



# Tijuana River Valley Needs and Opportunities Assessment – Water Quality Technical Memorandum

*San Diego, California*

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# 1 Introduction

## 1.1 Background

The Tijuana River Valley has a long history of water quality issues related to transboundary flows originating in Mexico. These issues include sewage and industrial waste, and trash and sediment that are transported across the border during both dry and wet weather conditions. Recent upgrades in the area of wastewater treatment have resulted in some improvement to water quality on both sides of the border, especially during dry weather flows. However, wet weather flows (stormwater) continue to convey significant quantities of sediment, trash, and other contaminants into the Tijuana River Valley from sources in both the United States (U.S.) and Mexico. The transport of sewage, sediment, and trash causes water quality impairments, threatens life and property from flooding, degrades valuable riparian and estuarine habitats, and affects recreational opportunities for residents, workers, and visitors in the area.

The Tijuana River Watershed is a large, binational watershed in southern California and northern Baja California. Three quarters of the watershed lies in Mexico and includes the cities of Tijuana and Tecate. On the U.S. side, the watershed extends into the City of San Diego, City of Imperial Beach, and County of San Diego. The Tijuana River flows from Mexico into the U.S. and discharges to the Pacific Ocean through the Tijuana River Estuary.

The flow of the Tijuana River, at any given time, may consist of stormwater, effluent discharged from wastewater treatment plants in Mexico, sewage spills, industrial/agricultural discharges, groundwater, and other unidentified sources from Mexico. The Tijuana River, Tijuana River Estuary, and coastal waters of the Pacific Ocean shoreline are listed as impaired water bodies under the Clean Water Act section 303(d) List of Water Quality Limited Waters for numerous constituents, including bacterial indicators, trash, ammonia, benthic community effects, eutrophication, low dissolved oxygen, pesticides, phosphorous, sedimentation/siltation, lead, selenium, solids, surfactants, synthetic organic chemicals, total nitrogen, toxicity, trace elements, nickel, thallium, and turbidity. Reaching the Pacific Ocean and coastal waters on the U.S., these constituents pose health and safety risks and environmental concerns.

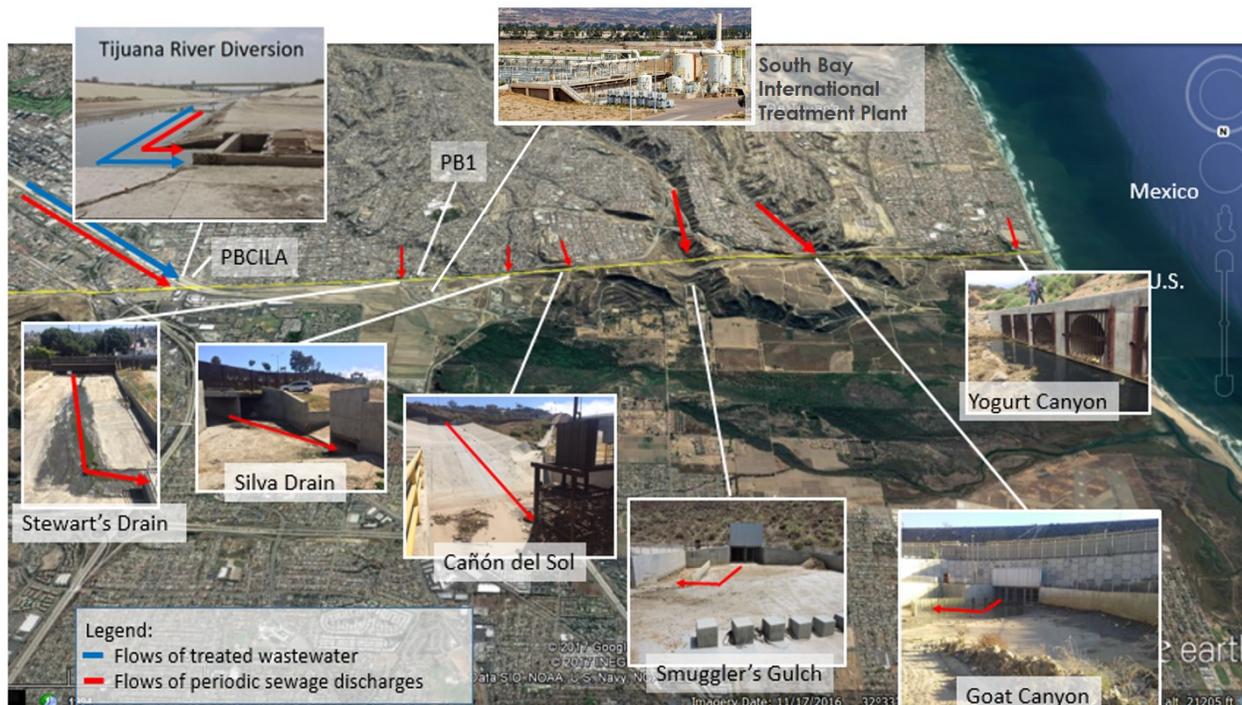
There is an agreement between the U.S. and Mexico to divert water from the Tijuana River in Mexico prior to crossing the border to the U.S. The U.S. and Mexico sections of the International Boundary and Water Commission (IBWC) are responsible for addressing sewage problems and the associated water quality issues in the Tijuana River Watershed. IBWC's efforts have led to the construction and operation of infrastructure on both sides of the border to capture, treat, and discharge the transboundary flows from Mexico. The infrastructure includes the following, as shown on Figure 1:

- The River Diversion Structure and Pump Station CILA (PBCILA) diverts flows from the Tijuana River at a point just south of the international border to the San Antonio de los Buenos outfall (a Pacific Ocean shoreline discharge point located in Mexico approximately 5.6 miles south of the border).
- A combination of pump stations and wastewater treatment plants in Mexico divert and treat sewage discharges.

- Concrete channels and basins form canyon collector systems designed to capture transboundary flows from Mexico in canyons and ravines draining north across the border to the Tijuana River. The five canyon collector systems are the Smuggler’s Gulch Diversion Structure, Goat Canyon Diversion Structure, Cañon del Sol Collector, Stewart’s Drain Canyon Collector, and Silva Drain Canyon Collector.
- The South Bay International Wastewater Treatment Plant (SBIWTP) treats transboundary flows that cross into the U.S. from Mexico at the mainstem of the Tijuana River, as well as flows collected by the canyon collectors.

The existing infrastructure is designed to handle dry weather flows up to 23 million gallons per day (mgd). Flows in excess of 23 mgd enter the river channel and cross into the U.S. These facilities are shut down during storm events, and during system malfunctions, during which time the transboundary flows move through the canyons and the main river channel, leading to uncontrolled (untreated) transboundary flows that ultimately reach the Tijuana River Estuary and Pacific Ocean south of Imperial Beach. Flows in the Tijuana River during storm events can reach over 1 billion gallons per day. After a storm event, it may take several months for flows in the Tijuana River to fall below 23 mgd. Per the capacity of the existing infrastructure, flows must fall below 23 mgd before they can be diverted to the treatment facilities or to the San Antonio de los Buenos outfall.

**Figure 1.1.** Dry-weather Flow Infrastructure in the Tijuana River



In 2012, the Tijuana River Valley Recovery Team (Recovery Team) set forth a Recovery Strategy that identified actions to restore the Tijuana River Valley’s beneficial uses. The Recovery Strategy focused on actions to address water quality issues, sediment, and trash that currently degrade the river’s beneficial uses, exacerbate flooding, affect habitat, and affect recreation. In 2017, the County of San Diego (County) identified the

need for an additional analysis (the Needs and Opportunities Assessment or NOA) to objectively and comprehensively identify possible solutions that could be implemented in the U.S. to address transboundary flows of sewage, trash, and sediment in four priority watersheds: Tijuana River, Smuggler's Gulch, Goat Canyon, and Yogurt Canyon. The NOA is intended to identify the critical issues within each of the four priority watersheds and to identify projects to address impacts on the Tijuana River Valley caused by transboundary flows.

## 1.2 Purpose

The main purpose of this technical memorandum is to identify projects that are viable and feasible to be implemented on the U.S. side of the border to improve water quality in the Tijuana River Valley when dry weather flows and storm events result in flows in excess of 23 mgd. A second goal is to consider projects that are viable for small wet-weather events to reduce the effects of first-flush pollution. The final goal is to consider projects that could reduce health and safety impacts and limitations on recreational use in the Tijuana River Valley and coastal beaches in San Diego.

Section 2 of this technical memorandum identifies the existing key infrastructure and other ongoing projects that are designed to address the water quality issues in each of the priority watersheds. Section 3 identifies the water quality issues by watershed that are not addressed by existing infrastructure. Section 4 identifies potential projects to address the priority issues in each of the priority watersheds. A planning-level cost estimate is also included for project implementation (capital costs) as well as for ongoing costs. Section 5 discusses potential interim measures to address the water quality issues until permanent infrastructure, as well as other projects, policies, and procedures, can be implemented. Finally, Section 6 summarizes the potential projects to be considered for future implementation.

## 2 Review of Existing Projects and Information

As part of the Step 1, "Data Organization and Gaps Summary," of the NOA, data was gathered from stakeholders regarding sediment, trash, and water quality. Over 600 documents were collected, recorded, and indexed for each related constituent. Twenty-three documents included pertinent information and data that could be used for consideration on future projects. Section 7 lists these documents. Information from these documents was applied to the development of the project concepts in this technical memorandum.

Water quality data are available for the Tijuana River, Smuggler's Gulch, Goat Canyon, and Yogurt Canyon Watersheds. The data include beach closures due to sewage, spill notifications, and dry- and wet-weather sampling for priority pollutants including heavy metals and fecal-indicator bacteria.

This section summarizes the existing projects that are in operation to improve the water quality of the Tijuana River Valley.

## 2.1 Tijuana River Flood Control

The U.S. section of the IBWC (USIBWC) operates and maintains the Tijuana River Flood Control Project. The flood control project consists of a concrete-lined channel for the Tijuana River in Mexico extending 2.7 miles upstream from the border, and a concrete- and rock-lined channel in the U.S. extending 0.9 mile downstream from the border. The downstream portion of the channel in the U.S. has a flared section to reduce the velocity of flows before discharging into the natural channel downstream of the project. The channel and bordering levees can contain a flood of approximately 88,000 mgd.

The levees in the U.S. tie into high ground on the north to protect the community of San Ysidro and on the south to protect the South Bay International Wastewater Treatment Plant (SBIWTP) and the City of Tijuana. The U.S. levee on the north bank of the river is 2.0 miles long and the levee on the south bank of the river is 1.9 miles long. Figure 2.1 shows the system of levees associated with the Tijuana River Flood Control Project.

Flows in the Tijuana River from Mexico that bypass the diversion structures, the three eastern canyon collectors, and pump station are conveyed into the Tijuana River Valley through this levee system. The condition and capacity of the levee system is currently being evaluated by the USIBWC.

**Figure 2.1.** Tijuana River Flood Control Project



## 2.2 Tijuana River Diversion Structure

The Tijuana River Diversion Structure located upstream of the border in Mexico is designed to collect dry-weather river flows and any river flows up to 23 mgd. Figure 2.2 shows the location of the Tijuana River main channel diversion structure. The diversion structure consists of a concrete barrier blocking the main concrete channel of the Tijuana River with an aqueduct leading to the PBCILA pump station.

**Figure 2.2.** Location of the Tijuana River Main Channel Diversion Structure



Figure 2.3 shows PBCILA, which consists of three pumps and a standby generator with capacity to power one pump during a power outage.

**Figure 2.3.** Pump Station CILA (PBCILA)



## 2.3 Canyon Collectors and Diversion Structures

Canyon collectors are concrete channels and basins designed to capture transboundary flows from Mexico in canyons and ravines draining north across the border to the Tijuana River. The five canyon collector systems are the Stewart's Drain Canyon Collector, the Silva Drain Canyon Collector, the Cañon del Sol Collector, the Smuggler's Gulch Diversion Structure, and the Goat Canyon Diversion Structure. This technical memorandum focuses only on the three western canyons (Smuggler's Gulch, Goat Canyon, and Yogurt Canyon), two of which have existing canyon collectors.

Each canyon collector system includes a detention basin designed to capture dry-weather flows, a screened drain/inlet, and conveyance to the SBIWTP by pump stations. Flows (dry and wet weather) at or under the maximum design capacity of 23 mgd are diverted to the SBIWTP for treatment and are disposed through the South Bay Ocean Outfall (SBOO).

Flows in the canyons that exceed the maximum design capacity of the canyon collectors overflow the respective structures and continue flowing north. Yogurt Canyon does not have a canyon collector, so transboundary flows in this area are not diverted to the existing infrastructure system for treatment. Excess flows that overflow the diversion infrastructure discharge into the Tijuana River and potentially get routed to the Tijuana River Estuary and the Pacific Ocean.

Water quality monitoring along the watersheds has been a valuable source of data for understanding the magnitude of impacts from transboundary flows. The San Diego Regional Water Quality Control Board (Regional Board) requires USIBWC to conduct water quality monitoring and assessment pursuant to the Monitoring and Reporting Program for the 2014 National Pollutant Discharge Elimination System (NPDES) Permit. The Monitoring and Reporting Program establishes conditions for USIBWC to conduct routine or episodic self-monitoring of the discharges regulated under Order Number R9-2014-0009 at specified influent, effluent, transboundary flow, and receiving water locations. The Monitoring and Reporting Program requires USIBWC to report the results to the Regional Board with information necessary to evaluate discharge characteristics and compliance status. USIBWC's monitoring is conducted jointly with the City of San Diego. In December 2018, the USIBWC initiated a 1-year binational monitoring program to collect data from the Tijuana River and adjacent canyons on both sides of the international border. The monitoring program does not address toxicity or trash and the monitoring frequencies of the program are limited. In addition, in 2018, U.S. Customs Border Protection embarked on a 6-month water sampling program from January through June to understand the water quality at each of the canyons. Other parties, including the Regional Board, conduct episodic monitoring for ambient monitoring and specific studies.

