CERTIFICATION AND FINANCING PROPOSAL

BASIC URBAN INFRASTRUCTURE PROJECT
HERMOSILLO, SONORA

Revised: April 8, 2013

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EXECUTIVE SUMMARY

BASIC URBAN INFRASTRUCTURE PROJECT
HERMOSILLO, SONORA

Project: The proposed project consists of constructing basic infrastructure for water and wastewater systems, storm drainage, street paving and other roadway improvements, as well as the acquisition of equipment and the installation of a centralized traffic system, in Hermosillo, Sonora (the "Project").

Project Objective: The purpose of the Project is to increase and improve access to basic water and wastewater services, reduce exposure to untreated wastewater discharges in urban areas, improve storm water management infrastructure, increase street paving coverage and improve roadway and traffic infrastructure to promote efficient urban mobility.

Expected Project Outcomes: The Project is expected to generate environmental and human health benefits related to the following project outcomes:

- Water system improvements will increase access to sustainable potable water service with an estimated 60 new residential hookups and improve current service for an estimated 10,600 households.
- Wastewater system improvements will increase access to safe and sanitary wastewater collection service with an estimated 4,500 new residential connections and improve current service for an estimated 10,400 households, eliminating approximately 20 liters per second (lps) or 0.45 million gallons per day (MGD) untreated or inadequately treated wastewater discharges.
- New wastewater treatment facilities will increase capacity by an estimated 35 lps (0.80 MGD).
- New storm water structures will improve storm water management at nine intersections, thereby preventing the ponding of stagnant water, which currently impacts traffic flows, may compromise surrounding infrastructure and creates a habitat for vectors, such as mosquitos.
- New paving is expected to contribute to the reduction of harmful emissions including 252 metric tons/year of PM_{10}, while better mobility and less congestion will help reduce

vehicle emissions, including an estimated 121 metric tons/year of volatile organic compound (VOC) emissions, 272 metric tons/year of carbon monoxide (CO) emissions and 64 metric tons/year of nitrogen oxides (NOx).

Population Benefitted: 784,342 residents of Hermosillo, Sonora.

Sponsor: Municipality of Hermosillo, Sonora.

Borrower: Municipality of Hermosillo, Sonora.

Project Cost: $841.8 million pesos (US$66.3 million).[1]

Loan Amount: Up to $500.0 million pesos (US$39.4 million).

Uses & Sources of Funds:
(Millions of pesos)

Uses	Amount	%
Construction*	$841.8	100.0
TOTAL	$841.8	100.0
Sources	**Amount**	**%**
NADB Loan	$500.0	59.4
Federal, state and municipal funds	$341.8	40.6
TOTAL	$841.8	100.0

* Includes costs related to design, construction and equipment, supervision, contingencies and taxes.

Repayment Period: Up to two hundred forty (240) months, including grace period on principal payments.

Grace Period: Up to twenty four (24) months on principal payments, computed as of the first disbursement.

Interest Rate: A fixed or variable market rate loan in Mexican pesos.

Repayment Sources: Federal tax revenues ("*participaciones*") pledged to an irrevocable trust.

Debt Service Coverage Ratio (DSCR): A DSCR equal to or greater than 1.0 for each fiscal year must be maintained in the trust.

[1] Unless otherwise noted, all U.S. dollar figures are quoted at an average exchange rate of $12.6993 pesos per dollar during January 2013, according to Bloomberg.com.

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1. ELIGIBILITY

Project Type

The Project components fall within the eligible sectors of water, wastewater, storm drainage and air quality.

Project Location

The Project is located in the municipality of Hermosillo in the central part of the State of Sonora, 162 miles (260 kilometers) south of the U.S. Mexico border.

Project Sponsor and Legal Authority

The **public-sector** Project sponsor is the Municipality of Hermosillo, Sonora (the "Municipality" or "Sponsor"), a public entity legally constituted under the Mexican Constitution, the Constitution of the State of Sonora and the Municipal Code of Hermosillo. The Project Sponsor has been granted authorization by the Sonora State Congress to contract a loan for this Project. Congressional Decree No. 8 was issued on November 15, 2012.

2. CERTIFICATION CRITERIA

2.1 TECHNICAL CRITERIA

2.1.1. Project Description

Geographic Location

Hermosillo is the capital of the state of Sonora and is located in the central region of the state, near the Gulf of California.

Figure 1 shows the approximate geographical location of the Project.

Figure 1
PROJECT VICINITY MAP

General Community Profile

According to the 2010 Mexican census, Hermosillo has a population of 784,342 (213,304 households), which represents 29.45% of the state's population.[2] Between 2000 and 2010, Hermosillo experienced an average annual growth rate of 2.22%, slightly higher than that of the country (1.8%).[3]

According to the latest economic census, manufacturing constitutes the most important sector in Hermosillo, generating 52.8% of the municipality's gross domestic product (GDP) and employing 20.7% of its working population. Electricity, gas and water pipeline transport together represent the second largest sector, generating 12.1% of the municipality's GDP and employing 2.7% of its work force. Commerce represents 8.9% of its economy and contributes with 27.2% of total employment. Overall, Hermosillo's economy constitutes 50.2% of the state's GDP.[4]

The status of public services in Hermosillo is described in the following table.

[2] Source: Mexican national statistics institute, *Instituto Nacional de Estadística, Geografía e Informática (INEGI*), *Censo de población y vivienda 2010* (2010 general population and housing census).
[3] Source: National population council, *Consejo Nacional de Población* (CONAPO), 2011.
[4] Source: INEGI, *Censos Económicos 2009* (2009 economic census).

