Feasibility Analysis for Project 8: Upgrade San Antonio de los Buenos Wastewater Treatment Plant to Reduce Untreated Wastewater to Coast

Technical Memorandum

USMCA Mitigation of Contaminated Tijuana Transboundary Flows Project

Prepared for:

United States Environmental Protection Agency
Office of Wastewater Management
1200 Pennsylvania Avenue, NW
Washington DC 20460

Prepared by:

PG Environmental, LLC (Subcontractor to ERG)

22 November 2021
Final Report

Work Performed Under EPA Contract No. 68HERH19D0033
Task Order No. 53

Version #	Stage	Description of changes	Changes made by	Date completed
1	Initial draft	Deliberative draft; copy editing and formatting	PG	1/14/21
2	Initial draft	EPA edits and comments on initial draft delivered 1/14/21	EPA	1/29/21
3	Final	Address EPA comments; further copy editing and formatting	PG	2/16/21
4	Final	Address EPA comments	PG	3/22/21
5	Final	Remove internal markings	PG	11/22/21

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS, ACRONYMS, AND SYMBOLS

BOD	biochemical oxygen demand
BOD_5	amount of oxygen consumed by microorganisms within five days
CEISA	Consorcio Especializado en Ingeniería
CESPT	Comisión Estatal de Servicios Públicos de Tijuana
EID	Environmental Information Document
EPA	United States Environmental Protection Agency
ERG	Eastern Research Group, Inc.
L/s	liters per second
MGD	million gallons per day
O&M	operation and maintenance
PB1-A	Pump Station 1A
PB1-B	Pump Station 1B
SAB	San Antonio de los Buenos
TSS	total suspended solids
USMCA	United States–Mexico–Canada Agreement

EXECUTIVE SUMMARY

PG Environmental conducted a feasibility analysis of Project 8, "Upgrade San Antonio de los Buenos Wastewater Treatment Plant to Reduce Untreated Wastewater to Coast," one of 10 proposed projects to mitigate transboundary wastewater flows in the Tijuana River watershed under the United States–Mexico–Canada Agreement (USMCA). This feasibility analysis report includes an analysis of the technical, economic, and environmental feasibility of the project and builds on past studies and consultation with engaged stakeholders using available data.

The project involves upgrading the San Antonio de los Buenos (SAB) wastewater treatment plant to improve wastewater discharge quality and reduce impacts of wastewater along the Pacific coastline near the international border. PG evaluated two individual sub-projects, one of which was proposed in 2020 by Mexican entity Comisión Estatal de Servicios Públicos de Tijuana (CESPT):

1. **Upgrade the SAB plant to properly treat flow received from Tijuana and the surrounding area**. PG relied on the existing CESPT report (MAV and CEISA 2020) to assess this option. The report recommends constructing three oxidation ditches capable of treating peak flows of approximately 40 MGD (sub-project 1). PG determined that the proposed oxidation ditch design in the CESPT report is improperly sized for operation as a true oxidation ditch: its tank volumes would need to be larger. This means the design and associated cost estimate need revision, and thus the sub-project's estimated capital cost ($75.9 million) and 40-year life cycle cost ($230.5 million) are questionable.

2. **Upgrade the SAB plant to properly treat reduced flows coming from Playas and the direct vicinity of the SAB plant**. PG used the existing study by CESPT to evaluate a scaled-down oxidation ditch system capable of treating approximately 10 MGD (sub-project 2). The estimated capital cost of the sub-project is $34.5 million, and the estimated 40-year life cycle cost is $104.8 million—but these costs are based on sub-project 1 and thus are also questionable.

This feasibility analysis evaluates the wastewater treatment plant design and costs as presented in the CESPT report. PG believes, though, that the CESPT report recommends improper technology for the treatment plant and that the costs presented in the CESPT report are thus also questionable. Therefore, as part of the forthcoming alternatives analysis, PG will develop an independent cost estimate for a wastewater treatment plant on the site of the current SAB plant that will provide the greatest benefit to the environment and optimize costs.

PG has also explored Project 8's projected performance in mitigating effects from discharges from the SAB plant, including some high-level environmental and social impacts. ERG is preparing an Environmental Impact Document with a more thorough evaluation of potential environmental and social impacts in the U.S. associated with Project 8.

Note that more information on background data analyzed and referenced in this document can be found in PG's *Baseline Conditions Summary: Technical Document,* available from EPA.

1. INTRODUCTION

Under EPA Contract No. 68HERH19D0033, Task Order No. 53, PG Environmental conducted a detailed feasibility analysis of 10 proposed projects to mitigate transboundary wastewater flows in the Tijuana River watershed. Each feasibility analysis considered an estimate of capital costs; an estimate of design, project, and construction management costs; operation and maintenance (O&M) costs; project implementation schedule; regulatory, engineering, and any possible implementation issues; and social and environmental impacts.

This feasibility analysis specifically addresses Project 8: "Upgrade San Antonio de los Buenos Wastewater Treatment Plant." During the analysis, PG consulted with stakeholders and reviewed previous work including the following:

- *Proyecto de Construcción y Rehabilitación de la Planta de Tratamiento de Aguas Residuales de San Antonio de los Buenos* (Construction and Rehabilitation Project of the San Antonio de los Buenos Wastewater Treatment Plant), referred to below as the CESPT report (MAV and CEISA 2020).
- *Modeling Impacts of Various Wastewater and Stormwater Flow Scenarios on San Diego South Bay and Tijuana Beaches* (Feddersen et al. 2020).

Baseline Conditions Summary: Technical Document, prepared for EPA under the United States–Mexico–Canada Agreement (USMCA) Mitigation of Contaminated Tijuana Transboundary Flows Project, contains more information on background data analyzed, U.S. and Mexico entities, infrastructure and its operating conditions, water bodies, affected areas, and other studies and reports referenced in this document.

