

## **Border Environment Cooperation Commission**

### **Air Quality Improvements for Nogales, Sonora.**

#### **I. General Criteria**

##### **Project Type**

The project proposed for development consists of reducing air pollution from suspended dust particles by paving urban streets in residential areas of Nogales with reinforced waterproof concrete and asphalt. This will be accomplished by the creation of an entity decentralized from the municipality, that will be in charge of the street paving program.

The project will contribute to reduce air pollution by dust in the Ambos Nogales (Both Nogales) air basin (Cocospera), inasmuch as the city's unpaved roads are one of the main sources of environmental pollution within this area. Airborne dust reduction will have a major impact on improving the overall state of health of the population that resides in the air basin's area.

Paving urban roadways will also help to improve the quality of life of area residents by facilitating the entrance of public services like police and firefighters to their communities, by facilitating the access to employment and trade sites, and by reducing the wear and tear of vehicles that travel on those streets. Paving will also increase the appraisal value of impacted properties, compensating thus the cost of the project for property owners.

The proposed project consists of paving a 300,000 m<sup>2</sup> surface area within a two-year period.

It has been estimated that the population that will derive a direct benefit from this project would be approximately 80,000. The project will seek to be continued to address the city's paving backlog.

##### **Project Location**

The City of Nogales, Sonora is the head of the municipality of Nogales. It covers a 1,654.76 Km<sup>2</sup> surface area, and is immediately adjacent to the United States of America, bordering the State of Arizona, and across from Nogales, Arizona. By the year 2000 its population was 159,787, and by 2013 it is expected to grow to 225,489 residents, pursuant to official data from INEGI/CONAPO.

The city is located at the crossing of coordinates 31° 15' 20" Northern latitude and 110° 58' Western longitude, in the north-central part of the State of Sonora. The city's importance relies on the fact that it is the primary border crossing for the states of Arizona and California in the United States, and for the states of Sonora and Chihuahua in Mexico, in to a lesser degree for other central states. The city's main economic activities include trade, services, the *maquiladora* industry, and tourism. Its border port

nature makes the city a regional clearinghouse for import and export services in the agriculture, industry and livestock fields.



The proposed project consists, in reducing air pollution from suspended dust particles by paving with reinforced concrete and asphalt, within a period of two years, 300,000 m<sup>2</sup> distributed among urban dirt roads located in residential areas of Nogales, Sonora that have water and wastewater services available, giving priority to roadways that are used for public and private transportation. This will be accomplished through the intensification of the street paving program implemented by the City of Nogales through its Directorate of Public Works [Dirección de Obras Públicas] and the Additional Municipal Development System [Sistema de Desarrollo Municipal Adicional de Nogales, Sonora. (SIDEMA)], a decentralized public agency approved by the City Council on February 3, 2004, as published on April 15, 2004 in the Sonora State Official Bulletin, with legal capacity and an independent capital structure, whose purpose is to represent and coordinate economic, social, professional and other sectors in the community, to carry out urban development and public infrastructure actions under a cooperation system within the corresponding municipal jurisdiction.

The population that will directly benefit from the implementation of this project is estimated to be 80,000, while the total population that will indirectly benefit from it will

be 175,000 residents (INEGI 2003). The average growth rate for the past 8 years has been 3.83%, and by the year 2013, this rate is expected to be 3.65%. Although there are other sources of information such as CNA, the Water Master Plan establishes that by 1999 the population was 205,000, with an annual average growth rate of 4.2% and an average of 5.5 residents per housing unit. Once the project is completed, the city's paved surface area would increase from 35% to 45%, insofar as the 300,000 m<sup>2</sup> of this first paving phase would cover 15% of the current paving backlog.

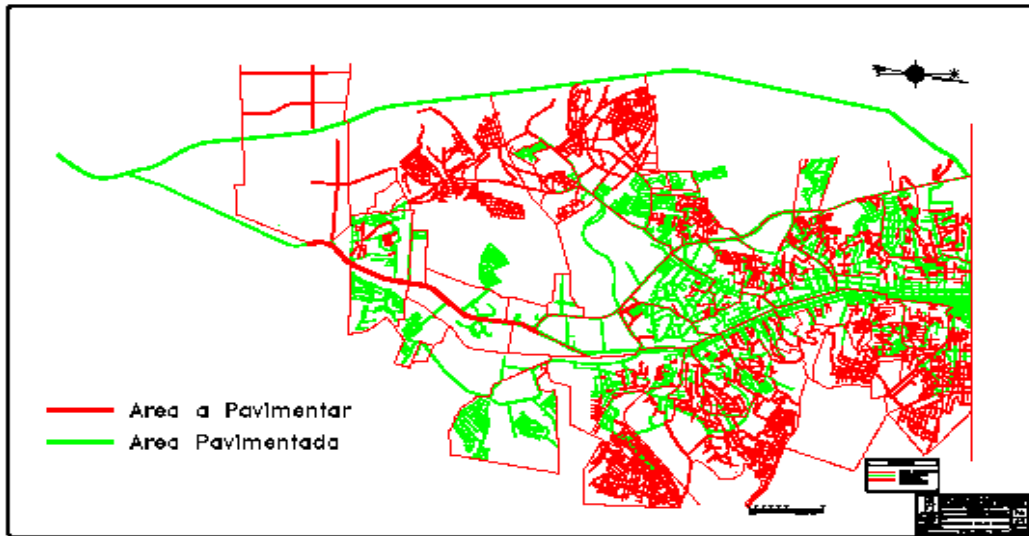
### **Background**

Currently, 65% of the city of Nogales lacks pavement. This situation represents a serious public health issue, since during the summer, when the ground is dry due to the lack of rain, the movement of private vehicles and public transportation and the area's frequent windy conditions cause fine particles from the ground to be suspended in air and turn into a potential source of respiratory illnesses, allergies, asthma, and ischemias, primarily among children and young adults.

