Border Environment Cooperation Commission
Wastewater Collection and Treatment Project (Mexicali IV) in Mexicali, Baja California.

1. General Criteria

1.a Project Type

The project consists of expanding the wastewater collection system and "Las Arenitas" wastewater treatment plant with facultative lagoons for the community of Mexicali in the municipality of Mexicali in Baja California

This project belongs to BECC's *Wastewater Treatment* and *Domestic Water and Wastewater Hookups* Sectors.

1.b Project Category

The project belongs to the *Community Environmental Infrastructure Projects – Community -wide Impact*. The project will improve the Mexicali's wastewater collection and treatment service, resulting in a positive impact.

1.c Project Location and Community Profile

The state of Baja California is situated in the northeast of the Republic of Mexico which borders the United States of America. The city of Mexicali is located in the northeast of the state of Baja California and borders with the City of Calexico in the state of California. Mexicali's economy centers on agribusiness, manufacture, commerce, service industry and tourism. The last three occupy 52.10% of the employed population, however, due to its proximity to the United States, an important percentage of the population works in the manufacture sector. Figure 1 illustrates the location of the City of Mexicali in the Municipality of Mexicali, located in far northeast of Baja California.

Demographics

According to the National Institute of Statistics, Geography and Data Processing (2000) (INEGI, for its initials in Spanish) and the National Population Council (CONAPO for its initials in Spanish), the current population (2007) of the City of Mexicali has been estimated at 891,361 inhabitants[1], with a growth rate of 2.3%. The average per capita income amounts to US$11, 885.00[2].

[1] Source: CONAPO – Municipal Growth Projections for the 2006-2030 period.

[2] Source: GDP per capita in US dollars. BECC's estimation based on statistics from INEGI and "Comisión Nacional de Salarios Mínimos". Exchange rate $11.00 pesos per dollar.

Figure 1. Project Location, Mexicali, Municipality of Mexicali, B.C.

Municipal Services

Water System

Mexicali's water supply is obtained from the Colorado River and deep wells which yield approximately 80,234,624 cubic meters per year that are stored in the Morelos dam, located 85 km to the east of the city. From its storage point, the collected water flows through a series of irrigation channels and reaches the Bennassini canal which conveys the water to the treatment plants I and II of the city of Mexicali. The WTP Mexicali I and II in addition to the Xochimilco treatment plant have a combined design capacity of 6200 lps. The water distribution system has 2,149 km of pipe lines and the potable water reaches 98% of the population represented by 235,811 water connections.

Sewer System

Mexicali's wastewater collection system reaches 93% of the city's population. The system includes laterals, manholes, and collectors with a length of 1,753 km. A variety of collectors and lift stations transport the wastewater to the existing wastewater treatment plants.

Wastewater Treatment

There are two wastewater treatment plants; a) The Mexicali I WWTP, which receives and treats 1100 lps approximately and discharges into a farming drain that eventually reaches the New River, and b) The "Las Arenitas" WWTP which has a capacity of 880 lps and discharges into the Hardy river. Las Arenitas is located in the southeast of the city.

Pavement and Solid Waste

The community of Mexicali has solid waste collection coverage of 100%. According to the Department of Public Works of Mexicali, the pavement coverage is of 70%.

1.d Legal Authority

The project sponsor is the Public Services State Commission of Mexicali (CESPM for its initials in Spanish). The legal authority of the CESPM is established in the Baja California Law for State Service Commissions. The CESPM is an agency with its own assets, liabilities and legal personality, and has the

authority to provide water and wastewater collections services to the community, including the design and construction of urban water infrastructure projects.

The CESPM was created on December 8, 1967 by initiative of the Engineer Raúl Sánchez Díaz, governor of the state at the time. The decree No. 99, was approved by the V state legislature of the State of Baja California and published on the same month. The legal attributes of CESPM are described below:

I. Study and plan the water and wastewater collection systems and other services for the Municipality of Mexicali.
II. Carry out the Works associated with water supply and distribution, wastewater collection and other services.
III. Operate and maintain water and wastewater collection systems, and other services.
IV. Collect revenues as prescribed by Law.

The project complies with international agreements between Mexico and the United States, aimed to improve the environment and the quality of life of border residents. There are six bilateral agreements between both countries related to air quality, water quality, land protection and pollution control, and all of them have been taken into account since the onset of the project. These agreements are:

- 1889 International Boundary Convention
- 1944 Water Treaty
- 1983 La Paz Agreement, or Border Environmental Agreement
- 1990 Integrated Border Environmental Plan (IBEP)
- 1994 North American Free Trade Agreement (NAFTA)
- Border 2012 Program

The project complies with the spirit of all these agreements, and all of them have been considered since the onset of the project.

1.e Project Summary

Project Description

The Project consists of the construction of a wastewater collection and conveyance system for the east part of the city of Mexicali B.C[3]. It also includes the expansion of the Las Arenitas WWTP, which is a lagoon system. In particular, the project will be implemented in the zone identified as Mexicali IV. The project comprises 26.21 Km of sewer lines, with diameters ranking between 200 mm and 450 mm, two lift stations, a pump station, and a force main of 910 mm diameter and 21 km long that will convey the wastewater to the "Las Arenitas" WWTP. Table 1 shows the project components, length, population and estimated cost.

[3] http://www.congresobc.gob.mx/legislacion/estatal/

Table 1
Components of the Mexicali IV Project Area in the City of Mexicali B.C.

