CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

LOWER TIJUANA RIVER INDICATOR BACTERIA AND TRASH ADVANCE RESTORATION PLAN

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California Regional Water Quality Control Board

San Diego Region

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LIST OF ACRONYMS AND ABBREVIATIONS

AG	attorney general
APTP	advanced primary treatment plant
ARP	advance restoration plan
BMP	best management practice
CalRecycle	California Department of Resources Recovery and Recycling
CAO	clean-up and abatement order
CBP	Customs and Border Protection
CCR	California Code of Regulations
CDO	cease and desist order
CESPT	Comisión Estatal de Servicios Públicos de Tijuana
CFR	Code of Federal Regulations
CFU	colony forming units
CILA	Comisión Internacional de Límites y Aguas (IBWC in Spanish)
CONAGUA	Comisión Nacional del Agua (Mexico's national water commission)
CWA	Clean Water Act
DA	district attorney
DHS	Department of Homeland Security
E. coli	*Escherichia coli*
EIR	environmental impact report
EPECG	Eligible Public Entities Coordination Group
FY	fiscal year
GM	geometric mean
HA	hydrologic area
HSA	hydrologic subarea
IBWC	International Boundary and Water Commission
IPCC	Intergovernmental Panel on Climate Change
IRSC	Institute for Regional Studies of the Californias
LA	load allocation
LiDAR	Light Detection and Ranging
MFAC	minimum frequency of assessment and collection
mgd	million gallons per day
mL	milliliter

MOU	memorandum of understanding
MPN	most probable number
MS4	municipal separate storm sewer system
MxIBWC	Mexican Section of IBWC
NADB	North American Development Bank
NAL	numeric action level
NEPA	National Environmental Policy Act
NCRWQCB	North Coast Regional Water Quality Control Board
NGO	non-governmental organization
NOA	needs and opportunities assessment
NOLF-IB	Naval Outlying Landing Field, Imperial Beach
NOV	notice of violation
NPDES	National Pollutant Discharge Elimination System
NTC	notice to comply
PEIS	programmatic environmental impact statement
ppth	parts per thousand
QAPrP	Quality Assurance Program Plan
REC-1	recreational activities involving body contact with water
REC-2	recreational activities involving proximity to water
SB 507	Senate Bill 507
SCCWRP	Southern California Coastal Water Research Project
SBIWTP	South Bay International Wastewater Treatment Plant
SBOO	South Bay Ocean Outfall
SED	substitute environmental documentation
STV	standard threshold value
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TBEL	technology-based effluent limitation
TDS	total dissolved solids
TMDL	total maximum daily load
TRAM	Tijuana River Action Month
TRAN	Tijuana River Action Network
TRNERR	Tijuana River National Estuarine Research Reserve

TRVEA	Tijuana River Valley Equestrian Association
USACE	U.S. Army Corps of Engineers
USDOJ	U.S. Department of Justice
USEPA	U.S. Environmental Protection Agency
USIBWC	U.S. Section of IBWC
USMCA	United States-Mexico-Canada Agreement
WDRs	waste discharge requirements
WLA	wasteload allocation
WQBEL	water quality-based effluent limitation
WQO	water quality objective

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EXECUTIVE SUMMARY

The San Diego Regional Water Quality Control Board (San Diego Water Board) developed this advance restoration plan (ARP) in response to impairments to human and wildlife beneficial uses of water in the lower Tijuana River. The lower Tijuana River refers to the stretch of the Tijuana River that crosses the border from Mexico into the U.S., traverses the Tijuana River Valley and the Tijuana River Estuary, and ultimately flows into the Pacific Ocean. This stretch of the river is approximately six miles in length. The beneficial uses designated for the lower Tijuana River include many ecosystem and recreational uses.

For decades, the lower Tijuana River has not met water quality standards for several pollutants. Pollutants impair beneficial uses and threaten public health and wildlife in and around the lower Tijuana River. Concentrations of indicator bacteria (*Escherichia coli* [*E. coli*] and enterococci) in the river, which indicate the potential presence of pathogens from fecal contamination, do not meet water quality objectives (WQOs) established in the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan). The lower Tijuana River does not meet WQOs for trash as established in the Basin Plan or the State Water Resources Control Board (State Water Board) *Amendment to the Water Quality Control Plan for the Ocean Waters of California to Control Trash* and *Part 1 Trash Provisions of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (Trash Amendments).

Section 303(d) of the federal Clean Water Act (CWA) establishes a water quality assessment and planning process through which states are required to include impaired water bodies on the CWA section 303(d) List of Water Quality Limited Segments (303(d) List). The lower Tijuana River is listed as impaired on the 303(d) List.

According to the CWA, each state must develop total maximum daily loads (TMDLs) for all the water body/pollutant combinations identified on their 303(d) List. A TMDL is the calculation of the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet and continue to meet water quality standards for that particular pollutant. For TMDLs established by the regional board through a Basin Plan amendment, the TMDL must include an implementation plan/schedule[1] and must be approved by the State Water Resources Control Board, Office of Administrative Law, and the U.S. Environmental Protection Agency (USEPA).

[1] For Basin Plan amendments, California Water Code section 13242 requires that a program of implementation include a time schedule for the actions to be taken.

An ARP is a near-term plan or description of actions, with a schedule and milestones, that can be more immediately beneficial or practicable in some cases in achieving water quality standards. This ARP is designed to address impairments in the lower Tijuana River prior to the development of a TMDL. The lower Tijuana River will remain on the 303(d) List as restoration activities are implemented (USEPA, 2023). This ARP, therefore, is not a substitute for a TMDL, but an interim step for addressing impairments in a way that is consistent with the goal of the State of California's (State's) *Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options* to ensure that all applicable beneficial uses are fully attained.

This ARP includes and is based upon calculations that identify the maximum amount of indicator bacteria and trash pollutants that the lower Tijuana River can receive and still attain applicable water quality standards. The conclusion is that to attain water quality standards in the river, indicator bacteria and trash loads must be reduced by preventing them from being discharged into the river.

This ARP identifies numeric targets protective of public health and wildlife for *E. coli* and enterococci equivalent to their respective water contact recreation (REC-1) WQOs in the Basin Plan. These concentrations are based on a health risk of 32 illnesses per 1,000 exposed individuals for recreational waters. The numeric target for trash is zero and is derived from narrative WQOs in the Basin Plan and is consistent with the State Water Board Trash Amendments.

Indicator bacteria and trash pollution in the lower Tijuana River are generated from point and nonpoint sources of pollution in the U.S. (upper and lower watershed) and Mexico. However, the only significant sources of indicator bacteria and trash causing the impairments are routine and episodic transboundary flows from Mexico often comprised of untreated domestic wastewater, industrial wastewater, and storm-driven flows. U.S. sources do not contain sufficient pollutants to cause the documented impairments.

To restore beneficial uses, the pollutants in transboundary flows must be reduced substantially. Even if it were possible to eliminate the indicator bacteria and trash loads generated in the U.S., the river impairments would not change due to transboundary pollution.

The U.S. Section of the International Boundary and Water Commission (USIBWC) is the federal agency responsible for providing binational solutions to issues that arise during the application of U.S.-Mexico treaties regarding water rights, sanitation, water quality, and flood control in the border region. USIBWC's responsibilities pertain to U.S.-side planning and implementation. USIBWC generally coordinates these responsibilities with its Mexican counterpart (MxIBWC) to comprehensively address issues.

Most of the Tijuana River Valley transboundary flows are conveyed by the following infrastructure owned and operated by USIBWC just north of the U.S.-Mexico border:

- Tijuana River Flood Control Channel (main channel)

- Five cross-border tributaries with canyon collectors:
    - Stewart’s Drain
    - Silva Drain
    - Canyon del Sol
    - Smuggler’s Gulch
    - Goat Canyon

The cross-border tributary through Yogurt Canyon is also considered a significant nonpoint source, but USIBWC does not operate a canyon collector at that location. The storm water conveyances in Yogurt Canyon are owned and maintained by the U.S. Department of Homeland Security (DHS).

The transboundary flows conveyed from Mexico through USIBWC and DHS infrastructure into the Tijuana River Valley are heavily polluted due to lack of effective wastewater and trash management in Tijuana. Monitoring indicates that most of the indicator bacteria pollution in transboundary flows is anthropogenic because of the consistent presence of human waste due to the poor condition of sewage collection infrastructure and to intentional domestic waste discharges to surface waters and land in Mexico.

A TMDL calculation for a given water body/pollutant combination is based on the amount of pollutant the water body can receive without experiencing impairments to WQOs (referred to as loading capacity), with a margin of safety applied to account for any uncertainties. When a TMDL is established, load allocations (LAs) are assigned to existing or future nonpoint sources of pollution or to natural background sources and wasteload allocations (WLAs) are assigned to existing and future point sources of pollution.[2] This ARP identifies potential LAs and WLAs to inform the actions of the San Diego Water Board and responsible parties as they consider appropriate management measures and assessment actions to attain water quality standards in the lower Tijuana River.

[2] U.S. Environmental Protection Agency (USEPA) regulations define LA as the portion of a receiving water’s loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loads should be distinguished (40 CFR § 130.2(g)). USEPA defines WLA as the portion of a receiving water’s loading capacity that is allocated to one of its existing or future point sources of pollution (40 CFR § 130.2(h)).

In the case of indicator bacteria in the lower Tijuana River, the loading capacities and corresponding pollutant load calculations are derived from levels (concentrations) of *E. coli* and enterococci that represent currently acceptable health risks in recreational waters.

The loading capacity and corresponding pollutant load calculation for trash in the lower Tijuana River are derived from narrative WQOs in the Basin Plan and State Water Board Trash Amendments. The trash pollutant load calculation is the maximum quantity that ensures the prevention of adverse impacts to beneficial uses. The trash LAs and WLAs identified in this ARP are equivalent to the numeric target.

This ARP relies on calculations to estimate load reductions for significant sources (transboundary flows) to meet water quality objectives for indicator bacteria. A statistical rollback method was used by applying the statistical characteristics of the indicator bacteria concentration distributions at each source to estimate future concentrations after abatement processes are applied. The resulting required reductions are up to 99% for all significant sources.

This ARP includes an implementation plan/schedule that describes recommended management measures and assessment actions to ensure that WQOs are achieved in the lower Tijuana River. This includes: (1) assessing compliance with existing waste discharge requirements (WDRs) and National Pollutant Discharge Elimination System (NPDES) permits, and if necessary and appropriate amending such WDRs and NPDES permits to include additional requirements, including, but not limited to updated monitoring and reporting programs and (2) developing agreements and projects with responsible parties to better assess, clean up, and control indicator bacteria and trash.

This ARP identifies reasonable schedules for responsible parties to reduce discharges of indicator bacteria and trash such that the WQOs should be achieved within seven years for indicator bacteria and a progressive reduction of trash loading achieved within five to nine years. These are reasonable timeframes for the significant sources of pollutants being conveyed by transboundary flows given that a broad range of potential projects have already been evaluated (see, e.g., *Tijuana River Valley Needs and Opportunities Assessment* [SB 507 NOA] and United States-Mexico-Canada Agreement [USMCA] Comprehensive Infrastructure Solution) and $400 million of federal funding has been appropriated by the U.S. Congress to address significant sources of pollutants at the border.

As part of the USMCA, the U.S. Environmental Protection Agency (USEPA) evaluated and developed a Comprehensive Infrastructure Solution that includes reduction of sewage releases in Mexico and river diversions and treatment systems in the U.S. that are likely to result in attainment of WQOs for indicator bacteria and progressive reductions in trash loading in the Tijuana River (PG Environmental, 2021). In addition, pursuant to Minute 320, approved in 2015, the International Boundary and Water Commission (IBWC) plans to develop a binational water quality improvement plan that will include project analyses similar to the SB 507 NOA, which will also include projects in Mexico. The projects will be prioritized by the Minute 320 binational core group and technical work groups and be considered by the IBWC commissioners in 2025.

The seven-year timeframe for indicator bacteria and five to nine-year timeframe for trash are also reasonable for U.S. sources of pollutants since the contributions from these sources are relatively minor and, in general, the controllable sources are currently regulated.

1 INTRODUCTION

The lower Tijuana River refers to the stretch of the Tijuana River that crosses the border from Mexico into the U.S., traverses the Tijuana River Valley and the Tijuana River Estuary, and ultimately flows into the Pacific Ocean.[3] This stretch of the river is approximately six miles in length. The existing and potential beneficial uses of the lower Tijuana River, including the estuary, are as follows (San Diego Water Board, 2021):[4,5]

1. Contact Water Recreation (REC-1)
2. Non-Contact Water Recreation (REC-2)
3. Preservation of Biological Habitats of Special Significance (BIOL)
4. Warm Freshwater Habitat (WARM)
5. Wildlife Habitat (WILD)
6. Rare, Threatened, or Endangered Species (RARE)
7. Industrial Service Supply (IND)
8. Commercial and Sport Fishing (COMM)
9. Estuarine Habitat (EST)
10. Marine Habitat (MAR)
11. Migration of Aquatic Organisms (MIGR)
12. Spawning, Reproduction, and/or Early Development (SPAWN)
13. Shellfish Harvesting (SHELL)

[3] The river mouth is generally open year-round. This maintains a hydrologic connection between the river and ocean (river flows and tidal influence).

[4] Beneficial use designations of the lower Tijuana River and the estuary also apply to their respective tributaries (San Diego Water Board, 2021).

[5] With the exception of WARM and EST, these beneficial uses are also designated for the Pacific Ocean, into which the Tijuana River flows. In addition, Navigation (NAV) and Aquaculture (AQUA) are designated beneficial uses for the Pacific Ocean.

These water bodies and their recreational and ecosystem beneficial uses are impaired by pollutants that cross the border into the U.S. Pollutants generated in the relatively small U.S. portions of the Tijuana River watershed may also be transported to the river, estuary, and ocean.

Pollutants are conveyed by dry season and storm-driven flow events in the main river channel and six cross-border (transboundary) tributaries into the Tijuana River Valley (within the lower watershed in the U.S.).[6] This occurs consistently with wet weather flows (i.e., storm-driven flows) and frequently with dry weather flows, polluting the river, estuary, and ocean in the U.S.

The wet and dry weather flows from Mexico contain trash, sediment, wastewater effluent from treatment plants, uncontrolled spills from water and wastewater pipeline breaks, and urban runoff (discharges from residential, industrial, commercial, and other unaccounted-for sources) (Arcadis, 2019). This threatens beneficial uses, public health, and wildlife in and around the river, estuary, and ocean shoreline.

Section 303(d) of the federal CWA establishes a water quality assessment and planning process through which states are required to include impaired water bodies on the 303(d) List. The lower Tijuana River, the Tijuana River Estuary, and the downstream Pacific Ocean shoreline are listed as impaired on the 303(d) List. Per CWA section 303(d), each state shall establish for the water body/pollutant combinations identified on the 303(d) List, a TMDL in order to attain water quality standards (consisting of beneficial uses, WQOs, and an antidegradation policy).

However, USEPA recognizes that under certain circumstances, non-TMDL restoration plans may be more immediately beneficial or practicable in achieving water quality standards than pursuing a conventional TMDL, in the near-term. This includes ARPs (USEPA, 2015; USEPA, 2023). ARPs are designed to address impairments for waters that will remain on the 303(d) List while restoration activities are implemented prior to conventional TMDL development.

The San Diego Water Board has chosen to develop this ARP, in advance of a conventional TMDL, as a more immediately effective way to address impairments in the lower Tijuana River due to the unique binational circumstances, an obvious significant source of pollution, collaborative willingness of the primary responsible party, well developed project proposals to address the pollution, time sensitivity of securing federal project funding, and the flexibility for adaptive implementation. This ARP meets the federal requirements for addressing impairments in a way that is consistent with the goal of the State's *Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options* to ensure that all applicable beneficial uses are fully attained.

[6] The entire lower U.S-side watershed is referred to as the Tijuana River Valley Hydrologic Area. The Tijuana River Valley is located in the southwest portion of the Tijuana River Valley Hydrologic Area.

Although this is not a conventional TMDL, this ARP contains elements of a conventional TMDL analysis to provide an underlying scientific basis for the actions outlined in Section 8.4 (Implementation Plan) to attain water quality standards in the lower Tijuana River.

These key elements are recommended by the USEPA and would be required for conventional TMDL development in the future (USEPA, 2002):[7]

1. Identification of water body, pollutant of concern, pollutant sources, and priority ranking.
2. Applicable water quality standards and numeric water quality targets.
3. Loading capacity.
4. Load allocations and/or wasteload allocations.
5. Margin of safety.
6. Consideration of seasonal variation.
7. Reasonable assurance for point and nonpoint sources.
8. Monitoring plan to track ARP effectiveness.
9. Implementation plan.
10. Public participation.

Although the ARP pertains to indicator bacteria and trash in the lower Tijuana River specifically, controlling the sources of indicator bacteria and trash is expected to improve water quality in the estuary and ocean shoreline as well since they are hydrologically connected to the main channel of the river.

[7] In May 2002, USEPA issued review guidelines for TMDL submissions in *Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992*.

2 PROBLEM STATEMENT

The purpose of this section is to provide background information and to discuss impairments in in the lower Tijuana River.

2.1 Tijuana River Watershed Description

The Tijuana River watershed is the southernmost watershed in the San Diego Region. It is located along the U.S.-Mexico border and is approximately 1,750 square miles in area. Over two-thirds of the watershed's area is in Mexico (Baja California) and less than one-third of its area is in the U.S. (California). It is set in a Mediterranean, dry summer, subtropical climate, where most of the precipitation occurs as rainfall from January to March. Annual rainfall varies throughout the watershed, ranging from approximately 5.9 to 25.6 inches (Tijuana River Valley Recovery Team, 2012). According to measurements taken between 1971 and 2001, the average rainfall in the lower watershed is approximately 8.5 inches (Lee, 2021).

The upper watershed on the U.S. side is sparsely populated. Morena Reservoir and Barrett Reservoir, which are owned and operated by the City of San Diego, are located in the upper watershed (Figure 2.1) and capture a significant amount of the surface water flows. Hence, only a small portion of the upper watershed surface water from the U.S. crosses the international border south into Mexico.

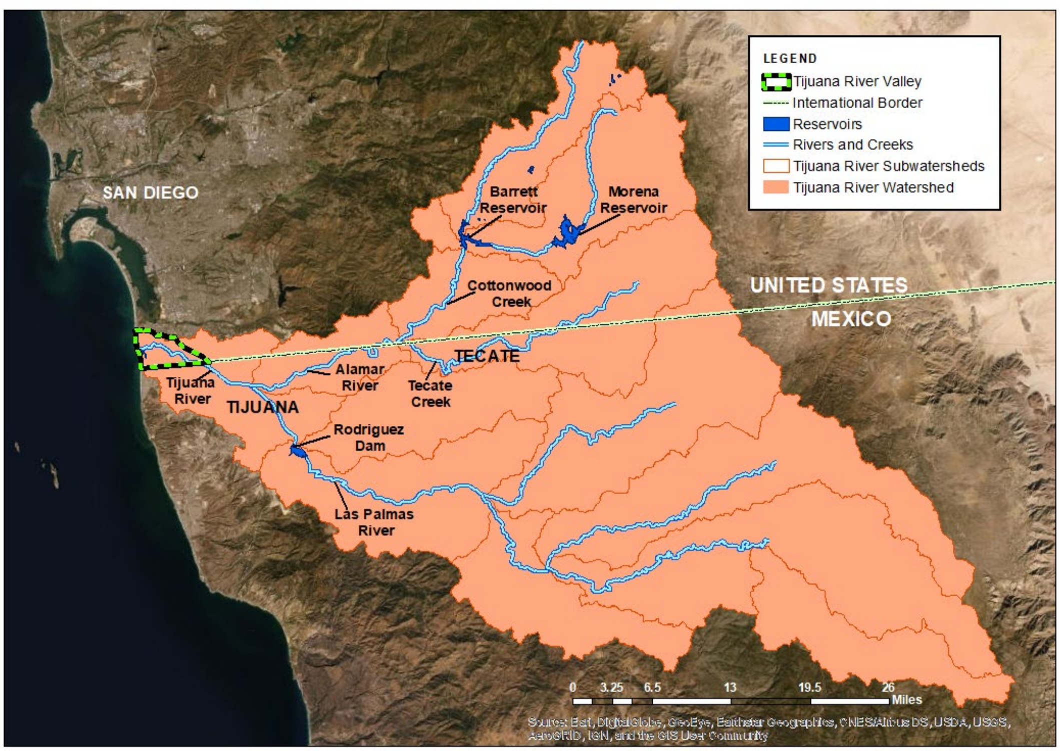
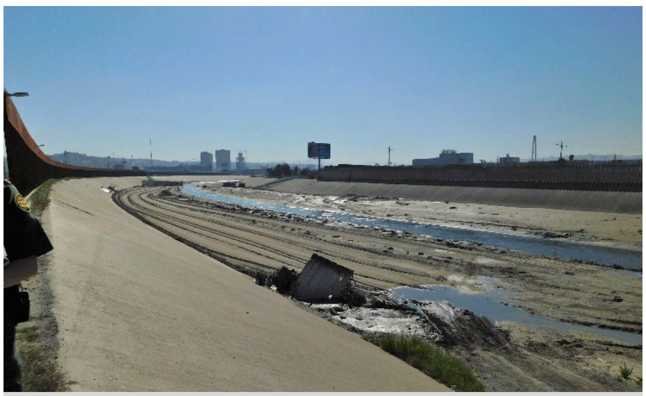


Figure 2.1 Tijuana River watershed

The Tijuana River is formed in Mexico by the confluence of the Alamar River and Las Palmas River, about 4.5 miles southeast of Tijuana. The Alamar River is fed by Cottonwood Creek and Tecate Creek, which have their confluence just north of the border near Tecate. Las Palmas River flows out of the mountains into a reservoir behind Rodríguez Dam in Tijuana (Figure 2.1).

Downstream of Rodríguez Dam, water flows comingled with discharged wastes in a 6.6-mile-long concrete flood control channel through Tijuana to the border. These flows contain treated wastewater effluent and sewage that has leaked or spilled from the sewage collection systems in Mexico (USEPA, 2014). From the border, the concrete channel continues northwest, for approximately 1,223 feet, into a grouted energy dissipator, for approximately 3,700 feet, that then becomes an unlined channel (collectively, the Tijuana River Flood Control Channel) (USIBWC, 2005).



Lined portion of Tijuana River Flood Control Channel (facing upstream)

The Tijuana River Flood Control Channel is owned and operated by the USIBWC from the border to just downstream of Dairy Mart Bridge.[8] Downstream of the USIBWC Tijuana River Flood Control Channel, the flows are conveyed through the Tijuana River Valley.

The valley consists of a broad natural floodplain containing a variety of wetland and riparian areas. A wide swath of the valley in the U.S. is in the 100-year floodplain. The river flows through the Tijuana River Estuary and ultimately to the Pacific Ocean.

More than 80 percent of the total watershed is undeveloped (Figure 2.2) and most of the urban development in the watershed is in Mexico (USEPA Region 9 and San Diego Water Board, 2009). In Mexico, the cities of Tijuana and Tecate are the largest urban developments in the watershed and are located immediately south of the international border. The populations of Tijuana and Tecate are approximately 2 million and 108,440, respectively.[9]

[8] IBWC is a joint commission with distinct U.S. and Mexican sections (USIBWC and MxIBWC, respectively).

[9] National System of Statistical and Geographic Information 2020 Census

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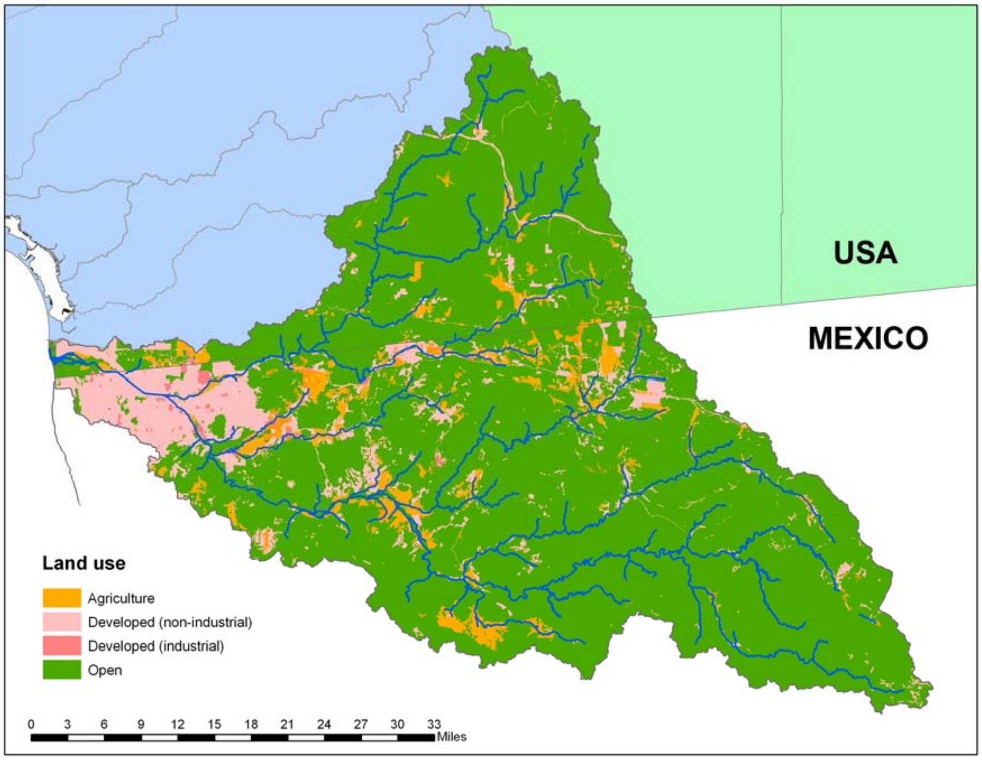

Figure 2.2 Land development in the Tijuana River watershed

On the U.S. side, portions of the County of San Diego and the cities of Imperial Beach and San Diego are in the lower watershed. The bulk of urban development on the U.S. side is north of the lower Tijuana River (Figure 2.2). The estimated population of the U.S. portion of the Tijuana River watershed in 2012 was 82,000 with projected growth to reach 119,000 by 2020 (Weston Solutions, 2012).

On the U.S. side of the watershed, the land is predominately undeveloped (60.3%) or parks (25.3%) (Weston Solutions, 2012). Other land uses include residential (7.3%), agriculture (2.9%), transportation (2.4%) with a mixture of commercial, recreation, industrial, construction, military and public facilities making up less than 2% of the total area (Weston Solutions, 2012).

2.1.1 Lower Tijuana River Watershed Features and Flow Characteristics

Between the location where the Tijuana River crosses the border from Mexico into the U.S. and where it reaches the Pacific Ocean shoreline, the river traverses the sparsely populated Tijuana River Valley. The Tijuana River Valley is a fan-shaped drainage area approximately six miles in length and approximately three miles wide at the shoreline. Its area is less than 1 percent of the total watershed area.

The lower Tijuana River can be characterized as a braided alluvial stream that shifts widely across the Tijuana River Valley floor during flood events forming an alluvial floodplain. Flows in the main channel naturally flow to the northwest. During dry weather, these flows are sometimes diverted just south of the border and pumped to a Pacific Ocean shoreline discharge point at Punta Bandera, approximately 4.2 miles south of the border. When flows do cross the border, they may reach the Tijuana River Estuary and Pacific Ocean shoreline in the U.S.


Pacific Ocean shoreline near mouth of Tijuana River

Historically, flows in the lower Tijuana River were intermittent and highly variable both seasonally and interannually, with long periods of minimal or no flow punctuated by infrequent high flow events (San Francisco Estuary Institute-Aquatic Science Center, 2017).

Since 1978, occurrences and durations of main channel flows crossing the international border (transboundary flows) have increased (USEPA Region 9 and San Diego Water Board, 2009). This is likely due, in large part, to channelization of the river as recommended in 1967 by IBWC for flood control purposes. In Tijuana, this consists of the aforementioned concrete flood control channel. Its original construction was completed in early 1979. This channelization eliminates most instream infiltration and evapotranspiration losses that had historically been present. In addition, in the late 1970s, the population of Tijuana began to grow exponentially, which has resulted in increased levels of untreated sewage flows into the flood control channel.

A Tijuana River diversion system just south of the border has been in operation in the main channel since 1991. Dry weather flows under 1,000 liters per second (35.3 cubic feet per second) are generally diverted from the main channel to an ocean shoreline discharge point at Punta Bandera in Mexico.

To the west of where the main channel crosses the border, there are six north-trending tributaries that also cross the border into the valley at Stewart's Drain, Silva Drain, Canyon del Sol, Smuggler's Gulch, Goat Canyon, and Yogurt Canyon.[10] These transboundary flows travel northwest through the valley to the river and estuary and then to the Pacific Ocean shoreline if not otherwise diverted. Infrastructure located just north of where these tributaries cross the border (except at Yogurt Canyon) are designed to divert the transboundary flows during dry weather and pump the flows to the South Bay International Wastewater Treatment Plant (SBIWTP) for treatment.

Nearby beaches in the U.S. along the Pacific Ocean are in the cities of Imperial Beach, Coronado, and San Diego. There are small north-flowing currents close to the shoreline, including the Silver Strand Littoral Cell, which can move pollutants from the Tijuana coastline and the Tijuana River mouth north, impacting water quality at Imperial Beach, Coronado, and San Diego beaches (Kuhn and Shepard, 1984). Modeling based on 2017 wastewater data suggests that wastewater plumes near the ocean shoreline that move north from Mexico increase the rate of illness in swimmers at Imperial Beach, especially during the tourist season (Memorial Day to Labor Day) (Feddersen et al., 2021).

The soils in the valley are predominantly in the Chino and Tujunga series. Chino soils are fine grained with considerable clay content characterized by low infiltration rates and high water-holding capacity. The majority of soil within the valley and surrounding hillsides are fine grained and have moderate to very slow infiltration rates. These soils become highly erodible when disturbed. In contrast, Tujunga soils are coarser grained with higher sand content that have high infiltration rates and low water-holding capacity (USIBWC, 2008). A much smaller area within the valley that traces historical courses of the Tijuana River has soils with high infiltration rates.

The Tijuana River Valley has contiguous beach, dune, salt marsh, riparian and upland ecosystems. The estuary is the largest functioning wetland in Southern California at almost 2,500 acres in size and has been identified by the Ramsar Convention as "wetlands of international importance."[11] It is a highly important salt marsh because over 90 percent of wetland habitat in Southern California has been lost to development. It is also one of the few estuaries and coastal lagoons in Southern California that is not bisected by a railroad or freeway.

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[10] The corresponding names in Mexico for the cross-border canyons/drainages are Dren Puerta Blanca (Stewart's Drain), Dren Silva (Silva Drain), Cañón del Sol (Canyon del Sol), El Matadero (Smuggler's Gulch), Los Laureles (Goat Canyon), and Los Sauces (Yogurt Canyon).

[11] The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

This more natural, less developed state of the estuary supports critical habitat and foraging for endangered and threatened species, shorebirds, and other wildlife. It is part of a nationwide network of federal reserves that protects estuaries and coastal habitats and provides opportunities for environmental research, education, and public recreation (e.g., Tijuana National Estuarine Research Reserve [TRNERR]). The reserve is managed by the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and California State Parks.

Border Field State Park is located in the southwestern corner of the reserve. In addition to supporting wildlife habitat, Border Field State Park also contributes to the Tijuana River Valley's abundant recreational resources. Overall, the Tijuana River Valley contains more than 35 miles of trails for hiking, biking, and equestrian uses. It is largely an undeveloped area between the extensive urban development in the San Diego and Tijuana metropolitan areas. Figures 2.3 and 2.4 depict land uses in the Tijuana River Valley.

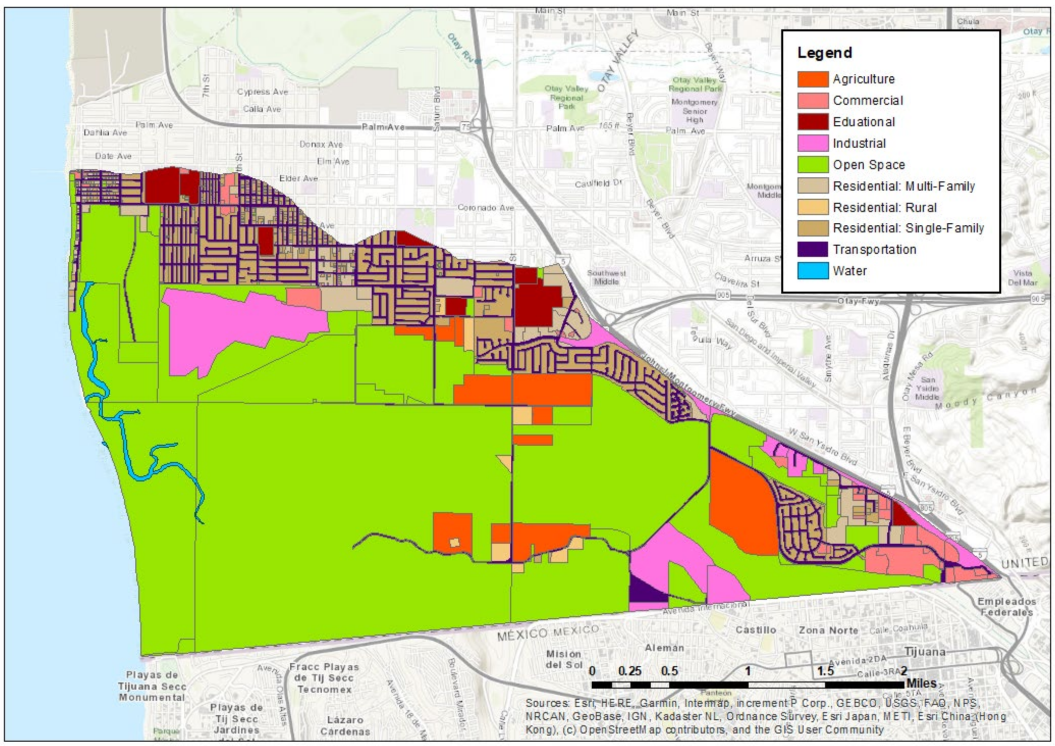

Figure 2.3 Land use map of the Tijuana River Valley

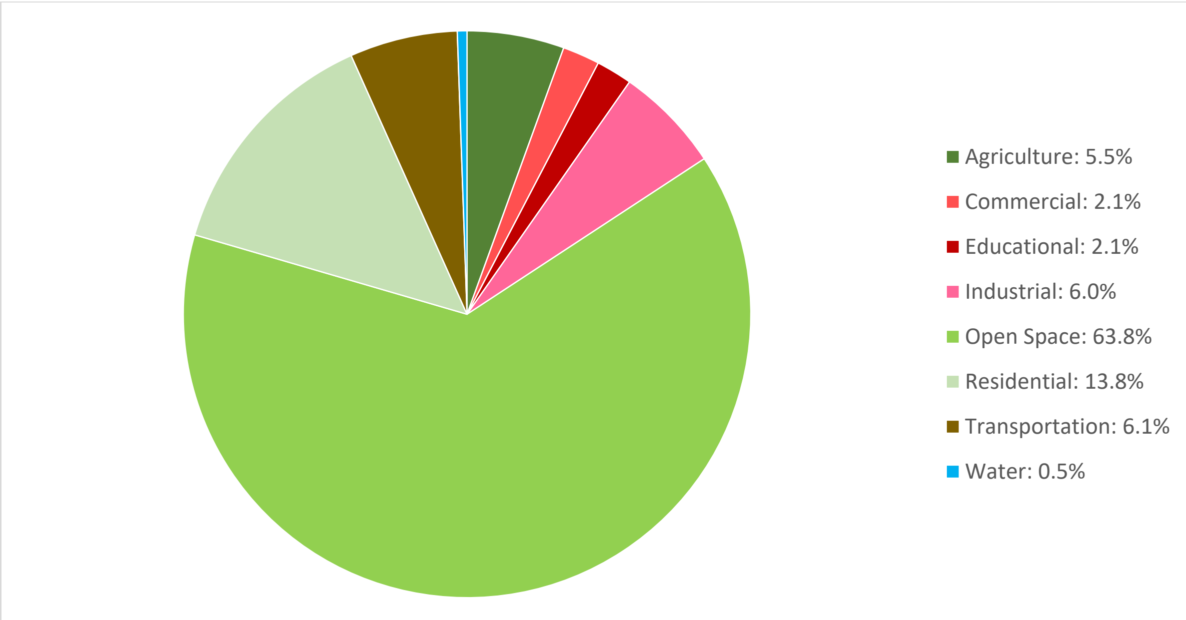

Figure 2.4 Land use within the Tijuana River Valley

The SBIWTP is located in the Tijuana River Valley, near the location where the Tijuana River crosses the border. USIBWC operates the SBIWTP. The purpose of the plant is to reduce dry weather flows of untreated sewage into the U.S. from Mexico. It treats sewage from the Tijuana sewage collection system and dry weather transboundary flows captured in canyon collectors in five of the six cross-border tributaries. The canyon collector system is in the Tijuana River Valley and consists of canyon flow diversion structures in Stewart's Drain, Silva Drain, Canyon del Sol, Smuggler's Gulch, and Goat Canyon. Two pump stations pump the diverted wastes from Smuggler's Gulch and Goat Canyon to the SBIWTP for treatment. The wastes from the other three diversion structures flow by gravity to the SBIWTP.

The SBIWTP provides secondary treatment. The treatment facility is currently permitted to discharge up to 25 million gallons per day (mgd) as a monthly average. The treated wastewater is discharged 3.5 miles from the coastline, into the Pacific Ocean, via the South Bay Ocean Outfall (SBOO).

The San Diego Water Board began regulating discharges of waste from the SBIWTP through an interagency Letter of Understanding, signed by USIBWC, USEPA, and the San Diego Water Board in 1995. Pursuant to the Letter of Understanding, and on November 14, 1996, the San Diego Water Board adopted Order No. 96-50 and National Pollutant Discharge Elimination System (NPDES) Permit No. CA0108928 (USIBWC NPDES Permit).[12] The USIBWC NPDES

[12] NPDES permits are generally renewed every five years. Each renewal is associated with a unique order number. Although order numbers change with each successive renewal, the NPDES number for a given discharge or category of discharges to surface waters is consistent. The current order, Order No. R9-2021-0001, went into effect on July 1, 2021, and was amended on March 8, 2023.

Permit includes requirements for USIBWC to properly operate and maintain the five canyon collectors to ensure that they are able to divert transboundary flows to the SBIWTP during dry weather. It also includes requirements for USIBWC to report spill events and transboundary flow events as defined in the USIBWC NPDES Permit.

2.2 Pollutants in the Lower Tijuana River

Although the overall water quality in the upper Tijuana River watershed on the U.S. side is considered good, water quality in the lower watershed is severely impaired. The San Diego Water Board has identified several "water quality limited segments" in and adjacent to the Tijuana River Valley, which include the Tijuana River, the Tijuana River Estuary, and the coastal shorelines at/near the mouth of the Tijuana River (San Diego Water Board, 2016).[13]

The main channel of the river is a conduit for pollutants generated in Mexico. The pollutants are transported through the river valley and estuary, and into coastal waters, causing severe impairments. Consequently, these surface waters in the U.S. no longer support all designated beneficial uses. The following pollutants are included on the 303(d) List for causing impairments in the lower Tijuana River:

1. Ammonia as Nitrogen
2. Benthic Community Effects
3. Cadmium
4. Chlorpyrifos
5. Diazinon
6. Eutrophic Conditions
7. Indicator Bacteria
8. Low Dissolved Oxygen
9. Malathion
10. Pesticides
11. Phosphorus
12. Sedimentation/Siltation
13. Selenium

[13] A *segment* is a water body (such as a river, lake, or estuary) or portion of a water body. Segments are referred to for water quality management purposes, such as the designation of water quality standards, assessments, issuance of waste discharge requirements, development of TMDLs, and allocation of grant funding. CWA section 303(d)(1)(A) requires states to identify "water quality limited segments" that are impaired by pollutants.

14. Solids
15. Surfactants (Methylene Blue Active Substances)
16. Synthetic Organics
17. Total Nitrogen as N
18. Toxicity
19. Trace Elements
20. Trash

Indicator bacteria, lead, low dissolved oxygen, eutrophic conditions, nickel, pesticides, thallium, toxicity, trash, and turbidity are also included in the 303(d) List for the Tijuana River Estuary. In addition, indicator bacteria are included in the 303(d) List for the adjacent Pacific Ocean shoreline starting from the international border and north through the City of Imperial Beach. The pollution from the Tijuana River commonly impacts water quality at beaches as far north as the City of Coronado.

While the Tijuana River is on the 303(d) List for impairments due to 20 pollutants, control of the sources of indicator bacteria and trash is likely to result in a significant degree of control of the remaining pollutants. A reduction in these pollutants can be expected because they are comingled with indicator bacteria and trash in flows that discharge to the lower river. In particular, transboundary flows are known to contain sewage and polluted urban runoff. Reduction of indicator bacteria and trash requires reduction of sewage and polluted urban runoff entering the Tijuana River Valley. Therefore, the loads and concentrations of other pollutants inherent in sewage and polluted urban runoff will also be reduced.

Although other pollutants will also be reduced with effective implementation of the ARP, they may still impair beneficial uses. Such impairments may be identified by future CWA section 303(d)/305(b) integrated report analyses.[14] This could lead to TMDL development for other pollutants in the lower Tijuana River.