Table 1
BASIC PUBLIC SERVICES AND INFRASTRUCTURE IN HERMOSILLO

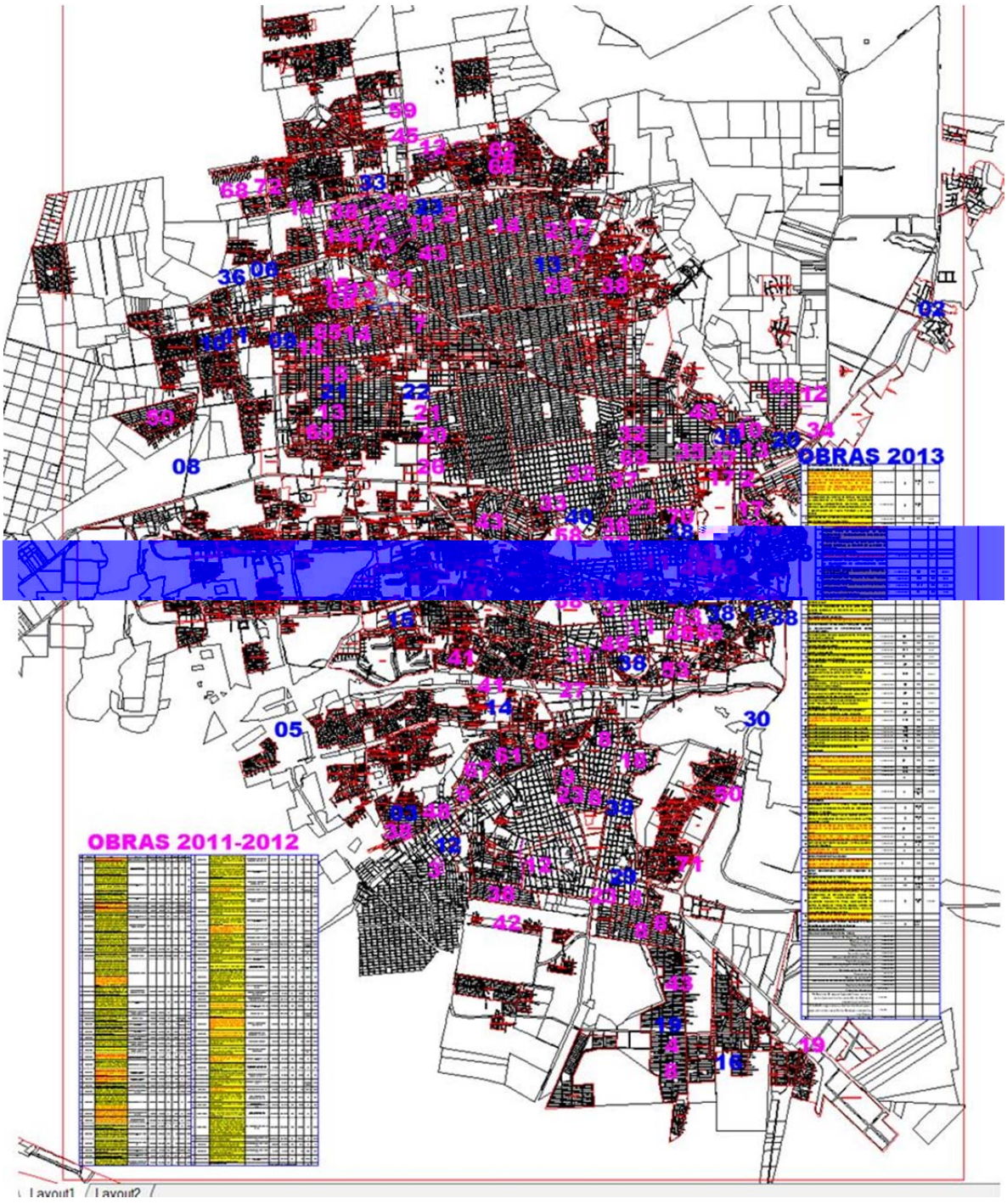
Water System [a]		
Coverage	95.24%	
Supply source [b]	124 deep wells and 1 outlet dam	
Residential hook ups	203,153	
Wastewater Collection [a]		
Coverage	94.59%	
Residential connections:	201,759	
Wastewater Treatment		
Coverage [b]	13%	
Treatment facilities	**Type**	**Capacity**
	Activated sludge [b]	105.5 lps (2.41 MGD)
	Activated sludge [c]	2,500 lps (57.0 MGD)
Solid Waste [d]		
Collection coverage	95%	
Final disposal	Landfill	
Street Paving [d]		
Street paving coverage	75.20%	

[a] Source: INEGI, 2010 general population and housing census.
[b] Source: State water agency, *Comisión Estatal de Agua* (CEA), 2010 questionnaire.
[c] Source: Local water utility, AGUAH. The plant is under construction and when completed is expected to increase treatment coverage to 100% of wastewater collected within the city limits.
[d] Source: General Office of Infrastructure, Urban Develop and Environment, *Coordinación General de Infraestructura, Desarrollo Urbano y Ecología (CIDUE),* 2012.

Project Scope and Design

The Project is part of the Municipality's comprehensive basic urban infrastructure program. The works selected for certification include: water and wastewater facilities, storm drainage infrastructure, street paving and roadway improvements. The water sector components represent approximately 14% of the proposed investment, while air quality components make up the remaining 86% of the total Project. Figure 2 shows the general location of the Project components throughout the city of Hermosillo.

Figure 2
LOCATION OF PROJECT



The Infrastructure components for each sector are described below.

Water Sector

The water and wastewater works considered for this Project are part of an ongoing capital improvement plan for the local water utility, *Agua de Hermosillo* (AGUAH), and are aimed at increasing coverage to unserved areas and rehabilitating existing infrastructure. The Project also includes the design and construction of sewer lines and two wastewater treatment plants within the jurisdiction of the Municipality of Hermosillo. This new infrastructure will provide first time wastewater treatment services in the communities of La Victoria, Tazajal, and Bahía de Kino. Currently, these communities use individual on site systems or latrines for their wastewater disposal.

The Municipality also continuously works to address storm water management within the city. A portion of the loan will be utilized to complement other sources of funding required to rehabilitate several storm water inlet structures in nine (9) intersections across the city.

The specific water infrastructure components are enumerated in Table 2.