The roads proposed to be paved as part of the project's schedule will be located within the city of Nogales. The Municipal Directorate of Urban Planning and Control prepared a study on paving two million square meters in Nogales, which is part of the Nogales Urban Development Plan approved for the 2004-2007 period.

The aforesaid study mentions that the city has 1896 roadways, of which 35% are paved with some type of overlay. This means that close to 1,200 roads are covered only with dirt, which proves that 250 lineal kilometers require paving, given that one of the city's most significant work backlogs belongs to this infrastructure area.

The areas with the greatest need for paving are located as follows: 60% in the northeast, where it is estimated that the most significant backlog exists, and 40% in the city's southeast. The following city map details paved vs. unpaved areas:



### **Objective**

The proposal involves a public project intended to reduce air pollution, especially that caused by  $PM_{10}$  and  $PM_{2.5}$  particles, by paving city roadways. The project proposes paving 300,000  $m^2$  of roads. The pavement backlog amounts to approximately 2'000,000  $m^2$  of city streets, which cover approximately 250 Km in length, according to the Comprehensive Paving and Urban Improvements Program [Programa Integral de Pavimentación y Mejoramiento Urbano].

### **Project Components**

The project includes the installation of pavement in 300,000  $m^2$  of urban roadways located in residential areas of various subdivisions of the city of Nogales, Sonora, within a two-year period. The areas with the most need for pavement are located 60% in the northeast, where the greatest backlog exists, and 40% in the southeast. In order to cover this surface area, the following activities will be carried out:

- Selecting the area to be paved.
- Reviewing the area's particular conditions, including natural runoffs and slopes, etc.
- Topographic survey and geotechnical analysis.
- Development of a final design.

Additionally, the construction process may include in some areas the introduction and rehabilitation of wastewater collection and water services, contingent upon the agreement of area residents and the local water utility.

### **Conformance to International Treaties and Agreements**

The project will improve health and environmental conditions on both sides of the border, and as such, is congruent with agreements signed by Mexico and the United States of America. The construction of the proposed work will take place only in Mexico and will not affect the U.S.

The project falls within the scope of agreements signed by Mexico and the United States of America pursuant to the environment and the enhancement of life quality conditions for border residents, such as the La Paz Agreement, the Comprehensive Border Environmental Plan, the Border 21 Program, and the North American Free Trade Agreement.

As for International Treaties, the U.S.-Mexico "Border 2012" Environmental Program, under Objective 2, proposes to "Reduce air pollution."

## II. Human Health and Environment

### 1. Human Health and Environmental Need

The project will contribute to reduce airborne dust generation within the Cocospera air basin, being that unpaved city roadways are the main source for the production of an annual 8,896 tons of suspended particles 10 microns in size (PM<sub>10</sub>), exceeding the official standard up to 26 times per year. The reduction in airborne dust levels will also have a major impact on improving the overall health status of the population that resides in the basin. Morbidity data from the General Directorate of Epidemiology of the State of Sonora find that 61.78% of the total number of cases recorded annually are due to respiratory problems, and 15% of them are related to gastrointestinal and parasitary diseases, for which pollution is the main triggering factor, and the impacts for the community are not only suffered by our country, but also by our neighbors in Nogales, Arizona.

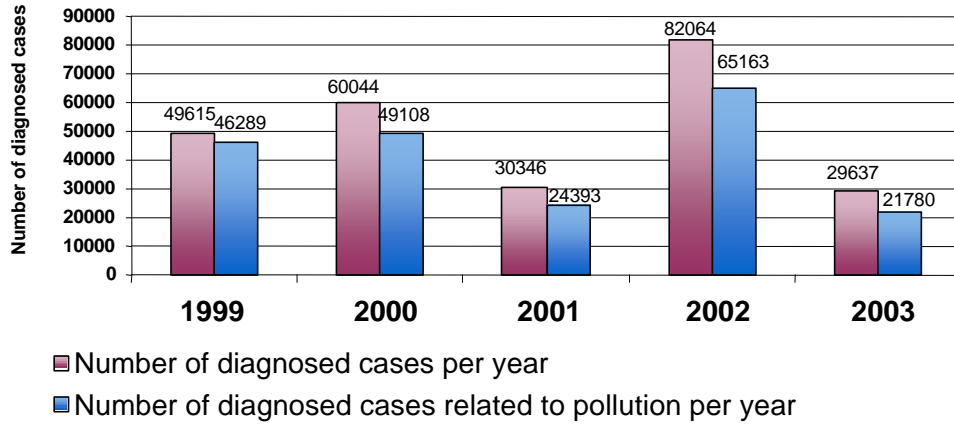
### PM MONITORING BACKGROUND FOR BOTH NOGALES