### 2.3.1 Smuggler's Gulch Diversion Structure

Constructed in 2009 as part of the Secondary Border Fence Project, the Smuggler's Gulch diversion structure consists of a 145-foot-high earthen berm topped with a road and border fence. The diversion structure is a 300-foot-wide culvert with a capacity of 4.67 mgd. Dry-weather flow from this canyon diversion structure is collected in a detention area directly downstream of the culvert and is routed to the SBIWTP via the existing pump station on the east side of the channel. The average design capacity of the existing diversion structure is 4.67 mgd, with a peak capacity of 14.0 mgd. Wet-weather flows from the 5.9-square mile watershed bypass the diversion structure and flow north into an earth channel, through a culvert under Monument Road, and ultimately to the Tijuana River. The existing culvert under Monument Road is frequently flooded, flooding Monument Road and cutting off access to the homes and properties west of the crossing. Figure 2.4 shows the diversion structure at Smuggler's Gulch.

**Figure 2.4.** Smuggler’s Gulch Diversion Structure



### 2.3.2 Goat Canyon Diversion Structure

The Goat Canyon Diversion Structure was constructed in 2009 as part of the Secondary Border Fence Project. The canyon diversion structure is part of the Goat Canyon Sediment Basin. The maximum design capacity of the Goat Canyon collector is 23 mgd. The average design capacity of the existing diversion structure is 2.33 mgd, with a peak capacity of 7.0 mgd. Dry-weather flow from this canyon diversion structure is collected in the existing pump station and diverted to the SBIWTP. Wet-weather events from the 4.6-square mile watershed, as well as any dry-weather events that bypass the diversion structure, discharge directly to the Tijuana River Estuary. Figure 2.5 shows the diversion structure at Goat Canyon.

**Figure 2.5.** Goat Canyon Diversion Structure



## 2.4 South Bay International Wastewater Treatment Plant

The SBIWTP was constructed in 1997 on a 75-acre site with a 30 mgd peak capacity with expansion capability of up to 100 mgd. The SBIWTP is located about two miles west of the San Ysidro Port of Entry. The plant treats dry-weather flows originating in Tijuana and discharges them to the Pacific Ocean through the South Bay Ocean Outfall (SBOO). Dry-weather transboundary flows from the five canyon collector systems, as well as the main Tijuana River channel upstream of the border, are directed to the SBIWTP. Figure 2.6 shows the layout of the SBIWTP and the space available for expansion. Table 2.1 shows the average annual flows and water quality characteristics of the influent and effluent to and from the SBIWTP.

**Figure 2.6.** Layout of South Bay International Wastewater Treatment Plant



**Table 2.1.** SBIWTP Annual Average Influent Wastewater Flow and Characteristics

Parameter	Value	Unit
Influent flow	25–30	mgd
Total suspended solids	421	mg/L
Volatile suspended solids	302	mg/L
pH	7.34	—
Total dissolved solids	1,594	mg/L
Biochemical oxygen demand	408	mg/L
Turbidity	219	NTU
Ammonia-N	51	mg/L

**Table 2.1.** SBIWTP Annual Average Influent Wastewater Flow and Characteristics

Parameter	Value	Unit
Total cyanide	ND	mg/L
Oil and grease	20.32	mg/L
Phenol	12.75	mg/L
Toluene	8.28	mg/L
bis-(2-ethylhexyl) phthalate	17.25	mg/L
Calcium	ND	mg/L
Arsenic	ND	µg/L
Chromium	0.80	µg/L
Copper	4.91	µg/L
Lead	1.39	µg/L
Nickel	22.89	µg/L
Silver	0.52	µg/L
Selenium	0.88	µg/L
Zinc	75.56	µg/L

Source: IBWC. 2015. SBIWTP 2015 Annual NPDES Report. Veolia Water.

Notes: µg/L = micrograms per liter, mg/L = milligrams per liter, mgd = million gallons per day, ND = no data, NTU = nephelometric turbidity units

Influent to the SBIWTP enters the inlet junction structure, which also receives dry weather flow from collection and conveyance facilities for transboundary flows from all five canyon collectors. The flows pass through mechanical bar screens, and the screenings are scraped and collected. The flow is pumped to the aerated grit chamber where large solids are removed. The collected grit is pumped out for disposal.

From the grit chambers, the water flows by gravity to the rapid-mix chambers, where ferric chloride and anionic polymer are added to help the solids coagulate. The flow then travels to the primary settling tanks. The settled solids are pumped to the sludge storage tank. The flows are treated through the aeration basins, where air is added to provide oxygen for aerobic degradation of organic constituents. Leaving the aeration basins, flow enters the secondary settling tanks where the biological solids are removed from the treated wastewater. The accumulated sludge at the bottom of the secondary settling tanks is pumped out to the sludge storage tank, where it is mixed with the primary sludge.

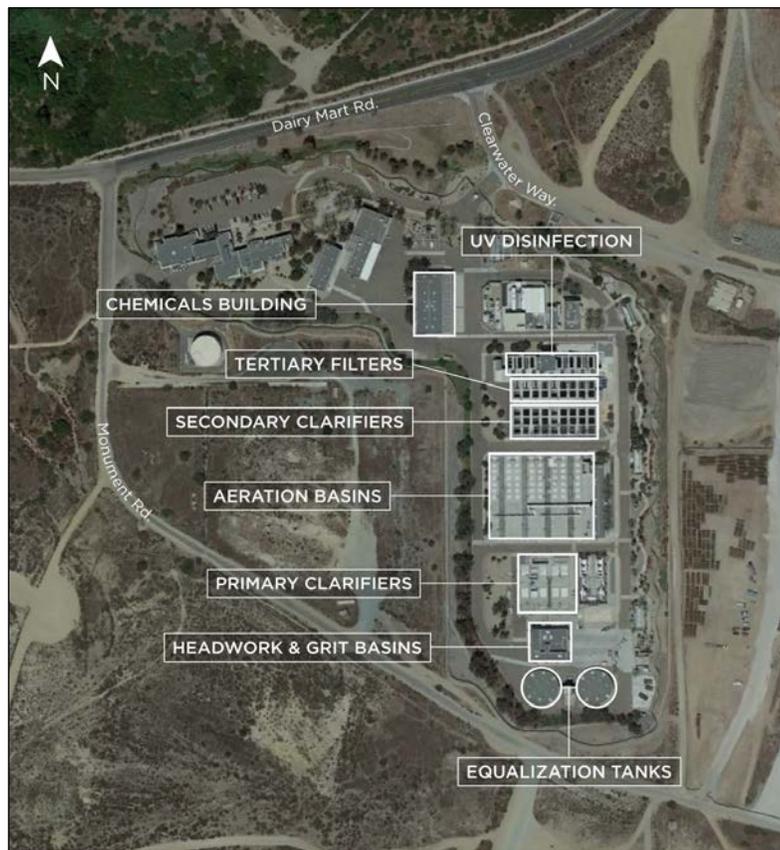
The combined sludge is processed by adding a small amount of polymer and is dewatered to 18% cake consistency at the belt filter press. The thickened sludge is then treated with lime and conveyed to the truck-loading building where it is deposited into hauling trucks and sent to Mexico for disposal.

The SBIWTP is independently operated by Veolia Water Technologies on behalf of IBWC.

## 2.5 South Bay Water Reclamation Plant

The South Bay Water Reclamation Plant (SBWRP) was constructed in 2002 by the City of San Diego in accordance with NPDES Permit Number CA01090445 (Order R9-2017-0023) and can treat up to 35 mgd of wastewater to secondary and/or tertiary recycled water standards. It is located on a 22-acre site near Dairy Mart Road and Monument Road in the eastern part of the Tijuana River Valley and is adjacent to the SBIWTP. Figure 2.7 shows the overall layout of the SBWRP, and Table 2.2 lists the plant’s wastewater characteristics. The SBWRP treats the wastewater collected from the South Bay communities and does not receive any transboundary dry-weather or stormwater flows from the Tijuana River.

**Figure 2.7.** Layout of South Bay Water Reclamation Plant



**Table 2.2.** SBWRP Annual Average Influent Wastewater Flow and Characteristics

Parameter	Value	Unit
Average influent flow	7.39	mgd
Total suspended solids	279	mg/L
Volatile suspended solids	258	mg/L
pH	7.56	—
Total dissolved solids	1,031	mg/L
Biochemical oxygen demand	327	mg/L

**Table 2.2.** SBWRP Annual Average Influent Wastewater Flow and Characteristics

Parameter	Value	Unit
Turbidity	181	NTU
Ammonia-N	37.0	mg/L
Total cyanide	0.001	mg/L
Phenol	45.4	mg/L
Toluene	ND	mg/L
bis-(2-ethylhexyl) phthalate	9.9	mg/L
Calcium	63.0	mg/L
Magnesium	28.5	mg/L
Manganese	0.12	mg/L
Sodium	208	mg/L
Potassium	19.8	mg/L
Aluminum	686	µg/L
Arsenic	0.59	µg/L
Cadmium	0.12	µg/L
Chromium	3.96	µg/L
Copper	94.2	µg/L
Lead	1.70	µg/L
Nickel	5.23	µg/L
Silver	0.33	µg/L
Selenium	1.78	µg/L
Zinc	178	µg/L

Source: Annual Report and Summary SBWRP & Ocean Outfall. City of San Diego Public Utilities. 2017

Notes: µg/L = micrograms per liter, mg/L = milligrams per liter, mgd = million gallons per day, ND = no data, NTU = nephelometric turbidity units

The SBWRP's primary and secondary processes consist of influent screening using mechanically cleaned bar screens, grit removal using aerated grit chambers, primary sedimentation clarifiers with chain and flight sludge collectors and tilting trough scum collectors, primary effluent flow equalization storage tanks, air-activated sludge biological treatment with anoxic selector, and secondary clarifiers with chain and flight sludge collectors. The tertiary treatment process consists of filter feed pumping, coagulation with chemical addition, and direct filtration with conventional deep bed monomedia filters, backwash facilities, electro dialysis reversal units, and disinfection using ultraviolet light.

## 2.6 South Bay Ocean Outfall

Effluent from both the SBWRP and the SBIWTP is mixed at the effluent distribution vault before entering South Bay Land Outfall. The South Bay Land Outfall is a tunnel that extends from the effluent distribution vault to the coastline, after which it discharges into the SBOO.

The SBOO and the South Bay Land Outfall were completed in 1998 and are owned and operated by the City of San Diego. The SBOO is an 11-foot-diameter tunnel extending 3.5 miles offshore to a depth of 93 feet below sea level. The SBOO is located just north of the international border. The SBOO was constructed for shared use by IBWC's SBIWTP and the City of San Diego's SBWRP.

The SBOO is designed to handle an average flow of 174 mgd with a peak flow of 233 mgd. Currently, the SBOO is permitted to receive up to 40 mgd from SBWRP but is underutilized with an average flow of 28.4 mgd. The 193 mgd unpermitted capacity could be used to dispose of partially treated or untreated flows from the Tijuana River. The excess capacity would be reduced to 163 mgd if the 30 mgd SBIWTP capacity is included.

The SBOO extends beneath the seabed offshore. From there, the outfall pipe connects to a vertical riser assembly that conveys effluent to a pipeline buried just beneath the surface of the sea floor. This subsurface pipeline then splits into a Y-shaped multiport diffuser system, with the two diffuser legs each extending an additional 1,980 feet to the north and south.

Figure 2.8 shows the location of the SBOO. Since the SBOO is not operating at full capacity, many diffuser ports have been closed in order to increase the exit velocity from the operating diffuser ports to enhance mixing of the treated water in the ocean.

USIBWC's SBIWTP discharges through the SBOO are regulated by Regional Board Order Number R9-2019-0012 (NPDES Permit Number CA0108928), and the City of San Diego's SBWRP discharges are regulated by Regional Board Order Number R9-2017-0023 (NPDES Permit Number CA0109045).

**Figure 2.8.** Location of the South Bay Ocean Outfall



## 3 Identification of Priority Issues

Neither the U.S. nor Mexico uses a comprehensive sampling and monitoring plan to characterize the stormwater flows entering the U.S. from Mexico. The USIBWC and its Mexican counterpart, the Comisión Internacional de Límites y Aguas, Sección Mexicana (CILA) have begun a joint sampling program, but this sampling is restricted to indicator bacteria only.

In January 2018, U.S. Customs Border Protection began a 6-month sampling and testing program to identify the full host of biological and chemical contaminants that could be present in the canyon collector systems and the main Tijuana River channel. This program monitored bacteria, inorganic chemicals, volatile organic chemicals, heavy metals, and other constituents along the tributaries. The sampling period extended from January through June 2018. For this analysis, samples collected by U.S. Customs Border Protection during wet-weather periods were reviewed to help characterize the stormwater flows.

This section discusses the potential for dry- and wet-weather flows to impact the water quality in the Tijuana River main channel and its tributaries.

### 3.1 Tijuana River Main Channel

#### 3.1.1 Dry-Weather Flow

North American Development Bank (NADB), in coordination with the U.S. Environmental Protection Agency (USEPA), the USIBWC, CILA, the Mexican National Water Commission (CONAGUA), and the Tijuana water utility, Comisión Estatal de Servicios Públicos (CESPT), conducted a study to analyze the transboundary flows, diversion infrastructure and operations. The study included diagnostics and evaluation of technical alternatives identified for potential infrastructure investments in Mexico, in the U.S., or in both countries for mitigation of transboundary flows. Part of the study identified new diversion facilities in the U.S. up to 35 mgd capacity and considered options of treatment at SBIWTP and discharge into the SBOO.

Average dry-weather flow in the Tijuana River north of the international border generally ranges from 14 to 23 mgd, of which 80 to 90 percent is treated effluent from Mexican wastewater treatment facilities with the remaining flows assumed to be uncontrolled raw sewage. This flow is typically captured, treated, and diverted to the PBCILA, thereby reducing the likelihood of flows reaching the U.S. side. Flows in excess of 23 mgd continue to flow in the river channel without treatment or diversion.

Table 3.1 lists the incidents of dry-weather flows that were released in the Tijuana River channel without treatment from 2015 through 2018. These represent dry-weather flows in excess of the 23 mgd that can be captured. Ongoing operations of the gaging station at the border is imperative to monitoring and recording transboundary flows that are not captured at the upstream diversion structure. This will allow quantification of the maximum dry-weather flows that should be diverted to the SBIWTP.