2.2.1 Indicator Bacteria

In this ARP, “bacteria” and “indicator bacteria” refer to fecal indicator bacteria unless otherwise noted. In the context of statewide bacteria objectives, “bacteria” and “indicator bacteria” refer specifically to two types of fecal indicator bacteria: *E. coli* and enterococci.

[14] The CWA requires that states report on the quality of their surface waters every two years. Known as the Integrated Report, in California, it is the result of a collaborative process between the State and regional water boards. California surface waters are assessed to determine if they contain pollutants at levels that exceed water quality standards.

Most strains of indicator bacteria do not cause illness (i.e., they are not pathogens); rather, they indicate the presence of fecal contamination. However, pathogens often co-occur with indicators of fecal contamination. Indicator bacteria in the river, estuary, and coastal waters are of particular concern due to their geographical extent and the high risk to public health from fecal contamination. The lower Tijuana River was first added to the 303(d) List for impairments due to indicator bacteria in 1992. The listing was due to elevated concentrations of *E. coli* and total coliform in the lower Tijuana River.

Statewide bacteria objectives for the protection of water contact recreation (REC-1) are established using *E. coli* and enterococci, as they indicate the likelihood of fecal-origin pathogens in surface waters. These bacteria are part of the intestinal biota of warm-blooded animals. Their presence in surface waters is an indicator of potential pollution.

USEPA recommends that states make a risk management decision regarding estimated illness rate to determine if criteria corresponding to “36 illnesses per 1,000 primary contact recreators” or “32 illnesses per 1,000 primary contact recreators” are most appropriate for their waters (USEPA, 2012). California has chosen the more stringent set of criteria, which apply to the protection of REC-1 beneficial use based on a risk protection level of 32 illnesses per 1,000 recreators (SWRCB, 2018).

The Basin Plan contains *E. coli* and enterococci WQOs associated with recreational exposure to fresh, estuarine, and ocean waters containing fecal bacteria. The very high and frequent *E. coli* and enterococci WQO exceedances in the lower Tijuana River indicate an unacceptable risk of exposure to illness-causing pathogens, which can constrain use of the river for the following recreational activities:

1. REC-1 activities involving body contact with water, where ingestion of water is reasonably possible (e.g., swimming and wading); and

2. REC-2 activities involving proximity to water, which do not normally involve body contact with water, but where ingestion of water is still reasonably possible (e.g., hiking and camping).


Ongoing raw sewage overflow in residential neighborhood of Tijuana

Results from water quality monitoring of transboundary flows from Mexico into the Tijuana River Valley indicate the presence of raw sewage. Many bacteria, viruses, and other pathogenic microorganisms commonly present in sewage lead to severe, even life-threatening, infections. This includes bacterial infections such as cholera, dysentery, salmonella, shigella; viral infections such as hepatitis A and E and those caused by the rotavirus and norovirus; and infections from parasites such as giardia and cryptosporidium.

In addition to human health risks from pathogens, sewage contains a wide variety of additional pollutants that negatively impact the ecosystem beneficial uses of the river/estuary. These beneficial uses are Preservation of Biological Habitats of Special Significance (BIOL), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD) and Rare, Threatened, Endangered Species (RARE), Estuarine Habitat (EST), Marine Habitat (MAR), Migration of Aquatic Organisms (MIGR), and Spawning, Reproduction, and Early Development (SPAWN).

Sewage contains high nutrient loads that have prompted eutrophic conditions and low dissolved oxygen concentrations in the Tijuana River Valley, which are detrimental to most aquatic life. The nutrients in sewage contaminated flows have also been linked to impacts on native plants from invasive shot hole borer beetles (Boland and Woodward, 2019). Sewage also contains surfactants, widely used in detergents and other cleaning products. Surfactants and other materials in sewage have toxic effects on aquatic plants and animals.

The Tijuana River Estuary and Pacific Ocean shoreline adjacent to the river mouth are also impaired by indicator bacteria due to the presence of fecal contamination. Untreated wastewater contributes to high bacterial concentrations resulting in frequent beach closures and creating health risks for recreational users (USEPA and USIBWC, 2022). For years the U.S. beach shoreline from the border (Border Field State Park) to Imperial Beach has been closed on an ongoing basis, and since December 8, 2021, it has been closed continuously. In June 2023, all mayors representing cities within San Diego County signed a letter to the Biden-Harris administration formally requesting a federal emergency declaration for the Tijuana River Valley and shoreline of Imperial Beach due to the public health impacts of fecal contamination and other pollutants. Fecal contamination also threatens safe consumption of filter-feeding shellfish, such as clams, oysters, and mussels (i.e., SHELL beneficial use).

2.2.2 Trash

In this ARP, “trash” refers to improperly discarded waste materials of all sizes generated from anthropogenic sources. This includes waste tires, plastics, metals, glass, paper, and other synthetic or natural materials from residential, commercial, and industrial areas. Trash is a significant pollutant in the lower Tijuana River. The river was first added to the 303(d) List for impairments due to trash in 1998.

The State Water Resources Control Board (State Water Board) Trash Amendments contain narrative WQOs specifically for trash. Trash must not be present in inland surface waters, enclosed bays, estuaries, ocean waters, or along shorelines or adjacent areas in amounts that adversely affect beneficial uses or cause nuisance. The Basin Plan also contains narrative WQOs that do not allow floating materials and suspended and settleable solids to be present in amounts/concentrations that adversely affect beneficial uses or cause nuisance.

Trash in the Tijuana River Flood Control Channel

Large quantities of trash in/deposited by transboundary flows from Mexico into the Tijuana River Valley are consistently observed and reported by stakeholder agencies and the general public. The trash is generally comingled with sediment, vegetation, and other wastes present in the transboundary flows. Trash in the valley creates conditions of pollution, contamination, and nuisance. It compromises use of the river for recreational beneficial uses, including activities involving proximity to water which do not normally involve body contact with water, but where ingestion of water is still reasonably possible.

Trash also presents pathogen threats as it promotes vectors. For example, a waste tire with standing water inside provides an ideal breeding habitat for Aedes aegypti, a competent mosquito vector of dengue, Zika, yellow fever, and chikungunya (Souza-Neto, Powell, and Bonizzoni, 2018).

Trash is a threat to the river’s ecosystem beneficial uses as well. Most of the trash found in the river is composed of plastics, which degrade and break down into small fragments. Plastic fragments can concentrate toxins in runoff and contaminate seafood (Rochman et al., 2013; Smith et al., 2018). Trash accumulates in and degrades the value of the habitat of the tidal wetlands. While often hidden by marsh vegetation, the habitat in some locations is covered with an almost solid mat of trash (TRNERR, 2010). Conditions in Tijuana, such as rapid population growth, that strain waste management in the Tijuana region contribute to rafts of litter that flow across the border and into the ocean (Hoellein and Rochman, 2021).

Mammals, turtles, birds, fish, and crustaceans may ingest or be entangled in larger trash, which can be detrimental to their health or even fatal. Trash can alter habitats and render them unsuitable for freshwater, estuarine, and marine life. Negative impacts from trash on aquatic life beneficial uses are discussed in the State Water Board's April 2015 staff report on the Trash Amendments (SWRCB, 2015).

In addition to the lower Tijuana River, the Tijuana River Estuary is impaired by trash.

2.3 Climate Change

According to the Intergovernmental Panel on Climate Change (IPCC), climatic changes directly related to increasing average and extreme temperature can be attributed to human activity and include the following:

1. More extreme precipitation and flooding events.
2. Longer and hotter summertime heat waves.
3. More frequent, intense, and longer lasting droughts.
4. Sea level rise (IPCC, 2022).

These conditions are expected to increase the variability in Tijuana River flow characteristics. A study using a macroscale hydrologic model for the Tijuana River watershed predicts a 2% reduction of runoff for each 1% reduction in precipitation; a 3% reduction of runoff from a 1-degree Centigrade increase in average temperature; and end-of-century temperature increases of 1 to 3 degrees, depending on assumed greenhouse gas emission rates (Das et al., 2010).

2.4 Project Purpose and Background

In October 2018, the San Diego Water Board adopted a prioritized list of proposed Basin Plan revisions developed through the 2018 Basin Plan triennial review, which included this project, "Tijuana River Valley Water Quality Restoration."[15] This resulting ARP builds upon a long history of efforts aimed at controlling wastes that are discharged into the lower Tijuana River. The purpose of the ARP is to determine indicator bacteria and trash loading capacities of the lower Tijuana River and to allocate those loads among pollutant sources, so the appropriate control actions are taken, and water quality standards are attained.

[15] California Water Code section 13240 requires a periodic review of the Basin Plan and CWA section 303(c)(1) requires a triennial review of water quality standards

Significant volumes of discharges to the lower Tijuana River originate from Tijuana, one of the largest and fastest growing urban regions in Mexico. The rapid growth of the region has placed a significant ongoing burden on public water and wastewater infrastructure and services for decades. Sanitation services to collect and treat sewage have not kept up with the demand for these services (i.e., generation of sewage). The lack of sufficient infrastructure and the poor condition of critical wastewater collection lines, pumps, and Tijuana's main wastewater treatment plant, San Antonio de los Buenos wastewater treatment plant, results in approximately 30 percent of Tijuana's wastewater entering the river and/or ocean without treatment (Arcadis, 2019). Some of this wastewater, and other wastes the river transports (i.e., trash), crosses into the Tijuana River Valley in the U.S. Since federal and State environmental regulatory agencies in the U.S. do not have jurisdiction in Mexico, they do not have authority to regulate discharges of wastes in Mexico.

To address the Tijuana River watershed border sanitation issues specifically, the two sections of IBWC exercised their sole discretion and adopted the five minutes described below to the 1944 U.S.-Mexico treaty, *Utilization of the Colorado and Tijuana Rivers and of the Rio Grande* (1944 Water Treaty).[16] In response to its obligations in these minutes, USIBWC built infrastructure to engage in activities subject to NPDES permitting.

> **Minute 270, *Recommendations for the First Stage Treatment and Disposal Facilities for the Solution of the Border Sanitation Problem at San Diego, California/Tijuana, Baja California***, was approved by both federal governments in 1985 as the last paragraph of Article 3 of the 1944 Water Treaty (IBWC, 1985). In this minute, IBWC agreed that transboundary flow pollution is to be given preferential attention in future planning and construction of infrastructure improvements, including expansion of sewage collection capacity in Tijuana to meet anticipated demands. Minute 270 also recognizes that littoral currents in coastal waters can carry Tijuana wastewaters that are discharged to the ocean south of the border northward onto beaches in south San Diego, impairing beneficial uses.

> **Minute 283, *Conceptual Plan for the International Solution to the Border Sanitation Problem in San Diego, California/Tijuana*, *Baja California***, was approved by both federal governments in July 1990 (IBWC, 1990) and provided the framework for designing, constructing, and operating an international sewage collection system and secondary treatment plant. Minute 283 laid the foundation for the construction and

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[16] The 1944 Water Treaty between the U.S. and Mexico created a joint commission with federal agencies on both sides of the border to provide binational solutions to issues that arise in the border region related to ownership of waters, sanitation, water quality, and flood control. The treaty, as amended, assigns the responsibilities for transboundary flows to IBWC. USIBWC shares responsibility for addressing border sanitation problems, including transboundary flows, with its Mexican counterpart, MxIBWC).

operation of the SBIWTP to address the uncontrolled sewage flows from Tijuana into the Tijuana River Valley.

Although Mexico has the primary responsibility for preventing the discharge of wastewater to receiving waters in the Tijuana River Valley per IBWC Minute 283, USIBWC also has a role. This includes assisting with equipment, maintenance, and resources in the containment of wastewater discharges through utilization of the canyon collectors, which are intended to collect and divert untreated sewage and other dry weather transboundary flows to the SBIWTP for treatment.

Minute 283 also led to a river diversion structure and pump station (Pump Station CILA) in Tijuana that divert dry weather flows from the Tijuana River. The flows are diverted to a Pacific Ocean shoreline discharge point at Punta Bandera, approximately 4.2 miles south of the U.S./Mexico border or can be diverted to the SBIWTP or another wastewater treatment plant in Tijuana, depending on how Comisión Estatal de Servicios Públicos de Tijuana (CESPT) configures the collection system.[17] The river diversion structure is not designed to collect wet weather river flows nor any river flows over 1,000 liters per second (35.3 cubic feet per second) and often fails at diverting flows under 1,000 liters per second due to lack of proper operation and maintenance.

Minute 298, *Recommendations for Construction of Works Parallel to the City of Tijuana, B.C. Wastewater Pumping and Disposal System and Rehabilitation of the San Antonio de los Buenos Treatment Plant*, was approved by both federal governments in 1997 and focuses on proposed projects to improve the collection, conveyance, and treatment of sewage generated in Tijuana (IBWC, 1997). Under this minute, Mexico's federal government and Baja California's state government are responsible for the design and construction of all work done in Mexico. The U.S. federal government is responsible for the design and construction of all work done in the U.S.

Minute 320, *General Framework for Binational Cooperation on Transboundary Issues in the Tijuana River Basin*, was approved by both federal governments in 2015 and establishes a framework of binational collaboration to address trash, sediment, and water quality issues (IBWC, 2015). It recognizes that the many stakeholders on both sides of the border are interested in an improved binational dialogue to identify joint cooperative opportunities to address the ongoing trash, sediment, and water quality problems that threaten the watershed's natural resources. The minute establishes an executive-level binational core group, consisting of representatives from IBWC, federal, state, and local governments, as well as a limited number of non-governmental organizations (NGOs) from both sides of the border.

Minute 328, *Sanitation Infrastructure Projects in San Diego, California - Tijuana, Baja California for Immediate Implementation and for Future Development*, was

[17] CESPT is the Baja California water utility for the City of Tijuana.

approved by both federal governments in 2022 and outlines specific projects planned for 2022-2027 and potential projects for the unspecified future.

Due to its obligations in these minutes, USIBWC owns and operates infrastructure in the Tijuana River Valley, including the SBIWTP, main channel, and five canyon collectors. Transboundary wastes flow across the border through USIBWC infrastructure and enter the lower Tijuana River. These transboundary waste flows do not meet WQOs.

In addition to the lack of sufficient wastewater infrastructure and services, trash management services and infrastructure have not kept up with the generation of trash in Tijuana either. Due to a lack of trash receptacles in public places and lack of collection of trash in the receptacles that are available, litter is prevalent in Tijuana. Municipal trash collection services do not exist in some areas of Tijuana. Several reasons contribute to the lack of municipal trash collection services in Tijuana, including lack of government funding, lack of planning in residential communities (e.g., unregulated settlements), and inability for municipal trash collection trucks to access residential communities (i.e., poor road conditions, such as steep slopes and gully erosion). The result is that the generation of trash exceeds the capacity of municipal collection and disposal services in Tijuana.

Residents that lack these services often haul their trash to dump sites or pay private haulers to do so. These dump sites exist throughout Tijuana; however, they are often not engineered landfills. These dump sites are generally empty properties, occupied private properties with owners that allow dumping in exchange for payment, or canyon slopes. Often, trash is burned at the dump sites (Institute for Regional Studies of the Californias [IRSC] and Department of Geography at SDSU, 2005). When it rains, litter, trash, and burn ash from dump sites are transported by storm water flows into natural and manmade channels. Some of the trash is carried across the border by these transboundary flows and deposited into the Tijuana River Valley.

There are also many industries in Tijuana, such as assembly plants for electronics, medical devices, and automotive parts. Hazardous wastes generated by these industries are sometimes disposed of improperly, similar to the residential dumping described above (IRSC and Department of Geography at SDSU, 2005).

Trash capture in Goat Canyon sediment basin

In 2005, after sediment deposition from transboundary flows destroyed valuable estuarine habitat, California State Parks invested nearly $6 million in constructing two sediment basins in Goat Canyon (Border Field State Park). Each of the two in-series basins contain a barrier system to capture trash and can cumulatively hold up to 60,000 cubic yards of trash and sediment. The cost to the State to maintain these basins is nearly $2 million a year. Although the sediment basins intercept substantial volumes of sediment and trash, some still escapes and flows to the estuary. No other structures have been installed to control the sediment and trash crossing the border into the Tijuana River Valley.

In 2009, responding to public complaints and concerns regarding trash, sediment, water pollution, and flooding in the Tijuana River, the San Diego Water Board convened the organizations that eventually formed the Tijuana River Valley Recovery Team (Recovery Team). Since 2009, the San Diego Water Board has led the Recovery Team and its steering committee of local, State, and federal agencies, and NGOs. By Resolution No. R9-2012-0030, the San Diego Water Board endorsed the Recovery Team's collaborative, multi-agency approach to addressing the issues in the Tijuana River Valley through a strategic approach—the *Tijuana River Valley Recovery Strategy: Living with the Water* (Recovery Strategy). In 2014, the San Diego Water Board convened a binational summit to update the Recovery Strategy and identify specific projects to advance through the Recovery Strategy and IBWC Minute 320, then in development.

In 2015, the Recovery Team also developed a Five-Year Action Plan that included these projects. Subsequently, the San Diego Water Board adopted Resolution No. R9-2015-0035, which strongly endorsed and encouraged the immediate implementation of the Five-Year Action Plan. At the time, the San Diego Water Board undertook the Five-Year Action Plan in good faith, in lieu of utilizing its substantial regulatory authorities, including development of TMDLs, enforcement orders, and litigation. The government agencies and NGOs participating on the Recovery Team steering committee submitted letters of commitment to work within the Recovery Team.

Although the Recovery Team made substantial progress on several projects led by the City of San Diego and U.S. Army Corps of Engineers (USACE), the County of San Diego, and California State Parks, the flows of waste across the border continued largely undiminished. Local and State agency members of the Recovery Team continued to spend millions of dollars annually removing transboundary wastes. Private property owners, residents, visiting members of the public, U.S. Customs and Border Protection (CBP) agents, and U.S. Navy facilities in Imperial Beach and Coronado continued to be impacted by unabated transboundary flows of waste.

Large volumes of transboundary sewage, trash, and sediment continued to impact the Tijuana River Valley as well as the communities of San Ysidro, Imperial Beach, and Coronado. Overall, the collaborative Recovery Strategy approach, while successful in some respects, was ineffective at materially changing the nature, timing, and volume of transboundary flows of wastes.

Despite having invested years into the Minute 320 process, the Recovery Team's efforts have not yielded significant results to reduce transboundary flows of wastes. As a result, the San Diego Water Board chose to develop TMDLs for indicator bacteria and trash and to issue an investigative order to USIBWC for transboundary pollution monitoring and assessment (San Diego Water Board, 2018).[18] Subsequently, the San Diego Water Board developed this ARP as a more immediately beneficial and practicable approach to attain water quality standards, in advance of a conventional TMDL.

In addition, the San Diego Water Board filed a CWA citizen suit against USIBWC for unpermitted discharges from the canyon collectors in violation of the CWA and for violations of its NPDES permit.[19] The California State Lands Commission and the City of San Diego were granted Plaintiff-Intervenor status in the San Diego Water Board's case. Two related cases were also filed by: (1) the City of Imperial Beach, the City of Chula Vista, and the Port of San Diego,[20] and (2) the Surfrider Foundation.[21] In April 2022, the parties to the citizen suit action entered into a settlement agreement to resolve the litigation and improve monitoring, notifications, and control of wastes discharges through the canyon collectors.

[18] Investigative Order No. R9-2020-0030, *An Investigative Order Directing the United States Section of the International Boundary and Water Commission to Submit Technical Reports Pertaining to an Investigation of Pollution, Contamination, and Nuisance from Transboundary Flows in the Tijuana River Valley*. Investigative Order No. R9-2020-0030 was rescinded in 2021. Some of the monitoring requirements from Investigative Order No. R9-2020-0030 were included in San Diego Water Board Order No. R9-2021-0001, as amended by Order No. R9-2023-0009, NPDES Permit No. CA0108928, *Waste Discharge Requirements for the United States Section of the International Boundary and Water Commission, South Bay International Wastewater Treatment Plant, Discharge to the Pacific Ocean through the South Bay Ocean Outfall*.

[19] *People of the State of California, Ex. Rel. The Regional Water Quality Control Board, San Diego Region v. International Boundary and Water Commission, United States Section; Jayne Harkins, in her capacity as Commissioner of the International Boundary and Water Commission, United States Section* (S.D.Cal., Case No. 3:18-cv-02050-JM-LL), filed September 4, 2018.

[20] *City of Imperial Beach et al. v. International Boundary and Water Commission-United States Section et al.* (S.D.Cal., Case No. 18-cv-00457-JM-JMA), filed March 2, 2018.

[21] *Surfrider Foundation v. International Boundary and Water Commission-United States Section* (S.D.Cal., Case No. 18-cv-1621-JM-JMA), filed July 17, 2018.

Tijuana River Valley Needs and Opportunities Assessment

In 2017, public outcry over ongoing threats to public health and degradation of the environment resulting from transboundary flows of waste prompted State Senate Bill 507 (SB 507; Hueso, 2017), which allocated $500,000 to the County of San Diego to commission a study focused on the improvement and protection of natural lands, including the main river channel, in the Tijuana River Valley. In April 2020, the County of San Diego finalized the study and corresponding SB 507 NOA report, which provides a comprehensive review and assessment of current and potential management strategies that could be implemented on the U.S. side of the border to address transboundary flows of sewage, trash, and sediment into the Tijuana River Valley (HDR, 2020a).

SB 507 NOA takes into account the known existing and proposed projects of stakeholders in the Tijuana River Valley to manage transboundary flows of waste, including the following projects:

- Tijuana River Diversion Study (Arcadis, 2019). This study, completed in July 2019, was directed by the North American Development Bank (NADB) in coordination with USEPA, IBWC, CONAGUA,[22] and CESPT. It consists of a transboundary flow analysis, diversion infrastructure and operations diagnostics, and an evaluation of technical alternatives identified as potential infrastructure improvements in the U.S. and/or Mexico for mitigation of the polluted dry weather flows conveyed through the USIBWC Tijuana River Flood Control Channel.

- Feasibility Study for Sediment Basins (Stantec, 2020). This feasibility study for installation of sediment basins in the Tijuana River Flood Control Channel, completed in September 2020, was directed by USIBWC. The feasibility study report includes river hydraulics and sediment transport modeling for existing river conditions and proposed conceptual sediment basin alternatives. The report identifies USIBWC's preferred alternative to address sediment and trash pollution transported by transboundary flows into the USIBWC flood control channel. However, shortly after the report was released in September 2020, USIBWC determined that the preferred alternative was too costly and, to date, has chosen not to implement any of the project alternatives.

- Tijuana River Valley Stakeholder Solution. This is a conceptual solution directed by Surfrider Foundation San Diego County and Dexter Engineering to reduce wastes impacting the Tijuana River Valley. The study was initiated in 2018 and the project concept was presented to stakeholders in November 2018, February 2019, and May 2019. The concept includes an extension and widening of the USIBWC flood control channel, construction of a low-flow diversion and pump system to divert flows from the channel to the SBIWTP, installation of a debris rack to capture trash, and construction of a sediment basin upstream of Dairy Mart Road Bridge.

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[22] The Comisión Nacional del Agua (CONAGUA) is Mexico's national water commission.

The SB 507 NOA also acknowledged the San Diego Water Board's plan to develop indicator bacteria and trash TMDLs. State and local stakeholders, including the San Diego Water Board, adopted a joint resolution that generally endorses the projects identified, developed, and analyzed under SB 507, but specifically endorses these preferred project alternatives:[23, 24]

- SB 507 NOA Matrix Alternative D to intercept, divert, and treat, in compliance with the CWA, as much of the polluted flows from the main channel of the Tijuana River at the SBIWTP as possible (currently estimated at 163 mgd based on the unpermitted carrying capacity of the SBOO) and to discharge that treated effluent through the SBOO; and to study, analyze, and assess the feasibility of constructing an 82-million-gallon basin for additional storage;

- Projects for Smuggler's Gulch (SB 507 NOA Matrix Alternatives L, M, O, and P or combination thereof) and Goat Canyon (SB 507 NOA Matrix Alternatives N, Q and R or a combination thereof) to address flows of polluted water, sediment, and trash; and

- SB 507 NOA Matrix Alternative K to support active sediment and trash management in the main channel of the Tijuana River on an annual basis as envisioned in the Tijuana River Valley Recovery Strategy.

In February 2023, the State Water Board awarded funds to support three water quality improvement projects that were evaluated in the SB 507 NOA:[25]

- Smuggler's Gulch Trash Boom and Sedimentation Basin. This project consists of the construction of a full-scale sediment and trash control basin and dredging to remove accumulated sediment, trash, and debris in Smuggler's Gulch and the Tijuana River Pilot Channel that contributes to flooding in the river valley. The State Water Board will grant the County of San Diego over $4 million for this project.

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[23] San Diego Water Board Resolution No. R9-2019-0246; *Joint Resolution Between the County of San Diego, City of San Diego, City of Imperial Beach, City of Chula Vista, City of Coronado, City of National City, Port of San Diego, San Diego Regional Water Quality Control Board, California State Lands Commission, and Surfrider Foundation Recommending Project Alternatives and Federal and State Actions to Eliminate Detrimental Transboundary Flows of Wastes in The Tijuana River Valley.*

[24] The stakeholders endorsed these projects during the time the SB 507 NOA report was still under development, but its project alternative matrix had already been completed.

[25] On February 2, 2023, the State Water Board announced in a media release that funding from the Division of Financial Assistance was approved to address water quality issues in the Tijuana River Valley as well as the New River.

https://www.waterboards.ca.gov/press_room/press_releases/2023/pr02022023-dfa-funds-projects.pdf

- Tijuana River Trash Booms. This demonstration project consists of the design, construction, operation, and maintenance of a floating trash boom system for two consecutive storm seasons in the concrete-lined portion of the main channel immediately downstream of the border. The information gathered will be used to develop permanent trash control infrastructure. The State Water Board will grant the Rural Community Assistance Corporation over $4.7 million for this project.

- Brown Property Restoration. This project will remediate a contaminated property adjacent along the main channel and restore floodplain and habitat. Significant alterations to the property have altered the river's natural flow; the disruption to the river channel impounds waterborne trash, which decomposes in pools of stagnant water year-round and degrades water quality. The State Water Board will grant the County of San Diego $2 million for this project.

USMCA Comprehensive Infrastructure Solution

Several State and local stakeholders, including the San Diego Water Board, participated in the USEPA-led USMCA Eligible Public Entities Coordination Group (EPECG). The USMCA (effective July 1, 2020) includes an appropriation of $300 million for wastewater infrastructure projects near the U.S.-Mexico border. Participation in the EPECG offered stakeholder agencies an opportunity to promote allocation of funds to high priority projects.

In November 2021, USEPA announced a suite of projects, referred to as the Comprehensive Infrastructure Solution, to receive the USMCA funding. This alternative consists of four "core projects" and six "supplemental projects." The core projects are sufficiently evolved to be ready for decision making and, after completing the National Environmental Policy Act (NEPA) process, are considered to be analyzed in sufficient detail for action to be taken immediately. The supplemental projects, several of which are not yet ready for decision-making, require additional consideration in subsequent tiered NEPA documents prior to decision-making and action (USEPA and USIBWC, 2022). The projects are:

1. Expanded SBIWTP (core project).

2. Flow diversions from El Matadero and Los Laureles for treatment at SBIWTP (core project).

3. Sewage collection system repairs in Mexico (core project).

4. 35 mgd advanced primary treatment plant (APTP) for advanced primary treatment of river flows diverted from Mexico to U.S. (core project).

5. Expansion of future APTP from 35 mgd to 60 mgd (supplemental project).

6. U.S.-side river diversion to APTP (supplemental project).

7. New wastewater treatment plant at San Antonio de los Buenos (supplemental project).

8. Reuse of Tijuana wastewater treatment plant effluent (supplemental project).
9. Reuse of SBIWTP effluent (supplemental project).
10. Trash boom(s) in main river channel (supplemental project).

The goal of the USMCA Comprehensive Infrastructure Solution is to reduce sewage and trash in the river and ocean. The structural realignment of sewers and diverted river flows in Tijuana away from problematic coastal discharge to an expanded and upgraded wastewater treatment facility in the U.S. will significantly reduce river flows and discharges in Tijuana of untreated sewage. USEPA estimates that the Comprehensive Infrastructure Solution projects will result in 76% fewer main channel transboundary flow days and 95% fewer days of impaired beach water quality in Imperial Beach (PG Environmental, 2021). Wastewater modeling suggests that treatment provided at San Antonio de los Buenos, in particular, is an important factor in reducing the rate of illness in swimmers at Imperial Beach (Feddersen et al., 2021).

USEPA and USIBWC coordinate on these projects. In November 2022, they jointly released a programmatic environmental impact statement (PEIS) for the USMCA Comprehensive Infrastructure Solution. The PEIS addresses initial programmatic decisions and establishes a tiering process for subsequent decisions to be made that are supported, in part, by the analysis detailed in the PEIS. In June 2023, USEPA and USIBWC approved a Record of Decision to document the selected alternative analyzed in the PEIS. USIBWC and USEPA selected the USMCA Comprehensive Infrastructure Solution (Core and Supplemental Projects), as it was determined to be the most effective set of projects to address the issue of transboundary pollution of the Tijuana River.

Minute 320 Binational Water Quality Improvement Plan

USIWBC and its Mexican counterpart, MxIBWC, also started the process of reactivating the Minute 320 binational core group and work groups in 2022. Initial efforts immediately following the inception of Minute 320 in 2015 were largely incomplete but in 2025, IBWC plans to develop a binational water quality improvement plan that will include project analyses similar to the SB 507 NOA but to include projects in Mexico as well. The projects will be prioritized by the Minute 320 binational core group and technical work group(s) and considered by the IBWC in 2025.

Projects in Mexico

While this ARP was being developed, Mexican agencies and organizations also implemented projects to control transboundary flows of wastes. This includes WILDCOAST's installation and maintenance of a trash boom in Los Laureles (upstream of Goat Canyon), Proyecto Fronterizo de Educación Ambiental's clean-up and prevention of illegal dumping in Anexa Miramar (community in Los Laureles), and MxIBWC's upgrades at Pump Station CILA (increased capacity to 30 mgd with the addition of chopper pumps).

2.5 Regulatory Framework

Section 303(d) of the CWA requires states to develop lists of water quality limited segments (or impaired water bodies) and TMDLs to address pollutants and restore water quality. An ARP is a near-term plan, or a description of actions, with a schedule and milestones, that is more immediately beneficial or practicable in certain cases to achieving water quality standards. Impaired waters for which a State, territory, or authorized tribe pursues an ARP to achieve water quality standards remain on the 303(d) list and require TMDLs until water quality standards are attained (USEPA, 2023).

The following State policies establish approaches to developing 303(d) Lists and TMDLs:

- *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List*, which describes the process by which the State Water Board and regional water quality control boards comply with the listing requirements of CWA section 303(d).

- *Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options*, which provides guidance to ensure that the impaired waters of the State are addressed in a timely and meaningful fashion.

Conventional TMDLs must conform to the federal Antidegradation Policy described in 40 CFR § 131.12 and State Water Board Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality Waters in California* to protect waters from degradation. While this is not a conventional TMDL, this ARP is nevertheless consistent with the federal and state antidegradation policies.

3 NUMERIC TARGET SELECTION

The purpose of this section is to describe the quantitative (numeric) targets used to calculate pollutant load calculations for indicator bacteria and trash in the lower Tijuana River. Numeric targets are selected based on the water quality standards (i.e., beneficial uses and the WQOs) that are applicable to the water body. When the numeric targets in the water body are met, the water quality standards are expected to be restored.

The numeric targets for indicator bacteria and trash in the lower Tijuana River are set equivalent to their respective WQOs, which are set forth in the Basin Plan.

3.1 Indicator Bacteria

Indicator bacteria numeric targets for the lower Tijuana River are statewide REC-1 WQOs established in the Basin Plan. The WQOs apply to *E. coli* and enterococci and are based on an acceptable health risk for recreational waters of 32 illnesses per 1,000 exposed individuals (SWRCB, 2018).

3.1.1 E. coli

The bacteria WQO for all waters where the salinity is equal to or less than 1 part per thousand (ppth) 95 percent or more of the time during the calendar year is: a six-week rolling GM of *E. coli* not to exceed 100 CFU per 100 mL, calculated weekly, and a statistical threshold value (STV) of 320 CFU/100 mL not to be exceeded by more than 10 percent of the samples collected in a calendar month, calculated in a static manner.

3.1.2 Enterococci

The bacteria WQO for all waters where the salinity is greater than 1 ppth more than 5 percent of the time during the calendar year is: a six-week rolling geometric mean of enterococci not to exceed 30 CFU/100 mL, calculated weekly, with an STV of 110 CFU/100 mL not to be exceeded by more than 10 percent of the samples collected in a calendar month, calculated in a static manner.

3.2 Trash

The trash numeric target for this ARP is zero in or on the water and on the shoreline. The numeric target is derived from the following narrative WQOs:

1. In the Basin Plan:

   a. For floating materials, "Waters shall not contain floating material, including solids, liquids, foams, and scum in concentrations which cause nuisance or adversely affect beneficial uses."

   b. For suspended and settleable solids, "Waters shall not contain suspended and settleable solids in concentrations of solids that cause nuisance or adversely affect beneficial uses."

2. In the State Water Board Trash Amendments (Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California): "Trash shall not be present in inland surface waters, enclosed bays, estuaries, and along shorelines or adjacent areas in amounts that adversely affect beneficial uses or cause nuisance."

3. In the State Water Board Trash Amendments (Water Quality Control Plan for Ocean Waters of California) "Trash shall not be present in ocean waters, along shorelines or adjacent areas in amounts that adversely affect beneficial uses or cause nuisance."

4 DATA INVENTORY AND ANALYSIS

The purpose of this section is to describe data and data analysis used to understand the conditions in the Tijuana River Valley that result in impairments. Data from known sources were used to characterize the conditions. The data were selected based on the San Diego Water Board's knowledge of data available through its programs and involvement with and outreach to the Tijuana River Valley Recovery Team at the time data were being collected for the analyses in the ARP. No new data were collected as part of this effort. Section 5 (Source Analysis) and Appendix C (Load Calculations) include an assessment of annual loads of indicator bacteria and trash from all identified sources.

4.1 Data Inventory

Flow/volume, bacteria, and trash data were compiled from various monitoring sources and studies. The data are provided in Appendix A. Values that were calculated by combining these data from various date ranges estimates do not pertain to a specific year or years, but are meant to provide general approximations of the pollution generated from known potential sources. Although some of the data was collected during the COVID-19 pandemic, this ARP does not assess any potential effects on the data from the COVID-19 pandemic.

4.1.1 Flow/Volume Data

Site-specific flow and volume data span from 2015 to 2021 and were gathered from the sources listed below.

USIBWC Monitoring of Transboundary Wastewater Flows
USIBWC estimated dry weather transboundary flow volumes that passed its canyon collectors, as required by the USIBWC NPDES permit that was in effect from April 2014 through June 2021 (San Diego Water Board Order No. R9-2014-0009, NPDES Permit No. CA0108928).[26, 27]

Tributary Study Funded by the U.S. Department of Justice (USDOJ)
USDOJ funded background analyses and field work conducted in 2019 to document conditions, including hydrologic conditions, of the tributaries that feed the lower Tijuana River (Lee, 2021).

Naval Outlying Landing Field, Imperial Beach (NOLF-IB) Monitoring
From 2018 to 2021, the U.S. Navy estimated wet weather flows from its 15 outfalls that discharge to the Tijuana River Estuary.

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[26] Per the USIBWC NPDES Permit, dry weather is defined as: when the preceding 72 hours have been without precipitation greater than 0.1 inch, based on the Goat Canyon Pump Station rain gauge.
[27] On May 12, 2021, the San Diego Water Board reissued the USIBWC NPDES Permit and adopted Order No. R9-2021-0001. On March 8, 2023, the San Diego Water Board adopted Order No. R9-2023-0009, which amended Order No. R9-2021-0001.

Municipal Separate Storm Sewer System Monitoring
The responsible permittees of the Tijuana River Watershed Management Area (the City of Imperial Beach, the City of San Diego, and the County of San Diego) coordinate and conduct ongoing monitoring, including dry weather flow monitoring, associated with their municipal separate storm sewer systems (MS4s). This monitoring is required by San Diego Water Board Order No. R9-2013-0001 (as amended), NPDES Permit No. CAS0109266 (Phase I MS4 Permit).

4.1.2 Bacteria Water Quality Data

The site-specific *E. coli* and enterococci data span from 2002 to 2021 and were gathered from the sources listed below.

Customs and Border Protection Agency Monitoring
From January to June 2018, DHS conducted monitoring to characterize transboundary wastewater discharges near the Imperial Beach CBP Station. This was done in response to ongoing concerns over the wastes in areas the CBP agents must patrol and the health effects they have experienced while in close proximity to such wastes (e.g., respiratory problems, skin rashes, and chemical burns).

USIBWC Monitoring of Transboundary Wastewater Flows
USIBWC conducted water quality monitoring of dry weather transboundary flows that passed its canyon collectors. The monitoring was a requirement of the USIBWC NPDES permit that was in effect from April 2014 through June 2021 (San Diego Water Board Order No. R9-2014-0009, NPDES Permit No. CA0108928).[28]

Municipal Separate Storm Sewer System Monitoring
The responsible permittees of the Tijuana River Watershed Management Area coordinate and conduct ongoing water quality monitoring as required by the Phase I MS4 Permit.

USIBWC Monitoring at Dairy Mart Bridge
From December 2013 to September 2017, USIBWC contracted with the City of San Diego to conduct weekly monitoring at Dairy Mart Bridge whenever water was flowing past the bridge.

San Diego Water Board Monitoring
In 2017, the San Diego Water Board conducted monitoring in response to public health concerns following a substantial cross-border raw sewage release through the Tijuana River Flood Control Channel.

NOLF-IB Monitoring

[28] On May 12, 2021, the San Diego Water Board reissued the USIBWC NPDES Permit and adopted Order No. R9-2021-0001. On March 8, 2023, the San Diego Water Board adopted Order No. R9-2023-0009, which amended Order No. R9-2021-0001.

From 2018 to 2021, the U.S. Navy collected wet weather enterococci data from one of its outfalls, which discharges to the Tijuana River Estuary.

Tijuana River Bacterial Source Identification Study
This study, conducted by Weston Solutions for the City of Imperial Beach, includes: (1) estimates of enterococci and fecal coliform loading to the lower Tijuana River based on 2008-2011 data and (2) indicator bacteria concentrations in groundwater collected in 2010 and 2011 from monitoring wells in the Tijuana River Valley (Weston, 2012).

IBWC Binational Monitoring
From December 2018 to November 2019, IBWC implemented a monitoring program to collect water and sediment samples (IBWC, 2020). Samples were collected from the Alamar River in Mexico and on both sides of the border in the Tijuana River and the river valley tributaries.

The San Diego Water Board requested the indicator bacteria monitoring results from USIBWC to augment the data inventory for this ARP. However, the data were not provided until the IBWC *Binational Water Quality Study of the Tijuana River and Adjacent Canyons and Drains* report was released to the public in October 2020. The ARP's concentration-based data analyses for the lower Tijuana River and its tributaries had already been completed at that point. However, since no other data were available for Silva Drain, the Silva Drain data in the IBWC report were used for mass loading estimates.

4.1.3 Trash Data

Trash-related data (e.g., excavation volumes, litter generation) were gathered from the sources listed below. At the time analyses were conducted for the ARP, the San Diego Water Board endeavored to gather the most site-specific, or most site-analogous, and recent data available that could be used to approximate trash loading, but much of the data available are from several years ago. However, no significant improvements in trash management have taken place to noticeably reduce deposition in the Tijuana River Valley since the time the sources below were developed.

Regional Trash Generation Rates for Priority Land Uses in San Diego County
Site-specific trash generation rates were not available for the Tijuana River watershed, but rates for some San Diego County land uses were available to estimate trash loads generated in the U.S. (Michael Baker International, 2018). This study does not associate a specific particle size range with the trash generation rates.

Trash TMDL for the Los Angeles River Watershed
The report for the Los Angeles River Trash TMDL also includes trash generation rates based on land uses (LARWQCB, 2007). Since San Diego-specific rates were not available for some land uses, the Los Angeles values were also used to estimate trash loads generated in the U.S. The Los Angeles River Trash TMDL report does not associate a specific particle size range with the trash generation rates.

Report of Trash, Waste Tire and Sediment Characterization

This study was conducted by URS for the California Department of Resources Recovery and Recycling (CalRecycle). It consisted of extensive qualitative and quantitative surveys conducted in 2009 to characterize the nature and extent of trash and sediment in the Tijuana River Valley (URS, 2010). This provided information to help estimate trash density (abundance) for load estimates for this ARP. The study did not specify a particle size range, but the surveys were visual so they pertained to trash large enough to see.

Excavation and Post Storm Observations in the Tijuana River Valley
This study was conducted by the City of San Diego to evaluate the nature and quantity of trash and sediment that had accumulated in Smuggler's Gulch and the Pilot Channel from 2003 to 2009 (City of San Diego, 2011). This provided information to help estimate trash density (abundance) for load estimates for this ARP. The study did not specify a particle size range, but the surveys were visual, so they pertained to trash large enough to see.

Nelson Sloan Management and Operations Plan and Cost Analysis
This study was conducted by AECOM for the County of San Diego and presents options to restore the former Nelson Sloan Quarry, located in the Tijuana River Valley (AECOM, 2016). The report includes estimates of volumes from historical excavations (comingled sediment, trash, and vegetation) performed by the City of San Diego, County of San Diego, and California State Parks.