Project Component	Pipeline Length (m)	Number of connections	Benefited Population	Estimated cost ($Pesos M)
Col. Mariano Abasolo	**4,848**	**318**	**1,272**	**4,964**
Col. Bugambilia Jardines	**4,590**	**535**	**2,140**	**5,034**
Col. Islas Agrarias A	**14,865**	**1,816**	**7,263**	**12,826**
Col. Ladrilleros	**2,395**	**373**	**1,490**	**1,855**
Col. Lomas de Abasolo	**5,933**	**641**	**2,564**	**5,291**
Col. Cuernavaca	**15,585**	**1,350**	**5,400**	**17,943**
Col. Nuevo Amanecer	**3,787**	**548**	**2,192**	**3,566**
Col. Granjas Arco Iris	**3,988**	**409**	**1,636**	**5,044**
Col. Caldera	**4,565**	**727**	**2,908**	**5,195**
Subtotal	***61,797***	***6,646***	***26,868***	***61,718***
Colector Abasolo	**2,250**	**28,904**	**115,615**	**16,718**
Colector Lomas	**2,160**	**2,869**	**11,476**	**5,761**
Colector Ladrilleros	**1,604**	**31,663**	**126,650**	**11,906**
Colector Cuernavaca	**2,170**	**7,288**	**29,150**	**6,901**
Colector Mexicali IV-A (M4-A)	**2,583**	**59,500**	**238,000**	**23,474**
Colector Mexicali IV (M4)	**6,500**	**84,550**	**338,200**	**72,019**
Subtotal	***17,267***			***136,778***
Cárcamo Abasolo	**N/A**	**28,904**	**115,615**	**38,511**
Emisor Abasolo	**1,170**	**28,904**	**115,615**	**4,967**
Cárcamo Islas Agrarias	**N/A**	**4,443**	**17,700**	**39,372**
Emisor Islas Agrarias	**450**	**4,443**	**17,700**	**4,589**
Cárcamo De Bombeo # 10	**N/A**	**84,550**	**338,200**	**67,915**
Emisor a Presión # 10	**18,470**	**84,550**	**338,200**	**105,252**
Ampliación PTAR "Las Arenitas" (880 lps)	**N/A**	**84,550**	**338,200**	**62,188**
Subtotal	***20,090***			***322,794***
TOTAL	***99,154***	***84,550***	***338,200***	***521,290***

Source: CESPM 2006, CESPM 2007.

The Project cost will be $ 521.3 Million pesos.

Figure 2 depicts the configuration of the wastewater collection system and wastewater treatment layout for the area of Mexicali IV.

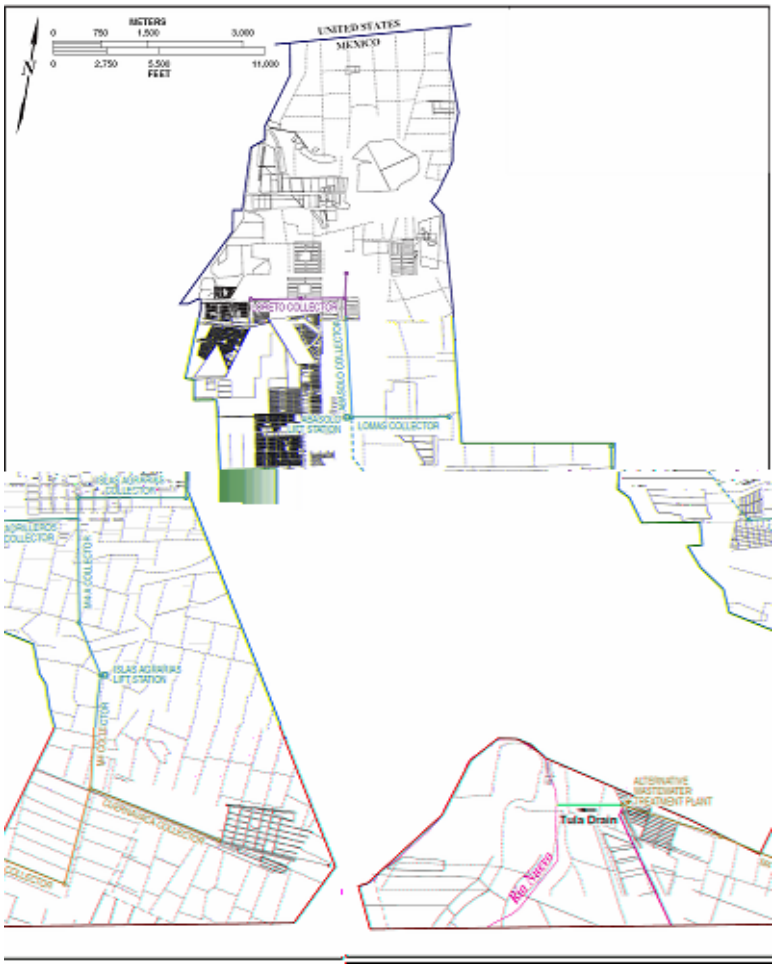

Figure 2. Sewer and WWTP system configuration Mexicali IV.

Project Justification

The expansion of the wastewater collection system will allow collecting 100% of the wastewater generated in Mexicali IV, thus reducing the potential for human contact with raw wastewater and vectors carrying diseases. Additionally, the risk of contaminating the aquifer and surface water bodies would be significantly reduced by eliminating latrines and cesspools. The collected wastewater would be treated at the Las Arenitas WWTP and then discharged into a drain that eventually reach the Hardy River, all of which results in environmental and human health benefits for the residents of Mexicali and United States.

Important issues for Certification:
The Project falls within the BECC's priority sectors and complies with General Criteria.