**Table 3.1.** Volume of Untreated Dry-Weather Flow in the Tijuana River

Year	Number of Incidents	Total Volume (millions of gallons)
2015	15	20,970
2016	21	36,116
2017	25	163,020
2018	11	16,365

### 3.1.2 Wet-Weather Flow

During storm events, flow in the Tijuana River can reach well over 1 billion gallons per day, exceeding the capacity to be handled by PBCILA. During storm events, PBCILA is shut down to protect the equipment from operational damage due to sediment and debris. Once flows exceed 23 mgd, flow from the Tijuana River channel crosses into the U.S. and flows downstream through the Tijuana River Estuary before discharging into the ocean just south of Imperial Beach. The normal practice is to restart the PBCILA pump station and divert flows from the river once the base flows decrease to below 23 mgd. Depending on how much rainfall has occurred, it may take several months for the river channel flow to fall below 23 mgd operational threshold and no additional rain can be forecast during the next 3 days, before PBCILA is restarted and flows begin to be diverted to the treatment facilities or to the San Antonio de los Buenos outfall.

Table 3.2 lists the magnitudes of possible flows in the Tijuana River channel based on return periods of 1, 2, 5 and 10 years. The discharge frequency curve for the Tijuana River is presented in Appendix A, Tijuana River Discharge Frequency Curve. Sewage-laden stormwater leads to beach closures and loss of recreational use of the Tijuana River Valley Regional Park. An average of 138 days of transboundary flow days have been estimated by NADB as a result of sewage flows into the main river channel. It might be possible to reduce the effects of sewage flows on recreational use of the Tijuana River Valley and South Bay beaches by capturing some of the sewage-laden stormwater using new pump stations or in-stream water quality detention basins, treating it at the existing SBWRP or at a new treatment facility at the SBIWTP, and discharging it through the existing SBOO.

**Table 3.2.** Stormwater Flows in the Tijuana River

Storm Event Return Period	Probable Flow* (mgd)	Estimated Storm Volume for Specified Duration (millions of gallons)			
		0.5 hour	1 hour	2 hours	6 hours
1 year	13	14	29	86	173
2 years	691	63	127	380	761
5 years	3,000	139	277	832	1,664
10 years	6,600	265	530	1,591	3,183

\* Source: U.S. Army Corps of Engineers 2018

## 3.2 Smuggler's Gulch

As discussed in Section 2.3.1, the existing Smuggler's Gulch facility consists of a diversion structure and pump station. The average design capacity of the existing diversion structure is 4.67 mgd, with a peak capacity of 14.0 mgd. The dry-weather flows are pumped to the SBIWTP. However, any excess flows are routed to an earthen channel that flows to the Tijuana River. The excess dry-weather flows are typically sewer spills. During storm events, the pump station is completely shut down, and all flows enter the Tijuana River.

Regular water quality monitoring is needed to better understand the quality (as well as quantity) of the dry and wet-weather flows crossing the border into the U.S. New facilities may also be needed to capture, divert and treat greater dry weather and potentially wet-weather flows.

## 3.3 Goat Canyon

As discussed in Section 2.3.2, the existing Goat Canyon facility consists of a diversion structure and pump station. The average design capacity of the existing diversion structure is 2.33 mgd, with a peak capacity of 7.0 mgd.

Similar to Smuggler's Gulch, dry-weather flows are pumped to the SBIWTP. However, any excess flows are routed to the Tijuana River Estuary. The excess dry-weather flows are typically sewer spills. During storm events, the pump station is completely shut down, and all flows enter the main river channel.

Regular water quality monitoring is needed to better understand the quality (as well as quantity) of the dry and wet-weather flows crossing the border into the U.S. New facilities may also be needed to capture, divert and treat greater dry weather and potentially wet-weather flows.

## 3.4 Yogurt Canyon

Yogurt Canyon is the watershed with the least amount of information available. Flows into the Tijuana River Estuary from Yogurt Canyon receive no intervention. Hence, documented sewer line breaks and spills are not captured and flow directly into the estuary. Yogurt Canyon does not have any means to capture either dry- or wet-weather flows. Of the three canyons, this canyon is located closest to the Pacific Ocean. Water quality and flow monitoring at this canyon will help in understanding the magnitude of dry- and wet-weather flows and pollutants in the flows.

At a minimum, the dry-weather flows from this canyon can be captured and treated at the SBIWTP.

## 4 Development of Potential Projects

The goal of this technical memorandum is to conceptualize projects on the U.S. side of the international border that could be implemented to address the priority issues related to dry- and wet-weather flows. This section discusses projects to:

- Monitor and sample dry- and wet-weather flows;
- Provide additional pumping capacity to route greater flows for treatment and disposal;
- Enhance the existing canyon collectors on the U.S. side of the border to divert greater than the cumulative 9.5 mgd dry-weather flows;
- Capture 1-to-2-year storm event flows and provide partial or full treatment; and/or
- Divert 1-to-2-year storm event flows directly into the SBOO without treatment.

The projects are described according to the watershed they would serve.

The costs of the potential projects are estimated using HDR's WaterCost Model. This model is planning-level cost tool that provides a Class 5 cost estimate. Class 5 is the ACE International and ASTM International recommended cost-estimating classification system. A Class 5 level provides a screening-level cost estimate with an accuracy of 50 to 20 percent below to 30 to 100 percent above the actual cost. Cost tables for potential projects are presented in Appendix B.

The construction cost estimates for the potential projects were prepared using the Timberline cost-estimating software. Construction costs are derived from default input values for a range of treatment process sizes. Operations and maintenance (O&M) costs are calculated based on known typical O&M costs and from USEPA cost curves. In addition to construction costs, soft costs for design, construction management, bond and insurance, and administration costs are included in the total project cost. Due to the preliminary nature of these costs, the values from the software were typically rounded up to the nearest order of magnitude value.

Table 4.1 shows the markup for the factors related to capital improvements, including a contingency cost for unknown variables, such as planning efforts; wide variations in design; and construction management costs, supply costs, energy costs, and spikes in labor costs. Environmental and legal costs are not explicitly included in these unit costs. Environmental permitting and monitoring costs were added separately to the total project costs when the individual projects were combined into project alternatives. A summary of each project is also included in Section 6.

**Table 4.1.** Capital Improvement Markup  
Cost Factors

Cost Factor	Percentage (%)
Administration costs	7
Design costs	8
Construction management costs	10
Bond and insurance	5
Contingency	25
<b>Total</b>	<b>55</b>

## 4.1 Tijuana River Main Channel

### 4.1.1 Projects 3 and 4: New Lift Station to Divert Flows to IBWC SBIWTP

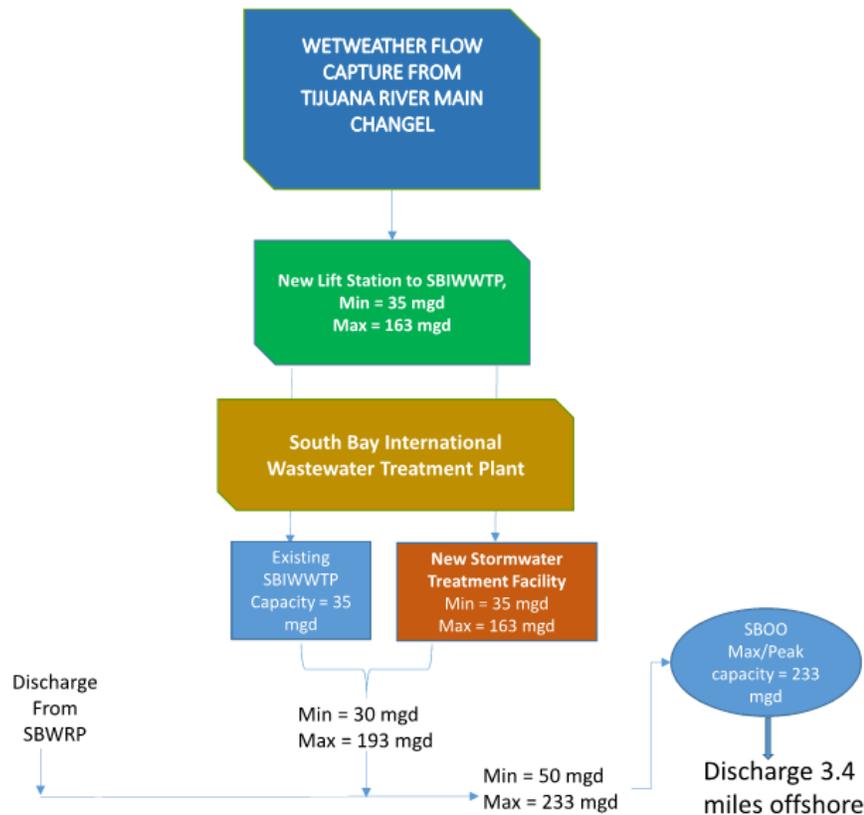
The overall concept of these projects includes construction of a new lift station to divert a range of flows from 35 mgd to 163 mgd from the Tijuana River main channel to a new stormwater treatment facility located at the SBIWTP. The new lift station would operate primarily during storm events and if dry-weather flows in the main river channel exceed the existing PBCILA pump station capacity, or when PBCILA is non-operational.

The federally owned land where SBIWTP is located has space available to accommodate a new primary treatment plant to handle up to 163 mgd or more of transboundary flows. This facility would be separate from the existing SBIWTP operations.

The diverted wet-weather flows from the Tijuana River main channel would be sent to the new stormwater treatment facility for primary treatment before discharging to the existing SBOO. Any dry weather flows up to 35 mgd will continue to be diverted to the existing SBIWTP to be treated within the existing treatment processes. A new diversion structure on the U.S. side of the border, upstream of the new and existing treatment facilities, will allow the flow routing based on the type of flow.

Figure 4.1 is a flow chart that shows the flow ranges and distribution to the new Stormwater Treatment Facility.

**Figure 4.1** Tijuana River Main Channel Flow Capture Diversion Plan to SBIWTP



The overall project can be phased into 4 different projects based on the capacity of the new lift station and the new stormwater treatment facility. The projects are as presented in Table 4.2.

**Table 4.2** Development of Potential Projects

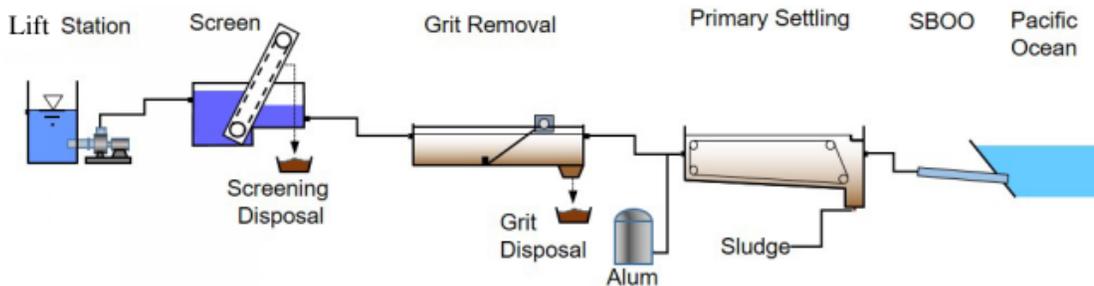
Project Number(s)	Description
3a/4a	Diversion of up to 35 mgd to SBIWTP for Treatment and Discharge to Deep Ocean through SBOO
3b/4b	Diversion of up to 100 mgd to SBIWTP for Treatment and Discharge to Deep Ocean through SBOO
3c/4c	Diversion of up to 163 mgd to SBIWTP for Treatment and Discharge to Deep Ocean through SBOO
3c/4d	Diversion of up to 163 mgd to SBIWTP for Treatment and Discharge to Deep Ocean through SBOO, plus Additional Storage at New San Ysidro Basin
3a/4e	Diversion of up to 35 mgd to Existing SBIWTP for Treatment and Discharge to Deep Ocean through SBOO (per NADB Tijuana River Diversion Study Alternative 4B)

The flow processed through the new lift station and the new stormwater treatment facility would be periodic in nature. The new lift station could be constructed to allow phased expansion of the diversion and treatment facilities. The structural component of the lift station can be constructed for the ultimate capacity of 163 mgd with the mechanical and electrical components added to accommodate each phased flow condition.

The planning level cost estimation for the lift station assumes horizontal centrifugal pumps, flow control valves, variable frequency drives, 1200 horsepower motors and all associated piping, valves, appurtenances, controls and instrumentation required for operation.

The new stormwater treatment facility would provide primary level treatment to the wet weather flows. The process flow diagram in Figure 4.2 outlines the different processes to be included in the new facility. The planning level cost estimate includes a diversion structure with motor operated gates to route the flows either to the new facility or the existing SBIWTP, new head works with mechanical travelling screens with conveyors, washer and compactor to remove the screenings, and a non-aerated grit chambers to remove the inorganics from the wastewater stream. The final step in treatment would be conventional rectangular primary clarifiers with chain and sprocket sludge removal. The treated effluent will be routed to the distribution vault for discharge by gravity into the existing SBOO. The screening, grit and sludge disposal would remain similar to the existing SBIWTP approach.

**Figure 4.2** New Stormwater Treatment Facility Process Flow Diagram



The existing IBWC property has sufficient space to accommodate the new stormwater treatment facility and allow space for future expansion of the existing IBWC. A preliminary layout of the new facility for the ultimate capacity of 163 mgd is presented in Figure 4.3.

As an additional enhancement, a new 82 acre-feet storage basin upstream of the new stormwater treatment facility will allow diversion and equalization of flows in excess of 163 mgd. The storage basin will be concrete lined and fitted with an outlet structure with gates to control flows back into the stormwater treatment facility.

**Figure 4.3** New Stormwater Treatment Facility Preliminary Layout for 163 mgd



*Project Cost*

Table 4.3 summarizes the implementation and ongoing annual cost for operating and maintaining the facilities for each flow condition. This table does not include costs for environmental monitoring that may be needed.