Tijuana River Watershed Management Area Water Quality Improvement Plan (WQIP)
The Phase I MS4 Permit requires a WQIP for each Watershed Management Area in the San Diego Region. The 2016 Tijuana River Watershed Management Area WQIP includes areas for various land uses, which was used to estimate trash loads (URS, 2016).

Feasibility Study for Main Channel Sediment Basins
This study was conducted by Stantec for USIBWC. The report includes an estimate for cumulative sediment, trash and debris capture based on Light Detection and Ranging (LiDAR) comparison from 2015 to 2019 (Stantec, 2020).

4.2 Evidence of Pollution

Observations, health impacts (e.g., respiratory problems, skin rashes, and chemical burns), and water quality data clearly demonstrate a state of ongoing pollution at the nine key sites in Table 4.1 and Figure 4.1. These are sites within the lower Tijuana River or within its cross-border tributaries, immediately north of the U.S.-Mexico border.

Table 4.1 Key sites in the Tijuana River Valley

Location	Approximate Coordinates	Description
IBWC Gauge	32°32’31.75” N 117°3’1.03” W	Site within the Tijuana River Flood Control Channel (owned by USIBWC) near the U.S.-Mexico border that conveys pollution on an ongoing basis.

Location	Approximate Coordinates	Description
Dairy Mart Bridge	32°32’54.60” N 117°3’52.10” W	Site within the lower Tijuana River at Dairy Mart Bridge impacted on an ongoing basis by pollution conveyed by upstream infrastructure owned by USIBWC.
Hollister Street Bridge	32°33’5.04” N 117°5’2.56” W	Site within the lower Tijuana River at Hollister Street Bridge impacted on an ongoing basis by pollution conveyed by upstream infrastructure owned by USIBWC.
Stewart’s Drain	32°32’25.69” N 17°3’28.19” W	Site of canyon collector (owned by USIBWC) near the U.S.-Mexico border that conveys pollution on an ongoing basis.
Silva Drain	32°32’22.06” N 117°3’55.44” W	Site of canyon collector (owned by USIBWC) near the U.S.-Mexico border that conveys pollution on an ongoing basis.
Canyon del Sol	32°32’21.01” N 17°4’7.18” W	Site of canyon collector (owned by USIBWC) near the U.S.-Mexico border that conveys pollution on an ongoing basis.
Smuggler’s Gulch	32°32’23.28” N 17°5’12.84” W	Site of canyon collector (owned by USIBWC) near the U.S.-Mexico border that conveys pollution on an ongoing basis.
Goat Canyon	32°32’13.20” N 117°5’57.52” W	Site of canyon collector (owned by USIBWC) near the U.S.-Mexico border that conveys pollution on an ongoing basis.
Yogurt Canyon	32°32’7.42” N 117°7’12.23” W	Site of cross-border tributary less than one-quarter of a mile from the Pacific Ocean shoreline that conveys pollution on an ongoing basis

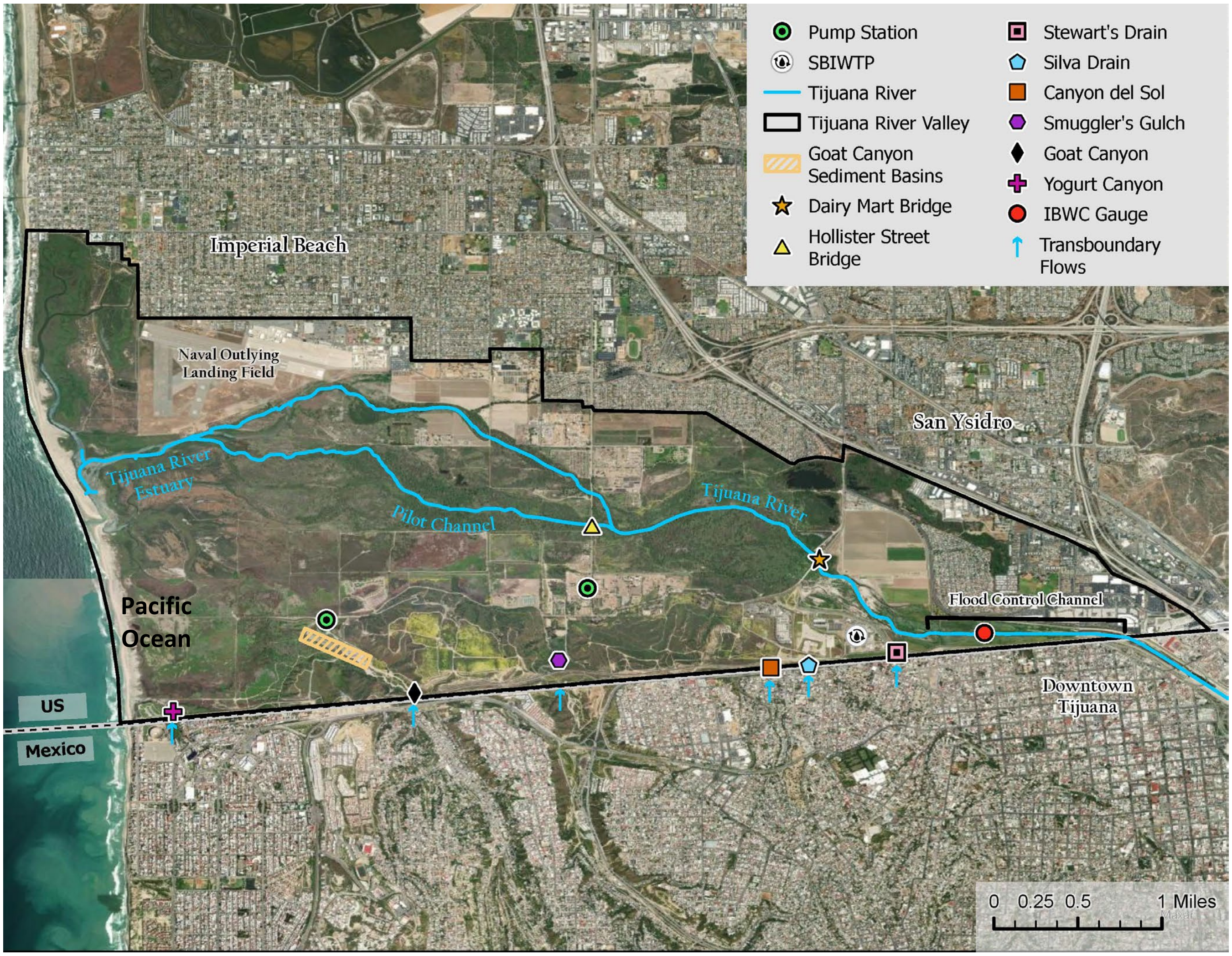

Figure 4.1 Key sites and features in the Tijuana River Valley

The Tijuana River Estuary and adjacent Pacific Ocean shoreline are also severely impacted by transboundary pollution. These areas contain additional sites with impaired waters. However, the focus of this ARP is to address the lower Tijuana River, specifically. The key sites in Table 4.1 and Figure 4.1 pertain specifically to the lower Tijuana River 303(d) listing and the ARP to address indicator bacteria and trash. However, attaining water quality standards in the river is also expected to alleviate impairments in the estuary and ocean shoreline since they are hydrologically connected to the river.

4.2.1 Bacteria

Available *E. coli* and enterococci data from the sources listed in section 4.1.2 confirm that levels are exceedingly high at key sites. Tables 4.2 and 4.3 present minimum, mean (average), and maximum values of the *E. coli* and enterococci data, respectively. The tables also present the frequency of the data's exceedances of established STV WQOs.[29]

Table 4.2 Summary of *E. coli* data at key sites (MPN/100 mL)

Location	Number of Samples	Minimum	Mean	Maximum	Frequency of Exceedance of STV WQO[30]
Dairy Mart Bridge	81	5	1,829,436	14,136,000	81%
Hollister Street Bridge	8	20	889,008	4,611,000	63%
IBWC Gauge	19	134	773,763	6,131,000	84%
Yogurt Canyon	8	10	526	3,450	25%
Goat Canyon	19	7,270	6,692,746	24,196,000	100%
Canyon del Sol	2	889	1,210,445	2,420,000	100%
Smuggler's Gulch	3	105,000	1,648,333	2,420,000	100%
Stewart's Drain	14	61,000	3,701,419	29,899,870	100%

[29] The minimum, mean, and maximum values are in units of most probable number (MPN) per 100 mL; these are the units the data were reported in by analytical laboratories. This is an estimate of the number of bacteria from a field sample based on growing the bacteria in a liquid medium in a laboratory. WQOs, however, are in units of CFU/100 mL. This is also an estimate of the number of bacteria from a field sample—but in this case, based on growing the bacteria in a solid medium in a laboratory. Because both MPN and CFU are used to represent the amount of bacteria present in a field sample, results in MPN and CFU may be directly compared to one another.

[30] The *E. Coli* STV is 320 CFU/100 mL, the 90th percentile value of the geometric mean for *E. Coli* in USEPA 2012 Recreational Water Quality Criteria.

Table 4.3 Summary of enterococci data at key sites (MPN/100 mL)

Location	Number of Samples	Minimum	Mean	Maximum	Frequency of Exceedance of STV WQO[31]
Dairy Mart Bridge	80	5	256,400	4,611,000	83%
Hollister Street Bridge	24	1,700	1,478,821	5,400,000	100%
IBWC Gauge	9	800	561,411	1,600,000	100%
Yogurt Canyon	7	1	1,482	5,000	43%
Goat Canyon	10	3,000	860,600	1,600,000	100%
Canyon del Sol	5	7,500	209,900	500,000	100%
Smuggler's Gulch	3	160,000	660,000	1,600,000	100%
Stewart's Drain	13	160,000	1,032,308	1,600,000	100%

The monitoring described in section 4.1.1 does not include data for Silva Drain, except for IBWC's one-year binational monitoring program. However, those data were not available until October 2020 and the data analyses for this ARP had already been completed at that point. Without the IBWC results, data were also limited for Canyon del Sol and Smuggler's Gulch. Like the other canyon collector locations, IBWC's data, including high indicator bacteria concentrations, for these three locations (Silva Drain, Canyon del Sol, and Smuggler's Gulch) indicate the presence of sewage. This is not unexpected given: (1) the purpose of installing canyon collectors was to capture waste-laden transboundary flows to divert them to the SBIWTP for treatment and (2) land uses upstream of the canyon collectors are similar (highly urbanized, mostly residential with some commercial and industrial use) and generate similar types of waste, including sewage that is not fully captured and/or contained in the sewage collection system.

Additional studies conducted in the Tijuana River Valley, after data analyses for this ARP were completed, confirm that fecal indicator bacteria, total coliforms, *E. coli*, enterococci, and pathogenic bacteria and viruses are prevalent in transboundary flows (Allsing et al., 2022; Rocha et al., 2022). There is a clear relationship between proximity to the border and fecal contamination and many pathogenic species have been detected at the fecal contaminated sites. These species persist out to the mouth of the river and may pose risks to local recreators (e.g., surfers, swimmers, hikers).

[31] The enterococci STV is 110 CFU/100 mL, the 90th percentile value of the geometric mean for enterococci in USEPA 2012 Recreational Water Quality Criteria.

Data Analysis of Key Sites (Lower Tijuana River and Transboundary Flows)
Indicator bacteria concentrations impair the lower Tijuana River's recreational beneficial uses. Available sources of data as described in section 4.1.2 for *E. coli* and enterococci concentrations at key sites were analyzed using a statistical rollback method (Ott, 1995) to determine load reductions required to attain the beneficial uses.[32] This method prescribes a procedure for using statistical characteristics of a concentration distribution to estimate future concentrations after management actions to address sources have been implemented.

A statistical estimate of the new concentration distribution is calculated after a reduction factor is applied. Protection of the REC-1 beneficial use is achieved only when both criteria described in section 3 are met (geometric mean and STV). Therefore, the required percent reduction at each site is based on the more restrictive of the two criteria.

Datasets analyzed using the statistical rollback method must consist of independent samples, show linearity, and be distributed normally (Butkus, 2013). For this ARP assessment, combined wet and dry weather data from key monitoring locations were evaluated.[33] Duplicate samples were averaged to provide one representative value. Linearity and log-transformed distribution of the indicator bacteria concentrations were evaluated visually (Appendix B).

USEPA recreational water quality criteria do not specify a minimum sample size for implementing state water quality standards (USEPA, 2012). Previous criteria indicated that there should be no less than five samples to evaluate indicator bacteria in marine and fresh waters (USEPA, 1976). Only three sites, Canyon del Sol, Smuggler's Gulch, and Silva Drain, did not meet this five-sample minimum at the time the data was analyzed to calculate required reductions. Since some data were available for Canyon del Sol and Smuggler's Gulch at that time, these sites were still included in the statistical analysis. No data were available for Silva Drain at the time indicator bacteria data were analyzed for the ARP analysis. However, data from IBWC's one-year binational monitoring program and the aforementioned multiple lines of evidence indicate elevated indicator bacteria concentrations at all five canyon collectors.

[32] Similar methods have been applied in the development of conventional TMDLs elsewhere in the United States, including the Lower Nooksack River Basin (Washington State Department of Ecology, 2000), Clarks Creek (Washington State Department of Ecology, 2008), and the Russian River (NCRWQCB, 2019).

[33] Definitions of wet and dry weather may vary slightly between the various entities in the Tijuana River Valley but in the context of flows, they generally distinguish between flows that are storm water-driven and those that are not. Data labeled "wet" and "dry" from the various monitoring efforts were combined to increase sample sizes for more reliable statistical analysis. Both wet and dry weather monitoring rendered excessively high fecal indicator bacteria concentrations, indicating the presence of sewage.

During the initial analysis, the datasets were log-transformed into normal probability plots that show the concentrations for *E. coli* and enterococci at each monitoring location. Results that were below reporting limits were included as half the minimum detection limit, and results that were above reporting limits were included as the maximum reporting limit.

With data sorted in ascending order, the expected proportion of observations less than or equal to the i^{th} data value is f_i (Sullivan, 2010). The proportion was calculated for each data point.

$f_i = (i – 0.375) / (n + 0.25)$
where i = order of sample in dataset, n = number of samples

Then, the inverse of the standard normal cumulative distribution function (Excel function: NORM.S.INV) was used to calculate the normal score, or Z-score, which corresponds to each f_i value (Sullivan, 2010).

Z-score = NORM.S.INV([f_i])

Indicator bacteria concentrations were then plotted as a scatter plot on a logarithmic scale as a function of Z-score. For the initial analysis, the trendline of the data was used to estimate the distribution, and a trendline equation was used to estimate the geometric mean and STV of the dataset at each monitoring location. For example, the calculated trendline equation for *E. coli* at Dairy Mart Bridge is shown:

y = 105203 * e^(4.0766x)
where x = Z-score, y = bacteria concentration

The geometric mean is the 50^{th} percentile of a dataset, while the STV is the 90^{th} percentile of a dataset. This means that the f_i value corresponding to the geometric mean is 0.5 and the f_i value corresponding to the STV is 0.9, with corresponding Z-scores of 0 and 1.28, respectively.

These values were then used in the trendline equation to estimate the geometric mean and STV.

GM = 105203 * e^(4.0766 * 0)

STV = 105203 * e^(4.0766 * 1.28)

The resulting site-specific bacteria concentration distributions were compared to the recreational water quality criteria for *E. coli* and enterococci (Appendix B). Required percent reductions were estimated for key sites to meet numeric targets. [34] The required percent reduction is the greater of the reduction driven by the geometric mean and STV (R_{GM} and R_{STV}, respectively):

$$R_{GM} = 100 * [(GM_{obs} – GM_{criterion}) / GM_{obs}]$$
where, GM_{obs} = observed geometric mean
and $GM_{criterion}$ = USEPA water quality criteria for geometric mean

$$R_{STV} = 100 * [(STV_{obs} – STV_{criterion}) / STV_{obs}]$$
where, STV_{obs} = observed 90th percentile
and $STV_{criterion}$ = USEPA water quality criteria for 90th percentile

The analyses demonstrated that the indicator bacteria concentrations at key sites in the river and cross-border tributaries are several orders of magnitude larger than numeric targets. As presented in Appendix B, in order to attain water quality standards, most of these locations would require a reduction in bacteria concentrations of over 99.9 percent (3-log reduction).[35]

4.2.2 Trash


Downstream view of trash deposition near Dairy Mart Road Bridge

Trash in the lower Tijuana River is prevalent in locations downstream of transboundary flows. The volume of trash in transboundary flows varies based on storm events and the prevalence of improper storage and disposal (dumping) of trash on the Mexican side of the watershed. Estimated volumes sometimes include other solids (vegetation and sediment) with which the trash is comingled when transported by transboundary flows.

[34] The GM numeric targets for *E. Coli* and enterococci are the six-week rolling averages presented in section 3.1. Since the site-specific data from sources discussed in section 4.1.2 were not continuous, the GM numeric targets were compared to the GMs estimated with each keys site's full data set for the respective indicator bacteria. The STV numeric targets allow for up to 10 percent exceedance per month. The STVs estimated with each keys site's full data set were compared directly to STVs for the respective indicator bacteria presented in section 3.1

[35] Each log reduction refers to 10-fold decrease in bacteria.

Trash Removals

Trash removal estimates from local NGO volunteer efforts in the Tijuana River Valley are presented in Tables 4.4 and 4.5.[36] They represent a few days of clean-up events over the course of a year. They do not represent full clean-up of trash in the valley, which is far beyond the capabilities of any volunteer clean-up efforts. The trash removed is only a small portion of the total trash accumulation in the valley, and therefore, does not represent the actual deposition rate from transboundary flows. The information in Tables 4.4 and 4.5 demonstrates the positive impact of local volunteers and their level of commitment to protecting the river valley, estuary, and downstream coastal waters.

The removal estimates in Table 4.4 are from Tijuana River Action Network (TRAN)-organized volunteer clean-ups performed on both sides of the border (within the Tijuana River watershed), but primarily in the Tijuana River Valley. [37] Most of the trash, including waste tires, collected in Mexico during these clean-up activities would have eventually been transported downstream into the Tijuana River Valley by transboundary flows. Since 2018, TRAN has discontinued its field efforts within the Tijuana River Valley due to concerns of health effects from exposure to transboundary wastes. The removal estimates in Table 4.5 are from other NGO-organized clean-ups sponsored by the City of San Diego.

Table 4.4 Tijuana River Action Month trash removal estimates (2010–2018)

Year[38]	Trash (tons)	Waste Tires
2010	56.5	2,324
2011	31.9	351
2012	32.4	687
2013	31.3	687
2014	39.4	106
2015	42.8	284
2016	3.4	29
2017	3.1	435
2018	6.0	0

[36] Trash is removed from dry beds, not from flowing or pooled waters.

[37] TRAN consists of TRNERR and the following NGOs: the Surfrider Foundation San Diego County Chapter, Tijuana Calidad de Vida, and WILDCOAST. TRAN organized Tijuana River Action Month (TRAM), a month-long volunteer cleanup effort held during the months of September and October, from 2010 to 2018.

[38] TRAM activities were carried out during the months of September and October.

Table 4.5 Trash removal estimates of other non-governmental organization-organized clean-ups (FY 2009–2018)

Fiscal Year[39]	Trash (tons)	Waste Tires
2009	11.1	No data provided
2010	6.7	No data provided
2011	3.8	4,330
2012	5.2	3,713
2013	3.5	1,195
2014	11.9	6,446
2015	12.4	1,474
2016	10.8	2,982
2017	49.4	1,693
2018	14.1	1,390

The City of San Diego, County of San Diego, California State Parks, and USIBWC also perform removal of trash, including waste tires, generated in Mexico and carried into the Tijuana River Valley by transboundary flows.[40, 41]

The City of San Diego performs channel clearing for flood control from Smuggler's Gulch (north of Monument Road) and from an engineered feature known as the Pilot Channel.[42] The County of San Diego also conducts removals from Smuggler's Gulch (south of Monument Road). California State Parks clears its two sediment basins located in Border Field State Park that capture trash and sediment from transboundary flows (cumulative volume of 60,000 cubic yards). USIBWC performed sediment and trash removal from its Tijuana River Flood Control Channel in 2012.

The removals performed by these agencies far exceed the volunteer clean-up values in Tables 4.4 and 4.5. However, the removal totals for these activities include sediment and vegetation. Appendix C includes estimates of annual trash loads from all identified sources.

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[39] FY (Fiscal Year) refers to the 12-month period starting on July 1. For example, FY 2009 refers to July 1, 2009, through June 30, 2010.

[40] From FY 2011 to FY 2018, the City of San Diego removed 23,223 tires. From FY 2011 to FY 2017, the County removed 16,361 tires. California State Parks removes trash, including approximately 2,000 tires, from its 60,000-cubic-yard sediment basins each year. In 2012, as part of a one-time sediment removal project in the Tijuana River Flood Control Channel, USIBWC removed 2,570 tons of sediment, rocks/rubble, and trash, including 8,000 tires.

[41] Trash is removed from dry beds, not from flowing or pooled waters.

[42] The Pilot Channel was constructed in 1993 to divert wet weather flows from two- to five-year storm events into the southern branch of the river's main channel. It is an earthen trapezoidal channel that is approximately five feet deep with a 23-foot top width and a 15-foot streambed width.

5 SOURCE ASSESSMENT

The purpose of this section is to identify the point and nonpoint sources of pollutants that cause impairments in the lower six miles of the Tijuana River. Point sources are discernible, confined, and discrete conveyances.[43] The CWA prohibits point source discharges of pollutants into waters of the U.S. except in compliance with a NPDES permit. A nonpoint source is any source of pollution that is not a point source. Nonpoint sources are the result of diffuse, disconnected sources and are more difficult to regulate than a single point source. Natural sources may also contribute to indicator bacteria loads (natural background loading) in addition to point sources and nonpoint sources of pollution.[44]

In the Basin Plan, the U.S. side of the Tijuana River watershed is referred to as the Tijuana Hydrologic Unit (HU 911), which contains eight hydrologic areas (HAs; subwatersheds). Some of these HAs contain hydrologic subareas (HSAs; smaller subwatersheds within a hydrologic area). The lower Tijuana River is located in HA 911.1 and HSA 911.11.[45]

The potential sources of indicator bacteria and trash in the lower Tijuana River are:

1. Discharges from U.S.-side upper watershed
2. Transboundary discharges
3. Discharges from HSA 911.12
4. Discharges from Phase I MS4 outfalls to the lower Tijuana River
5. Discharges from NOLF-IB outfalls to the lower Tijuana River

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[43] This includes, but is not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged (40 CFR § 122.2).

[44] For purposes of this ARP, the San Diego Water Board is considering the following border infrastructure owned and operated by USIBWC as nonpoint sources: Tijuana River Flood Control Channel and canyon collectors located in Stewart's Drain, Silva Drain, Canyon del Sol, Smuggler's Gulch, and Goat Canyon. The Yogurt Canyon cross-border tributary is also considered a nonpoint source; there is no canyon collector at this location.

[45] Hydrologic unit, hydrologic area, and hydrologic subarea are defined in the endnotes of the introduction section of the Basin Plan (San Diego Water Board, 2021) and are included in the Basin Plan map:

https://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/docs/e_Basin_Plan_MAP.pdf (PDF format)

https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=1f58bd97fdcd45329a5e16e373ede24d (web app)

6. Discharges from agricultural operations in HSA 911.11

7. Discharges from open space/public lands in HSA 911.11

8. Discharges from groundwater in HSA 911.11

The sections below discuss each of these potential sources of indicator bacteria and trash. Descriptions of how indicator bacteria and trash loads were estimated for each of the potential sources are presented in Appendix C. For some potential sources, no quantitative data were available to estimate annual loads but based on known conditions, the contributions from these sources are expected to be negligible relative to other sources. The load estimates in these cases are deemed "*de minimus*" in the sections below.

5.1 Discharges from the U.S-Side Upper Watershed

Although a portion of the U.S.-side upper watershed (HAs 911.2-911.8) is hydrologically connected to the U.S.-side lower watershed (hereinafter referred to as the Tijuana Valley Hydrologic Area), a significant amount of the upper watershed surface water flows are captured in reservoirs.

The 2020/2022 303(d) List identifies three impaired water quality limited segments in the Tijuana River watershed that are outside of the Tijuana Valley Hydrologic Area—Pine Valley Creek, Cottonwood Creek, and Campo Creek in the U.S.-side upper watershed. Indicator bacteria are included as a pollutant on the 2020/2022 303(d) List for causing impairments in these creeks. The sources of indicator bacteria are unknown. However, for Pine Valley Creek and Cottonwood Creek, the 303(d) listings are based on data collected from monitoring sites upstream of Morena Reservoir and Barrett Reservoir. Flows at these locations of Pine Valley Creek and Cottonwood Creek do not reach the U.S.-Mexico border because they are captured in the reservoirs and ultimately conveyed to Otay Lakes.

Campo Creek crosses the border into Mexico approximately five miles east of the city of Tecate. Surface flows in the upper watershed that flow south into Mexico are primarily from undeveloped land. The dominant developed land use is rural residential. The headwater streams are typically intermittent to ephemeral in nature, limiting flows that may cross into Mexico. The limited flows from Campo Creek that do cross into Mexico comingle with surface flows from the cities of Tecate and Tijuana.

The signature of any indicator bacteria contributions from Campo Creek are likely to be overwhelmed by bacteria loads from Tecate and Tijuana, where treated and untreated sewage are known to discharge regularly into the Tijuana River. The average enterococci concentration measured in the lower Tijuana River and the valley's cross-border tributaries is two orders of magnitude greater than the average enterococci concentration measured in creeks in the U.S.-side upper watershed.

There are no trash-impaired water quality limited segments in the U.S.-side upper watershed.

Because flows that originate in the U.S.-side upper watershed and cross into Mexico are limited and come primarily from open space (undeveloped land), they are not expected to contribute to impairments in the lower Tijuana River due to indicator bacteria and trash.

5.2 Transboundary Discharges

There are seven locations in the Tijuana Valley Hydrologic Area where polluted transboundary flows are hydrologically connected to the lower Tijuana River:

1. Tijuana River Flood Control Channel
2. Stewart's Drain
3. Silva Drain
4. Canyon del Sol
5. Smuggler's Gulch
6. Goat Canyon
7. Yogurt Canyon

Wastewater pollution at Goat Canyon collector

For purposes of this ARP, flows originating in Mexico that discharge from these transboundary channels are considered nonpoint sources.[46] Most of the polluted flows are conveyed through infrastructure owned and operated by USIBWC: the Tijuana River Flood Control Channel and canyon collectors in Stewart's Drain, Silva Drain, Canyon del Sol, Smuggler's Gulch, and Goat Canyon. DHS owns and/or maintains storm water infrastructure in Yogurt Canyon.

[46] The San Diego Water Board's consideration of these transboundary flows as nonpoint source discharges for purposes of this ARP does not prevent the Board from making a future determination that these transboundary flows are discharges of pollutants from point sources, including in future conventional TMDLs.

Section 1.2 of the PEIS provides more information on the canyon collector infrastructure, including photos (USEPA and USIBWC, 2022). USIBWC built this infrastructure to control polluted transboundary flows during dry weather. However, discharges from these nonpoint sources impair beneficial uses and create serious hazards to the health and well-being of those that live, work, and recreate in the area.

Tijuana struggles to maintain a municipal wastewater collection system that has the capacity for its rapid population growth. Inadequate collection of wastewater throughout Tijuana contributes significantly to the presence of indicator bacteria that impair the lower Tijuana River (Arcadis, 2019). Even with operation of the SBIWTP and the San Antonio de los Buenos wastewater treatment plant, the existing Tijuana wastewater treatment system has insufficient capacity to collect and treat all the sewage generated in Tijuana. In addition to its limited capacity, the San Antonio de los Buenos wastewater treatment plant provides little, if any notable treatment since it has not been modernized or adequately maintained (Arcadis, 2019). The existing collection and treatment structures in Tijuana are generally overwhelmed, not properly maintained or upgraded, and, thus, experience ruptures/failures resulting in discharges of sewage and pollution into the environment. When failures occur, sewage and pollution often flows north, directly into the Tijuana River or the cross-border tributaries that flow into the U.S.

Ongoing wastewater pollution at Smuggler's Gulch canyon collector

In addition to failures of the collection and treatment systems, some areas in Tijuana have no sewage connection at all. There are many housing developments and unplanned/unregulated settlements that discharge wastes and pollution directly into the north-trending cross-border canyons (Weston Solutions, 2012). These wastes flow through the cross-border tributaries to canyon collectors in the U.S. To the extent the canyon collectors do not divert the flows to the SBIWTP for treatment,[47] the waste and pollution flow through the canyon collectors and enter the lower Tijuana River.

[47] Each canyon collector is designed to divert a certain amount of dry weather transboundary flows to the SBIWTP for treatment and discharge to the Pacific Ocean. With proper operations and maintenance, the canyon collectors should divert transboundary flows up to their respective maximum design capacities. However, the canyon collectors may not divert flows to their maximum design capacities if they are malfunctioning, blocked with debris or trash, or for other reasons. USIBWC does not operate the canyon collectors during periods of wet weather.

IBWC is responsible for addressing transboundary flows. Its U.S. Section, USIBWC, owns and operates infrastructure in the Tijuana River Valley to divert for treatment and control a portion of the transboundary flows.

Over the past 20 years, CESPT has invested in expanding wastewater collection infrastructure to eliminate unsanitary conditions related to direct discharges or inadequate on-site disposal practices. This has increased the number of wastewater connections from 170,916 in 1997 to 569,211 in 2017 and improved service coverage from 61.8% to 89.6% of households (Arcadis, 2019). However, the poor condition of critical wastewater collection lines, pumps, and wastewater treatment in Tijuana, which have not been modernized or received sufficient maintenance, still results in approximately 30 percent of Tijuana's wastewater entering the river and/or ocean without treatment (Arcadis, 2019).

A study performed by the Southern California Coastal Water Research Project (SCCWRP) concluded that water quality in the river and nearby beaches is impacted by the cross-border transport of this human fecal contamination from Tijuana (SCCWRP, 2020). During the study, samples were analyzed for enterococci and human-associated genetic markers (HF183 and Lachno3) to identify the extent and impact of human fecal contamination in the border region. High levels of both human markers were observed in the Tijuana River Estuary and in the ocean, just south of the mouth of the Tijuana River.

Transboundary flows into the river valley also deposit substantial volumes of trash. These discharges are not regulated or well controlled. Trash flows unabated through the main channel and six cross-border tributaries into the U.S. The trash originates in Mexico, primarily Tijuana, which struggles to maintain a trash management system that has the capacity for its rapid population and infrastructure growth. During storm events, substantial amounts of trash from Mexico are observed in transboundary flows (USIBWC, 2008). Dry weather transboundary flows from ongoing sewage collection failures in Tijuana also transport trash into the river valley. These immense quantities of trash from Mexico are visible in and downstream of the Tijuana River Flood Control Channel and the cross-border canyons to the west of it.

The CalRecycle-funded trash survey in the valley evaluated trash along transects, in test borings, and with visual observations (URS, 2010). The areas surveyed included the Tijuana River Flood Control Channel, three locations downstream of the Tijuana River Flood Control Channel reach, Smuggler's Gulch, and Goat Canyon. The trash present during the study largely consisted of waste tires, lumber, and plastic bottles. Plastic bags were also present at the time but mostly in the subsurface, observed in test pits and borings. In 2018, the Tijuana City Council voted to ban the use of disposable plastic bags in stores, with a two-year phase-out period.

Ongoing inadequate and illegal waste management systems, and failures of retaining walls made of waste tires in Tijuana contribute to compromised downstream native habitats. The trash can choke waterways, harm wildlife, and contain pollutants that leach into waters. Waste tires pose fire hazards, cause ecological damage to sensitive habitats, and provide breeding habitat for vectors (e.g., mosquitos) that can carry disease (California-Mexico Border Relations Council, 2017). Annually, government land managers and NGOs in the U.S. remove thousands of pounds of trash from the Tijuana River Valley. Not all the trash can be removed annually, so the documented amounts that are removed represent only a portion of the total trash discharged into the river valley by transboundary flows.

Annual indicator bacteria and trash loadings from the transboundary flows are estimated below. The estimated percent contributions they represent of total annual indicator bacteria and trash loadings to the lower river are also included.[48]

Source	*E. coli*	Enterococci	Trash
Tijuana River Flood Control Channel	3.97×10^{16} MPN/year 38%	5.70×10^{16} MPN/year 69%	883 tons/year 22-23%
Stewart's Drain	1.68×10^{16} MPN/year 16%	9.91×10^{15} MPN/year 12%	622 tons/year 16%
Silva Drain	9.03×10^{13} MPN/year <1%	1.29×10^{14} MPN/year <1%	124 tons/year 3%
Canyon del Sol	7.87×10^{13} MPN/year <1%	9.89×10^{13} MPN/year <1%	82 tons/year 2%
Smuggler's Gulch	1.98×10^{16} MPN/year 19%	8.94×10^{15} MPN/year 11%	1,159 tons/year 29-31%
Goat Canyon	2.65×10^{16} MPN/year 25%	5.15×10^{15} MPN/year 6%	788 tons/year 20-21%

[48] The top three contributors of indicator bacteria and trash loads are the Tijuana River Flood Control Channel, Smuggler's Gulch, and Goat Canyon.

Source	*E. coli*	Enterococci	Trash
Yogurt Canyon	N/A; only enterococci WQOs apply to saline receiving waters (not *E. coli* WQOs).	2.56×10^{11} MPN/year <1%	106 tons/year 3%
Total (Transboundary Discharges)	1.03×10^{17} MPN/year 97%	8.12×10^{16} MPN/year 99%	3,764 tons/year 96-99%

5.3 Discharges from HSA 911.12

Some discharges generated in the eastern portion of the Tijuana Valley Hydrologic Area, east of Interstate 805 (HSA 911.12), have the potential to flow across the border into Tijuana and discharge to the Tijuana River. These are potential point and nonpoint sources of pollution. During wet weather and sometimes during dry weather, the river crosses into the U.S. Therefore, indicator bacteria and trash generated in HSA 911.12 may impact the lower Tijuana River.

The land uses in HSA 911.12 that have the potential to impact the lower Tijuana River are:

1. Agriculture
2. Commercial
3. Freeway
4. Industrial
5. Institutional, Public, and Semi-Public Facilities
6. Junkyard/Dump/Landfill
7. Low-Density Residential
8. School
9. Transportation
10. Vacant and Undeveloped Land

Like pollutants generated in the U.S.-side upper watershed, the loads from HSA 911.12 are minimal compared to pollutant loads generated in Mexico. However, unlike the U.S.-side upper watershed, runoff from HSA 911.12 is not captured by dams and the runoff is not only from rural/undeveloped land uses.

Maximum annual indicator bacteria and trash loadings from HSA 911.12 are estimated below. The estimated percent contributions they represent of total annual indicator bacteria and trash loadings to the lower river are also included. As discussed in Appendix C, these values are likely overestimated based on conservative assumptions.

E. coli	Enterococci	Trash
1.46×10^{15} MPN/year 1%	4.39×10^{14} MPN/year <1%	12-75 tons/year <1-2%

5.4 Discharges from Phase I MS4 Outfalls to the Lower Tijuana River

There are 14 major Phase I MS4 outfalls in HSA 911.11 that may discharge to the lower Tijuana River and estuary.[49] These are potential point sources of pollution. They are owned by the City of Imperial Beach and the City of San Diego and regulated by the Phase I MS4 Permit. The land uses in HSA 911.11 that are expected to drain via Phase I MS4 outfalls to the lower river or the estuary are:

1. Agriculture
2. Commercial
3. Freeway
4. High-Density Residential
5. Industrial
6. Institutional, Public, and Semi-Public Facilities
7. Junkyard/Dump/Landfill
8. Low-Density Residential
9. Open Space Park or Preserve
10. Other Park, Open Space and Recreation
11. School
12. Transportation
13. Vacant and Undeveloped Land

[49] A major outfall is defined as 36 inches or larger in diameter.

Discharges from some of these land uses are also regulated under separate waste discharge requirements (WDRs). This includes point source discharges from freeways owned by Caltrans, industrial facilities, and construction sites. However, for the most part, these discharges are ultimately conveyed by Phase I MS4s. Discharges to the Phase I MS4s in HSA 911.12 are not discharged directly from the MS4s into the lower Tijuana River. However, as discussed in section 5.3, they may cross into Mexico and eventually reach the lower river via the Tijuana River Flood Control Channel. Annual indicator bacteria and trash loadings from Phase I MS4 outfalls in HSA 911.11 are estimated below. The estimated percent contributions they represent of total annual indicator bacteria and trash loadings to the lower river are also included. As discussed in Appendix C, the trash values are likely overestimated based on conservative assumptions.

E. coli	**Enterococci**	**Trash**
1.33×10^{15} MPN/year 1%	4.00×10^{14} MPN/year <1%	12-76 tons/year <1-2%

5.5 Discharges from NOLF-IB Outfalls to the Lower Tijuana River

Naval Outlying Landing Field, Imperial Beach (NOLF-IB) is located within HSA 911.11. Its property is 1,295 acres in size; 283 acres are part of TRNERR. Two industrial storm water outfalls and 13 municipal storm water outfalls discharge from NOLF-IB to the river/estuary. These are potential point sources of pollution.

The maximum annual enterococci loading from the NOLF-IB discharges is estimated below. The estimated percent contribution it represents of total annual enterococci loadings to the lower river is also included. As discussed in Appendix C, this value is likely overestimated based on conservative assumptions.

No trash loading is expected from NOLF-IB outfalls. During dry weather, minimal if any flow reaches the estuary (Weston Solutions, 2012). In addition, the U.S. Navy conducts wet weather sampling and visual observations at two industrial outfalls four times a year and at a municipal outfall twice a year. Trash has not been identified in storm water runoff from NOLF-IB during these activities.

E. coli	***Enterococci***	***Trash***
N/A; only enterococci WQOs apply to saline receiving waters (not *E. coli* WQOs).	3.49×10^{12} MPN/year <1%	None

5.6 Discharges from agricultural operations in HSA 911.11

Any potential indicator bacteria and trash loads from agricultural lands from HSA 911.12 are accounted for in section 5.3. Agriculture land use is also present in HSA 911.11 and consists primarily of commercial growers (crops and turf/plants for landscaping) and equestrian operations (horse ranches). Discharges from these properties are potential nonpoint sources of pollution.

No site-specific indicator bacteria data or non-site-specific references were available to reliably estimate *E. coli* loading or enterococci loading from agricultural land uses. However, loads are expected to be far less likely to cause impairments than the known sources of indicator bacteria. This land use makes up approximately 5 percent of the Tijuana River Valley Hydrologic Area (URS, 2016).

According to Geotracker, four commercial agricultural operations with 134.6 acres of irrigated land are present in the Tijuana River Valley.[50] All are regulated under San Diego Water Board Order No. R9-2016-0004, general WDRs for commercial agricultural operations. These WDRs require proper management of wastes and prohibit the discharge or deposition of trash into surface waters. The WDRs also require the agricultural operators to prepare a water quality protection plan (WQPP), which includes information on how materials and wastes are managed to protect receiving waters. The agricultural operators certify the WQPPs under penalty of perjury.

In addition, the valley has at least 16 equestrian facilities on over 165 acres. These facilities offer boarding, trail riding, and private event rentals. Cumulatively, these facilities house at least 540 horses. Additional private small holdings and leasings in the Tijuana River Valley may house additional horses or other livestock. As an average horse can produce 45 pounds of manure and urine daily, improperly managed manure from equestrian facilities has the potential to impair waters (USEPA, 2001).

The Tijuana River Valley Equestrian Association (TRVEA) provided valley-specific information on best management practices at equestrian facilities. Although equestrian facilities in the valley do not have individual WDRs prescribed by the San Diego Water Board, most of the known facilities have manure management practices. Nine of the 16 known equestrian facilities (with approximately 295 horses) have manure hauled weekly to a 100-acre composting facility in the Tijuana River Valley. Four of these facilities (with approximately 140 horses) put manure in dumpsters which is then hauled to city and county trash facilities. One facility (with approximately 100 horses) does its own composting to produce fertilizer for adjacent agricultural fields. Two of the facilities have unknown manure management practices.

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[50] GeoTracker is the Water Boards' data management system for sites that impact or have the potential to impact water quality in California, with an emphasis on groundwater. https://geotracker.waterboards.ca.gov/

All the equestrian facilities are located west (downstream) of the Tijuana River Flood Control Channel and Dairy Mart Bridge, the two sites with the highest recorded indicator bacteria on the U.S. side of the watershed. While the contributions of indicator bacteria in the Tijuana River that come exclusively from equestrian facilities has not been calculated, the available data indicate that these operations are far less likely to cause impairments than the known significant sources of indicator bacteria.

Annual trash loading from agricultural operations is estimated below. The estimated percent contribution it represents of total annual trash loading to the lower river is also included.

E. coli	**Enterococci**	**Trash**
de minimus	*de minimus*	0.8-6 tons/year <1%

5.7 Discharges from Open Space/Public Lands in HSA 911.11

Any potential indicator bacteria and trash loads from open space/public lands from HSA 911.11 that drain into Phase I MS4s is accounted for in section 5.4, as are loads from pollutant sources in HSA 911.12 (section 5.3). No site-specific indicator bacteria data or non-site-specific references were available to reliably estimate *E. coli* loading or enterococci loading from the remaining open space/public lands (nonpoint sources in HSA 911.11). However, bacteria loads from these areas come from mostly natural sources (e.g., wildlife feces) and are considered relatively *de minimus*.