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- ✍ 1973 - 1986: Samples of Total Suspended Particles collected in Nogales, AZ.
  - ✍ 1985 - 1993: Samples of fine (0-2.5 microns) and large (2.5-10 microns) particles collected in Nogales, AZ. Intensive Study, Fall, 1988
  - ✍ 1994 - 1995: Samples of fine and large PM10 collected in Nogales, AZ and Nogales, SON as part of the Binational Air Quality Study
  - ✍ 1995 - Present: Samples of PM10 and PM2.5 collected in Nogales, AZ and Nogales, SON

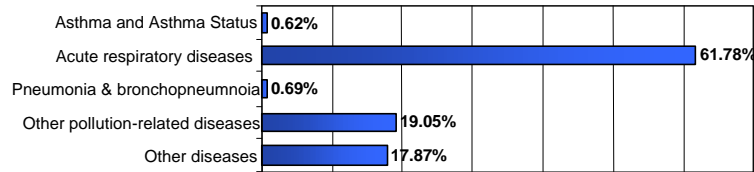
The proposed project addresses the problem of air pollution in the area caused by the generation of particles due to the lack of pavement, which results in longer vehicle traveling times, the transport of dust particles by the wind, and the sliding of slopes during the rainy season.

### 2. Health and Environmental Statistics

**MORBIDITY RECORDED IN NOGALES, SONORA  
1999 - 2003  
PRIMARY FACTOR IS POLLUTION**

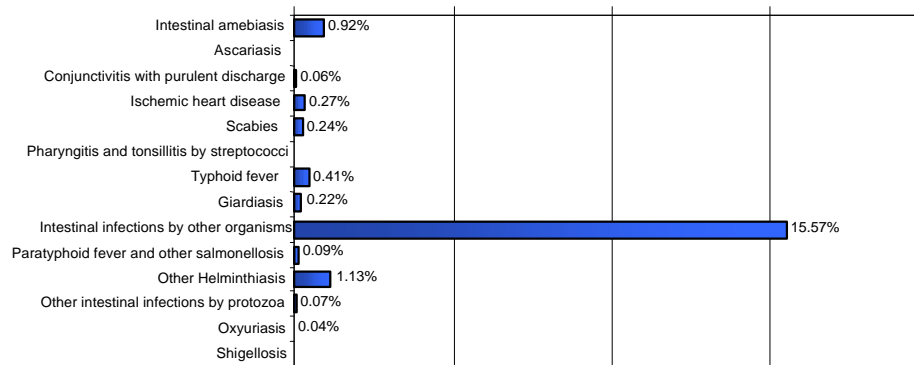


**MORBIDITY RECORDED IN NOGALES, SONORA.  
1999 - 2003  
PRIMARY FACTOR IS POLLUTION**



Source: National Health System  
 Secretariat of Health  
 General Directorate of Epidemiology of the State of Sonora  
 Statistical Yearbooks 1999, 2000, 20001, 2002 and weeks 1 through 38 of 2003.

**MORBIDITY RECORDED IN THE CITY OF NOGALES, SONORA**  
**1999 - 2003**  
**PRIMARY FACTOR IS POLLUTION**



Source: National Health System  
 Secretariat of Health  
 General Directorate of Epidemiology of the State of Sonora  
 Statistical Yearbooks 1999, 2000, 20001, 2002, and weeks 1 through 38 of 2003.

During 2000 alone, 32 instances of exceedance were recorded, taking as a reference the 24-hour standard for PM<sub>10</sub>, with 49,108 cases of air pollution-related cases recorded. In 2002, the number of diagnosed cases recorded by the health sector was 82,064, of which 65,163 were diseases related to air pollution; in other words, 79.4% of the diseases during that year were attributable to the 8,896 tons of PM<sub>10</sub> and 4,314 tons of PM<sub>2.5</sub> that are produced by the city on a yearly basis, mainly by the 1,200 unpaved roads where part of the 45,000 registered vehicles travel, and by the aggravating 32,295 tons of dirt dragged by rain currents that also cause obstructions in the wastewater collection system and the loss of human lives.

Other sources of information, such as IMSS, report that 70% of their financial resources earmarked for providing health care to their beneficiaries are used to address diseases that may be triggered by pollution, primarily in the most vulnerable age groups (children and senior citizens), even though they also appear significantly in the economically active population group, aged between 25 and 35.

The most frequently occurring diseases are acute respiratory infections (ARI) and chronic respiratory infections (CRI), intestinal parasitosis, conjunctivitis, and dermatitis.

All of them share a common risk factor: in addition to the household's hygiene and environmental conditions, inexistence of insufficient public utilities –primarily drinking water and sewage collection. Thus, if the paving project that includes such services is completed, it will have a major impact on addressing environmental contamination,



which necessarily will impact the health of the overall population, significantly reducing thus the incidence of the aforementioned causes of morbidity.

At the current annual paving rate reported by each municipal administration, solving the lack of pavement issue would take 25 city administrations, in addition to the reduction in survival rate, and work, school, and social absenteeism. Thus, it would take 75 years to cover the deficit, due to having a 36,000 m<sup>2</sup> annual paving rate when the deficit is 2,250,000 m<sup>2</sup>. Therefore, it must be considered that the growth of the urban area and the population increase in the next 75 years will considerably aggravate the backlog.

## **2. Environmental Evaluation**

Considering that these tasks will be developed in previously impacted urban areas, this type of project will not require an Environmental Impact Statement (EIS).