**Table 4.3** Implementation and Ongoing Cost Summary for Projects 3 through 4

Project Number(s)	Flows	Implementation Cost, in Million USD	Ongoing O&M Cost, in Million USD per year
3a/4a	35 mgd	\$78	\$1.9
3b/4b	100 mgd	\$167	\$2.9
3c/4c	163 mgd	\$230	\$4.5
3c/4d	163 mgd	\$408	\$4.8
3a/4e	35 mgd	\$52	\$7

The planning level costs are developed using WaterCost Model developed by HDR. This model is planning-level cost tool that provides a Class 5 cost estimate. Class 5 is the AACE International and ASTM International recommended cost-estimating classification system. A Class 5 level provides a screening-level cost estimate with an accuracy of 50 to 20 percent below to 30 to 100 percent above the actual cost.

The implementation cost includes labor, material and equipment costs for the baseline cost estimate. It includes percentage cost factor mark ups to account for soft costs for design, construction management, bond and insurance, and administration costs to

develop the total capital cost. Appendix B includes cost tables which summarize the line items and the percentage mark up for each Lift Station and Treatment Plant flow condition. The implementation costs in Table 4.3 also include a \$4M estimate for Environmental Permitting.

The ongoing operations and maintenance cost includes the following cost assumptions:

- Labor: \$75/hr
- Energy: \$0.106/kWh
- Alum: \$300/ton

The O&M cost for existing SBIWTP facility is significantly higher than the planning level costs for the potential diversion and treatment scenarios described above. The existing SBIWTP is a full secondary treatment plant that has significantly higher chemical and power requirements. In addition, these processes are very labor intensive requiring higher labor hours for maintenance and operation. The annual O&M cost for the existing SBIWTP is at about \$14 Million. These costs include the cost of treating and maintaining the diversion structures from all five Canyon Collectors as well.

The existing treatment facility includes the following processes:

- Mechanical screens
- Non aerated grit chamber
- Primary settling (gravity settling)
- Biological process with aeration tanks
- Air supply
- Secondary clarifiers
- Secondary sludge thickening.
- Secondary sludge pumping
- Sludge digestion
- Digested sludge pumping
- Waste Activated Sludge pumping
- Digested sludge thickening
- Disinfection
- Internal pumping

Typically, primary treatment O&M costs are about 15-20% of the overall O&M costs associated with a conventional wastewater treatment facility. This is due to primary treatment being less energy and operation intensive. The secondary treatment with disinfection of effluent, digestion and sludge handling typically constitutes 70% of the overall O&M cost. 10% of the overall O&M cost can be attributed to miscellaneous costs such as security, ground keeping, admin building, etc. Based on these estimations, the ongoing O&M cost developed for the new stormwater treatment facility is determined to be within the acceptable range.

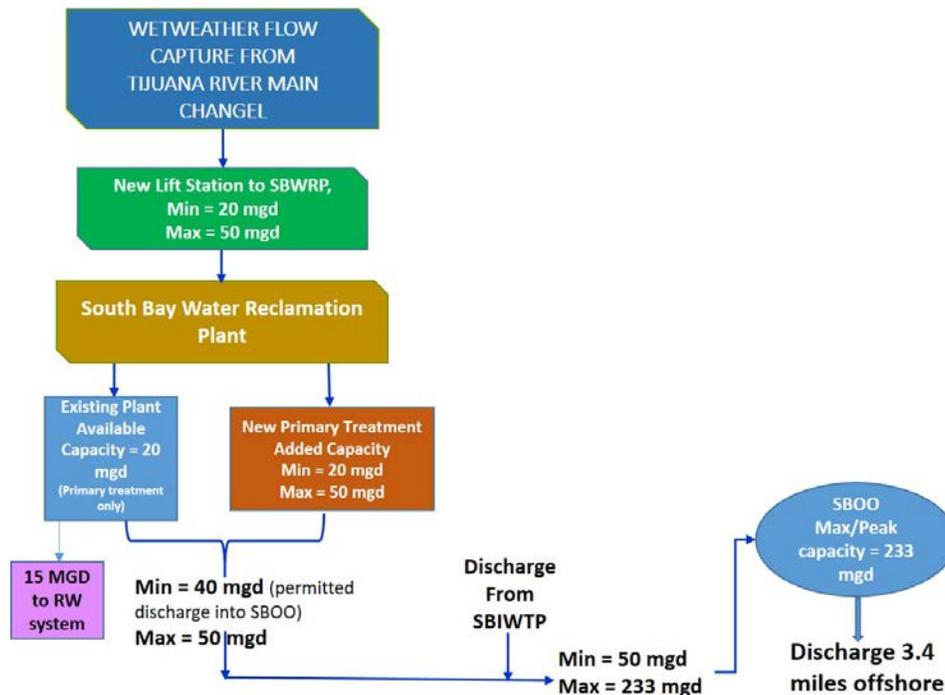
### 4.1.2 Projects 5 and 6: New Lift Station to Divert Flows to Existing City of San Diego SBWRP

These projects include construction of a new lift station to divert a range of flows up to 50 mgd from the Tijuana River main channel to the existing SBWRP with new treatment expansion and modifications. The new lift station would operate primarily during storm events and if dry-weather flows in the main river channel exceed the existing PBCILA lift station capacity, or when PBCILA Lift Station is non-operational.

The City of San Diego owns and operates the SBWRP which has some unused treatment capacity. However, the SBWRP has limited space to accommodate new primary treatment facility. Thus, a combination of utilizing the existing extra capacity with addition and modification to existing treatment can handle up to 50 mgd of transboundary flows.

The diverted wet-weather flows from the Tijuana River main channel would be sent to SBWRP primary treatment before discharging to the existing SBOO. A diversion structure upstream of the new and existing treatment facilities will allow the flow routing based on the type of flow. Figure 4.4 is a flow chart that shows the flow ranges and distribution to the new stormwater treatment facility.

**Figure 4.4** Tijuana River Main Channel Flow Capture Diversion Plan to SBWRP



The overall project can be phased into 2 different projects based on the capacity of the new lift station and utilization of the existing extra treatment capacity with modification and addition or direct diversion to SBOO. The projects are summarized in Table 4.4.

**Table 4.4** Development of Potential Projects for Projects 5 through 6

Project Number(s)	Description
5a/6a	Diversion of up to 20 mgd to SBWRP for Treatment and Discharge to Deep Ocean through SBOO
5b/6b	Diversion of up to 50 mgd to SBWRP for Discharge to Deep Ocean through SBOO

The flow processed through the new lift station and the new Stormwater Treatment Facility will be periodic in nature. The new lift station could be constructed to allow phased expansion of the diversion and treatment facilities. The structural component of the lift station can be constructed for the ultimate capacity of 50 mgd with the mechanical and electrical components added to accommodate each phased flow condition.

The planning level cost estimation for the lift station assumes horizontal centrifugal pumps, flow control valves, variable frequency drives, motors and all associated piping, valves, appurtenances, controls and instrumentation required for operation.

The new primary treatment expansion will provide primary level treatment to the wet weather flows. The process flow diagram in Figure 4.2 outlines the processes to be included in the treatment scheme. The planning level cost estimate includes a diversion structure with motor operated gates to route the flows either to the new facility or the existing SBWRP, new head works with mechanical travelling screens with conveyors, washer and compactor to remove the screenings, and a non-aerated grit chambers to remove the inorganics from the wastewater stream. The final step in treatment will be conventional rectangular primary clarifiers with chain and sprocket sludge removal. The treated effluent will be routed to the distribution vault for discharge by gravity into the existing SBOO.

The screening, grit and sludge disposal will remain similar to the existing SBWRP approach.

#### *Project Cost*

Table 4.5 summarizes the implementation and ongoing annual cost for operating and maintaining the facilities for each flow condition.

The planning level costs estimates are developed using HDR's WaterCost Model with the same assumptions and specifics as discussed in Section 4.1.1. The implementation costs in Table 4.5 also include a \$4 million estimate for Environmental Permitting.

**Table 4.5** Implementation and Ongoing Cost Summary for Projects 5 through 6

Project Number(s)	Flows	Implementation Cost, in Million USD	Ongoing O&M Cost, in Million USD per year
5a/6a	20 mgd	\$47	\$1
5b/6b	50 mgd	\$83	\$1.5

#### 4.1.3 Project 7: Pumped Direct Discharge up to 193 mgd to SBOO without Treatment

This project would construct a new lift station to divert up to 193 mgd to the existing SBOO without primary or secondary treatment. Trash control, sediment removal, and screening would be provided at the new lift station. The existing SBOO currently has 134 mgd average and 193 mgd peak of unpermitted capacity (assumes no flow from SBIWTP) that could be used in the case of an emergency spill or potentially during minor storm events to capture additional pollutant-laden runoff. However, permitting by the Regional Water Quality Control Board would need to be secured before implementing this project because the effect on the ocean water needs to be addressed.

##### *Project Cost*

The estimated implementation cost is approximately \$22 million, and the annual O&M cost is estimated to be less than \$1.6 million. The implementation cost includes a \$4 million estimate for Environmental Permitting.

#### 4.1.4 Project 8: Gravity Flow Direct Discharge of up to 193 mgd to SBOO without Treatment

Similar to the pumped direct discharge to the SBOO project (see Section 4.1.5), this project would provide a new storm drain to divert up to 100 mgd to the existing SBOO without primary or secondary treatment (physical sediment screening only). If the flows are captured at higher elevations upstream, the topography of the region would allow gravity flow without the need for pumping. However, the gravity flow alternative would require constructing a longer, large-diameter gravity pipe to reach the SBOO. As mentioned in Section 2.6, the SBOO has excess unused capacity that could be used for this direct discharge to the ocean. However, permitting and monitoring for the discharges and water quality in the ocean would need to be considered.

##### *Project Cost*

The estimated implementation cost is less than \$87 million, and the annual O&M cost is estimated to be about \$125,000. The implementation cost includes a \$4 million estimate for Environmental Permitting.

#### 4.1.5 Project 9: Tijuana River In-stream Water Quality Detention Basin 20 mgd

The main goal of this project is capturing flow before it flows downstream into the Tijuana River and reaches the ocean. The project would construct a detention basin to capture sewage flows just downstream of Hollister Avenue. The basin would be necessary to capture flows that are bypassed from the upstream diversion structure. The basin would have an inline weir for routing flows into a sub-basin to pump the collected flow into a force main and convey it to the SBIWTP and/or the SBWRP. However, it would be necessary to increase the treatment capacity at these two plants before this project would be effective.

### *Project Cost*

The estimated implementation cost is approximately \$75 million, and the annual O&M cost is estimated to be about \$200,000. The implementation cost includes a \$4 million estimate for Environmental Permitting.

## 4.2 Smuggler’s Gulch Canyon Collector

### 4.2.1 Project 12: Smuggler’s Gulch Retrofit Low-flow Diversion

The capacity of the existing low-flow diversion at Smuggler’s Gulch is periodically exceeded (dry and wet-weather conditions), with flows subsequently reaching the Tijuana River Valley and ultimately the ocean. It is important to capture and divert all dry-weather flows. This project would capture a greater volume of dry-weather flows at Smuggler’s Gulch by reconstructing the outlet ponding basin to prevent dry-weather flows from flowing downstream. The existing pump station would be retrofitted with larger-capacity pumps and associated equipment.

The increase in diversion capacity would add flow to the existing treatment facilities, so this project depends on increasing the treatment capacity at either the SBIWTP or the SBWRP.

### *Project Cost*

The estimated implementation cost is approximately \$13 million, and the annual O&M cost is estimated to be about \$500,000. The implementation cost includes a \$4 million estimate for Environmental Permitting.

### 4.2.2 Project 13: Smuggler’s Gulch In-stream Water Quality Detention Basin

This project would construct a new in-stream water quality basin to capture wet-weather flows bypassed from a proposed sedimentation basin upstream. The basin would be located downstream of Monument Road. The basin would be fitted with a large-capacity pump station to route flows via a force main either into the SBIWTP or the SBWRP or directly into the SBOO. If flows are routed to either the SBIWTP or the SBWRP, then the treatment capacity of these plants would need to be increased in order to handle the additional flow. If flows are directly disposed to the SBOO, permitting and impacts on ocean water quality would need to be addressed.

### *Project Cost*

The estimated implementation cost is approximately \$44 million, and the annual O&M cost is estimated to be about \$1.5 million. The implementation cost includes a \$4 million estimate for Environmental Permitting.

## 4.3 Goat Canyon Collector

### 4.3.1 Project 14: Goat Canyon Retrofit Low-flow Diversion

This project would increase the low-flow conveyance at Goat Canyon by reconstructing the outlet ponding basin to prevent dry-weather flows from flowing downstream. The existing pump station would be retrofitted with larger-capacity pumps and associated equipment. The diverted flow would be sent to either the SBIWTP or the SBWRP. However, capacity consideration and expansion needs at these two plants would need to be addressed.

#### *Project Cost*

The estimated implementation cost is approximately \$15 million, and the annual O&M cost is estimated to be about \$500,000. The implementation cost includes a \$4 million estimate for Environmental Permitting.

### 4.3.2 Project 15: Goat Canyon Retrofit In-stream Water Quality Detention Basin

This project would retrofit the existing sedimentation basin to capture transboundary flows at Goat Canyon. The basin would be deepened to create ponding toward the end of the series of basins. A new pump station and force main would be constructed to route these flows to either the SBIWTP or the SBWRP for treatment. Expanding the treatment capacities at SBIWTP or SBWRP is essential for accepting additional diverted flows.

#### *Project Cost*

The estimated implementation cost is approximately \$44 million, and the annual O&M cost is estimated to be about \$1.5 million. The implementation cost includes a \$4 million estimate for Environmental Permitting.

## 4.4 Yogurt Canyon Collector

### 4.4.1 Project 17: Yogurt Canyon Low-flow Diversion

Yogurt Canyon does not have structures to collect or divert dry-weather flows. This project would construct a new outlet ponding basin to prevent dry-weather flows from flowing downstream. The diverted flow would be pumped via a new pump station and force main to either the SBIWTP or the SBWRP. However, the effect on treatment capacity at these plants would need to be considered.

#### *Project Cost*

The estimated implementation cost is \$14 million, and annual O&M costs is estimated to be \$500,000. The implementation cost includes a \$4 million estimate for Environmental Permitting.