This report has been revised and finalized from the draft version based on comments and discussions with EPA. Consistent with the task order scope, PG will work with EPA to develop and analyze several infrastructure alternatives, including a preferred alternative, to mitigate the transboundary wastewater and stormwater flows. The alternatives will include groupings of one or more projects evaluated in the feasibility analyses, scaled if necessary, and will be presented to EPA in the Alternatives Document. Where applicable, the Alternatives Document will include any changes to the proposed technology and estimated costs for a properly sized and designed San Antonio de los Buenos (SAB) plant.

1.1 Project Purpose

Improve wastewater discharge quality at the SAB wastewater treatment plant to reduce impacts of wastewater along the coastline.

1.2 Current Conditions

Along with wastewater from Tijuana's sewer system, Tijuana River water is diverted and pumped from the Tijuana River basin to the SAB plant. The SAB plant is configured as a lagoon system and is ineffective due to poor operations and maintenance, as documented in the CESPT report. The SAB plant is also known to be undersized, at a design flow capacity of 25 MGD; the September, October, and November 2020 monthly summary of flows within the Tijuana system shows that 1,756 to 1,778 liters per second (40 MGD) of wastewater and Tijuana River water flow toward the SAB plant. As a result, the system discharges undertreated and untreated wastewater which discharges into the Pacific Ocean via SAB Creek (CESPT 2020). Recent seawater modeling by the Scripps

Institution of Oceanography shows this wastewater affects water quality along the coastline, extending across the international border and causing beach impacts as far north as Point Loma in the United States during periods of northward ocean currents (Feddersen et al. 2020).

According to the CESPT report, the SAB plant began operation in 1987 as an aerated lagoon system with a design flow rate of 750 L/s (17 MGD). It was expanded in 2003 with superficial aerators to treat a flow rate of 1,100 L/s (25 MGD). Wastewater is pumped from pump stations PB1-A and PB1-B, which receive wastewater from the International Collector—a 72-inch diameter gravity main that receives wastewater flows from much of the city of Tijuana.

As described in the CESPT report and the PG *Technical Document,* the SAB plant has fallen into disrepair and cannot provide any significant level of treatment. As a result, little attention is paid to whether wastewater coming from the Tijuana sanitary sewer is routed to the SAB plant or straight to SAB Creek.

The SAB treatment train is as follows:

- Mechanical bar screens.
- Aerated vortex grit chamber.
- Lift station.
- Distribution box.
- Three lagoons—aerated lagoon, aerated lagoon, and polishing lagoon.
- Chlorine disinfection.
- Surface discharge into the ocean.

The CESPT report identifies the following problems with this treatment train:

- The pretreatment components (mechanical bar screens and grit chamber) are not functioning as intended, due to inadequate maintenance.
- Only three of the 39 aerators in the primary aerated lagoon are operating, and only one of the 11 aerators in the secondary aerated lagoon is operating, due to lack of preventive maintenance.
- The lagoons have not been cleaned out for a long time, which reduces available volume and residence time in each lagoon.
- The existing sludge treatment has not been operating, causing it to fall into disrepair.

These issues have reduced the treatment capacity of the plant, resulting in effluent water quality that does not meet Mexican regulations. The effluent discharged into the Pacific Ocean has created social and political controversies; U.S. and Mexican organizations have spoken out about the negative impacts of this discharge.

1.3 Major Project Elements Considered

The feasibility analysis addresses two sub-projects.

1. **Upgrade the SAB plant to properly treat flow received from Tijuana and the surrounding area**. PG relied on the existing CESPT report to assess this option. The report recommends constructing three oxidation ditches capable of treating peak flows of approximately 40 MGD (sub-project 1).

2. **Upgrade the SAB plant to properly treat reduced flows coming from Playas and the direct vicinity of the SAB plant**. PG used the existing study by CESPT to evaluate a scaled-down oxidation ditch system capable of treating approximately 10 MGD (sub-project 2).

PG reviewed the CESPT report, evaluated the feasibility of the proposed treatment system, and converted the costs presented to U.S. dollars. PG then created an additional cost estimate based on scaling down the proposed plant to a capacity of 10 MGD.

As described in Sections 2 and 4 of this feasibility analysis, PG believes that the CESPT report recommends improper technology for the treatment plant and that the costs presented in the CESPT report are questionable. Therefore, as part of the forthcoming alternatives analysis, PG will develop an independent cost estimate for a wastewater treatment plant on the site of the current SAB plant that will provide the greatest benefit to the environment and optimize costs. However, consistent with the task order scope, this feasibility analysis evaluates the wastewater treatment plant design and costs as presented in the CESPT report.

2. DESIGN INFORMATION

Sections 2.1 and 2.2 provide overviews of the project locations, design features, and engineering and regulatory issues associated with both sub-projects. Figure 2-1, on the next page, shows the location, relation to the floodplain and known elevations of the SAB plant, which is the proposed location for both sub-projects. The entire project area is well outside the 100-year floodplain for the Tijuana River, as the figure illustrates.

2.1 Design Features

The CESPT report considers several different alternatives for the SAB plant, including rehabilitation of the existing lagoon system, conversion to conventional activated sludge, and conversion to an oxidation ditch system. The report evaluates the three alternatives operationally and economically. It concludes that conversion to an oxidation ditch system (sub-project 1) would be the preferable alternative, despite its relative complexity, for several reasons: its potential to provide the best effluent quality (96% removal of TSS and 96% removal of BOD), CESPT's familiarity with the process,[1] and flexibility of operation. The proposed oxidation ditch plant could be implemented in three stages, each with a design flow of 400 L/s (9.1 MGD), for a total design flow of 1,200 L/s (27.4 MGD). As discussed in the CESPT report, each of these modules would be able to handle up to 600 L/s (13.7 MGD) of peak flow, which would mean the plant's full capacity with all three modules operating would be 41 MGD. Sub-project 1 also includes a 12-inch line conveying flows of approximately 123 L/s (less than 3 MGD) from the Tecolote–La Gloria neighborhood to the SAB plant.

