

Border Environment Cooperation Commission

Water Distribution and Wastewater Collection and Treatment Projects for Rio Bravo and Nuevo Progreso, Tamaulipas

1. General

1.a Project Type

The project consists of improvements to and expansion of the water distribution and wastewater collection systems, in addition to the construction of a wastewater treatment plant based on oxidation lagoons for the communities of Rio Bravo and Nuevo Progreso, Tamaulipas.

This project belongs to the *Household Connections to Water and Wastewater Collection Services*, and *Wastewater Treatment* sectors.

1.b Project Category

The project falls in to the *Community Environmental Infrastructure Projects – Community-wide Impact* category, inasmuch as it will improve the quality of water and wastewater collection and treatment services for Rio Bravo and Nuevo Progreso, and will result in a positive impact for these communities.

1.c Project Location and Community Profile

The State of Tamaulipas is located in the northeastern part of the Republic of Mexico and

Demographics

Population projections prepared for the development of the "Final Design of Wastewater Infrastructure for Río Bravo and Nuevo Progreso, Tamps." were based on census data obtained by the National Institute for Statistics, Geography, and Information (INEGI), and the National Population Council (CONAPO). By 2008, the number of residents for both communities combined was estimated to be 93,603, with an annual -0.17% growth rate. The communities' median per capita income is \$3,072 pesos per month¹.

Public Services in Río Bravo

Water System

The system obtains its water supply from the Anzalduas Canal, which reaches the Río Bravo after crossing through the city of Reynosa. The system's pumping capacity is 400 lps. Water is pumped for 492 ft to be delivered to the water treatment facility. The water treatment plant's installed capacity is 400 lps (two modules with 200 lps capacity each). The city has 200 miles of water lines that vary in their diameters. Water is stored in 4 elevated storage tanks.

The current water coverage rate is 87%. Records indicate the number of existing water connections is 21,257. The overall average water rate is 4.80 Mexican pesos per cubic meter, with 40% of this figure being used to cover sewage collection costs. The utility user registry is made up of 96.2% residential connections, 3.5% commercial connections, and 0.3% industrial type connections.

Sanitary Wastewater Collection System

The wastewater collection system consists of 174 miles of sewer collection lines and 15 secondary collectors that convey wastewater to 3 mains, a collector, and ultimately to a receiving body or on-farm drainage system called the Río Bravo Drain, whose final discharge point is the Laguna Madre. The wastewater collection coverage rate is low, as only 66% of residents are served through 13,851 sewage connections. Residents who are not connected to the wastewater collection system dispose of their wastewater in latrines and cesspools.

Wastewater Treatment

Wastewater treatment is non-existent.

Solid Waste

Street Sweeping System

Street cleaning is manually performed by employees of the Sanitation Department. One hundred and seventy dumpsters are used to collect the solid waste using this method. In addition, mechanical sweeping is used for cleaning the city's main thoroughfares. The system uses two mechanical sweepers that were repaired in 2005; accordingly, they are in good operating conditions.

Waste Collection System

Waste collection services are provided by the city through the Department of Primary Services. The system uses garbage collection trucks with fixed routes, two mechanical sweepers, dumpsters, and push carts for manual street sweeping.

¹ Source: BECC estimation based on statistics by INEGI and the National Commission of Minimum Wages.

Waste Treatment

The city does not provide any solid waste treatment, although there is pre-sorting ("*pepena*") of the waste during collection routes, and materials such as plastic, cardboard, glass, and aluminum are picked out of the loads by workers.

Final Disposal

The dumpsite that serves this community is located 14 km southeast of the city; it covers 18 hectares of which 14 (80%) are currently operational. This is an open site that has no scale and does not meet the provisions established by applicable regulations for the operation of a sanitary landfill or for closure at the end of its life cycle.

To address the issue of solid waste generated by the Municipality of Río Bravo, officials have highlighted the need to establish a solid waste landfill. A 50-hectare tract of land has been purchased for this purpose, located along Federal Highway 109, about 14 km south of the Ciudad Río Bravo.

Street Paving

70% of the local streets and avenues may be considered paved. The remaining 30% of the roads are covered with dirt; however, they may be traveled during any time of the year.

Public Services in Nuevo Progreso

Water System

Villa Nuevo Progreso obtains its water supply from 2 deep wells located within the city limits. Water supply is available 24 hours/day. The capacity of available pumping equipment is 40 and 30 HP. The municipal utility, Junta de Aguas y Obras Municipales, currently has a registry of 2,014 users, and water service coverage is estimated to be 95%. The make up of the utility's user registry includes 88% residential connections and 12% commercial connections.

Sanitary Wastewater Collection System

The wastewater collection service coverage rate is low, estimated to be slightly above 30%. The system consists of 685 sewage connections recorded in the user registry.

Wastewater Treatment

The city has a lagoon-based wastewater treatment system that is not operational at the time. Wastewater is discharged into an agricultural drain that ultimately reaches the Río Grande.

Solid Waste

Street Sweeping System

Street sweeping is carried out by Public Works personnel only at the downtown square and the highway that crosses the city. Street sweeping in other areas is performed by the residents themselves in their properties.

Solid Waste Collection System

Villa Nuevo Progreso has 3 solid waste collection trucks that operate five collection routes.

Solid Waste Treatment

The city does not provide any solid waste treatment, although there is pre-sorting ("*pepena*") of the waste during collection routes, and materials such as plastic, cardboard, glass, and aluminum are picked out of the loads by workers.

Final Disposal

The existing dumpsite in Villa Nuevo Progreso is located 2 km south of the community, about 750 meters from the highway to Ciudad Río Bravo. The site covers an area of 2 hectares, of which 1.5 hectares have already been occupied for several years, and garbage has been buried on site. The remaining half hectare shows evidence of more recent waste disposal activities.

Street Paving

The street paving coverage rate in Nuevo Progreso is approximately 30%.