Non-point source annual trash loading from open space/public lands in HSA 911.11 is estimated below. The estimated percent contribution it represents of total annual trash loading to the lower river is also included. As discussed in Appendix C, this value is likely overestimated based on conservative assumptions.

E. coli	**Enterococci**	**Trash**
de minimus	*de minimus*	2-11 tons/year <1%

5.8 Discharges from Groundwater in HSA 911.11

In general, groundwater has the potential to transport pathogens to surface waters, which may impact beneficial uses. Hydrologic soil groups indicate hydrologic factors that enable groundwater flow and the potential transport of pathogens.

Most soils in the Tijuana Valley Hydrologic Area are characterized as Group D soils, which have the lowest infiltration rates of all hydrologic soil groups. These soils have a very slow rate of water transmission (Weston Solutions, 2012). Group A and Group B soils, which have high and medium infiltration rates, respectively, surround the lower Tijuana River in HSA 911.11 until it reaches approximately one mile from shore, where Group D soils are present (Weston Solutions, 2012). As a result, there is potential for groundwater contamination from surface water flows, which include polluted transboundary flows.

Although pathogens and the bacteria that indicate their presence may survive and reproduce in groundwater, total coliform, fecal coliform, and enterococci data from USIBWC groundwater wells suggest that it is unlikely that they reach the lower Tijuana River (Weston Solutions, 2012).

Groundwater samples assessed in the *Tijuana River Bacterial Source Identification Study* were collected from five wells in Group A and Group B soils in the Tijuana River Valley. Every sample was below surface water WQOs for fecal coliform (35/35 samples), and the vast majority of samples for total coliform (34/35 samples) and enterococcus (30/35 samples) were also below surface water WQOs. The groundwater samples collected from wells near the border where the river enters the U.S., however, all exceeded surface water WQOs. Bacteria counts in groundwater generally declined the further each sample well was from the border. While general *Bacteroides* was detected in 29/35 samples, all samples were negative for human-specific *Bacteroides*.

Although there is some potential for indicator bacteria loading from groundwater, the available data indicate that this is far less likely to cause impairments than the known sources of indicator bacteria. *E. coli* and enterococci loading attributed to groundwater are expected to be *de minimus*. Trash loading attributed to groundwater is zero.

E. coli	**Enterococci**	**Trash**
de minimus	*de minimus*	None

5.9 Source Assessment Summary

The seven cross-border nonpoint sources of indicator bacteria and trash contribute substantially higher loads of waste than sources generated in the U.S.

Source	***E. coli***	**Enterococci**	**Trash**
Transboundary Flows	1.03×10^{17} MPN/year 97%	8.12×10^{16} MPN/year 99%	3,764 tons/year 96-99%
Sources Generated in the U.S.	2.80×10^{15} MPN/year 3%	8.42×10^{14} MPN/year 1%	26-168 tons/year <1-4%
Total	1.06×10^{17} MPN/year	8.21×10^{16} MPN/year	3,790-3,931 tons/year

Nonpoint Sources
Load estimates, calculated using monitoring data, indicate that transboundary flows are the only significant sources of indicator bacteria and trash. These transboundary flows enter the U.S. through infrastructure at the main channel and six cross-border tributaries. The flows cumulatively discharge immense volumes of sewage and other pollution into the lower Tijuana River and its tributaries, are not regulated, are less controlled, and less predictable than sources generated in the U.S. In contrast, the U.S.-side sources are better understood, monitored, and controlled since most have been regulated by the San Diego Water Board for many years.

Indicator bacteria and trash generated within the Tijuana River Valley Hydrologic Area (the U.S.-side lower watershed) may also be present in agricultural fields, equestrian facilities, and open space/public lands, which have a potential hydrologic connection to the lower Tijuana River.

Wind action can also transport trash into (and redistribute trash within) the Tijuana River Valley. Visitors, workers, and residents who recreate or otherwise access the valley may contribute some incidental trash. However, indicator bacteria and trash loads estimated from these nonpoint sources in the Tijuana River Valley Hydrologic Area are *de minimus* relative to the immense loads from the seven identified significant sources. There are no data to suggest that indicator bacteria from nonpoint U.S.-side sources are significant contributors to the impairment of recreational beneficial uses in the lower Tijuana River.

Point Sources
Indicator bacteria and trash generated within the Tijuana River Valley Hydrologic Area may be present in storm water and non-storm water discharges from MS4s, which are hydrologically connected to the lower Tijuana River. Phase I MS4s contain discharges from various upstream activities/facilities, including some that are regulated under other NPDES permits. These permits require controls to reduce the discharge of pollutants in storm water to the maximum extent practicable and to effectively eliminate non-storm water discharges (i.e., dry weather flows) containing pollutants, including trash. The NPDES permits for direct MS4 discharges to the lower river and upstream point sources that may discharge to these MS4s are:

- Phase I MS4s. Discharges from these conveyances are regulated under San Diego Water Board Order No. R9-2013-0001 (as amended), NPDES Permit No. CAS0109266 (Phase I MS4 Permit). This includes conveyances that discharge directly to the lower Tijuana River, including one from the Canyon del Sol canyon collector. The pipeline passes beneath the City of San Diego South Bay Water Reclamation Plant and is included in the WQIP for the Tijuana River Watershed.

- A practice field for helicopter operations, Naval Outlying Landing Field, Imperial Beach (NOLF-IB). Discharges from this facility are regulated under San Diego Water Board Order No. R9-2015-0117, as amended by R9-2017-0011, NPDES Permit No. CA0109185 (Naval Base Coronado Permit). This includes direct discharges to the lower Tijuana River.

- Groundwater extraction. Discharges from groundwater extraction activities are regulated under San Diego Water Board Order No. 2015-0013, NPDES Permit No. CAG919003 (Groundwater Extraction Permit). This may include direct discharges to the lower Tijuana River.

- Caltrans MS4s. Discharges from these conveyances are regulated under State Water Board Order 2022-033-DWQ, NPDES Permit No. CAS000003 (Caltrans Permit). These are not direct discharges to the lower Tijuana River. These flows are captured by Phase I MS4s before discharging to other surface waters.

- Phase II MS4s. Discharges from these conveyances are regulated under State Water Board Order 2013-0001-DWQ (as amended), NPDES Permit No. CAS000004 (Phase II MS4 Permit). There are no Phase II MS4 dischargers currently enrolled in the Phase II MS4 Permit in the Tijuana River Valley Hydrologic Area.

- Industrial activities. Discharges from industrial facilities are regulated under State Water Board Order 2014-0057-DWQ, NPDES Permit No. CAS000001 (Industrial General Permit). These are not direct discharges to the lower Tijuana River. Generally, flows from industrial facilities that may reach the lower Tijuana River are first captured by Phase I MS4s before discharging to the river. An exception is discharges from California State Parks' sediment basins in Goat Canyon (Border Field State Park). Discharges from the sediment basins to the river are regulated by the Industrial General Permit but are not conveyed by MS4s.

- Construction activities. Discharges from construction projects that disturb at least one acre of soil are regulated under State Water Board Order 2009-009-DWQ, NPDES Permit No. CAS000002 (Construction General Permit). These are not direct discharges to the lower Tijuana River. These flows are captured by Phase I MS4s before discharging to surface waters.

Discharges from Phase I MS4s are likely to be the primary point source of indicator bacteria generated within the Tijuana River Valley Hydrologic Area. However, an analysis of land uses in the 2016 Tijuana River WMA WQIP indicates that although MS4s are a source of indicator bacteria, they are not a significant contributor to the impairment of REC-1 beneficial use in the river, estuary, and ocean (URS, 2016). This conclusion is also supported by the *Tijuana River Bacterial Source Identification Study*, which concluded that the vast majority of the indicator bacteria originate in Mexico (99 percent) and not the MS4s in the U.S. (less than 1 percent) (Weston Solutions, 2012).

6 CALCULATIONS AND ALLOCATIONS

The purpose of this section is to describe the approach used to determine pollutant load calculations, associated load and wasteload allocations, and required reductions for indicator bacteria and trash. A TMDL for a given water body/pollutant combination is based on the amount of pollutant the water body can receive (referred to as "loading capacity") while maintaining ecological and human uses as defined by its assigned beneficial uses with a margin of safety applied to account for any uncertainties. TMDLs can be expressed in terms of mass per time or other appropriate measures, such as concentration (USEPA, 2007).

The term "load allocation" refers to how a TMDL is allocated among the various sources of the pollutant in order to attain water quality standards. Pollutant sources are characterized as either nonpoint sources that receive load allocations (LAs) or point sources that receive wasteload allocations (WLAs).

<u>Indicator Bacteria Loading Capacities and Load and Wasteload Allocations</u>
The San Diego Water Board derived loading capacities for the lower Tijuana River from the numeric targets for *E. coli* and enterococci in section 3.1. The loading capacities are concentration-based, which is appropriate for protection of human health, and include a daily limit as recommended by USEPA (USEPA, 2007).

The loading capacities for waters where salinity is equal to or less than 1 ppth 95 percent or more of the time during the calendar year are: 1) a six-week rolling GM of *E. coli* not to exceed 100 CFU/100 mL, calculated weekly, and 2) a daily maximum of 320 CFU/100 mL.

The loading capacities for waters where salinity is greater than 1 ppth more than 5 percent of the time during the calendar year are: 1) a six-week rolling geometric mean of enterococci not to exceed 30 CFU/100 mL, calculated weekly, and 2) a daily maximum of 110 CFU/100 mL.

The corresponding LAs and WLAs for nonpoint and point sources of indicator bacteria are set equivalent to the loading capacities. The LAs and WLAs for all discharges to the freshwater (low salinity) stretch of the Tijuana River are in terms of *E. coli* as well as enterococci since these discharges are hydrologically connected to the higher salinity downstream stretch (in estuary). The LAs and WLAs for all discharges into the higher salinity stretch of the Tijuana River (within estuary) are in terms of enterococci only.

The LAs and WLAs for indicator bacteria contain three implicit margins of safety.

1. The extensive epidemiological studies conducted by USEPA, upon which the indicator bacteria WQOs are based, constitutes a margin of safety. The USEPA 2012 recreational water quality criteria are based, in part, on an extensive National Epidemiological and Environmental Assessment of Recreational Water (NEEAR study). The NEEAR study design, which was approved by USEPA's external expert advisory panel, incorporated conservative criteria for study site selections, such as wastewater treatment plant and urban runoff influences, large populations, and broad age range to include potentially vulnerable populations. The NEEAR study also defined gastrointestinal illness broadly and evaluated other health endpoints that could have been caused by pathogens from fecal matter (USEPA, 2012).

2. State Water Board's choice of indicator bacteria WQOs constitutes a margin of safety. USEPA used the NEEAR study results and other lines of evidence to develop two sets of recreational water quality criteria. One set of criteria is based on an estimated illness rate of 36 per 1,000 primary contact recreators; the other is more protective, based on an estimated illness rate of 32 per 1,000 primary contact recreators. The State Water Board adopted the more protective criteria as primary contact recreation (REC-1) WQOs in 2018 (SWRCB, 2018).

3. The daily limits of 320 CFU/100 mL and 110 CFU/100 mL for *E. coli* and enterococci, respectively, constitute a margin of safety since the WQOs they are derived from include these as STV values that may be exceeded in up to 10 percent of the samples collected in a calendar month, calculated in a static manner.

Source	Indicator Bacteria LAs and WLAs
Discharges from U.S.-side upper watershed	LAs and WLAs are set equivalent to the *E. coli* and enterococci loading capacities for any controllable sources that originate in the U.S.-side upper watershed and cross into Mexico.
Transboundary discharges	LAs are set equivalent to the *E. coli* and enterococci loading capacities for nonpoint sources that cross the border into the Tijuana River Flood Control Channel, Stewart's Drain, Silva Drain, Canyon del Sol, Smuggler's Gulch, Goat Canyon, and Yogurt Canyon.

Source	Indicator Bacteria LAs and WLAs
Discharges from HSA 911.12	WLAs are set equivalent to the *E. coli* and enterococci loading capacities for point sources generated in HSA 911.12. Nonpoint sources in HSA 911.12 are generally natural and relatively *de minimus* (open space/public lands).
Discharges from Phase I MS4 outfalls	WLAs are set equivalent to the *E. coli* and enterococci loading capacities for these point sources that discharge into the lower Tijuana River.
Discharges from NOLF-IB outfalls	WLAs are set equivalent to the enterococci loading capacities for these point sources that discharge into the lower Tijuana River.
Discharges from agricultural operations	LAs are set equivalent to the *E. coli* and enterococci loading capacities for this potential nonpoint source.
Discharges from open space/public lands	No applicable WLAs or LAs as these are generally nonpoint sources that are natural and relatively *de minimus* (e.g., wildlife feces).
Discharges from groundwater	LAs are set equivalent to the *E. coli* and enterococci loading capacities for this potential nonpoint source.

Because the primary beneficial use of concern for indicator bacteria is REC-1, which applies year-round, and some sources present a particularly high level of pathogenic risk due to the significant amount of sewage they carry, there is no exception for exceedances during wet weather for indicator bacteria.[51]

[51] Unless appropriately defined otherwise by another regulatory measure, weather is considered dry if the preceding 72 hours have been without precipitation greater than 0.1 inch, based on the Goat Canyon Pump Station rain gauge; and wet weather is the period of time of a storm event of 0.1 inches or greater plus 72 hours after cessation of precipitation, based on the Goat Canyon Pump Station rain gauge. This definition comes from the USIBWC NPDES permit.

The LAs and WLAs are based on concentrations of the appropriate indicator bacteria based on the salinity of receiving waters (*E. coli* for freshwater and enterococci for saline water) regardless of the magnitude of flow; therefore, there is no seasonal variation of LAs and WLAs. The use of concentration-based limits intrinsically accounts for seasonality. The loading capacities are derived from allowable *E. coli* and enterococci concentrations to protect public health during all times of the year, regardless of seasonal weather conditions.

E. coli and enterococci are used as indicators of fecal contamination and the potential presence of pathogens capable of causing gastrointestinal illnesses because these bacteria are easy and relatively inexpensive to measure. In the future, reporting human-specific genetic markers in conjunction with *E. coli* and enterococci may be used to determine attainment of water quality standards. This may aid in distinguishing between natural and anthropogenic sources of indicator bacteria to allow dischargers to better allocate resources by focusing on source abatement in areas that pose the greatest threat to public health. However, at this time, human-specific genetic markers are not part of the WQOs for protection of REC-1 beneficial use and therefore, cannot be used in lieu of *E. coli* and enterococci to determine attainment of water quality standards.

In the future, as this ARP is implemented to reduce indicator bacteria, there may be value in distinguishing natural and anthropogenic sources. However, at this time, reports from IBWC suggest that the vast majority of indicator bacteria discharged to the lower Tijuana River is from anthropogenic sources (i.e., wastes from sewage collection system failures and intentional domestic waste discharges to surface waters and land in Mexico).

6.1 Indicator Bacteria Required Reductions

Estimates of the maximum reductions necessary to achieve the indicator bacteria loading capacities are required for implementation planning and is one of the key elements of a watershed plan to be eligible for CWA section 319(h) funds.[52] Appendix B describes the estimated maximum reductions in indicator bacteria in the lower Tijuana River and the cross-border tributaries that would be necessary to achieve the loading capacities. Appendix A includes an evaluation of historical data from numerous locations in the Tijuana River Valley. As described in section 4, a statistical rollback method was applied to use the statistical characteristics of a bacteria concentration distribution to estimate future concentrations after abatement processes are applied to significant sources.

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[52] CWA Section 319(h) funds are provided to designated State and tribal agencies to implement their approved nonpoint source management programs. State and tribal nonpoint source programs include a variety of components, including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and regulatory programs.

The percent reductions necessary to achieve both the geometric mean and daily limit derived from the statewide WQOs were estimated at each location for which historical data were available for key sites—those within the lower Tijuana River and its cross-border tributaries. The required reductions are approximately 99% for each of the seven identified significant sources of bacteria to the lower Tijuana River.

6.2 Trash Load and Wasteload Allocations

The San Diego Water Board derived the loading capacity for the lower Tijuana River from the numeric target of zero for trash, which was derived from narrative WQOs in the Basin Plan and State Water Board Trash Amendments described in section 3.2. The allowable trash load is expressed as a daily limit, as recommended by USEPA, and consists of the maximum quantity that ensures the prevention of nuisance and adverse impacts to beneficial uses. Responsible parties will need to remove and properly dispose of 100 percent of the trash during collection events at intervals that prevent nuisance and adverse impacts to beneficial uses between collections. The implementation of this is described in section 8.5.

The corresponding trash LAs and WLAs are set equivalent to the loading capacity. Since the LAs and WLAs are directly defined in terms of protecting beneficial uses and since responsible parties will need to remove and properly dispose of 100 percent of the trash during collection events, a margin of safety is not necessary.

7 LINKAGE ANALYSIS

The purpose of this section is to provide a linkage analysis that establishes:

1. The connection between pollutant load allocations for indicator bacteria and the protection of beneficial uses through attaining established indicator bacteria WQOs.

2. The connection between a pollutant load allocation of zero for trash and the protection of beneficial uses.

Section 4 and Appendix B provide evidence of the substantial presence of human fecal waste and trash in the Tijuana River Valley. The results reveal major exceedances of WQOs. Section 5 describes the significant sources of these pollutants (polluted transboundary flows). Figures 7.1 and 7.2 present factors that potentially contribute pollutants to these significant sources, leading to impairments in the lower Tijuana River.

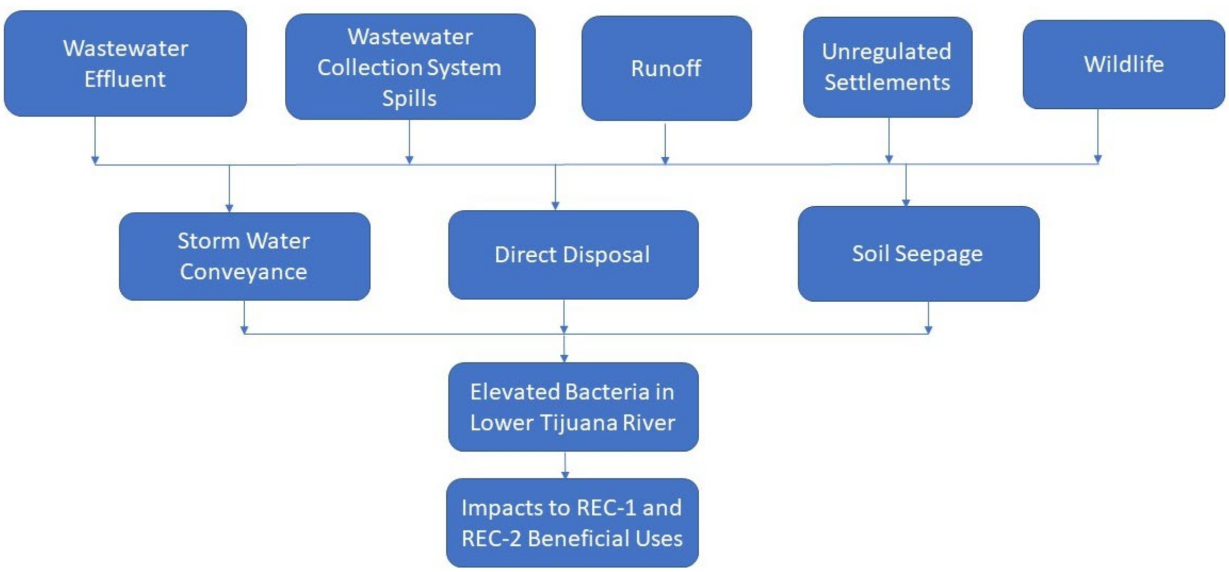

Figure 7.1 Factors that potentially contribute to indicator bacteria loads

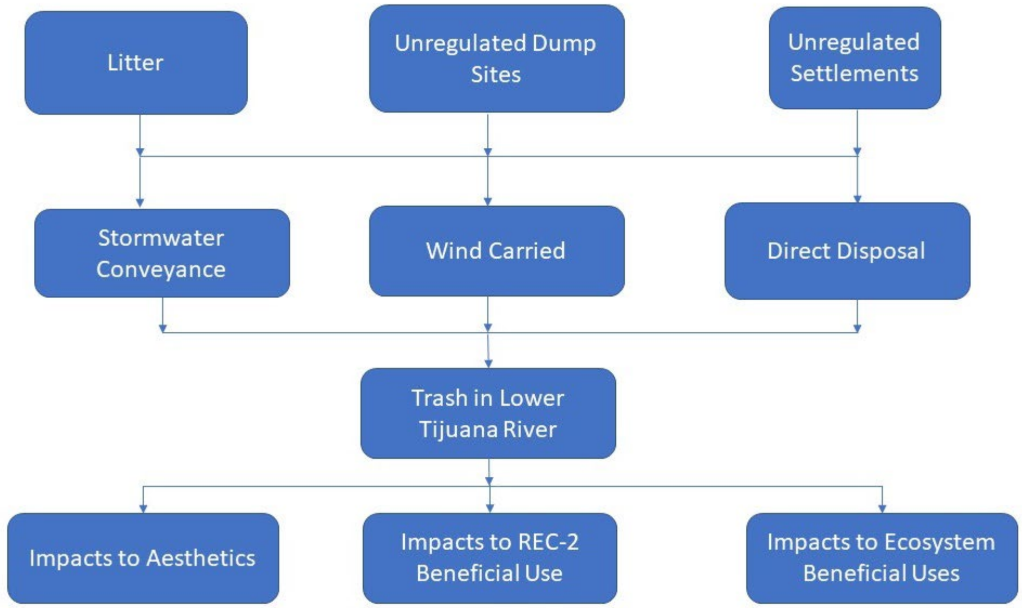

Figure 7.2 Factors that potentially contribute to trash loads

The overwhelming majority of the indicator bacteria and trash present in the lower Tijuana River is due to the lack of wastewater infrastructure and services and trash management infrastructure and services in Tijuana. The sewage and polluted urban runoff that cross into the U.S. carry a wide variety of pollutants that compromise beneficial uses, threaten human health, impact estuarine habitat, cause beach closures, damage agricultural resources, adversely impact the economy, compromise border security, and may affect U.S. military training activities within the impacted area.

The pollutants compromise the following designated beneficial uses of the lower Tijuana River, including the estuary:

1. Contact Water Recreation (REC-1)
2. Non-Contact Water Recreation (REC-2)
3. Preservation of Biological Habitats of Special Significance (BIOL)
4. Warm Freshwater Habitat (WARM)
5. Wildlife Habitat (WILD)
6. Rare, Threatened, or Endangered Species (RARE)
7. Industrial Service Supply (IND)
8. Commercial and Sport Fishing (COMM)

9. Estuarine Habitat (EST)
10. Marine Habitat (MAR)
11. Migration of Aquatic Organisms (MIGR)
12. Spawning, Reproduction, and/or Early Development (SPAWN)
13. Shellfish Harvesting (SHELL)

Even with significant reductions, or 100 percent elimination, of indicator bacteria and trash loads generated in the U.S., the river's beneficial uses would still remain impaired. In order to restore beneficial uses and meet water quality objectives, the pollutants in the transboundary flows must be reduced substantially.

7.1 Indicator Bacteria in Significant Sources of Pollution

The elevated and frequent indicator bacteria objective exceedances indicate an unacceptable risk of exposure to illness-causing pathogens, which can compromise beneficial uses and constrain use of the river and the downstream ocean shoreline for recreational activities and national security needs. As discussed in the section 5 source assessment, the indicator bacteria analyses indicate the presence of human fecal waste, primarily due to the poor condition of sewage collection infrastructure and to intentional domestic waste discharges to surface waters and land in Mexico, which presents risk of infection to those recreating and working in polluted areas. In addition to pathogens, sewage contains a wide variety of other pollutants that also present risks to public health and the river's designated beneficial uses.

The ARP analysis for *E. coli* and enterococci applies statewide WQOs that represent a risk of no more than 32 illnesses per 1,000 recreators. As discussed in section 6, the corresponding LAs and WLAs for indicator bacteria are based on these WQOs and include implicit margins of safety. Monitoring is recommended in the implementation plan in section 8 to track progress toward achieving WQOs and restoration of beneficial uses.

7.2 Trash in Significant Sources of Pollution

The immense quantities of trash transported by transboundary flows and deposited in the valley threaten the river's designated beneficial uses by posing risks from ingestion, entanglement, and alteration of habitats. Such risks are detrimental to freshwater, estuarine, and marine life. Trash also presents public health threats. It may carry pathogens on its surfaces, contain items that lead to illness and/or injury (e.g., syringes and other sharp objects), and promote breeding of vectors, leading to pest infestation and transmission of diseases (e.g., from mosquitos). In addition, trash compromises recreational activities, including ones that rely on the aesthetic quality of the river valley.

The ARP analysis for trash applies the narrative WQOs in the Basin Plan and State Water Board Trash Amendments. As discussed in section 6, the corresponding LAs and WLAs of zero for trash are based on these WQOs. Monitoring is recommended in the implementation plan in section 8 to track progress toward achieving the WQOs. A trash-free lower Tijuana River will ensure protection of its designated beneficial uses.

8 IMPLEMENTATION

The purpose of this section is to discuss ARP implementation actions to reduce pollutant loads to achieve WQOs and restore the beneficial uses of the lower Tijuana River. This ARP is not self-implementing or directly enforceable for sources in the watershed. Instead, the ARP must be implemented through the programs or authorities of the San Diego Water Board and/or other entities to compel dischargers responsible for controllable sources to achieve the pollutant load reductions identified by the ARP to restore and protect the designated beneficial uses of a water body.

8.1 Control of Point Sources

Section 301 of the CWA prohibits the discharge of any pollutant from a point source to waters of the U.S., except as authorized by an NPDES permit. Section 402 of the CWA establishes the NPDES program to regulate the ‘‘discharge of a pollutant,’’ other than dredged or fill materials, from a ‘‘point source’’ into ‘‘waters of the U.S.” Under section 402, discharges of pollutants from point sources to waters of the U.S. are authorized by obtaining and complying with NPDES permits. In California, WDRs serve as NPDES permits that are required under the CWA.

8.2 Control of Nonpoint Sources

While laws mandating control of point source discharges are contained in the federal CWA and associated NPDES regulations, direct control of nonpoint source pollution is largely left to state programs developed under state law. LAs for nonpoint sources are not directly enforceable under the CWA and are only enforceable to the extent they are made so by state laws and regulations. The Porter-Cologne Water Quality Control Act applies to both point and nonpoint sources of pollution and serves as the principal legal authority in California for the regulation of discharges from controllable nonpoint sources.

State policy pertaining to regulation of nonpoint sources of pollution in California is provided in the *Nonpoint Source Program Strategy and Implementation Plan* (SWRCB and California Coastal Commission, 2000) and the *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Implementation and Enforcement Policy; SWRCB and California Environmental Protection Agency, 2004). The NPS Implementation and Enforcement Policy provides information on the statutory and regulatory authorities of the State Water Board and the regional water quality control boards to prevent and control nonpoint source pollution.

The San Diego Water Board has historically implemented memorandums of understanding (MOUs) with federal agencies to facilitate water quality protection. With the development of several federal and binational projects in the USEPA-USIBWC June 9, 2023, Record of Decision and proposed in Minutes 320 and 328 that may address sewage and trash in the Tijuana River Valley and nearby coastal waters, the San Diego Water Board has renewed interest in an MOU with USIBWC and USEPA, and in consultation with DHS, to address achieving WQOs at infrastructure owned and operated by federal agencies.

8.3 San Diego Water Board Actions

The San Diego Water Board uses its authorities and programs given under the Porter-Cologne Water Quality Control Act to regulate discharges from the controllable sources within its region. The available regulatory authorities include establishing discharge prohibitions in the Basin Plan,[53] issuing individual or general WDRs (including those that serve as NPDES permits),[54] or issuing individual or general conditional waivers of WDRs.[55] The San Diego Water Board has the authority to enforce Basin Plan prohibitions, WDRs, and conditional waivers of WDRs through enforcement actions (e.g., time schedule orders, cleanup and abatement orders, cease and desist orders, administrative civil liability orders).[56] The San Diego Water Board also has the authority to require water quality investigations and submittal of monitoring and technical reports from known, suspected, and proposed dischargers, which may be used to support the development, refinement, and/or implementation of the ARP.[57]

Section 5 identifies regulated and unregulated point and nonpoint sources of pollution. The majority of controllable sources generated in the Tijuana River Valley Hydrologic Area are regulated by WDRs which include requirements for controlling waste discharges so that they do not cause or contribute to an exceedance of water quality standards in receiving waters. These U.S. sources of indicator bacteria and trash are not significant contributors to the impairment of beneficial uses in the lower Tijuana River.

The river's beneficial uses would still remain impaired due to transboundary pollution even if it were possible to entirely eliminate indicator bacteria and trash loads generated in the U.S. In order to restore beneficial uses, the pollutants in transboundary flows must be reduced substantially. Discharges from the seven transboundary flow points identified as significant sources of indicator bacteria and trash in the Tijuana River Valley Hydrologic Area are not regulated by WDRs, less controlled, and less predictable than U.S.-side sources.

Table 8.1 includes actions planned by the San Diego Water Board to meet the goal of attaining water quality standards in the lower Tijuana River. This includes San Diego Water Board direction and oversight on best management practices (BMP) and infrastructure performance standards and timelines based on required load reductions.

The San Diego Water Board has identified several responsible parties that must attain WQOs in their discharges to the lower Tijuana River. Most importantly, USIBWC owns and operates infrastructure which convey the significant sources of indicator bacteria and trash to the lower Tijuana River.

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[53] Wat. Code, § 13243.

[54] Wat. Code, §§ 13263, 13264, 13376, 13377.

[55] Wat. Code, § 13269.

[56] Wat. Code, §§ 13300, 13301, 13304, 13308, 13350, 13385, 13399.33.

[57] Wat. Code, §§ 13225, 13267, 13383.

The 1944 Water Treaty, as amended, assigns the responsibilities for transboundary flows to IBWC. Moreover, USIBWC acknowledged the need for permit oversight of the facilities constructed pursuant to Minute 283 in a 1995 Letter of Understanding between the San Diego Water Board, USEPA, and USIBWC. USIBWC has the ability to exert a measure of control over six of the seven transboundary flow points because it owns and operates infrastructure at those locations. Therefore, this ARP considers USIBWC as a responsible party for achieving WQOs for those six significant sources of pollutants.

DHS owns and/or maintains storm water infrastructure in Yogurt Canyon through which polluted transboundary flows are also conveyed. DHS has the ability to exert a measure of control along the border, including over its infrastructure at Yogurt Canyon. Thus, this ARP considers DHS as a responsible party for achieving WQOs at Yogurt Canyon. Unlike USIBWC, DHS is not charged with addressing transboundary sanitation problems and has no direct ability to coordinate with agencies in Mexico on such problems. Therefore, DHS will likely need to coordinate with USIBWC and USEPA to achieve WQOs for transboundary flows through Yogurt Canyon.

While responsible parties are generally able to choose the specific manner of compliance with the San Diego Water Board’s regulatory actions, such that the ultimate goal is achieved through any lawful means, the San Diego Water Board can provide recommendations and support for economically feasible, effective BMPs and infrastructure that attain and maintain beneficial uses. The recommendations pertaining to significant sources will be largely based on the USMCA Comprehensive Infrastructure Solution, preferred project alternatives from the SB 507 NOA/San Diego Water Board Resolution No. R9-2019-0246, and/or other projects with timeframes to achieve compliance in a reasonable amount of time and in a manner that is equally reliable and sustained.

8.4 ARP Implementation Plan/Schedule

Table 8.1 describes a set of proposed actions to help achieve the necessary reductions in trash and indicator bacteria loading and necessary monitoring to track the progress of meeting water quality standards in the lower Tijuana River. The San Diego Water Board requests that the U.S. Government advance the necessary intergovernmental cooperation and coordination required to implement this ARP and achieve WQOs in transboundary sources.

As authorized and appropriate, the regulatory measures in Table 8.1 may include compliance schedules for responsible parties to achieve WQOs. For this ARP, the schedules are within seven years after San Diego Water Board approval of the ARP for indicator bacteria and within five to nine years after approval of the ARP for the progressive reduction in trash loading.

The San Diego Water Board requests the development of an MOU with USIBWC and USEPA, in consultation with DHS, to establish agreements, roles, and responsibilities to control transboundary sources of pollution within these timeframes and within respective jurisdictions and funding allocations. The San Diego Water Board will request that USIBWC take the lead in the minimum frequency of assessment and collection (MFAC) program described in section 8.5.

The San Diego Water Board considers the seven-year and five to nine-year timeframes for indicator bacteria and trash, respectively, reasonable for sources of pollutants generated in the U.S. since the contributions from these sources are relatively minor and, in general, the controllable sources are already subject to existing, enforceable WDRs.

Table 8.1, Items 4, 6, and 7 pertain to potential sources of indicator bacteria and trash generated within the Tijuana Hydrologic Unit that may not have regulatory coverage by the San Diego Water Board. Although there are no data to suggest that indicator bacteria or trash from these sources are significant contributors to the impairment of beneficial uses in the lower Tijuana River, they must still be regulated proactively to achieve WQOs.

Table 8.1 Items 8-14 pertain to point source discharges that reach the lower Tijuana River, which are already subject to NPDES permits.

Item 1 pertains to unregulated sources in the Tijuana River Valley Hydrologic Area that are generated in Mexico. Data, studies, and observations demonstrate that these are the significant sources of wastes impairing beneficial uses of the lower Tijuana River. USIBWC is expected to work with USEPA to implement USMCA Comprehensive Infrastructure Solution projects that are expected to significantly reduce indicator bacteria and trash loads in the transboundary flows.

The San Diego Water Board will move forward with the implementation actions in Table 8.1 to the extent possible given its authority, funds available to the dischargers, and negotiations between the San Diego Water Board and the responsible parties.

Table 8.1 Implementation actions and schedule

Item	Implementation Action	Responsible Party	Date
1	Develop a Memorandum of Understanding (MOU) between the San Diego Water Board, USIBWC, and USEPA to identify procedures, actions, roles, and responsibilities within respective jurisdictions and funding allocations to control transboundary sources of pollution, if practicable. DHS may be consulted as needed. The MOU may include specific language to support the implementation of projects in the USEPA-USIBWC June 9, 2023, Record of Decision. (pollutant source: transboundary flows)	San Diego Water Board, USIBWC, and USEPA (consultation with DHS)	Within one year of San Diego Water Board approval of this ARP.
2	Develop, propose, and implement a Minimum Frequency of Assessment and Collection (MFAC) program for trash to attain applicable water quality standards and achieve the schedule for progressive reductions in trash loading in the lower Tijuana River. (pollutant source: transboundary flows)	USIBWC	Proposal of MFAC program within one year of San Diego Water Board approval of this ARP.
3	Consideration of a Resolution identifying potential federal, state, and local projects to be considered for funding pursuant to Proposition 4. Proposition 4 was approved by California voters on November 5, 2024 and makes $50 million available to the State Water Board for loans or grants for projects that will address water quality problems arising from cross-border rivers and coastal waters. (pollutant source: transboundary flows)	San Diego Water Board	Within one year of San Diego Water Board approval of this ARP.

Item	Implementation Action	Responsible Party	Date
4	For commercial agricultural operations in the Tijuana Hydraulic Unit whose discharges may affect the lower Tijuana River, identify and enroll in general WDRs for commercial agricultural operations (San Diego Water Board Order Nos. R9-2016-0004 and R9-2016-0005) or issue individual WDRs. (pollutant source: agricultural operations)	San Diego Water Board	Within one year of San Diego Water Board approval of this ARP.
5	Review compliance with the general WDRs for commercial agricultural operations (San Diego Water Board Order Nos. R9-2016-0004 and R9-2016-0005) and determine whether discharges are causing or contributing to conditions of pollution or nuisance in the lower Tijuana River. If necessary and appropriate, consider amending the general WDRs for commercial agricultural operations to include additional requirements, including but not limited to amending monitoring and reporting requirements to determine the effect of discharges. (pollutant source: agricultural operations)	San Diego Water Board	Compliance at these facilities will be evaluated within the permit term consistent with program and regional priorities, which include considerations such as ambient monitoring data, efforts to deter and/or respond to suspected violations, compliance assistance, and potential TMDL development. Amendment or reissuance within five years of San Diego Water Board approval of this ARP, if needed.
6	For equestrian operations in the Tijuana Hydrologic Unit whose discharges may affect the lower Tijuana River, enroll in the Animal Operations Waiver (Waiver No. 5 – Discharges from Animal Operations, Order No. R9-2024-0001) which includes requirements consistent with achieving WQOs. (pollutant source: equestrian operations)	San Diego Water Board	Within two years of San Diego Water Board approval of this ARP.

Item	Implementation Action	Responsible Party	Date
7	For small MS4s in the Tijuana Hydrologic Unit whose discharges to surface waters may affect the lower Tijuana River, identify and enroll in statewide WDRs for stormwater discharges from small MS4s (Water Quality Order 2013-0001-DWQ, as amended; NPDES Permit No. CAS000004). (pollutant source: Phase II MS4 outfalls)	State Water Board	Upon State Water Board renewal of the Phase II MS4 Permit.
8	Review compliance with the statewide WDRs for small MS4s (Water Quality Order 2013-0001-DWQ, as amended; NPDES Permit No. CAS000004) and determine whether discharges are causing or contributing to conditions of pollution or nuisance in the lower Tijuana River. If necessary and appropriate, work with the State Water Board for consideration of amending the statewide WDRs for small MS4s to include additional requirements, including but not limited to, amending monitoring and reporting requirements to determine the effect of discharges. (pollutant source: Phase II MS4 outfalls)	San Diego Water Board	Compliance at these facilities will be evaluated within the permit term consistent with program and regional priorities, which include considerations such as ambient monitoring data, efforts to deter and/or respond to suspected violations, compliance assistance, and potential TMDL development. Amendment or reissuance within five years of San Diego Water Board approval of this ARP, if needed.

Item	Implementation Action	Responsible Party	Date
9	Review compliance with the Phase I MS4 Permit (Order No. R9-2013-0001, as amended; NPDES Permit No. CAS0109266) and determine whether discharges are causing or contributing to conditions of pollution or nuisance in the lower Tijuana River. If necessary and appropriate, consider amending the Phase I MS4 permit to include additional requirements, including but not limited to amending monitoring and reporting requirements to determine the effect of discharges. (pollutant source: Phase I MS4 outfalls)	San Diego Water Board	Compliance at these facilities will be evaluated within the permit term consistent with program and regional priorities, which include considerations such as ambient monitoring data, efforts to deter and/or respond to suspected violations, compliance assistance, and potential TMDL development. Amendments upon San Diego Water Board renewal of Phase I MS4 Permit, if needed.

Item	Implementation Action	Responsible Party	Date
10	For discharges from NOLF-IB, review compliance with Order No. R9-2015-0117, as amended by R9-2017-0011 (NPDES Permit No. CA0109185), and other related WDRs, and determine whether discharges are causing or contributing to conditions of pollution or nuisance in the lower Tijuana River. If necessary and appropriate, consider amending Orders No. R9-2015-0117 and/or R9-2017-0011 (NPDES Permit No. CA0109185), and other related WDRs to include additional requirements, including but not limited to amending monitoring and reporting requirements to determine the effect of discharges. (pollutant source: NOLF-IB outfalls)	San Diego Water Board	Compliance at these facilities will be evaluated within the permit term consistent with program and regional priorities, which include considerations such as ambient monitoring data, efforts to deter and/or respond to suspected violations, compliance assistance, and potential TMDL development. Amendments upon San Diego Water Board renewal of Naval Base Coronado Permit.

Item	Implementation Action	Responsible Party	Date
11	Review compliance with Order No. R9-2015-0013 (NPDES Permit No. CAG919003; Groundwater Extraction Permit) and determine whether discharges are causing or contributing to conditions of pollution or nuisance in the lower Tijuana River. If necessary and appropriate, consider amending Order No. R9-2015-0013 (NPDES Permit No. CAG919003; Groundwater Extraction Permit) to include additional requirements, including but not limited to amending monitoring and reporting requirements to determine the effect of discharges. (pollutant source: direct discharge of extracted groundwater or via Phase I MS4 outfalls)	San Diego Water Board	Compliance at these facilities will be evaluated within the permit term consistent with program and regional priorities, which include considerations such as ambient monitoring data, efforts to deter and/or respond to suspected violations, compliance assistance, and potential TMDL development. Amendments upon renewal of Groundwater Extraction Permit, if needed.
12	Review compliance with Order No. 2022-0033-DWQ (NPDES Permit No. CAS000003; Caltrans Permit) and determine whether discharges are causing or contributing to conditions of pollution or nuisance in the lower Tijuana River. If necessary and appropriate, work with the State Water Board for consideration of amending Order No. 2012-0011-DWQ (NPDES Permit No. CAS000003; Caltrans Permit) to include additional requirements, including but not limited to amending monitoring and reporting requirements to determine the effect of discharges. (pollutant source: Caltrans Facilities)	San Diego Water Board	Compliance at these facilities will be evaluated within the permit term consistent with program and regional priorities, which include considerations such as ambient monitoring data, efforts to deter and/or respond to suspected violations, compliance assistance, and potential TMDL development. Amendments upon State Water Board renewal of Caltrans Permit, if needed.