In addition, a subaquatic discharge line is proposed to be built, which would extend 1,100 meters over land, then 200 meters into the ocean along the ocean floor, to discharge into the Pacific Ocean. This feasibility analysis includes costs for the submarine discharge line, but did not include modeling to evaluate the water quality impacts of moving the point of discharge. That evaluation is a suggested next step (see Section 7), particularly if Project 8 is recommended as part of the forthcoming alternatives analysis. In assessing project impacts for this analysis, PG assumed that the SAB plant discharges into SAB Creek, as any impacts of the subaquatic discharge line were not discussed in the CESPT report.

PG is not convinced that an oxidation ditch system is necessary for this plant, given that the plant discharges the effluent into the Pacific Ocean via SAB Creek. PG recommends a conventional activated sludge system for this plant, which requires less area, is less costly to operate, and would still provide secondary-level treatment. In fact, upon closer evaluation of the design parameters for the proposed oxidation ditch, PG has concluded that (if constructed according to the design in the CESPT report) this plant would operate like a conventional activated sludge plant. PG will further explore, as part of the forthcoming alternatives analysis, the proper design and size for a wastewater treatment plant on the site of the current SAB plant.

[1] It is PG's understanding that CESPT would be responsible for operating the system.

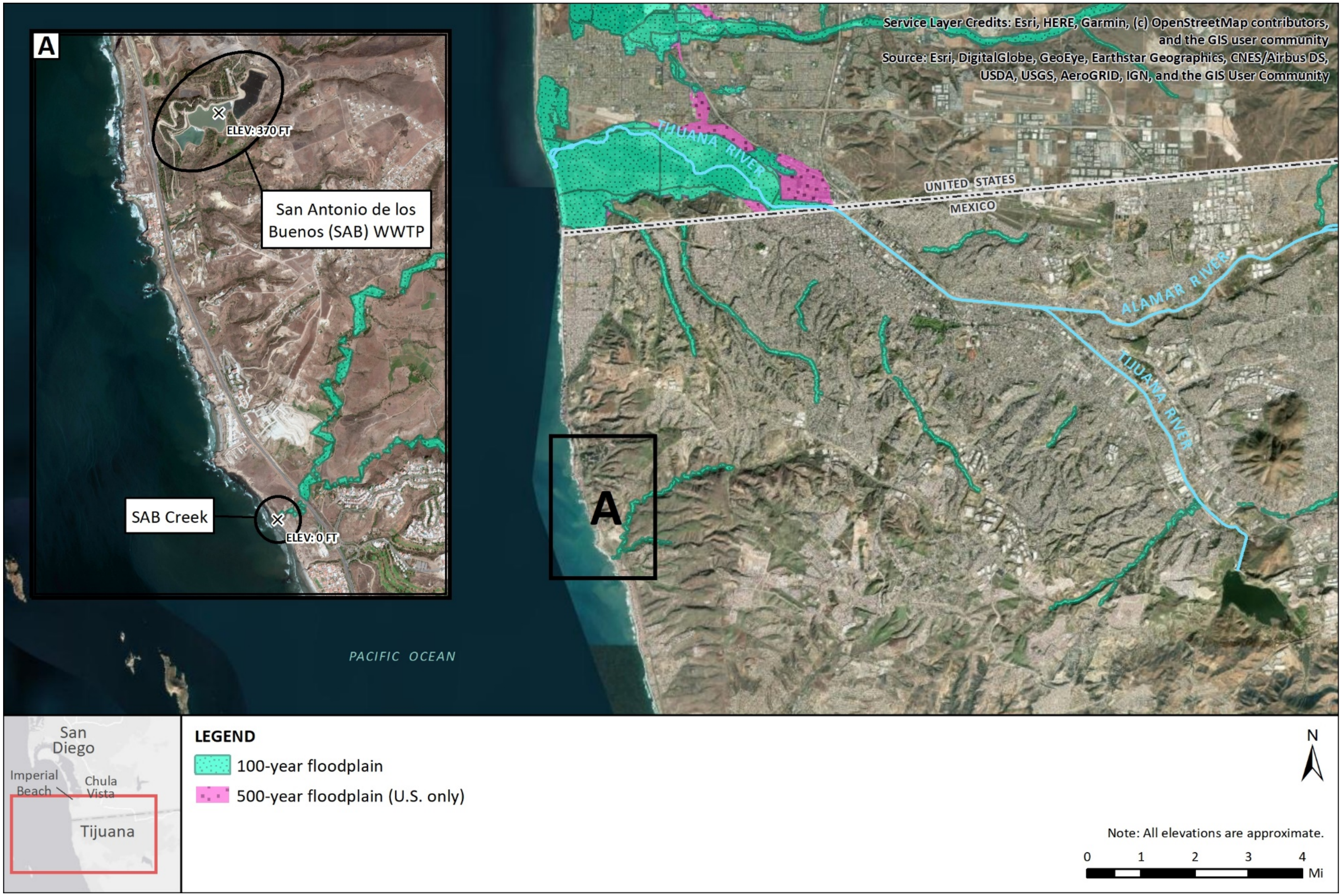

Figure 2-1. Locations and Known Elevations of the SAB Plant and SAB Creek

The design proposed in the CESPT report is inadequate for an oxidation ditch for the following reasons:

- The tank volumes and residence times needed for an oxidation ditch system to perform correctly would be about three times greater than those described in the CESPT report. Typically, an oxidation ditch reactor would have a 20-hour to 24-hour hydraulic detention time, and the solids retention time would be 20 to 40 days. This likely would also mean that an oxidation ditch with adequate dimensions for the required volume would not fit within the footprint of the current SAB plant.
- Anaerobic digesters and cogeneration equipment would be unnecessary in a typical oxidation ditch system because the biomass is almost fully oxidized before being wasted from the liquid process. Thus, biogas production in the anaerobic digesters would be very low, which means cogeneration would yield very little energy.