1.d Legal Authority

The project sponsor is the local utility, *Comisión Municipal de Agua Potable y Alcantarillado de Río Bravo* (COMAPA), in coordination with state utility, *Comisión Estatal de Agua de Tamaulipas* (CEAT).

Under the Constitution of Mexico, Article 115, Section III, Subsection A, the provision of public water and wastewater collection services is a responsibility of local municipalities.

On August 7, 1992 the Government of the State of Tamaulipas published on the Official Journal Executive Order No. 319 to issue the Water and Wastewater Service Act for the State of Tamaulipas, with the purpose of legally establishing in each municipality a decentralized utility with legal standing and equity, headquartered in their respective head of municipality.

Additionally, on December 5, 2002, the Government of the State of Tamaulipas published on the Official Journal Executive Order No. 124, which amends the aforesaid Water and Wastewater Act.

The project falls within the scope of agreements targeted at improving the environment and the quality of life of border residents, which have been signed by Mexico and the United States. Both countries have signed six major bilateral agreements related to air, water, land protection, and pollution control issues. These include:

- 1889 International Boundary Convention
- 1944 Water Treaty
- 1983 La Paz Agreement, or Border Environment 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 project was originally conceived.

Project Summary

Project Description

The project consists of the expansion and rehabilitation of the existing water and wastewater collection systems, and the construction of a new lagoon-based wastewater treatment plant (WWTP) for the communities of Río Bravo and Nuevo Progreso.

Figure No. 2 shows the primary components of the wastewater collection and treatment system.

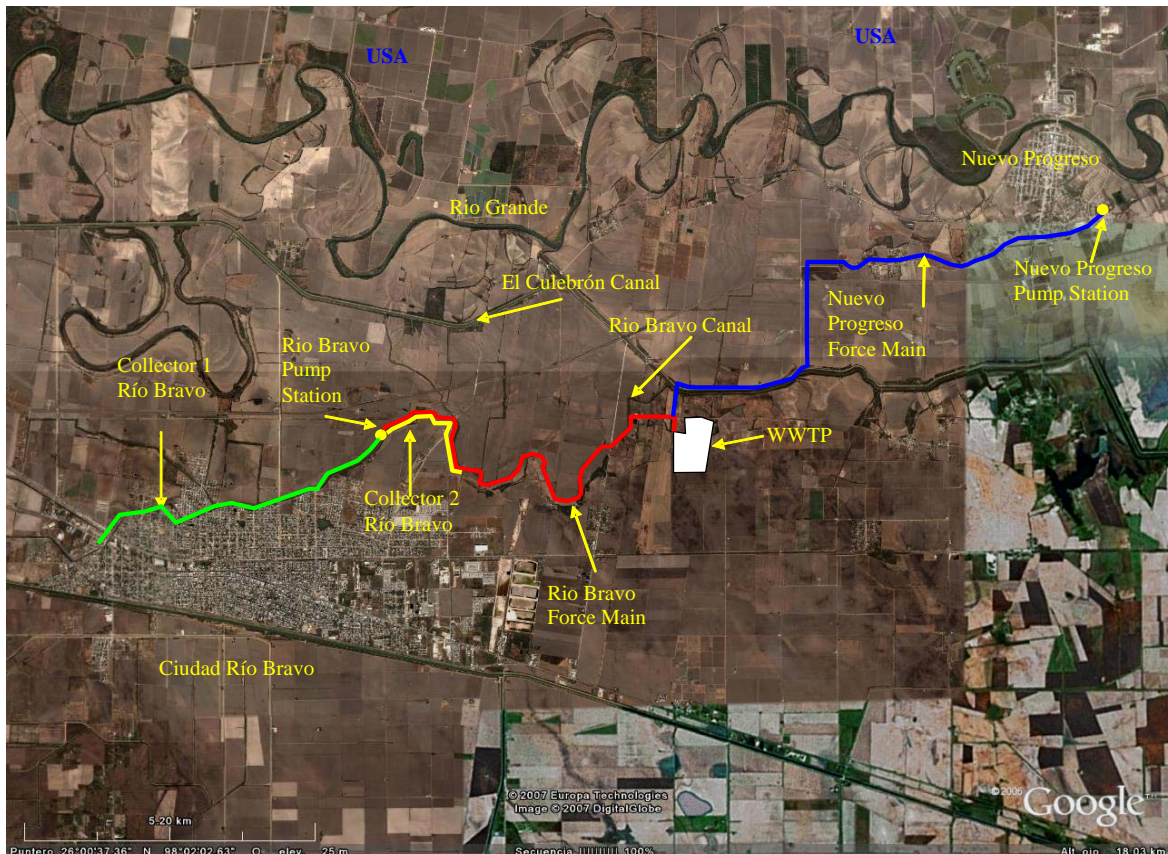


Figure 2. Location of Wastewater Treatment Plant, lift stations, and conveyance lines in Río Bravo and Nuevo Progreso, State of Tamaulipas.

The project includes the following components:

Expansion of the Río Bravo water system

- 8,704 ft of 3 inch PVC piping
- 57,322 ft of 6 inch PVC piping
- 12,631 ft of 14 inch PVC piping
- 7,329 ft of 16 inch PVC piping
- 10,925 ft of 20 inch PVC piping

Expansion of wastewater collection lines throughout 16 subdivisions (*colonias*) in Río Bravo, and installation of wastewater collection system in currently unserved areas.

- 140,895 ft of 8 inch PVC piping

- 18,677 ft of 12 inch PVC piping
- 1,181 ft of 18 inch. PVC piping

Rehabilitation of the Wastewater Collection System in 6 colonias of Río Bravo

- 54,271 ft. of 8 inch PVC piping
- 10,036 ft of 12 inch PVC piping
- 5,285 ft of 18 inch PVC piping

Expansion of the Wastewater Collection System in Nuevo Progreso.