Table 2
WATER INFRASTRUCTURE

Drinking Water	
Distribution lines	28,495 m (93,464 ft.)
Rehabilitation of pump equipment	1 pump
New residential hookups	60
Wastewater	
Sewer lines	59,737 m (195,987 ft.)
Treatment plants	Bahía de Kino, 20.0 lps (0.46 MGD) La Victoria / Tazajal, 15.0 lps (0.34 MGD) Total: 35.0 lps (0.80 MGD)
Rehabilitation of pump equipment	2 pumps
New residential connections	4,500
Storm Water	
Storm water inlet structures	9

Construction activities for these water sector components initiated in 2011 and are anticipated to conclude by 2014. To date, approximately 25% of the water component investments have been completed. Under Mexican federal and state program rules, funding for these works must include a municipal match. Hermosillo is planning to use a portion of the loan to support its required funding participation of completed and/or future projects.

Table 3 represents the list of key tasks related to the 2013 2014 water components.

Table 3
WATER COMPONENT MILESTONES

Key Milestones	Status
Wastewater Collection	
Final Design	Complete
Environmental Authorization Municipal	In progress
Wastewater Treatment Plants	
Environmental Authorization	Not applicable*
Site Acquisition – Bahía de Kino: Agreement with	

In addition to paving new areas, mobility related components of the Project are expected to result in further emission reduction benefits. In 2010, the Hermosillo Municipal Institute of Urban Planning (IMPLAN) developed a mobility study to determine traffic loads and congestion points and identified several actions for improving urban mobility within Hermosillo's roadway system.[6]

Urban traffic management is a very important component of IMPLAN's mobility study and includes the installation and use of modern traffic lights and signage for 266 intersections, including pedestrian crossing lights for five streets, as well as the construction of a centralized building where the efficient movement of traffic can be controlled and monitored. The infrastructure investment also required the acquisition of appropriate computer hardware, tailored software, and cameras that support improved management of traffic flows in real time. Additionally, the Project scope includes the construction of targeted overpasses that were selected based on the 2010 mobility study, in order to streamline the flow of vehicles at major city intersections.

Construction activities and equipment installation for the air quality sector components initiated in 2011, and all works for this Project are scheduled to be completed by 2014. To date, an estimated 70% of the investment related to roadway and mobility improvements has been completed.

Table 4 represents the list of key task related to the 2013 2014 air quality components. The tasks described as "in progress" are expected to be completed in the second quarter of 2013.

Table 4
AIR QUALITY COMPONENT MILESTONES

Key Milestones	Status
Final Design	Complete
Environmental Authorization Municipal	In progress

2.1.2. Technical Feasibility

Selected Technology

Water Sector

As part of project development, Hermosillo, in coordination with the local water utility AGUAH, evaluated water and wastewater improvements based on the following factors:

- capital and O&M costs;
- material and equipment reliability and compatibility with existing infrastructure;
- topography;
- environmental impact; and
- social/community acceptance.

[6] Source: *Acciones 2010 para mejorar el transito vial (2010 Traffic Improvement Activities).*

In accordance with best engineering practices, the analysis for network infrastructure considered the use of pipe materials in compliance with current norms and regulations. Pipe layout will be designed based on existing rights of way, according to the urban land use plan. In order to reduce costs and make the best use of the topography in the Project area, the shortest routes have been considered for pipe alignments. Crossings through paved avenues and other existing underground infrastructure will also be minimized. Sewage lines at Bahía de Kino include hermetic joints to prevent water infiltrations, because of the groundwater level, especially near the pump stations.

Below are general layout maps reflecting the collection system designed for the new service, which will be installed in Bahía de Kino and La Victoria/Tazajal.

Figure 3
BAHÍA DE KINO AND LA VICTORIA/TAZAJAL COLLECTION SYSTEMS

The new plants that will serve the communities of Bahía de Kino and La Victoria/Tazajal are expected to provide a total capacity of 35 lps (0.80 MGD). An analysis of alternatives and preliminary design is currently under development supported by a technical assistance consultant contracted by BECC with funding support from NADB. The determination of the discharge method is also pending and will be considered as part of the Project's final design and confirmed once the land acquisition process has been completed. It is estimated that the analyses and preliminary designs for the treatment facilities will be completed and the treated discharge disposal plan will be defined during the next 30 days. A discharge permit, if applicable, will be requested from CONAGUA after these activities are complete and prior to construction.

The storm water inlet structures are designed to convey storm water by means of gravity and prevent the intrusion of vehicles or pedestrians into the drains.

The Project components were designed based on standard engineering practices and technical regulations and in accordance with the municipal urban development plan. Water and wastewater infrastructure components are consistent with AGUAH's design guidelines, while the storm water drain designs adhere to the technical guidelines of the Mexican federal water

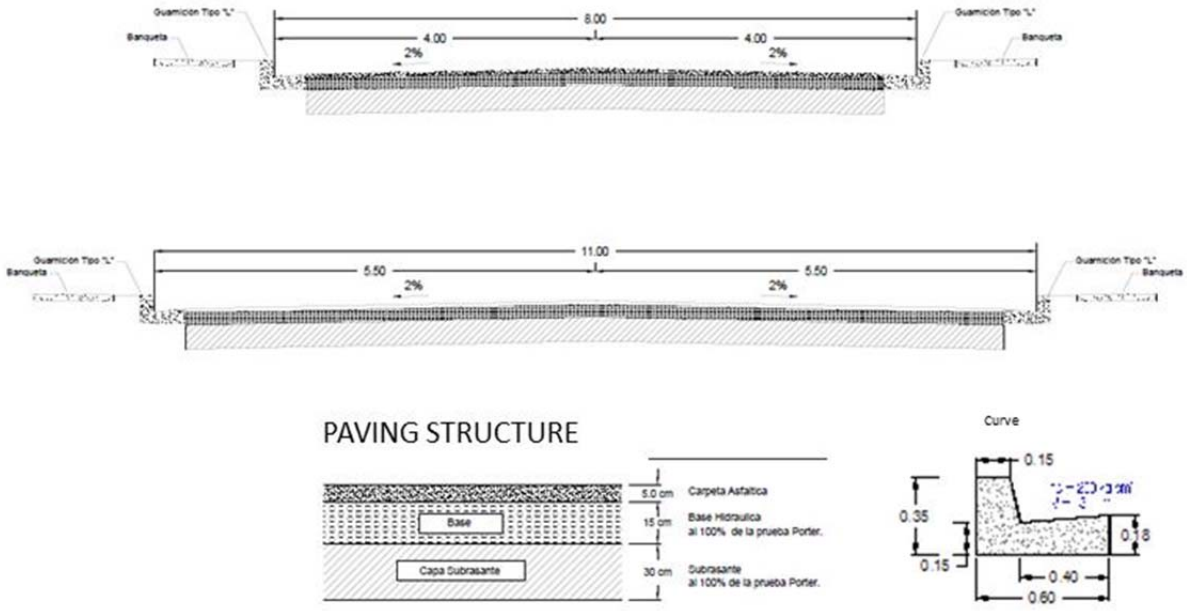
agency, CONAGUA. To ensure design quality and constructability, BECC and NADB will review the designs for all water components pending construction.