Pendent issues:
None.

2. Health and Environment

2.a Compliance with Applicable Environmental Laws and Regulations

The proposed works will be constructed according to the National Water Commission (CONAGUA) regulations and guidelines. Additionally, conservation areas are not anticipated to be affected by the project. , CESPM and CONAGUA will supervise the project implementation according to the established guidelines and best management practices.

The WWTP expansion has been designed in strict compliance with the Mexican Official Norm NOM-001-SEMARNAT-1996, which establishes the maximum allowable limits for contaminants in wastewater discharged into national water bodies.

Due to the Project will be constructed along existing right-of-ways and urban areas, it will not be necessary to consult the National Institute of Anthropology and History (INAH for its initials in Spanish) regarding impacts to cultural resources, archeological sites and historical monuments. With respect to the "Las Arenitas", the corresponding authorities have already evaluated the project site.

2.b Human Health and Environmental Impacts

Human Health Impacts

The project is located within the area identified as Mexicali IV in the southeast part of the city, a few kilometers from the US-Mexico border. The people living in this area lack wastewater collection and treatment services, causing potential health and environmental risks. The unserved areas' wastewater is disposed untreated to latrines and cesspools or directly discharged into agricultural drains that eventually discharge into the New River.

The lack of wastewater collection service along with the type of sandy-clayey soil, and a shallow water table, results in the creation of sewage springs, which constitutes a risk for transmitting diseases due human contact with this raw sewage. The purpose of this project is to address health risks and groundwater contamination as well as prevent risks inherent to inappropriate wastewater management.

The development of this project will help address these issues and improve public health conditions as follows:

(1) Human health conditions will be improved by reducing or eliminating wastewater overflows and the risk of human contact with sewage as a result of an improved wastewater collection system.

(2) Reduced potential for soil and aquifer contamination that may result from the inadequate use of latrines and septic tanks in areas that lack wastewater collection service, as well as from the use of poorly maintained lines and the discharge of raw wastewater onto arroyos or washes.

(3) With the expansion of the "Las Arenitas" WWTP, the construction of new sewer lines and the improvements to the existing collection system, the contamination of groundwater, surface water and soils will be reduced.

Human Health Information

Infections and gastrointestinal diseases constitute the most frequent cases of human disease in the zone, after the respiratory infections, according to Mexicali's health data. Human health statistics in the Mexicali zone reveal that there is a relationship between the inadequate handling and disposal of

wastewater and the incidence of gastrointestinal diseases in the study zone. Table 1 shows the high incidence of gastrointestinal diseases in the study zone. The sum of infections and gastrointestinal diseases represent about 14% of the most frequent cases in the zone.

The gastrointestinal diseases are associated with the inadequate disposal of wastewater and the supply of contaminated water. The helmitiasis, Amebiasis, and salmonella are frequently caused by poor wastewater management, lack of infrastructure, and contaminated water and food, and are conditions common to underprivileged areas.

Table 2

Number of cases associated with poor handling of contaminated water in the City of Mexicali B.C.

Cause	**Year**			
Intestinal illnesses (Other organisms)	**2003**	**2004**	**2005**	**2006**
Helmintiasis	32,268	36,196	36,799	32,592
Amebiasis	1,750	1,767	1,252	876
Typhoid and salmonella	1,235	1,141	1,066	1,019
Infections and unspecified	754	877	1,169	1,078

Source: SUIVE Department of Epidemiology of Baja California

The most common organisms or parasites found in untreated wastewater include: E. coli (*Escherichia coli*), cholera (*Vibrio cholerae*), hepatitis A (*Enterovirus ssp*), Giardia (*Giardia lamblia*), Cryptosporidium (*Cryptosporidium parvum*), and helminth eggs. An individual may become ill after drinking water that has been contaminated with these organisms; eating uncooked foods that have been in contact with contaminated water; or having bad hygiene habits that contribute to the dissemination of diseases by direct or indirect human contact.

Environmental Impacts

The environmental impacts of this project will be in general positive, for it will provide sewer to 100% of the people living in the Mexicali IV area and that lack these services, reducing the health risks associated with the inadequate handling of wastewater and infiltration of raw wastewater due to the use of latrines and cesspools. Further, the improvements will be constructed in previously affected areas.

The project construction will reduce the disposal of untreated discharges, produce by the existing unregulated systems from the project area, into the New River.

Minor impacts to the environment will be generated during the construction phase produced by the installation of sewer lines and WWTP expansion. These impacts include particulate matter emissions, gases generated by the construction equipment, temporary obstruction of streets, and potential hazardous conditions for workers, residents and vehicles.

To reduce the environmental impacts during the construction phase, mitigation measures will be taken such as watering roads to reduce dust, maintaining vehicles to reduce emissions, setting up precautionary signs, installing portable restrooms, etc.

Regarding the operational phase, negative impacts are not anticipated as long as the proposed activities are carried out as specified in the final design and stipulated in the environmental clearance process as specified in the ruling of the Environmental Impact Assessment.

Transboundary Impacts

No negative Transboundary impacts are expected by the implementation of the water distribution and wastewater collection project; on the contrary, a positive effect is expected on the US side mainly because untreated wastewater that is discharged to agricultural drains and the New river will now be sent to the "Las Arenitas" WWTP. Additionally, the risk of wastewater flow infiltration into the aquifer will be reduced and the risk for the US border people of contracting or spreading waterborne diseases will be reduced as well.