- 19,117 ft of 8 inch PVC piping
- 7,644 ft of 12 inch PVC piping
- 15,098 ft of 8 inch PVC piping

Construction of the Río Bravo Main Sewer

- 30,046 ft of high-density polyethylene lines between 14 and 36 inches. in diameter.

Force Main from Nuevo Progreso to the Wastewater Treatment Plant

- 35,567 ft of 12 inches. diameter high-density polyethylene lines.

Force Main from Río Bravo to the Wastewater Treatment Plant

- 27,746 ft of 26 inches. diameter high-density polyethylene lines.

Río Bravo to WWTP Pump Station

- Includes 3 pumps with 150 KW and 200 lps capacity each.

Nuevo Progreso to WWTP Pump Station

- Includes 3 pumps with 45 KW and 33 lps capacity each.

Lagoon-based Wastewater Treatment Plant with capacity for 5.48 MGD.

- Includes a treatment train consisting of two anaerobic lagoons, two facultative lagoons and a maturation pond and the treated water discharge pipe.

The cost of the project will be US \$29.2 million.

Project Justification

With the implementation of the water project, a reliable and efficient distribution system will be in place that would reduce the transmission risk of water related diseases. The proposed wastewater collection system would allow the collection of 100% of the wastewater produced in the cities of Río Bravo and Nuevo Progreso, thereby reducing the potential human contact with wastewater and disease carrying vectors. In addition, potential underground and surface water contamination will be reduced with the elimination of latrines, septic tanks and cesspools. The effluent of the proposed WWTP will be discharged in agricultural drains, providing an environmental and human health benefit to the residents of the area and neighboring areas of the U.S. Furthermore, untreated wastewater discharges to the Río Grande will be eliminated. The WWTP sludge will be disposed of in the solid waste landfill in approximately 5 year periods.

This project was assessed as a Category 1 Project in the 2005/06 Environmental Protection Agency (EPA) Prioritization Process, due to the lack of local wastewater treatment infrastructure.

Important aspects for Certification:

The project falls within BECC's priority sectors and complies with the basic general criteria.

Pending Issues:

None.

2. Human Health and Environment

2.a Compliance with Applicable Environmental and Cultural Resource Laws and Regulations

The Final Design for the proposed wastewater treatment facility was developed considering applicable environmental regulations established by Official Mexican Standard NOM-001-SEMARNAT-1996, which establishes the maximum permissible levels of contaminants for wastewater discharges to national waters and properties.

The development of the proposed tasks will follow the guidelines established by Mexico's National Water Commission (CONAGUA) for the construction of this type of structures. Additionally, the tasks to be developed are not expected to impact protected areas or ecological reserves. During the project's implementation, CEAT and CONAGUA will oversee the tasks for conformance with the aforesaid guidelines.

The National Institute of Anthropology and History, through Official Communication No. 042/2006 found no objection to the development of the WWTP project, inasmuch as there is no evidence of archeological or historical settlements in the area and other tasks proposed by the project would be performed in urban areas that have already been developed. Based on the above, no impacts to cultural resources are anticipated as a result of the project's implementation.

2.b Human Health and Environmental Impacts

Human Health Impacts

The lack of an adequate water distribution system in various areas of Río Bravo and Villa Nuevo Progreso represents a major water contamination risk. Low water pressure creates a potential for cross-connections that allow for contaminated water to enter the system; this water may potentially be distributed to end users. The lack of chlorination allows for bacterial growth in the lines, with the associated health risks. Finally, the local practice of transporting water from the water well source to their houses involves water contamination.

The public health impact resulting from improved water service will be positive, as there will be available water with the necessary quality to prevent health risks, water disinfection will be appropriate, and local residents will have water in sufficient quantity and quality to ensure their well-being.

The Río Bravo wastewater collection system discharges raw wastewater to the Río Bravo canal, which eventually discharges into the Laguna Madre. Nuevo Progreso discharges its wastewater into an agricultural drain and eventually to the Río Grande, as there are no sewers to collect and convey said wastewater to a treatment site. This practice creates a human health and environmental hazard, and jeopardizes the health status of both Mexican and United States communities downstream from Río Bravo and Nuevo Progreso that obtain their water supply from the Río Grande.

Additionally, inasmuch as there is no treatment for the wastewater generated by these communities, once raw wastewater is discharged into the Laguna Madre and the Río Grande, it becomes a source of infection, as it favors the development of vector-borne diseases, and

wastewater seepage causes contamination of subsurface water and water tables and the corresponding environmental deterioration. The purpose of this project is to address the existing public health and groundwater contamination risks, and to prevent the risks associated to inadequate wastewater management.

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

- (1) Improvements to the water system will reduce the risk for the transmission of infectious diseases associated to inadequate water management.
- (2) Human health conditions will be improved by reducing or eliminating wastewater leaks and overflows as a result of an improved sanitary wastewater collection system; the risk of the residents' contact with wastewater will also be reduced.
- (3) 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 to agricultural canals.
- (4) The construction of new lines, lift station, and the improvements to existing wastewater collection lines, will reduce groundwater, surface water, and soil contamination.
- (5) The construction and operation of the proposed WWTP will reduce groundwater, surface water, and soil contamination.
- (6) The project will help prevent contamination of the Rio Grande, the main source of water supply for communities downstream from Rio Bravo and Nuevo Progreso.
- (7) The project will help prevent contamination of the Laguna Madre resulting from raw wastewater discharges from Rio Bravo City.
- (8) The project will eliminate the risk for raw wastewater discharges from the city of Nuevo Progreso to the Río Grande.

Human Health Information

Human health statistics for the Rio Bravo and Nuevo Progreso areas are limited. Table 1 shows the most recent public health studies conducted in communities adjacent to the United States-Mexico border. The conditions in the project area are very similar to those of communities in the State of Texas. As shown in Table 1, occurrence rates for diseases such as hepatitis or shigellosis are significantly higher in the Texas border than in the rest of the United States.

