

Border Environmental Cooperation Commission

Air Quality and Street Paving Project in Puerto Peñasco, Sonora

1. General Criteria

1.1 Type of Project

The City of Puerto Peñasco proposes to reduce air pollution by paving several streets located within the urban area in order to reduce suspended dust particles with a diameter smaller than $10\ \mu\text{m}$ (PM_{10}), thus improving air quality and the health of the inhabitants of Puerto Peñasco. This project is known as the Air Quality and Street Paving Project in Puerto Peñasco.

1.2 Project Location

The Project will be developed in the City of Puerto Peñasco, Sonora, part of the Municipality of Puerto Peñasco. The Municipality is located in the border region, in the northwestern part of the State, in the coordinates $31^{\circ} 18'$ North latitude and $13^{\circ} 32'$ West longitude. The City of Puerto Peñasco is located 100 km south of the Arizona-Sonora border. The City of Puerto Peñasco is located south of the Municipality of Plutarco Elias Calles, to the East of the Santa Clara Gulf, to the north of the Gulf of California, and to the west of the Municipality of Caborca. Puerto Peñasco's estimated population is 37,416 inhabitants, according to the information provided by CONAPO (1998).

The scope of the project is limited to street paving within the City limits of Puerto Peñasco limits. The proposed project entails paving 29 segments on 24 streets located in the urban areas with the most residential and commercial concentration. The proposed streets to be paved are highly transited and due to their actual unpaved state, they allow dust particles to be dispersed to the atmosphere. The project will be implemented in two years and will be performed in different sectors of the urban areas of Puerto Peñasco.

Figure 1 shows the location of the City of Puerto Peñasco.



Figure 1. Puerto Peñasco, Sonora

The following table shows the information about the proposed streets. The project will be implemented in two years.

Puerto Peñasco, Son.					
Year 1					
Street Name	From (Street)	To (Street)	Long(m)	Wide (m)	Area (m2)
Juan Aldama	Sinaloa	Blvd. Josefa Ortiz	1172.00	16	18752.00
Constitución	No Reección	Blvd. Samuel Ocaña	1670.00	16	26720.00
Ave. Luis Encinas	Calle 20	Revolución	1190.00	16	19040.00
Calle 14	Ave. Venustiano Carranza	Ave. Plutarco Elías Calles	301.53	16	4824.54
Ave. Puerto de Ensenada	Eutiquio Amador	Blvd. López Portillo	329.59	16	5273.38
Blvd López Portillo	Ave. Puerto de Ensenada.	Blvd. Benito Juárez	176.55	20	3531.00
Simón Morua	Blvd. Josefa Ortiz	Ave. Rocaportense	1095.00	16	17520.00
No reelección	Derecho de Vía	Ave. Plutarco Elías Calles	527.00	16	8432.00
Subtotal					104092.92

Puerto Peñasco, Son.					
Year 2					
Street Name	From (Street)	To (Street)	Long (m)	Wide (m)	Area (m2)
Lázaro Cárdenas	Ave. Ferrocarril	Blvd. Benito Juárez	315.00	13	4095.00
Benito Juárez	Ave. Ferrocarril	Blvd. Benito Juárez	320.00	13	4160.00
Juan Aldama	Ave. Constitución	Ave. Guillermo Prieto	240.00	13	3120.00
Adolfo Ruiz Cortinez	Ave. Constitución	Ave. Juan de la Barrera	200.00	13	2600.00
Simón Morua	Ave. Constitución	Ave. Agustín Melgar	160.00	13	2080.00
Aquiles Serdán	Ave. Ferrocarril	Ave. Cuahutemoc	90.00	13	1170.00
Prolong. Nicolás Bravo	Ave. Constitución	Ave. Francisco I. Madero	55.00	13	715.00
Ave. San Luis	Simón Morúa	Blvd Melchor Ocampo	127.18	13	1653.34
Ave. San Luis	Melchor Ocampo	Blvd. Sonora	100.00	13	1300.00
Ave. San Luis	Blvd. Sonora	Blvd. Kino	255.00	13	3315.00
Ave. Guillermo Prieto	Melchor Ocampo	Blvd. Kino	450.00	13	5850.00
Ave. Cuahutemoc	Melchor Ocampo	Blvd. Kino	461.00	13	5993.00
Ave. Francisco I. Madero	Melchor Ocampo	Blvd. Kino	480.00	13	6240.00
Ave. Alvaro Obregón	Blvd. Benito Juárez	Blvd. Kino	260.00	16	4160.00
Ave. J. María Pino Suárez	Crescencio Rejón	Calle 9	200.00	13	2600.00
Ave. Francisco Villa	Calle 14	Avenida 2	200.00	13	2600.00
Ave. Emiliano Zapata	Calle 14	Avenida 2	200.00	13	2600.00
Adolfo Ruiz Cortinez	Ave. Sinaloa	Blvd. Josefa Ortiz	1240.00	16	19840.00
León de la Barra	Blvd. Kino	Blvd. Josefa Ortiz	1140.00	16	18240.00
Melchor Ocampo	Blvd. Josefa Ortiz	Ave. Rocaportense	1100.00	16	17600.00
Blvd. Sonora	Blvd. Josefa Ortiz	Ave. Rocaportense	1110.00	Variable	23610.00
Total					133541.34

