sources of sediment.

The Tijuana River WMA special studies will attempt to answer the following:

- What types of sediment sources are present in the subwatersheds draining to MS4 discharge outfalls?
- Are potential sediment source locations correlated with specific land use types, geographic areas or topographic features?
- What are the estimated sediment loads originating from potential sediment source locations?
- Are the sediment load estimates correlated with specific land use types, geographic areas or topographic features?
- What types of sediment source reduction BMPs for sediment load reduction priority areas are available to be implemented on municipal property?
- What types of sediment source reduction BMPs can the RAs facilitate implementation on private property?

- What is the estimated total annual sediment load reduction is needed so that sedimentation is reduced to meet interim and final numeric goals at MS4 discharge points?

The City of Imperial Beach optional strategy Infrastructure Improvements to Dirt Alleys (IB-53) monitoring will evaluate flow and pollutant reduction benefits of improving existing unpaved alleyway areas with permeable pavers that allow for storm water retention. Pre- and post-construction flow measurements and grab samples will be analyzed and compared to estimate sediment and other pollutant load reduction benefits of the structural improvements. Pre- and post-strategy implementation data for TSS, SSC, turbidity, and flow, may be compared on an annual basis and over several monitoring seasons, to assess the effect of alley improvement on reducing runoff volume and associated pollutant loads.

Future special studies related to BMP effectiveness that are implemented by the RAs in the Tijuana River WMA will be included in these assessments. The RAs may choose to report the results of BMP effectiveness studies that are being performed in other WMAs if they relate to the highest priority water quality conditions and results are expected to be transferrable to strategies planned for the Tijuana River WMA.

4.1.4 Integrated Assessment

The integrated assessment will build on the receiving water assessments, MS4 outfall discharge assessments, and special studies assessments described in Sections 4.2.1 through 4.2.3. The integrated assessment will be conducted as part of the iterative approach and adaptive management process that is summarized here and further described in Section 5.

The RAs will integrate the data collected and analyzed as part of the Monitoring and Assessment Program, along with information collected during the implementation of the JRMP. The data will be evaluated to assess the effectiveness of the WQIP in addressing the highest priority water quality conditions, and to identify whether other priority water quality conditions may need to be elevated to a highest priority water quality condition. In addition, the integrated assessment will evaluate the progress in achieving goals and assess the effectiveness of the implemented strategies. Specifically, TSS, SSC, turbidity and flow data collected from the receiving water monitoring, MS4 outfall discharge monitoring, and special studies components may be used to inform the effectiveness of water quality improvement strategies toward meeting interim and final numeric sediment load reduction goals.

The permit outlines what assessments should be included as part of the integrated assessment. Reevaluation of the priority water quality conditions and goals includes the following five-step process:

(1) Re-evaluate the receiving water conditions, per the methodology described in Section 2.1;

(2) Re-evaluate the impacts of MS4 discharges on receiving waters, per the methodology presented in Section 2.2;

(3) Re-evaluate the identification of MS4 sources and/or stressors, described in Section 2.5;

(4) Identify beneficial uses in receiving waters that are protected, per the Receiving Water Assessment (Section 4.2.1); and

(5) Evaluate the progress toward achieving interim and final numeric goals for protecting affected beneficial uses in receiving waters.

To re-evaluate the water quality improvement strategies, this four-step process will be followed:

(1) Identify the non-stormwater and stormwater pollutant loads from the MS4 outfalls, based on the MS4 Outfall Discharge Assessment (Section 4.2.2);

(2) Identify the non-stormwater and stormwater pollutant load reductions, or other improvements that are necessary to attain the interim and final numeric goals;

(3) Identify the non-stormwater and stormwater pollutant load reductions, or other improvements, that are necessary to demonstrate that non-stormwater and stormwater discharges are not causing or contributing to exceedances of receiving water limitations; and

(4) Evaluate the progress of the strategies toward achieving interim and final numeric goals for protecting beneficial uses in receiving waters.

The Monitoring and Assessment Program will be evaluated and adapted in the context of the Annual Reporting and the ROWD. The re-evaluation will consider data gaps and the results of each monitoring program element. Modifications may be made to the program, but the core elements required by the permit and described in Section 4.1 will be maintained. This will limit the amount of adaptation that is possible. Potential changes can include increased frequency of sampling, the addition of a new analyte of concern, changing a monitoring location, and a changing sampling or analytical method.