Hepatitis A is a liver disease associated with unhealthy wastewater disposal and the use of an inadequate or contaminated water supply. Shigellosis is often the result of poor sanitation, lack of water or wastewater facilities, the use of contaminated water and food, and is a condition common to underprivileged areas.

Table 1
 Diseases and Occurrence Rates in United States-Mexico Border Communities

AREA	Disease				
	Hepatitis A	Measles	Shigellosis	Tuberculosis	AIDS
Overall U.S. population	12.64	11.2	10.9	10.3	16.7
Arizona Border	39.4	9.8	38.3	6.9	15.1
California Border	30.7	61.9	22.1	12.7	22.0
New Mexico Border	46.9	14.6	21.2	7.3	3.9
Texas Border	40.4	38.9	49.1	26.5	7.9

Source: National Center for Health Statistics. Centers for Disease Control and Prevention, Vital Statistics Database. HRSA, n.d. <http://bphc.hrsa.gov/bphc/borderhealth/table1.htm>

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.

Table 2 shows the high incidence of transmissible diseases in the State of Tamaulipas in comparison with the rest of the country. Note that the rates for hepatitis A and several intestinal infections are higher in Tamaulipas than in the rest of the country. The above substantiates the need to provide adequate management to wastewater generated by the locality and then treat wastewater for safe reuse and disposal.

Table 2
 Intestinal diseases in the State of Tamaulipas and Mexico.

Gastrointestinal Diseases and Hepatitis A in Tamaulipas and Mexico										
E= State N= National	Hepatitis A		Amoebiasis		Paratyphoid and other Salmonellosis		Shigellosis		Undefined Intestinal Infections	
	Cases	Rate ²	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
2000-E	343	12.5	14,086	511	4,617	167	361	13.1	124,792	4533
2000-N	7,792	8	1,025,276	1052	60,654	62.2	22,301	22.9	3,021,542	3099
2001-E	895	31.8	18,433	656	1,713	60.9	558	19.9	218,594	7777
2001-N	18,864	19	1,250,186	1260	80,346	81	32,758	33	5,043,775	5083
2002-E	744	25.9	15,313	534	1,405	49	436	15.2	213,353	7439
2002-N	16,807	16.6	1,186,221	1175	80,494	79.7	31,473	31.2	5,374,980	5323
2003-E	298	10.2	ND	ND	2,255	77.1	493	16.9	136,812	4676
2003-N	12,275	12	ND	ND	79,646	77.5	26,940	26.2	4,318,940	4205

Source: Secretaría de Salud (2004)

² Cases for each 100,000 residents.

Environmental Impacts

The environmental impact resulting from the project will be positive overall, as water service conditions will improve and wastewater collection service will be made available to 100% of the residents, reducing thus the risk for wastewater seepage caused by the use of latrines and cesspools. In addition, all the project tasks will be carried out in areas of the city that have been previously impacted.

During the construction phases, minor environmental impacts will result from the excavation needed to lay piping for sewers and mains, as well as the engineering works for the construction of the pump station and wastewater treatment facilities; said impacts include fugitive dust emissions, gas emissions by construction machinery, temporary street blockage, presence of workers in the area, and fall hazards for individuals and vehicles.

A number of mitigation actions will be implemented to reduce environmental impacts during the construction phase, including the application of treated water to reduce fugitive dust emissions, vehicle tune ups to reduce emissions, placement of warning signage to prevent hazardous situations, placement of portable toilets, etc.

No negative impacts are expected during the project's operational phase, provided the project tasks are carried out according to specifications as to timing and development conditions established in the Final Design, and the provisions of the Environmental Impact Statements are met.

Transboundary Impacts

No negative transboundary impacts are anticipated as a result of the development of water and wastewater collection tasks. On the contrary, a beneficial effect is anticipated on the U.S. side of the border, as the project will prevent raw wastewater from reaching the Rio Grande and the Laguna Madre, improving thus the quality of the river, which is the main source of water supply for various communities downstream.

Formal Environmental Authorization

Pursuant to the provisions of the Law on Ecological Balance and Environmental Protection pursuant to Environmental Impact Statements, the Secretariat of the Environmental and Natural Resources (SEMARNAT) established through official communication SGPA/03.3380/05 that the project requires a Manifestación de Impacto Ambiental (MIA). Said MIA was prepared and submitted to SEMARNAT on January 14, 2008, and the final clearance was issued on February 12, 2008 via official letter SGPA/03-0320/2008.

As for the U.S. environmental assessment process (NEPA), a transboundary impact study was developed and submitted for consideration to the EPA. Based on this assessment, the EPA issued a Finding of No Significant Impact (FONSI) on May 12, 2007, which established that the project will not result in significant environmental impacts that may affect the U.S. border area. After a 30-day public review period in which no comments were issued, the document was officially approved on April 12, 2007.

During the environmental assessment process, the International Boundary and Water Commission (IBWC) and its Mexican counterpart (CILA) were given notice of the project. No negative comments have been issued by these agencies.

Important aspects for Certification:

The project addresses a major human health and environmental issue.

The FONSI and MIA authorization has been obtained from the U. S. and México respectively

Pending Issues:

None.



3. Technical Feasibility

3.a Technical Aspects

Project Development Requirements

The final design of the water, wastewater collection and treatment systems were developed pursuant to technical specifications contained in the Wastewater Collection and Treatment Manual prepared by CONAGUA's Technical Directorate and Official Mexican Standard NOM-001-CNA-1995 "Sanitary Sewerage System – Specifications for Hermeticity".

The project includes the following components:

Water

Expansion of the water supply system to *colonias* on the outskirts of Río Bravo that lack water service

Length (ft)	Diameter (inches)	Material
8,704	3	PVC
4,777	6	PVC
12,631	14	PVC
7,329	16	PVC
10,925	20	PVC

The following task was developed in 2006:

Water loop closure (Madero at the intersection with the Río Bravo canal) that included the installation of 679 ft of 12 inch PVC piping.