Air Quality

The paving designs are consistent with standard engineering practices and comply with applicable local regulations. Standard street paving designs were used as the basis for developing the final designs for selected streets. Asphalt was considered the appropriate technology for most of the roadway paving activities based on the availability of sufficient asphalt production in the city and the competitive costs inherent to having a local supply, when compared to other alternatives.

A typical paving section is shown in Figure 4.

Figure 4
PAVING SECTION



The asphalt mix must meet the volumetric rate established by Mexican paving norms and contain the least amount of impurities in order to satisfy spatial specifications. The Project also includes construction of curbs and gutters. Curbs will be constructed of hydraulic concrete placed over the compacted base before the asphalt layer is applied.

Overpasses were designed in accordance with the federal design standards issued by the Mexican Ministry of Communications and Transportation (SCT). All new road works include terrain plotting and leveling, excavation or cutting, hauling of material, formation and compaction of earth fills, treatment of the subgrade layer and development of the hydraulic

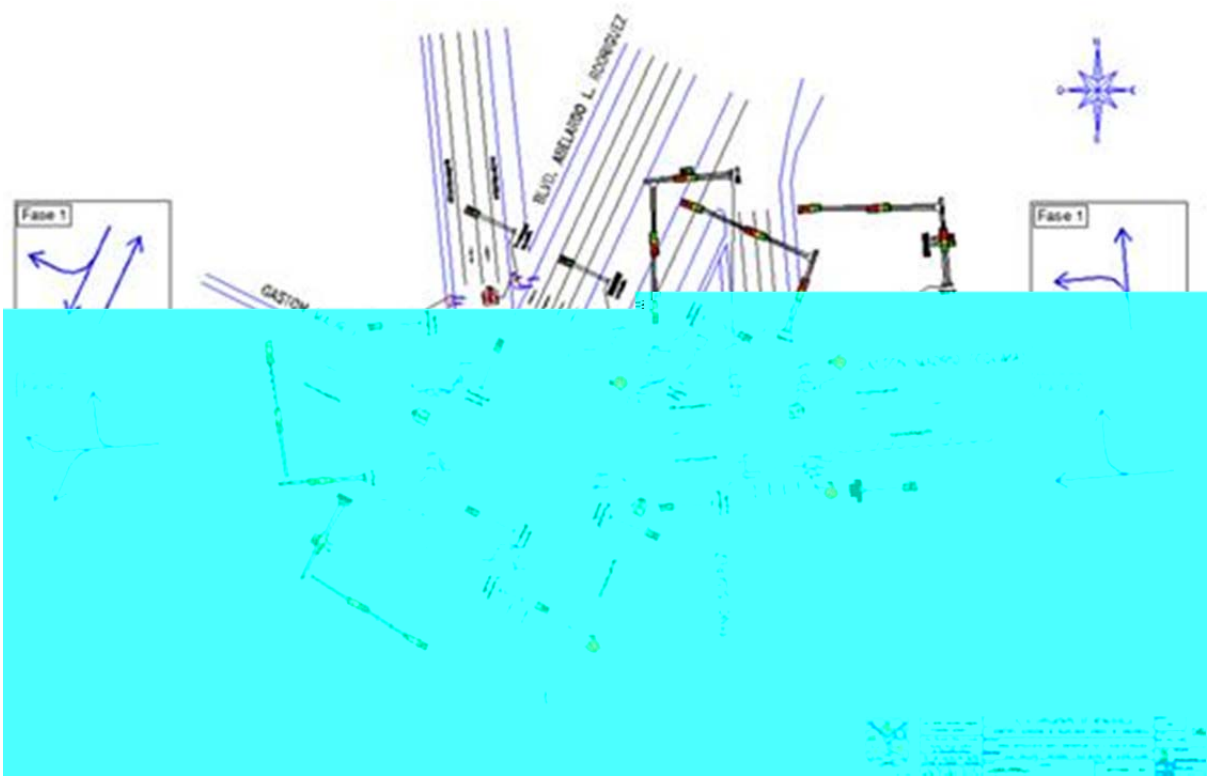
base layer. The pavement includes hydraulic base prime coating for the asphalt layer, followed by the installation of the asphalt concrete layer, as shown in Figure 4.

The geometric design of the roadways incorporates the installation of a minimum 2% transverse slope (crown) towards the center of the street that will convey runoff to the shoulders. Manholes are built or modified to prevent water from infiltrating the sewer system. The Project also includes curb plotting and leveling, and the construction of hydraulic concrete curbs and sidewalks. The Municipality's project engineers are responsible for confirming that the paving works comply with the applicable specifications.

Another important element of the air quality sector components is the Urban Traffic Management and Control (UTMC) system, a complete program that includes software specifically designed for Hermosillo, cameras, automotive presence sensors in the main intersections and specially trained staff able to manage the system to promote efficient traffic flow. The software uses preloaded traffic behavior information about Hermosillo, such as mobility routes, time and number of stops at lights, and traffic flows on main avenues and roadways. All the modules are amalgamated into a single console located in a central control building, where, based on data collected by the cameras and sensors, engineers can make decisions in real time and modify signal times to improve traffic flows.