Due to its size and nature, the project only requires the submission of a preventive report in the corresponding format. This report was submitted for review and a finding to the Secretariat of Urban Infrastructure and Ecology [Secretaría de Infraestructura Urbana y Ecología] of the State of Sonora on October 28, 2003. According to the finding issued by Sonora's General Directorate of Environmental Regulations [Dirección General de Normatividad Ecológica] on November 5, 2003, the project does not affect any ecological reserve, habitat, or protected species.

Since the tasks will be developed within the urban area in existing rights of way, a review by the Instituto Nacional de Antropología e Historia (INAH) on impacts to historical and/or cultural resources is not applicable.

## **3. Compliance with Applicable Environmental and Cultural Laws and Regulations**

### **1. List of project authorizations**

The paving projects will be developed in accordance with guidelines established by the construction code for the Municipality of Sonora, as well as with recommendations regarding urban development and traffic provided by Law 101 of the State of Sonora. In addition, the project must conform to requirements established by the Directorate of Ecology for slope and runoff control, although for this last aspect, the municipal government will consider a specific program to manage rainfall discharges.

The municipal government of Nogales, through the Municipal Directorate of Ecology, created short, mid and long-term municipal programs consisting of reforesting slopes and streets for water absorption and dust retention. Additionally, the Directorate of Public Works is developing a final design for the construction of two reservoirs for collecting rainwater and preventing flooding in the city's central areas.

The Directorate of Urban Development Planning and Control [Dirección de Planeación y Control del Desarrollo Urbano y Ecología] of Nogales, Sonora, in Official Letter No. 0253-1003 of October 27, 2003, issues a finding on the Feasibility of the Construction of the Comprehensive Paving Program. Additionally, Official Letter No. 0262/1003 notifies

SIUE of the issuance of a Land Use Authorization for the project, since the tasks to be developed do not affect protected or ecological areas, nor land use changes will be made. Moreover, the project is included in the Urban Development Program for Nogales.

Furthermore, the City of Nogales, Sonora, by means of Official Letter No. 051/03, asked the Secretariat of Urban Infrastructure and Ecology to evaluate the Preventive Report for the Air Quality and Comprehensive Paving Project, for which SIUE issued Finding 10-1947-03, File: DGENE-280-IP/03, Code: DGNE-RESOL-IP-03. The agency found that the Air Quality and Comprehensive Paving Project, given its characteristics, does not result in significant environmental impacts that may cause environmental unbalance or an exceedance of the limits and conditions established by Mexican official norms issued by the federal government to protect the environment.

In light of the above, the Secretariat found that, for the development of tasks and activities related to reinforced concrete and asphalt paving of 300,000,000 m<sup>2</sup> of urban roadways in the city of NOGALES, SONORA, the project does not require the environmental impact authorization alluded to in Article 21 of the Law for Ecological Equilibrium and Environmental Protection for the State of Sonora (Law No. 217). Thus, the document herein will be regarded as an environmental resolution.

### III. Technical Feasibility

#### **Appropriate Technology.**

##### Background.

Current pavement types include flexible pavement, based on an asphalt mixture, and rigid pavement based on reinforced concrete slabs. By virtue of the nature of the project, the technology that will be used will conform to specifications provided by the municipality such technologies must be applied by construction companies and developers that have the necessary and appropriate equipment to carry out paving activities.

This project recommends the use of both paving technologies, and estimates a 50% use of each of them in the overall scope of the project, depending on soil and topography conditions in the areas to be paved. For this reason, a concise description of model projects with reinforced concrete and asphalt is included below.

Specifications for materials, construction procedures, and additional requirements for road paving in Nogales, Sonora, have been defined by the municipality and are detailed in a separate technical document, which indicates for the benefit of the applicant itself, applicable construction standards and regulations.

##### Need for the Project

At this time, only 35% of the urban area is paved, and this causes air pollution problems, essentially due to the emission of particles ( $PM_{10}$  and  $PM_{2.5}$ ). Additionally, the lack of an appropriate roadway pavement limits the access of unpaved area residents other services such as the police, fire department, etc.

#### 2. Work Schedule

Once the roadways to be paved are identified, the type of pavement to be installed will be determined, and the corresponding final designs will be developed pursuant to specifications established by the municipality and based on model final designs for each type of technology.

Three phases for the two-year paving program have been identified: the first one will begin in late September 2004, and will be completed by December 2004; the second phase covers the year 2005, and the last phase includes the year 2006. Awards to contractors in charge of developing the tasks will be awarded on the basis of the progress made in the process of identifying roads and reaching agreements with area residents.

Given the nature of the project, the different phases are linked. By type of task, they are divided into site preparation and construction.

A. Construction work developed for site preparation

Land cuts, natural surface treatment, and earthwork with site materials. By the nature of the project, land cuts and embankments will not exceed 25 cm, since the project will be developed on existing roadways and the residential, commercial, and industrial nature of the site has been taken into account.

No.	Item	Unit	Quantity	Week I	Week II	Week III	Week IV
1	Cutting natural surface to earthwork level	M <sup>3</sup>	8,589.54				
2	Treatment of the natural surface	M <sup>3</sup>	7,998.05				
3	Earthwork with site materials	M <sup>3</sup>	4,094.03				
4	Base with embankment materials	M <sup>3</sup>	4,799.40				
5	Concrete curb	M <sup>3</sup>	559.85				
6	Concrete Mr= 42.5 kg/cm2	M <sup>3</sup>	1,119.72				
7	Asphalt concrete	M <sup>3</sup>	1,679.59				

Volumetric area: 39,990.27 m<sup>2</sup>

B. Roadways

The tasks proposed under this project will be developed on roadways located in different city areas; therefore, various access ways to the city's urban area will be used. This project does not cause any impacts to ecological areas or land use changes, and will not affect protected areas.