1.3 Project Description and Tasks

Project Description

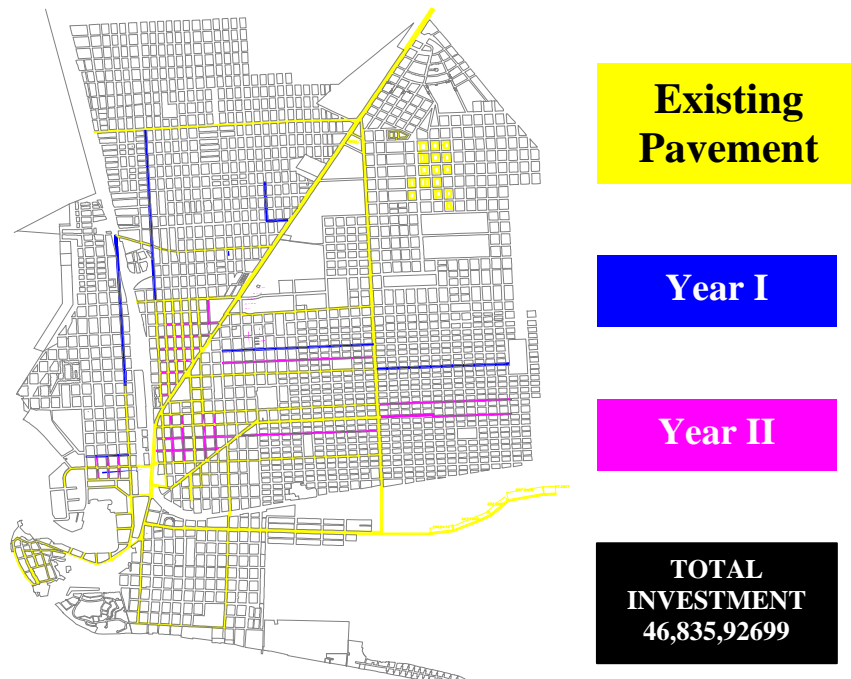
The purpose of the proposed project is to reduce air pollution generated by dust (suspended particles), and particularly those known as PM₁₀, which can be responsible for respiratory diseases in the community. In order to solve this problem, the Municipality implemented a street paving project which plans to pave a total of 237,634 m² of unpaved streets.

The project will be implemented in two years and proposes paving 104, 092 m² in Year 1 and 133, 541 m² in Year 2 (a total of approximately 17 km of paved streets assuming a width of 14 m). The plan is to pave the 29 segments of the streets designated in a timeframe of approximately two years. The streets are located in five different areas of the city and they were selected according to their traffic counts as well as the most important routes for public transportation

which generates the most amount of dust. Paving these streets represents an increment of about 4% of the total streets in the urban area. This project will allow the City of Puerto Peñasco to have 21% of its streets paved. The selected pavement method is to place concrete asphalt over a layer of compacted bedding. The project includes the placement of curb and gutter. In addition, the project will consider, according to the applicable Federal regulations and specifications, all necessary components using standard construction techniques to assure an adequate operation.

It is also important to mention that the City of Puerto Peñasco started to paving activities with the No Reeleccion Street (from Derecho de Via to Avenue Plutarco Elias Calles)

Figure 2 shows the general location of the streets to be paved in the City of Puerto Peñasco.



Project Tasks Program

The City of Puerto Peñasco plans to complete the Project, in its entirety within a period of 2 years. The Municipal Urban Development, Public Works and Environment Department anticipates the following work tasks program for this project.

This program proposes to increase the existing pavement from 17.56 % to 21.13%. The total surface proposed for paving is 237,634 m² in two phases: 104,092 m² during the first year of the project and 133,542 m² the following year. The next table shows the approximate costs for the project.

YEAR	Pavement	Investment Required(pesos)
First	104,092 m ²	\$ 20,501,111.93
Second	133,542 m ²	\$ 26,334,738.00
Total	237,634 m ²	\$ 46,835,926.99

Community Description

The population of the City of Puerto Peñasco is estimated at approximately 37,416 people for the year 2005, and the estimated population is expected to reach approximately 52,273 inhabitants in the year 2020, according to the projections made by CONAPO. Based on the information provided by the Municipal Potable Water, Sewage and Sanitation Administrator (OOMAPAS in Spanish), the potable water service covers 91 percent of the city and the sewage collection at 52 percent. All the wastewater collected is treated at the Municipal Wastewater Treatment Plant. The city at this moment has 17.6 percent of its streets paved. Implementing this project would increase the paved surface to 21.5 percent. It is estimated that the population directly benefited by this project, that is, the citizens who live directly adjacent to the streets, is approximately 5,600 people, but the benefits will impact the entire area due to the improvement to air quality. The following table shows some relevant information about the population of Puerto Peñasco.

Population	2000 ¹	2005 ²	2010 ²	2015 ²	2020 ²
	(People)	(People)	(People)	(People)	(People)
Total	32 374	37 416	42 402	47 369	52 273
Younger than 14 years of age	10 681	11 349	11 559	11 684	12 044
Older than 60 years of age	1 620	2 201	2 979	4 082	5 583
Males	16 652	19 242	21 800	24 344	26 851
Females	15 722	18 174	20 602	23 025	25 422

(1) Source – INEGI, XII General Population and Housing Census 2000.

(2) Source - CONAPO Mexico Population Projections 1996-2050 - Mexico 1998.

Project Alternatives

As part of project development, several viable alternatives were considered which would accomplish the project's goals. Moreover, this analysis considered the alternative of no action; however, because it is likely that the city of Puerto Peñasco exceeds the standard for suspended particle concentration of type PM₁₀ in the atmosphere, this alternative was ruled out.