As noted above, PG's alternatives analysis will include an independent cost estimate for a wastewater treatment plant on the site of the current SAB plant that will provide the greatest benefit to the environment and optimize costs. However, consistent with the task order scope, this feasibility analysis evaluates the wastewater treatment plant design and costs as presented in the CESPT report. .

Figure 2-2 below provides a schematic of the proposed oxidation ditch process.

Sub-project 2 involves scaling down the proposed design of the oxidation ditch system to a design flow rate of 10 MGD to handle the expected combined flow from six pump stations: C. Mirador, C. Laureles 1, C. Laureles 2, PB Playas, PB-3 (Matadero), and Aport. Lazaro C.

The CESPT report suggested that the full-sized plant could be implemented in three stages, each with a design flow of 400 L/s (9.1 MGD), for a total design flow of 1,200 L/s (27.4 MGD). As mentioned above, if designed as a true oxidation ditch system, the full-size plant may not fit within the footprint of the SAB plant. However, the smaller plant might fit within the footprint. This sub-project could mean that only one module would be necessary. Given that each module has a design capacity of 9.1 MGD and can treat up to 13.7 MGD, the plant could operate and properly treat flows at 10 MGD, if needed. This smaller plant might have a similar layout to that shown in Figure 2-2.

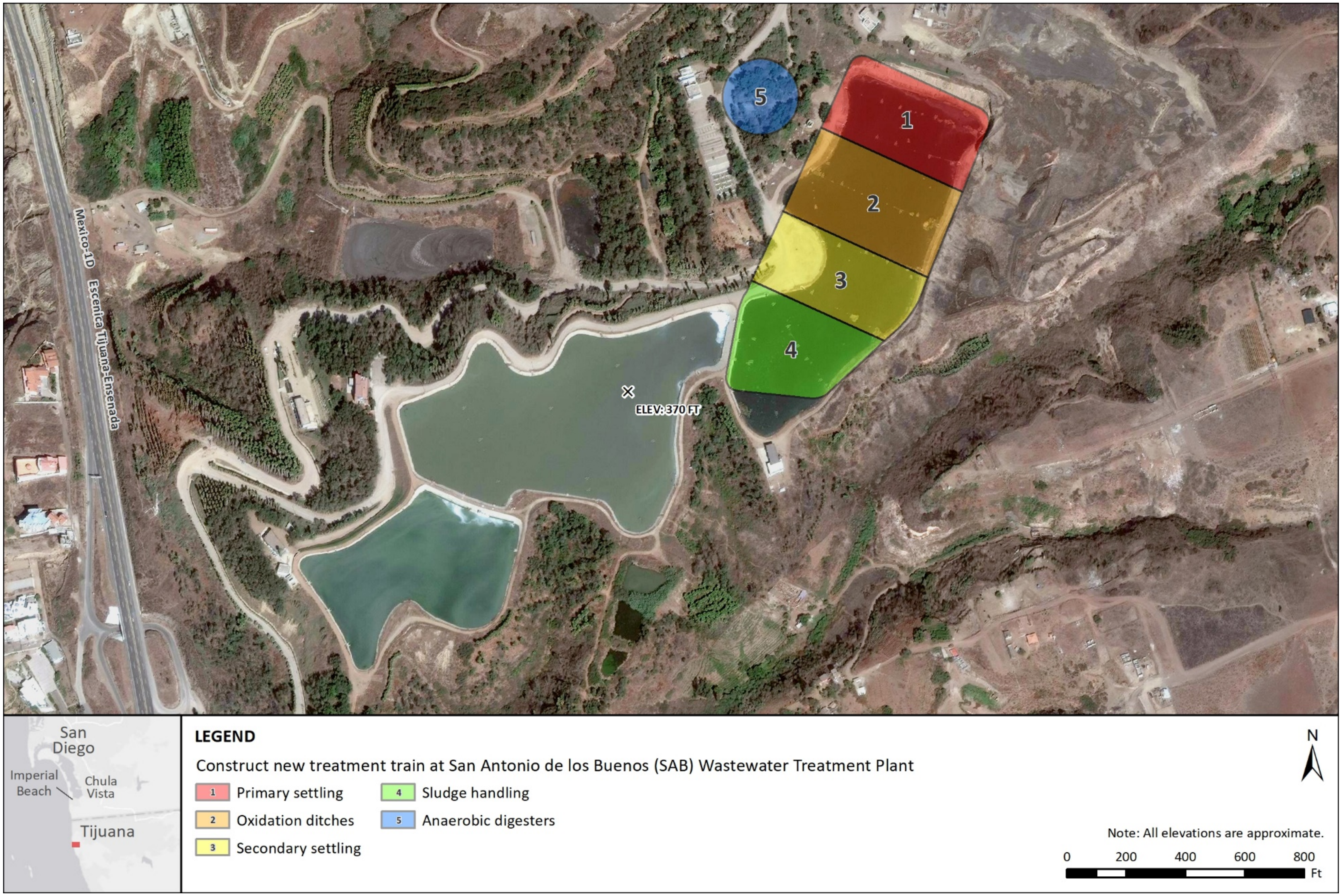

Figure 2-2. Proposed Layout of Oxidation Ditch Facility Within the SAB Footprint

2.2 Engineering Issues

The sub-project 1 design proposed in the CESPT report does not appear to adhere to standard design practices, although PG is not familiar with guidance that may exist within the state of Baja California, Mexico. The design flow rate is 1,200 L/s (27.4 MGD), with a peak flow of 1,800 L/s (41 MGD). When properly designed and operated, oxidation ditches are a proven technology that can effectively treat the wastewater. The proposed design results in an estimated disposal of 59,400 cubic meters of sludge per year, which is proposed to be transported to and disposed of at El Morro, located in Playas de Rosarito.