As described above, the integrated assessment will evaluate the main drivers of the WQIP. The priority water quality conditions will be re-evaluated using the receiving water and MS4 outfall discharge assessments, based on the methodology presented in Section 2. The goals and schedules that are presented in Section 3 will be reviewed, based on the results of the receiving water and MS4 outfall discharge assessments, along with data collected as part of the JRMP. This evaluation will highlight the progress towards achievement of compliance goals. Furthermore, both water quality monitoring data and maintenance/observational data related to BMP effectiveness will be used to assess the strategies implemented by the RAs. Table 4-4 summarizes the assessment program components that will be used to evaluate the main drivers of the integrated assessment.

Table 4-4
Integrated Assessment Components

Water Quality Improvement Plan Driver	Assessment
Priority Water Quality Conditions	• Receiving Water Assessments • MS4 Outfall Discharge Assessments
Goals and Schedules	• Receiving Water Assessments • MS4 Outfall Discharge Assessments • JRMP Assessments
Strategies	• Special Studies Assessments for BMP Effectiveness • JRMP Assessments

Based on the timeline shown in Table 4-3, the integrated assessment for all three WQIP drivers will be performed during development of the ROWD. Strategies will be evaluated in the WQIP Annual Report, based on the data collected as part of the JRMP and any new relevant BMP effectiveness data collected by the RAs.

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SECTION 5 ITERATIVE APPROACH AND ADAPTIVE MANAGEMENT PROCESS

Each WMA must implement an iterative approach to adapt the WQIP, monitoring and assessment program, and JRMP programs to achieving their goals. The MS4 permit describes various triggers that may require program adaptation, including exceedances of water quality standards in receiving waters, new information, Regional Board recommendations, and public participation. Effectiveness assessments of JRMP programs and strategies also may trigger adaptations to the WQIP. Each trigger will result in specific adaptive management processes or actions within the time frames specified in the MS4 permit. The timing of the adaptive management requirements typically is either annually or at the end of the MS4 permit term.

MS4 permit requirements, annual assessments and adaptation, and ROWD assessments and adaptations, including triggers and resulting actions, are described in Sections 5.1 through 5.3.

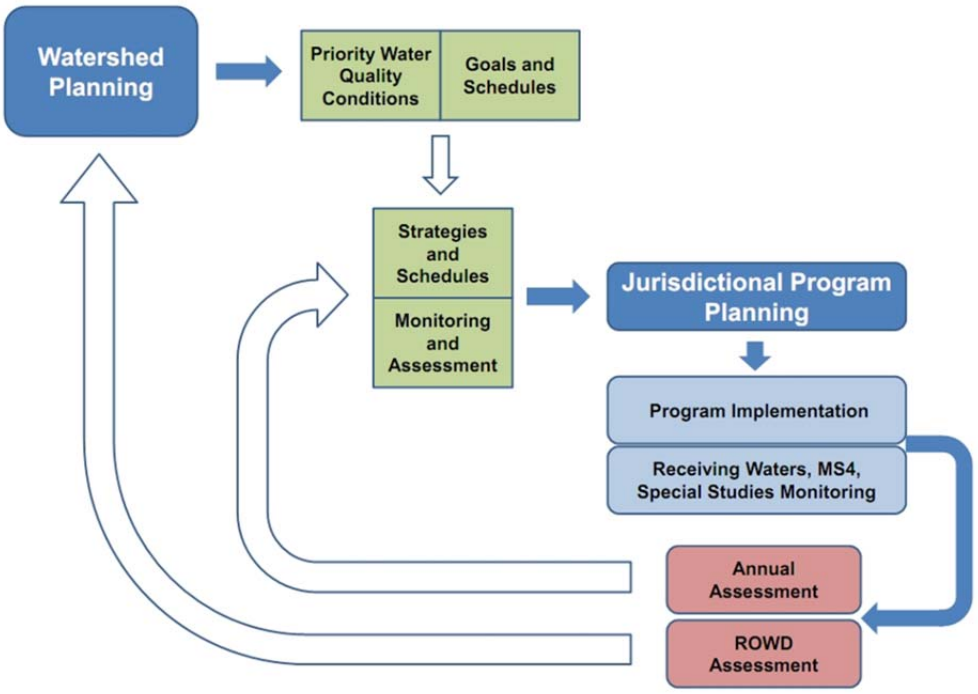

Figure 5-1
Water Quality Improvement Plan Adaptive Management Process

5.1 PERMIT REQUIREMENTS: ITERATIVE APPROACH AND ADAPTIVE MANAGEMENT

The permit includes the requirements for the adaptive management in multiple provisions. Provisions A.4, B.5, D.4.d, and F.2.c each contain requirements related to adaptive management. These are summarized as follows:

- Provision A.4 requires the WQIP to be designed and adapted to ultimately achieve compliance with the discharge prohibitions (Provisions A.1.a and A.1.c) and receiving water limitations (Provision A.2.a) specified in the MS4 permit. It addresses the adaptive management process that may be triggered when exceedances of water quality standards persist in receiving waters.
- Provision B.5 contains specific considerations that must be included in the adaptive management process, whether performed as part of the WQIP Annual Report or as part of the ROWD. This includes the re-evaluation of priority water quality conditions; adaptation of goals, strategies, and schedules; and adaptation of the Monitoring and Assessment Program.
- Provision D.4.d contains the processes for the assessments and adaptive management that must occur in preparation of the ROWD.
- Provision F.2.c describes the requirements for updates to the WQIP that can result from implementation of the adaptive management requirements.

MS4 permit timelines, triggers, and adaptive management processes are summarized in Table 5-1. The following sections elaborate on the adaptive management processes, including the frequencies of adaptation required by the MS4 permit (annual versus MS4 permit term), triggers, and resulting actions.

Table 5-1
Adaptive Management Processes for the Water Quality Improvement Plan Drivers

Water Quality Improvement Plan Drivers	Timeline	Trigger	Adaptive Management Process Considerations
Priority Water Quality Conditions	MS4 Permit Term	Report of Waste Discharge (B.5.a, D.4.d.[1])	*Provision B.5.a Iterative Approach and Adaptive Management Considerations* • Achievement of the goal of improved water quality through the implementation of strategies identified in the WQIP; • New information developed in the re-assessment of receiving water conditions, impacts from MS4 discharges, and subsequent re-evaluation of priorities; • Spatial and temporal accuracy of monitoring data; • Availability of new information and data from sources other than the JRMP programs that inform the effectiveness of implementation strategies and actions; • Recommendations from the Regional Board; and • Recommendations received through a public participation process. *Provision D.4.d(1) Integrated Assessment Considerations* • Re-evaluate the receiving water conditions and the impacts of MS4 discharges on receiving waters per the process developed in Section 2 of the WQIP. This includes the identification of beneficial uses in receiving waters that are protected per Monitoring and Assessment Program. • Re-evaluate the identification of MS4 sources and/or stressors if corresponding to elevation of a new highest priority.
Water Quality Goals and Schedules	MS4 Permit Term	Report of Waste Discharge (B.5.b, D.4.d.[1])	*Provision B.5.b Iterative Approach and Adaptive Management Considerations* • Modifications to the priority water quality conditions based on Provision B.5.a; • Progress toward achieving numeric goals for the highest priority water quality conditions; • Progress in meeting established schedules; • New policies or regulations that may affect goals; • Reductions of non-stormwater discharges; • Reductions of pollutants in stormwater; • New information resulting from the re-evaluation of impacts from MS4 discharges and/or pollutants and stressors; • Efficiency in implementing the WQIP; • Recommendations from the Regional Board; and • Recommendations received through a public participation process. *Provision D.4.d(1) Integrated Assessment Considerations* • Evaluate the progress toward achieving interim and final numeric goals for protecting affected beneficial uses in receiving waters.

Table 5-1
Adaptive Management Processes for the Water Quality Improvement Plan Drivers

Water Quality Improvement Plan Drivers	Timeline	Trigger	Adaptive Management Process Considerations
Water Quality Strategies and Schedules	Annual Report	Persistent Exceedances Not Addressed (A.4.a.[2])	*Provision A.4.a(2) Integrated Assessment Considerations (Summarized in Figure 5-3)*[2] • Water quality standard exceedances for pollutants that are addressed by the WQIP; implementation of the accepted plan continues and is updated as necessary. • If MS4 discharges are causing or contributing to a new exceedance of an applicable water quality standard for pollutants that are not addressed by the WQIP, the plan will be updated as part of the WQIP Annual Report (unless directed to update it earlier by the Regional Board). • Following Regional Board approval of modifications to the WQIP, the RAs must update their JRMPs accordingly.
Water Quality Strategies and Schedules (continued)	Annual Report	New Information (B.5.b)	*Provision B.5.b Iterative Approach and Adaptive Management Considerations* • Modifications to the priority water quality conditions based on Provision B.5.a; • Progress toward achieving numeric goals for the highest priority water quality conditions; • Progress in meeting established schedules; • New policies or regulations that may affect goals; • Reductions of non-stormwater discharges; • Reductions of pollutants in stormwater; • New information resulting from the re-evaluation of impacts from MS4 discharges and/or pollutants and stressors; • Efficiency in implementing the Water Quality Improvement Plan; • Recommendations from the Regional Board; and • Recommendations received through a public participation process.
	MS4 Permit Term	Report of Waste Discharge (D.4.d.[2])	*Provision D.4.d(2) Integrated Assessment Considerations* • Identify the non-stormwater and stormwater pollutant loads from the MS4 outfalls per Provision D.4.b; • Identify the non-stormwater and stormwater pollutant load reductions, or other improvements that are necessary to attain the interim and final numeric goals; • Identify the non-stormwater and stormwater pollutant load reductions, or other improvements, that are necessary to demonstrate that non-stormwater and stormwater discharges are not causing or contributing to exceedances of receiving water limitations; and • Evaluate the progress of the strategies toward achieving interim and final numeric goals for protecting beneficial uses in receiving waters.