Item	Implementation Action	Responsible Party	Date
13	Review compliance with Order No. 2014-0057-DWQ (NPDES Permit No. CAS000001; Industrial General Permit) and determine whether discharges are causing or contributing to conditions of pollution or nuisance in the lower Tijuana River. If necessary and appropriate, work with the State Water Board for consideration of amending Order No. 2014-0057-DWQ (NPDES Permit No. CAS000001; Industrial General Permit) to include additional requirements, including but not limited to amending monitoring and reporting requirements to determine the effect of discharges. (pollutant source: Industrial Sites)	San Diego Water Board	Compliance at these facilities will be evaluated within the permit term consistent with program and regional priorities, which include considerations such as ambient monitoring data, efforts to deter and/or respond to suspected violations, compliance assistance, and potential TMDL development. Amendments upon State Water Board renewal of the Industrial General Permit, if needed.

Item	Implementation Action	Responsible Party	Date
14	Review compliance with Order No. 2009-0009-DWQ (NPDES Permit No. CAS000002; Construction General Permit) and determine whether discharges are causing or contributing to conditions of pollution or nuisance in the lower Tijuana River. If necessary and appropriate, work with the State Water Board for consideration of amending Order No. 2009-0009-DWQ (NPDES Permit No. CAS000002; Construction General Permit) to include additional requirements, including but not limited to amending monitoring and reporting requirements to determine the effect of discharges. (pollutant source: Construction Sites)	San Diego Water Board	Compliance at these facilities will be evaluated within the permit term consistent with program and regional priorities, which include considerations such as ambient monitoring data, efforts to deter and/or respond to suspected violations, compliance assistance, and potential TMDL development. Amendments upon State Water Board renewal of the Construction General Permit, if needed.
15	Evaluate if water quality standards are attained in the lower Tijuana River, in accordance with the schedules identified in this ARP, and consider the prioritization and development of TMDLs for trash and indicator bacteria, as necessary.	San Diego Water Board	During CWA section 303(d)/305(b) Integrated Report cycles[58] and in accordance with this ARP's schedule for the attainment of indicator bacteria WQOs within 7 years, and progressive trash reduction schedule of 5-9 years.

[58] The CWA requires that states report on the quality of their surface waters every two years. In California, a statewide Integrated Report is developed every two years for three of the nine regional water boards that are "on cycle". The Integrated Report contains a regional assessment of the State's surface waters to determine if they contain pollutants at levels that exceed water quality standards. While each of the state's nine regional water boards are "on cycle" every six years, regional water boards may submit an additional "off cycle" report to assess new high-priority data or to make new listing or delisting decisions.

The best solutions to attain WQOs in the lower Tijuana River are those that focus on reducing and eliminating the source of the pollution. The waste and pollution that enter the lower Tijuana River are largely attributable to the transboundary flows that originate in Mexico. Due to its unique position in a joint, binational commission, USIBWC is in the best position to effectuate meaningful and lasting solutions through coordinated efforts with Mexico to protect water quality and beneficial uses in the lower Tijuana River watershed. Any U.S.-focused solutions to attain WQOs in transboundary flows should be applied immediately north of the border to prevent wastes from reaching the lower Tijuana River.

8.5 MFAC Program and Progressive Trash Reductions

Table 8.1 describes proposed measures to achieve necessary reductions in trash loading. Data, studies, and observations demonstrate that transboundary flows are the significant sources of wastes impairing beneficial uses of the lower Tijuana River. Therefore, trash reduction efforts will be primarily focused on transboundary flow loads, which the San Diego Water Board estimates at 97% of the total trash loading.

The necessary reductions in trash loading can be achieved based on full removal of trash during MFAC collection events and achievement of the phased reductions in Table 8.2. These reductions must be calculated based on the estimated annual baseline loading of trash. The schedule for the phased reductions starts on the San Diego Water Board’s approval of this ARP.

Table 8.2 Progressive transboundary trash reductions

Year[59]	Progressive Trash Reduction Schedule
5	50% reduction of the estimated baseline load
6	60% reduction of the estimated baseline load calculated as a two-year average (Years 5 and 6)
7	70% reduction of the estimated baseline load calculated as a rolling three-year average
8	80% reduction of the estimated baseline load calculated as a rolling three-year average
9	90% reduction of the estimated baseline load calculated as a rolling three-year average (ongoing from Year 9 on)

The San Diego Water Board will request that USIBWC develop, propose, and implement an MFAC program to achieve these progressive trash reductions. A proposed MFAC program can consist of regularly scheduled trash assessment, collection, and disposal, along with structural and/or nonstructural BMP implementation at an interval that prevents trash from accumulating to the extent that causes nuisance or adversely affects beneficial uses between collections.

[59] Year 1 starts upon San Diego Water Board approval of this ARP.

A proposed MFAC program should include details of the frequency, location, and reporting of trash monitoring to the San Diego Water Board. At a minimum, the MFAC program should include:

1. An estimate of the annual baseline loading of trash in the Tijuana River Valley from transboundary flows based on a scientifically defensible assessment of data.

2. Monitoring stations for Tijuana River Valley receiving water monitoring at or near coordinates specified in the USIBWC NPDES Permit (TRV stations in Table E-1 of Attachment E of San Diego Water Board Order No. R9-2021-0001 as amended by Order No. R9-2023-0009, NPDES Permit No. CA0108928).

3. Monitoring frequency of at least once per transboundary flow event, when flows cross the U.S.-Mexico border into the Tijuana River Flood Control Channel or Yogurt Canyon, or when flows bypass the canyon collectors (during both dry and wet weather).

4. Annual reporting of trash monitoring to the San Diego Water Board.

Other metrics to determine effectiveness of BMPs and assess trash reduction goals may also be included. The goal is to remove 100 percent of the trash at each MFAC location during collection events and dispose of it properly.

A proposed MFAC program would need to be approved by the San Diego Water Board or its Executive Officer prior to implementation.

If the amount of trash accumulating between MFAC events does not decrease in accordance with the schedule in Table 8.2, the collection frequency and/or BMP implementation should be increased to meet the trash reductions. Trash reductions should be calculated based on the estimate of the annual baseline loading of trash, derived from a scientifically defensible assessment of data. If no such estimate is provided by USIBWC, annual baseline loading could be based on the values in Section 5.2 (3,897 total tons/year).

Beginning in Year 9 after San Diego Water Board approval of this ARP, USIBWC should: (1) maintain 90% reduction of the estimated baseline load calculated as a rolling three-year average, (2) continue to remove and properly dispose of 100 percent of the trash at each MFAC location during collection events, and (3) remove trash at each MFAC location at intervals that prevent nuisance and adverse impacts to beneficial uses between collections.

8.6 Monitoring of Sources and Assessment of Receiving Waters

An essential component of ARP implementation is water quality monitoring. Water quality monitoring is needed to evaluate the progress toward attainment of WQOs and restoration of the beneficial uses in receiving waters. Additionally, sufficient water quality data are necessary to support the removal of a water body (in this case, the lower Tijuana River) from the 303(d) List. Water quality data can also be used to identify additional regulatory actions that the San Diego Water Board may need to implement to restore and protect beneficial uses.

The San Diego Water Board will request that USIBWC conduct monitoring of significant sources and receiving waters. Components of a monitoring program for significant sources and receiving waters to evaluate progress toward attainment of WQOs should include:

1. Monitoring provisions included in the Monitoring and Reporting Program (MRP), and specifically the Tijuana River Valley Monitoring Program, of the USIBWC NPDES Permit (Attachment E, Section 4.2 of San Diego Water Board Order No. R9-2021-0001 as amended by Order No. R9-2023-0009, NPDES Permit No. CA0108928). To avoid duplication of efforts, the San Diego Water Board encourages coordination between monitoring required by the USIBWC NPDES Permit and ARP-related monitoring to assess pollutant reductions and attainment of WQOs.

2. Monitoring stations for Tijuana River Valley receiving water monitoring at or near coordinates specified in the USIBWC NPDES Permit (TRV stations 1 through 6 in Table E-1 of Attachment E of San Diego Water Board Order No. R9-2021-0001 as amended by Order No. R9-2023-0009, NPDES Permit No. CA0108928) in addition to monitoring stations at/near the IBWC Gauge (32° 32' 31.75" N latitude, -117° 3' 1.03" W longitude), Hollister Bridge (32° 33' 5.04" N latitude, -117° 5' 2.56" W longitude), and Yogurt Canyon (32° 32' 7.42" N latitude, -117° 7' 12.23" W longitude). Coordinates for ARP monitoring may vary slightly to allow for installation of BMP/infrastructure to divert/treat/remove wastes.

3. Monthly monitoring at the canyon collectors (i.e., of water in the concrete aprons); monitoring once per transboundary flow event (during both dry and wet weather) at the Tijuana River Flood Control Channel and Yogurt Canyon and at the canyon collectors when flows bypass them.

4. Water quality monitoring of *E. coli* and enterococci sufficient to assess progress toward attaining WQOs in the lower Tijuana River.

5. Development and implementation of a model to predict microbial pathogen abundance in the lower Tijuana River and/or coastal waters.[60]

6. Trash assessments as specified in section 4.2.3 of Attachment E of San Diego Water Board Order No. R9-2021-0001 as amended by Order No. R9-2023-0009, NPDES Permit No. CA0108928.

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[60] Predictive modeling allows the evaluation of benefits of proposed infrastructure projects (i.e., reduced beach closures and reduced probability of illness among beach recreators) for informed cost-benefit analyses and decision-making. The ability to determine the net benefit of individual pollution control projects (USMCA, Minute 320, SB 507 NOA, and/or others) would optimize capital project planning, project implementation, water quality monitoring, and protection of public health. The Scripps Institution of Oceanography, University of California San Diego has already developed a proposal to develop, validate, and implement a real-time coastal ocean pathogen impacts model, which can help achieve these goals.

7. Trash monitoring as specified in an approved MFAC program.

8. Annual reporting prepared by USIBWC that assesses reductions in indicator bacteria and trash loading, receiving water WQOs, and progressive trash reductions.

9. A Quality Assurance Project Plan (QAPP) describing the project objectives and organization, functional activities, and quality assurance and quality control protocols for the monitoring. Monitoring shall be conducted in accordance with the most recent Surface Water Ambient Monitoring Program (SWAMP) Quality Assurance Program Plan (QAPrP) in terms of laboratory reporting limits and measurement quality objectives, unless otherwise noted. The current SWAMP QAPrP is available on the State Water Board web site located at: https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/swamp-qaprp-2022.pdf.

The San Diego Water Board may use its regulatory authority to require water quality monitoring and reporting to assess implementation of this ARP.

9 ANTIDEGRADATION POLICIES

Conventional TMDLs must conform to the federal Antidegradation Policy described in 40 CFR § 131.12 and State Water Board Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality Waters in California* to protect waters from degradation. While this is not a conventional TMDL, this ARP is nevertheless consistent with the federal and state antidegradation policies.

The federal Antidegradation Policy described in 40 CFR § 131.12 and State Water Board Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality Waters in California* protect waters from degradation. The ARP implementation plan/schedule in section 8 takes into account principles contained in the State and federal antidegradation policies by recommending actions to restore water quality through attainment of water quality standards.

Currently, the water quality of the lower Tijuana River and cross-border tributaries does not support beneficial uses. Excessive trash and exceedingly high concentrations of indicator bacteria are present due to polluted transboundary flows. Trash is a threat to the river and downstream beneficial uses. Trash poses risks from ingestion and entanglement of trash, which can be fatal for freshwater, estuarine, and marine life. The alteration of habitats due to trash can render them unsuitable. Although the pathogens present in the Tijuana River and its tributaries specifically present a risk to human health, the sewage they are part of contains a wide variety of additional pollutants that negatively impact the river's beneficial uses as well.

The ARP implementation actions necessary to achieve reductions in indicator bacteria and trash loading in Table 8.1 are consistent with antidegradation policies by implementing a plan designed to achieve pollutant source reductions to attain water quality standards. Success of the implementation plan will be based on monitoring and assessment to determine if the actions taken are effective in improving water quality and, ultimately, achieving WQOs. Comprehensive monitoring and assessment will help to identify areas where site-specific management measures are necessary to attain water quality standards.

10 PUBLIC OUTREACH AND PARTICIPATION

The San Diego Water Board has provided public outreach and participation while developing the ARP for indicator bacteria and trash in the lower Tijuana River. The following describes the San Diego Water Board's public outreach and participation process:

<u>San Diego Water Board Web Site</u>
Since the inception of this ARP, the San Diego Water Board has maintained a web page containing background information, a description of the ARP, and status of the ARP:

https://www.waterboards.ca.gov/sandiego/water_issues/programs/tmdls/tijuanarivervalley.html

The San Diego Water Board also posts regular updates, generally every three months, online in its Executive Officer Reports:

https://www.waterboards.ca.gov/sandiego/publications_forms/publications/eoreports.html

The information and updates posted on the San Diego Water Board web site include contact information in case members of the public have any questions or comments on the ARP.

Outreach to Tribes and Disadvantaged Communities

In May and June 2023, the San Diego Water Board reached out to known interested persons in disadvantaged communities and California Native American Tribes of the San Diego Region to invite feedback on any concerns related to environmental justice or potential impacts on water quality for disadvantaged communities or tribes due to ARP implementation. The San Diego Water Board did not receive any responses of concern. In February 2024, the San Diego Water Board once again solicited feedback during its in-person and virtual public workshops.

Public Review and Public Workshops

On February 26 and 28, 2024, the San Diego Water Board hosted in-person and virtual public workshops, respectively, to receive comments on the ARP. The San Diego Water Board also accepted written comments during the public comment period until 5:00 p.m. on March 13, 2024. The San Diego Water Board posted its responses to written comments and provided notice to those who submitted comments on September 30, 2024.

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APPENDIX A

DATA INVENTORY

Data from the sources presented in Appendix A were used to calculate: (1) general statistical summaries of indicator bacteria at key sites in the lower Tijuana River and in its cross-border tributaries, (2) required reductions of indicator bacteria at the key sites, (3) annual pollutant loads in the lower Tijuana River from various sources of indicator bacteria and trash, and (4) the general statistical summaries included in section 4 of the main body of the ARP. The method used to determine the maximum required reductions for indicator bacteria and the corresponding results are included in section 4 of the main body of the ARP and Appendix B, respectively. The methods used to estimate annual pollutant loads are included in Appendix C and the corresponding results are included in section 5 of the main body of the ARP and Appendix C.

Table A.1 Data Sources

Index	Data Source	Location(s)	Station Name(s)	Year(s)	Use in Advance Restoration Plan
1	Customs and Border Protection (CBP) Monitoring	Canyon del Sol Canyon Collector Goat Canyon Canyon Collector Tijuana River Border Crossing Smuggler's Gulch Canyon Collector Stewart's Drain Canyon Collector Yogurt Canyon Border Crossing North of Yogurt Canyon	Canyon del Sol[1] Goat Canyon[2] IBWC Gauge[3] Smuggler's Gulch Stewart's Drain[4] Yogurt Canyon[5] Yogurt Canyon Road	1/2018-6/2018	Water quality monitoring data used to: (1) evaluate indicator bacteria concentration distribution at key sites along the international border to calculate maximum required reductions to attain water quality objectives (WQOs) and (2) calculate indicator bacteria loads.

Index	Data Source	Location(s)	Station Name(s)	Year(s)	Use in Advance Restoration Plan
2	USIBWC Monitoring of Transboundary Wastewater Flows	Canyon del Sol Canyon Collector Goat Canyon Canyon Collector Stewart's Drain Canyon Collector	Canyon del Sol[1] Goat Canyon[2] Stewart's Drain[4]	1/2016-10/2017	Dry weather water quality monitoring data used to: (1) evaluate indicator bacteria concentration distribution at key sites along the international border to calculate maximum required reductions to attain WQOs and (2) calculate indicator bacteria loads.
3	Municipal Separate Storm Sewer System (MS4) Monitoring	Lower Tijuana River	MS4-TIJ-0402	Monitoring Year (MY) 19-20	Results from water quality monitoring provided dry weather indicator bacteria loads.
4	USIBWC Monitoring at Dairy Mart Bridge	Tijuana River at Dairy Mart Bridge	Dairy Mart	12/2013-9/2017	Water quality monitoring data used to: (1) evaluate indicator bacteria concentration distribution at Dairy Mart Bridge to calculate maximum required reductions to attain WQOs and (2) calculate indicator bacteria loads.

Index	Data Source	Location(s)	Station Name(s)	Year(s)	Use in Advance Restoration Plan
5	San Diego Water Board Monitoring	Canyon del Sol Canyon Collector Goat Canyon Canyon Collector Groundwater Discharge at Border Crossing Tijuana River at Hollister Bridge Tijuana River Border Crossing Near Goat Canyon Border Crossing Downstream of Goat Canyon Border Crossing Stewart's Drain Canyon Collector	Canyon del Sol[1] Goat Canyon[2] GW Discharge Hollister [6] IBWC Gauge [3] SD 234-2 SD 234-2 (Downstream) Stewart's Drain [4]	3/2017-8/2017	Water quality monitoring data used to: (1) evaluate indicator bacteria concentration distribution at key sites along the international border to calculate maximum required reductions to attain WQOs and (2) calculate indicator bacteria loads.

Index	Data Source	Location(s)	Station Name(s)	Year(s)	Use in Advance Restoration Plan
6	San Diego Water Board Monitoring	Near Canyon del Sol Border Crossing Yogurt Canyon Border Crossing	W-9 Yogurt Canyon[5]	3/2017-8/2017	Water quality monitoring data used to evaluate indicator bacteria concentration distribution at key sites along the international border and to calculate maximum required reductions to attain WQOs and (2) calculate indicator bacteria loads.
7	Naval Outlying Landing Field, Imperial Beach (NOLF-IB) Monitoring	Lower Tijuana River/Estuary	NOLF-101	2018-2021	Flow data and water quality monitoring data used to calculate enterococci loads.
8	Tijuana River Bacterial Source Identification Study	Hollister Street Dairy Mart Road Smuggler's Gulch	Hollister Street Dairy Mart Road Smuggler's Gulch	2008-2011	Summary of results from water quality monitoring provided enterococci load estimates and were used to extrapolate *E. coli* load estimates for Phase I MS4 discharges.
9	USIBWC Binational Monitoring	Silva Drain	Silva Drain	12/2018-2/2019	Water quality monitoring data used to calculate indicator bacteria loads.

Index	Data Source	Location(s)	Station Name(s)	Year(s)	Use in Advance Restoration Plan
10	USIBWC Transboundary Spill Reports	Tijuana River Flood Control Channel and cross-border tributaries	Tijuana River Main Channel Canyon del Sol Yogurt Canyon/Border Field State Park Goat Canyon Stewart's Drain	2015-2020	Dry weather spill volumes used to calculate indicator bacteria loads.
11	Tributary Study Funded by the U.S. Department of Justice (USDOJ)	Tijuana River Valley cross-border tributaries	Stewart's Drain Silva Drain Canyon Del Sol	Water Year 2019	Runoff volumes and subwatershed areas used to calculate indicator bacteria loads.
12	Tijuana River Valley Recovery Team Recovery Strategy	Tijuana River Watershed	NA	NA	Watershed area used to calculate indicator bacteria loads from the Tijuana River Flood Control Channel.
13	URS Report of Trash, Waste Tire and Sediment Characterization	Various locations in the Tijuana River Valley	Various locations in the Tijuana River Valley	4/2009-1/2010	Trash density, visual observations, and trash removal estimates used to characterize trash in the Tijuana River Valley.

Index	Data Source	Location(s)	Station Name(s)	Year(s)	Use in Advance Restoration Plan
14	City of San Diego Excavation and Post Storm Observations	Various locations in the Tijuana River Valley	Various locations in the Tijuana River Valley	10/2009-1/2010	Trash abundance used to calculate trash loads.
15	Nelson Sloan Management and Operations Plan and Cost Analysis	Various locations in the Tijuana River Valley	Various locations in the Tijuana River Valley	NA	Estimated (projected) volume of sediment, trash and debris excavations used to calculate trash loads.
16	USIBWC Sediment Basin Feasibility Study	Tijuana River Flood Control Channel	NA	NA	Estimated (modeled) volume of sediment, trash and debris capture used to calculate trash load.
17	Tijuana River Watershed Management Area Water Quality	Tijuana River Watershed	NA	2012	Areas for various land uses used to calculate trash loads.
18	Regional Trash Generation Rates for Priority Land Uses in San Diego	San Diego County	NA	2016-2017	Litter generation rates used to calculate trash loads.
19	Los Angeles River Trash TMDL	Los Angeles River Watershed	NA	2002-2004	Litter generation rates used to calculate trash loads.

Index	Data Source	Location(s)	Station Name(s)	Year(s)	Use in Advance Restoration Plan
20	Needs and Opportunities Assessment – Trash Technical Memorandum	Tijuana River Valley	NA	2020	Trash density used to calculate trash loads.
21	Tijuana River Action Month (TRAM) Trash Removal Estimates	Various locations in the Tijuana River watershed in the U.S. and in Mexico	Various locations in the Tijuana River watershed in the U.S. and in Mexico	9/2010-10/2018	Trash removal estimates used to quantify the amount of trash removed during Tijuana River Action Network-organized volunteer cleanups performed on both sides of the border.

[1] *Canyon del Sol* refers to *W8e* station from San Diego Water Board monitoring and *Canyon del Sol* station from Customs and Border Patrol monitoring and USIBWC transboundary flow monitoring.

[2] *Goat Canyon* refers to *Goat Canyon* station from Customs and Border Patrol monitoring, USIBWC transboundary flow monitoring, & San Diego Water Board monitoring.

[3] *IBWC Gauge* refers to *Whiskey-4* station from Customs and Border Patrol monitoring and *IBWC gauge* and *Upstream of IBWC gauge* stations from San Diego Water Board monitoring.

[4] *Stewart's Drain* refers to *Stewart's Drain* station from Customs and Border Patrol monitoring, USIBWC transboundary flow monitoring, & San Diego Water Board monitoring.

[5] *Yogurt Canyon* refers to *Yogurt Canyon* station from Customs and Border Patrol monitoring and San Diego Water Board monitoring.

Table A.2 Indicator Bacteria Data Used for Analyses

Location/Station	Date	Parameter	Unit	Result	Source
SD_DW1034	9/8/2016	*E. coli*	MPN/100 mL	41	MS4 Monitoring
SD_DW1035	9/8/2016	*E. coli*	MPN/100 mL	281	MS4 Monitoring
Dairy Mart	12/24/2013	*E. coli*	MPN/100 mL	1,299,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/4/2014	*E. coli*	MPN/100 mL	884,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/11/2014	*E. coli*	MPN/100 mL	308,800	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/4/2014	*E. coli*	MPN/100 mL	3,255,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/11/2014	*E. coli*	MPN/100 mL	686,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/18/2014	*E. coli*	MPN/100 mL	1,850	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/25/2014	*E. coli*	MPN/100 mL	100	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/8/2014	*E. coli*	MPN/100 mL	579,400	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/15/2014	*E. coli*	MPN/100 mL	4,611,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/16/2014	*E. coli*	MPN/100 mL	2,382,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/23/2014	*E. coli*	MPN/100 mL	3,654,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/30/2014	*E. coli*	MPN/100 mL	275,500	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/6/2015	*E. coli*	MPN/100 mL	1,500,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/13/2015	*E. coli*	MPN/100 mL	2,909,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/20/2015	*E. coli*	MPN/100 mL	10,430,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/27/2015	*E. coli*	MPN/100 mL	1,250,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/3/2015	*E. coli*	MPN/100 mL	5,172,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/24/2015	*E. coli*	MPN/100 mL	3,968,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/3/2015	*E. coli*	MPN/100 mL	2,098,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/10/2015	*E. coli*	MPN/100 mL	1,354,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/12/2015	*E. coli*	MPN/100 mL	1,314,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/19/2015	*E. coli*	MPN/100 mL	2,247,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/26/2015	*E. coli*	MPN/100 mL	1,970	USIBWC Monitoring at Dairy Mart
Dairy Mart	6/2/2015	*E. coli*	MPN/100 mL	479	USIBWC Monitoring at Dairy Mart
Dairy Mart	7/28/2015	*E. coli*	MPN/100 mL	6,300	USIBWC Monitoring at Dairy Mart

Location/Station	Date	Parameter	Unit	Result	Source
Dairy Mart	8/4/2015	*E. coli*	MPN/100 mL	18,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/22/2015	*E. coli*	MPN/100 mL	8,130	USIBWC Monitoring at Dairy Mart
Dairy Mart	10/6/2015	*E. coli*	MPN/100 mL	7,270,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/3/2015	*E. coli*	MPN/100 mL	4,352,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/10/2015	*E. coli*	MPN/100 mL	1,119,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/17/2015	*E. coli*	MPN/100 mL	1,374,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/15/2015	*E. coli*	MPN/100 mL	1,374,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/21/2015	*E. coli*	MPN/100 mL	1,483,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/28/2015	*E. coli*	MPN/100 mL	75,900	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/5/2016	*E. coli*	MPN/100 mL	1,086,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/2/2016	*E. coli*	MPN/100 mL	11,870,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/9/2016	*E. coli*	MPN/100 mL	8,164,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/8/2016	*E. coli*	MPN/100 mL	2,481,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/15/2016	*E. coli*	MPN/100 mL	770,100	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/12/2016	*E. coli*	MPN/100 mL	1,789,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/10/2016	*E. coli*	MPN/100 mL	1,918,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/22/2016	*E. coli*	MPN/100 mL	1,413,600	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/29/2016	*E. coli*	MPN/100 mL	2,419,600 [i]	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/6/2016	*E. coli*	MPN/100 mL	48,840	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/20/2016	*E. coli*	MPN/100 mL	1,137,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/27/2016	*E. coli*	MPN/100 mL	2,187,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/3/2017	*E. coli*	MPN/100 mL	959,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/10/2017	*E. coli*	MPN/100 mL	4,106,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/17/2017	*E. coli*	MPN/100 mL	987,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/24/2017	*E. coli*	MPN/100 mL	238,200	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/31/2017	*E. coli*	MPN/100 mL	14,136,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/7/2017	*E. coli*	MPN/100 mL	2,064,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/14/2017	*E. coli*	MPN/100 mL	3,873,000	USIBWC Monitoring at Dairy Mart

Location/Station	Date	Parameter	Unit	Result	Source
Dairy Mart	2/21/2017	*E. coli*	MPN/100 mL	2,143,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/28/2017	*E. coli*	MPN/100 mL	193,500	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/7/2017	*E. coli*	MPN/100 mL	224,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/14/2017	*E. coli*	MPN/100 mL	146,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/21/2017	*E. coli*	MPN/100 mL	579,400	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/28/2017	*E. coli*	MPN/100 mL	1,723,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/4/2017	*E. coli*	MPN/100 mL	3,873,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/11/2017	*E. coli*	MPN/100 mL	2,359,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/18/2017	*E. coli*	MPN/100 mL	204,600	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/25/2017	*E. coli*	MPN/100 mL	15,100	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/2/2017	*E. coli*	MPN/100 mL	528,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/9/2017	*E. coli*	MPN/100 mL	7,270,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/16/2017	*E. coli*	MPN/100 mL	2,410	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/23/2017	*E. coli*	MPN/100 mL	310	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/30/2017	*E. coli*	MPN/100 mL	200	USIBWC Monitoring at Dairy Mart
Dairy Mart	6/6/2017	*E. coli*	MPN/100 mL	50 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	6/20/2017	*E. coli*	MPN/100 mL	5 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	6/27/2017	*E. coli*	MPN/100 mL	10	USIBWC Monitoring at Dairy Mart
Dairy Mart	7/5/2017	*E. coli*	MPN/100 mL	5 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	7/11/2017	*E. coli*	MPN/100 mL	5 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/8/2017	*E. coli*	MPN/100 mL	31	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/15/2017	*E. coli*	MPN/100 mL	10	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/22/2017	*E. coli*	MPN/100 mL	5 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/29/2017	*E. coli*	MPN/100 mL	50 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/5/2017	*E. coli*	MPN/100 mL	253	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/12/2017	*E. coli*	MPN/100 mL	9,804	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/19/2017	*E. coli*	MPN/100 mL	235	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/26/2017	*E. coli*	MPN/100 mL	52	USIBWC Monitoring at Dairy Mart

Location/Station	Date	Parameter	Unit	Result	Source
IBWC gauge	3/14/2017	*E. coli*	MPN/100 mL	241,960 [i]	San Diego Water Board Monitoring
Hollister	3/14/2017	*E. coli*	MPN/100 mL	61,310	San Diego Water Board Monitoring
IBWC gauge	3/23/2017	*E. coli*	MPN/100 mL	6,131,000	San Diego Water Board Monitoring
Hollister	3/23/2017	*E. coli*	MPN/100 mL	2,419,000	San Diego Water Board Monitoring
Goat Canyon	3/23/2017	*E. coli*	MPN/100 mL	24,196,000 [i]	San Diego Water Board Monitoring
IBWC gauge	4/3/2017	*E. coli*	MPN/100 mL	5,794,000	San Diego Water Board Monitoring
Hollister	4/3/2017	*E. coli*	MPN/100 mL	4,611,000	San Diego Water Board Monitoring
Goat Canyon	4/3/2017	*E. coli*	MPN/100 mL	15,531,000	San Diego Water Board Monitoring
Yogurt Canyon	4/3/2017	*E. coli*	MPN/100 mL	100	San Diego Water Board Monitoring
W-9	4/3/2017	*E. coli*	MPN/100 mL	200	San Diego Water Board Monitoring
GW Discharge	4/20/2017	*E. coli*	MPN/100 mL	10	San Diego Water Board Monitoring
IBWC gauge	4/20/2017	*E. coli*	MPN/100 mL	41,000	San Diego Water Board Monitoring
IBWC gauge	4/20/2017	*E. coli*	MPN/100 mL	11,530	San Diego Water Board Monitoring
Hollister	4/20/2017	*E. coli*	MPN/100 mL	20,000	San Diego Water Board Monitoring
Goat Canyon	4/20/2017	*E. coli*	MPN/100 mL	19,890,000	San Diego Water Board Monitoring
Stewart's Drain	4/20/2017	*E. coli*	MPN/100 mL	61,000	San Diego Water Board Monitoring
Stewart's Drain	4/20/2017	*E. coli*	MPN/100 mL	3,680,000	San Diego Water Board Monitoring
IBWC gauge	5/1/2017	*E. coli*	MPN/100 mL	5,730	San Diego Water Board Monitoring
Goat Canyon	5/1/2017	*E. coli*	MPN/100 mL	23,330,000	San Diego Water Board Monitoring
SD 234-2	5/1/2017	*E. coli*	MPN/100 mL	899	San Diego Water Board Monitoring
SD 234-2 (Downstream)	5/1/2017	*E. coli*	MPN/100 mL	126	San Diego Water Board Monitoring
IBWC gauge	6/22/2017	*E. coli*	MPN/100 mL	142	San Diego Water Board Monitoring
Goat Canyon	6/22/2017	*E. coli*	MPN/100 mL	1,413,600	San Diego Water Board Monitoring
Hollister	6/22/2017	*E. coli*	MPN/100 mL	26 [iii]	San Diego Water Board Monitoring
Canyon del Sol	6/27/2017	*E. coli*	MPN/100 mL	889	San Diego Water Board Monitoring
IBWC gauge	7/13/2017	*E. coli*	MPN/100 mL	173	San Diego Water Board Monitoring
GW Discharge	7/13/2017	*E. coli*	MPN/100 mL	25 [iii]	San Diego Water Board Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
Hollister	7/13/2017	*E. coli*	MPN/100 mL	20	San Diego Water Board Monitoring
Goat Canyon	7/13/2017	*E. coli*	MPN/100 mL	24,196,000 [i]	San Diego Water Board Monitoring
Hollister	7/28/2017	*E. coli*	MPN/100 mL	132	San Diego Water Board Monitoring
IBWC gauge	7/28/2017	*E. coli*	MPN/100 mL	134	San Diego Water Board Monitoring
GW discharge	7/28/2017	*E. coli*	MPN/100 mL	26	San Diego Water Board Monitoring
Goat Canyon	7/28/2017	*E. coli*	MPN/100 mL	100,100	San Diego Water Board Monitoring
Stewart's Drain	7/28/2017	*E. coli*	MPN/100 mL	29,899,870	San Diego Water Board Monitoring
Hollister	8/7/2017	*E. coli*	MPN/100 mL	576 [iii]	San Diego Water Board Monitoring
IBWC gauge	8/7/2017	*E. coli*	MPN/100 mL	3,754	San Diego Water Board Monitoring
Goat Canyon	8/7/2017	*E. coli*	MPN/100 mL	40,200	San Diego Water Board Monitoring
Goat Canyon	8/7/2017	*E. coli*	MPN/100 mL	1,314,000	San Diego Water Board Monitoring
Goat Canyon	1/24/2018	*E. coli*	MPN/100 mL	1,550,000	CBP Monitoring
Goat Canyon	1/27/2018	*E. coli*	MPN/100 mL	7,270	CBP Monitoring
Yogurt Canyon Road	1/28/2018	*E. coli*	MPN/100 mL	36,500	CBP Monitoring
Stewart's Drain	1/25/2018	*E. coli*	MPN/100 mL	980,000	CBP Monitoring
Stewart's Drain	1/24/2018	*E. coli*	MPN/100 mL	1,730,000	CBP Monitoring
Smuggler's Gulch	1/27/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
Yogurt Canyon	1/28/2018	*E. coli*	MPN/100 mL	85	CBP Monitoring
IBWC gauge	2/21/2018	*E. coli*	MPN/100 mL	1,330	CBP Monitoring
Stewart's Drain	2/21/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
Smuggler's Gulch	2/23/2018	*E. coli*	MPN/100 mL	105,000	CBP Monitoring
Goat Canyon	2/23/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
Yogurt Canyon	2/26/2018	*E. coli*	MPN/100 mL	97	CBP Monitoring
IBWC gauge	2/26/2018	*E. coli*	MPN/100 mL	10,500	CBP Monitoring
Canyon del Sol	2/27/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
Stewart's Drain	2/27/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
IBWC gauge	3/15/2018	*E. coli*	MPN/100 mL	1,050,000	CBP Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
Stewart's Drain	3/15/2018	*E. coli*	MPN/100 mL	2,420,000	CBP Monitoring
Goat Canyon	3/16/2018	*E. coli*	MPN/100 mL	1,990,000	CBP Monitoring
Smuggler's Gulch	3/17/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
IBWC gauge	3/19/2018	*E. coli*	MPN/100 mL	816,000	CBP Monitoring
Goat Canyon	3/20/2018	*E. coli*	MPN/100 mL	1,730,000	CBP Monitoring
Yogurt Canyon	3/20/2018	*E. coli*	MPN/100 mL	345	CBP Monitoring
IBWC gauge	4/16/2018	*E. coli*	MPN/100 mL	51,200	CBP Monitoring
Stewart's Drain	4/17/2018	*E. coli*	MPN/100 mL	2,420,000	CBP Monitoring
Goat Canyon	4/17/2018	*E. coli*	MPN/100 mL	2,420,000	CBP Monitoring
Yogurt Canyon	4/18/2018	*E. coli*	MPN/100 mL	3,450	CBP Monitoring
IBWC gauge	4/19/2018	*E. coli*	MPN/100 mL	10,500	CBP Monitoring
Stewart's Drain	4/20/2018	*E. coli*	MPN/100 mL	2,420,000	CBP Monitoring
IBWC gauge	5/29/2018	*E. coli*	MPN/100 mL	545	CBP Monitoring
Yogurt Canyon	5/30/2018	*E. coli*	MPN/100 mL	10	CBP Monitoring
Goat Canyon	5/30/2018	*E. coli*	MPN/100 mL	204,000	CBP Monitoring
Stewart's Drain	5/31/2018	*E. coli*	MPN/100 mL	173,000	CBP Monitoring
Goat Canyon	6/1/2018	*E. coli*	MPN/100 mL	1,990,000	CBP Monitoring
Stewart's Drain	6/4/2018	*E. coli*	MPN/100 mL	365,000	CBP Monitoring
Yogurt Canyon	6/4/2018	*E. coli*	MPN/100 mL	10	CBP Monitoring
IBWC gauge	6/20/2018	*E. coli*	MPN/100 mL	204,000	CBP Monitoring
Goat Canyon	6/20/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
Stewart's Drain	6/21/2018	*E. coli*	MPN/100 mL	411,000	CBP Monitoring
Goat Canyon	6/22/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
Yogurt Canyon	6/22/2018	*E. coli*	MPN/100 mL	109	CBP Monitoring
IBWC gauge	6/25/2018	*E. coli*	MPN/100 mL	328,000	CBP Monitoring
Stewart's Drain	6/25/2018	*E. coli*	MPN/100 mL	2,420,000 [i]	CBP Monitoring
Stewart's Drain	1/28/2016	Enterococcus	CFU/100 mL	1,600,000 [i]	USIBWC Monitoring of Transboundary Wastewater Flows

Location/Station	Date	Parameter	Unit	Result	Source
Canyon del Sol	9/5/2016	Enterococcus	CFU/100 mL	500,000	USIBWC Monitoring of Transboundary Wastewater Flows
Goat Canyon	11/29/2016	Enterococcus	CFU/100 mL	NR	USIBWC Monitoring of Transboundary Wastewater Flows
Goat Canyon	3/1/2017	Enterococcus	CFU/100 mL	NR	USIBWC Monitoring of Transboundary Wastewater Flows
Stewart's Drain	4/24/2017	Enterococcus	CFU/100 mL	1,600,000 [i]	USIBWC Monitoring of Transboundary Wastewater Flows
Goat Canyon	5/1/2017	Enterococcus	CFU/100 mL	NR	USIBWC Monitoring of Transboundary Wastewater Flows
Stewart's Drain	5/21/2017	Enterococcus	CFU/100 mL	NR	USIBWC Monitoring of Transboundary Wastewater Flows
Stewart's Drain	5/24/2017	Enterococcus	CFU/100 mL	NR	USIBWC Monitoring of Transboundary Wastewater Flows
Canyon del Sol	6/27/2017	Enterococcus	CFU/100 mL	7,500	USIBWC Monitoring of Transboundary Wastewater Flows
Canyon del Sol	10/7/2017	Enterococcus	CFU/100 mL	12,000	USIBWC Monitoring of Transboundary Wastewater Flows
Canyon del Sol	10/19/2017	Enterococcus	CFU/100 mL	30,000	USIBWC Monitoring of Transboundary Wastewater Flows
MS4-TIJ-040	MY 19-20	Enterococcus	CFU/100 mL	2.98E+09	Municipal Separate Storm Sewer System (MS4) Monitoring
MS4-TIJ-040	MY 19-20	Volume	Cubic feet	5,266	Municipal Separate Storm Sewer System (MS4) Monitoring
Lower Tijuana River	MY 19-20	Dry weather days	Days	289	Municipal Separate Storm Sewer System (MS4) Monitoring
Dairy Mart	12/24/2013	Enterococcus	MPN/100 mL	155,300	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/4/2014	Enterococcus	MPN/100 mL	214,300	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/11/2014	Enterococcus	MPN/100 mL	67,700	USIBWC Monitoring at Dairy Mart

Location/Station	Date	Parameter	Unit	Result	Source
Dairy Mart	3/4/2014	Enterococcus	MPN/100 mL	198,900	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/11/2014	Enterococcus	MPN/100 mL		USIBWC Monitoring at Dairy Mart
Dairy Mart	3/18/2014	Enterococcus	MPN/100 mL	3,860	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/25/2014	Enterococcus	MPN/100 mL	2,460	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/8/2014	Enterococcus	MPN/100 mL	29,090	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/15/2014	Enterococcus	MPN/100 mL	209,800	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/16/2014	Enterococcus	MPN/100 mL	172,200	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/23/2014	Enterococcus	MPN/100 mL	125,900	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/30/2014	Enterococcus	MPN/100 mL	54,750	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/6/2015	Enterococcus	MPN/100 mL	21,430	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/13/2015	Enterococcus	MPN/100 mL	101,400	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/20/2015	Enterococcus	MPN/100 mL	10,460	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/27/2015	Enterococcus	MPN/100 mL	70,800	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/3/2015	Enterococcus	MPN/100 mL	261,300	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/24/2015	Enterococcus	MPN/100 mL	88,200	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/3/2015	Enterococcus	MPN/100 mL	275,500	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/10/2015	Enterococcus	MPN/100 mL	186,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/12/2015	Enterococcus	MPN/100 mL	57,940	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/19/2015	Enterococcus	MPN/100 mL	48,840	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/26/2015	Enterococcus	MPN/100 mL	630	USIBWC Monitoring at Dairy Mart
Dairy Mart	6/2/2015	Enterococcus	MPN/100 mL	84	USIBWC Monitoring at Dairy Mart
Dairy Mart	7/28/2015	Enterococcus	MPN/100 mL	100	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/4/2015	Enterococcus	MPN/100 mL	500 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/22/2015	Enterococcus	MPN/100 mL	310	USIBWC Monitoring at Dairy Mart
Dairy Mart	10/6/2015	Enterococcus	MPN/100 mL	261,300	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/3/2015	Enterococcus	MPN/100 mL	547,500	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/10/2015	Enterococcus	MPN/100 mL	579,400	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/17/2015	Enterococcus	MPN/100 mL	118,700	USIBWC Monitoring at Dairy Mart