According to the CESPT report, the oxidation ditch is constructible within the footprint of the existing SAB lagoon system. PG has found that the designed volumes and residence times are not nearly large enough for the system to operate as a true oxidation ditch, so the system may not fit within the current footprint of the plant if implemented as a properly designed oxidation ditch. The proposed design appears to use the footprint of only one of the current lagoons, leaving the lower two lagoons as an area for future expansion, additional facilities, or a properly designed oxidation ditch. It is not clear, however, whether the soils at the SAB plant—particularly those within the footprint of the existing lagoons—have been adequately studied to establish that they would be able to support the construction proposed.

For sub-project 2, the design flow rate would be 400 L/s (9.1 MGD), with a peak flow of 600 L/s (13.7 MGD). The plan for the estimated disposal of 19,800 cubic meters of sludge per year (one third of the full plant solids production) is the same as for the design proposed in the CESPT report, with transport and disposal at El Morro. A plant design for only one module may fit within the footprint of the current plant, leaving the lower two lagoons as potential additional area for expansion or additional facilities.

2.3 Implementation and Regulatory Issues

A project schedule was not included in the CESPT report. Without consideration to the potential permitting issues, or the procurement process for a large construction project in Mexico, PG estimates that construction of this modified plant may take up to two years. Funding could be available through the USMCA. PG is not aware of any financial analyses performed by federal agencies in Mexico or the United States. Because the project would take place entirely in Mexico, it is not expected to require any burdensome environmental regulatory approvals by U.S. federal, state, or local agencies.

3. PROJECT IMPACT

Both sub-projects involve improvements to the wastewater treatment plant at the SAB plant that will provide secondary treatment to wastewater before discharge into the Pacific Ocean via SAB Creek. As the Scripps report (Feddersen et al. 2020) demonstrates, this would have a positive impact on water quality along the coast as far north as Point Loma, especially during periods of northward ocean currents. This would likely improve the beach conditions on both sides of the international border and reduce the number of days with impacts predicted to result in beach closures.

PG estimated the total BOD_5 and sediment loads that are conveyed to SAB Creek under current conditions for both the 40 MGD (sub-project 1) and 10 MGD (sub-project 2) scenarios. PG estimated the discharges from SAB Creek using flow data from the major pump stations from January 1, 2016, through December 31, 2019, and flow balances. More details on this methodology, including assumptions about BOD_5 and sediment levels, can be found in PG's *Baseline Conditions Summary: Technical Document.* Table 3-1 presents the reduction in BOD_5 and sediment loads to SAB Creek for both sub-projects, compared to current conditions.

Table 3-1. Impact of Project 8 on SAB Discharge

Parameter	Existing Conditions	40 MGD Plant	10 MGD Plant
Annual BOD_5 load conveyed to SAB Creek (tons)	15,860	555	213
Percent change in annual BOD_5 load to SAB Creek	N/A	-97%	-99%
Annual sediment load to SAB Creek (tons)	16,250	650	244
Percent change in annual sediment load to SAB Creek	N/A	-96%	-99%

Sections 3.1 to 3.5 provide details on specific areas of impact.

3.1 Water Quality Impacts

This project is not expected to have an impact on the water quality within the Tijuana River Estuary, although the impact on the beaches is likely to be substantial. As shown in the Scripps report, during the periods of northward currents, the untreated sewage flowing into the ocean from SAB Creek causes most of the pollution and resulting beach impacts in the United States, including those to the Navy SEALs training facility in Coronado, California.

3.2 Sediment Impacts

This project is expected to provide a significant reduction in sediment loads reaching the Pacific Ocean via SAB Creek due to the vast improvement that a functioning SAB plant will provide over the currently non-functioning plant.

3.3 Trash Impacts

This project is not expected to affect trash within the Tijuana River Basin.

3.4 Non-Water-Quality Environmental Impacts

In conjunction with the feasibility assessment, ERG is currently preparing an Environmental Impact Document (EID) that will describe the potential environmental impacts of the 10 proposed projects (including Project 8), focusing on impacts in the U.S. or caused by activities in the U.S. Based on a review of existing available information, Project 8 is not expected to trigger any non-water-quality environmental impacts of concern in the U.S. [2] The EID will include a more thorough evaluation of potential non-water-quality impacts in the U.S.

3.5 Social Impacts

Under Project 8, long-term positive socioeconomic impacts to affected populations in both the U.S. and Mexico (e.g., reduced public health risk and increased economic activity in coastal areas) are expected to outweigh the negative, localized impacts during construction in Mexico (e.g., temporary increase in noise, equipment/dust emissions, and traffic). The EID will include a more thorough evaluation of potential transboundary socioeconomic impacts.

Project 8 would reduce contaminated transboundary flows in the ocean that migrate north from Mexico to the U.S. However, it would not resolve existing impacts to U.S. Customs and Border Protection operations and workforce resulting from exposure to contaminated transboundary flows near border infrastructure in the Tijuana River main channel, Goat Canyon, or Smuggler's Gulch.