Table 5-1
Adaptive Management Processes for the Water Quality Improvement Plan Drivers

Water Quality Improvement Plan Drivers	Timeline	Trigger	Adaptive Management Process Considerations
Monitoring and Assessment Program	Annual Report	Persistent Exceedances Not Addressed (A.4.a.[2])	*Provision A.4.a(2) Integrated Assessment Considerations (Summarized in Figure 5-3)*[1] • Follow the process as described in Figure 5-3, this may potentially include modifying the monitoring program to fill data gaps. Modifications could include moving monitoring locations, adding additional sample collection, or changing type of sample collected.
		New Information (B.5.c)	*Provision B.5.c Iterative Approach and Adaptive Management Considerations* • Re-evaluate based on new information such as modified priority water quality conditions, goals, strategies, or schedules. • New information may include new regulations. • The Monitoring and Assessment Program must include the MS4 permit required monitoring.
	MS4 Permit Term	Report of Waste Discharge (B.5.c)	*Provision B.5.c Iterative Approach and Adaptive Management Considerations* • Review Monitoring and Assessment Programs based on the requirements in Provision D. • Adjust the monitoring program to determine whether discharges from the MS4 are causing/contributing to exceedances in the receiving water when new exceedances persist; identify and address data gaps via re-assessment of monitoring locations and frequencies; adjust the monitoring program to address results of special studies.

1. This procedure does not have to be repeated for continuing or recurring exceedances of the same water quality standard(s) after scheduled strategies are implemented unless the RAs are directed to do so by the Regional Board.

Figure 5-2 shows a tentative timeline for the adaptive management process. The first WQIP Annual Report is scheduled to be submitted by the RAs to the Regional Board in January 2017. It will include an abbreviated monitoring and JRMP implementation period because the Monitoring and Assessment Program and JRMP will be effective after approval of the WQIP. The timeline assumes that the WQIP will be approved by the Regional Board by the end of September 2015, with implementation beginning in October 2015. The second Annual Report for the current MS4 permit cycle will be submitted in January 2018. This submittal will occur following submittal of the ROWD that is due to the Regional Board by December 2017.

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Task Name	Start	Finish
Submittal of WQIP to RWQCB	6/27/2015	6/27/2015
Approval of WQIP	9/30/2015	9/30/2015
WQIP/JRMP Implementation - Year 1	11/1/2015	6/30/2016
Monitoring and Assessment Program - Year 1	10/1/2015	9/30/2016
WQIP Annual Report - Year 1	1/31/2017	1/31/2017
WQIP/JRMP Implementation - Year 2	7/1/2016	6/30/2017
Monitoring and Assessment Program - Year 2	10/1/2016	9/30/2017
Prepare Report of Waste Discharge (ROWD)	7/1/2017	12/31/2017
ROWD Due to RWQCB	12/27/2017	12/27/2017
WQIP Annual Report - Year 2	1/31/2018	1/31/2018
Permit Expiration	6/27/2018	6/27/2018