UTMC is designed to allow the tools used in modern traffic management systems to communicate and share information with each other and to be managed from a single location, which supports global strategies aimed at traffic light optimization and improvements to the mobility of vehicles within the city. Phases I and II of the UTMC have been implemented in 154 intersections prioritized based on traffic volume and patterns in the 2010 mobility study. Phase III will be implemented with the Project and includes 112 additional intersections.

Figure 5
TYPICAL DRAWING OF MAIN INTERSECTION LIGHTS DESIGN



2.1.3. Land Acquisition and Right-of-way Requirements

The proposed Project is being developed within the urban area, primarily within existing rights of way. The Project Sponsor has indicated that property ownership and appropriate access to rights of way for all works within the urban area have been secured. For Project components outside the urban area, such as the new wastewater systems to serve Bahía de Kino and La Victoria/Tazajal, the Municipality has identified potential sites for the treatment plants but has not yet acquired the properties. The Sponsor is currently taking the necessary steps to secure these properties, one of which is owned by the State of Sonora and the other by a private party. Construction permits and property rights will be obtained from all local, state and federal agencies, prior to construction. The City's General Office of Infrastructure, Urban Develop and Environment, CIDUE, has issued a letter indicating its commitment to obtain all applicable rights of way, and NADB/BECC will make sure that all pending land acquisition tasks are completed prior to funding disbursement.

2.1.4. Management and Operations

During Project implementation, the Municipality of Hermosillo will oversee the execution of the proposed construction tasks through CIDUE. In accordance with the Internal Code for Municipal Administration and other applicable agreements and provisions, the Municipality, through

CIDUE, is responsible for maintaining the roadways and non federal storm water structures located within the city limits. It will be responsible for implementing preventive and corrective maintenance of the roadways and absorbing operation and maintenance costs, which are considered part of its annual operating budget.

CIDUE has an organization manual approved by the Municipality of Hermosillo in 2011. This document defines the roles, expectations, objectives and functions of the different administrative offices that are part of CIDUE, as well as the budget for operations.[7]

Additionally, *Agua de Hermosillo* (AGUAH) will maintain and operate the water and wastewater works in compliance with the Operation Program and Subprograms in place for each specific type of work. AGUAH was created in 2002 by an agreement signed by the Municipality of Hermosillo.[8] Currently, the Sponsor operates wastewater treatment facilities that employ an activated sludge process and provide drinking water and wastewater services to more than 200,000 households.

2.2 ENVIRONMENTAL CRITERIA

2.2.1. Compliance with Applicable Environmental Laws and Regulations

Applicable Laws and Regulations

Most of the Project components will be implemented in areas subject to the jurisdiction of the city of Hermosillo and which have been previously impacted and are not part of protected natural areas or regions considered a priority due to biodiversity. Based on these characteristics, no federal environmental authorization requirement applies to those components. For the UTMC system no environmental permits are required.

In the case of Project components located outside the city limits, especially the wastewater treatment plants for La Victoria/Tazajal and Bahía de Kino, the Sponsor must obtain the applicable environmental authorizations prior to construction. However, under Mexican Environmental Impact Assessment Regulations, wastewater treatment facilities of less than 100 lps (2.29 MGD) do not require an environmental clearance authorization.[9] To confirm this, a letter has been sent to the offices of SEMARNAT in Sonora and to the Sonora Commission of Environment and Sustainable Development, CEDES. Discharge permits, if applicable, will be obtained once the final designs for the plants are completed.

The Project will support compliance with the following environmental laws and regulations related to water, wastewater, air quality and applicable international agreements:

[7] Source: Municipality of Hermosillo, *Manual de Organización CIDUE* (CIDUE Organization Manual).
[8] Source: *Acuerdo de Creación de AGUAH* (AGUAH creation agreement), http://www.aguadehermosillo.gob.mx/inicio/downloads/organismo/acuerdo_creacion.pdf
[9] Source: Chapter II, Article 5, subsection A, VI a), of the Environmental Impact Assessment Regulations under the General Law of Environmental Stability and Protection (*Reglamento de la Ley General del Equilibrio Ecológico y la Protección al Ambiente en materia de Evaluación del Impacto Ambiental*).

- *Official Mexican Standard NOM-001-SEMARNAT-1996*, which establishes the maximum permissible limits of contaminants in the discharges of wastewaters into national waters and resources.
- *Official Mexican Standard NOM-002-SEMARNAT-1996*, which establishes the maximum permissible levels of contaminants for wastewater discharges to urban or municipal wastewater collection systems.
- *Official Mexican Standard NOM-004-SEMARNAT-2002*, which establishes specifications and maximum permissible levels of contaminants for the use and final disposal of sludge and biosolids.
- *Official Mexican Standard NOM-127-SSA1-1994*, which establishes treatment processes and quality standards for drinking water for environmental health and human use and consumption.
- *Official Mexican Standard NOM-001-CONAGUA-2011,* which establishes hermetic specifications and test methods for water distribution systems, residential hookups, wastewater collection systems.
- *Official Mexican Standard NOM-025-SSA1-1993,* which establishes criteria for evaluating ambient air quality and the permissible value for concentrations of total suspended particles (TSP), particles below 10 microns (PM_{10}), and particles below 2.5 microns ($PM_{2.5}$), with a permissible limit of 150 µg/m3 in 24 hours, once a year.
- *Official Mexican Standard NOM-020-SSA1-1993*, which establishes criteria for evaluating ambient air quality with respect to ozone (O_3) and the regulated value for O_3 concentrations in ambient air, as a public health protection measure, with a permissible limit of 0.11 ppm or what is equivalent to 216 µg /m3 in one hour, once a year.
- *Official Mexican Standard NOM-021-SSA1-1993,* which establishes criteria for evaluating ambient air quality with respect to carbon monoxide (CO) and the permissible value for CO concentrations in ambient air, as a public health protection measure, with a permissible limit of 11.00 ppm or what is equivalent to 12,595 µg/m3 averaged over eight hours, once a year.
- *Official Mexican Standard NOM-022-SSA1-2010*, which establishes criteria for evaluating ambient air quality with respect to sulfur dioxide (SO_2) and the regulated value for SO_2 in ambient air, as a public health protection measure, with a permissible limit of 0.130 ppm or 341 µg/m3 averaged over 24 hours, once a year.
- *Official Mexican Standard NOM-023-SSA1-1993*, which establishes criteria for evaluating ambient air quality with respect to nitrogen dioxide (NO_2) and the regulated value for NO_2 concentrations in ambient air, as a public health protection measure, with a permissible limit of 0.21 ppm or what is equivalent to 395 mg/m3 in one hour, once a year.