3. Labor requirements for all phases of the project:

Based on the specifications established by the municipality, the tables below show an estimate of labor needed for the different phases of the project.

<b>PHASE 1 SITE PREPARATION</b>	
CUTS NO DEEPER THAN 25CMS	16 PEOPLE/MONTH
NATURAL SURFACE TREATMENT 20CMS	26 PEOPLE/MONTH
EARTHWORK WITH SITE MATERIAL -NO MORE THAN 25CMS	26 PERSONAS/MES

**For reinforced concrete paving**

<b>PHASE 2 SITE CONSTRUCTION</b>	
BASE WITH EMBANKMENT MATERIAL 0.10MTS WIDE	26 PEOPLE/MONTH
CURB FORMWORK AND CASTING WITH PREMIXED CONCRETE	31 PEOPLE/MONTH
SLAB FORMWORK AND CASTING IN ROADWAYS WITH PREMIXED CONCRETE 0.10 TO 0.14 MTS.	23 PEOPLE/MONTH

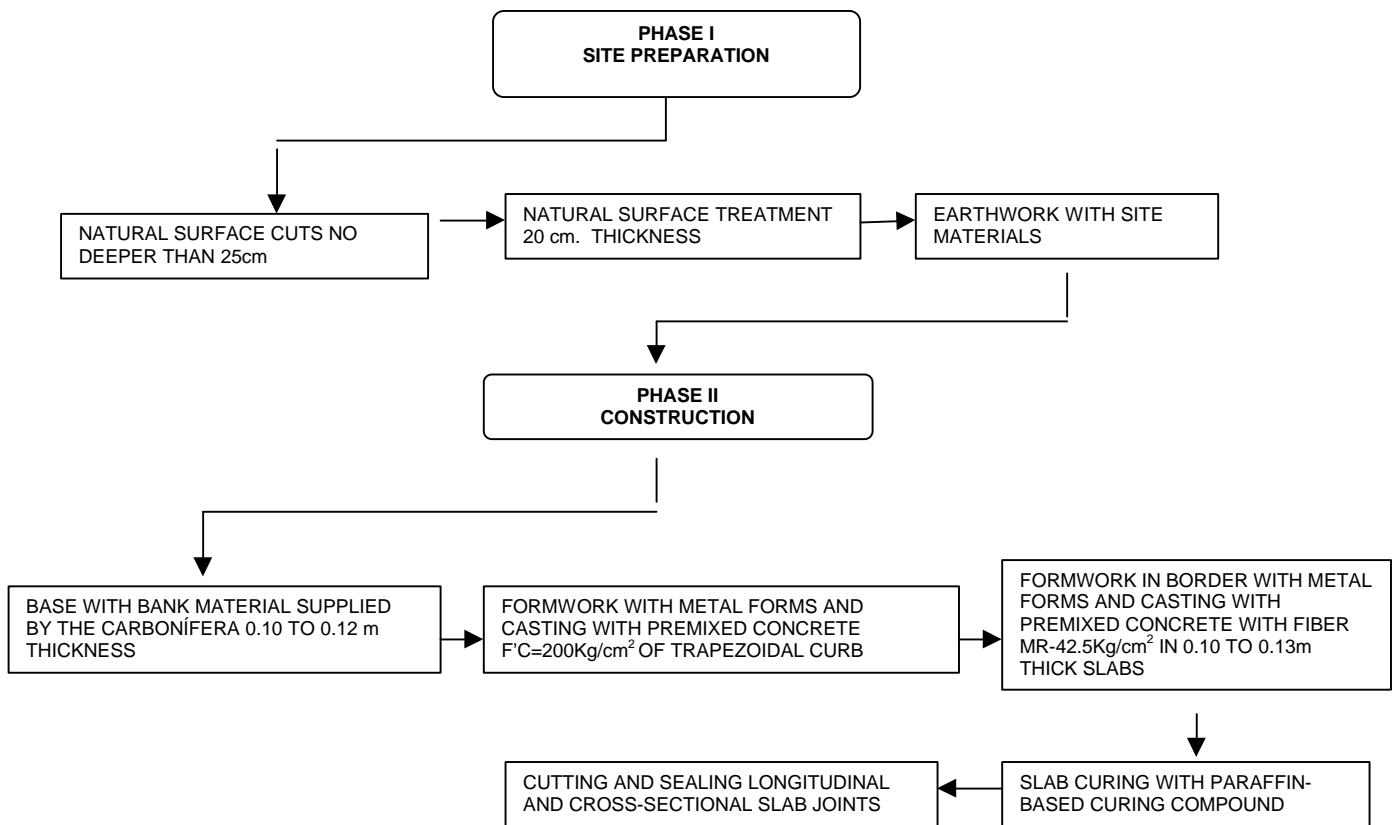
SLAB AND CURB CURING WITH PARAFFIN-BASED CURING COMPOUND	2 PEOPLE/MONTH
CUTTING AND SEALING LONGITUDINAL AND CROSS-SECTIONAL SLAB JOINTS	4 PEOPLE/MONTH