[2] ERG considered the following "impacts of concern" to be indicators of potentially significant environmental impacts that warrant detailed review during preparation of the EID, the subsequent National Environmental Policy Act process, and related consultations and resource-specific studies: disproportionate, adverse effects on minority and/or low-income communities; potential for adverse effects on federally listed threatened or endangered species or their critical habitat; adverse effects on tribal/cultural resources; adverse effects on important natural resource areas such as wetlands, floodplains, coastal zones, and significant fish or wildlife habitat; modification, diversion, and/or alteration of the main course of the Tijuana River; criteria pollutant emissions that exceed Clean Air Act General Conformity Rule *de minimis* thresholds; and significant public controversy about a potential environmental impact.

4. COST IMPACT ANALYSIS

PG reviewed the cost estimate in the CESPT report. The CESPT costs are presented primarily as lump sum items for each portion of the treatment process, which makes assessment of those costs difficult. Again, PG does not agree with the design specifications of the proposed oxidation ditch system. This also likely means that the cost estimates in CESPT report are questionable, as they do not reflect the cost for a properly designed system.

The project construction cost estimates for the full-size 40 MGD SAB plant (sub-project 1) and the smaller 10 MGD SAB plant (sub-project 2) are based on the CESPT report, which contains cost estimates in Mexican pesos for the full-size SAB plant. PG converted those costs to U.S. dollars using the exchange rate from December 8, 2020 (19.7231 pesos per dollar). PG used the cost estimates from the CESPT report as a basis to estimate costs for sub-project 2, then divided those costs by a factor of 2.2.

Project capital costs are based on project construction cost multiplied by a factor of 1.4 to account for project engineering and owner administration costs. That total is multiplied by a general contingency factor of 1.5 to account for unanticipated construction, unknown subsoils, and other factors. Therefore, project capital cost equals project construction cost × 1.4 × 1.5, which is equivalent to project construction cost × 2.1.

The CESPT report also includes estimated O&M costs. These include equipment and labor costs associated with removing and disposing of sediment and trash from the basins and booms and performing general maintenance. An inflation factor of 2% annually was applied to calculate the life cycle cost for each sub-project over a 40-year lifespan. Service life of all equipment is estimated to be 20 years.

Table 4-1 summarizes the estimated capital and life cycle costs for each sub-project. The basis for these cost estimates can be found in the CESPT report.

Table 4-1. Cost Estimate for Full-Size SAB Plant

Category	Item	Estimated Cost (Dollars)	
		Sub-Project 1	Sub-Project 2
Capital costs	Pretreatment	$222,466	$101,121.28
	Extension and rehabilitation of the ditch	$440,207	$200,094.14
	Preliminary	$12,675	$5,761.59
	Distribution box	$38,001	$17,273.62
	Primary settler	$812,555 (3 modules)	$369,343.21 (1 module)
	Primary settler equipment	$1,079,871	$490,850.80
	Bioreactor	$1,601,436	$727,925
	Secondary settler	$846,270 (3 modules)	$384,668 (1 module)
	Secondary settler equipment	$544,779	$247,627
	Sludge thickener	$154,773 (2 modules)	$70,351 (1 module)
	Sludge recirculation	$58,892	$26,769
	Sludge pump	$51,171.55	$23,259
	Anaerobic digester	$3,754,001	$1,706,364
	Gasometer	$1,628,400	$740,182

Category	Item	Estimated Cost (Dollars)	
		Sub-Project 1	**Sub-Project 2**
	Cogeneration equipment	$2,846,602	$1,293,910
	Chlorination relocation	$76,052	$34,569
	Plumbing and equipment	$809,761	$368,073
	Paths	$521,883	$237,219
	Line from Tecolote to La Gloria	$1,524,994	$693,179
	Expansion of effluent channel and SAB outfall	$313,859	$142,663
	Drop	$29,628	$13,467
	Receiving box	$24,255	$11,025
	Subaquatic discharge	$6,560,482	$2,982,037
	Total capital cost (plus 16% tax)	$27,785,507	$12,629,776
	General contractor: mobilization/demobilization, insurance, bonds, general administration, profit (30%)	$8,335,652.17	$3,788,932.81
	Total construction cost	$36,121,159	$16,418,708
	Engineer and administrative contingency (40%)	$14,448,463	$6,567,483.53
	Total construction cost (with engineering)	$50,569,623	$22,986,192
	Contingency (50%)	$25,284,811	$11,493,096.18
	Total capital costs	**$75,900,000**	**$34,500,000**
O&M	Annual O&M costs	$4,531,496	$2,059,771
	Mid-cycle replacement/major repair cost	$5,332,186	$2,423,721
	Interest rate	3%	3%
Life cycle factors	Inflation rate	2%	2%
	Total life cycle used	40 Years	40 Years
Total life cycle cost		**$230,500,000**	**$104,800,000**

Source: MAV and CEISA 2020.

5. DISCUSSION

5.1 Feasibility

The primary objective of Project 8 is to improve wastewater discharge quality from SAB to reduce impacts of wastewater along the coastline. Both sub-projects appear to be feasible, though if designed as a true oxidation ditch system, the full-size plant may not fit within the current footprint of the SAB plant. The effectiveness of either sub-project in achieving the project objective depends on management of construction and ongoing O&M. As noted in the CESPT report, the existing SAB plant is ineffective due to lack of ongoing O&M. It is unclear whether a plan has been developed to ensure ongoing O&M for a new SAB plant.

The merits of this project—to begin treating up to 40 MGD of sewage that is currently being discharged untreated into the Pacific Ocean via SAB Creek—are compelling. The CESPT report does not discuss what might be done to treat the wastewater during construction of the modified plant. However, since the untreated wastewater is being discharged to the Pacific Ocean, that would likely continue to be the case until the plant is brought online. If it is possible to design the modified plant to fit within the existing footprint of the plant, an alternative location would not be needed. Sludge is proposed to be disposed of at El Morro.