Formal Environmental Authorization

On May 29, 2007, CESPTM (file DG-269/07) presented the Environmental Impact Statement for the Constriction of Wastewater Collection and Treatment Improvements Projects Denominated as Mexicali IV to the Baja California Secretariat of Environment (file # 2.3C-252/2007). This agency issued its resolution on July 16, 2007, as annotated in an official document identified as SPA- MXL-1115/2007, only after it was verified that all requisites of the Mexican environmental process had been fulfilled.

Important issues for Certification:

The project resolves a significant human health and environmental problem.
The project has the required environmental clearance.

Pendent issues:

None.

3. Technical Feasibility

3.a Technical Aspects

Project Development Requirements

The sanitary sewer and wastewater treatment plant expansion design was conducted in accordance with the technical specifications of the Sewer and Wastewater Treatment Manual of CONAGUA Technical Division and the Mexican Official Norm NOM-001-CNA-1995 titled "Sanitary Sewer System – Tightness Specifications" and the "Technical Norms for Sanitary Sewer System Projects", of the State Water Commission of the state of Baja California. The effluent of the wastewater treatment plant will comply with the Mexican Official Norm NOM-001-SEMARNAT-1996.

Sewer System

The sewer Project was developed in strict compliance with the norms of CONAGUA. The design of the sewer system was developed in accordance with the alternative analysis and following the preferred option. The site topography afforded the opportunity to configure the system by gravity. The laterals will discharge their flows into collectors and then conveyed to lift stations, continuing to pump station No. 10, then via a force main reach the wastewater treatment plant. The lengths, diameters and manholes of the laterals are presented in Table 3.

Table 3
PVC Sewer Pipe Dimensions

Mexicali Zone IV – Laterals Network					
Component	**Length (ml) Diameter (mm)**		**Manholes**	**Ave. Flow (lps)**	**Connections**
Col. Mariano Abasolo	4001 ml	200 mm	53	3.38	318
	847 ml	380 mm			
Col. Bugambilia Jardines	3950 ml	200 mm	56	6.99	535
	640 ml	250 mm			
Col. Islas Agrarias A	12610 ml	200 mm	141	22.37	1816
	1014 ml	300 mm			
	1241 ml	450 mm			
Col. Ladrilleros	1923 ml	200 mm	29	5.10	373
	472 ml	300 mm			
Lomas de Abasolo	5785 ml	200 mm	93	7.31	641
	148 ml	250 mm			
Col. Cuernavaca	13337 ml	200 mm	145	23.44	1350
	1301 ml	250 mm			
	947 ml	300 mm			
Col. Nuevo Amanecer	3787 ml	200 mm	50	5.86	548
Col. Granjas Arco Iris	3578 ml	200 mm	44	6.78	409
	410 ml	250 mm			
Col. Caldera	4157 ml	200 mm	69	9.04	727
	295 ml	250 mm			
	113 ml	300 mm			

Collectors

The sewer system for Mexicali IV includes a series of collectors that will capture the flows from residential subdivisions. These collectors are distributed throughout the Mexicali IV area and were designed to handle the current and future flows contributed by the laterals. These collectors will discharge their flows into Pump Station No.10, and then the sewage flows will be conveyed to the "Las Arenitas" WWTP. The lengths, diameters, manholes and capacities are presented in Table 4.

Table 4
Collectors Pipe Design Data

Mexicali Zone IV – Collectors					
Component	**Length (ml) Diameter (mm)**		**Manholes**	**Ave. Flow (lps)**	**Connections**
Collector Lomas	720 ml	380 mm	23	29.9	2,869
	720 ml	450 mm			
	720 ml	610 mm			
Collector Abasolo	400 ml	760 mm	24	301.1	28,904
	1850 ml	910 mm			
Collector Ladrilleros	1604 ml	910 mm	16	329.8	31,663
Collector Cuernavaca	390 ml	450 mm	23	75.91	7,288
	610 ml	530 mm			
	500 ml	610 mm			
	670 ml	690 mm			
Collector M4-A	2583 ml	1070 mm	27	619.8	59,500
Collector M4	1500 ml -	1220 mm	27	880.7	84,550
	5000 ml -	1520 mm			

Lift and Pump Stations

The Project site exhibits a relatively flat topography that requires the design to be considerably deep, hence the need to construct lift stations to convey the wastewater and increase the head before the flows are sent to Pump Station No. 10 and eventually to "Las Arenitas" WWTP. The system is comprised of two lift stations and one pump station; the stations wet wells, designed for a residence time of less than 25 minutes to avoid septic conditions, will provide the necessary head to lift the maximum peak wastewater flows and will have an emergency (backup) system to protect the infrastructure for whenever there are power outrages. The ancillary structures include pretreatment, influent grit removal and screen to eliminate medium and large solids, as well as sands present in the wastewater flows, control room, power plant, dry and wet wells, and backup pump station equipment. The pumps will operate in sequence and activate based on the flow variation that occurs during the day. This type of lift station has a receiving and storage box that connect to the suction side of the pumping equipment and another one denominated dry well where the pumping equipment will be installed. The wells will have, calculated by design, additional volume to ensure that the equipment is submersed the minimum level required and that the peak or excess flows are properly handled. The lift station Abasolo has a flow of 700 l/s and will receive flows contributions from the Loreto, Lomas and Abasolo collectors. From the lift station Abasolo the flows will be sent via a force main to a transition box and discharged to the Ladrilleros collector. The Lift Station Islas Agrarias has a flow of 900 l/s and will receive the contributions of the following collectors: Ladrilleros, Islas Agrarias, and Mexicali IV-A (M4-A). This lift station will send the flows via a force main to a transition box and then discharged to the Mexicali IV (M4) collector that will take those flows

by gravity to Pump Station No. 10. The wastewater treatment plant design anticipates treatment for average flow 880 l/s that corresponds to the flow generated by the projected built-out population for Mexicali IV, similar to the flow that will be discharged by the collector M4 that has an average flow capacity of 880 l /s. The Pump Station will be constructed in two phases. The first phase, identified in this project, will pump the flows through 2024 and will provide coverage to 50% of the Mexicali IV zone service area. The estimated average flow of the first phase is 439 l/s and will have four equipment components, three of which will cover a instantaneous flow of 792 l/s and a fourth one as backup.