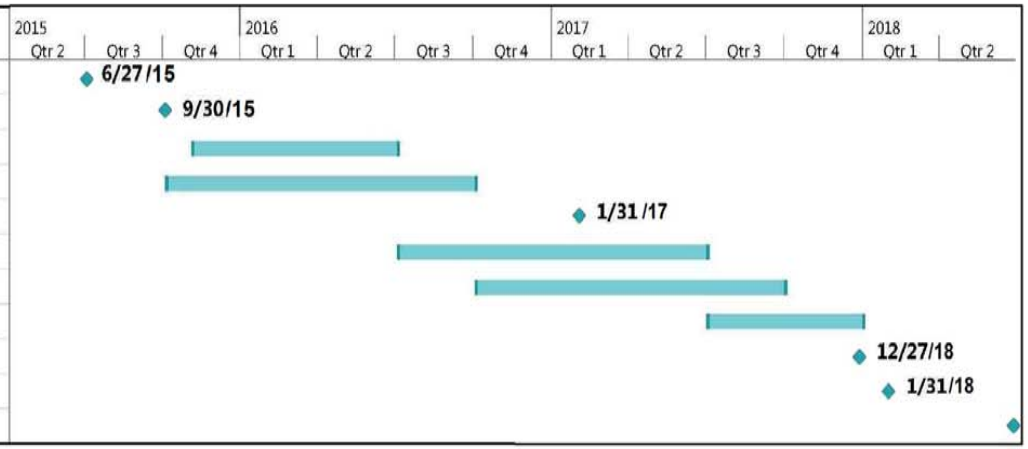

Figure 5-2
Anticipated Water Quality Improvement Plan Assessment and Reporting Timeline

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5.2 ANNUAL ASSESSMENTS AND ADAPTIVE MANAGEMENT

The Permit contains two conditions that may trigger adaptation annually:

(1) Exceedances of water quality standards in receiving waters; and

(2) New information.

In either case, modifications may be appropriate for the water quality goals, strategies, schedules, and/or Monitoring and Assessment Program. The priority water quality conditions may be modified as needed during the Permit term, but are likely to be modified only as a result of assessments conducted for the ROWD.

5.2.1 Receiving Water Assessments

Evaluation of receiving water and MS4 outfall discharge data will be performed annually as part of the WQIP Annual Report (Provision F.3.b.[3][a]). More comprehensive evaluations of receiving water data will be performed for the Transitional Monitoring and Assessment Program Report and for the ROWD (Provision D.4.a.[1]). These evaluations will summarize receiving water data collected within the Tijuana River WMA and will provide information with the potential to trigger the adaptive management process described under Provision A.4.

Provision A.4 describes adaptive management procedures that the RAs must implement "if exceedance(s) of water quality standards persist in receiving waters." Thus, the trigger for the adaptive management process under this provision will be indications of exceedances of water quality standards that persist in receiving waters. If the adaptive management process is triggered under this provision, the process will include the following assessments:

- Whether the MS4 is a source of pollutants causing the exceedances to persist in the receiving waters; and
- Whether the exceedances are addressed by the WQIP.

If the receiving water exceedances are addressed under the WQIP, then the RAs will continue its implementation. If the receiving water exceedances are not addressed, then the RAs will update the plan to address the exceedances as described in Provision A.4.a.(2) and will submit the updates with the WQIP Annual Report. The updates will include, as applicable:

- A description of existing strategies that are determined to be effective (these will likely continue);
- A description of strategies that will be implemented to reduce or eliminate pollutants or conditions that are a source of the receiving water exceedances;
- Updates to the implementation schedules for existing, revised, or additional strategies; and
- Updates to the Monitoring and Assessment Program, to track progress toward achieving compliance with Provision A.1.a, A.1.c, and Provision A.2.a.

The adaptive management process as required under Provision A.4 is shown in Figure 5-3.

5.2.2 Annual Evaluation of New Information

The adaptive management process also may be triggered as new information becomes available (Provision B.5.b). Where appropriate, modifications may be made to goals, strategies, schedules, and/or the Monitoring and Assessment Program and will be reported in the WQIP Annual Report. Types of new information that may trigger the adaptive management process as part of the annual assessment process are discussed below, including the potential trigger(s) for modification(s), and the resulting adaptive management process to be employed.

5.2.2.1 Regulatory Drivers

Where new regulations or policies are adopted that will affect Tijuana River WMA planning and implementation processes in the near term, modifications to the WQIP goals, strategies, schedules, and/or monitoring and assessment plan may be warranted, and, in some cases, required. An example of a regulatory driver that may trigger modifications to the WQIP include new state policies (e.g., trash, toxicity, biological objectives, bacteria) and changes resulting from modifications to existing permit requirements (e.g., as a result of a permit reopener).

5.2.2.2 Special Study Results

As part of the Monitoring and Assessment Program, the RAs will be performing special studies related to the highest priority water quality conditions for the Tijuana River WMA. The special studies are designed to provide information related to sources of the highest priority water quality conditions within the Tijuana River WMA. They will be implemented during the MS4 permit term and typically will be performed over multiple years. As relevant data, conclusions, and lessons learned become available from these studies, the WQIP may be modified. The study results may affect the goals, strategies, schedules, and monitoring and assessment plans. For example, results of the Sediment Source Identification and Prioritization special study may provide information to help refine and adapt the MS4 outfall discharge monitoring program. Data and information collected during the special study may be used to focus outfall monitoring locations and frequencies on the highest priority sources of sediment.