5.2 Other Stakeholder Information

As conceptualized, this project would take place within the boundaries of the current SAB plant and would therefore not have a long-term negative impact on other stakeholders. However, neighbors of the SAB plant may be affected in the short-term during construction due to construction traffic, noise, and dust. As stated in the Scripps report (Feddersen et al. 2020), the long-term positive impacts on water quality in the Pacific Ocean would lead to fewer impacts predicted to result in beach closures.

6. CONCLUSION

The overall objective of Project 8 is to improve the quality of wastewater discharges from the SAB plant to reduce impacts of wastewater along the Pacific coastline near the international border. If properly designed and sized, either of two sub-projects would accomplish the project objective. PG assessed the feasibility of the two sub-projects that would modify the SAB plant to properly treat sanitary sewer flows that are being discharged untreated from SAB Creek and arrived at the following conclusions:

1. The proposed oxidation ditch design in the CESPT report is improperly sized for operation as a true oxidation ditch. The oxidation ditch tank volumes would need to be about three times larger, which would also increase hydraulic and solids retention times. The proposed design in the CESPT report would function essentially as a conventional activated sludge system. PG's Alternatives Document will further evaluate the design needed to meet effluent discharge levels appropriate for the SAB plant, including a correct cost for the project. The size of the plant(s) designed may differ from the two sizes analyzed in this report and will be optimized for any alternative(s) in which it is included.

2. By treating wastewater flows that are being discharged without effective treatment, this project would likely improve wastewater discharge quality from SAB Creek and have a positive impact on beaches north and south of the international border, including the Navy SEALs training base.

3. The potential water quality and non-water-quality benefits of this project will only be realized if the plant constructed will be properly operated and maintained. A long-term O&M plan and/or other assurance that an upgraded SAB plant will not be allowed to fall into disrepair should be in place before an investment is made.

7. SUGGESTED NEXT STEPS

1. PG's Alternatives Document will include an independent cost estimate for a wastewater treatment plant on the site of the current SAB plant that will provide the required level of treatment for the expected influent quality and quantity.

2. The specific attributes of the proposed ocean outfall and its impact on near- and far-shore water quality, in both Mexico and the U.S., should be examined.

3. It is not clear whether the soils at the SAB plant have been adequately studied to determine whether they would be able to support the construction proposed. Since the proposed construction is expected to take place within the footprint of an existing lagoon, it may not be suitable for construction. This assessment should occur before the onset of design.

8. REFERENCES

CESPT. (2020). *Volumen de Alejamiento de Agua Residual a la Planta de Tratamiento de Aguas Residuales de San Antonio de los Buenos, Subdirección de Agua y Saneamiento Departamento de Control de Calidad Volumenes de Agua Residual Tratada.* WWTP Flow Data.

Feddersen, F., Wu, X., Giddings, S. (2020). *Modeling Impacts of Various Wastewater and Stormwater Flow Scenarios on San Diego South Bay and Tijuana Beaches*. Scripps Institute of Oceanography, University of California San Diego.

MAV Ingeniería Integral (MAV) and Consorcio Especializado en Ingeniería (CEISA). (2020). *Proyecto de Construcción y Rehabilitación de la Planta de Tratamiento de Aguas Residuales de San Antonio de los Buenos.* Written for CESPT and the State of Baja California.

APPENDIX A: Itemized Cost Impact Analysis

Project 8: 10 MGD SAB Plant - Opinion of Probable Cost

Category	Item	Quantity	Unit	Unit Price	Cost ($)	Source/Description
	Pretreatment	1	LS	$101,121.28	$101,121	MAV and CEISA 2020 scaled down by a factor of 2.2
	Extension and Rehabilitation of Ditch	1	LS	$200,094.14	$200,094	MAV and CEISA 2020 scaled down by a factor of 2.2
	Preliminary engineering	1	LS	$5,761.59	$5,762	MAV and CEISA 2020 scaled down by a factor of 2.2
	Distribution Box	1	LS	$17,273.62	$17,274	MAV and CEISA 2020 scaled down by a factor of 2.2
	Primary Settler (3 modules)	1	LS	$369,343.21	$369,343	MAV and CEISA 2020 scaled down by a factor of 2.2
	Primary Settler Equipment	1	LS	$490,850.80	$490,851	MAV and CEISA 2020 scaled down by a factor of 2.2
	Bioreactor	1	LS	$727,925.49	$727,925	MAV and CEISA 2020 scaled down by a factor of 2.2
	Secondary Settler (3 modules)	1	LS	$384,668.37	$384,668	MAV and CEISA 2020 scaled down by a factor of 2.2
	Secondary Settler Equipment	1	LS	$247,627.11	$247,627	MAV and CEISA 2020 scaled down by a factor of 2.2
	Sludge Thickener (2 modules)	1	LS	$70,351.39	$70,351	MAV and CEISA 2020 scaled down by a factor of 2.2
	Sludge Recirculation	1	LS	$26,769.24	$26,769	MAV and CEISA 2020 scaled down by a factor of 2.2
Equipment, Materials, and Construction Costs	Sludge Pump	1	LS	$23,259.80	$23,260	MAV and CEISA 2020 scaled down by a factor of 2.2
	Anaerobic Digester	1	LS	$1,706,364.35	$1,706,364	MAV and CEISA 2020 scaled down by a factor of 2.2
	Gasometer	1	LS	$740,182.00	$740,182	MAV and CEISA 2020 scaled down by a factor of 2.2
	Cogeneration Equipment	1	LS	$1,293,910.00	$1,293,910	MAV and CEISA 2020 scaled down by a factor of 2.2
	Chlorination Relocation	1	LS	$34,569.52	$34,570	MAV and CEISA 2020 scaled down by a factor of 2.2
	Plumbing and Equipment	1	LS	$368,073.46	$368,073	MAV and CEISA 2020 scaled down by a factor of 2.2
	Path Construction	1	LS	$237,219.96	$237,220	MAV and CEISA 2020 scaled down by a factor of 2.2
	Line from Tecolote to La Gloria	1	LS	$693,179.31	$693,179	MAV and CEISA 2020 scaled down by a factor of 2.2
	Expansion of Effluent Channel and PTAR Outfall	1	LS	$142,663.43	$142,663	MAV and CEISA 2020 scaled down by a factor of 2.2
	Drop	1	LS	$13,467.33	$13,467	MAV and CEISA 2020 scaled down by a factor of 2.2
	Receiving Box	1	LS	$11,025.14	$11,025	MAV and CEISA 2020 scaled down by a factor of 2.2
	Subaquatic Discharge	1	LS	$2,982,037.40	$2,982,037	MAV and CEISA 2020 scaled down by a factor of 2.2
	16% tax	16%			$1,742,038	MAV and CEISA 2020 scaled down by a factor of 2.2
	Total Equipment, Materials, and Construction Costs				**$12,629,776**	
Indirect Costs	General Contractor, Mob/Demob, Ins, Bonds, Gen Admin, Profit	30%			$3,788,933	
	Engineer and Administrative Contingency, 40% of subtotal	40%			$6,567,484	
	Contingency 50%	50%			$11,493,096	
	Total Indirect Costs				**$21,849,513**	
	Total Capital Costs				**$34,500,000**	
O&M Costs	**Total Annual O&M Costs**				$2,059,771	
Life Cycle Cost	Total Capital Cost				$34,500,000	
	Annual O&M Costs				$2,059,771	
	Service Life				40	
	Present Value of Service Life O&M				$68,308,265	
	Major Upgrade(s) Cost at 20 years				$2,423,721	MAV and CEISA 2020 scaled down by a factor of 2.2
	Present Value of Major Upgrade(s)				$1,986,347	
	Interest Rate				3%	
	Inflation Rate				2%	
	Location Adjustment Factor				1	United States
	Total Life Cycle Cost (10 MGD)				**$104,800,000.00**	