#### 4.4.2 Project 18: Yogurt Canyon Pilot Channel

A pilot channel is considered to convey Yogurt Canyon flows and sediment. The pilot channel would cross Monument Road under a pre-fabricated creek crossing structure. The pilot channel would be integrated north of the road with restored salt marsh habitat.

A new pump station downstream of the pilot channel could facilitate routing the flows to either the SBWRP or the SBIWTP or directly into the SBOO. Similar to Project 17, a feasibility study would be required to determine the technical feasibility of this option. This project was not considered as part of the NOA.

##### *Project Cost*

The estimated implementation cost for the pilot channel only is less than \$9 million, and the annual O&M cost is estimated to be less than \$5,000. The implementation cost includes a \$4 million estimate for Environmental Permitting.

## 5 Emergency Action Plan

The water quality of the Tijuana River is currently deteriorating as a result of bypass flows and sewage-laden stormwater. This deterioration is significantly reducing the water quality in the South Bay and causing health concerns at its beaches.

In the absence of immediate actions to mitigate these issues, an Emergency Action Plan (EAP) is needed for fast and coordinated responses to spills and bypass flows. The first component of an EAP is an early detection and monitoring system, and the second component is rapid communication. EAP planning requires identifying available resources and capacities across the region and making these resources available on short notice.

This section discusses implementing an early transboundary bypass flow monitoring and notification system coupled with a mutual-aid agreement across the region to provide the necessary response to all spills and bypass flows in the Tijuana River.

### 5.1 Project 26: Early Monitoring and Notification of Transboundary Bypass Flows

The sewage that is flowing directly into the Tijuana River and reaching the Pacific Ocean is mostly a result of the transboundary flows that bypass the main Tijuana River and canyon collectors. The Regional Board's NPDES permit requires USIBWC to monitor and report all bypass flows. However, dry-weather bypass flows are not always promptly discovered and reported. These delays have allowed sewage to flow directly to the U.S. side of the border before any response or remedial action can occur.

Developing an early detection and alarm system to detect any bypass flows at the canyon collectors is essential for allowing an early emergency response that would prevent sewage from reaching the Pacific Ocean and closing beaches. One option is a network of remote sensors powered by solar panels and linked through a radio or cellular

network to alert emergency staff if flow bypasses the canyon collectors during dry weather.

An early alarm and warning system would help local Cities and County staff take early mitigation action to protect public health and closely monitor water quality. The alarm would also be used to alert IBWC and Mexican authorities to take immediate action.

## 5.2 Project 22: Water Quality Monitoring

In the San Diego region, transboundary flows across the Mexican border pose a threat to the region's ecological health, the beneficial uses of its waters, the economic vitality of its southern communities, and public health. However, water quality monitoring along the Tijuana River channel and canyon collectors has been limited. In addition, numerical model simulations in the region have provided valuable information about hydrology and hydraulics but have also been limited.

The monitoring program, model outputs, and risk assessments required will enable the regulating entities to better quantify the scope and magnitude of the impacts of unauthorized discharges to waters of the U.S. and the state. Water quality data and model outputs are necessary for developing an effective response to reduce the negative impacts of unauthorized discharges and to protect the beneficial uses of these waters. Furthermore, this information is needed to accurately characterize the condition and impairments of these waters pursuant to Section 303(d) of the Clean Water Act.

Developing a monitoring program and conducting numerical modeling simulations can help in understanding the magnitude, extent, duration, trends, and risks associated with transboundary flows.

# 6 Summary of Project Recommendations by Watershed

This section describes the potential projects recommended for reducing impacts to the Tijuana River from sewage-contaminated transboundary flows. The project concepts presented would provide treatment benefits for first flush, partial treatment of 1-to-2-year storms, and irregular dry-weather flows through the canyon collectors.

The planning-level costs were developed based on the following assumptions:

- The cost estimates are planning-level (Class 5) cost estimates. The accuracy of these estimates ranges from 50 to 20 percent below to 30 to 100 percent above the actual cost.
- O&M costs are calculated based on information about typical O&M costs.
- Costs are adjusted to 2019 using *Engineering News-Record's* (ENR) Construction Cost Index.

Coordinating with stakeholders will continue to be a key element in the NOA process. The Recovery Team members were instrumental collecting data and have been identified as a key stakeholder group to continue through the NOA. Specifically, the

implementing agencies within the Recovery Team will need to participate so that the projects can be implemented successfully. It is anticipated that a series of meetings, workshops, and other outreach opportunities will be effective in continuing the dialogue and advancing project development during the next phase.

Table 6.1 through Table 6.4 describe the projects and implementation costs for each project within each watershed.

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## 6.1 Tijuana River Main Channel

**Table 6.1.** List of Potential Projects for the Tijuana River Main Channel

Project Number(s)*	Project	Description	Implementation Cost	Example
3a/4a	Diversion of up to 35 mgd to New SBIWTP for Primary Treatment and Discharge to Deep Ocean through SBOO	Provide a new lift station to divert up to 35 mgd to the South Bay International Wastewater Treatment Plant (SBIWTP) for primary treatment before discharging 3.4 miles of shore through the South Bay Ocean Outfall (SBOO). Provide a new treatment facility at SBIWTP to handle up to 35 mgd of stormwater flow and provide primary level of treatment. This would allow for some limited wet weather diversion volumes to be routed for treatment.	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$78M</li> <li>• Estimated ongoing cost: \$1.9M per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	
3b/4b	Diversion of up to 100 mgd to New SBIWTP for Primary Treatment and Discharge to Deep Ocean through SBOO	Provide a new lift station to divert up to 100 mgd to the South Bay International Wastewater Treatment Plant (SBIWTP) for primary treatment before discharging 3.4 miles of shore through the South Bay Ocean Outfall (SBOO). Provide a new treatment facility at SBIWTP to handle up to 100 mgd of stormwater flow and provide primary level of treatment. This would allow for some limited wet weather diversion volumes to be routed for treatment.	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$167M</li> <li>• Estimated ongoing cost: \$2.9M per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	

**Table 6.1.** List of Potential Projects for the Tijuana River Main Channel

Project Number(s)*	Project	Description	Implementation Cost	Example
3c/4c	Diversion of up to 163 mgd to New SBIWTP for Primary Treatment and Discharge to Deep Ocean through SBOO	Provide a new lift station to divert up to 163 mgd to the South Bay International Wastewater Treatment Plant (SBIWTP) for primary treatment before discharging 3.4 miles of shore through the South Bay Ocean Outfall (SBOO). Provide a new treatment facility at SBIWTP to handle up to 163 mgd of stormwater flow and provide primary level of treatment. This would allow for some limited wet weather diversion volumes to be routed for treatment.	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$230M</li> <li>• Estimated ongoing cost: \$4.5M per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	
3c/4d	Diversion of up to 163 mgd to New SBIWTP for Primary Treatment and Discharge to Deep Ocean through SBOO, plus Additional Storage at New San Ysidro Basin	Provide a new lift station to divert up to 163 mgd to the South Bay International Wastewater Treatment Plant (SBIWTP) for primary treatment before discharging 3.4 miles of shore through the South Bay Ocean Outfall (SBOO). Provide a new treatment facility at SBIWTP to handle up to 163 mgd of stormwater flow and provide primary level of treatment. This would allow for some limited wet weather diversion volumes to be routed for treatment. Addition of of-channel storage would allow for greater capture of flow volume during a wet weather event.	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$408M</li> <li>• Estimated ongoing cost: \$4.8M per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	
3a/4e	Diversion of up to 35 mgd to Existing SBIWTP for Primary Treatment and Discharge to Deep Ocean through SBOO (per NADB Tijuana River Diversion Study Alternative 4B)	<p>Construct a new lift station to divert up to 35 mgd to the new storm-water treatment facility at the SBIWTP for primary treatment before discharging to the SBOO.</p> <p>This project is currently being considered in the ongoing Tijuana River Diversion Study (Infrastructure Assessment and Development) sponsored by USEPA, USIBWC, NADB, CESPT, and CONAGUA. The SB 507 NOA is considering diversions up to 100 mgd along with additional treatment.</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$52M</li> <li>• Estimated ongoing cost: \$7M per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	

**Table 6.1.** List of Potential Projects for the Tijuana River Main Channel

Project Number(s)*	Project	Description	Implementation Cost	Example
5a/6a	Diversion of up to 20 mgd to Existing SBWRP and Discharge to Deep Ocean through SBOO	<p>Construct a new lift station to divert up to 20 mgd of flows to the existing City of San Diego SBWRP for primary treatment before discharging to the SBOO</p> <p>This project is currently being assessed by the SB 507 NOA.</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: less than \$47M</li> <li>• Estimated ongoing cost: \$1M per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	
5b/6b	Diversion of up to 50 mgd to Existing SBWRP and Discharge to Deep Ocean through SBOO	<p>Provide 50 mgd additional capacity for primary at the SBWRP. This expansion would increase the SBWRP's overall capacity to 50 mgd and allow treating low-flow runoff.</p> <p>This project is currently being assessed by the SB 507 NOA.</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$83M</li> <li>• Estimated ongoing cost: \$1.5M per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	
7	Pumped Direct Discharge of up to 193 mgd to SBOO without Treatment	<p>Provide a new lift station to divert up to 193 mgd to the existing SBOO with physical sediment and trash screening only (without primary or secondary treatment). The existing SBOO currently has 233 mgd of unused capacity (per City of San Diego) that could be used in the case of an emergency spill or potentially during minor storm events to capture additional pollutant-laden runoff. SBOO will discharge diverted flows 3.4 miles offshore.</p> <p>This project is currently being considered (for up to 35 mgd) in the NADB Diversion Study.</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$22M</li> <li>• Estimated ongoing cost: \$1.6M per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	

**Table 6.1.** List of Potential Projects for the Tijuana River Main Channel

Project Number(s)*	Project	Description	Implementation Cost	Example
8	Gravity-flow Direct Discharge of up to 193 mgd to SBOO without Treatment	<p>Provide a new storm drain inlet to divert up to 193 mgd to the existing SBOO with physical sediment and trash screening only (without primary or secondary treatment). The existing SBOO currently has 233 mgd unused capacity (per City of San Diego) that could be used in the case of an emergency spill or potentially during minor storm events to capture additional pollutant laden runoff. SBOO will discharge diverted flows 3.4 miles offshore.</p> <p>This project is currently being considered (for up to 35 mgd) in the NADB Diversion Study (Alternative 4E). The SB 507 NOA is considering diversions up to 193 mgd.</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: less than \$87M</li> <li>• Estimated ongoing cost: \$125K per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	
9	Tijuana River In-stream Water Quality Detention Basin – 20 mgd	<p>Construct a detention basin to capture flows just upstream of Hollister Avenue. The basin would capture flows that are bypassed from the upstream proposed sedimentation basins. The basin will include an inline weir and new pump for routing flows into a sub basin. From the sub basin, new pumps and force main would deliver the flows to either the SBIWTP or SBWRP.</p> <p>This project is currently being assessed by SB 507 NOA. This project could require increasing the capacities of either the SBIWTP or the SBWRP.</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$75M</li> <li>• Estimated ongoing cost: \$200K per year</li> <li>• Environmental Monitoring: \$10M</li> </ul>	

**Table 6.1.** List of Potential Projects for the Tijuana River Main Channel

Project Number(s)*	Project	Description	Implementation Cost	Example
22	Water Quality Sampling and Monitoring	Water quality data and model outputs across the Tijuana River system is needed to assess water quality conditions and changes over time, which will help determine where additional infrastructure is needed to address water quality issues. This program could include numerical model simulations and sampling of water and soil quality at multiple locations along the main river, from the border to the beach, as well as the tributaries.	<ul style="list-style-type: none"> <li>• Estimated ongoing cost: less than \$1M per year</li> <li>• Estimated expanded cost: less than \$5M per year</li> </ul>	

Notes: CESPT = Comisión Estatal de Servicios Públicos de Tijuana, CONAGUA = Comisión Nacional del Agua, IBWC = International Boundary and Water Commission, K = thousand, M = million, mgd = million gallons per day, NADB = North American Development Bank, No. = number, NOA = Needs and Opportunities Assessment, SB = Senate Bill, SBIWTP = South Bay International Wastewater Treatment Plant, SBOO = South Bay Ocean Outfall, SBWRP = South Bay Water Reclamation Plant, TR = Tijuana River, USEPA = United States Environmental Protection Agency, USIBWC = United States Section of the International Boundary and Water Commission

\* Numbering matches the County of San Diego’s SB 507 Needs Assessment preliminary list of projects.