Final Force Main

The force main consists of a pressurized conveyance line that will be constructed along the highway to San Felipe in a southerly direction and that will convey raw sewage from Pump Station No. 10 to the "Las Arenitas" wastewater treatment plant. The force main will be ductile iron type K7 (ISO 2531) of 900 mm and will have a length of 18.47 Km, and includes 39 bypass and interconnection valves. This force main will reach first a steel reinforced concrete diversion box, at the WWTP, that will split the flow evenly into each one of the treatment lagoons. The lengths, diameters, and flows of the lift stations and collectors are presented in Table 5.

Table 5
Lift Stations and Force Main General Data

Lift Stations and Force Mains of Mexicali IV				
Component	**Avg. Flow (l/s)**	**Length (ml) Diameter (mm)**	**Connections**	**Benefited Population**
Abasolo Lift Station (PBAR-12)	700 lps	N/A	67 200	268 800
Abasolo Force Main		1770 ml 610 mm		
Islas Agrarias Force Main (PBAR-11)	900 lps	N/A	86 400	345 600
Islas Agrarias Lift Station		450 ml 760 mm		
Lift Station # 10 (PBAR-10) 1st Phase	880 lps	N/A	84,550	338,200
Force Main # 10 1st Phase		18470 ml 900 mm		

"Las Arenitas" Wastewater Treatment Plant

In May 2007, CESPM concluded the design of the Las Arenitas WWTP expansion. This plant is located next to the Cerro Prieto Volcano, in an area completely uninhabited at the 22-Km of the Mexicali – San Felipe highway. The WWTP is in operation and has an 880-l/s module that treats the flow from the Mexicali II Zone. The plant is of the lagoon type and the new module will have the capacity to treat an average flow of 880 l/s with a hydraulic retention time of 8.9 days. The effluent will be discharged to a drain and will flow in a north-to-south direction toward the Hardy river. The treatment will be continuously batched using partially aerated lagoons and facultative lagoons in series without aeration and disinfected with chlorine gas. In order to provide protection against seepage from the interior sides of the berms and to provide slope stability, the installation of a 1-mm thick high-density polyethylene liner, placed atop a 200 gr/m2 geotextile screen to prevent possible damages to the HDPE liner was considered.

Primary Treatment

The primary treatment for the new module will include four partially aerated lagoons. Six directional aerators that will operate simultaneously and continuous will be installed at each lagoon. The partially aerated lagoons will be constructed with excavated material and will have a rectangular shape with the following dimensions: Width 98 m, Length 198 m and water line of 4 m. The lagoon has a design flow of 210 l/s with a 3.77-day calculated retention period. The semi-treated effluent in the partially aerated lagoons will flow by gravity through pipes to the facultative sedimentation lagoons. The rectangular-shaped lagoon walls will be constructed with the material that results from the excavation and will have the following dimensions: Width: 98 m; Length: 170 m; Depth: 2.2 m. Each lagoon will have a design flow of 220 l/s with a retention time of 1.7 days. The partially treated effluent will go from the sedimentation lagoons to the primary lagoons. The rectangular-shaped primary lagoons will also be constructed with excavated material and will have the following dimensions: Width: 98 m; Length: 204 m, and Depth: 1.8 m. Each lagoon will have a design flow of 220 l/s with a retention time of 1.7 days.

Secondary Treatment

The facultative lagoons will have similar characteristics to those of the sedimentation lagoons, with berm walls constructed from the excavated material with the following dimensions: Width: 98 m, Length: 242 m, and Depth: 1.5 m. The treated effluent will flow by gravity to the disinfection system. The chlorination will take place in the first contact tank chamber by adding previously diluted chlorine. The tank will have six chambers to achieve the required 15 minutes for handling the 1,260 l/s peak flow. The chlorine dosage at this point of the plant will be 4 ppm of pure chlorine so that at the final discharge there will be fecal coliforms of 1000 NMP/100 ml. The treated effluent will be discharged through a structure located at an adjacent agriculture drain and into the Hardy river, which is a tributary to the Colorado river that empties in the Gulf of California. Figure 3 shows a top view of the WWTP arrangement.