Environmental Studies and Compliance Activities

The Sponsor has consulted with the corresponding authority regarding the type of environmental impact statement required for each Project component located within the city limits. Typically, final designs for new construction must be submitted to obtain environmental

clearance authorization from the corresponding environmental authority (CIDUE). Because the Project is located in the predisturbed urban area, only minimal impacts are anticipated, including primarily temporary impacts associated with construction. In accordance with the practices recommended by federal environmental authorities, mitigation measures to address the temporary environmental effects of construction will be carried out.

As previously mentioned, the Sponsor, in coordination with AGUAH, has sent appropriate consultation letters to federal and state environmental authorities to confirm the requirements for the wastewater treatment plants. Although it is anticipated that an environmental authorization will not be required (see Footnote 9), basic studies are currently under development to better define any potentially sensitive conditions existing at the proposed sites or with the treatment process or discharge disposal plan under consideration, to meet the requirements for Project authorizations (i.e. construction, discharge permits, as applicable), as well as to consider any risks that should be managed at the site during construction. The basic studies, which are anticipated to be complete in April 2013, will also support the development of the design of the plants and the discharge permit application, if necessary.

Pending Environmental Tasks and Authorizations

Documentation related to the environmental clearance authorizations for completed works under the jurisdiction of the Municipality have been made available. For Project components anticipated to be contracted in 2013, additional local authorization will be required. The Sponsor anticipates that these authorizations will be issued in the second quarter of 2013.

Compliance Documentation

The Sponsor maintains all issued environmental clearance rulings in the technical file of the various Project components, a practice also required by any federal funding program contributing to such components. BECC/NADB staff observed the availability of the issued communication documents at the Sponsor's offices.

2.2.2. Environmental Effects/Impacts

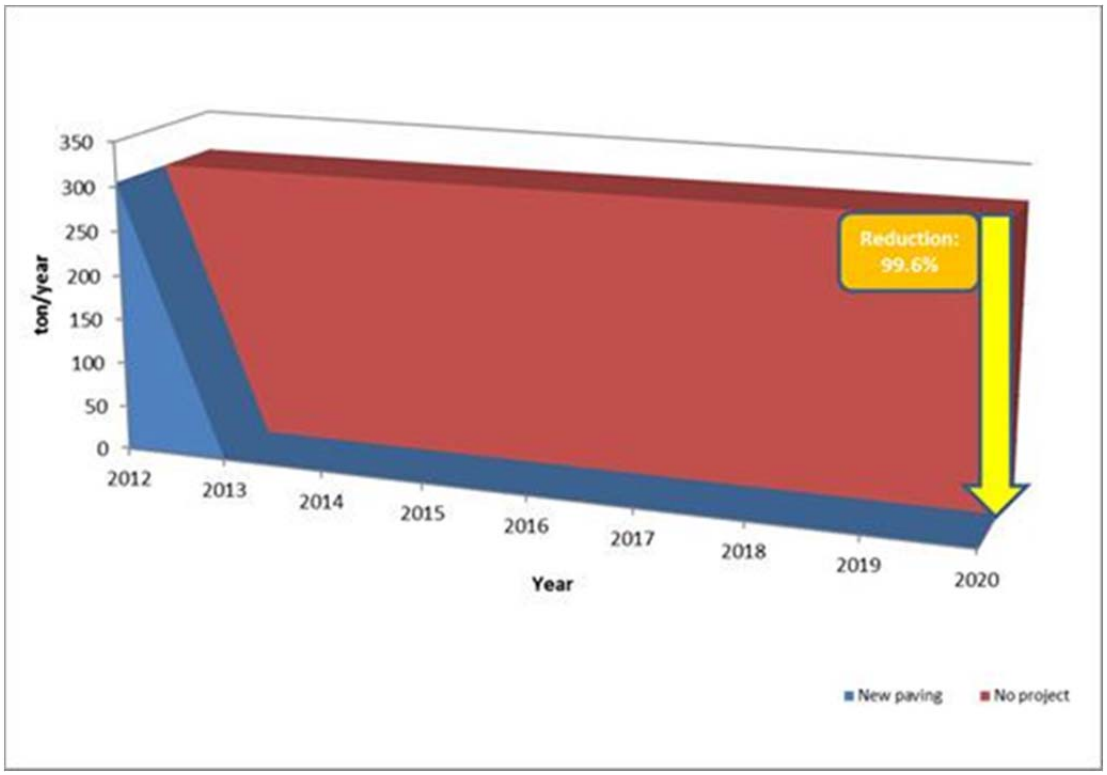
Existing Conditions and Project Impact – Environment

The local water utility, with the support of the Municipality, has worked to keep up with the demand for basic services with continuous investments to extend and rehabilitate infrastructure and mitigate incidents of untreated discharges. The drinking water distribution works included in the Project will either provide or improve service to approximately 10,600 households, and wastewater collection infrastructure will provide or improve service to approximately 10,400 households, better protecting human health and the environment**.** Additionally, storm water infrastructure improvements are intended to mitigate the risks of flooding in the urban area and appropriately manage storm water separately from wastewater collection infrastructure, avoiding illegal cross connections and providing adequate conveyance capacity to protect urban areas.