Wastewater Collection

Expansion of the wastewater collection system in Río Bravo:

Task	Length (ft)	Diameter (in)	Material
Colonia Martínez Manatu	18,848	8 & 12	PVC
Colonia Juan Báez	3,743	8 & 12	PVC
Colonia "la 26" or Santander	19,249	8 & 12	PVC
Colonia Arnulfo Martínez Gallegos	3,271	8 & 12	PVC
Colonia Nuevo León	10,538	8	PVC
Colonia Integración Familiar	10,856	8 & 12	PVC
Colonia Ampliación Octavio Silva	4,236	8 & 12	PVC
Colonia Campestre	7,644	8 & 12	PVC
Colonia Manuel Cavazos Lerma *	11,732	8 & 12	PVC
Colonia Niños Héroeos	10,436	8,12 & 18	PVC
Colonia Ampliación Lomas	8,727	8 & 12	PVC
Colonia Lomas	20,472	8 & 12	PVC
Colonia Madero	11,631	8 & 12	PVC
Colonia Del Carmen *	8,645	8 & 12	PVC
Colonia Las Cumbres	7,014	8,12 & 18	PVC
Colonia Nuevo Amanecer	11,201	8 & 12	PVC

* Tasks developed in 2007.

Expansion of the Wastewater System in Nuevo Progreso:

Task	Length (ft)	Diameter (in)	Material
Colonia Jardín.	8,041	8 & 18	PVC
Colonia Madero.	10,170	8 & 12	PVC
Avenida Las Flores	5,249	18	PVC
Calle Mante y Colonia Las Flores	3,477	8 & 18	PVC
Av. Juárez de Calle Coahuila a Av. Las Flores	5,577	18	PVC
Emisor del Cárcamo existente al nuevo	6,561	12	PVC

Rehabilitation of the Wastewater System in Río Bravo:

Task	Length (ft)	Diameter (in)	Material
Colonia Morelos	4,914	8	PVC
Colonia Cuauhtémoc	3,084	8	PVC
Fraccionamiento Uno	20,577	8, 12 & 18	PVC
Calle San Luis Fracc. Tres	1,509	8 & 18	PVC
Infonavit San Diego	1,968	8	PVC
Fraccionamientos 2 y 3	37,277	8, 12 & 18	PVC

Río Bravo Main Sewer	Length (ft)	Diameter (in)	Material
Río Bravo to lift station	30,046	14 to 36	HDPE ³

Force Main	Length (ft)	Diameter (in)	Material
Río Bravo to the Wastewater Treatment Plant	27,746	26	HDPE
Nuevo Progreso to the Wastewater Treatment Plant	35,567	12	HDPE

Pump Stations

Pump Station	Features
Río Bravo	<ul style="list-style-type: none"> ○ Includes 3 pumps with 150 KW and 4.56 MGD capacity each
Nuevo Progreso	<ul style="list-style-type: none"> ○ Includes 3 pumps with 45 KW and 0.75 MGD capacity each Equipment and fixtures

The following tasks were developed during 2006:

³ HDPE = High-Density Polyethylene

Rehabilitation of sanitary sewage lines in 1, 2, and 3 subdivisions (3,927 ft of 8 inch PVC piping)
Rehabilitation of downtown sewer lines on Madero street, from Mina to Matamoros (679 ft of 12 inch PVC piping)
Introduction of wastewater collection lines (sub-collector and sewer lines) in Nuevo Progreso (7814 ft of 8 inch PVC piping)
Rehabilitation of the sanitary sewage system (279 ft. of 18 in diameter PVC pipe along Jalapa street between Colon Norte and Coahuila Sur streets).

The wastewater collection project's final design was developed in strict adherence to CONAGUA standards and has been validated by said agency.

Wastewater Treatment

Wastewater Treatment Plant

The final design of the wastewater treatment plant was based on the alternatives and the preferred option, seeking high treatment efficiency and low capital, operation and maintenance costs.

The "Final Design for the Rio Bravo and Nuevo Progreso Wastewater Treatment Infrastructure Project" was finalized in January 2008. It will be a lagoon-based facility and will have sufficient capacity to treat an average flow of 5.48 MGD during its first phase. The plant's hydraulic detention time will be 26 days.

In order to prevent potential seepage through the base or side slopes of the lagoon, the project proposes that both the base and the sides be made of clay material with a 95% compaction pursuant to the Proctor test. Additionally, to protect brim slopes from erosion resulting from wastewater waves, the project proposes the installation of prefabricated reinforced concrete slabs with the following specifications: $f'c=250 \text{ kg/in}^2$ and size 2.4 m x 2.4 m x 0.1 m.

Description of Wastewater Treatment Plan

Pretreatment

Untreated wastewater will go through a screen prior to reaching the pump stations (of Rio Bravo and Nuevo Progreso) that will send it off to the treatment site. Small solids and silt will be eliminated from incoming wastewater prior to its entrance to the WWTP.

Distribution Box

The distribution box includes a 26 ft. x 7.4 ft. and 5.6 ft. deep reinforced concrete structure that will be built to distribute wastewater flows to the grit removal unit.

Primary Treatment

This type of treatment includes three anaerobic lagoons with 2.19 MGD treatment capacity each. The lagoons in the upper brim will be 295 ft. long x 138 ft. wide and 13 ft. deep, with 2.26 days detention time.

Secondary Treatment

During the first phase there will be three facultative lagoons with 1.8 MGD treatment capacity each, a surface organic load of 158.29 lb of BOD/acre, an average 16.5 acres area in the middle part of the brim, and a plug flow pattern. The average dimensions in the upper part of the brim will be 2,100 ft. in length by 321 ft. in width, 5.9 ft. depth, and 18 days detention time.