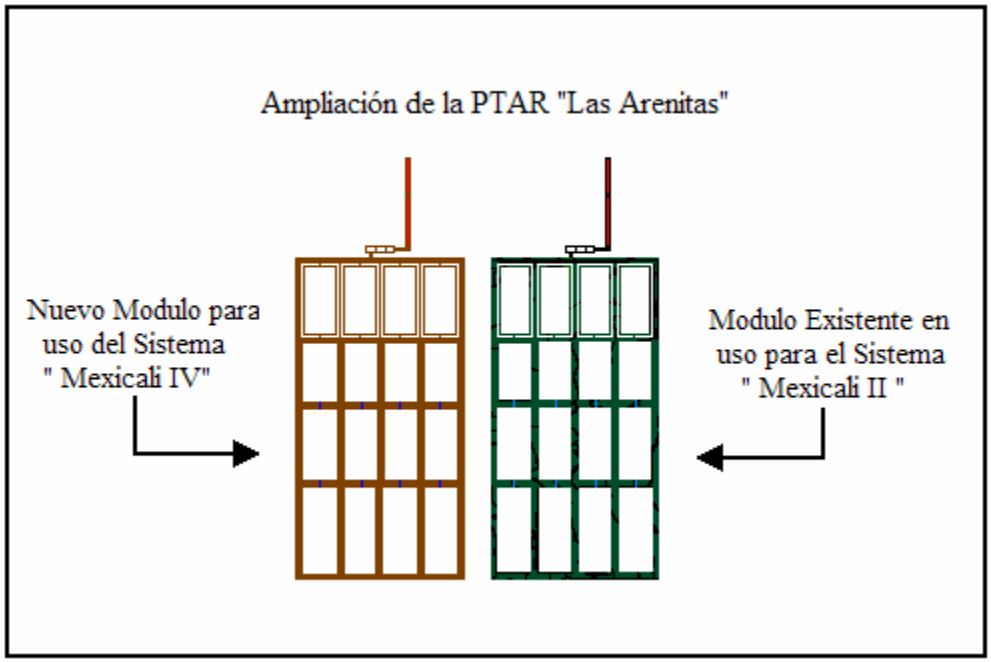

Figure 3. Wastewater Treatment Plant Top

Sewer and Wastewater Treatment System

In order to have an adequate sanitary sewer and wastewater treatment system that operates in an efficient manner, a concept was developed to evaluate multiple technical alternatives. The analyzed alternatives consisted basically of studying the following:

a) **No Action**. Because of implications with the environment, human health and social issues, this alternative was discarded from the beginning, given that the current population would continue to discharge raw sewage into latrines and poorly designed cesspools, which tend to create human health risks due to surface runoff of sewage or potential contamination of the shallow aquifer.

b) **Construct the system such that it discharges onto another treatment location.** This alternative was analyzed and discarded, mainly because it implies the construction of a new extended aeration activated sludge plant. This alternative requires the total discharge of effluent at Pump Station No. 10, and would be sent through a 760 mm-diameter 6.6 Km-long force main to the new plant, whose initial capacity would be 400 l/s in its first stage. Although the sewer system would be the same, it would require much more energy because the O&M costs of this type of plant are elevated. Further, having specialized personnel operate this plant would make this alternative financially unacceptable. Moreover, the cost-benefit analysis of this alternative turns out to be less because requires the construction of a new plant and the associated O&M costs of the new technology. Additionally, the construction of the new WWTP would produce additional environmental impacts associated with the urban setting of the area.

c) Construct the sewer system such that it will discharge at the existing wastewater treatment plant. This option was analyzed and was considered to be the most adequate because, even though it includes the construction of a new, longer and larger force main, its operation costs are less than the cost associated with building, maintaining and operating a new plant. In addition, this alternative requires less skilled people, less maintenance requirements, and its operation cost is less. Additionally this alternative would not produce additional environmental impacts since the vast majority of the project would be implemented in previously impacted areas. These factors make this alternative the most viable for the community.

Treatment

The effluent from the "Las Arenitas" WWTP will meet the discharge quality requirements as established by the Mexican Official Norm NOM-001-SEMARNAT-1996. Concerning the handling and disposal of the sludge produced by the WWTP operation it meets the requirements of the Mexican Official Norm NOM-004-SEMARNAT-2002.

Property and Utilities Requisites

Since the sewer lines will be constructed within the urban area and there is ROW there will be no need to acquire ROW or land. The land for lift stations and the pump station was donated by urban developers to the municipality. The land for the expansion of the "Las Arenitas" WWTP was previously acquired. The plant expansion had been considered during the original acquisition operation. BECC has documentation as proof of the land ownership.

Tasks and Schedule

The Project certification comprises all of the previously described elements. The sanitary sewer construction process was initiated in September 2007. The rest of the sewer system and WWTP is expected to be constructed in the 2008-2010 period. Figure 4 shows the project schedule.

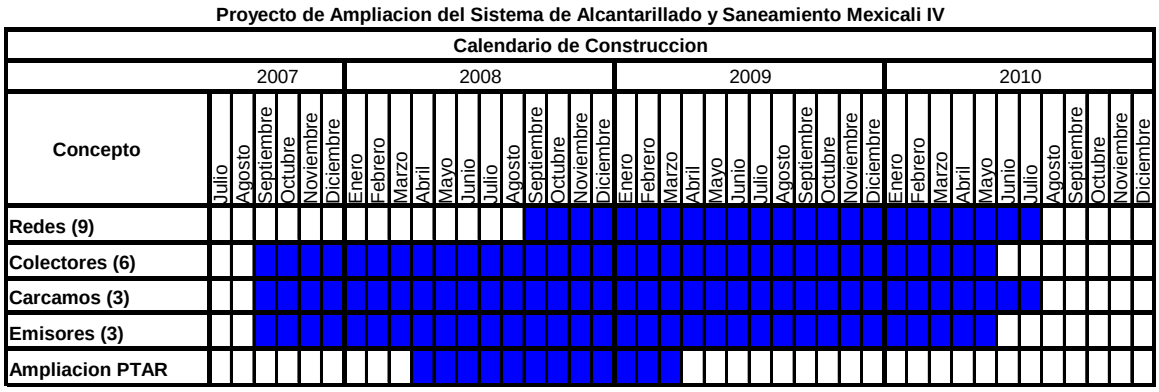

Figure 4. Project Construction Schedule.