Air quality in Hermosillo in recent years has been affected by the large number of vehicles and traffic congestion, as well as by airborne dust and PM_{10} generated by the poor condition of roadway surfaces. First time paving and repaving are considered proven methods to reduce the amount of fugitive dust resulting from vehicle traffic. This Project also contributes to a reduction of the concentration of pollutant emissions, such as volatile organic compounds (VOCs), nitrogen oxides (NOx) and carbon monoxide (CO), by improving traffic mobility conditions.

Reduction of PM_{10} and $PM_{2.5}$ Emissions. Vehicle traffic on unpaved roads causes the suspension of particles that directly impact public health. In addition to these direct impacts related to a lack of pavement, other deficient road conditions contribute to poor air quality effects. Pursuant to the methodology recommended and approved by USEPA AP 42 for estimating PM_{10} emissions by vehicles traveling on unpaved roads, it is estimated that newly paved roads will reduce PM_{10} emissions by 99.6%, which equates to 252 metric tons/year (see Figure 6), and $PM_{2.5}$ emissions by 98.6%, which equates to 25 metric tons/year.

Figure 6
PM_{10} EMISSION REDUCTION RESULTING FROM THE CONSTRUCTION OF NEW PAVEMENT



Reduction of Motor Vehicle Combustion Gases. Due to high traffic volumes, the city has suffered from congestion and mobility problems, which are also a source of air pollution. The deficiencies of existing road surfaces directly impacts Hermosillo residents in many ways, including traffic jams or slow moving traffic, as well as deterioration of underground and surrounding infrastructure.

The construction of new overpasses, roads and repaving, as well as implementation of the traffic control system, can improve mobility and reduce the emission of combustion gases. Anticipated benefits associated with this roadway infrastructure were evaluated taking into account vehicle volume and driving cycles observed within the Project area. Higher vehicle speeds are expected based on:

- Continuous traffic flow through overpasses;
- Sequential synchronization of green lights;
- Reduced period of time at red lights;
- Immediate detection of network failures of traffic lights; and
- Modification in real time of traffic flow, due to accidents or traffic congestion.

Mobility improvements were modeled based on available information provided by IMPLAN, CIDUE and SEMEX, the company that manufactures and installs the UTMC system. The average speed under current traffic conditions on the roadways included in the Project is 30 km/h (19 mph). The scenarios analyzed improved traffic efficiency resulting from increased speeds on and under the overpasses, as well as from improved paving and the traffic light system. With the implementation of the Project, vehicle speeds increased an average of 10 km/h (6 mph), and on the overpasses increased to the maximum limit allowed.

Based on these assumptions, the analyses performed using the Mobile 6.2 Mexico model indicate that VOC emissions will be reduced by 121 metric tons/year (10.9%), NOx by 64 metric tons/year (6.7%), and CO by 272 metric tons/year (3.2%).

Mitigation of Risks

During the implementation of the Project, measures are being taken to mitigate the temporary effects of construction by introducing the preventive actions recommended by the federal environmental authorities, such as:

- *Noise*
    - All operating vehicles must close their exhaust and operate at low speed around the work areas.
    - All vehicles must comply with Mexican standard NOM 080 ECOL 1994, which establishes the maximum permissible levels of noise from motor vehicles, motorcycles, and three wheel motor vehicles, as well as noise measuring methods.

- *Site preparation and construction*
    - Minimize the emission of dust generated by vehicle traffic by irrigating the areas where work will be performed.
    - With regard to air emissions caused by motor vehicles, all vehicles used in the Project must have emission control systems.

- Wastewater collected in portable containers will be disposed of by an authorized company.
- The use of water should be optimized during construction of the Project. The water required during the construction phase should be obtained from a water tap provided by AGUAH or from an alternative source authorized by CONAGUA.
- Excavations will only be performed in areas previously identified by the Project.
- In fill activities will be performed, preferably, with the material from the excavations whenever appropriate.

- *Waste management*
  - All non recyclable solid wastes must be disposed of according to applicable procedures and in facilities designated by the authorities for this purpose.
  - Backfill and compacting materials should be free of hazardous and non hazardous waste, ensuring that such materials are moved to authorized confinement or treatment sites.
  - In order to avoid ground contamination generated by vehicle, machinery and equipment maintenance and oil changes, these activities will be carried out in authorized service shops.

Additional mitigation measures may be identified during the preliminary engineering and basic studies for the potential WWTP sites. All mitigation measures will be incorporated into contracting documents for construction.

Natural Resource Conservation

The Project will support natural resource conservation by improving air quality through new urban mobility infrastructure. The Project also helps prevent environmental deterioration through the construction of wastewater collection lines that will convey sewage to facilities for proper treatment, reducing the risk of aquifer or surface water contamination. Finally, the Project will direct storm water flows to natural receiving water bodies, creating improved opportunities for the beneficial use of the water and reducing the potential effects of flooding, such as erosion.

No Action Alternative

The no action alternative was dismissed because the ongoing need for basic services and the deterioration of roadways, which poses risks to the community's air and water resources, as well as to public health. The Project is necessary to meet the existing and future urban development needs of Hermosillo. Affordable project financing is important to support the implementation and ongoing investment in adequate basic infrastructure. Without access to affordable financing, the needed works and future investments by the Municipality may be delayed or postponed.

Existing Conditions and Project Impact – Health

Although human health statistics for Sonora are limited, pursuant to information provided by the Sonora Ministry of Health, through the Office of Epidemiological Service Coordination, the agency is aware of an incidence of diseases caused by acute respiratory infections. The Ministry reports the most frequent diseases identified in the state of Sonora. Yearly incidence rates for respiratory diseases and intestinal infections have been prepared based on a total population of 784,342 in Hermosillo and information generated by the epidemiological surveillance system over a three year period (see Table 5 below). Said disorders are among the ten leading causes of disease in the municipality.

Table 5
INCIDENCE RATES OF MOST FREQUENT DISEASES IN HERMOSILLO

Disease	Incidence Rates		
	2007	2008	2009
Respiratory diseases	292 x 1,000 residents	207 x 1,000 residents	333 x 1,000 residents
Intestinal diseases	51 x 1,000 residents	50 x 1,000 residents	48 x 1,000 residents

Source: Sonora Ministry of Health.