## 6.2 Smuggler’s Gulch

**Table 6.2.** List of Potential Projects for Smuggler’s Gulch

Project Number*	Project Title	Project Description	Implementation Cost	Example
12	Smuggler's Gulch Retrofit Low-flow Diversion	<p>Increase the low-flow diversion and conveyance capacity at Smuggler's Gulch by reconstructing the outlet ponding basin to prevent dry-weather flows from flowing downstream.</p> <p>This project is currently being assessed by the SB 507 NOA. This project could require increasing capacities at either of the treatment plants (see projects 4 and 6).</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$13M</li> <li>• Estimated ongoing cost: \$500K per year</li> </ul>	
13	Smuggler's Gulch In-stream Water Quality Detention Basin	<p>Construct a basin to capture flows just downstream of Monument Road. The basin would capture flows bypassed from the proposed sedimentation basin upstream. The basin would include an inline weir and a new pump to route flows via a force main either into the SBIWTP the SBWRP or directly into the SBOO.</p> <p>This project is currently being assessed by the SB 507 NOA. This project could require increasing capacities at either of the treatment plants (see projects 4 and 6).</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$44M</li> <li>• Estimated ongoing cost: \$1.5M per year</li> </ul>	

**Table 6.2.** List of Potential Projects for Smuggler’s Gulch

Project Number*	Project Title	Project Description	Implementation Cost	Example
22	Water Quality Sampling and Monitoring	Water quality data and model outputs across the Tijuana River system is needed to assess water quality conditions and changes over time, which will help determine where additional infrastructure is needed to address water quality issues. This program could include numerical model simulations and sampling of water and soil quality at multiple locations along the main river, from the border to the beach, as well as the tributaries.	<ul style="list-style-type: none"> <li>• Estimated ongoing cost: less than \$1M per year</li> <li>• Estimated expanded cost: less than \$5M per year</li> </ul>	

### 6.3 Goat Canyon

**Table 6.3.** List of Potential Projects for Goat Canyon

Project Number*	Project Title	Project Description	Implementation Cost	Example
14	Goat Canyon Retrofit Low-flow Diversion	<p>Increase the low-flow diversion and conveyance capacity at Goat Canyon by reconstructing the outlet ponding basin to prevent dry-weather flows from flowing downstream.</p> <p>This project is currently being assessed by the SB 507 NOA. This project could require increasing capacities at either of the treatment plants (see projects 4 and 6).</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$15M</li> <li>• Estimated ongoing cost: \$500K per year</li> </ul>	

**Table 6.3.** List of Potential Projects for Goat Canyon

Project Number*	Project Title	Project Description	Implementation Cost	Example
15	Goat Canyon Retrofit In-stream Water Quality Detention Basin	<p>Retrofit the existing sedimentation basin to capture transboundary flows. The basin would be deepened to create ponding toward the downstream end of the series of basins. A new pump and force main would route these flows to a treatment plant or directly into the SBOO.</p> <p>This project is currently being assessed by the SB 507 NOA. This project could require increasing capacities at either of the treatment plants (see projects 4 and 6).</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$44M</li> <li>• Estimated ongoing cost: \$1.5M per year</li> </ul>	
22	Water Quality Sampling and Monitoring	<p>Water quality data and model outputs across the Tijuana River system is needed to assess water quality conditions and changes over time, which will help determine where additional infrastructure is needed to address water quality issues. This program could include numerical model simulations and sampling of water and soil quality at multiple locations along the main river, from the border to the beach, as well as the tributaries.</p>	<ul style="list-style-type: none"> <li>• Estimated ongoing cost: less than \$1M per year</li> <li>• Estimated expanded cost: less than \$5M per year</li> </ul>	

## 6.4 Yogurt Canyon

**Table 6.4.** List of Potential Projects for Yogurt Canyon

Project Number*	Project Title	Project Description	Funding Needs	Example
17	Yogurt Canyon Low-flow Diversion	<p>There is no infrastructure to divert or treat flows at Yogurt Canyon. A feasibility study would be required to assess the feasibility of installing low-flow diversions to divert flows back to existing treatment facilities (similar to Smuggler’s Gulch and Goat Canyon, as well as other tributaries).</p> <p>This project is currently being assessed by the SB 507 NOA.</p>	<ul style="list-style-type: none"> <li>• Estimated soft cost (feasibility study): \$250K to \$500K</li> <li>• Estimated implementation: \$14M</li> <li>• Estimated ongoing cost: \$500k/year</li> </ul>	
18	Yogurt Canyon Pilot Channel	<p>A pilot channel is considered to convey Yogurt Canyon flows and sediment. The pilot channel would cross Monument Road under a pre-fabricated creek crossing structure. The pilot channel would be integrated north of the road with restored salt marsh habitat.</p> <p>This project is currently being assessed by the SB 507 NOA.</p>	<ul style="list-style-type: none"> <li>• Estimated implementation cost: \$9M</li> <li>• Estimated ongoing cost: &lt;\$5,000/year</li> </ul>	
22	Water Quality Sampling and Monitoring	<p>Water quality data and model outputs across the Tijuana River system is needed to assess water quality conditions and changes over time, which will help determine where additional infrastructure is needed to address water quality issues. This program could include numerical model simulations and sampling of water and soil quality at multiple locations along the main river, from the border to the beach, as well as the tributaries.</p>	<ul style="list-style-type: none"> <li>• Estimated ongoing cost: less than \$1M per year</li> <li>• Estimated expanded cost: less than \$5M per year</li> </ul>	

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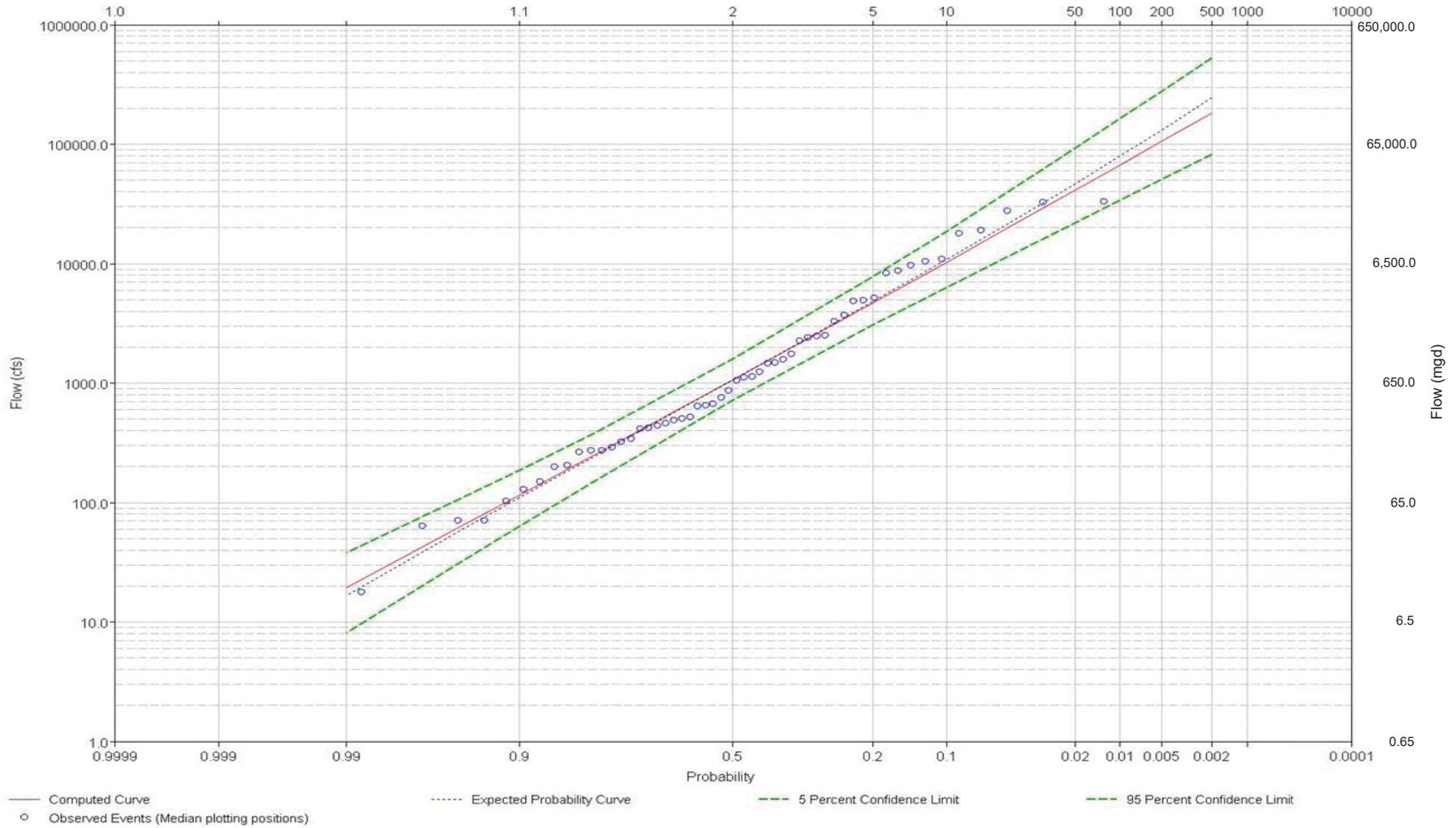
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# Appendix A. Tijuana River Discharge Frequency Curve



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# Water Quality Technical Memo, Appendix A: Tijuana River Discharge Frequency Curve





## Appendix B. Potential Project Cost Tables



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# Cost Summary



**Project**  
35 mgd Pump Station to SBIWTP, Project #3a

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
Intake Structure	\$ 1,140,864	\$ 4,757,000			
35 MGD Pump Station To SBIWWTP	\$ 1,153,637	\$ 4,811,000	\$ 362,489	\$ 4,517,409	\$ 9,328,409
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 2,294,501</b>	<b>\$ 9,568,000</b>	<b>\$ 362,489</b>	<b>\$ 4,517,409</b>	<b>\$ 9,328,409</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 458,900				
C. Miscellaneous Site Structures	\$ 344,175				
<b>D. Unit Process Subtotal</b>	<b>\$ 3,097,577</b>				
E. Sitework	\$ 309,758				
F. Yard Piping	\$ 464,637				
G. Soil Conditions	\$ 216,830				
H. Site Electrical Power Distribution	\$ 30,976				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 4,119,777</b>				
J. Misc. Items Not Itemized	\$ 823,955				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 4,943,733</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 593,248				
M. Sales Tax (Allowance), 5%	\$ 276,849				
N. Overhead & Profit, 10%	\$ 581,383				
O. Bonds & Insurance, 2%	\$ 95,928				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 6,491,141</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 389,468				
R. Construction Contingency - Change Orders, 4%	\$ 259,646				
<b>S. Total Construction Cost</b>	<b>\$ 7,140,255</b>				
T. Engineering, 12%	\$ 856,831				
U. Legal, 2%	\$ 142,805				
V. Construction Administration, 8%	\$ 571,220				
W. Owner Administration, 12%	\$ 856,831				
<b>X. Total Project Capital Cost</b>	<b>\$ 9,567,942</b>				

# Cost Summary



**Project**  
Tijuana River Pumping Project #3b

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
Intake Structure	\$ 2,447,613	\$ 10,206,000			
100 MGD Pump Station To SBIWWTP	\$ 2,601,011	\$ 10,846,000	\$ 854,381	\$ 10,647,478	\$ 21,493,478
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 5,048,624</b>	<b>\$ 21,052,000</b>	<b>\$ 854,381</b>	<b>\$ 10,647,478</b>	<b>\$ 21,493,478</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 1,009,725				
C. Miscellaneous Site Structures	\$ 757,294				
<b>D. Unit Process Subtotal</b>	<b>\$ 6,815,643</b>				
E. Sitework	\$ 681,564				
F. Yard Piping	\$ 1,022,346				
G. Soil Conditions	\$ 477,095				
H. Site Electrical Power Distribution	\$ 68,156				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 9,064,805</b>				
J. Misc. Items Not Itemized	\$ 1,812,961				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 10,877,766</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 1,305,332				
M. Sales Tax (Allowance), 5%	\$ 609,155				
N. Overhead & Profit, 10%	\$ 1,279,225				
O. Bonds & Insurance, 2%	\$ 211,072				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 14,282,550</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 856,953				
R. Construction Contingency - Change Orders, 4%	\$ 571,302				
<b>S. Total Construction Cost</b>	<b>\$ 15,710,805</b>				
T. Engineering, 12%	\$ 1,885,297				
U. Legal, 2%	\$ 314,216				
V. Construction Administration, 8%	\$ 1,256,864				
W. Owner Administration, 12%	\$ 1,885,297				
<b>X. Total Project Capital Cost</b>	<b>\$ 21,052,478</b>				

# Cost Summary



**Project**  
163 mgd Pump Station to SBIWTP, Project #3c

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
Intake Structure	\$ 3,872,932	\$ 16,150,000			
163 MGD Pump Station To SBIWWTP	\$ 3,660,562	\$ 15,264,000	\$ 1,381,289	\$ 17,213,918	\$ 32,477,918
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 7,533,494</b>	<b>\$ 31,414,000</b>	<b>\$ 1,381,289</b>	<b>\$ 17,213,918</b>	<b>\$ 32,477,918</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 1,506,699				
C. Miscellaneous Site Structures	\$ 1,130,024				
<b>D. Unit Process Subtotal</b>	<b>\$ 10,170,217</b>				
E. Sitework	\$ 1,017,022				
F. Yard Piping	\$ 1,525,533				
G. Soil Conditions	\$ 711,915				
H. Site Electrical Power Distribution	\$ 101,702				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 13,526,389</b>				
J. Misc. Items Not Itemized	\$ 2,705,278				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 16,231,667</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 1,947,800				
M. Sales Tax (Allowance), 5%	\$ 908,973				
N. Overhead & Profit, 10%	\$ 1,908,844				
O. Bonds & Insurance, 2%	\$ 314,959				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 21,312,243</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 1,278,735				
R. Construction Contingency - Change Orders, 4%	\$ 852,490				
<b>S. Total Construction Cost</b>	<b>\$ 23,443,467</b>				
T. Engineering, 12%	\$ 2,813,216				
U. Legal, 2%	\$ 468,869				
V. Construction Administration, 8%	\$ 1,875,477				
W. Owner Administration, 12%	\$ 2,813,216				
<b>X. Total Project Capital Cost</b>	<b>\$ 31,414,246</b>				

# Cost Summary



**Project**  
SBIWWTP Primary, 35 mgd, Project #4a

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
35 mgd Flow Splitting	\$ 180,638	\$ 753,000			
35 mgd Screens	\$ 1,916,507	\$ 7,992,000	\$ 183,340	\$ 2,284,823	\$ 10,276,823
35 mgd Primary Clarifiers	\$ 10,523,964	\$ 43,884,000	\$ 290,995	\$ 3,626,445	\$ 47,510,445
35 mgd Flow Splitting	\$ 172,494	\$ 719,000			
35 mgd Alum Feed	\$ 329,476	\$ 1,374,000	\$ 9,712	\$ 121,029	\$ 1,495,029
35 mgd Sludge Thickening					
35 mgd Grit Chamber	\$ 2,073,074	\$ 8,645,000	\$ 605,891	\$ 7,550,743	\$ 16,195,743
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 15,196,153</b>	<b>\$ 63,367,000</b>	<b>\$ 1,089,938</b>	<b>\$ 13,583,040</b>	<b>\$ 75,478,040</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 3,039,231				
C. Miscellaneous Site Structures	\$ 2,279,423				
<b>D. Unit Process Subtotal</b>	<b>\$ 20,514,807</b>				
E. Sitework	\$ 2,051,481				
F. Yard Piping	\$ 3,077,221				
G. Soil Conditions	\$ 1,436,036				
H. Site Electrical Power Distribution	\$ 205,148				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 27,284,693</b>				
J. Misc. Items Not Itemized	\$ 5,456,939				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 32,741,632</b>				
L. Field General Conditions, Mobilization, Demobilization, 1%	\$ 3,928,996				
M. Sales Tax (Allowance), 5%	\$ 1,833,531				
N. Overhead & Profit, 10%	\$ 3,850,416				
O. Bonds & Insurance, 2%	\$ 635,319				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 42,989,893</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 2,579,394				
R. Construction Contingency - Change Orders, 4%	\$ 1,719,596				
<b>S. Total Construction Cost</b>	<b>\$ 47,288,883</b>				
T. Engineering, 12%	\$ 5,674,666				
U. Legal, 2%	\$ 945,778				
V. Construction Administration, 8%	\$ 3,783,111				
W. Owner Administration, 12%	\$ 5,674,666				
<b>X. Total Project Capital Cost</b>	<b>\$ 63,367,103</b>				