Technical Process

The treatment process is sufficient to achieve an acceptable quality for reuse, eliminating human health risks that could arise because of contact with the treated wastewater, as prescribed in Mexican Official Norm NOM-001-SEMARNAT-1996, which establishes the maximum allowable limits for discharge into federal bodies of water. The technology has been used extensively and effectively to achieve the desired results of this project. The treatment system will produce a quality effluent better than that required for agricultural reuse (75 mg/l BOD and 75 mg/l of TSS). The treated wastewater will have, in average the following: 30 mg/l BOD and 40 mg/l TSS. The handling and disposition of the sludge produce by the WWTP will comply with the Mexican Official Norm NOM-004-SEMARNAT-2002.

3.b Management and Operation

Project Management

The Project will be manager and administrated by CESPM.

Operation and Maintenance

Organization

CESPM, as a decentralized agency of the state of Baja California, is governed by a Board headed by the state's executive power and is composed of various government and public-at-large members, which have the mission of providing potable water and sewer to Mexicali and its valley. The CESPM has the technical capacity and skilled personnel to operate and maintain the water and sewer infrastructure. The Water and WW Treatment Department includes the sewage division that handles the operation of the sewer and wastewater treatment plant. Furthermore, the division has a section that specializes in maintaining the sewer network, pump station and force mains. CESPM also has skilled personnel that operate and maintain the WWTP.

Operation and Maintenance

The O&M plan that is included in the Project design, addresses the main activities for conducting preventive maintenance on the sewer and treatment systems. CESPM will be responsible for the O&M program.

The sewer infrastructure preventive maintenance has the primary objective of providing a useful tool to carry out the activities associated with controlling effluent quality, sound O&M practices and to prevent failures of the system. By ensuring the proper operation of the system, the target effluent quality will be achieved. Maintenance of the pumps, gates, screens, valves and other structures such as berms and slopes should be a constant and pre-scheduled task.

Pre-Treatment Program

CESPM has expressed that they will comply with the Mexican Official Norm NOM-002-ECOL-1996, which establishes the maximum allowable limits for wastewater discharges into the municipal sewer system. CESPM, with support from the Municipal Ecology Department, will be in charge of monitoring compliance of this norm. In light that the project will be located within residential developments, no additional pre-treatment is anticipated beyond the one proposed for the efficient operation of the system in accordance with the O&M Plan.

Permits, Licensees, and other Regulatory Licenses

CESPM has the appropriate permits from CONAGUA to discharge wastewater, and also has the environmental authorizations for the development of the projects. The sewer and wastewater treatment projects have been reviewed by BECC, CESPM and the North American Development Bank, and have been validated by CONAGUA.

Important Issues for Certification:

The project has been reviewed by BECC, CESPM and the NADB, and has been validated by CONAGUA

Pending Issues:

None.

4. Financial Feasibility

4.a Financial Feasibility

The North American Development Bank (NADB) reviewed the financial information presented by the project's sponsor, the Comisión Estatal de Servicios Públicos de Mexicali, Baja California (CESPM), and based on it determined that the financial and structural capacity proposed are adequate. The information presented and the financial analysis include, among other items:

i) Historic and pro forma financial statements;
ii) Financial structure of the project;
iii) Investment budget;
iv) Historic and pro forma operation and maintenance budget; and
v) Economic and demographic information from the project area.

A detailed analysis of the project's financial information is included as a proposal for credit that will be submitted to the NADB Board for its authorization. The following is a summary of the financial analysis.

The total cost of the project is estimated at MX$521.290 million, including value-added-tax.

Item	Amount (Pesos)
Sewer Network, Collectors, Lift and Pumping Stations, Force Mains, and Wastewater Treatment Plant	521,290,000
TOTAL	521,290,000

The CESPM y the BDAN agreed that the financial structure will allow the implementation of the project, as further indicated:

Financial Source	Type	Amount (Pesos)	%
CESPM-State-Federal	NR[4]/Grant	321,290,000	61.63
NADB	Loan	200,000,000	38.37
TOTAL		521,290,000	100.00

The CESPM has a professional financial and technical administration; a solid financial situation is reflected, in general, by their level of revenue and control for the last five fiscal years. Additionally, the NADB credit will not affect its financial situation.

4.b Fee/Rate Model

[4] Net Revenue

Due to the characteristics of the project, the CESPM will not require the implementation of a fee model for the project. Currently, the CESPTE has an adequate rate scheme that provides sufficient income to cover its operation and maintenance costs and the debt service.

4.c Project Administration

The project will be managed by the CESPM, who has the adequate staff to manage the proposed infrastructure and address any potential emergency related to the operation and maintenance of the project, once it starts operating.

Important Issues for Certification:

The project has been reviewed and was determined that is financial feasible.
Pending Issues:

None.

5. Community Participation

5.a Local Steering Committee

The Comprehensive Community Participation Plan developed by the Local Steering Committee was approved by the BECC on December 5, 2005. The Local Steering Committee was responsible for preparing an outreach program, including informing the resident of the benefits resulting from the project, as well as the associated costs and economic impacts for the community.