Mexican Standard NOM 020 SSA1 1993 establishes that health risks associated with air pollutants are correlated to the time elapsed between the exposure and the onset of adverse effects in exposed individuals and cause changes in pulmonary function that render affected individuals more susceptible to respiratory diseases and infections. Furthermore, with respect to epidemiological surveillance, in Mexican Standard NOM 017 SSA2 1994, potential health impacts from environmental pollution are defined as poisonings and disorders resulting from contact with or handling of toxic substances and environmental factors.

The Project helps improve environmental conditions associated with health problems, such as respiratory and water borne ailments, by improving access to potable drinking water, decreasing exposure to untreated or inadequately treated wastewater discharges or stagnant water related to uncontrolled storm water, as well as reducing harmful pollutants which affect air quality.

Transboundary Effects

Due to the distance from the US Mexico border, no negative transboundary impacts are anticipated as a result of the implementation of this Project.

Other Local Project Benefits

Additional direct benefits to the local community include promoting access to emergency, security and other public services; reducing travel times; and fostering economic development.

2.3. FINANCIAL CRITERIA

The Project Sponsor has requested a loan for up to $500.0 million pesos from NADB to complete the financing of the Project, which is estimated to cost a total of $809.4 million pesos. The loan will be used to pay for construction and related costs, such as designs, equipment, supervision, contingencies and taxes. The NADB loan will complement federal, state of Sonora and other municipal funds.

The Project's proposed payment mechanism is consistent with financial structures for loans to Mexican municipalities with federal revenues (*Participaciones Federales*) as the source of payment. The source of repayment will be the *Participaciones Federales* received by the Municipality of Hermosillo, which shall be irrevocably pledged and deposited into a trust to pay for the NADB loan's debt service in accordance with the applicable laws.

NADB performed a financial analysis of the Municipality of Hermosillo and of the payment source in particular. The cash flow projections indicate that Hermosillo has the capacity to meet all its financial obligations, including those related to this loan, without adversely affecting current expenses for the operation and maintenance of the Municipality. In 2012, Fitch Ratings and Standard & Poor's assigned Hermosillo a local high currency credit rating of A+(mex) and mxA+ (both equivalent), respectively, indicating strong payment capacity.

In addition, NADB has verified that Hermosillo has the legal authorization to contract this loan and to pledge its *Participaciones Federales* as the source of payment for its debt service. Hermosillo has also the legal and financial capacity to operate and maintain the works constructed under this Project, either directly or through its water utility (AGUAH).

Considering the Project's characteristics and based on the financial and risk analyses performed by NADB, the proposed Project is considered to be financially feasible and presents an acceptable level of risk. Therefore, NADB proposes providing a market rate loan of up to $500.0 million pesos to the Municipality of Hermosillo, Sonora for the construction of the Project described herein.

3. PUBLIC ACCESS TO INFORMATION

3.1. PUBLIC CONSULTATION

BECC released the Draft Project Certification and Financing Proposal for a 30 day public comment period beginning March 7, 2013, and no comments were received. The following Project documentation is available upon request:

- *Plan de Desarrollo Urbano de Hermosillo* (PDU), 2010 (Hermosillo urban development plan).
- *Manual de organización, Coordinación General de Infraestructura, Desarrollo Urbano y Ecología* (Organizational Manual, CIDUE), Municipality of Hermosillo, approved in November 2011.
- *Actualización del Estudio Integral de Vialidad y Transporte para la Ciudad de Hermosillo* (Update of the Comprehensive Roadway and Transportation Study for the City of Hermosillo), 2010.
- *Plano de localización de obras municipales 2011, 2012 y 2013.* (Location map of municipal works 2011, 2012 and 2013).
- *Estudios y aforos vehiculares* (Studies of traffic volumes and flows), *2010.*
- *Programa de Evaluación y Mejoramiento de la Calidad del Aire (PEMCA), Reportes técnicos anuales, años 2007 a 2011.* (Air Quality Evaluation and Improvement Program, Annual Technical Reports, 2007 2011).
- *Acciones 2010 para mejorar el transito vial* (2010 traffic improvement activities).
- *Programa Integral de Pavimentación de Hermosillo.* (Hermosillo's Comprehensive Paving Program).
- Anticipated emission reduction calculations developed by BECC.
- Environmental clearance authorizations.
- Steering Committee meetings for evaluating and authorizing municipal projects.

3.2. OUTREACH ACTIVITIES

In addition to the public comment period and as is the normal practice in Hermosillo, Project information has been made available to community residents through general newsletters and media coverage of the Municipality's investment plans. A search of local media sources confirmed that Project information was made accessible to the general public.

Moreover, as required for projects partially funded with contributions from federal programs such as HABITAT, public outreach efforts have also been formally conducted, which are summarized below.

- The Project Sponsor established a steering committee for all project components to be funded through the federal program HABITAT. To date, the Mexican Ministry of Social Development (SEDESOL) has held several committee meetings with agendas related to executed municipal projects.
- Additional information regarding the Municipality's projects, including clear steps for reviewing all the Project components, is available for the community at http://www.hermosillo.gob.mx/portaltransparencia/.

Additionally, BECC conducted a media search to identify public opinion regarding the Project. References were found in several articles on Internet sites, including online newspapers such as *Imparcial*, *La Prensa Sonora-Arizona*, and *El Entorno*. The article published by *El Entorno* includes photographs and favorable opinions about the paving on the streets of Hermosillo. No opposition to the Project was detected in the media search.

Media search results*:*

- http://www.ehui.com/2012/10/30/aprueba cabildo de hermosillo refinanciamiento de deuda
- http://www.ehui.com/2012/11/13/aprueba congreso creditos para nogales hermosillo guaymas cajeme y navojoa
- http://www.uniradionoticias.com/noticias/hermosillo/articulo140504.html
- http://www.prensaescrita.com/adiario.php?codigo=MEX&pagina=http://www.entornoinformativo.com.mx