Project 8: Full-Size SAB Plant - Opinion of Probable Cost

Category	Item	Quantity	Unit	Unit Price	Cost ($)	Source/Description
Equipment, Materials, and Construction Costs	Pretreatment	1	LS	$222,466.82	$222,467	MAV and CEISA 2020
	Extension and Rehabilitation of Ditch	1	LS	$440,207.11	$440,207	MAV and CEISA 2020
	Preliminary engineering	1	LS	$12,675.49	$12,675	MAV and CEISA 2020
	Distribution Box	1	LS	$38,001.96	$38,002	MAV and CEISA 2020
	Primary Settler (3 modules)	1	LS	$812,555.06	$812,555	MAV and CEISA 2020
	Primary Settler Equipment	1	LS	$1,079,871.77	$1,079,872	MAV and CEISA 2020
	Bioreactor	1	LS	$1,601,436.08	$1,601,436	MAV and CEISA 2020
	Secondary Settler (3 modules)	1	LS	$846,270.41	$846,270	MAV and CEISA 2020
	Secondary Settler Equipment	1	LS	$544,779.65	$544,780	MAV and CEISA 2020
	Sludge Thickener (2 modules)	1	LS	$154,773.06	$154,773	MAV and CEISA 2020
	Sludge Recirculation	1	LS	$58,892.33	$58,892	MAV and CEISA 2020
	Sludge Pump	1	LS	$51,171.55	$51,172	MAV and CEISA 2020
	Anaerobic Digester	1	LS	$3,754,001.58	$3,754,002	MAV and CEISA 2020
	Gasometer	1	LS	$1,628,400.41	$1,628,400	MAV and CEISA 2020
	Cogeneration Equipment	1	LS	$2,846,602.01	$2,846,602	MAV and CEISA 2020
	Chlorination Relocation	1	LS	$76,052.95	$76,053	MAV and CEISA 2020
	Plumbing and Equipment	1	LS	$809,761.61	$809,762	MAV and CEISA 2020
	Path Construction	1	LS	$521,883.91	$521,884	MAV and CEISA 2020
	Line from Tecolote to La Gloria	1	LS	$1,524,994.48	$1,524,994	MAV and CEISA 2020
	Expansion of Effluent Channel and PTAR Outfall	1	LS	$313,859.54	$313,860	MAV and CEISA 2020
	Drop	1	LS	$29,628.12	$29,628	MAV and CEISA 2020
	Receiving Box	1	LS	$24,255.31	$24,255	MAV and CEISA 2020
	Subaquatic Discharge	1	LS	$6,560,482.28	$6,560,482	MAV and CEISA 2020
	16% tax	16%			$3,832,484	MAV and CEISA 2020
	Total Equipment, Materials, and Construction Costs				**$27,785,507**	
Indirect Costs	General Contractor, Mob/Demob, Ins, Bonds, Gen Admin, Profit	30%			$8,335,652	
	Engineer and Administrative Contingency, 40% of subtotal	40%			$14,448,464	
	Contingency 50%	50%			$25,284,812	
	Total Indirect Costs				**$48,068,928**	
	Total Capital Costs				**$75,900,000**	
O&M Costs	**Total Annual O&M Costs**				$4,531,497	MAV and CEISA 2020
Life Cycle Cost	Total Capital Cost				$75,900,000	
	Annual O&M Costs				$4,531,497	
	Service Life				40	
	Present Value of Service Life O&M				$150,278,182	
	Major Upgrade(s) Cost at 20 years				$5,332,187	Major Equipment from 'Construction Costs' above
	Present Value of Major Upgrade(s)				$4,369,964	
	Interest Rate				3%	
	Inflation Rate				2%	
	Location Adjustment Factor				1	United States
	Total Life Cycle Cost (50 MGD)				**$230,500,000**	