For the paving materials, the analysis considered paving the roadways with a mixture of asphalt and discarded used tires. Although this process has proven successful in other areas of the country, in this case it was not technically feasible due to the lack of proper equipment to shred the tires and produce the paving material, additionally the scarce availability of contractors familiarized with the preparation and application of the rubber-asphalt mixture for this paving method was also a problem. Because of the previously mention limitations the cost of the project becomes an insurmountable obstacle and a burden for the citizens.

The final selection for the paving method and material was based on the cost, availability, and ease of maintenance. Based on those criteria the decision was to pave with an asphalt concrete mixture.

Project Justification

The project is required in order to reduce the concentration of PM₁₀ particles in the atmospheric basin of Puerto Peñasco. Not implementing this project would represent a continuation of dispersed PM₁₀ particles in the atmosphere, and continue exposure of the population to respiratory ailments. This situation represents a serious health problem, as during the summer months, when the ground is dry due to lack of rain, automobile transit, and frequent winds in the region, cause the finest dust particles to remain suspended in the air and thus create a potential source of diseases in the respiratory system, and allergies, mainly in children, young adults and senior citizens. Once the project is completed it will immediately reflect a considerable reduction of suspended particles. Street paving is the only viable and substantiated alternative for reducing the fleeting dust produced by motor vehicles traffic, especially on high traffic streets. The project will also have a secondary effect, beyond the direct benefit due to the reduction of the suspended dust particles, to reduce the combustion particles emission time by decreasing the urban traveling time required by an average vehicle.

1.4 Compliance with International Agreements and Treaties

The project is developed according to international agreements issued for this purpose by Mexico and the United States of America, particularly the Border Program 2012. This program was instituted to reduce the air pollution in both borders and its goal is “on the year 2012 or before, reduce the emissions of atmospheric pollutants in order to comply with the air quality norms and reduce the exposure to contaminants in the border region”. In essence, the Project is consistent with this mission. It is important to mention that during the construction of the proposed works, which will be performed in Mexico only, no international treaty or agreement will be violated.

2. Human Health and Environment

2.1 Human Health and Environmental Need

The City of Puerto Peñasco experiences a serious atmospheric pollution problem due to suspended dust caused by vehicular traffic on unpaved streets. The suspended PM₁₀ particles can be defined as solid or liquid particles, such as dust, ash, soot, metallic particles, cement or pollen dispersed in the atmosphere, whose diameter is equal or smaller to 10 µm (1 micrometer corresponds to the thousandth part of 1 millimeter). Some substances that can be associated with these particles are: lead, arsenic, beryllium, cadmium, mercury, sulphates, nitrates and aromatic polycyclic hydrocarbons, all of which are generated by anthropogenic pollutants deposited on the ground.

The effects on human health are determined by the size of the particles, according to their degree of penetration and permanence of these particles to remain in the respiratory system. Most of the particles whose diameter is bigger than 5 µm are deposited in the superior airways (nose), windpipe and bronchus. Those particles whose diameter are smaller, have a better probability of being deposited in the tertiary bronchi, therefore smaller particles are more harmful to human health.

The effects on human health directly related to prolonged exposure to fine particulate matter (particles with a diameter of 10µm or less) are:

- Eyes and nose irritation
- Increase in respiratory illnesses
- Aggravation of asthma cases
- Decrease in lung functions
- Increase in respiratory symptoms

Once the particles have been deposited in the respiratory system, irritation is in part caused by their chemical composition and toxicity, as well as by their ability to carry other substances on their surface, producing a synergy effect which increases their aggressiveness.

In 1996 the U.S. Environmental Protection Agency of the United States (EPA) published a document called “*Air Quality Criteria for Particulate Matter*” (AQC PM), in which, among other aspects related to atmospheric pollution by suspended particles, reviews the different studies regarding the effects of said pollutants on human health. This document concludes that the vast majority of available epidemiological evidence suggests an increment in human mortality caused by exposure to particulate matter (PM) in the environment, both on short and long terms; however, the limited available evidence makes it impossible to quantify the number of years lost by this increment in the mortality of the exposed population.

The document also recognizes that the complexity of synergetic effects (association with other pollutants, size of the particles, source of the particulate matter, age, susceptibility of the exposed population, etc.) results in significant variations between the different studies on human exposure to atmospheric pollutants such as particulate matter. However, it concludes that said studies provide enough reasons to worry about the detectable effects on human health caused by the exposure to PM in the environment, even in levels lower than the national standard.

The Official Mexican Norm **NOM-025-SSA1-1993** establishes the maximum limits of PM₁₀ concentration in the atmosphere. In order to protect the public health, these limits are established at 50 µg/m³ as a monthly average and 150 µg/m³ in a period of 24 hours. It is important to mention that the same norms apply for the United States.

The exposure to pollution by suspended particles may cause, both on the long and short terms, a decrease in lung function, which in turn may result in chronic respiratory illnesses and premature death. It is estimated that the risk of dying prematurely escalates from 2 to 8% in relationship with each 50 µg of PM₁₀ increment. The health risks associated with particles deposited in the lung area are much higher than those for particles that linger in the throat.