Location/Station	Date	Parameter	Unit	Result	Source
Dairy Mart	12/15/2015	Enterococcus	MPN/100 mL	148,300	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/21/2015	Enterococcus	MPN/100 mL	218,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/28/2015	Enterococcus	MPN/100 mL	104,620	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/5/2016	Enterococcus	MPN/100 mL	325,500	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/2/2016	Enterococcus	MPN/100 mL	46,110	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/9/2016	Enterococcus	MPN/100 mL	581,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/8/2016	Enterococcus	MPN/100 mL	298,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/15/2016	Enterococcus	MPN/100 mL	131,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/12/2016	Enterococcus	MPN/100 mL	57,940	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/10/2016	Enterococcus	MPN/100 mL	78,900	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/22/2016	Enterococcus	MPN/100 mL	4,611,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	11/29/2016	Enterococcus	MPN/100 mL	387,300	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/6/2016	Enterococcus	MPN/100 mL	8,550	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/20/2016	Enterococcus	MPN/100 mL	125,900	USIBWC Monitoring at Dairy Mart
Dairy Mart	12/27/2016	Enterococcus	MPN/100 mL	238,200	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/3/2017	Enterococcus	MPN/100 mL	307,600	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/10/2017	Enterococcus	MPN/100 mL	488,400	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/17/2017	Enterococcus	MPN/100 mL	143,900	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/24/2017	Enterococcus	MPN/100 mL	297,800	USIBWC Monitoring at Dairy Mart
Dairy Mart	1/31/2017	Enterococcus	MPN/100 mL	4,352,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/7/2017	Enterococcus	MPN/100 mL	547,500	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/14/2017	Enterococcus	MPN/100 mL	2,359,000	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/21/2017	Enterococcus	MPN/100 mL	98,700	USIBWC Monitoring at Dairy Mart
Dairy Mart	2/28/2017	Enterococcus	MPN/100 mL	70,300	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/7/2017	Enterococcus	MPN/100 mL	19,180	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/14/2017	Enterococcus	MPN/100 mL	14,970	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/21/2017	Enterococcus	MPN/100 mL	64,880	USIBWC Monitoring at Dairy Mart
Dairy Mart	3/28/2017	Enterococcus	MPN/100 mL	83,300	USIBWC Monitoring at Dairy Mart

Location/Station	Date	Parameter	Unit	Result	Source
Dairy Mart	4/4/2017	Enterococcus	MPN/100 mL	178,500	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/11/2017	Enterococcus	MPN/100 mL	103,900	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/18/2017	Enterococcus	MPN/100 mL	4,880	USIBWC Monitoring at Dairy Mart
Dairy Mart	4/25/2017	Enterococcus	MPN/100 mL	2,310	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/2/2017	Enterococcus	MPN/100 mL	17,250	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/9/2017	Enterococcus	MPN/100 mL	128,100	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/16/2017	Enterococcus	MPN/100 mL	410	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/23/2017	Enterococcus	MPN/100 mL	50 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	5/30/2017	Enterococcus	MPN/100 mL	100	USIBWC Monitoring at Dairy Mart
Dairy Mart	6/6/2017	Enterococcus	MPN/100 mL	50 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	6/20/2017	Enterococcus	MPN/100 mL	31	USIBWC Monitoring at Dairy Mart
Dairy Mart	6/27/2017	Enterococcus	MPN/100 mL	20	USIBWC Monitoring at Dairy Mart
Dairy Mart	7/5/2017	Enterococcus	MPN/100 mL	10	USIBWC Monitoring at Dairy Mart
Dairy Mart	7/11/2017	Enterococcus	MPN/100 mL	20	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/8/2017	Enterococcus	MPN/100 mL	5 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/15/2017	Enterococcus	MPN/100 mL	245	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/22/2017	Enterococcus	MPN/100 mL	10	USIBWC Monitoring at Dairy Mart
Dairy Mart	8/29/2017	Enterococcus	MPN/100 mL	50 [ii]	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/5/2017	Enterococcus	MPN/100 mL	121	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/12/2017	Enterococcus	MPN/100 mL	52	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/19/2017	Enterococcus	MPN/100 mL	1,296	USIBWC Monitoring at Dairy Mart
Dairy Mart	9/26/2017	Enterococcus	MPN/100 mL	10	USIBWC Monitoring at Dairy Mart
Goat Canyon	1/24/2018	Enterococcus	MPN/100 mL	160,000 [i]	CBP Monitoring
Goat Canyon	1/27/2018	Enterococcus	MPN/100 mL	3,000	CBP Monitoring
Yogurt Canyon Road	1/28/2018	Enterococcus	MPN/100 mL	160,000	CBP Monitoring
Stewart's Drain	1/25/2018	Enterococcus	MPN/100 mL	160,000 [i]	CBP Monitoring
Stewart's Drain	1/24/2018	Enterococcus	MPN/100 mL	160,000 [i]	CBP Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
Smuggler's Gulch	1/27/2018	Enterococcus	MPN/100 mL	160,000 [i]	CBP Monitoring
Yogurt Canyon	1/28/2018	Enterococcus	MPN/100 mL	230	CBP Monitoring
IBWC gauge	2/21/2018	Enterococcus	MPN/100 mL	5,000	CBP Monitoring
Stewart's Drain	2/21/2018	Enterococcus	MPN/100 mL	1,600,000 [i]	CBP Monitoring
Smuggler's Gulch	2/23/2018	Enterococcus	MPN/100 mL	220,000	CBP Monitoring
Goat Canyon	2/23/2018	Enterococcus	MPN/100 mL	1,600,000 [i]	CBP Monitoring
Yogurt Canyon	2/26/2018	Enterococcus	MPN/100 mL	5,000	CBP Monitoring
IBWC gauge	2/26/2018	Enterococcus	MPN/100 mL	2,200	CBP Monitoring
Canyon del Sol	2/27/2018	Enterococcus	MPN/100 mL	500,000	CBP Monitoring
Stewart's Drain	2/27/2018	Enterococcus	MPN/100 mL	300,000	CBP Monitoring
IBWC gauge	3/15/2018	Enterococcus	MPN/100 mL	240,000	CBP Monitoring
Stewart's Drain	3/15/2018	Enterococcus	MPN/100 mL	900,000	CBP Monitoring
Goat Canyon	3/16/2018	Enterococcus	MPN/100 mL	1,600,000 [i]	CBP Monitoring
Smuggler's Gulch	3/17/2018	Enterococcus	MPN/100 mL	1,600,000 [i]	CBP Monitoring
IBWC gauge	3/19/2018	Enterococcus	MPN/100 mL	1,600,000	CBP Monitoring
Goat Canyon	3/20/2018	Enterococcus	MPN/100 mL	220,000	CBP Monitoring
Yogurt Canyon	3/20/2018	Enterococcus	MPN/100 mL	80	CBP Monitoring
IBWC gauge	4/16/2018	Enterococcus	MPN/100 mL	3,000	CBP Monitoring
Stewart's Drain	4/17/2018	Enterococcus	MPN/100 mL	1,600,000	CBP Monitoring
Goat Canyon	4/17/2018	Enterococcus	MPN/100 mL	1,600,000 [i]	CBP Monitoring
Yogurt Canyon	4/18/2018	Enterococcus	MPN/100 mL	1 [ii]	CBP Monitoring
IBWC gauge	4/19/2018	Enterococcus	MPN/100 mL	1,700	CBP Monitoring
Stewart's Drain	4/20/2018	Enterococcus	MPN/100 mL	1,600,000 [i]	CBP Monitoring
IBWC gauge	5/29/2018	Enterococcus	MPN/100 mL	800	CBP Monitoring
Yogurt Canyon	5/30/2018	Enterococcus	MPN/100 mL	20	CBP Monitoring
Goat Canyon	5/30/2018	Enterococcus	MPN/100 mL	900,000	CBP Monitoring
Stewart's Drain	5/31/2018	Enterococcus	MPN/100 mL	500,000	CBP Monitoring
Goat Canyon	6/1/2018	Enterococcus	MPN/100 mL	900,000	CBP Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
Stewart's Drain	6/4/2018	Enterococcus	MPN/100 mL	900,000	CBP Monitoring
Yogurt Canyon	6/4/2018	Enterococcus	MPN/100 mL	40	CBP Monitoring
IBWC gauge	6/20/2018	Enterococcus	MPN/100 mL	1,600,000	CBP Monitoring
Goat Canyon	6/20/2018	Enterococcus	MPN/100 mL	23,000	CBP Monitoring
Stewart's Drain	6/21/2018	Enterococcus	MPN/100 mL	1,600,000	CBP Monitoring
Goat Canyon	6/22/2018	Enterococcus	MPN/100 mL	1,600,000 [i]	CBP Monitoring
Yogurt Canyon	6/22/2018	Enterococcus	MPN/100 mL	5,000	CBP Monitoring
IBWC gauge	6/25/2018	Enterococcus	MPN/100 mL	1,600,000	CBP Monitoring
Stewart's Drain	6/25/2018	Enterococcus	MPN/100 mL	900,000	CBP Monitoring
Main Stream Border	2010-2011	Enterococci	MPN/year (wet weather)	1.9E+17	Tijuana River Bacterial Source Identification Study
TJ-SMUG	2010-2011	Enterococci	MPN/year (wet weather)	2.5E+16	Tijuana River Bacterial Source Identification Study
Total US Develop	2010-2011	Enterococci	MPN/year (wet weather)	4.0E+14	Tijuana River Bacterial Source Identification Study
MS4-TIJ-0402	2019-2020	Enterococcus	MPN/year (dry weather)	2.98E+09	Phase I MS4 Monitoring
NOLF-IB	2020	Hydrostatic flushing volume	gallons (dry weather)	52,350	NOLF-IB Monitoring
NOLF-IB	2021	Hydrostatic flushing volume	gallons (dry weather)	56,060	NOLF-IB Monitoring
NOLF-2/3	1/9/2018	Wet weather discharge volume	gpd	2.5E+06	NOLF-IB Monitoring
NOLF-4	1/9/2018	Wet weather discharge volume	gpd	7.1E+05	NOLF-IB Monitoring
NOLF-105	1/9/2018	Wet weather discharge volume	gpd	3.2E+05	NOLF-IB Monitoring
NOLF-6	1/9/2018	Wet weather discharge volume	gpd	2.4E+05	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-1	1/9/2018	Wet weather discharge volume	gpd	1.8E+05	NOLF-IB Monitoring
NOLF-104	1/9/2018	Wet weather discharge volume	gpd	9.2E+04	NOLF-IB Monitoring
NOLF-5	1/9/2018	Wet weather discharge volume	gpd	9.2E+04	NOLF-IB Monitoring
NOLF-102	1/9/2018	Wet weather discharge volume	gpd	6.6E+03	NOLF-IB Monitoring
NOLF-103	1/9/2018	Wet weather discharge volume	gpd	4.0E+03	NOLF-IB Monitoring
NOLF-101	1/9/2018	Wet weather discharge volume	gpd	3.4E+03	NOLF-IB Monitoring
NOLF-OLF4	1/9/2018	Wet weather discharge volume	gpd	2.8E+03	NOLF-IB Monitoring
NOLF-OLF2B	1/9/2018	Wet weather discharge volume	gpd	6.8E+02	NOLF-IB Monitoring
NOLF-OLF2	1/9/2018	Wet weather discharge volume	gpd	5.6E+02	NOLF-IB Monitoring
NOLF-OLF2A	1/9/2018	Wet weather discharge volume	gpd	2.5E+02	NOLF-IB Monitoring
NOLF-2/3	2/27/2018	Wet weather discharge volume	gpd	7.4E+05	NOLF-IB Monitoring
NOLF-4	2/27/2018	Wet weather discharge volume	gpd	2.1E+05	NOLF-IB Monitoring
NOLF-6	2/27/2018	Wet weather discharge volume	gpd	1.6E+04	NOLF-IB Monitoring
NOLF-5	2/27/2018	Wet weather discharge volume	gpd	3.9E+03	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-1	2/27/2018	Wet weather discharge volume	gpd	3.5E+03	NOLF-IB Monitoring
NOLF-105	2/27/2018	Wet weather discharge volume	gpd	1.5E+03	NOLF-IB Monitoring
NOLF-OLF4	2/27/2018	Wet weather discharge volume	gpd	3.1E+02	NOLF-IB Monitoring
NOLF-101	2/27/2018	Wet weather discharge volume	gpd	2.5E+02	NOLF-IB Monitoring
NOLF-102	2/27/2018	Wet weather discharge volume	gpd	1.8E+02	NOLF-IB Monitoring
NOLF-OLF2	2/27/2018	Wet weather discharge volume	gpd	5.9E+01	NOLF-IB Monitoring
NOLF-OLF2B	2/27/2018	Wet weather discharge volume	gpd	1.9E+00	NOLF-IB Monitoring
NOLF-2/3	1/31/2019	Wet weather discharge volume	gpd	8.0E+05	NOLF-IB Monitoring
NOLF-4	1/31/2019	Wet weather discharge volume	gpd	2.3E+05	NOLF-IB Monitoring
NOLF-6	1/31/2019	Wet weather discharge volume	gpd	2.2E+04	NOLF-IB Monitoring
NOLF-1	1/31/2019	Wet weather discharge volume	gpd	6.0E+03	NOLF-IB Monitoring
NOLF-5	1/31/2019	Wet weather discharge volume	gpd	5.6E+03	NOLF-IB Monitoring
NOLF-105	1/31/2019	Wet weather discharge volume	gpd	4.1E+03	NOLF-IB Monitoring
NOLF-OLF4	1/31/2019	Wet weather discharge volume	gpd	3.8E+02	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-101	1/31/2019	Wet weather discharge volume	gpd	3.2E+02	NOLF-IB Monitoring
NOLF-102	1/31/2019	Wet weather discharge volume	gpd	2.8E+02	NOLF-IB Monitoring
NOLF-OLF2	1/31/2019	Wet weather discharge volume	gpd	7.2E+01	NOLF-IB Monitoring
NOLF-OLF2B	1/31/2019	Wet weather discharge volume	gpd	6.6E+00	NOLF-IB Monitoring
NOLF-OLF2A	1/31/2019	Wet weather discharge volume	gpd	1.2E+00	NOLF-IB Monitoring
NOLF-2/3	2/13/2019	Wet weather discharge volume	gpd	1.4E+06	NOLF-IB Monitoring
NOLF-4	2/13/2019	Wet weather discharge volume	gpd	3.9E+05	NOLF-IB Monitoring
NOLF-6	2/13/2019	Wet weather discharge volume	gpd	8.2E+04	NOLF-IB Monitoring
NOLF-105	2/13/2019	Wet weather discharge volume	gpd	6.7E+04	NOLF-IB Monitoring
NOLF-1	2/13/2019	Wet weather discharge volume	gpd	4.6E+04	NOLF-IB Monitoring
NOLF-5	2/13/2019	Wet weather discharge volume	gpd	2.7E+04	NOLF-IB Monitoring
NOLF-104	2/13/2019	Wet weather discharge volume	gpd	1.2E+04	NOLF-IB Monitoring
NOLF-102	2/13/2019	Wet weather discharge volume	gpd	1.8E+03	NOLF-IB Monitoring
NOLF-101	2/13/2019	Wet weather discharge volume	gpd	1.2E+03	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-OLF4	2/13/2019	Wet weather discharge volume	gpd	1.1E+03	NOLF-IB Monitoring
NOLF-103	2/13/2019	Wet weather discharge volume	gpd	5.3E+02	NOLF-IB Monitoring
NOLF-OLF2	2/13/2019	Wet weather discharge volume	gpd	2.2E+02	NOLF-IB Monitoring
NOLF-OLF2B	2/13/2019	Wet weather discharge volume	gpd	1.4E+02	NOLF-IB Monitoring
NOLF-OLF2A	2/13/2019	Wet weather discharge volume	gpd	4.5E+01	NOLF-IB Monitoring
NOLF-2/3	11/20/2019	Wet weather discharge volume	gpd	1.5E+06	NOLF-IB Monitoring
NOLF-4	11/20/2019	Wet weather discharge volume	gpd	4.3E+05	NOLF-IB Monitoring
NOLF-6	11/20/2019	Wet weather discharge volume	gpd	9.7E+04	NOLF-IB Monitoring
NOLF-105	11/20/2019	Wet weather discharge volume	gpd	8.7E+04	NOLF-IB Monitoring
NOLF-1	11/20/2019	Wet weather discharge volume	gpd	5.8E+04	NOLF-IB Monitoring
NOLF-5	11/20/2019	Wet weather discharge volume	gpd	3.3E+04	NOLF-IB Monitoring
NOLF-104	11/20/2019	Wet weather discharge volume	gpd	1.7E+04	NOLF-IB Monitoring
NOLF-102	11/20/2019	Wet weather discharge volume	gpd	2.2E+03	NOLF-IB Monitoring
NOLF-101	11/20/2019	Wet weather discharge volume	gpd	1.4E+03	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-OLF4	11/20/2019	Wet weather discharge volume	gpd	1.3E+03	NOLF-IB Monitoring
NOLF-103	11/20/2019	Wet weather discharge volume	gpd	7.6E+02	NOLF-IB Monitoring
NOLF-OLF2	11/20/2019	Wet weather discharge volume	gpd	2.5E+02	NOLF-IB Monitoring
NOLF-OLF2B	11/20/2019	Wet weather discharge volume	gpd	1.8E+02	NOLF-IB Monitoring
NOLF-OLF2A	11/20/2019	Wet weather discharge volume	gpd	6.0E+01	NOLF-IB Monitoring
NOLF-2/3	11/27/2019	Wet weather discharge volume	gpd	6.2E+05	NOLF-IB Monitoring
NOLF-4	11/27/2019	Wet weather discharge volume	gpd	1.8E+05	NOLF-IB Monitoring
NOLF-6	11/27/2019	Wet weather discharge volume	gpd	9.0E+03	NOLF-IB Monitoring
NOLF-5	11/27/2019	Wet weather discharge volume	gpd	1.7E+03	NOLF-IB Monitoring
NOLF-1	11/27/2019	Wet weather discharge volume	gpd	7.7E+02	NOLF-IB Monitoring
NOLF-OLF4	11/27/2019	Wet weather discharge volume	gpd	2.0E+02	NOLF-IB Monitoring
NOLF-101	11/27/2019	Wet weather discharge volume	gpd	1.4E+02	NOLF-IB Monitoring
NOLF-102	11/27/2019	Wet weather discharge volume	gpd	5.6E+01	NOLF-IB Monitoring
NOLF-OLF2	11/27/2019	Wet weather discharge volume	gpd	3.8E+01	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-105	11/27/2019	Wet weather discharge volume	gpd	3.0E+01	NOLF-IB Monitoring
NOLF-2/3	1/21/2020	Wet weather discharge volume	gpd	3.7E+05	NOLF-IB Monitoring
NOLF-4	1/21/2020	Wet weather discharge volume	gpd	1.1E+05	NOLF-IB Monitoring
NOLF-6	1/21/2020	Wet weather discharge volume	gpd	5.1E+02	NOLF-IB Monitoring
NOLF-OLF4	1/21/2020	Wet weather discharge volume	gpd	4.3E+01	NOLF-IB Monitoring
NOLF-101	1/21/2020	Wet weather discharge volume	gpd	1.1E+01	NOLF-IB Monitoring
NOLF-OLF2	1/21/2020	Wet weather discharge volume	gpd	7.8E+00	NOLF-IB Monitoring
NOLF-2/3	2/10/2020	Wet weather discharge volume	gpd	7.1E+05	NOLF-IB Monitoring
NOLF-4	2/10/2020	Wet weather discharge volume	gpd	2.0E+05	NOLF-IB Monitoring
NOLF-6	2/10/2020	Wet weather discharge volume	gpd	1.5E+04	NOLF-IB Monitoring
NOLF-5	2/10/2020	Wet weather discharge volume	gpd	3.4E+03	NOLF-IB Monitoring
NOLF-1	2/10/2020	Wet weather discharge volume	gpd	2.8E+03	NOLF-IB Monitoring
NOLF-105	2/10/2020	Wet weather discharge volume	gpd	8.9E+02	NOLF-IB Monitoring
NOLF-OLF4	2/10/2020	Wet weather discharge volume	gpd	2.8E+02	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-101	2/10/2020	Wet weather discharge volume	gpd	2.2E+02	NOLF-IB Monitoring
NOLF-102	2/10/2020	Wet weather discharge volume	gpd	1.5E+02	NOLF-IB Monitoring
NOLF-OLF2	2/10/2020	Wet weather discharge volume	gpd	5.4E+01	NOLF-IB Monitoring
NOLF-OLF2B	2/10/2020	Wet weather discharge volume	gpd	9.8E-01	NOLF-IB Monitoring
NOLF-2/3	12/28/2020	Wet weather discharge volume	gpd	1.0E+06	NOLF-IB Monitoring
NOLF-4	12/28/2020	Wet weather discharge volume	gpd	2.9E+05	NOLF-IB Monitoring
NOLF-6	12/28/2020	Wet weather discharge volume	gpd	4.0E+04	NOLF-IB Monitoring
NOLF-105	12/28/2020	Wet weather discharge volume	gpd	1.9E+04	NOLF-IB Monitoring
NOLF-1	12/28/2020	Wet weather discharge volume	gpd	1.7E+04	NOLF-IB Monitoring
NOLF-5	12/28/2020	Wet weather discharge volume	gpd	1.2E+04	NOLF-IB Monitoring
NOLF-104	12/28/2020	Wet weather discharge volume	gpd	1.1E+03	NOLF-IB Monitoring
NOLF-102	12/28/2020	Wet weather discharge volume	gpd	7.0E+02	NOLF-IB Monitoring
NOLF-OLF4	12/28/2020	Wet weather discharge volume	gpd	6.2E+02	NOLF-IB Monitoring
NOLF-101	12/28/2020	Wet weather discharge volume	gpd	5.8E+02	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-OLF2	12/28/2020	Wet weather discharge volume	gpd	1.2E+02	NOLF-IB Monitoring
NOLF-103	12/28/2020	Wet weather discharge volume	gpd	6.0E+01	NOLF-IB Monitoring
NOLF-OLF2B	12/28/2020	Wet weather discharge volume	gpd	3.6E+01	NOLF-IB Monitoring
NOLF-OLF2A	12/28/2020	Wet weather discharge volume	gpd	1.0E+01	NOLF-IB Monitoring
NOLF-2/3	3/3/2021	Wet weather discharge volume	gpd	2.0E+06	NOLF-IB Monitoring
NOLF-4	3/3/2021	Wet weather discharge volume	gpd	5.7E+05	NOLF-IB Monitoring
NOLF-105	3/3/2021	Wet weather discharge volume	gpd	1.9E+05	NOLF-IB Monitoring
NOLF-6	3/3/2021	Wet weather discharge volume	gpd	1.7E+05	NOLF-IB Monitoring
NOLF-1	3/3/2021	Wet weather discharge volume	gpd	1.2E+05	NOLF-IB Monitoring
NOLF-5	3/3/2021	Wet weather discharge volume	gpd	6.1E+04	NOLF-IB Monitoring
NOLF-104	3/3/2021	Wet weather discharge volume	gpd	5.0E+04	NOLF-IB Monitoring
NOLF-102	3/3/2021	Wet weather discharge volume	gpd	4.3E+03	NOLF-IB Monitoring
NOLF-101	3/3/2021	Wet weather discharge volume	gpd	2.3E+03	NOLF-IB Monitoring
NOLF-103	3/3/2021	Wet weather discharge volume	gpd	2.2E+03	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
NOLF-OLF4	3/3/2021	Wet weather discharge volume	gpd	2.0E+03	NOLF-IB Monitoring
NOLF-OLF2B	3/3/2021	Wet weather discharge volume	gpd	4.1E+02	NOLF-IB Monitoring
NOLF-OLF2	3/3/2021	Wet weather discharge volume	gpd	4.0E+02	NOLF-IB Monitoring
NOLF-OLF2A	3/3/2021	Wet weather discharge volume	gpd	1.5E+02	NOLF-IB Monitoring
NOLF-2/3	3/10/2021	Wet weather discharge volume	gpd	4.6E+05	NOLF-IB Monitoring
NOLF-4	3/10/2021	Wet weather discharge volume	gpd	1.3E+05	NOLF-IB Monitoring
NOLF-6	3/10/2021	Wet weather discharge volume	gpd	2.0E+03	NOLF-IB Monitoring
NOLF-5	3/10/2021	Wet weather discharge volume	gpd	9.7E+01	NOLF-IB Monitoring
NOLF-OLF4	3/10/2021	Wet weather discharge volume	gpd	8.1E+01	NOLF-IB Monitoring
NOLF-101	3/10/2021	Wet weather discharge volume	gpd	3.6E+01	NOLF-IB Monitoring
NOLF-OLF2	3/10/2021	Wet weather discharge volume	gpd	1.5E+01	NOLF-IB Monitoring
NOLF-101	1/9/2018	Enterococci	MPN/100 mL	1,800	NOLF-IB Monitoring
NOLF-101	1/31/2019	Enterococci	MPN/100 mL	900	NOLF-IB Monitoring
NOLF-101	11/20/2019	Enterococci	MPN/100 mL	9,000	NOLF-IB Monitoring
NOLF-101	1/21/2020	Enterococci	MPN/100 mL	240	NOLF-IB Monitoring
NOLF-101	12/28/2020	Enterococci	MPN/100 mL	1,600	NOLF-IB Monitoring
NOLF-101	3/3/2021	Enterococci	MPN/100 mL	300	NOLF-IB Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
Dairy Mart Road	12/15/2008 12/20/2010 11/04/2010	Annual wet weather enterococci load	MPN/year	1.9E+17	Tijuana River Bacterial Source Identification Study
Smuggler's Gulch	12/15/2008 12/20/2010 11/04/2010	Annual wet weather enterococci load	MPN/year	2.5E+16	Tijuana River Bacterial Source Identification Study
Veterans' Park (U.S. urbanized area)	12/15/2008 12/20/2010 11/04/2010	Annual wet weather enterococci load	MPN/year	4.0E+14	Tijuana River Bacterial Source Identification Study
Well B-10	08/31/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-11	08/31/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well C-2	08/31/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-15	08/31/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-6	08/31/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-10	10/14/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-11	10/14/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well C-2	10/14/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-15	10/14/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-6	10/14/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study

Location/Station	Date	Parameter	Unit	Result	Source
Well B-10	11/18/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-11	11/18/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well C-2	11/18/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-15	11/18/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-6	11/18/2010	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-10	02/01/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-11	02/01/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well C-2	02/01/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-15	02/01/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-6	02/01/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-10	03/02/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-11	03/02/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well C-2	03/02/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-15	03/02/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study

Location/Station	Date	Parameter	Unit	Result	Source
Well B-6	03/02/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-10	07/13/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-11	07/13/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well C-2	07/13/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-15	07/13/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-6	07/13/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-10	12/14/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-11	12/14/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well C-2	12/14/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-15	12/14/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-6	12/14/2011	Fecal coliform	MPN/100 mL	<20	Tijuana River Bacterial Source Identification Study
Well B-10	08/31/2010	Enterococcus	MPN/100 mL	20	Tijuana River Bacterial Source Identification Study
Well B-11	08/31/2010	Enterococcus	MPN/100 mL	315	Tijuana River Bacterial Source Identification Study
Well C-2	08/31/2010	Enterococcus	MPN/100 mL	120	Tijuana River Bacterial Source Identification Study

Location/Station	Date	Parameter	Unit	Result	Source
Well B-15	08/31/2010	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-6	08/31/2010	Enterococcus	MPN/100 mL	10	Tijuana River Bacterial Source Identification Study
Well B-10	10/14/2010	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-11	10/14/2010	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well C-2	10/14/2010	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-15	10/14/2010	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-6	10/14/2010	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-10	11/18/2010	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-11	11/18/2010	Enterococcus	MPN/100 mL	173	Tijuana River Bacterial Source Identification Study
Well C-2	11/18/2010	Enterococcus	MPN/100 mL	52	Tijuana River Bacterial Source Identification Study
Well B-15	11/18/2010	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-6	11/18/2010	Enterococcus	MPN/100 mL	41	Tijuana River Bacterial Source Identification Study
Well B-10	02/01/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-11	02/01/2011	Enterococcus	MPN/100 mL	10	Tijuana River Bacterial Source Identification Study

Location/Station	Date	Parameter	Unit	Result	Source
Well C-2	02/01/2011	Enterococcus	MPN/100 mL	41	Tijuana River Bacterial Source Identification Study
Well B-15	02/01/2011	Enterococcus	MPN/100 mL	98	Tijuana River Bacterial Source Identification Study
Well B-6	02/01/2011	Enterococcus	MPN/100 mL	41	Tijuana River Bacterial Source Identification Study
Well B-10	03/02/2011	Enterococcus	MPN/100 mL	712	Tijuana River Bacterial Source Identification Study
Well B-11	03/02/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well C-2	03/02/2011	Enterococcus	MPN/100 mL	120	Tijuana River Bacterial Source Identification Study
Well B-15	03/02/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-6	03/02/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-10	07/13/2011	Enterococcus	MPN/100 mL	233	Tijuana River Bacterial Source Identification Study
Well B-11	07/13/2011	Enterococcus	MPN/100 mL	473	Tijuana River Bacterial Source Identification Study
Well C-2	07/13/2011	Enterococcus	MPN/100 mL	146	Tijuana River Bacterial Source Identification Study
Well B-15	07/13/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-6	07/13/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-10	12/14/2011	Enterococcus	MPN/100 mL	10	Tijuana River Bacterial Source Identification Study

Location/Station	Date	Parameter	Unit	Result	Source
Well B-11	12/14/2011	Enterococcus	MPN/100 mL	31	Tijuana River Bacterial Source Identification Study
Well C-2	12/14/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-15	12/14/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-6	12/14/2011	Enterococcus	MPN/100 mL	<10	Tijuana River Bacterial Source Identification Study
Well B-10	08/31/2010	*Bacteroides* (general/human)	N/A	Pos/Neg	Tijuana River Bacterial Source Identification Study
Well B-11	08/31/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well C-2	08/31/2010	*Bacteroides* (general/human)	N/A	Pos/Neg	Tijuana River Bacterial Source Identification Study
Well B-15	08/31/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-6	08/31/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-10	10/14/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-11	10/14/2010	*Bacteroides* (general/human)	N/A	Pos/Neg	Tijuana River Bacterial Source Identification Study
Well C-2	10/14/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-15	10/14/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-6	10/14/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study

Location/Station	Date	Parameter	Unit	Result	Source
Well B-10	11/18/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-11	11/18/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well C-2	11/18/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-15	11/18/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-6	11/18/2010	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-10	02/01/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-11	02/01/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well C-2	02/01/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-15	02/01/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-6	02/01/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-10	03/02/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-11	03/02/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well C-2	03/02/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-15	03/02/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study

Location/Station	Date	Parameter	Unit	Result	Source
Well B-6	03/02/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-10	07/13/2011	*Bacteroides* (general/human)	N/A	Pos/Neg	Tijuana River Bacterial Source Identification Study
Well B-11	07/13/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well C-2	07/13/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-15	07/13/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-6	07/13/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-10	12/14/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well B-11	12/14/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Well C-2	12/14/2011	*Bacteroides* (general/human)	N/A	Pos/Neg	Tijuana River Bacterial Source Identification Study
Well B-15	12/14/2011	*Bacteroides* (general/human)	N/A	Pos/Neg	Tijuana River Bacterial Source Identification Study
Well B-6	12/14/2011	*Bacteroides* (general/human)	N/A	Neg/Neg	Tijuana River Bacterial Source Identification Study
Silva Drain	12/06/2018	*E. coli*	MPN/100 mL	>24,000	USIBWC Binational Monitoring
Silva Drain	01/31/2019	*E. coli*	MPN/100 mL	>24,000	USIBWC Binational Monitoring
Silva Drain	02/20//2019	*E. coli*	MPN/100 mL	82,000	USIBWC Binational Monitoring
Silva Drain	12/06/2018	Enterococcus	MPN/100 mL	>24,000	USIBWC Binational Monitoring
Silva Drain	01/31/2019	Enterococcus	MPN/100 mL	>24,000	USIBWC Binational Monitoring
Silva Drain	02/20//2019	Enterococcus	MPN/100 mL	240,000	USIBWC Binational Monitoring

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	2/12/2015	Dry weather volume	gallons	53,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/14/2015	Dry weather volume	gallons	172,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/17/2015	Dry weather volume	gallons	47,600	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/25/2015	Dry weather volume	gallons	556,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/31/2015	Dry weather volume	gallons	846,400	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/2/2015	Dry weather volume	gallons	2,165,930	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/3/2015	Dry weather volume	gallons	1,592,945	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/6/2015	Dry weather volume	gallons	437,465	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/8/2015	Dry weather volume	gallons	109,366	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/19/2015	Dry weather volume	gallons	7,729,398	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	10/13/2015	Dry weather volume	gallons	1,350,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	10/14/2015	Dry weather volume	gallons	1,240,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	10/17/2015	Dry weather volume	gallons	1,300,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	11/19/2015	Dry weather volume	gallons	1,310,000	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	12/11/2015	Dry weather volume	gallons	2,060,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/16/2016	Dry weather volume	gallons	6,620,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/17/2016	Dry weather volume	gallons	8,450,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/19/2016	Dry weather volume	gallons	2,080,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/20/2016	Dry weather volume	gallons	2,090,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/21/2016	Dry weather volume	gallons	1,600,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/23/2016	Dry weather volume	gallons	2,170,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/23/2016	Dry weather volume	gallons	720,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/24/2016	Dry weather volume	gallons	1,440,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/25/2016	Dry weather volume	gallons	940,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/26/2016	Dry weather volume	gallons	480,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/28/2016	Dry weather volume	gallons	2,238	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/29/2016	Dry weather volume	gallons	690,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/12/2016	Dry weather volume	gallons	370,000	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	4/5/2016	Dry weather volume	gallons	4,860,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/30/2016	Dry weather volume	gallons	440,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/2/2016	Dry weather volume	gallons	1,320,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/4/2016	Dry weather volume	gallons	33,000	USIBWC Transboundary Spill Reports
Canyon del Sol	9/5/2016	Dry weather volume	gallons	390	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/8/2016	Dry weather volume	gallons	690,000	USIBWC Transboundary Spill Reports
Yogurt Canyon/Border Field State Park	10/26/2016	Dry weather volume	gallons	920,000	USIBWC Transboundary Spill Reports
Goat Canyon	11/29/2016	Dry weather volume	gallons	200,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/6/2017	Dry weather volume	gallons	143,000,000	USIBWC Transboundary Spill Reports
Goat Canyon	3/1/2017	Dry weather volume	gallons	145,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/24/2017	Dry weather volume	gallons	143,000	USIBWC Transboundary Spill Reports
Stewart's Drain	4/24/2017	Dry weather volume	gallons	12,850	USIBWC Transboundary Spill Reports
Goat Canyon	4/30/2017	Dry weather volume	gallons	645,000	USIBWC Transboundary Spill Reports
Stewart's Drain	5/21/2017	Dry weather volume	gallons	1,560	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	5/21/2017	Dry weather volume	gallons	400,000	USIBWC Transboundary Spill Reports
Stewart's Drain	5/24/2017	Dry weather volume	gallons	3,800	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/25/2017	Dry weather volume	gallons	335,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/9/2017	Dry weather volume	gallons	42,800	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/10/2017	Dry weather volume	gallons	161,670	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/12/2017	Dry weather volume	gallons	66,600	USIBWC Transboundary Spill Reports
Yogurt Canyon/Border Field State Park	6/20/2017	Dry weather volume	gallons	100,000	USIBWC Transboundary Spill Reports
Canyon del Sol	6/27/2017	Dry weather volume	gallons	5,500,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/31/2017	Dry weather volume	gallons	1,720,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/7/2017	Dry weather volume	gallons	311,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/17/2017	Dry weather volume	gallons	411,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/9/2017	Dry weather volume	gallons	3,900,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/12/2017	Dry weather volume	gallons	192,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/19/2017	Dry weather volume	gallons	38,000	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Canyon del Sol	10/6/2017	Dry weather volume	gallons	4,152,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	10/11/2017	Dry weather volume	gallons	80,800	USIBWC Transboundary Spill Reports
Canyon del Sol	10/19/2017	Dry weather volume	gallons	1,207,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/4/2018	Dry weather volume	gallons	100,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/9/2018	Dry weather volume	gallons	561,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/10/2018	Dry weather volume	gallons	664,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/20/2018	Dry weather volume	gallons	304,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/25/2018	Dry weather volume	gallons	1,185,000	USIBWC Transboundary Spill Reports
Goat Canyon	2/27/2018	Dry weather volume	gallons	54,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/5/2018	Dry weather volume	gallons	1,500,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/6/2018	Dry weather volume	gallons	63,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/29/2018	Dry weather volume	gallons	109,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	10/19/2018	Dry weather volume	gallons	1,640,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	11/21/2018	Dry weather volume	gallons	2,240,000	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	11/25/2018	Dry weather volume	gallons	7,900,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	12/11/2018	Dry weather volume	gallons	147,600,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	12/28/2018	Dry weather volume	gallons	47,900,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/1/2019	Dry weather volume	gallons	38,800,000	USIBWC Transboundary Spill Reports
Canyon del Sol	1/4/2019	Dry weather volume	gallons	N/A	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/18/2019	Dry weather volume	gallons	610,000,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/8/2019	Dry weather volume	gallons	313,500,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/24/2019	Dry weather volume	gallons	390,200,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/28/2019	Dry weather volume	gallons	89,200,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/5/2019	Dry weather volume	gallons	93,600,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/11/2019	Dry weather volume	gallons	152,300,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/19/2019	Dry weather volume	gallons	123,000,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/26/2019	Dry weather volume	gallons	83,300,000	USIBWC Transboundary Spill Reports
Stewart's Drain	4/5/2019	Dry weather volume	gallons	500	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	4/10/2019	Dry weather volume	gallons	2,000,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/11/2019	Dry weather volume	gallons	30,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/12/2019	Dry weather volume	gallons	19,800	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/17/2019	Dry weather volume	gallons	27,800,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/17/2019	Dry weather volume	gallons	1,500,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/18/2019	Dry weather volume	gallons	9,148,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/25/2019	Dry weather volume	gallons	3,800,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/3/2019	Dry weather volume	gallons	4,186,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/10/2019	Dry weather volume	gallons	56,700,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/16/2019	Dry weather volume	gallons	9,750,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/1/2019	Dry weather volume	gallons	80,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/8/2019	Dry weather volume	gallons	99,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/18/2019	Dry weather volume	gallons	109,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/19/2019	Dry weather volume	gallons	1,870,000	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	6/22/2019	Dry weather volume	gallons	399,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/27/2019	Dry weather volume	gallons	4,642,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/1/2019	Dry weather volume	gallons	65,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/12/2019	Dry weather volume	gallons	40,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/20/2019	Dry weather volume	gallons	287,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/11/2019	Dry weather volume	gallons	125,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/4/2019	Dry weather volume	gallons	142,888,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/11/2019	Dry weather volume	gallons	10,159,378	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/13/2019	Dry weather volume	gallons	16,036,547	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/26/2019	Dry weather volume	gallons	1,506,900	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/29/2019	Dry weather volume	gallons	8,291,540	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	10/12/2019	Dry weather volume	gallons	14,497,873	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	10/21/2019	Dry weather volume	gallons	9,219,399	USIBWC Transboundary Spill Reports
Stewart's Drain	11/18/2019	Dry weather volume	gallons	3,739	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	12/2/2019	Dry weather volume	gallons	104,490,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	12/11/2019	Dry weather volume	gallons	863,837,415	USIBWC Transboundary Spill Reports
Canyon del Sol	12/13/2019	Dry weather volume	gallons	500	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	12/29/2019	Dry weather volume	gallons	1,036,007,958	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/13/2020	Dry weather volume	gallons	435,803,450	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	1/24/2020	Dry weather volume	gallons	826,993,241	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/13/2020	Dry weather volume	gallons	433,831,602	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	2/25/2020	Dry weather volume	gallons	147,746,364	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/1/2020	Dry weather volume	gallons	503,241,000	USIBWC Transboundary Spill Reports
Stewart's Drain	3/16/2020	Dry weather volume	gallons	20,196	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/23/2020	Dry weather volume	gallons	454,997,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	3/30/2020	Dry weather volume	gallons	544,751,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/6/2020	Dry weather volume	gallons	7,654,000,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	4/16/2020	Dry weather volume	gallons	1,666,210,000	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Canyon del Sol	5/3/2020	Dry weather volume	gallons	33,600	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/14/2020	Dry weather volume	gallons	8,846,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/15/2020	Dry weather volume	gallons	8,272,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/16/2020	Dry weather volume	gallons	22,565,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/18/2020	Dry weather volume	gallons	36,325,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/21/2020	Dry weather volume	gallons	8,276,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	5/22/2020	Dry weather volume	gallons	154,369,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	6/1/2020	Dry weather volume	gallons	536,507,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	7/1/2020	Dry weather volume	gallons	358,950,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/20/2020	Dry weather volume	gallons	8,560,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/26/2020	Dry weather volume	gallons	1,400,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/28/2020	Dry weather volume	gallons	3,660,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/30/2020	Dry weather volume	gallons	1,777,,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	8/31/2020	Dry weather volume	gallons	3,607,000	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Main Channel	9/1/2020	Dry weather volume	gallons	1,714,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/2/2020	Dry weather volume	gallons	283,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/5/2020	Dry weather volume	gallons	33,900	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	9/19/2020	Dry weather volume	gallons	875,315	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	11/2/2020	Dry weather volume	gallons	7,180	USIBWC Transboundary Spill Reports
Stewart's Drain	11/10/2020	Dry weather volume	gallons	2,500	USIBWC Transboundary Spill Reports
Stewart's Drain	11/16/2020	Dry weather volume	gallons	141,750	USIBWC Transboundary Spill Reports
Stewart's Drain	11/23/2020	Dry weather volume	gallons	25,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	11/25/2020	Dry weather volume	gallons	29,803	USIBWC Transboundary Spill Reports
Stewart's Drain	11/26/2020	Dry weather volume	gallons	314,000	USIBWC Transboundary Spill Reports
Stewart's Drain	11/28/2020	Dry weather volume	gallons	900	USIBWC Transboundary Spill Reports
Stewart's Drain	12/12/2020	Dry weather volume	gallons	2,290	USIBWC Transboundary Spill Reports
Stewart's Drain	12/15/2020	Dry weather volume	gallons	589	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	12/16/2020	Dry weather volume	gallons	2,870	USIBWC Transboundary Spill Reports