Polishing or Maturation

The project includes the construction of two maturation lagoons with 2.74MGD each to receive the effluent from the facultative lagoons. The proposed lagoons will cover an area of 11 acres, which is the surface area recommended to achieve a reduction in the amount of fecal coliforms. Average dimensions are: 2214 ft. in length by 249 ft. in width in the upper brim, with 4.9 ft. depth and 6.4 days detention time.

The treated effluent will be discharged into an agricultural irrigation canal adjacent to the wastewater treatment system.

Treatment Sludge

The sludge resulting from wastewater treatment will be stored and stabilized in the lagoons. Sludge will remain at the bottom of the lagoons from 5 to 7 years, during which time the characteristics of the sludge will change until it mineralizes. After this time, the sludge may be extracted from the lagoons to be dried and disposed of at the local sanitary landfill.

Figure no. 3 shows the general layout of the proposed Wastewater Treatment Plant.

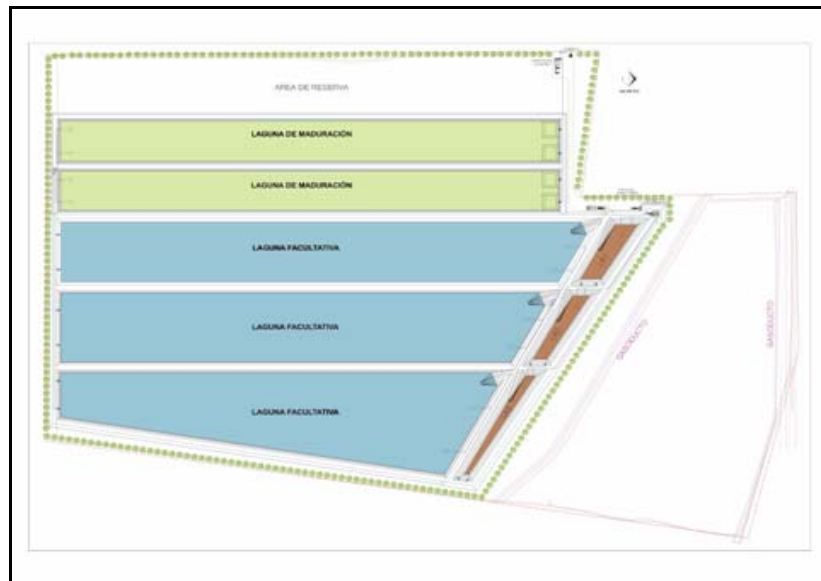


Figure 3. Wastewater Treatment Plant Layout

Appropriate Technology

In order to develop an appropriate and efficient water system, a facility plan was developed considering various alternatives. The project alternatives reviewed are described below.

Water System

- a) **No-action alternative.** Under this alternative, residents of these communities, who lack a water supply system, would have to continue hauling water from to their households using tank trucks, so the risk for bacteriological contamination would be high. In view of these drawbacks, this alternative was determined to be unacceptable.

- b) **Expanding the water system to the unserved community.** This alternative was reviewed and considered to be the preferred alternative, as it includes the expansion of water service to 100% of the community, an action that will reduce the risk of water-borne diseases associated to inadequate water management.

Wastewater Collection System

To develop an appropriate and efficient wastewater collection system, a final design for the construction of collectors, pump stations, and the main sewer were developed. These structures will collect and convey wastewater from the communities to the treatment site. As these tasks will complement an existing wastewater treatment system and may only be carried out in projected sites or routes, the alternatives reviewed consisted basically of two scenarios:

- c) **No-action alternative.** This alternative was ruled out in consideration of its environmental, human health, social, and political implications. Under this scenario, wastewater will continue to be directly discharged into the Rio Grande and the Laguna Madre, representing a risk for human health and a detriment to the quality of these surface bodies, with the resulting contamination.

demand specialized personnel for its operation. In addition, operation and maintenance costs under this scenario are the lowest (\$1.17 pesos/m³ of treated wastewater). These factors render this as the most appropriate option for this community.

Property and Right-of-Way Requirements

Inasmuch as wastewater lines will be laid on municipal rights of way and thoroughfares, no additional land needs to be purchased for the project. The land required for the construction of the Río Bravo and Nuevo Progreso Wastewater Treatment Plant is owned by the local water utility (COMAPA). The surface area is 141 acres. BECC has copies of the corresponding proof of ownership documentation.

Project Tasks and Timelines

The construction of some water and wastewater structures was undertaken during 2006 and 2007 by request of CONAGUA to be considered for match funding. The remaining water, wastewater collection and treatment projects are scheduled to be developed during the 2008-2009 period.

Figure 4 shows the proposed project schedule.

ITEM		PROPOSED TASK COMPLETION TIME (MONTHS)																							
		2006		2007		2008												2009							
						J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
<i>Wastewater Collection</i>																									
1	SEWERS AND HOUSEHOLD CONNECTIONS (First Phase)																								
2	SEWERS AND HOUSEHOLD CONNECTIONS (Second Phase)																								
<i>Water</i>																									
3	WATER SUPPLY LINES																								
4	HOUSEHOLD CONNECTIONS																								
<i>Wastewater Treatment</i>																									
5	FORCE MAINS AND LIFT STATIONS																								
6	RIO BRAVO AND NUEVO PROGRESO WASTEWATER TREATMENT PLANT																								

Figure 4. Project Timeline

Technical Process

The proposed treatment process will be sufficient to achieve treated wastewater of adequate quality for reuse purposes, thus eliminating health risks for residents who have contact with treated wastewater, pursuant to the applicable environmental regulations established by Official Mexican Standard NOM-001-SEMARNAT-1996. This standard establishes the maximum permissible levels of contaminants for wastewater discharges to national waters and properties.

The technology to be used for the wastewater treatment process is a technology that has been widely employed as a solution for wastewater sanitation in small and medium-size communities.