The following table shows the incidence of respiratory illnesses in the City of Puerto Peñasco during the past three years:

Table 2-1 – Number of incidences of respiratory related illnesses

Type of Illnesses	2002	2003	2004
Asthma and status asthmaticus	6	63	31
Pharyngitis and amigdalitis streptococci	1	126	167
Acute Respiratory Infections	1592	7555	5426
Pneumonias and Bronchopneumonias	2	45	14
Total	1,601	7,789	5,638

Source: National Health System, Health Department, General Epidemiology Board.

The reduction of dust will have an important impact in the general health of the population living in the area, as it is estimated that pollution may be the detonating factor for respiratory illnesses and in some cases gastrointestinal diseases and parasites. The following table shows the number of cases of respiratory illnesses in the City of Puerto Peñasco by age group, according to mortality statistics issued by the Health Department, General Epidemiology Board.

Table 2-2 Number of cases reported of respiratory illnesses in Puerto Peñasco for 2004 by age group

Group I	Group II	Group III	Group IV
From less than one year old to 14 years of age	From 15 to 19 years of age	From 20 to 44 years of age	From 45 to 65 or more years of age
3140	377	1276	845

Source: EPIMORBI Database, 2004

2.2 Environmental Assessment

According to the Urban Infrastructure and Environment Department of Mexico, this project does not require an Environmental Assessment, as these projects are responsibility of the municipalities.

According to Article 8, Fraction VIII and Article 22, Paragraph B, Fraction I, of the Ecological Equilibrium and Environmental Protection Law of the State of Sonora, the Municipalities are granted the power to authorize street paving projects. The Urban Development, Public Works and Municipal Environmental Department, by means of official letter number 1557 dated August 31, 2005, has authorized this Project, approving the pavement of the proposed streets in the first year.

The area benefited by the project is located within an urban area and therefore it is considered that the adverse impacts resulting from project implementation are of little or no significance. As there are no sensitive habitats or ecosystems in the project area, no significant environmental impacts are anticipated in the project area. The most significant and unavoidable impacts of the project will occur during pavement due to excavation, filling and compacting activities. Dispersion of PM₁₀ particles will be caused mainly by earth displacement and the use of heavy machinery required to complete the project and which may cause a temporary increase of PM₁₀ particles, excessive noise, emission of air pollutants, traffic problems and access to the neighborhoods and businesses, causing probable economic problems to the affected area. These impacts will be temporary, as once the streets are paved, we anticipate not only the reduction of PM₁₀ particles suspended in the air, but also said streets will return to their normal use, therefore the temporary consequences caused by the construction will disappear.

During the implementation of the project all the necessary measures in order to reduce said temporary effects will be applied, through preventive actions which include among others: the control of daily risk of dispersion of dust and exposed materials, proper maintenance of the construction equipment to improve its performance and thus reduce the emissions, management of run-off to prevent ground contamination, restrict traffic in the work areas to reduce dust production, and to instate a work schedule as a tool to minimize all these negative temporary effects. Table 2-3 presents a list of standard mitigation measures that will be considered during construction.

Table 2-3 – Mitigation Measures During Construction Phase

1.- AIR AND NOISE		
Site Preparation of the Areas to be Paved.		Mitigation Measures
Emission of dust and gases caused by excavation and cleaning,	1.1	Minimize the emission of dust generated by vehicular traffic, by irrigating the terrain in which operations will be performed.
terrain preparation, excavation and formation of subgrade, earthworks, hauling of excavation material and hydraulic base, formation of hydraulic base, and concrete asphalt layer.	1.2	To comply with regulations regarding atmospheric emissions caused by motor vehicles, all vehicles used in the project will adhere to a scheduled maintenance program according to the work schedule. Vehicles transporting scrap materials produced during construction should be covered by a canvas in order to avoid dispersing particles during the trajectory. Norm NOM-041-ECOL-1993 establishes the maximum level of polluting gases allowed for exhausts in vehicles using gasoline. Norm NOM-042-ECOL-1993 establishes the maximum level permissible of non-burnt hydrocarbons, carbon monoxide and nitrogen oxide in new motor vehicles, as well as evaporated hydrocarbons. Norm NOM-044-ECOL-1993 establishes maximum permissible levels of hydrocarbons, carbon monoxide, and nitrogen oxide, suspended particles, smoke opacity from motors using diesel.

Noise emission caused by the circulation of motor vehicles and the use of heavy machinery during excavation and cleaning, terrain preparation, excavation and formation of subgrade, earthworks, hauling of excavation materials and hydraulic base, formation of hydraulic base, and concrete asphalt layer.

- 1.3** Norm **NOM-045-ECOL-1993** establishes the maximum permissible levels of smoke opacity from the exhausts of motor vehicles circulating and using diesel as fuel.
All vehicles operating must close their exhausts and operate at low speed around work area.
- 1.4** Norm **NOM-080-ECOL-1994** establishes the maximum permissible limits for noise emission caused by motor vehicles, motorcycles and motor tricycles in circulation and their method of measurement.
All machinery and equipment must comply with the following norm:
NOM-080-STPS-1993 which establishes the maximum levels of noise exposure by project workers.
- 1.5** Avoid having more than two teams working at the same time, which could generate noise levels higher than the above mentioned norm.
- 1.6** Work during the day to avoid causing noise while neighbors are at rest.
- 1.7** Provide audio protection and persuade the personnel exposed to noise to use the protectors.