**For asphalt paving**

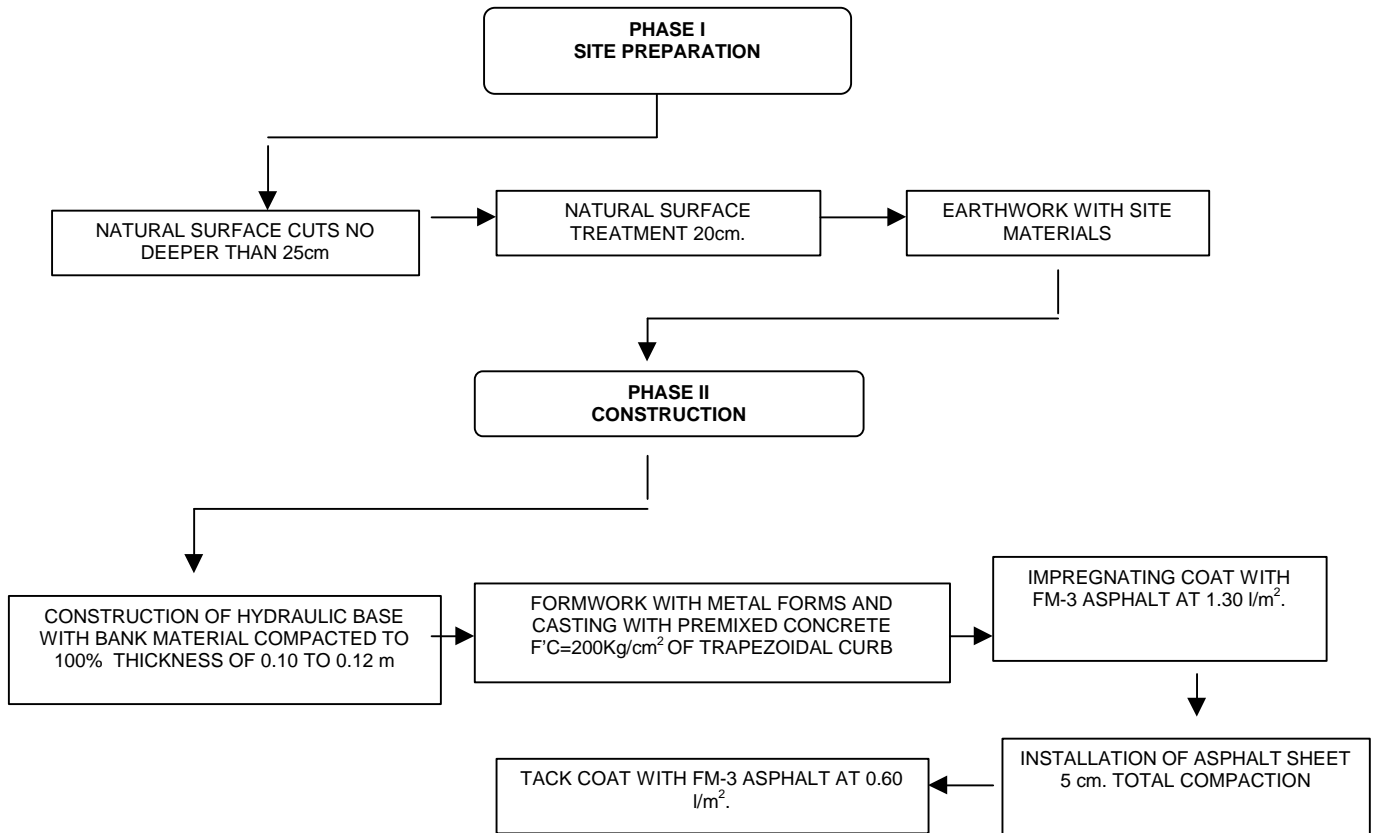
<b>PHASE 2 SITE CONSTRUCTION</b>	
INSTALLATION OF 5 CM SHEET ASPHALT ON ROADWAYS	23 PEOPLE/MONTH

4. Process Description

**For Reinforced Concrete Pavement**



**For Asphalt Concrete Pavement.**



## 5. Materials to be used

The materials that will be used for the site preparation and construction phases are described in the aforementioned specifications document.

## 6. Required equipment

Equipment required for the site preparation, construction, and operation phases is as follows:

<b>Site Preparation Phase</b>	<b>Construction Phase</b>
Motor grader	Motor grader
Vibrating compactor	Vibrating compactor
Front loader	Front loader
Dump truck	Dump truck
Tank truck	Finisher
Topography equipment	Pneumatic compactor
	Rakes
	Metal forms for concrete

#### 7. Design Plan for Stormwater Drainage System.

The project proposes to address the drainage of rain runoffs within the different areas to be paved, by designing the necessary infrastructure to dispose of such water in an effective, safe, and economically viable manner. For the development of this part of the project, rainfall data provided by the City of Nogales, Arizona will be considered.

The demarcation of each of inflow basins and sub-basins in the project area will be based on level curves resulting from a topographic survey of the study area and data obtained by a topographic study developed for COAPAES with funding assistance from BECC.

The project's different study areas are located in various city subdivisions, and are separated by streets that define their territory. The areas included in this project are residential in nature. The design of the stormwater drainage system will consist of reviewing rain runoffs according to proposed pavement grades and designing conduits for water disposal, and includes the following items:

1. Design of pavement grades.
2. Design of stormwater drainage system.

#### 8. Operation and Maintenance Plan

The operation and maintenance plan will be developed during the construction of the proposed infrastructure. The cost of developing the O & M plan has been included in the project cost.