The wastewater treatment system will produce water with sufficient quality to be used for urban public uses or agricultural irrigation of long stem plants (75 mg/l of BOD; 75 mg/l of TSS).

In order to prevent the potential inflow of treated wastewater to the Río Grande and/or the Laguna Madre, COMAPA requested authorization from CONAGUA to discharge treated wastewater to an agricultural drain that conveys irrigation water to the agricultural area within the municipality of Río Bravo. It must be noted that the aforesaid irrigation canal does not intersect with the Río Grande. CONAGUA issued the requested discharge authorization under Official Communication No. BOO.00.R07.04.02.-1505.

The final design included the implementation of green building practices as part of the technical construction specifications.

3.b Management and Operations

Project Management

Management of the proposed project will be the responsibility of COMAPA, with the assistance and supervision of CEAT.

Operation and Maintenance

Organization

The COMAPA has a General Manager, Technical Manager, Treasurer, Administrative Assistants, and Technical Assistants for the system's operation and maintenance. In addition, it has support from CEAT, a utility that has staff specialized in operation and maintenance of water and wastewater systems.

Operation and Maintenance

The Operation and Maintenance Manual presented as part of the project's final design includes the main activities needed to provide preventive maintenance to the proposed wastewater collection and treatment system. The treatment system's operation and maintenance will be the responsibility of COMAPA, under supervision of CEAT's technical staff.

The Wastewater Treatment Plant will have a qualified Chief of Operations, who will be trained by CEAT as to the operation of wastewater treatment systems. The Chief of Operations will be assisted by two operators for the development of maintenance tasks.

The Operation and Maintenance Manual is intended to assist in activities related to effluent quality control, facility operation and prevention of system breakdowns. Ensuring the proper operation of treatment units will generate a good effluent quality. The conservation of treatment unit components, including pumps, screens, gates, valves, as well as structures such as brims, slopes, etc., must be a scheduled and consistent task.

Pretreatment Program

Inasmuch as the project area only includes residential users, COMAPA has determined that the pretreatment program will conform to Official Mexican Standard NOM-002-ECOL-1996, which establishes the maximum permissible levels of contaminants for wastewater discharges to urban or municipal wastewater collection systems. Compliance enforcement will be a responsibility of COMAPA with assistance from CEAT.

Permits, Licenses, and other Regulatory Requirements

Río Bravo and Nuevo Progreso have obtained permission from CONAGUA to withdraw water and discharge wastewater. In addition, they have requested environmental authorizations for the development of projects. The proposed wastewater collection and treatment projects have been reviewed by BECC, EPA, CEAT, and the North American Development Bank (NADB) and are being validated by CONAGUA.

Important aspects for Certification:

Final designs have been reviewed by EPA, BECC, CEAT, and NADB, and validated by CONAGUA.

Pending Issues:

None.

4. Financial Feasibility

1. Financial Feasibility

The North American Development Bank (NADB) reviewed the financial information presented by the Project’s Sponsor and, based on it, determined that the financial and structural capacity proposed by the COMAPA Río Bravo is adequate. The information presented and the financial analysis includes, among other items:

- Historic Financial Statements;
- Financial structure of the project;
- Investment budget;
- Budget for operation and maintenance, historic and pro forma; and Economic and demographic information of the project area.

The following is a summary of the financial analysis. The total cost of the project is estimated at \$29.20 million dollars, including the costs for construction and supervision.

Item	Quantity (Millions of Dollars)
Construction	28.50
Supervision	0.70
TOTAL	29.20

The Utility proposes a financial structure that will allow the implementation of the project, as further indicated:

Financial Source	Amount (Millions of Dollars)	%
Mexico	12.76	44
NADB-BEIF Construction Assistance	12.76	44
Loan	3.68	12
TOTAL	29.20	100

2. Fee/Rate Model

The annual budget of the Utility, proposed by the Sponsor, is expected to cover the operation and maintenance expenses, such as water treatment and distribution, wastewater treatment and collection, reserve funding, debt service, as well as necessary maintenance and improvements to the water and wastewater systems, among the most important cost elements.

3. Project Management

The project will be managed by the “Comisión Municipal de Agua Potable y Alcantarillado del Municipio de Río Bravo (COMAPA)”, who has adequate staff to manage the proposed infrastructure and address any potential emergency related to the operation and maintenance of the project.

Important issues for Certification:

The project was analyzed and determined to be viable.

Pending issues:

None.

5. Public Participation

5. a Steering Committee

The Comprehensive Public Participation Plan developed by the Río Bravo and Nuevo Progreso Steering Committee was approved by the BECC on October 26, 2007. The Steering Committee set to the task of preparing an outreach program, including the benefits resulting from the project, as well as the associated costs and economic impacts for the community.

The Steering Committee was formally installed on October 23, 2007 at a meeting held at COMAPA's headquarters in Río Bravo, Tamaulipas. The meeting was attended by special guests, including the utility's General Manager, Francisco Javier Pulido-Serna. At this meeting, a Board of Directors was elected, comprised of the following individuals:

Chairman of the Steering Committee: Zaragoza Rodríguez Flores.

Secretary of the Steering Committee: Juan Alberto Torres Ávalos.

Treasurer of the Steering Committee: Jorge Alberto Gómez García.

Alternates:

Elsa Rodela Rojas
Mario Alberto Cárdenas García
Patricia González Morales

5. b Public Access to Project Information

Public Notice

The Steering Committee, with assistance from COMAPA, prepared written information about the project and designed flyers and brochures that were distributed at public meetings and among the various local community and service groups, committees, and associations. An intense project advertising campaign was launched in the printed media and the radio. The project's technical and financial information was made available to the public for review.

Additional Communication Activities

Information meetings were held with local residents and groups involved in various social, economic, and service activities, in preparation for the BECC Public Meetings. Organizations contacted included Villa de Nuevo Progreso, Universidad Tamaulipeca, Universidad del Noreste, Universidad ICN, the Lions Club, the Rotary Club, the Chamber of Commerce, and other academic institutions.