In addition, lessons learned and study results from outside the Tijuana River WMA, especially those related to sediment and turbidity impairments, also may be incorporated into the WQIP. Results from the SCCWRP San Diego Regional Reference Stream Study may be useful to evaluate the appropriateness of the sediment numeric target and related final numeric goal. As discussed in Section 3, natural background levels of sediment in the Tijuana WMA are not well-characterized, and methodologies utilized in the regional study to develop numeric targets for sediment may inform the approach for refining the target in the Tijuana WMA.

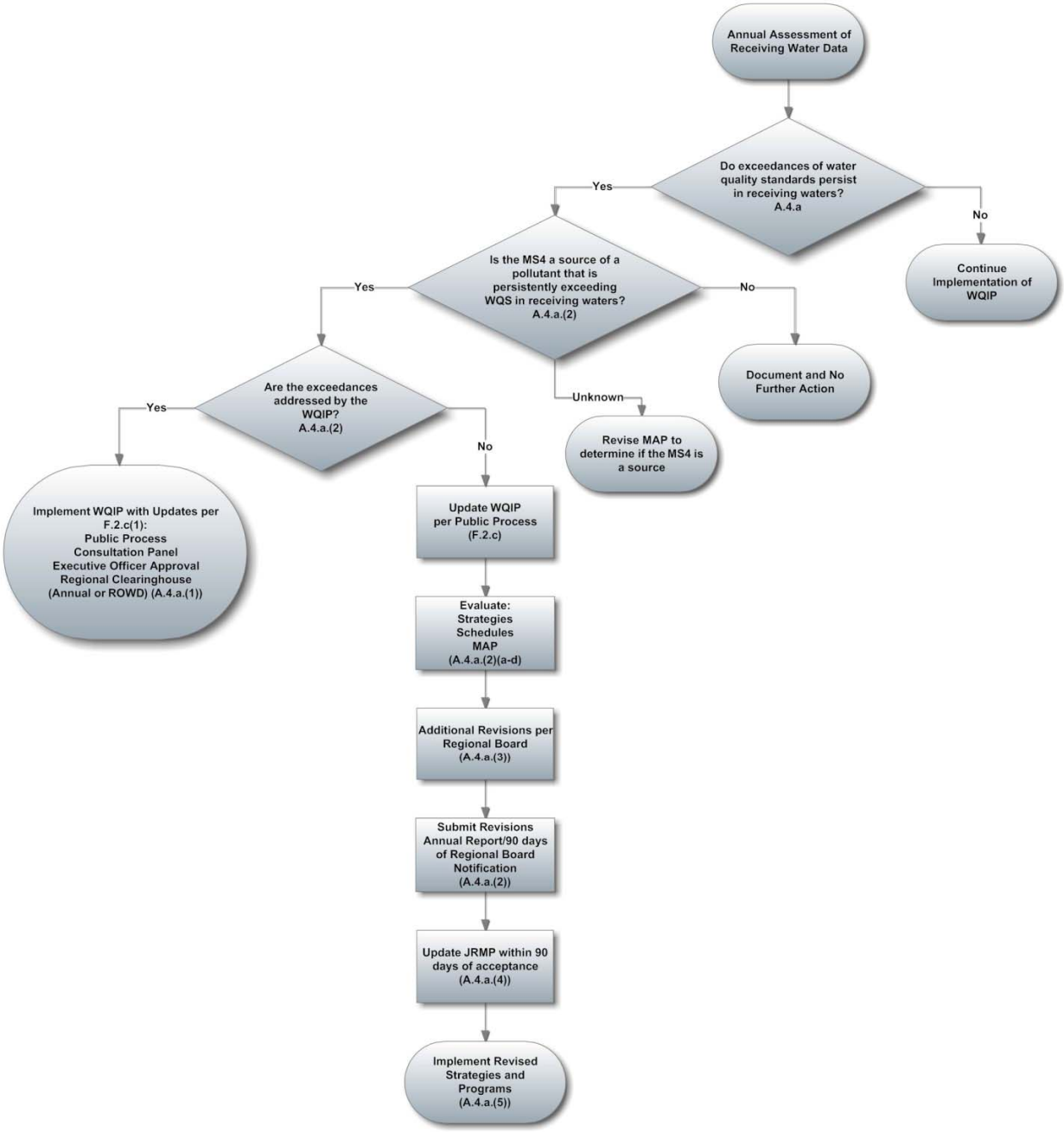

Figure 5-3
Receiving Water Exceedance Process (Provision A.4)

5.2.2.3 Program Effectiveness Assessments

Strategies developed in the WQIP will be incorporated into individual RA programs through implementation of their respective JRMPs. Each RA is implementing programs that address the highest priority water quality conditions within the Tijuana River WMA. Although implementation of these programs has been ongoing in many cases, refinements and enhancements to the programs will provide additional focus on the particular water quality issues identified in the WQIP. Over time, the RAs will use various assessment methods to determine the effectiveness of the program refinements. In some cases, the program effectiveness assessment results may provide useful information leading to adaptation of elements in the WQIP. Where new information is found to be valid, it may be used to modify goals, strategies, schedules, and the Monitoring and Assessment Program.