#### 9. Compliance with Design Standards and Regulations

Paving projects will be developed in agreement with applicable Urban Development Plan guidelines, and must conform to guidelines proposed by the municipality through the Directorate of Public Works, and for natural slope and runoff control, with principles proposed by the Directorate of Ecology, although for the latter, the Municipal Government must consider a specific rainwater discharge management program.

## IV. Financial Feasibility and Project Management

### Financial Structure of the Project

The Project for Air Quality Improvements for Nogales falls within the so-called BECC and NADB Mandate Expansion; as such, it is eligible to receive assistance from lending institutions as well as other federal, state, municipal, and private institutions, such as indicated below :

- The city submitted an application to NADB on October 10, 2003 for the Debt Capacity Analysis, to obtain a loan for 50% of the total cost of the project.
- On October 4, 2003, Banobras started developing a debt capacity study on Nogales for the paving project, indicating the possibility of offering a loan to cover 25% of the project's total cost.
- The State Government would provide up to 25% of the Program's total cost.

The Municipal Government received a letter from the State Government (Secretaría de Hacienda) expressing their commitment to participate in this project with a total of \$30 million, to be disbursed in 3 phases: a first phase for \$8 million during the September-December 2004 period, and two disbursements for \$11 million each for the 2005 and 2006 fiscal years.

### **Project Funding.**

The total cost of the three project phases is estimated to be \$111,000,000 pesos (9.73 million dollars, using an exchange rate of 11.40 pesos to the dollar).

### **Financial Structure**

		Participation without
	%	revolving fund
BANOBRAS	25	\$ 26'000,000
NADB	50	\$ 55'000,000
Sonora State Government	25	\$ 30'000,000
<b>Total</b>	<b>100</b>	<b>\$111'000,000</b>

The overall scheme of the project's financial structure is presented in the following table, which also shows the interest rates that would be applied by the different participating institutions to loans granted to the community, and the rate that would be charged to residents of roads benefited by the paving program.



<b>GENERAL</b>	
Expected annual population growth 2004-2011	4.03%
<b>PAYMENTS</b>	
% of the community that makes initial payments	80%
% of the community that makes remaining payments	0%
Annual interest rate to be paid by residents	10%
<b>BANOBRAS LOAN</b>	
TIIE (Interbank Interest Rate)	6.95%
Overcharge	2.50%
	9.45%
<b>NADB LOAN</b>	
Loan rate	8.50%
<b>PAVEMENT</b>	
% m2 paved with asphalt	60%
% m2 paved with concrete	40%
Total m2 to be paved	300,000
Oversight costs	5%
Management costs	6%
Contingency fund	15%

The following figure indicates the two types of pavements that will be used for this program, as well as the distribution of costs for each of them.

## ASSOCIATED COSTS

Asphalt	60%
Concrete	40%
Total	100%
Direct cost per m2 of asphalt	\$278.53
Direct cost per m2 of concrete	\$501.98
Study and projects per m2	\$11.70
<b>Cost of Study and Projects</b>	<b>\$3,510,000</b>
Oversight	5%
<b>Oversight Costs</b>	<b>\$5,550,000</b>
Management	6%
<b>Management Costs</b>	<b>\$6,660,000</b>
<b>Legal, technical and financial costs</b>	<b>\$250,000.00</b>
Legal, technical and financial costs per m2	\$0.60
Contingency Fund	15%

<b>Contingency Fund</b>	<b>\$22'000,000</b>
Contingency Fund per m2	\$55.19
<b>Total Overhead</b>	<b>\$32'385,000</b>
Total Overhead per m2	\$107.95
Total Project	<b>\$142'758,000</b>
Total Project per m2	\$475.86
% Overhead	23%
% Direct Costs	77%

As for the participation of the community in covering the cost of paving works, the scheme presented in the following table has been considered:

#### Contributions

Paving cost by typical beneficiary: \$ 19,000.00		
Contributions		
Government	\$9.500	50%
Beneficiaries – Construction cost	\$9.500	50%
<b>Total</b>	<b>\$19.000</b>	<b>100%</b>
<b>Charged to beneficiaries</b>		
Construction cost	\$9.500	
Management cost @ 10%	\$950	
<b>Total</b>	<b>\$10.450</b>	

#### Payments by Project Beneficiaries

Paving cost by typical beneficiary: \$19,000		Amounts
Total charged to beneficiaries		\$10.450,00
Charged at onset of construction work (25%)		\$2.612,50
Paid in installments at completion of work (75%)		\$7.837,50
Total paid		\$10.450,00
<b>Installments</b>	<b>Monthly charge</b>	<b>Total payments</b>
6 months	\$1.382,40	\$8.294,43
12 months	\$731,15	\$8.778,00
18 months	\$516,10	\$9.289,76
24 months	\$409,64	\$9.831,36
Loan Cost		12% (annual)
Operating Cost		5.7% (annual)
Funding Cost for beneficiaries		17.7% (annual)
		1.48% (monthly)

To support the project funding, a 5% down payment will be made upon the submission of a paving application. By the beginning of the construction, the remaining 20% will have been collected, to make up a 25% down payment on the cost of paving. The creation of a

bank account is suggested to deposit these payments. The City will develop an incentive program to promote the prompt payment of this contribution by benefited residents. The city must provide guidance to residents interested in the paving program as to the opening and management of their bank account for purposes of paving.