Location/Station	Date	Parameter	Unit	Result	Source
Stewart's Drain	12/19/2020	Dry weather volume	gallons	43,354	USIBWC Transboundary Spill Reports
Stewart's Drain	12/20/2020	Dry weather volume	gallons	600	USIBWC Transboundary Spill Reports
Stewart's Drain	12/21/2020	Dry weather volume	gallons	33,000	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	12/24/2020	Dry weather volume	gallons	344,750	USIBWC Transboundary Spill Reports
Stewart's Drain	12/26/2020	Dry weather volume	gallons	325,380	USIBWC Transboundary Spill Reports
Tijuana River Main Channel	12/26/2020	Dry weather volume	gallons	777,460	USIBWC Transboundary Spill Reports
Stewart's Drain	Water Year 2019	Runoff volume (modeled)	million gallons	331	Tributary Study Funded by USDOJ
Silva Drain	Water Year 2019	Runoff volume (modeled)	million gallons	66	Tributary Study Funded by USDOJ
Canyon Del Sol	Water Year 2019	Runoff volume (modeled)	million gallons	43	Tributary Study Funded by USDOJ
Smuggler's Gulch	Water Year 2019	Runoff volume (modeled)	million gallons	616	Tributary Study Funded by USDOJ
Goat Canyon	Water Year 2019	Runoff volume (modeled)	million gallons	419	Tributary Study Funded by USDOJ
Yogurt Canyon	Water Year 2019	Runoff volume (modeled)	million gallons	56	Tributary Study Funded by USDOJ
Smuggler's Gulch	1971-2001	Average rainfall	inches/year	8.5	Tributary Study Funded by USDOJ
Tijuana River Watershed (U.S)	N/A	Area	square miles	468	Tijuana River Valley Recovery Team Recovery Strategy
Tijuana River Watershed (U.S)	N/A	Area	square miles	1,256	Tijuana River Valley Recovery Team Recovery Strategy

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Watershed	N/A	Average rainfall	inches/year	5.9-25.6	Tijuana River Valley Recovery Team Recovery Strategy
Tijuana River Valley Survey Sites	2009	Number of Sites with Trash Density of 0 to 1 Percent	-	568 (58% of total)	URS Report of Trash, Waste Tire and Sediment Characterization
Tijuana River Valley Survey Sites	4/2009-1/2010	Number of Sites with Trash Density of 2 to 10 Percent	-	233 (23% of total)	URS Report of Trash, Waste Tire and Sediment Characterization
Tijuana River Valley Survey Sites	4/2009-1/2010	Number of Sites with Trash Density of 11 to 25 Percent	-	89 (9% of total)	URS Report of Trash, Waste Tire and Sediment Characterization
Tijuana River Valley Survey Sites	4/2009-1/2010	Number of Sites with Trash Density of 26 to 50 Percent	-	30 (3% of total)	URS Report of Trash, Waste Tire and Sediment Characterization
Tijuana River Valley Survey Sites	4/2009-1/2010	Number of Sites with Trash Density of 51 to 75 Percent	-	31 (3% of total)	URS Report of Trash, Waste Tire and Sediment Characterization
Tijuana River Valley Survey Sites	4/2009-1/2010	Number of Sites with Trash Density of 76 to 100 Percent	-	64 (6% of total)	URS Report of Trash, Waste Tire and Sediment Characterization
Smugglers Gulch	10/2009	Percent Trash	percent	0-5	City of San Diego Excavation and Post Storm Observations
Confluence	10/2009	Percent Trash	percent	5-15	City of San Diego Excavation and Post Storm Observations
Pilot Channel, West of Confluence	11/2009	Percent Trash	percent	0-100	City of San Diego Excavation and Post Storm Observations
Beyond Pilot Channel, West of Confluence	-	Percent Trash	percent	0-5	City of San Diego Excavation and Post Storm Observations

Location/Station	Date	Parameter	Unit	Result	Source
Pilot Channel, East of Confluence	01/2010	Percent Trash	percent	3	City of San Diego Excavation and Post Storm Observations
Tijuana River Flood Control Channel	2020 report	Excavation Volume	cubic yards	50,471	USIBWC Sediment Basin Feasibility Study
HSA 911.11	2012	Agriculture Land Use	acres	389	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Commercial Land Use	acres	204	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Freeway Land Use	acres	532	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	High-Density Residential Land Use	acres	605	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Industrial Land Use	acres	60	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Institutional, Public and Semi-Public Facilities Land Use	acres	313	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Junkyard/Dump/Landfill Land Use	acres	2	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Low-Density Residential Land Use	acres	1,312	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Open Space Park or Preserve Land Use	acres	4,633	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Other Park, Open Space and Recreation	acres	139	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	School Land Use	acres	349	Tijuana River Watershed Management Area WQIP
HSA 911.11	2012	Transportation Land Use	acres	1,056	Tijuana River Watershed Management Area WQIP

Location/Station	Date	Parameter	Unit	Result	Source
HSA 911.11	2012	Vacant and Undeveloped Land Land Use	acres	531	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Agriculture Land Use	acres	720	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Commercial Land Use	acres	136	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Freeway Land Use	acres	432	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	High-Density Residential Land Use	acres	0	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Industrial Land Use	acres	998	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Institutional, Public and Semi-Public Facilities Land Use	acres	62	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Junkyard/Dump/Landfill Land Use	acres	18	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Low-Density Residential Land Use	acres	61	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Open Space Park or Preserve Land Use	acres	2,441	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Other Park, Open Space and Recreation	acres	0	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	School Land Use	acres	18	Tijuana River Watershed Management Area WQIP
HSA 911.12	2012	Transportation Land Use	acres	1,590	Tijuana River Watershed Management Area WQIP

Location/Station	Date	Parameter	Unit	Result	Source
HSA 911.12	2012	Vacant and Undeveloped Land	acres	3,099	Tijuana River Watershed Management Area WQIP
Los Angeles County	2002-2004	Litter Generation Rate for Commercial Land Use	lb/acre	22.12	Tijuana River Watershed Management Area WQIP
Los Angeles County	2002-2004	Litter Generation Rate for High Density Single Family Residential Land Use	lb/acre	10.82	Tijuana River Watershed Management Area WQIP
Los Angeles County	2002-2004	Litter Generation Rate for Industrial Land Use	lb/acre	21.58	Tijuana River Watershed Management Area WQIP
Los Angeles County	2002-2004	Litter Generation Rate for Low Density Single Family Residential Land Use	lb/acre	9.47	Tijuana River Watershed Management Area WQIP
Los Angeles County	2002-2004	Litter Generation Rate for Open Space and Parks Land Use	lb/acre	16.58	Tijuana River Watershed Management Area WQIP
Los Angeles County	2002-2004	Litter Generation Rate for Commercial Land Use	lb/square mile	7,479.36	Tijuana River Watershed Management Area WQIP
-	2020	Trash Density	lb/cubic yard	350	Needs and Opportunities Assessment – Trash Technical Memorandum
In/near Tijuana River Valley	2010	Trash Weight	tons	56.5	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2011	Trash Weight	tons	31.9	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2012	Trash Weight	tons	32.4	TRAM Trash Removal Estimates

Location/Station	Date	Parameter	Unit	Result	Source
In/near Tijuana River Valley	2013	Trash Weight	tons	31.3	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2014	Trash Weight	tons	39.4	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2015	Trash Weight	tons	42.8	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2016	Trash Weight	tons	3.4	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2017	Trash Weight	tons	3.1	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2018	Trash Weight	tons	6.0	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2010	Waste Tires	NA	2,324	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2011	Waste Tires	NA	351	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2012	Waste Tires	NA	687	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2013	Waste Tires	NA	687	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2014	Waste Tires	NA	106	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2015	Waste Tires	NA	284	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2016	Waste Tires	NA	29	TRAM Trash Removal Estimates
In/near Tijuana River Valley	2017	Waste Tires	NA	435	TRAM Trash Removal Estimates

Location/Station	Date	Parameter	Unit	Result	Source
In/near Tijuana River Valley	2018	Waste Tires	NA	0	TRAM Trash Removal Estimates
Tijuana River Valley	2009	Trash Weight	tons	11.1	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2010	Trash Weight	tons	6.7	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2011	Trash Weight	tons	3.8	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2012	Trash Weight	tons	5.2	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2013	Trash Weight	tons	3.5	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2014	Trash Weight	tons	11.9	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2015	Trash Weight	tons	12.4	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2016	Trash Weight	tons	10.8	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2017	Trash Weight	tons	49.4	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2018	Trash Weight	tons	14.1	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2011	Waste Tires	NA	4,330	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2012	Waste Tires	NA	3,713	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2013	Waste Tires	NA	1,195	Non-TRAM NGO Trash Removal Estimates

Location/Station	Date	Parameter	Unit	Result	Source
Tijuana River Valley	2014	Waste Tires	NA	6,446	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2015	Waste Tires	NA	1,474	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2016	Waste Tires	NA	2,982	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2017	Waste Tires	NA	1,693	Non-TRAM NGO Trash Removal Estimates
Tijuana River Valley	2018	Waste Tires	NA	1,390	Non-TRAM NGO Trash Removal Estimates

[i] Maximum reporting limit used for results that exceeded maximum reporting limit

[ii] One-half of the detection limit used for results below detection limit

[iii] Mean of results used for duplicate samples

APPENDIX B

DATA ANALYSIS OF KEY SITES IN THE TIJUANA RIVER VALLEY

To estimate percent reductions required to meet water quality objectives (WQOs) and load allocations (LAs), combined wet and dry weather data for individual key sites in the Tijuana River Valley were considered. The Dairy Mart Bridge, Hollister Bridge, and IBWC Gauge (in the Tijuana River Flood Control Channel near the U.S.-Mexico border) locations are within the lower Tijuana River itself (receiving waters). Yogurt Canyon, Goat Canyon, Canyon del Sol, Smugglers Gulch, and Stewart’s Drain are locations of cross-border tributaries that convey pollution to the lower Tijuana River on an ongoing basis.

As described in section 6 of the main body of this ARP, transboundary flows through the Tijuana River Flood Control Channel (where the IBWC Gauge is located), Yogurt Canyon, Goat Canyon, Canyon del Sol, Smugglers Gulch, and Stewart’s Drain are all considered significant sources of pollution and LAs were calculated for such sources. The San Diego Water Board estimates that transboundary flows cumulatively contribute over 97% of the combined *E. coli* and enterococci loads to the lower Tijuana River, impairing beneficial uses and threatening public health and wildlife.

In a conventional TMDL analyses, mass-based reductions that will be required for nonpoint sources to achieve LAs may be estimated based on flow volumes from each source and the relative contribution of each source to the total mass load. However, in this ARP, the LAs for nonpoint sources of indicator bacteria to the lower Tijuana River TMDLs are concentration-based and, therefore, the estimated required reductions to achieve WQOs are also based on concentrations.

The statistical rollback method used to analyze the data from key sites is described in section 4.2.1 of the main body of the ARP. In the figures below, data points for individual key sites were plotted on a log scale along with a trendline used to estimate a linear distribution, geometric mean (GM), and standard threshold value (STV) for that key site. These values were compared to the WQOs and LAs (also in terms of GM and STV) to estimate the indicator bacteria reductions required to meet: (1) WQOs at Dairy Mart Bridge and Hollister Bridge and (2) LAs in the Tijuana River Flood Control Channel, Yogurt Canyon, Goat Canyon, Canyon del Sol, Smugglers Gulch, and Stewart’s Drain.

Although the linear relationship is better for some key sites than others, the R^2 values, which quantify the degree of linear correlation, were generally over 0.8. R^2 values may vary between 0 and 1, with a value of 1 indicating perfect linear correlation.

Although data for Canyon del Sol and Smuggler’s Gulch were limited when required reductions were calculated, the estimated values appear reasonable when compared to other polluted cross-border tributaries with canyon collectors. This is not unexpected given: (1) the purpose of installing canyon collectors was to divert transboundary flows that are known to be laden with wastes and (2) land uses upstream of the canyon collectors are similar (highly urbanized, mostly residential with some commercial and industrial use) and generate similar types of waste, including sewage that is not fully captured and/or contained in the sewage collection system. Silva Drain, another cross-border tributary with a canyon collector, also has calculated LAs but reductions were not calculated for it since no data was available at the time the data analysis was performed.

Table B.1 Percent reductions required to meet WQOs and LAs at key sites

Site	Analyte	Dataset Size[1]	Geometric Mean (MPN/100mL)	Geometric Mean Reduction (%)	Standard Threshold Value (MPN/100mL)	Standard Threshold Value Reduction (%)
Dairy Mart	*E. coli*	81	105,203	>99	19,417,691	>99
Dairy Mart	Enterococci	80	15,655	>99	1,253,911	>99
Hollister	*E. coli*	8	5,194	98	3,563,002	>99
Hollister	Enterococci	24	522,385	>99	6,510,404	>99
IBWC Gauge	*E. coli*	19	22,880	>99	2069568	>99
IBWC Gauge	Enterococci	9	32,815	>99	2,078,425	>99
Yogurt Canyon	*E. coli*	8	101	N/A	1,149	N/A
Yogurt Canyon	Enterococci	7	120	75	7,299	98
Goat Canyon	*E. coli*	19	1,669,942	>99	26,822,388	>99
Goat Canyon	Enterococci	10	324,366	>99	4,400,003	>99
Canyon del Sol	*E. coli*	2	46,383	>99	248,780,190	>99
Canyon del Sol	Enterococci	5	58,326	>99	832,752	>99
Smugglers Gulch	*E. coli*	3	850,368	>99	8,563,816	>99
Smugglers Gulch	Enterococci	3	383,314	>99	2,087,726	>99
Stewart's Drain	*E. coli*	14	1,338,618	>99	9,067,764	>99
Stewart's Drain	Enterococci	13	790,368	>99	2,283,267	>99

[1] USEPA recreational water quality criteria do not specify a minimum sample size for implementing state water quality standards (USEPA, 2012). Previous criteria indicated that there should be no less than five samples to evaluate indicator bacteria in marine and fresh waters (USEPA, 1976). Only three sites, Canyon del Sol, Smuggler's Gulch, and Silva Drain, did not meet this five-sample minimum at the time the data was analyzed to calculate required reductions. Since some data were available for two of these sites (Canyon del Sol and Smuggler's Gulch) at that time, these sites were still included in the statistical analysis. No data were available for Silva Drain at that time.