5.2.2.4 Regional Board Recommendations

The WQIP also may be adapted based on recommendations from the Regional Board. Recommendations may be a result of the public participation process, Consultation Panel recommendations, review of submitted reports, or other Regional Board interests.

5.3 PERMIT TERM ASSESSMENTS AND ADAPTIVE MANAGEMENT

The MS4 permit contains specific assessments to be performed during the preparation of the ROWD. The assessments are longer term in nature, occurring only once during the MS4 permit cycle. Because the updates to the WQIP are required to undergo a full public participation process, per Provision F.2.c, including reconvening the Consultation Panel, modifications will consider input from the public and Regional Board. Adaptation of WQIP elements also will consider new regulations or policies as appropriate. In the ROWD preparation, each element of the WQIP will be eligible for modifications through the required adaptive management processes. Elements that will be evaluated will include the water quality conditions (i.e., priorities), goals and accompanying schedules, strategies and accompanying schedules, and the Monitoring and Assessment Program.

5.3.1 Priority Water Quality Conditions

The process for selecting the highest priority water quality condition(s) is documented in Section 2 of this WQIP. Because of the relatively short duration of the remainder of this MS4 permit term after expected approval of the WQIP, the priority water quality conditions selected during development of the WQIP will remain for the duration of the term. The priority water quality conditions will be modified only on the basis of new information assessed as part of the ROWD. Data collected during the MS4 permit term will be used to update the analysis of the priority water quality conditions, based on the methodology described in Section 2.

5.3.2 Progress toward Achieving Goals

As part of the preparation of the ROWD, the RAs will evaluate the progress toward achieving the interim and final numeric goals, described in Section 3.1. The restoration and protection of the receiving water is the desired outcome. As discussed in Section 3, discharges from sources other than the Phase I MS4s are outside the jurisdiction and regulatory discharge responsibility of the WQIP. In some cases, no regulatory mechanism is in place to address certain discharges (e.g., cross border discharges from Mexico). These other discharges cause or contribute to impairments of receiving waters, including the priority water quality conditions addressed by this WQIP. 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 in this watershed, all dischargers must participate and address their respective contributions. The RAs will work to address discharges from their MS4s; however, discharges from non-MS4 sources must be addressed by other responsible parties. Only in this manner can the numeric goals appearing in this WQIP be achieved.

The adaptive management approach will be used to guide the verification and/or revision of the final numeric goal over time, based on MS4 outfall discharge monitoring under the WQIP (Section 4.1). Depending on the monitoring results and related assessment, it may be appropriate to adjust either or both of the numeric goals and/or the schedules associated with each goal. Uncertainty related to natural background levels of sediment transport (and associated TSS concentration) in the watershed may warrant refinement of the numeric goals in the future. As mentioned in Chapter 3, the Storm Water Blue Ribbon Panel has acknowledged that the natural background turbidity and/or TSS levels in stormwater runoff are quite high in many locations in California, particularly in semi-arid or arid regions that tend to have less vegetative cover (SWRCB, 2006).

Data and information from the long-term receiving water monitoring program will be evaluated to assess possible alternatives to the MS4 outfall discharge-based final numeric goal. Receiving water- and/or beneficial use-based metrics may provide a more appropriate basis for developing final numeric goals related to sediment discharges. Habitat- and beneficial use-based metrics have been used both locally and regionally (SDRWQCB, 2012) (USEPA Region IX, 2012) to set the long-term goal and/or compliance targets in watersheds with sediment-impaired waterbodies/TMDLs. Habitat- and beneficial use-based metrics are likely to provide a more appropriate approach for evaluating sediment impairments given the relative impact of watershed topography, soils and other factors that influence natural sediment transport processes. However, given the relative influence of sediment discharge from flows generated in Mexico, a long timeframe and/or specifically focused long-term receiving water and habitat monitoring data may be required to adequately evaluate alternative goal scenarios.

Other studies that may be considered to modify the final numeric goal could include bed-load studies, land-use studies that focus on priority historical sediment sources specific to the Tijuana River WMA watershed, and studies that focus on updating the numeric target (i.e., concentration-based component) based on local data collected during future permit terms.