2.- Water

Site Preparation and Construction

- 2.1** For excavation cleaning and wastewater. The wastewater collected in portable containers will be disposed of by a company authorized to handle these residues. These waters will be disposed of in approved areas and under the conditions established by the authorities in compliance with environmental laws in effect.
- 2.2** During construction water will be necessary for dust control irrigation, preparation of concrete, compacting beddings, as well as potable water for human consumption, and water for lavatories. The use of water should be optimized during the whole project.
- 2.3** Potable water will be obtained in containers from local suppliers.
- 2.4** Only raw water will be used for the different activities related to the project.
- 2.5** The water required during the construction stage should be obtained from a water tap provided by COAPAES, or from any other source authorized by the CNA.

3.- SOIL

Construction stage.

- 3.1** During excavations. The stone materials required for construction should be obtained, preferably, from source providers authorized to do so. If this is not possible all necessary mitigation measures must be adopted in order to minimize impacts in the area.
- 3.2** Excavations will only be performed in areas defined by the project.
- 3.3** The earth-fill activities will be performed, preferably, with the

Handling of wastes generated during construction could affect the ground soil.

material from the excavations as long as it is appropriate. The excess material should be sent to a location authorized by the Municipality.

- 3.4** If it is necessary to extract any material for filling or any other activity from an area outside of the project, this location will be restored when the project is finished to avoid erosion and changes to drainage patterns, as well as to restore the overlying native plant species cover.
- 3.5** If it is necessary to perform activities in an undisturbed site it will be necessary to collect the surface material for use in the restoration of areas impacted by the project or in the site itself.
- 3.6** Metallic containers will be strategically located with their lids in order to store different types of wastes (domestic or construction materials such as metal, cardboard, plastic, iron, etc.) in order to recycle what can be recycled in an authorized facility. The containers will include signs to indicate their contents, to help workers separate them.
- 3.7** All non-recyclable solid wastes must be disposed of according to the procedures and in the facilities designated by the authorities for this purpose.
- 3.8** The work area will be cleaned periodically to avoid contamination and to control the dispersion of waste around the area.
- 3.9** The bedding and compacting materials should be free of both hazardous and non-hazardous wastes.
- 3.10** In order to avoid ground contamination generated by vehicle, machinery and equipment maintenance and oil change, these activities will be carried out in maintenance shops or facilities especially reserved for these activities.

2.3 Compliance with Applicable Environmental and Cultural Resource Laws and Regulations

The purpose of the project is to improve the air quality according to the standards established Official Mexican Norm NOM-025-SSA1-1993, which states the maximum limits of PM₁₀ concentration in the air.

The projects will be implemented according to the regulations stated in the Puerto Peñasco Public Works regulations, and the recommendations provided by Law 101 of the State of Sonora regarding urban development. Also this construction will not affect ecologically protected areas and the project will not require any changes to land use in areas impacted by the project. During the implementation of the project, the Urban Development, Public Works and Environmental Municipal Department will supervise the construction based on these provisions.

Consultation to the National Anthropology and History Institute (INAH) is not required since the project will be performed within the already impacted urban area, and no impacts to cultural or historical resources are anticipated. In the case any cultural resources are found, these will be respected and will not be disturbed until an evaluation by INAH is performed..

Pending items:

- The municipal environmental authorization for the projects in the second year will be provided once their corresponding final design is completed.

3. Technical Feasibility

3.1 Appropriate Technology

Project Specifications

The streets will be paved using asphalt concrete, which is largely used for paving roadways in the City of Puerto Peñasco. The pavement project consists of surface pavement coating of 30 sections of streets located within the urban area. The final design submitted by the sponsor (municipality) includes the pavement design specifications and calculations, cost analysis, unit price study and construction plans with profile sections for each of the streets to be paved.

The project will require rough grading operations such as cut and fill, stabilization, compacting and preparation of the subgrade. Once the subgrade achieves the required compaction, the base course will be placed and treated to specification. Prior to the surface course placement a prime coat will be applied to the hydraulic base course followed by a tack coat as a binding agent. The surface course will be constructed of hot mix asphalt concrete (HMAC) with a seal coat to prevent infiltration. The project implementation includes the construction of concrete curb and gutter. Furthermore, the project development incorporates geometric design to address water runoff and possible adverse impacts to the sewer system such as infiltration. The design includes the installation of a crown along the centerline of the street, a slope with a minimal gradient of 2% towards the shoulders, directing the runoff to the gutter. When possible sewer manholes should be located along the center crown of the road, if this not an option, they should be elevated over the level of the runoff and if necessary sealed to prevent water infiltration to the wastewater system.

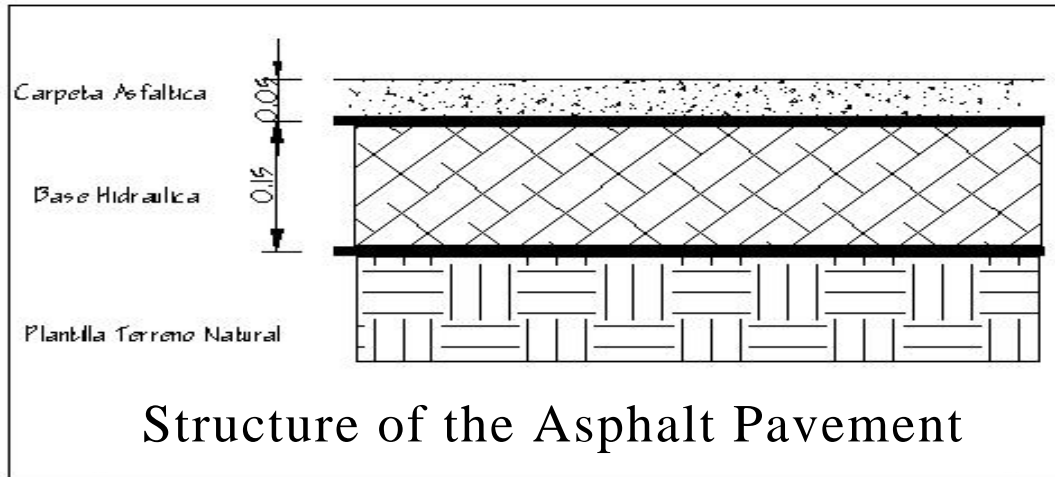
The promoter has coordinated with the Municipal Potable Water, Sewage and Sanitation Administrator (OOMAPAS, acronym in Spanish) during the selection process of the roadways to be paved in order to verify that the streets selected have potable water and sewage services already in place. The project's final design includes plans for each street showing the relative location of the water and sewer network.