# Cost Summary



**Project**  
SBIWWTP Primary, 100 mgd, Project #4b

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
100 mgd Flow Splitting	\$ 311,073	\$ 1,297,000			
100 mgd Screens	\$ 3,235,617	\$ 13,492,000	\$ 358,187	\$ 4,463,797	\$ 17,955,797
100 mgd Primary Clarifiers	\$ 22,437,630	\$ 93,564,000	\$ 512,542	\$ 6,387,408	\$ 99,951,408
100 mgd Flow Splitting	\$ 257,012	\$ 1,072,000			
100 mgd Alum Feed	\$ 471,235	\$ 1,965,000	\$ 12,656	\$ 157,718	\$ 2,122,718
100 mgd Sludge Thickening	\$ 1,886,435	\$ 7,866,000	\$ 16,550	\$ 206,246	\$ 8,072,246
100 mgd Grit Chamber	\$ 5,135,925	\$ 21,417,000	\$ 1,152,612	\$ 14,364,088	\$ 35,781,088
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 33,734,926</b>	<b>\$ 140,673,000</b>	<b>\$ 2,052,546</b>	<b>\$ 25,579,257</b>	<b>\$ 163,883,257</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 6,746,985				
C. Miscellaneous Site Structures	\$ 5,060,239				
<b>D. Unit Process Subtotal</b>	<b>\$ 45,542,150</b>				
E. Sitework	\$ 4,554,215				
F. Yard Piping	\$ 6,831,322				
G. Soil Conditions	\$ 3,187,950				
H. Site Electrical Power Distribution	\$ 455,421				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 60,571,059</b>				
J. Misc. Items Not Itemized	\$ 12,114,212				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 72,685,271</b>				
L. Field General Conditions, Mobilization, Demobilization, 1	\$ 8,722,233				
M. Sales Tax (Allowance), 5%	\$ 4,070,375				
N. Overhead & Profit, 10%	\$ 8,547,788				
O. Bonds & Insurance, 2%	\$ 1,410,385				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 95,436,052</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 5,726,163				
R. Construction Contingency - Change Orders, 4%	\$ 3,817,442				
<b>S. Total Construction Cost</b>	<b>\$ 104,979,657</b>				
T. Engineering, 12%	\$ 12,597,559				
U. Legal, 2%	\$ 2,099,593				
V. Construction Administration, 8%	\$ 8,398,373				
W. Owner Administration, 12%	\$ 12,597,559				
<b>X. Total Project Capital Cost</b>	<b>\$ 140,672,740</b>				

# Cost Summary


**Project**

SBIWWTP Primary, 163 mgd, Project #4c

<i>Unit Process</i>	<i>Construction (w/out adders)</i>	<i>Construction (with adders)</i>	<i>O&amp;M (\$/yr)</i>	<i>PV O&amp;M (\$M)</i>	<i>PV (\$M)</i>
163 mgd Flow Splitting	\$ 406,841	\$ 1,697,000			
163 mgd Screens	\$ 4,698,175	\$ 19,591,000	\$ 489,375	\$ 6,098,691	\$ 25,689,691
163 mgd Primary Clarifiers	\$ 31,278,133	\$ 130,428,000	\$ 644,955	\$ 8,037,569	\$ 138,465,569
163 mgd Flow Splitting	\$ 281,353	\$ 1,173,000			
163 mgd Alum Feed	\$ 591,699	\$ 2,467,000	\$ 14,372	\$ 179,107	\$ 2,646,107
163 mgd Sludge Thickening	\$ 2,101,501	\$ 8,763,000	\$ 18,878	\$ 235,256	\$ 8,998,256
163 mgd Grit Chamber	\$ 7,066,673	\$ 29,468,000	\$ 1,555,547	\$ 19,385,552	\$ 48,853,552
<b>A. Subtotal (Raw Estimate)</b>	\$ 46,424,375	\$ 193,587,000	\$ 2,723,127	\$ 33,936,176	\$ 224,653,176
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 9,284,875				
C. Miscellaneous Site Structures	\$ 6,963,656				
<b>D. Unit Process Subtotal</b>	<b>\$ 62,672,906</b>				
E. Sitework	\$ 6,267,291				
F. Yard Piping	\$ 9,400,936				
G. Soil Conditions	\$ 4,387,103				
H. Site Electrical Power Distribution	\$ 626,729				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 83,354,964</b>				
J. Misc. Items Not Itemized	\$ 16,670,993				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 100,025,957</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 12,003,115				
M. Sales Tax (Allowance), 5%	\$ 5,601,454				
N. Overhead & Profit, 10%	\$ 11,763,053				
O. Bonds & Insurance, 2%	\$ 1,940,904				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 131,334,482</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 7,880,069				
R. Construction Contingency - Change Orders, 4%	\$ 5,253,379				
<b>S. Total Construction Cost</b>	<b>\$ 144,467,930</b>				
T. Engineering, 12%	\$ 17,336,152				
U. Legal, 2%	\$ 2,889,359				
V. Construction Administration, 8%	\$ 11,557,434				
W. Owner Administration, 12%	\$ 17,336,152				
<b>X. Total Project Capital Cost</b>	<b>\$ 193,587,027</b>				

# Cost Summary



**Project**  
20 mgd Pump Station to SBWRP, Project #5a

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
Intake Structure	\$ 898,441	\$ 3,746,000			
20 MGD Pump Station to SBWRP	\$ 935,452	\$ 3,901,000	\$ 279,053	\$ 3,477,614	\$ 7,378,614
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 1,833,893</b>	<b>\$ 7,647,000</b>	<b>\$ 279,053</b>	<b>\$ 3,477,614</b>	<b>\$ 7,378,614</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 366,779				
C. Miscellaneous Site Structures	\$ 275,084				
<b>D. Unit Process Subtotal</b>	<b>\$ 2,475,755</b>				
E. Sitework	\$ 247,576				
F. Yard Piping	\$ 371,363				
G. Soil Conditions	\$ 173,303				
H. Site Electrical Power Distribution	\$ 24,758				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 3,292,755</b>				
J. Misc. Items Not Itemized	\$ 658,551				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 3,951,305</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 474,157				
M. Sales Tax (Allowance), 5%	\$ 221,273				
N. Overhead & Profit, 10%	\$ 464,674				
O. Bonds & Insurance, 2%	\$ 76,671				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 5,188,080</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 311,285				
R. Construction Contingency - Change Orders, 4%	\$ 207,523				
<b>S. Total Construction Cost</b>	<b>\$ 5,706,888</b>				
T. Engineering, 12%	\$ 684,827				
U. Legal, 2%	\$ 114,138				
V. Construction Administration, 8%	\$ 456,551				
W. Owner Administration, 12%	\$ 684,827				
<b>X. Total Project Capital Cost</b>	<b>\$ 7,647,230</b>				

# Cost Summary



**Project**  
Tijuana River Pumping Project #5b

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
Intake Structure	\$ 1,501,846	\$ 6,263,000			
50 MGD Pump Station to SBWRP	\$ 1,480,915	\$ 6,175,000	\$ 481,764	\$ 6,003,845	\$ 12,178,845
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 2,982,761</b>	<b>\$ 12,438,000</b>	<b>\$ 481,764</b>	<b>\$ 6,003,845</b>	<b>\$ 12,178,845</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 596,552				
C. Miscellaneous Site Structures	\$ 447,414				
<b>D. Unit Process Subtotal</b>	<b>\$ 4,026,728</b>				
E. Sitework	\$ 402,673				
F. Yard Piping	\$ 604,009				
G. Soil Conditions	\$ 281,871				
H. Site Electrical Power Distribution	\$ 40,267				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 5,355,548</b>				
J. Misc. Items Not Itemized	\$ 1,071,110				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 6,426,658</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 771,199				
M. Sales Tax (Allowance), 5%	\$ 359,893				
N. Overhead & Profit, 10%	\$ 755,775				
O. Bonds & Insurance, 2%	\$ 124,703				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 8,438,227</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 506,294				
R. Construction Contingency - Change Orders, 4%	\$ 337,529				
<b>S. Total Construction Cost</b>	<b>\$ 9,282,050</b>				
T. Engineering, 12%	\$ 1,113,846				
U. Legal, 2%	\$ 185,641				
V. Construction Administration, 8%	\$ 742,564				
W. Owner Administration, 12%	\$ 1,113,846				
<b>X. Total Project Capital Cost</b>	<b>\$ 12,437,947</b>				

# Cost Summary


**Project**

20 mgd Primary at SBWRP, Project #6a

<b>Unit Process</b>	<b>Construction (w/out adders)</b>	<b>Construction (with adders)</b>	<b>O&amp;M (\$/yr)</b>	<b>PV O&amp;M (\$M)</b>	<b>PV (\$M)</b>
20 mgd Flow Splitting	\$ 143,203	\$ 597,000			
20 mgd Screens	\$ 1,674,420	\$ 6,982,000	\$ 128,353	\$ 1,599,566	\$ 8,581,566
20 mgd Primary Clarifiers	\$ 5,849,442	\$ 24,392,000	\$ 215,336	\$ 2,683,564	\$ 27,075,564
20 mgd Flow Splitting	\$ 141,659	\$ 591,000			
20 mgd Alum Feed	\$ 246,794	\$ 1,029,000	\$ 8,399	\$ 104,668	\$ 1,133,668
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 8,055,518</b>	<b>\$ 33,591,000</b>	<b>\$ 352,088</b>	<b>\$ 4,387,799</b>	<b>\$ 36,790,799</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 1,611,104				
C. Miscellaneous Site Structures	\$ 1,208,328				
<b>D. Unit Process Subtotal</b>	<b>\$ 10,874,949</b>				
E. Sitework	\$ 1,087,495				
F. Yard Piping	\$ 1,631,242				
G. Soil Conditions	\$ 761,246				
H. Site Electrical Power Distribution	\$ 108,749				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 14,463,683</b>				
J. Misc. Items Not Itemized	\$ 2,892,737				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 17,356,419</b>				
L. Field General Conditions, Mobilization, Demobilization, 1%	\$ 2,082,770				
M. Sales Tax (Allowance), 5%	\$ 971,959				
N. Overhead & Profit, 10%	\$ 2,041,115				
O. Bonds & Insurance, 2%	\$ 336,784				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 22,789,048</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 1,367,343				
R. Construction Contingency - Change Orders, 4%	\$ 911,562				
<b>S. Total Construction Cost</b>	<b>\$ 25,067,953</b>				
T. Engineering, 12%	\$ 3,008,154				
U. Legal, 2%	\$ 501,359				
V. Construction Administration, 8%	\$ 2,005,436				
W. Owner Administration, 12%	\$ 3,008,154				
<b>X. Total Project Capital Cost</b>	<b>\$ 33,591,057</b>				

# Cost Summary



**Project**  
50 mgd Primary at SBWRP, Project #6b

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
50 mgd Flow Splitting	\$ 215,050	\$ 897,000			
50 mgd Screens	\$ 2,220,145	\$ 9,258,000	\$ 230,155	\$ 2,868,235	\$ 12,126,235
50 mgd Primary Clarifiers	\$ 12,660,220	\$ 52,792,000	\$ 352,640	\$ 4,394,669	\$ 57,186,669
50 mgd Flow Splitting	\$ 206,223	\$ 860,000			
50 mgd Alum Feed	\$ 372,441	\$ 1,553,000	\$ 10,523	\$ 131,144	\$ 1,684,144
<b>A. Subtotal (Raw Estimate)</b>	\$ 15,674,079	\$ 65,360,000	\$ 593,318	\$ 7,394,048	\$ 70,997,048
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 3,134,816				
C. Miscellaneous Site Structures	\$ 2,351,112				
<b>D. Unit Process Subtotal</b>	<b>\$ 21,160,007</b>				
E. Sitework	\$ 2,116,001				
F. Yard Piping	\$ 3,174,001				
G. Soil Conditions	\$ 1,481,200				
H. Site Electrical Power Distribution	\$ 211,600				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 28,142,809</b>				
J. Misc. Items Not Itemized	\$ 5,628,562				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 33,771,371</b>				
L. Field General Conditions, Mobilization, Demobilization, 1%	\$ 4,052,565				
M. Sales Tax (Allowance), 5%	\$ 1,891,197				
N. Overhead & Profit, 10%	\$ 3,971,513				
O. Bonds & Insurance, 2%	\$ 655,300				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 44,341,945</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 2,660,517				
R. Construction Contingency - Change Orders, 4%	\$ 1,773,678				
<b>S. Total Construction Cost</b>	<b>\$ 48,776,140</b>				
T. Engineering, 12%	\$ 5,853,137				
U. Legal, 2%	\$ 975,523				
V. Construction Administration, 8%	\$ 3,902,091				
W. Owner Administration, 12%	\$ 5,853,137				
<b>X. Total Project Capital Cost</b>	<b>\$ 65,360,027</b>				