5.3.3 Strategies and Schedules

The strategies and implementation schedules developed to address the highest priority water quality conditions in the Tijuana River WMA will be re-evaluated as part of preparation of the ROWD. Ultimately, the effectiveness of the strategies will be based on the progress toward achieving the interim and final numeric goals. However, an evaluation of strategies based on the achievement of the interim and final numeric goals may take many years of implementation and monitoring to assess. To supplement the "goal-based" assessments, water quality and programmatic data collected over the MS4 permit term will be incorporated into the assessment and adaptive process to modify strategies and implementation schedules as appropriate.

5.3.3.1 Water Quality Data Evaluation of Strategies

Receiving water data will be assessed as described in Section 5.1. The assessment will indicate progress toward goals and protection of beneficial uses from MS4 sources. These data may be used to evaluate the collective effectiveness of the WQIP strategies. This information will provide a "big picture" assessment of the success of the strategies over the long term.

MS4 outfall data and special studies results may provide information that is more directly linked to implementation of individual strategies. Where possible, this information will be used to modify, eliminate, and/or develop new strategies to address the highest priority water quality conditions in the Tijuana River WMA. For example, pre- and post-strategy implementation data for TSS, SSC, turbidity, and flow, may be compared on an annual basis and over several monitoring seasons, to assess the effect of sediment reduction efforts on a subwatershed-level. Total suspended solids concentration and MS4 outfall runoff volumes may be used to calculate sediment loads for comparison within and between subwatersheds to assess strategy effectiveness. These data will provide the foundation for the MS4 outfall discharge assessments described in Section 5, which will evaluate the results of the RA IDDE Programs and MS4 Outfall Discharge Monitoring Programs. Where strategies can be linked to measurable or demonstrable reductions of non-stormwater discharges or of pollutants in stormwater, appropriate modifications will be made.

5.3.3.2 Program Assessments

Where available, the results of program effectiveness assessments performed at the jurisdictional or WMA scale also may drive the adaptation of specific strategies. The level of information will vary by jurisdiction and by program, as these types of assessments are not explicitly required under the MS4 permit. However, in many cases, the RAs will be performing programmatic assessments to provide the most effective use of limited resources. For example, results from the MS4 monitoring component will be assessed to determine whether more focused strategy-specific monitoring may be needed to provide information to optimize existing jurisdictional and optional strategies to address sediment. A numeric-based assessment process will be utilized to evaluate the efficacy of strategy implementation incorporating pre- and post-strategy monitoring data (to estimate effectiveness in sediment load reduction), operational capacity, and available resources. Based on the monitoring and assessment results, factors such as implementation frequency, geographic implementation area, and operational procedures,

may be modified to optimize strategy implementation to improve sediment and other pollutant load reductions.

These assessments have the potential to provide information to determine the effectiveness of specific strategies that may be more relevant than water quality data collected at outfalls or in receiving waters, and the assessments may be a key driver in adapting strategies. In some cases, modifications to strategies also may be the result of internal jurisdictional opportunities or constraints, such as increases or decreases in available funding or staffing.

5.3.4 Monitoring and Assessment Program

As part of the ROWD, the RAs will consider modifications to the Monitoring and Assessment Program, consistent with the requirements in Provision D.4.d.(3). During the MS4 permit term, modifications will be consistent with the requirements of Provisions D.1, D2, and D.3 (i.e., receiving water, MS4 outfall, and special study monitoring requirements, respectively), which will focus on adaptation elements. For example, the MS4 outfall discharge monitoring program may be adapted to focus efforts on identification and quantification of high priority sources of sediment, as needed. Modifications such as increased monitoring frequency, expansion of upstream investigations, and/or specialized monitoring events that focus on measuring effectiveness of specific water quality improvement strategies to reduce sediment levels, may be necessary to adapt the MS4 monitoring program.

Data and information collected as part of the various Monitoring and Assessment Program components will be evaluated to demonstrate progress toward meeting the numeric goals for the highest priority water quality condition (sediment). Specifically, data collected from the receiving water monitoring, MS4 outfall discharge monitoring, and special studies components may be used to inform the effectiveness of water quality improvement strategies toward meeting interim numeric sediment load reduction goals. Recommendations in the ROWD will provide an opportunity to make more meaningful modifications to the Monitoring and Assessment Program. Examples of modifications to the Monitoring and Assessment Program will include the following adjustments:

- Identify whether discharges from the MS4 are linked to exceedances in the receiving water;
- Address data gaps via re-assessment of monitoring locations and frequencies; and
- Address results of special studies.

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