Public Meetings

First Public Meeting. A 30-day advance notice published on October 28, 2007 to announce the First Public Meeting was published on "El Mañana," a Reynosa newspaper that covers Río Bravo and Villa Nuevo Progreso. The meeting was held on November 27, 2007. Attendees included the Mayor of Río Bravo, Juan de Dios Cavazos-Cardenas, and Mayor elect Roberto Benet-Ramos; members of the Steering Committee, the General Manager of COMAPA Río Bravo, Francisco Javier Pulido-Serna, and the representative of the National Water Commission in Tamaulipas, Jorge Zapata-Valdez. The meeting was attended by 120 residents. During the meeting, 92 surveys were applied, and 100% of those surveyed said they were able to fully understand the project and explicitly expressed their support for it.



Second Public Meeting

The second public meeting was held on March, 27 at the “Salon Arcadia” in the City of Río Bravo, Tamps. The meeting started at 19:30 hrs. and was attended by 112 residents. During the meeting, 99 surveys were applied, and 100% of those surveyed said they were able to fully understand the project and explicitly expressed their support for it.

5. c Final Public Participation Report

The Steering Committee and the applicant prepared the "Final Public Participation Report" to demonstrate that the proposed objectives were fully met to BECC's satisfaction.

Important Aspects for Certification:

The project has extensive support from local residents. The corresponding information to document public support is available.

Pending Issues:

None.

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 for the *Comision de Agua Potable y Alcantarillado de Rio Bravo and Nuevo Progreso* (COMAPA) include:

- Improving the utility's necessary water distribution and wastewater collection infrastructure
- Building a wastewater treatment system
- Operating a wastewater collection system that meets applicable state and federal regulations
- Training operating staff

CEAT will provide basic technical training to COMAPA's staff for the operation and maintenance of the new infrastructure that will be built as a result of the project's implementation. The staff will be provided operation and maintenance training prior to the commencement of WWTP operations. CEAT's technical staff will provide guidance to COMAPA as needed.

6.b C Conformance to applicable Local, State, and Regional Regulations and Conservation and Development Plans

As stated in Chapter 2, the proposed project conforms to applicable water and wastewater laws and regulations. In addition, the project supplements the actions set forth in the Master Plan for Improvements to Water, Wastewater and Collection Services in Rio Bravo and Nuevo Progreso, Tamaulipas, which address the need to develop basic sanitary infrastructure works in these cities. The implementation of the project will help eliminate risks associated to the inadequate management of wastewater, and will provide treated wastewater for other uses.

The project adheres to the U.S.-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 improve water utility efficiency). One of the program's guiding principles is to reduce major risks to public health and conserving and restoring the natural environment. The project conforms to the State Development Plan under the areas of Urban Development, Social Development, Health, and Environmental Protection.

6.c Natural Resource Conservation

The project contributes to reduce environmental deterioration by building sewers and pump stations that will collect and convey wastewater to the new WWTP to improve its quality, so as to reduce aquifer contamination and human health hazards resulting from the discharge of raw wastewater to streams or agricultural drains.

The project proposes the implementation of green building practices to be included in the construction specifications.

6.d Community Development

The completion of this project is crucial to the development of the community. The tasks proposed by the project will contribute to reduce the conditions that favor the proliferation of water-borne and arboviral diseases related to inadequate wastewater disposal.

The implementation of an appropriate wastewater collection system promotes the development of the community, as it will help reduce contamination in local areas and will improve the quality of life for residents of Río Bravo, Nuevo Progreso, and downstream communities.

Treated wastewater will be able to be diverted to other purposes, such as urban and agricultural uses.

Important aspects for Certification:

The project meets all sustainable development principles.

Pending Issues:

None.

Available Project Documentation:

Official Communication No. 004/2006 dated January 4, 2006, in which COMAPA requests a finding from INAH regarding the existence of archeological sites in the Río Bravo and Nuevo Progreso area.

Official Communication No. 042/2006 dated January 26, 2006, in which INAH finds no objection for the development of this project in Río Bravo/Nuevo Progreso area, inasmuch as no historical or archeological monuments or settlements exist in the area.

EPA's "Finding of no significant impact" (FONSI) dated March 12, 2007.

Consultation with SEMARNAT to determine jurisdiction and environmental clearance modality, Official Communication 1.4-058/2005 dated August 9, 2005, COMAPA.

SEMARNAT's response regarding the Manifestación de Impacto Ambiental modality. Official Communication No. SGPA. 03.1180/06, Tamaulipas Federal Delegation, Subdivision of Environmental Protection and Natural Resource Management. April 7, 2006.

Final Clearance of Manifestación de Impacto Ambiental issued by SEMARNAT via Official Communication SGPA/03-0320/2008, February 12, 2008

Final Design for Water and Wastewater Collection projects in Río Bravo and Nuevo Progreso, Tamaulipas. Developed by COMAPA de Río Bravo, 2006, 2007.

Final Design for Wastewater Treatment infrastructure for Río Bravo and Nuevo Progreso, Tamaulipas. Developed by AyMA Ingeniería y Consultoría, S. A. de C.V. January 2008.

Master Plan for improvements to the Water, Wastewater Collection, and Treatment services in Río Bravo, Tamaulipas. Developed by Solano Consultores S.A. de C.V. (BECC, June 2004).

Master Plan for improvements to the Water, Wastewater Collection, and Treatment services in Nuevo Progreso, Tamaulipas. Developed by Solano Consultores S.A. de C.V. (BECC, June 2004).

Final Public Participation Report

Official Communication No. BOO.05.06.-094/08 dated April 11, 2008, in which CONAGUA agreed with the Final Design for the Wastewater Treatment Plant for Río Bravo and Nuevo Progreso.