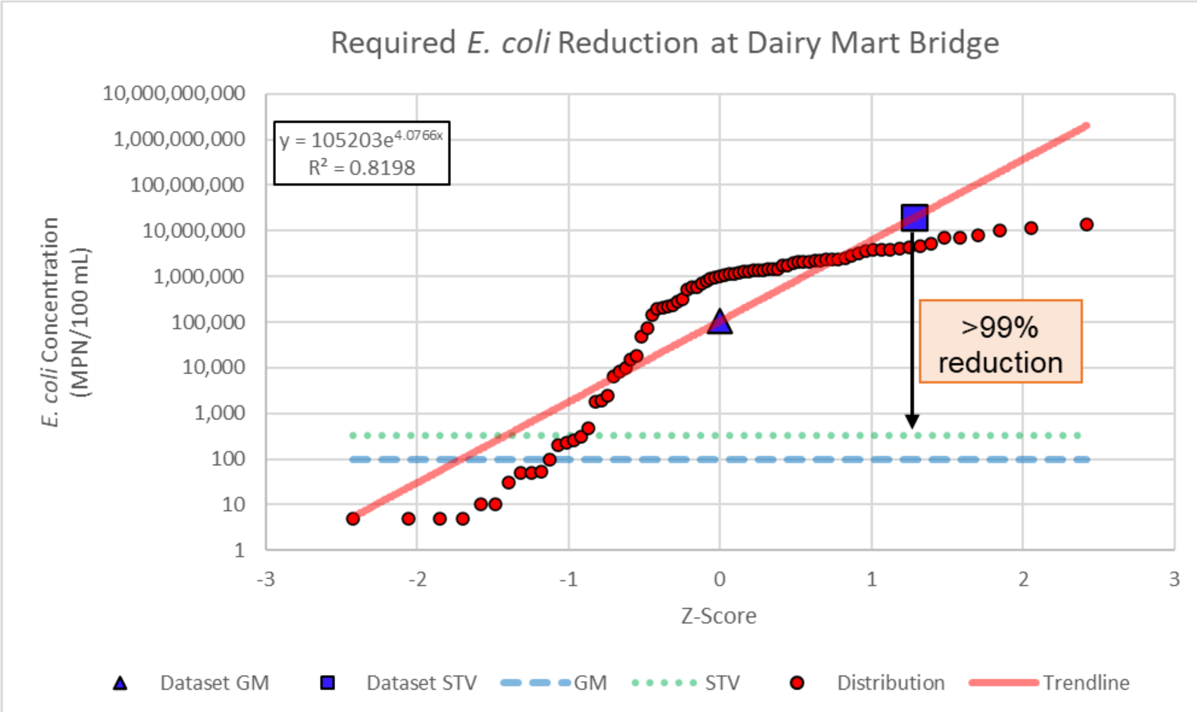

Figure B.1 ***E. coli*** **reduction to meet WQO at Dairy Mart Bridge**

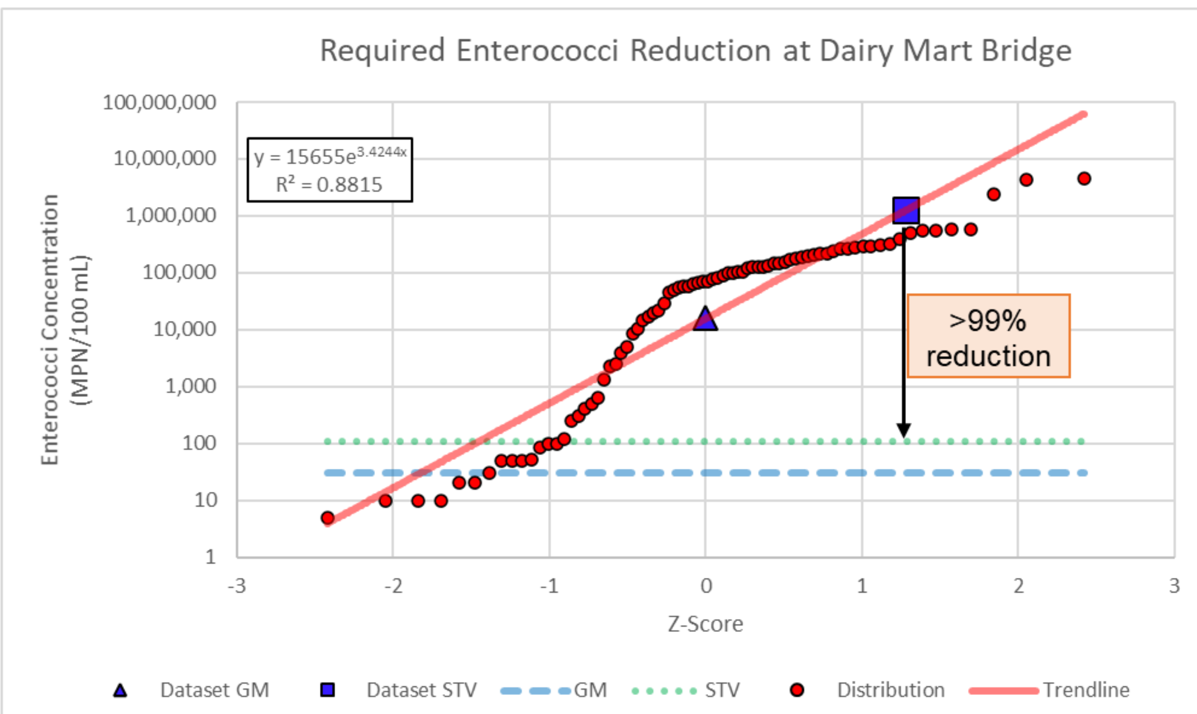

Figure B.2 Enterococci reduction to meet WQO at Dairy Mart Bridge

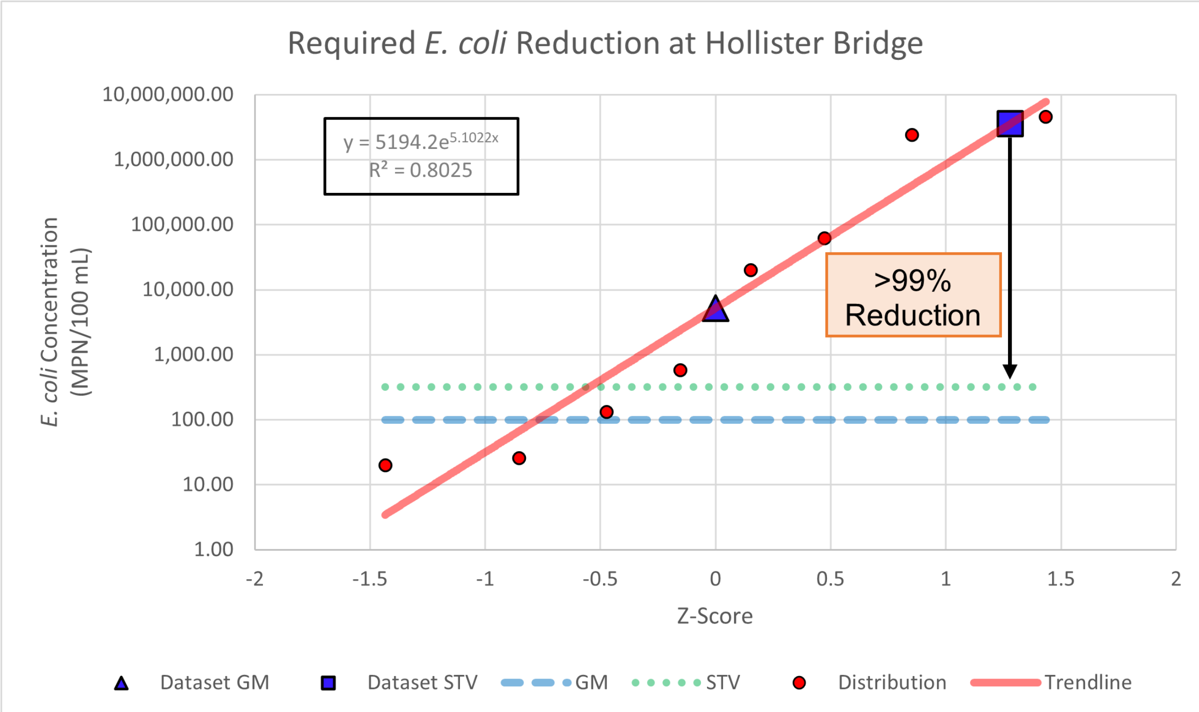

Figure B.3 ***E. coli*** **reduction to meet WQO at Hollister Bridge**

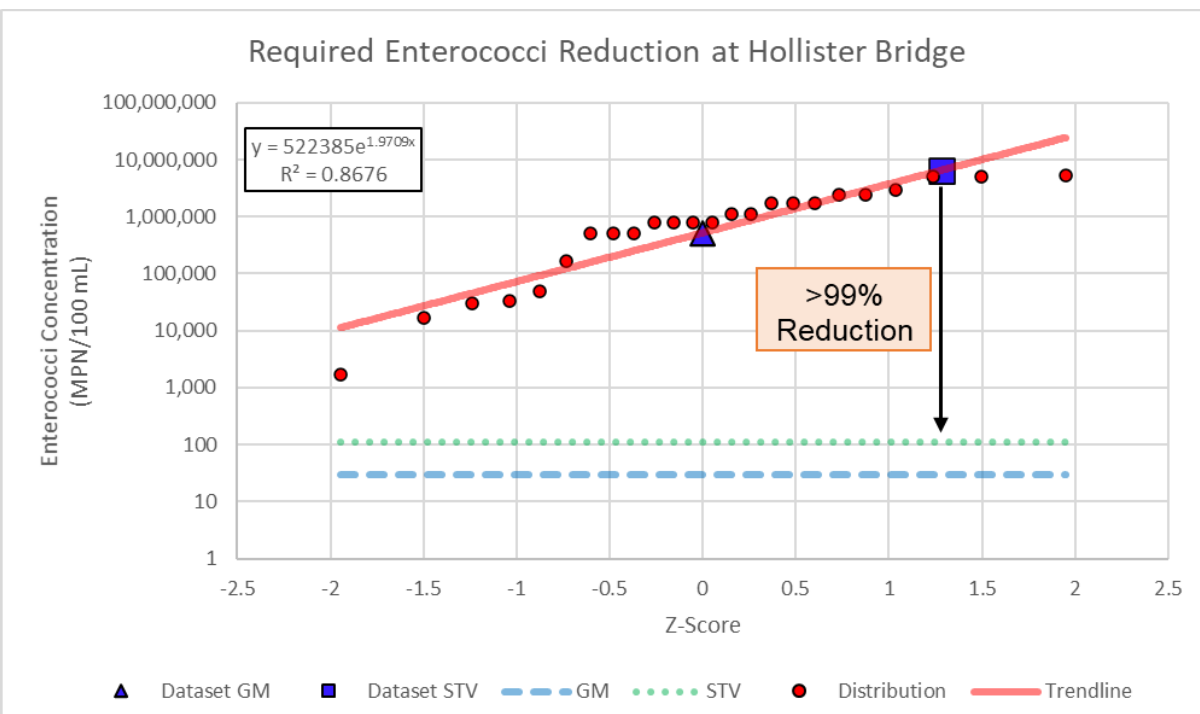

Figure B.4 Enterococci reduction to meet WQO at Hollister Bridge

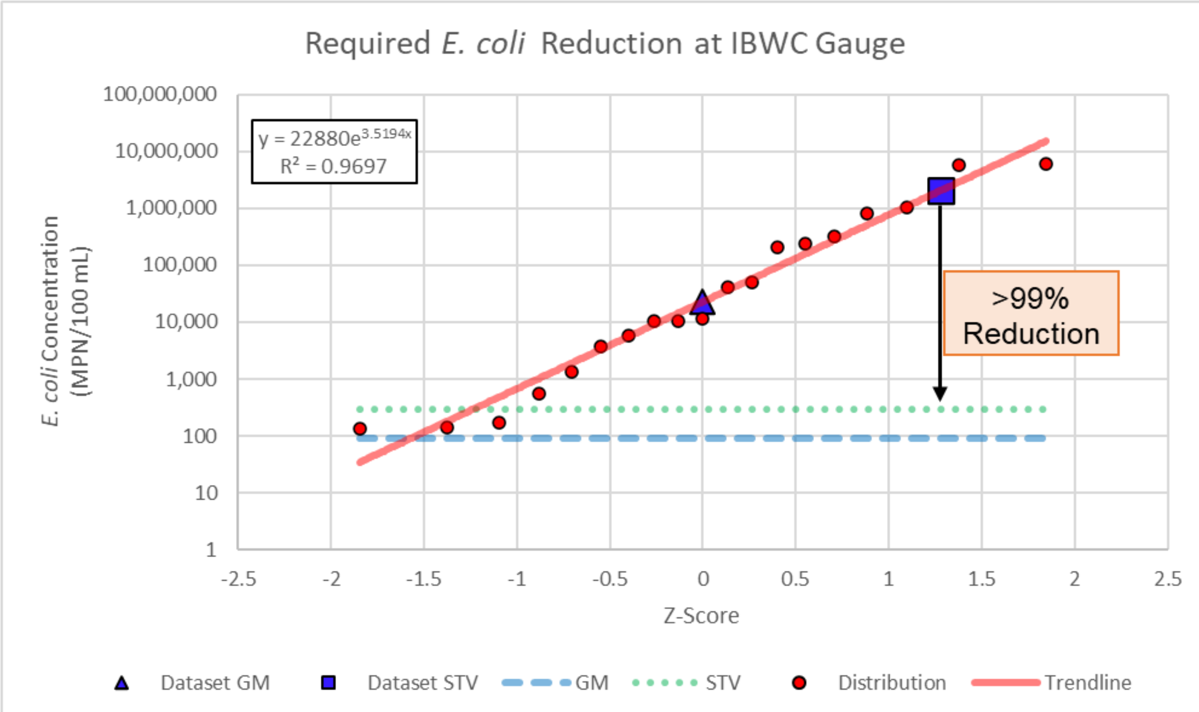

Figure B.5 ***E. coli*** **reduction to meet LA and WQO at IBWC Gauge**

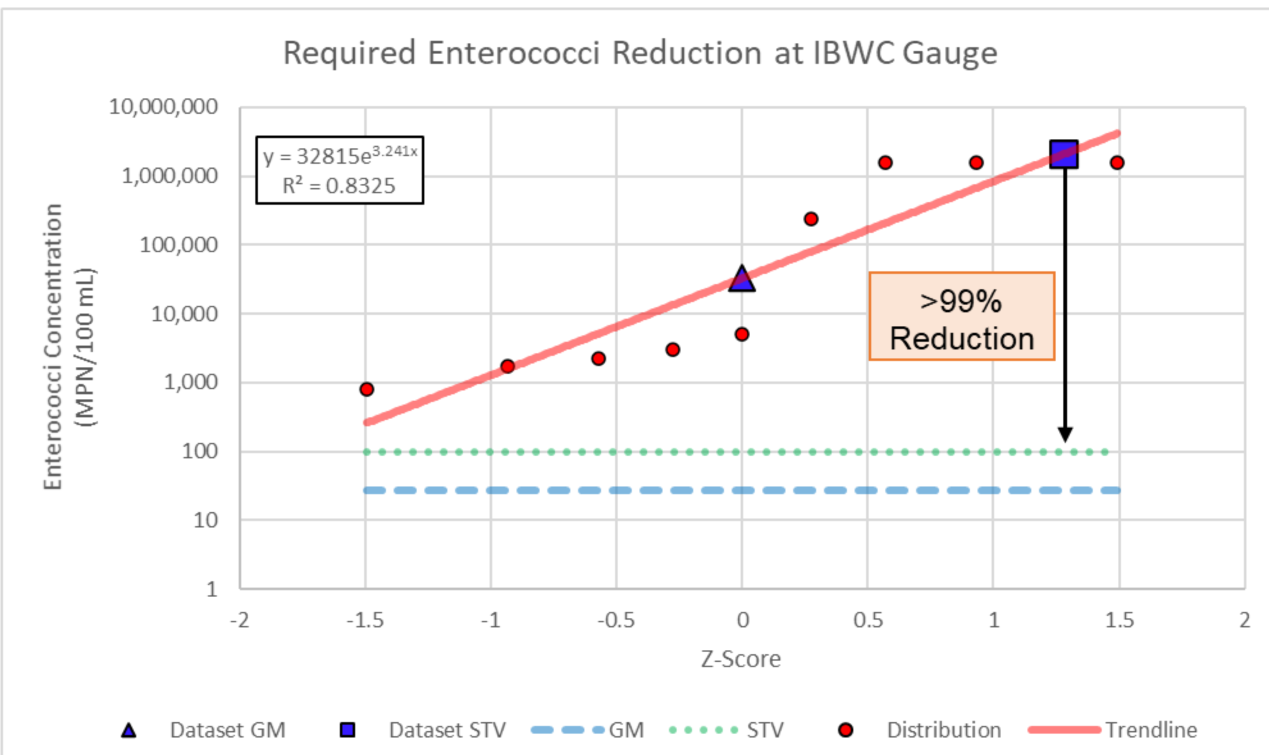

Figure B.6 Enterococci reduction to meet LA and WQO at IBWC Gauge

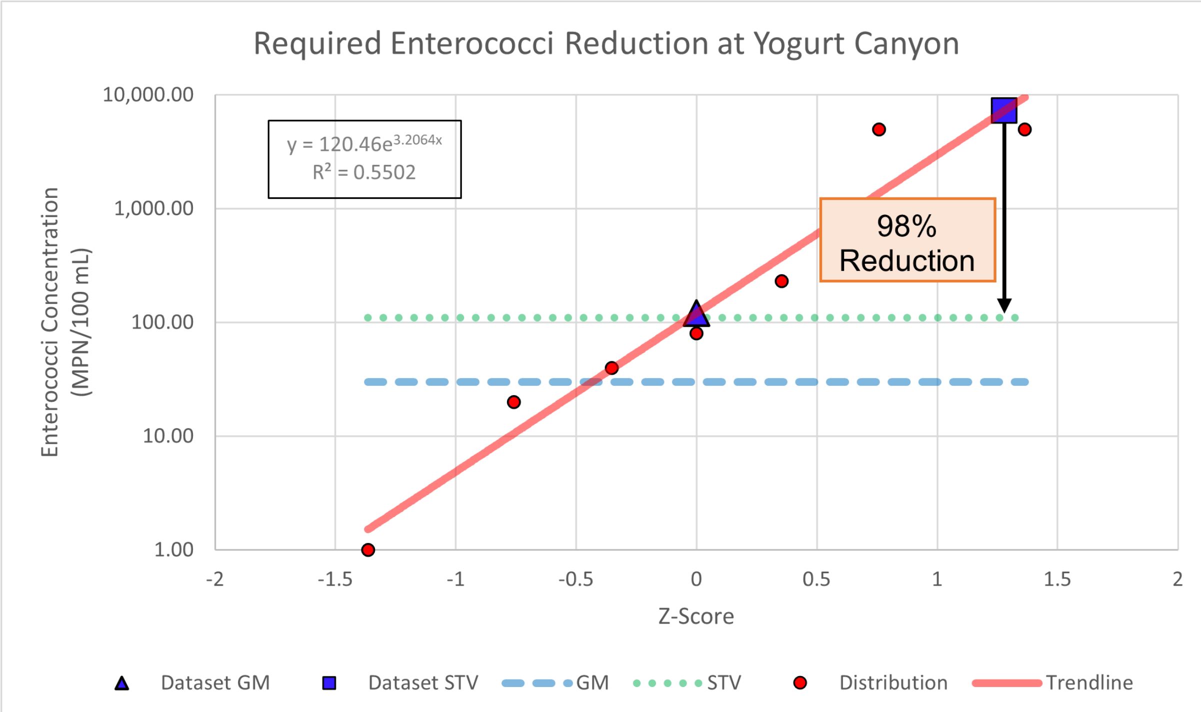

Figure B.7 Enterococci reduction to meet LA at Yogurt Canyon

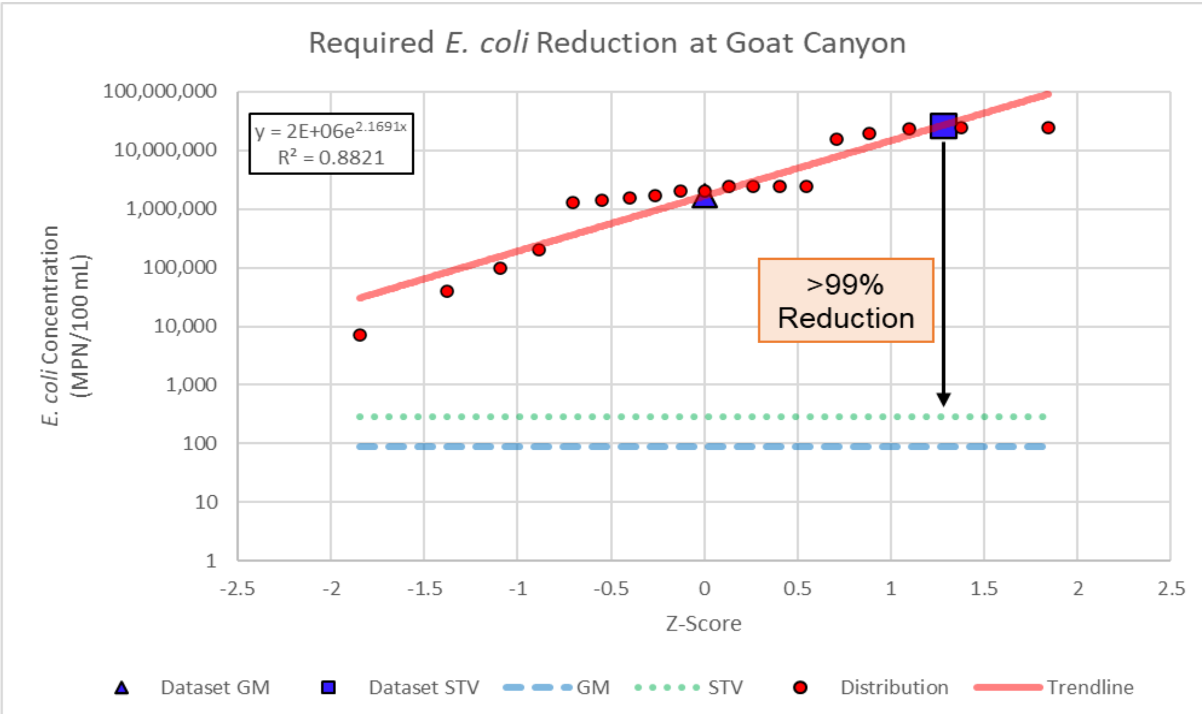

Figure B.8. ***E. coli*** **reduction to meet LA at Goat Canyon**

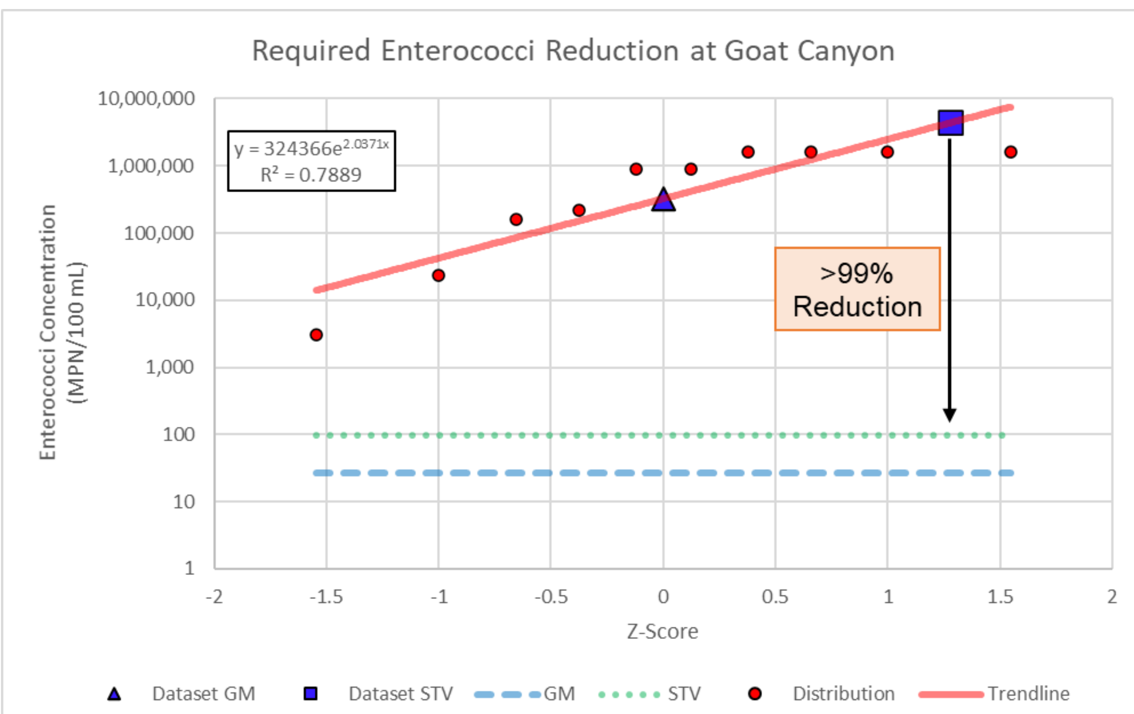

Figure B.9 Enterococci reduction to meet LA at Goat Canyon

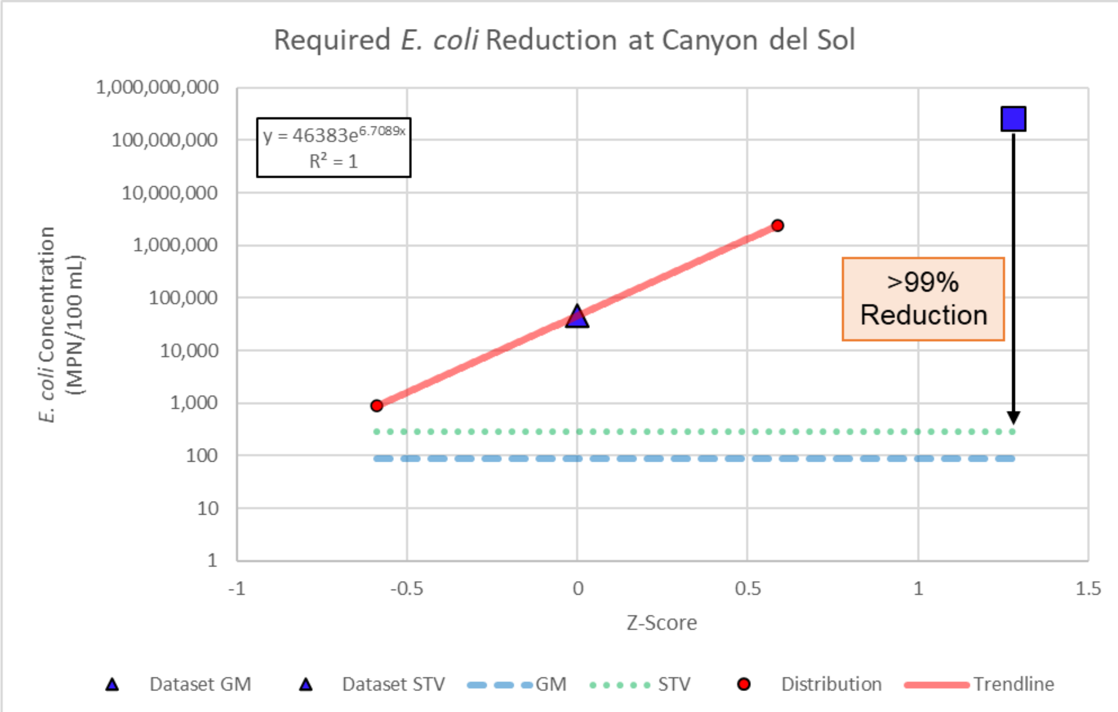

Figure B.10 ***E. coli*** **reduction to meet LA at Canyon del Sol**

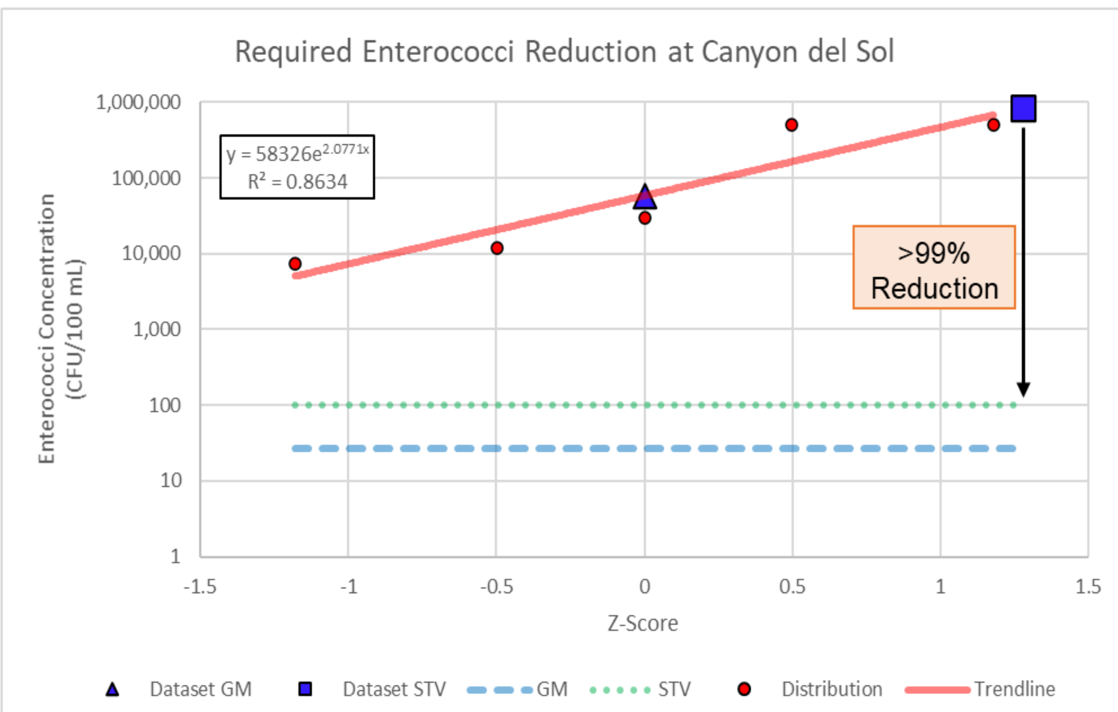

Figure B.11 Enterococci reduction to meet LA at Canyon del Sol

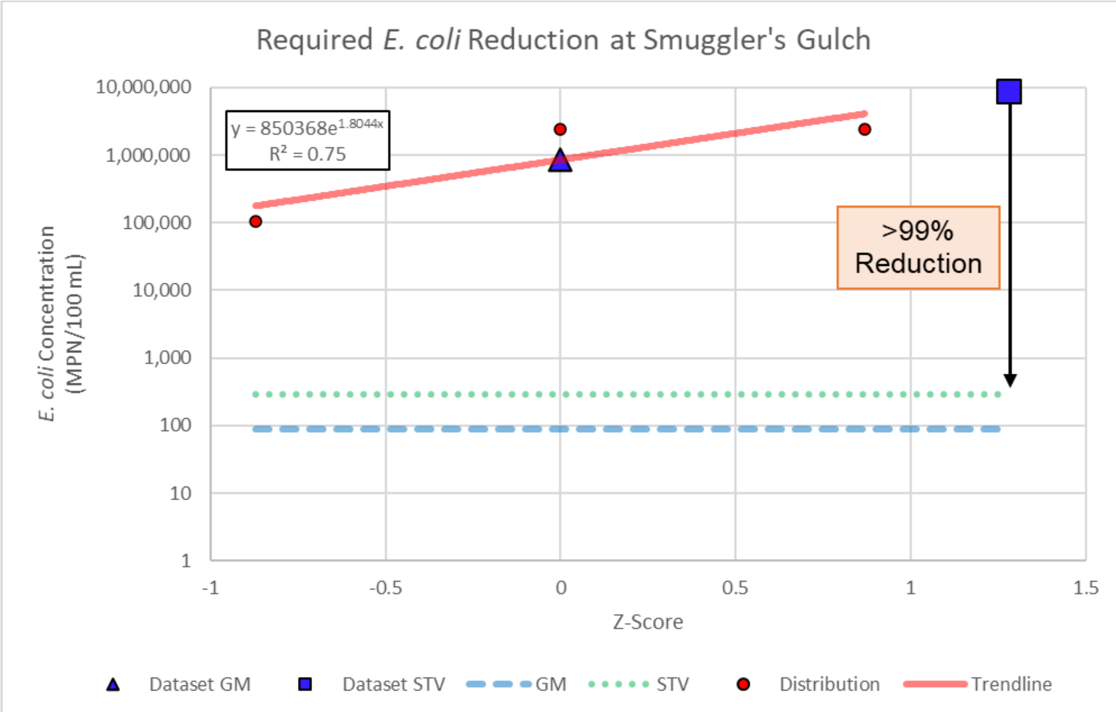

Figure B.12 ***E. coli*** **reduction to meet LA at Smuggler's Gulch**

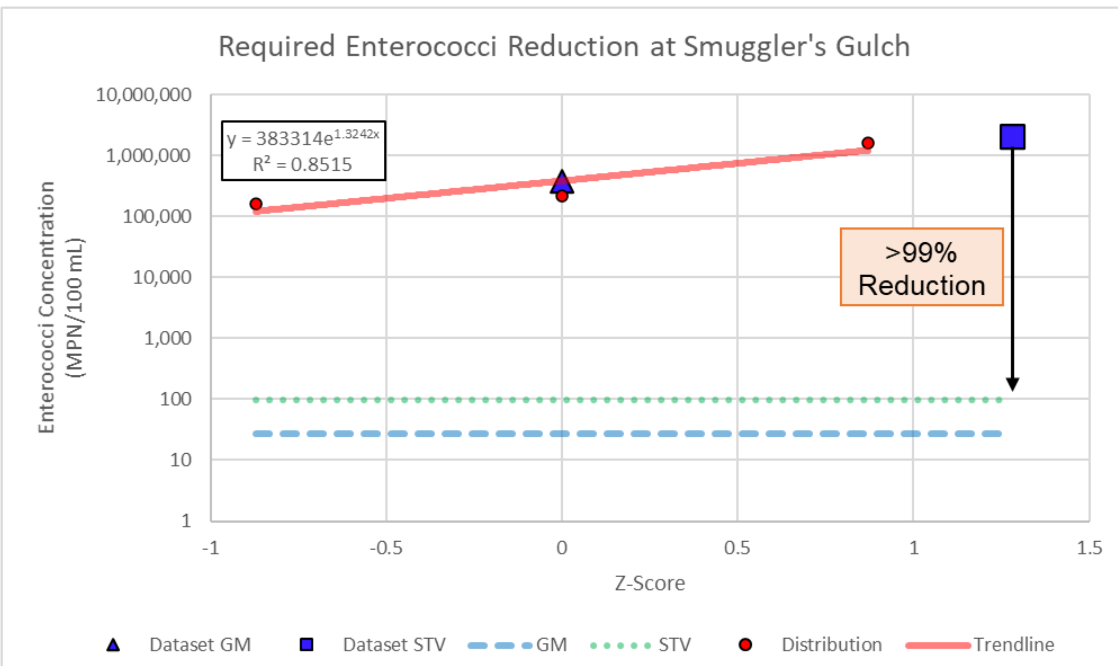

Figure B.13 Enterococci reduction to meet LA at Smuggler's Gulch

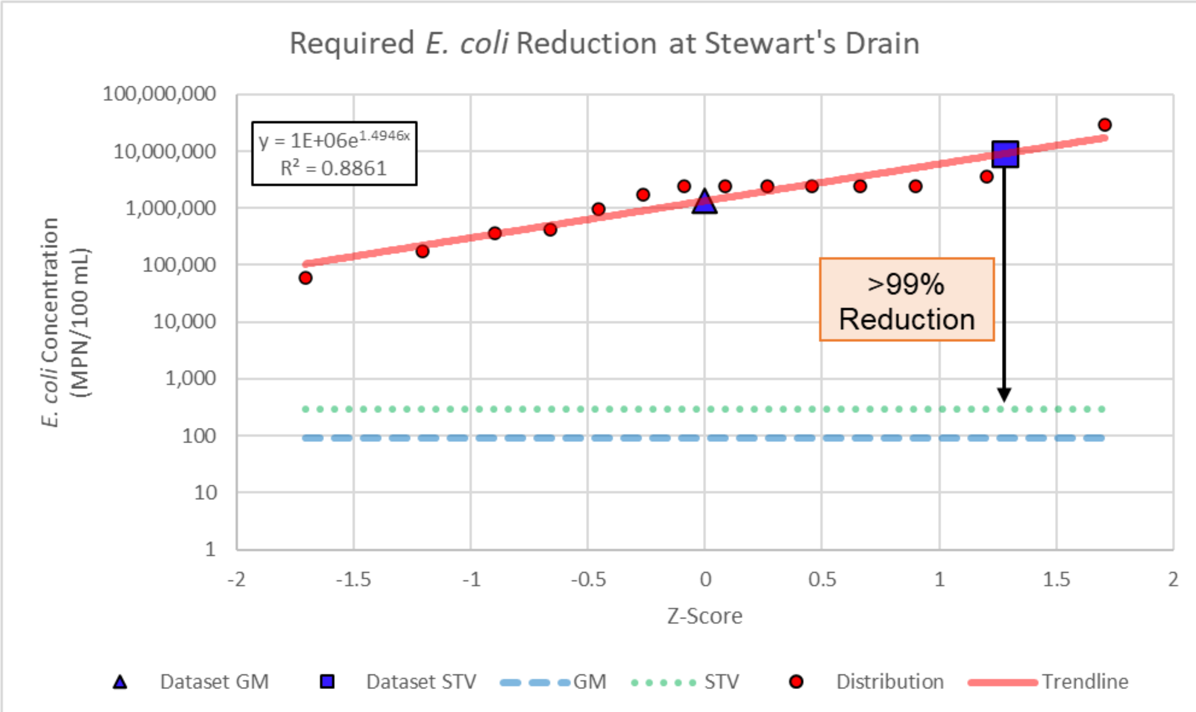

Figure B.14 ***E. coli*** **reduction to meet LA at Stewart's Drain**

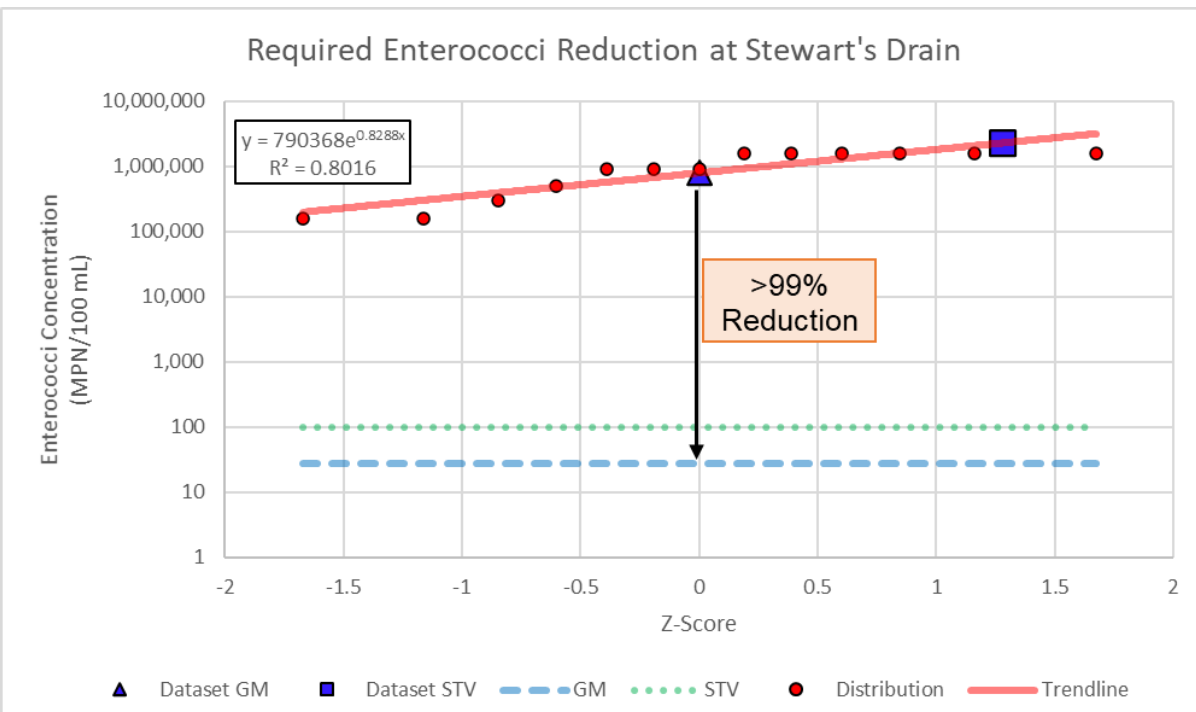

Figure B.15 Enterococci reduction to meet LA at Stewart's Drain

APPENDIX C

LOAD CALCULATIONS

Appendix C describes how the San Diego Water Board estimated indicator bacteria and trash loads for each of the known potential sources of indicator bacteria and trash pollution to the lower Tijuana River. The San Diego Water Board estimated the loads using data available at the time of ARP analysis. These data spanned various date ranges as described in section 4.1 of the main body of this ARP. Therefore, the estimates do not pertain to a specific year or years but are meant to provide a general approximation of the loads from each known potential source.

As described in section 5 of the ARP for indicator bacteria and trash in the lower Tijuana River, the known potential sources of pollution are:

1. Discharges from U.S.-side upper watershed
2. Transboundary discharges
3. Discharges from Hydrologic Subarea (HSA) 911.12
4. Discharges from Phase I MS4 outfalls to the lower Tijuana River
5. Discharges from NOLF-IB outfalls to the lower Tijuana River
6. Discharges from agricultural operations in HSA 911.11
7. Discharges from open space/public lands in HSA 911.11
8. Discharges from groundwater in HSA 911.11

Descriptions of how indicator bacteria and trash loads were estimated are presented below. For some potential sources, no quantitative data were available to estimate annual loads but based on known conditions, the contributions from these sources are expected to be negligible relative to other sources. The load estimates in these cases are deemed "*de minimus*" in the sections below.

1. DISCHARGES FROM U.S.-SIDE UPPER WATERSHED

Flows that originate in the U.S.-side upper watershed and cross into Mexico are limited and come primarily from open space (undeveloped land). They are not expected to contribute to impairments in the lower Tijuana River due to indicator bacteria and trash. Therefore, they were not calculated. For the sake of this ARP, contributions of *E. coli*, enterococci, and trash from the U.S.-side upper watershed are considered *de minimus*.

2. TRANSBOUNDARY DISCHARGES

For purposes of this ARP, transboundary flows from the Tijuana River Flood Control Channel and six cross-border tributaries in HSA 911.11 are considered nonpoint sources of indicator bacteria and trash that discharge directly to the lower Tijuana River and estuary.

The following sections describe how indicator bacteria and trash loads were estimated for each. Not all the same types of data were available for each cross-border subwatershed. Estimates for the subwatersheds with limited data were extrapolated based on data available for the other subwatersheds using scaling factors to account for the differences in size because although they vary in size, they have similar land uses, waste generation, geomorphology, landscape position, soils, vegetation, and hydrologic conditions (Lee, 2021). For example, anticipated sediment excavation volumes were available for the Tijuana River Flood Control Channel and Goat Canyon. These volumes multiplied by estimated trash abundance of the excavation volume and by trash density rendered trash load values. However, since anticipated sediment excavation volumes were not available for the other cross-border subwatersheds, their trash load values were extrapolated from the Goat Canyon value.

Annual dry weather estimates for indicator bacteria and trash loads were calculated with average annual volume of dry weather flow based on transboundary spill volumes submitted by USIBWC from 2015 through 2020 as required by its NPDES permit. Although USIBWC is required to divert transboundary flows to the SBIWTP during dry weather, some flows pass its canyon collectors and discharge into the Tijuana River Valley during dry weather.

Tijuana River Flood Control Channel

E. coli loading from this nonpoint source is estimated as 3.97×10^{16} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the Smuggler's Gulch runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021), (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP), and (3) a scale-up factor of 446/6.24 to account for the difference in subwatershed size (Tijuana River Valley Recovery Team, 2012 and Lee, 2021).

Enterococci loading is estimated as 5.70×10^{16} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the Smuggler's Gulch runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021), (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP), and (3) a scale-up factor of 446/6.24 to account for the difference in subwatershed size (Tijuana River Valley Recovery Team, 2012 and Lee, 2021).

Trash loading is estimated as 883 tons/year. This value was calculated by multiplying: (1) anticipated volume of sediment excavation needs in the Tijuana River Flood Control Channel as reported in the *Feasibility Study for Sediment Basins Tijuana River International Border to Dairy Mart Road* (Stantec, 2020) (2) a default value of 10 percent for trash abundance (by volume) based on the *Report of Trash, Waste Tire and Sediment Characterization* (URS, 2010) and the *Excavation and Post Storm Observations in TJ River Valley* (City of San Diego, 2011), and (3) a trash density of 350 lb/cubic yard based on the *Tijuana River Valley Needs and Opportunities Assessment – Trash Technical Memorandum* (HDR, 2020).

The trash loading from this source (main channel transboundary flows) is based on anticipated volume of excavation needs for the Tijuana River Flood Control Channel, which is predictive (based on modeling) since no data from measured clean-outs that could be used to calculate the trash loading are available.

The estimate of 883 tons/year for this source does not account for trash in main channel transboundary flows that is deposited beyond the Tijuana River Flood Control Channel. Although visual observations confirm that the river transports significant quantities of trash beyond the flood control channel, there are no data available to approximate those values, which would ideally be added to the estimate of 883 tons/year.

The estimate also does not account for trash in the Tijuana River Flood Control Channel potentially coming from other sources that have may have hydrologic connection to the Tijuana River Flood Control Channel, especially during wet weather: (1) Stewart's Drain, (2) Silva Drain, and (3) HSA 911.12. There is no data available to approximate what portion of these sources of trash may be transported and captured in the flood control channel. It is possible that the Light Detection and Ranging (LiDAR) surveys used to calculate the anticipated volume of sediment excavation needs in the flood control channel (Stantec, 2020) could have included sediment and trash that originally came from Stewart's Drain, Silva Drain, and/or HSA 911.12. However, there are no data available to approximate those values, which would ideally be subtracted from the estimate of 883 tons/year.

- Dry Weather Volume: 1,801 million gallons (annually)
- Wet Weather Volume: 46,633 million gallons (annually)
- *E. coli* Concentration: 22,880 MPN/100 mL
- Enterococci Concentration: 32,851 MPN/100 mL
- Excavation Volume: 50,471 cubic yards

Stewart's Drain

Polluted water from Mexico crosses the border into the U.S. via the cross-border tributary at Stewart's Drain. It enters onto USIBWC property/infrastructure (through culverts and canyon collectors) and into waters of the U.S. Dry weather flows are often diverted to the South Bay International Wastewater Treatment Plant (SBIWTP). Wet weather flows and some dry weather flows continue downstream to the main channel of the lower Tijuana River.

E. coli loading from this nonpoint source is estimated as 1.68 x 10^{16} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP).

Enterococci loading is estimated as 9.91 x 10^{15} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP)

During dry weather, trash is generally removed from the canyon collector at Stewart's Drain. Trash data specific to Stewart's Drain was not available to calculate a site-specific wet weather annual trash load. However, transboundary trash estimates from the Goat Canyon subwatershed are reliable due to well documented clean-outs of the sediment basins. Land uses upstream of the border at Stewart's Drain and at Goat Canyon are similar (Lee, 2021). Therefore, trash generation rates were assumed to be similar and trash loading was estimated by extrapolation, adjusting for subwatershed size.

Trash loading at Stewart's Drain is estimated as 622 tons/year. This was calculated by multiplying: (1) estimated annual trash loading at Goat Canyon (section 2.6 of this appendix) and (2) a scale-down factor of 3.35/4.24 to account for the difference in subwatershed size (Lee, 2021).

- Dry Weather Volume: 151,587 gallons (annually)
- Wet Weather Volume: 331 million gallons (annually)
- *E. coli* Concentration: 1,338,618 MPN/100 mL
- Enterococci Concentration: 790,368 MPN/100 mL

Silva Drain

Polluted water from Mexico crosses the border into the U.S. via the cross-border tributary at Silva Drain. The polluted water enters onto USIBWC property/infrastructure (canyon collector) and into waters of the U.S. Dry weather flows are often diverted to the SBIWTP. Wet weather flows and some dry weather flows continue downstream to the main channel of the lower Tijuana River.

E. coli loading from this nonpoint source is estimated as 9.03 x 10^{13} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of *E. coli* data from this location as reported in IBWC's *Binational Water Quality Study of the Tijuana River and Adjacent Canyons and Drains* (IBWC, 2020). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP).

Enterococci loading is estimated as 1.29 x 10^{14} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of enterococci data from this location as reported in IBWC's *Binational Water Quality Study of the Tijuana River and Adjacent Canyons and Drains* (IBWC, 2020). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP)

Trash loading at Silva Drain is estimated as 124 tons/year. This was calculated by multiplying: (1) estimated annual trash loading at Goat Canyon (section 2.6 of this appendix) and (2) a scale-down factor of 3.35/4.24 to account for the difference in subwatershed size (Lee, 2021).

- Dry Weather Volume: 0 gallons
- Wet Weather Volume: 66 million gallons (annually)
- *E. coli* Concentration: 36,148 MPN/100 mL
- Enterococci Concentration: 51,706 MPN/100 mL

Canyon del Sol

Polluted water from Mexico crosses the border into the U.S. via the cross-border tributary at Canyon del Sol. The polluted water enters onto USIBWC property/infrastructure (canyon collector) and into waters of the U.S. Dry weather flows are often diverted to the SBIWTP. Wet weather flows and some dry weather flows continue downstream to the main channel of the lower Tijuana River.

E. coli loading from this nonpoint source is estimated as 7.87 x 10^{13} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP).

Enterococci loading is estimated as 9.89 x 10^{13} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP)

Trash data specific to Canyon del Sol was not available. However, transboundary trash estimates from the Goat Canyon subwatershed are reliable due to well documented clean-outs of the sediment basins. Land uses upstream of the border at Canyon del Sol and at Goat Canyon are similar (Lee, 2021). Therefore, trash generation rates were assumed to be similar and trash loading was estimated by extrapolation, adjusting for subwatershed size.

Trash loading at Canyon del Sol is estimated as 82 tons/year. This was calculated by multiplying: (1) estimated annual trash loading at Goat Canyon (section 2.6 of this appendix) and (2) a scale-down factor of 0.44/4.24 to account for the difference in subwatershed size (Lee, 2021)

- Dry Weather Volume: 2 gallons (annually)
- Wet Weather Volume: 43 million gallons (annually)
- *E. coli* Concentration: 46,383 MPN/100 mL
- Enterococci Concentration: 58,326 MPN/100 mL

Smuggler's Gulch

Polluted water from Mexico crosses the border into the U.S. via the cross-border tributary at Smuggler's Gulch. The polluted water enters onto USIBWC property/infrastructure (canyon collector) and into waters of the U.S. Dry weather flows are often diverted to the SBIWTP. Wet weather flows and some dry weather flows continue downstream to the main channel of the lower Tijuana River.

E. coli loading from this nonpoint source is estimated as 1.98 x 10^{16} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP).

Enterococci loading is estimated as 8.94 x 10^{15} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP)

Trash data specific to Smuggler's Gulch was not available. However, transboundary trash estimates from the Goat Canyon subwatershed are reliable due to well documented clean-outs of the sediment basins. Land uses upstream of the border at Smuggler's Gulch and at Goat Canyon are similar (Lee, 2021). Therefore, trash generation rates were assumed to be similar and trash loading was estimated by extrapolation, adjusting for subwatershed size.

Trash loading at Smuggler's Gulch is estimated as 1,159 tons/year. This was calculated by multiplying: (1) estimated annual trash loading at Goat Canyon (section 2.6 of this appendix) and (2) a scale-up factor of 6.24/4.24 to account for the difference in subwatershed size (Lee, 2021)

- Dry Weather Volume: 0 gallons
- Wet Weather Volume: 616 million gallons (annually)
- *E. coli* Concentration: 850,368 MPN/100 mL
- Enterococci Concentration: 383,314 MPN/100 mL

Goat Canyon

Polluted water from Mexico crosses the border into the U.S. via the cross-border tributary at Goat Canyon. The polluted water enters onto USIBWC property/infrastructure (canyon collector) and into waters of the U.S. Dry weather flows are often diverted to the SBIWTP. Wet weather flows and some dry weather flows continue downstream to the sediment basins owned and maintained by State Parks. Flows that travel beyond the sediment basins reach the downstream estuary, depositing any trash and sediment that are not captured in the sediment basins.

E. coli loading from this nonpoint source is estimated as 2.65 x 10^{16} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP).

Enterococci loading is estimated as 5.15 x 10^{15} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP)

Trash loading is estimated as 788 tons/year. This value was calculated by multiplying: (1) anticipated volume of sediment excavation needs in this area as reported in the *Nelson Sloan Management and Operations Plan and Cost Analysis* (AECOM, 2016) (2) a default value of 10 percent for trash abundance (by volume) based on the *Report of Trash, Waste Tire and Sediment Characterization* (URS, 2010) and the *Excavation and Post Storm Observations in TJ River Valley* (City of San Diego, 2011), and (3) a trash density of 350 lb/cubic yard based on the *Tijuana River Valley Needs and Opportunities Assessment – Trash Technical Memorandum* (HDR, 2020). This trash load value is likely underestimated since it does not account for trash that passes through the sediment basins.

- Dry Weather Volume: 174,000 gallons (annually)
- Wet Weather Volume: 419 million gallons (annually)
- *E. coli* Concentration: 1,669,942 MPN/100 mL
- Enterococci Concentration: 324,366 MPN/100 mL
- Excavation Volume: 45,000 cubic yards

Yogurt Canyon

Polluted water from Mexico crosses the border into the U.S. via the cross-border tributary at Yogurt Canyon. The polluted water enters onto Department of Homeland Security property/infrastructure and into waters of the U.S. Wet weather flows and some dry weather flows continue downstream to the estuary.

E. coli loading from this nonpoint source is estimated as 2.14×10^{11} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of *E. coli* data from this location (data sources described in section 4 of the main body of the ARP). However, only enterococci WQOs apply to saline receiving waters (not *E. coli* WQOs).

Enterococci loading is estimated as 2.56×10^{11} MPN/year. The dry weather portion of this value was calculated by multiplying: (1) the average annual volume of flow reported by USIBWC in transboundary spill reports as required by its NPDES permit from 2015 through 2020 and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP). The wet weather portion was calculated by multiplying: (1) the runoff volume estimated by modeling for water year 2019, which corresponds approximately to average annual rainfall (Lee, 2021) and (2) the geometric mean of enterococci data from this location (data sources described in section 4 of the main body of the ARP)

Trash data specific to Yogurt Canyon was not available. However, transboundary trash estimates from the Goat Canyon subwatershed are reliable due to well documented clean-outs of the sediment basins. Land uses upstream of the border at Yogurt Canyon and at Goat Canyon are similar (Lee, 2021). Therefore, trash generation rates were assumed to be similar and trash loading was estimated by extrapolation, adjusting for subwatershed size.

Trash loading at Yogurt Canyon is estimated as 106 tons/year. This was calculated by multiplying: (1) estimated annual trash loading at Goat Canyon (section 2.6 of this appendix) and (2) a scale-down factor of 0.57/4.24 to account for the difference in subwatershed size (Lee, 2021)

- Dry Weather Volume: 170,000 gallons (annually)
- Wet Weather Volume: 56 million gallons (annually)
- *E. coli* Concentration: 101 MPN/100 mL
- Enterococci Concentration: 120 MPN/100 mL

3. DISCHARGES FROM HSA 911.12

Some discharges generated in HSA 911.12 have the potential to flow across the border into Tijuana and discharge to the Tijuana River. During wet weather and sometimes during dry weather, the river crosses into the U.S. Therefore, point and nonpoint sources of indicator bacteria and trash generated in HSA 911.12 may impact the lower Tijuana River.

Site-specific *E. coli* data needed to reliably calculate potential loads that may cross the border from HSA 911.12 into Mexico were not available. Therefore, the value was calculated by assuming that the per area magnitude of *E. coli* generated in the areas of HSA 911.11 that drain to Phase I MS4s is comparable to the per area magnitude of *E. coli* generated across HSA 911.12. *E. coli* loading from HSA 911.12 is estimated as 1.46 x 10^{15} MPN/year. This was calculated by multiplying: (1) estimated annual *E. coli* loading in Phase 1 MS4s in HSA 911.11 (section 4 of this appendix) and (2) a scale-up factor of 9,577/8,733 to account for the difference in the areas drained (URS, 2016; Tables 1-2 and 2-13 in WQIP).

Site-specific enterococci data needed to reliably calculate potential loads that may cross the border from HSA 911.12 into Mexico were not available. Therefore, the value was calculated by assuming that the per area magnitude of enterococci per area in the areas of HSA 911.11 that drain to Phase 1 MS4s in HSA 911.11 is comparable to the per area magnitude of enterococci generated across HSA 911.12. Enterococci loading from HSA 911.12 is estimated as 4.39 x 10^{14} MPN/year. This was calculated by multiplying: (1) estimated annual enterococci loading in Phase 1 MS4s in HSA 911.11 (section 4 of this appendix) and (2) a scale-up factor of 9,577/8,733 to account for the difference in the areas drained (URS, 2016; Tables 1-2 and 2-13 in WQIP).

The trash load estimated ranges from as up to 12-75 tons/year. Site-specific trash data needed to reliably calculate potential loads that may cross the border from HSA 911.12 into Mexico were not available. Therefore, the trash load was calculated by multiplying: (1) annual trash generation per area for land uses (Michael Baker International, 2018; Los Angeles Regional Board, 2007) and (2) the area pertaining to the respective major land use in HSA 911.12 (URS, 2016).

Trash generation rates for some San Diego County land uses were available to estimate trash loads generated in the U.S. (Michael Baker International, 2018). Since San Diego-specific rates were not available for other land uses, Los Angeles values were also used to estimate trash loads generated in the U.S. (LARWQCB, 2007). The minimum and maximum values from these two studies were used to calculate an estimated range of trash for land uses in the U.S. that may impact the lower Tijuana River. However, this trash load range for discharges generated in HSA 911.12 is likely overestimated because using the trash generation rates does not account for existing best management practices employed to reduce trash; for example, those employed by the Phase I MS4 copermittees (URS, 2016).

Land Use	Acres in HSA 911.12
Agriculture	720
Commercial	136
Freeway	432
Industrial	998
Institutional, Public, and Semi-Public Facilities	62
Junkyard/Dump/Landfill	18
Low-Density Residential	61
Open Space Park or Preserve	2,441
Transportation	18
Vacant and Undeveloped Land	1,590

Land use-based trash generation rates available in the technical report for San Diego County (Michael Baker International, 2018) and in the Los Angeles Regional Water Quality Control Board trash TMDLs (LARWQCB, 2007):

- Commercial
- High-Density Residential; this value was also used for institutional, public, and semi-public facilities land use and school land use.
- Industrial; this value was also used for junkyard/dump/landfill and transportation land uses.
- Low-Density Residential
- Open Space Park or Preserve; this value was also used for agriculture land use and vacant and undeveloped land use.
- Freeway

4. DISCHARGES FROM PHASE I MS4 OUTFALLS

Phase I MS4 outfalls that discharge to the lower Tijuana River (in HSA 911.11) are point sources of indicator bacteria and trash.

E. coli loading from these point sources directly to the lower river is estimated as 1.33×10^{15} MPN/year. The dry weather portion of this value was calculated by extrapolation of the annual dry weather enterococci load in the most recent WQIP annual report (Tijuana River WMA Responsible Agencies, 2021) by comparing the ratio of *E. coli*-to-enterococci standards (USEPA, 2012; Table 1). The wet weather portion was calculated by the same method of extrapolation, using the annual wet weather enterococci load estimate in the *Tijuana River Bacterial Source Identification Study* (Weston, 2012).

Enterococci loading from these point sources directly to the lower river is estimated as 4.00×10^{14} MPN/year. The dry weather portion of this value comes from the most recent WQIP annual report (Tijuana River WMA Responsible Agencies, 2021). The wet weather portion comes from the *Tijuana River Bacterial Source Identification Study* (Weston, 2012).

The trash load estimated from these point sources directly to the lower river ranges from 12 to 76 tons/year. This was calculated by multiplying: (1) annual trash generation per area for land uses (Michael Baker International, 2018; Los Angeles Regional Board, 2007) and (2) the area pertaining to land uses that may drain directly to the lower (URS, 2016). This trash load range is likely overestimated because using the litter generation rate does not account for existing best management practices employed to reduce trash; for example, those employed by the Phase I MS4 copermittees (URS, 2016).

Land Use	Acres in HSA 911.11 draining to Phase I MS4s
Commercial	204
Freeway	532

Land Use	Acres in HSA 911.11 draining to Phase I MS4s
High-Density Residential	605
Industrial	60
Institutional, Public and Semi-Public Facilities	313
Junkyard/Dump/Landfill	2
Low-Density Residential	1,312
Open Space Park or Preserve	3,892
Other Park, Open Space and Recreation	126
School	349
Transportation	1,056
Vacant and Undeveloped Land	531

Land use-based trash generation rates available in the technical report for San Diego County (Michael Baker International, 2018) and in the Los Angeles Regional Water Quality Control Board trash TMDLs (LARWQCB, 2007):

- Commercial
- High-Density Residential; this value was also used for institutional, public, and semi-public facilities land use and school land use.
- Industrial; this value was also used for junkyard/dump/landfill and transportation land uses.
- Low-Density Residential
- Open Space Park or Preserve; this value was also used for agriculture land use and vacant and undeveloped land use.
- Freeway

5. DISCHARGES FROM NOLF-IB OUTFALLS

NOLF-IB outfalls that discharge to the Tijuana River Estuary are potential point sources of indicator bacteria and trash. Generally, during dry weather, minimal if any flow reaches the estuary (Weston Solutions, 2012 and San Diego Regional Board, 2019). Due to the absence of dry weather indicator bacteria data, wet weather data was used for both dry and wet weather load calculations.

E. coli loading from the NOLF-IB outfalls was not estimated since the *E. coli* TMDLs do not apply to saline receiving waters.

Enterococci loading is estimated as 3.49 x 10^{12} MPN/year. The dry weather portion of this value was calculated by first multiplying: (1) an approximate volume of discharge used for hydrostatic tests as reported by the U.S. Navy and (2) the geometric mean of enterococci data for six samples collected from an outfall from 2018 to 2021. The wet weather portion was calculated by first multiplying: (1) volume of discharge per day based on flow data provided by the U.S. Navy, (2) number of rainfall days corresponding to average annual rainfall (Lee, 2021), and (3) the geometric mean of enterococci data for six samples collected from an outfall from 2018 to 2021.

The enterococci load value is likely overestimated because the number of rainfall days was multiplied by the volume of discharge per day even though precipitation generally does not last the entire day. In addition, the number of rainfall days was based on precipitation measured in by the Smuggler's Gulch rain gage during water year 2019, which corresponds approximately to average annual rainfall; however the rain gage measurements are for greater than 0.4 inch of precipitation, whereas "wet weather" is commonly based on precipitation of greater than 0.1 inch.

Trash loading from NOLF-IB outfalls is expected to be *de minimus*. During dry weather, minimal if any flow reaches the estuary (Weston Solutions, 2012 and San Diego Regional Board, 2019). In addition, the U.S. Navy conducts wet weather sampling and visual observations at two industrial outfalls four times a year and at a municipal outfall twice a year. Trash has not been identified in storm water runoff from NOLF-IB during these activities.

- Dry Weather Volume: 50,000 gallons (annually)
- Wet Weather Flow (Geometric Mean): 1.3 million gallons per day
- Wet Weather Volume: 84.5 million gallons (annually)
- Enterococci Concentration: 1,090 MPN/100 mL

6. DISCHARGES FROM AGRICULTURAL OPERATIONS

Any potential indicator bacteria and trash loads from agricultural lands in HSA 911.12 are accounted for in Section 3. Loads from agricultural lands in HSA 911.11 are assumed to be nonpoint sources that do not enter into Phase I MS4s.

No indicator bacteria data or non site-specific references were available to reliably estimate *E. coli* loading or enterococci loading from agricultural land uses in HSA 911.11. This land use makes up only approximately 5% of the Tijuana River Valley Hydrologic Area and less than 4% of HSA 911.11. Therefore, loads are expected to be far less likely to cause impairments than the known sources of indicator bacteria.

Trash loads from agricultural operations are also expected to be far less likely to cause impairments than the known sources of trash. However, information was available to estimate a trash load range of 0.8 to 6 tons/year. This was calculated by multiplying: (1) annual trash generation per area for open space/public land use as a substitute for agricultural land use (Los Angeles Regional Board, 2007) and (2) the agricultural land use area in the Tijuana Valley Hydrologic Area (URS, 2016). This trash load range is likely overestimated because using the litter generation rate does not account for existing best management practices employed to reduce trash.

7. DISCHARGES FROM OPEN SPACE/PUBLIC LANDS

Indicator bacteria and trash loads from open space/public lands from HSA 911.11 into MS4s is accounted for in section 4 of this appendix, as are loads from point and nonpoint sources in HSA 911.12 (section 3 of this appendix). No site-specific indicator bacteria data or non site-specific references were available to reliably estimate *E. coli* loading or enterococci loading from the remaining open space/public lands (nonpoint sources in HSA 911.11). However, loads from these areas come from mostly natural sources (e.g., wildlife feces) and are considered relatively *de minimus*.

Trash from open spaces/public lands (nonpoint sources in HSA 911.11) is not expected to cause impairments in the lower Tijuana River. However, information was available to estimate a trash load range of 2 to 11 tons/year. This was calculated by multiplying: (1) annual trash generation per area for open space/public land use (Los Angeles Regional Board, 2007) and (2) the open space/public land use area in HSA 911.11 that are not expected to drain to Phase I MS4s (URS, 2016). This trash load range is likely overestimated because using the litter generation rate does not account for existing best management practices employed to reduce trash and based on observation, very little trash is generated in the open space/public lands of HSA 911.11.

- Total open space/public lands in HA:7,214 acres
- Open space/public lands draining to Phase I MS4s in HSA 911.11:3,381 acres
- Open space/public lands in HSA 911.12:2,441 acres
- Open space/public land nonpoint sources in HSA 911.11:1,391 acres

8. DISCHARGES FROM GROUNDWATER

Although there is some potential for indicator bacteria loading from groundwater, the available data indicate that this is far less likely to cause impairments than the known sources of indicator bacteria. Trash loading attributed to groundwater is zero.

9. SIGNIFICANT SOURCES

The estimated indicator bacteria and trash loads for each of the known potential sources of indicator bacteria and trash pollution to the lower Tijuana River demonstrate that the only significant sources of pollution identified in the Tijuana River Valley Hydrologic Area are the seven cross-border nonpoint sources of pollution (transboundary flows). Even if 100 percent of indicator bacteria and trash loads generated in the U.S. were to be eliminated, the river’s beneficial uses would still remain impaired due to transboundary pollution. In order to restore beneficial uses, the pollutants in transboundary flows must be reduced substantially.