It is important to mention that the chosen roadways are distributed in the five different sectors of the city. Furthermore the roadways have heavy traffic flow connecting to major thoroughfares.

Technical Process

The project will use concrete asphalt to pave the selected streets, as this material is readily available and its installation is fairly simple, moreover the cost is lower than for other paving materials available in the region. The pavement structure is composed of an asphalt layer of at least 5 cm. with a minimum compaction of 95% (Marshall test), this layer, after treating of the subgrade layer, will be placed over a base layer made of 50% gravel and 50% sand, with a minimum thickness of 15 cm. and with a minimum compaction of 100% (ASTM D 1556 modified Proctor test).

The Urban Development, Public Works and Environmental Department uses concrete asphalt on most of the paved streets, because of the reasons stated above and therefore they are prepared to perform the maintenance required. The following figure describes graphically the structure of the pavement.



3.2 Operation Plan and Maintenance

The Urban Development, Public Works and Environmental Department is responsible for the operation and maintenance of the streets in the City of Puerto Peñasco. This Department depends on an operation manual for the maintenance of paved streets both new and existent, according to the Municipal Law for Public Works and Services. The current manual is currently under review, any deficiencies or additional elements related to the project will be included during the implementation of the project.

3.3 Compliance with the Norms and Design Regulations

The project design was issued according to the requirements established by the Urban Development, Public Works and Environmental Department, as well as according to standard engineering practices. This project complies with the design regulations established by AASHTO (American Association of State Highway and Transportation Officials) and also complies with the test requirements of ASTM (American Society of Testing Materials). Regarding environmental regulations, during the implementation of the project, the Urban Development, Public Works and Environmental Department will verify compliance with the environmental regulations according to municipal rulings pertaining to the burn and run-off control.

Pending items:

- Final design for the projects to be implemented in the second and third years are pending.
- Operation and maintenance considerations will be addressed during project implementation.

4. Financial Feasibility and Project Administration

4.1 Financial Feasibility

The North American Development Bank reviewed the financial information presented by the project sponsor and made the corresponding financial analysis. The information presented and the financial analysis includes, among other things, the criteria for certification required by the BECC:

- Financial statements historic and pro forma;
- Financial structure of the project;
- Capital Improvement Plan/Budget;
- Operation and Maintenance Budget - historic and pro forma;
- Sensitivity and financial break-even analysis
- Demographic and economic information of the proposed service area

The detailed analysis of the financial information of the project is found within the financial analysis issued by the North American Development Bank, which will be submitted to its Council as part of a loan proposal for authorization.

The total cost of the Project in Puerto Peñasco is approximately in \$50.0 million pesos, including design costs, supervision, fees, as well as incidentals and taxes. The direct costs of pavement are estimated in \$42.0 million pesos and the indirect costs are estimated in \$8.0 million pesos.

TABLE 4-1: –Project Total Costs
(Millions of Pesos)

ITEM	MX\$	%
Direct Costs	42.0	84%
Indirect Costs	<u>8.0</u>	<u>16%</u>
TOTAL	50.0	100%

Source: Municipal Government of Puerto Peñasco 2005

The Municipal Government has requested from the North American Development Bank a loan to complement the \$25 million pesos that will be contributed by both the Municipal Government and the Trust for the Rio Colorado Bridge.

Table 4-2 shows the cost breakdown of the project

TABLE 4-2: Project Cost Breakdown and Funding Sources
(Millions of Pesos)

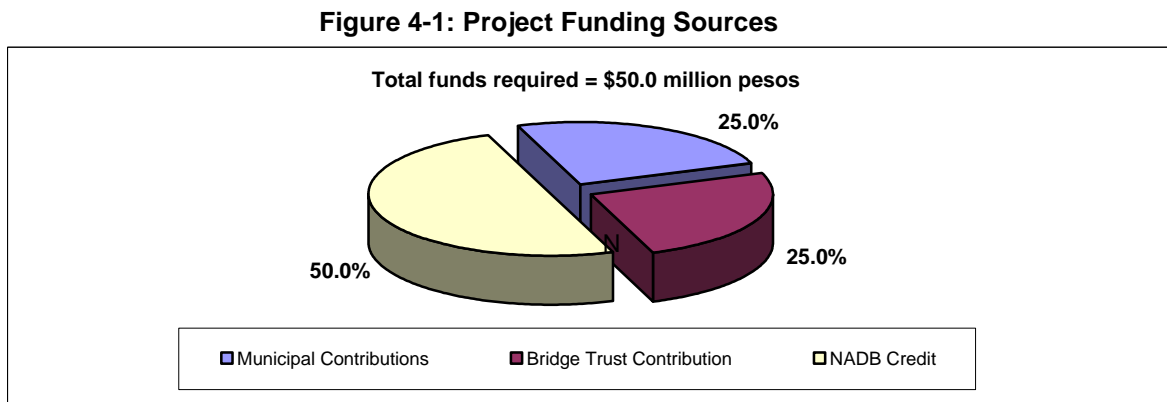
Concept	Period (2006 - 2008)	
Pavement direct costs	42.0	84%
Development and supervision costs	4.0	8%
Financial costs and commissions	<u>4.0</u>	<u>8%</u>