The Local Steering Committee was formally established on March 18, 2003, and was reactivated to assist the public participation process for the Wastewater Collection and Treatment Project (Mexicali IV), at a meeting held at the CESPM Facilities at which, representatives of the community such as the neighbor's committee from the Colonia Abasolo assisted, as well as the members of the association of user of the Rio Hardy, and member of the construction and commerce chambers. CESPM, COCEF and Engineering Associations also participated. A Board of Directors was elected, and is integrated by the following individuals:

Chairman of the Steering Committee: Ing. Rogelio Blanco Jester, Representative of the Mexicali's Civil Engineers Association

Secretary: Lic. Juan José Sánchez Soler, Representative of the Chamber of the Construction Industry

Public Meeting Official: Ing. David Antonio Vázquez Oropeza, CESPM Department of projects

Outreach Officials:

- Lic. Antonio Solano Larrañaga
- Ing. Ricardo Valenzuela Stevenson
- Lic. Rene X. Acuña Uscanga
- Arq. Roy Blanco Cordero
- Ing. Armando Aranda Miranda
- Ing. Marco Antonio Vilchis

5.b Public Access to Project Information

Public Notice

An invitation to the First Public Meeting, scheduled to be held on December 13, 2005, was published on November 13 in the "La Crónica" newspaper. A notice for the second public meeting scheduled for September 20, 2007 was published on September 14, 2007 in the "La Crónica" newspaper.

Additional Outreach Activities

The Local Steering committee in coordination with the CESPM prepared written information about the project, which was distributed during the public meetings. Project information was available with the Local Steering Committee and at the utility's facilities. Information meetings were held with local residents and members of the community in anticipation of BECC public meetings.

Public Meetings

First Public Meeting

The public meeting was held on December 13, 2005, in the recreational park "Rio Hondo" in Mexicali. The meeting was attended by the Local Steering Committee and the CESPM Director Ing. Efrain Muñoz

Martin. Several of the project area residents assisted to the meeting. During the meeting surveys were applied from which it was established that they understood the project and provide support.

Second Public Meeting
This meeting is programmed to be held on September 19, 2007.

5.c Final Public Participation Report

The Local Steering Committee and the project sponsor will prepare the "Final Public Participation Report" to demonstrate that the proposed objectives were fully met according to BECC's criteria. This document will be submitted once the second public meeting is held.

Important Aspects for Certification:

There is overwhelming community support for the project, and the corresponding information to demonstrate public support is available.

Pending Issues:

- Second public meeting.
- Final Public Participation Report

6. Sustainable Development

6.a Institutional and Human Capacity Building

Actions within the scope of the project that contribute to institutional and human capacity building at the State Commission of Public Services for Mexicali (CESPM) are the following:

- Improving the utility's necessary wastewater collection and treatment infrastructure (wastewater collection lines).
- Operating a wastewater collection system that meets applicable state and federal regulations.
- Provide training to operating staff.
- Optimize the use of water resources and create environmental stewardship in the community
- Promote the development and revision of laws and regulations that affect the functioning of the utility, in order to fulfill all the federal and state laws and norms.

CESPM will provide basic technical training to the staff for the operation and maintenance of the new infrastructure that will be built as a result of the project's implementation.

6.b Conformance with Applicable Local, State, and Regional Laws and Regulations and Conservation and Development Plans

As referenced in Chapter 2, the project complied with all laws and regulations applicable to the subject. In addition, the project supplements the actions set forth in the Master Plan for Improvements to Water, Wastewater and Collection Services in Mexicali B.C., which include the need to develop basic sanitary infrastructure works for unserved areas in Mexicali. The proposed project complements the actions considered in the 2005-2007 Municipal Development Plan, which proposes to improve wastewater collection coverage and create new infrastructure.

At the state level, the project meets the objectives and lines of actions set forth by the 2025 Development Plan for the City of Mexicali, which proposes to develop appropriate wastewater treatment facilities and infrastructure, and a more efficient enforcement of environmental rules and regulations to address water management issues with a long-term vision and financially viable, community endorsed, and environmentally sustainable alternatives.

At the federal level, the project meets all applicable rules and regulations regarding wastewater collection, treatment, and disposal. It also includes action lines and works contained in the National Hydraulic Plan (PNH), which intends to promote actions to reduce pollution in binational watersheds.

The project adheres to the US-Mexico Border 2012 Environmental Program by meeting Goal 1 (Reducing water contamination) and Objectives 1 (Promoting an increase in the number of household connections to wastewater collection and treatment services) and 4 (Promoting improved water utility efficiency). One of the program's guiding principles is reducing major risks to public health and conserving and restoring the natural environment.

6.c Natural Resource Conservation

The project contributes to reduce environmental deterioration by expanding existing wastewater collection lines and providing hookups to households that currently lack this service. Wastewater will be collected and conveyed to the WWTP to improve its quality, thus reducing aquifer contamination and human health risks resulting from raw wastewater discharges to streams or agricultural drains.
The project also includes the implementation of sustainable building practices that will be part of the specifications of the construction process.

6.d Community Development

The completion of this project is crucial to the development of the community, as it will promote a harmonious development in areas that currently lack wastewater collection and treatment services. The expansion of the wastewater collection system will promote the development of the local community by reducing contamination caused by untreated wastewater runoff, thus improving the quality of life. The treated effluent with added treatment could have other uses such as irrigation in parks and fields.

Important Aspects for Certification:

The project meets all applicable Sustainable Development principles.

Pending Issues:

None.

Project Documentation Available:

- ”Estrategia de Gran Visión para el Abastecimiento y Manejo del Agua en las ciudades y Cuencas de la Frontera Norte en el Período 1999-2025”, CONAGUA, December 1999.

- Proyecto Ejecutivo de Alcantarillado Mexicali IV.”. Comisión de Servicios Públicos de Mexicali, November-March 2007.