# Cost Summary



**Project**  
193 mgd Pump Station to SBOO, Project #7

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
50 MGD Pump Station to SBWRP	\$ 4,249,202	\$ 17,719,000	\$ 1,504,649	\$ 18,751,257	\$ 36,470,257
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 4,249,202</b>	<b>\$ 17,719,000</b>	<b>\$ 1,504,649</b>	<b>\$ 18,751,257</b>	<b>\$ 36,470,257</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 849,840				
C. Miscellaneous Site Structures	\$ 637,380				
<b>D. Unit Process Subtotal</b>	<b>\$ 5,736,422</b>				
E. Sitework	\$ 573,642				
F. Yard Piping	\$ 860,463				
G. Soil Conditions	\$ 401,550				
H. Site Electrical Power Distribution	\$ 57,364				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 7,629,442</b>				
J. Misc. Items Not Itemized	\$ 1,525,888				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 9,155,330</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 1,098,640				
M. Sales Tax (Allowance), 5%	\$ 512,698				
N. Overhead & Profit, 10%	\$ 1,076,667				
O. Bonds & Insurance, 2%	\$ 177,650				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 12,020,985</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 721,259				
R. Construction Contingency - Change Orders, 4%	\$ 480,839				
<b>S. Total Construction Cost</b>	<b>\$ 13,223,083</b>				
T. Engineering, 12%	\$ 1,586,770				
U. Legal, 2%	\$ 264,462				
V. Construction Administration, 8%	\$ 1,057,847				
W. Owner Administration, 12%	\$ 1,586,770				
<b>X. Total Project Capital Cost</b>	<b>\$ 17,718,932</b>				

# Cost Summary



**Project**  
193 mgd Gravity Flow, Project #8

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
193 mgd Gravity Flow	\$ 19,879,722	\$ 82,897,000	\$ 124,826	\$ 1,555,608	\$ 84,452,608
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 19,879,722</b>	<b>\$ 82,897,000</b>	<b>\$ 124,826</b>	<b>\$ 1,555,608</b>	<b>\$ 84,452,608</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 3,975,944				
C. Miscellaneous Site Structures	\$ 2,981,958				
<b>D. Unit Process Subtotal</b>	<b>\$ 26,837,625</b>				
E. Sitework	\$ 2,683,762				
F. Yard Piping	\$ 4,025,644				
G. Soil Conditions	\$ 1,878,634				
H. Site Electrical Power Distribution	\$ 268,376				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 35,694,041</b>				
J. Misc. Items Not Itemized	\$ 7,138,808				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 42,832,849</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 5,139,942				
M. Sales Tax (Allowance), 5%	\$ 2,398,640				
N. Overhead & Profit, 10%	\$ 5,037,143				
O. Bonds & Insurance, 2%	\$ 831,129				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 56,239,702</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 3,374,382				
R. Construction Contingency - Change Orders, 4%	\$ 2,249,588				
<b>S. Total Construction Cost</b>	<b>\$ 61,863,673</b>				
T. Engineering, 12%	\$ 7,423,641				
U. Legal, 2%	\$ 1,237,273				
V. Construction Administration, 8%	\$ 4,949,094				
W. Owner Administration, 12%	\$ 7,423,641				
<b>X. Total Project Capital Cost</b>	<b>\$ 82,897,321</b>				

# Cost Summary



**Project**  
20 MGD Storage Basin, Project #9

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
20 MGD Storage Basin	\$ 17,021,689	\$ 70,979,000	\$ 193,739	\$ 2,414,416	\$ 73,393,416
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 17,021,689</b>	<b>\$ 70,979,000</b>	<b>\$ 193,739</b>	<b>\$ 2,414,416</b>	<b>\$ 73,393,416</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 3,404,338				
C. Miscellaneous Site Structures	\$ 2,553,253				
<b>D. Unit Process Subtotal</b>	<b>\$ 22,979,280</b>				
E. Sitework	\$ 2,297,928				
F. Yard Piping	\$ 3,446,892				
G. Soil Conditions	\$ 1,608,550				
H. Site Electrical Power Distribution	\$ 229,793				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 30,562,443</b>				
J. Misc. Items Not Itemized	\$ 6,112,489				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 36,674,931</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 4,400,992				
M. Sales Tax (Allowance), 5%	\$ 2,053,796				
N. Overhead & Profit, 10%	\$ 4,312,972				
O. Bonds & Insurance, 2%	\$ 711,640				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 48,154,331</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 2,889,260				
R. Construction Contingency - Change Orders, 4%	\$ 1,926,173				
<b>S. Total Construction Cost</b>	<b>\$ 52,969,764</b>				
T. Engineering, 12%	\$ 6,356,372				
U. Legal, 2%	\$ 1,059,395				
V. Construction Administration, 8%	\$ 4,237,581				
W. Owner Administration, 12%	\$ 6,356,372				
<b>X. Total Project Capital Cost</b>	<b>\$ 70,979,484</b>				

# Cost Summary



**Project**  
Smuggler's Gulch, Retrofit Low-Flow Diversion, Project #12

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
Earth Work	\$ 214,349	\$ 894,000			
Retrofit Structure	\$ 737,711	\$ 3,076,000	\$ 97,564	\$ 1,215,863	\$ 4,291,863
30 mgd Pump Station	\$ 1,044,544	\$ 4,356,000	\$ 386,810	\$ 4,820,509	\$ 9,176,509
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 1,996,605</b>	<b>\$ 8,326,000</b>	<b>\$ 484,374</b>	<b>\$ 6,036,373</b>	<b>\$ 13,468,373</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 399,321				
C. Miscellaneous Site Structures	\$ 299,491				
<b>D. Unit Process Subtotal</b>	<b>\$ 2,695,416</b>				
E. Sitework	\$ 269,542				
F. Yard Piping	\$ 404,312				
G. Soil Conditions	\$ 188,679				
H. Site Electrical Power Distribution	\$ 26,954				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 3,584,904</b>				
J. Misc. Items Not Itemized	\$ 716,981				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 4,301,884</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 516,226				
M. Sales Tax (Allowance), 5%	\$ 240,906				
N. Overhead & Profit, 10%	\$ 505,902				
O. Bonds & Insurance, 2%	\$ 83,474				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 5,648,391</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 338,903				
R. Construction Contingency - Change Orders, 4%	\$ 225,936				
<b>S. Total Construction Cost</b>	<b>\$ 6,213,231</b>				
T. Engineering, 12%	\$ 745,588				
U. Legal, 2%	\$ 124,265				
V. Construction Administration, 8%	\$ 497,058				
W. Owner Administration, 12%	\$ 745,588				
<b>X. Total Project Capital Cost</b>	<b>\$ 8,325,729</b>				

# Cost Summary



**Project**  
Smuggler's Gulch, In-stream Water Quality Detention Basin, Project #13

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
20 MG In-Stream Water Quality Detention Basin	\$ 5,702,527	\$ 23,779,000	\$ 168,800	\$ 2,103,621	\$ 25,882,621
163 mgd Pump Station	\$ 3,660,562	\$ 15,264,000	\$ 1,298,513	\$ 16,182,343	\$ 31,446,343
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 9,363,089</b>	<b>\$ 39,043,000</b>	<b>\$ 1,467,313</b>	<b>\$ 18,285,964</b>	<b>\$ 57,328,964</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 1,872,618				
C. Miscellaneous Site Structures	\$ 1,404,463				
<b>D. Unit Process Subtotal</b>	<b>\$ 12,640,170</b>				
E. Sitework	\$ 1,264,017				
F. Yard Piping	\$ 1,896,025				
G. Soil Conditions	\$ 884,812				
H. Site Electrical Power Distribution	\$ 126,402				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 16,811,426</b>				
J. Misc. Items Not Itemized	\$ 3,362,285				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 20,173,711</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 2,420,845				
M. Sales Tax (Allowance), 5%	\$ 1,129,728				
N. Overhead & Profit, 10%	\$ 2,372,428				
O. Bonds & Insurance, 2%	\$ 391,451				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 26,488,163</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 1,589,290				
R. Construction Contingency - Change Orders, 4%	\$ 1,059,527				
<b>S. Total Construction Cost</b>	<b>\$ 29,136,979</b>				
T. Engineering, 12%	\$ 3,496,438				
U. Legal, 2%	\$ 582,740				
V. Construction Administration, 8%	\$ 2,330,958				
W. Owner Administration, 12%	\$ 3,496,438				
<b>X. Total Project Capital Cost</b>	<b>\$ 39,043,552</b>				

# Cost Summary



**Project**  
Goat Canyon, Retrofit Low Flow Diversion, Project #14

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
Earth Work	\$ 707,642	\$ 2,951,000	\$ 42,200	\$ 525,905	\$ 3,476,905
Retrofit Structure	\$ 737,711	\$ 3,076,000	\$ 29,680	\$ 369,884	\$ 3,445,884
30 mgd Pump Station	\$ 1,044,544	\$ 4,356,000	\$ 410,873	\$ 5,120,387	\$ 9,476,387
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 2,489,898</b>	<b>\$ 10,383,000</b>	<b>\$ 482,754</b>	<b>\$ 6,016,177</b>	<b>\$ 16,399,177</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 497,980				
C. Miscellaneous Site Structures	\$ 373,485				
<b>D. Unit Process Subtotal</b>	<b>\$ 3,361,362</b>				
E. Sitework	\$ 336,136				
F. Yard Piping	\$ 504,204				
G. Soil Conditions	\$ 235,295				
H. Site Electrical Power Distribution	\$ 33,614				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 4,470,611</b>				
J. Misc. Items Not Itemized	\$ 894,122				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 5,364,733</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 643,768				
M. Sales Tax (Allowance), 5%	\$ 300,425				
N. Overhead & Profit, 10%	\$ 630,893				
O. Bonds & Insurance, 2%	\$ 104,097				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 7,043,916</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 422,635				
R. Construction Contingency - Change Orders, 4%	\$ 281,757				
<b>S. Total Construction Cost</b>	<b>\$ 7,748,308</b>				
T. Engineering, 12%	\$ 929,797				
U. Legal, 2%	\$ 154,966				
V. Construction Administration, 8%	\$ 619,865				
W. Owner Administration, 12%	\$ 929,797				
<b>X. Total Project Capital Cost</b>	<b>\$ 10,382,733</b>				

# Cost Summary



**Project**  
Goat Canyon, In-stream Water Quality Detention Basin, Project #15

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
In-Stream Water Quality Detention Basin	\$ 5,702,527	\$ 23,779,000	\$ 168,800	\$ 2,103,621	\$ 25,882,621
163 mgd Pump Station	\$ 3,660,562	\$ 15,264,000	\$ 1,298,513	\$ 16,182,343	\$ 31,446,343
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 9,363,089</b>	<b>\$ 39,043,000</b>	<b>\$ 1,467,313</b>	<b>\$ 18,285,964</b>	<b>\$ 57,328,964</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 1,872,618				
C. Miscellaneous Site Structures	\$ 1,404,463				
<b>D. Unit Process Subtotal</b>	<b>\$ 12,640,170</b>				
E. Sitework	\$ 1,264,017				
F. Yard Piping	\$ 1,896,025				
G. Soil Conditions	\$ 884,812				
H. Site Electrical Power Distribution	\$ 126,402				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 16,811,426</b>				
J. Misc. Items Not Itemized	\$ 3,362,285				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 20,173,711</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 2,420,845				
M. Sales Tax (Allowance), 5%	\$ 1,129,728				
N. Overhead & Profit, 10%	\$ 2,372,428				
O. Bonds & Insurance, 2%	\$ 391,451				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 26,488,163</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 1,589,290				
R. Construction Contingency - Change Orders, 4%	\$ 1,059,527				
<b>S. Total Construction Cost</b>	<b>\$ 29,136,979</b>				
T. Engineering, 12%	\$ 3,496,438				
U. Legal, 2%	\$ 582,740				
V. Construction Administration, 8%	\$ 2,330,958				
W. Owner Administration, 12%	\$ 3,496,438				
<b>X. Total Project Capital Cost</b>	<b>\$ 39,043,552</b>				

# Cost Summary



**Project**  
Yogurt Canyon, Low-Flow Diversion, Project #17

Unit Process	Construction (w/out adders)	Construction (with adders)	O&M (\$/yr)	PV O&M (\$M)	PV (\$M)
Earth Work	\$ 161,251	\$ 672,000			
Diversion Structure	\$ 1,096,343	\$ 4,572,000	\$ 53,127	\$ 662,086	\$ 5,234,086
30 mgd Pump Station	\$ 1,044,544	\$ 4,356,000	\$ 426,785	\$ 5,318,688	\$ 9,674,688
<b>A. Subtotal (Raw Estimate)</b>	<b>\$ 2,302,139</b>	<b>\$ 9,600,000</b>	<b>\$ 479,913</b>	<b>\$ 5,980,773</b>	<b>\$ 14,908,773</b>
<b>Additions/Contingency</b>					
B. Undefined Unit Processes	\$ 460,428				
C. Miscellaneous Site Structures	\$ 345,321				
<b>D. Unit Process Subtotal</b>	<b>\$ 3,107,887</b>				
E. Sitework	\$ 310,789				
F. Yard Piping	\$ 466,183				
G. Soil Conditions	\$ 217,552				
H. Site Electrical Power Distribution	\$ 31,079				
<b>I. Construction Subtotal (Excluding Contingency)</b>	<b>\$ 4,133,490</b>				
J. Misc. Items Not Itemized	\$ 826,698				
<b>K. Construction Subtotal (Including Contingency)</b>	<b>\$ 4,960,188</b>				
L. Field General Conditions, Mobilization, Demobilization, 12%	\$ 595,223				
M. Sales Tax (Allowance), 5%	\$ 277,771				
N. Overhead & Profit, 10%	\$ 583,318				
O. Bonds & Insurance, 2%	\$ 96,247				
<b>P. Construction Bid Price Subtotal</b>	<b>\$ 6,512,747</b>				
Q. Projection to Midpoint of Construction, 6%	\$ 390,765				
R. Construction Contingency - Change Orders, 4%	\$ 260,510				
<b>S. Total Construction Cost</b>	<b>\$ 7,164,022</b>				
T. Engineering, 12%	\$ 859,683				
U. Legal, 2%	\$ 143,280				
V. Construction Administration, 8%	\$ 573,122				
W. Owner Administration, 12%	\$ 859,683				
<b>X. Total Project Capital Cost</b>	<b>\$ 9,599,789</b>				