Funding Sources	TOTAL	50.0	100%
Contributions by Municipal Government		12.50	25%
Contributions by the Rio Colorado Trust		12.50	25%
NADB loan ¹		<u>25.0</u>	<u>50%</u>
	TOTAL	50.0	100%

Source: Municipal Government of Puerto Peñasco 2005

1. The total amount of the loan will be defined according to the credit analysis of the Municipal Government, performed by the NADB, and will be subject to approval.

Figure 4-1 shows the sources of the project resources.



The City of Puerto Peñasco started paving streets in 2003 and spent a total of \$3.1 million pesos, 12.4% of the contribution by the project sponsor, considered distinctly from the debt funds total.

In order to increase paving coverage, the City of Puerto Peñasco has contemplated additional paving phases with an estimated cost of \$1,000 million pesos. This amount is in addition to any funds that the City will have to invest in order to accommodate the accelerated rate of growth of the population.

The City of Puerto Peñasco has a solid financial situation, which is reflected in its “adequate” credit rating which has been evaluated as “BBB (mex)” (Investment Grade) by FitchRatings and Baa2.mx by Moody’s. The City has assigned a portion of its total revenues, including City own revenues such as surpluses and property taxes to repay the loan with the NADB.

Generally speaking, Puerto Peñasco has an efficient and proactive management of its finances. The healthy use of its resources and financial discipline has translated into a continuous operative surplus. The NADB loan will have not affect the financial situation of the City, important in order to maintain the current credit rating and future needs for infrastructure in Puerto Peñasco.

4.2 Fee/Rate Model

In order to accomplish both the effects of benefiting the community and a minimal effect on the municipal finances, the City of Puerto Peñasco has decided to charge the beneficiaries of the paved streets a total of 15% of the cost of paving their street. Also, a term of three years will be granted to repay the amount (without interest) For example, a beneficiary located at 117 Luis Encinas Street in its segment from Avenue 20 to Revolution Avenue, with a total pavement cost of \$3,749,737.60, will pay the amount of \$4,800.00 in 36 monthly installments of \$133.33 pesos.

4.3 Project Administration

The Municipal Council of Puerto Peñasco authorized the City to request a loan from the North American Development Bank in order to finance part of the project. The project will be administered by the Urban Development, Public Works and Environmental Department. This Department is responsible for pavement and maintenance of the streets of the City.

5. Community Participation

5.1 Comprehensive Community Participation Plan

On May 17, 2005, the Comprehensive Community Participation Plan, developed by the Steering Committee was approved. This committee prepared a public outreach plan to notify the community about the project proposed for certification, the benefits that the project will bring to the community, as well as the costs associated and the economic impact the project will have on the population.

Local Steering Committee

The Steering Committee was created on April 29, 2005, with the following representatives::

President:	Dra. Noemi M. Valdes Castolo
Vice-President	Dr. Maria Asuncion Macias S.
Committee Member:	M.C. Eduardo Aguirre H.
Committee Member:	Dr. Miguel Angel Padilla Duran
Committee Member:	Dr. Patricia Flores Araujo
Committee Member:	Mr. Jose Luis Duran Romero
Technical Secretary:	Mr. Milton E. Felix Reyes

During the installation session the committee was informed of the activities that are included in the public process and the certification of this project by BECC.

Meetings with Local Organizations

There have been 11 meetings held with the residents on the streets proposed to be paved under this project in the populated neighborhoods of the community.

Public Access to Project Information.

The Steering Committee, supported by the City of Puerto Peñasco prepared a project summary, in order to inform the community during the meetings held about project details. In addition, the project summary and other project related information was available at the Municipal Planning Department in City Hall, for review and public consultation.

Public Meetings

According to the BECC certification criteria, at least two public meetings should be held, these meetings are open to the general public, where an explanation of the project is provided and any questions regarding its development would be answered, giving the community the opportunity to give their opinions about the project at hand. One of these two meetings should be announced in the major newspapers of the region, at least 30 days in advance. A public meeting notice was published from May 7 to May 13, 2005 in the newspaper “ De Deveras” of Puerto Peñasco, Sonora, in order to duly comply with the criteria.

First Public Meeting

The first public meeting was held on June 9, 2005, in the Municipal Civic Auditorium of Puerto Peñasco, Sonora with a Steering Committee composed by an ample and varied representation of the public who demonstrated their commitment with the project. The first public meeting was held with excellent attendance and enthusiastic participation. More than 400 people attended the meeting.

In addition to the Steering Committee, Mr. Francisco Ramon Martinez Gonzalez, City Mayor, Mr. Ramon Corral, representing the North American Development Bank (NADB), and the Public Participation personnel from BECC were present at the meeting. Dra. Noemi M. Valdez Castolo, President of the

Steering Committee coordinated this meeting, presenting details about the project and answering all the questions that arose. Three hundred and two (302) opinion surveys were conducted and the statistical analysis showed that 98% of the people surveyed support the project and approve the proposed fee.

Second Public Meeting

According to the Public Participation Plan the second public meeting was advertised 30 days in advance in the local newspapers on Thursday June 23, 2005, The second public meeting was held, ratifying the excellent job performed by the Steering Committee and the project sponsor.

According to the agenda, the meeting was started by the President of the Steering Committee, Dra. Noemi Valdez Castolo, who exhorted the community to be more conscious about environmental problems and the health impact that the dust creates, through pertinent statistical information presented by Dr. Valdez. Next Mr. Heriberto Renteria, Public Works Director, presented the components of the project, and described its scope, street by street, and the fee schedule; then the question and answer session was opened with 11 participants, all of which showed support for the project and the proposed fees, and also to request that their street be included as part of the project. Three hundred and twenty (328) eight surveys were conducted and their statistical analysis showed that 99% of the people surveyed support the project and approved the proposed fee. Finally the Mayor, Mr. Ramon Martinez Gonzalez delivered his closing message.

5.2 Report Documenting Public Support

The Steering Committee and the project sponsor have presented and documented in the “Public Participation Process Final Report” that the public participation activities complete and satisfy the BECC criteria. This document contains all the tasks required by the BECC public participation criteria. Some of these tasks include: minutes from the meeting when the Steering Committee was created, public participation plan, notices of publication for the meetings, photographs from the meetings, and project related information.

6. Sustainable Development

Sustainable development is defined as economic and social development based in the conservation and protection of the environment, as well as the rational use of natural resources considering current and future needs, as well as present and future impacts of human activities.

6.1 Definition and Principles

According to the definition for sustainable development, the project to pave the streets in the City of Puerto Peñasco complies with the following four principles in order to satisfy the sustainable developments requirements of a project.

The first principle of the sustainable development criterion states that the project should result in a benefit to human health, Puerto Peñasco residents are entitled to a healthy and productive life in harmony with nature. Therefore, this project satisfies this principle as it will improve the air quality by reducing the PM₁₀ particles which may increase the incidence of respiratory illnesses, eyes and nose irritation, aggravation of asthma conditions, decrease in lung function and increase in respiratory symptoms in the population of Puerto Peñasco, and specially in high risk groups such as children and senior citizens.

The second principle states that the right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations. This project satisfies this principle as it will eliminate, by means of street paving, the dispersion of dust particles and therefore reducing air pollution and at the same time protecting the environment both for current and future populations. Also, this project will improve the flow of traffic and will promote economic development, thereby helping in the development of present and future generations.

The third principle establishes that in order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it. The main objective of this pavement is to reduce the fleeting dust particles, especially the ones known as PM₁₀, which are dispersed by vehicle traffic in unpaved roads and the predominant winds in the region. The reduction of dust particles in the atmospheric basin will contribute directly to improve the health of the inhabitants of the region. In essence, the implementation of this project intends to improve air quality in the region, which is a fundamental part of improving the environment.

The fourth principle states that the groups and individuals impacted by, and having an impact on development projects, must be part of any related activity and should have the opportunity to make decisions about the protection and use of natural resources, together with participation groups and institutions involved in improving the social, economic and environmental conditions. This principle is satisfied by the implementation of an extensive community participation program which allows different sectors of the society to participate, together with different institutions dedicated to environmental, social and economic improvements in the region.

6.2 Institutional and Human Capacity Building

The actions considered for the project will strengthen the City of Puerto Peñasco by increasing its capability to provide quality paved streets, by improving the support and public response to the implementation of future street paving. Also, the loan from the North America Development Bank (NADB) will have a positive impact by improving their bond rating, a very important aspect in order to guarantee future loans for the infrastructure needs of Puerto Peñasco. The project will be operated by the City of Puerto Peñasco through the Urban Development, Public Infrastructure and Environmental Department, which has trained personnel, a training program and an operation manual for maintaining the streets.

6.3 Conformance with Applicable Local and Regional Conservation and Development Plans

The project complies with the Urban Development and Tourist Plan and with the goals established pertaining to the strengthening of the urban infrastructure by paving the most important streets according to their geographical location, their traffic and their influence in the transportation patterns. The Department of Public Works is responsible for establishing policies for development and urban progress, by means of a comprehensive program, as established in the Municipal Development Plan in order to reinforce the basic services considering the sustainable development aspect.

The 2001-2006 National Program on Natural Resources and the Environment establishes that due to its demographic and economic dynamics as well as its environmental characteristics, Mexico's northern border is singled out as a priority region for the design and application of environmental policies and programs.

6.4 Natural Resource Conservation

The purpose of the project is to improve the air quality of the Puerto Peñasco region and at the same time benefit the health of its population without deteriorating the environment. The project does not interfere with the conservation of natural resources of the region as it will be carried out in an urban area over existing streets and it will not require any change regarding land use

6.5 Community Development

This project will foster community development by reducing the incidence of respiratory illnesses in the region. A benefit to the community will be obtained by improving the quality of life of the population, by reducing the pollution levels, by improving the urban street grid, by reducing transportation times, by promoting quick access to emergency, security and other public services, and fostering economic development and increasing the value of the properties of the area.

Available Documentation

Final design
Municipal environmental clearance
Public participation plan
Final public participation report