Resident contributions for road paving will enable the city to create a revolving fund that may be used to expand the scope of the paving program.

**a. Project Management**

The City, through its Directorate of Public Works and SIDEMA, an agency responsible for promoting, contracting out, overseeing and managing the program. SIDEMA will handle paving applications made by city residents and will also promote various community plans to organize, contract out and build paving projects for area residents, provided they assume responsibility for part of the total cost of the construction work.

The City will also finance the cost of the program for participating residents, by offering 6, 12, 18 and 24-month payment plans for the fulfillment of their financial obligations. Every individual or entity directly benefited by the project will be obligated to pay their corresponding part, which will be determined based on the area encompassed by the front of their property and half of the width of the road. The cost of paving areas in front of schools, parks, churches, and other public places, as well as street intersections, will be proportionally divided among residents.

Once a road eligible for paving is identified, the following steps will be followed to complete the construction:

- An estimation of costs is prepared and used as the basis for charges made to residents of roads eligible for paving.
- A determination is made that at least 80% of the owners of properties along this road agree to pay the construction costs.
- The Municipal Administration is given 5% of the project's cost as an initial down payment.
- The project is referred to the City's technical department to start the preassessment process.
- Residents are given a 3-month period to cover 20% of the amount, corresponding to the total down payment.
- Once 25% of the amount is collected, the city starts the bidding process (public, restricted, or direct procurement) based on the Public Works Law for the State of Sonora, to be completed in approximately 30 days.
- Once the construction is completed, it is turned over to city authorities in the presence of area residents.
- The collection process starts, using monthly payments for 6, 12, 18, and 24-month payment plans.

The City tries to arrange for five to six blocks to be paved to form a construction package. The construction is open to bidding by contractors only if the total cost of the construction exceeds \$1.2 million pesos. For smaller amounts, the Operating Committee uses direct procurement to select a contractor. The project intends that 100% of the work be awarded through public bidding.

The City will charge benefited residents 6% of the construction cost estimation to cover administrative and operating costs. Only this small profit margin is charged because the program is not intended for profit, as its main objective is to serve the community by implementing road-paving projects. The average paving cost by beneficiary has been approximately \$19,000.00 pesos, of which residents would only pay 50%.

In February 2004, the City Mayor obtained authorization from the City Council to create the decentralized agency that will be in charge of overseeing and coordinating the paving program along with the Municipal Directorate of Public Works.

## V. Public Participation

**Beginning of the Public Process:** This public process started on October 16, 2003, when Ms. Josefina Guerrero, as the official project sponsor, was provided with the BECC Community Participation Guidelines and other reference documents to begin the public process.

**Steering Committee:** The Steering Committee was created on November 17, 2003 at a meeting held in the City Council Room of the Nogales City Hall. At this meeting, the Steering Committee's Board was elected and established as follows:

- Miguel Salazar Candia, Chairman of the Steering Committee
- Constantino Valenzuela, Secretary
- Dr. Alberto Vázquez Gudiño, Treasurer

**Comprehensive Community Participation Plan:** With an enthusiasm strengthened by previous experiences of the Nogales community with the BECC, the Steering Committee developed a Comprehensive Community Participation Plan, which was submitted on November 24, 2003, and approved by the BECC on December 9, 2003.

**Public Information:** With an exemplary performance, the Steering Committee, with assistance from the project sponsor, developed intense activities to inform the community about the project and to give an opportunity for residents to provide their input. During this public process, the contact with "local organizations" was constant, and we must highlight the presentation of the project and its ramifications to 21 Non Governmental Organizations, 28 academic institutions, 5 trade associations, 7 professional associations, 9 unions, 8 religious groups, and 3 social clubs.

Ten project fact sheets were distributed at public meetings and meetings with residents; 960 radio spots were broadcast to announce Public Meetings; and 6 announcements were inserted in local and state newspapers to invite attendance to these meetings. In addition, 7,000 leaflets with general information were distributed, as well as 500 eight-page brochures with detailed project information.

Ninety information meetings with residents were conducted in more than 61 subdivisions, at which 1,531 surveys were administered. These established that 89% of the surveyed residents supported the project.

### **Public Meetings:**

**First Public Meeting:** This meeting was held on January 13, 2004 at the Cinemas Gemelos movie theater facility in Nogales, Sonora, and was attended by approximately 240. The general technical characteristics of the project were presented at this meeting, as well as the project scope and the tentative user fees per square meter that may be charged to cover paving costs.

After the question and answer session, 141 exit surveys were administered, and it was determined that 88% of those surveyed supported the project. A highlight was the participation of individuals who supported the project but asked the city to address specific roadways. This issue was referred to city officials to be reviewed as part of the current municipal paving program. Some participants made the remark that the proposed fee for m<sup>2</sup> of pavement was a little high, and requested that costs be reviewed for the benefit of residents.

Overall, attendees showed support for the project and there was general acceptance of the proposed fees, a fact that was confirmed by the review of surveys.

**Second Public Meeting:** It is pending but proposed for June 26, 2004. Considering the outreach and public information effort made for this project, as well as the acceptance by different sectors of the Nogales community, the support of the majority of the population is expected to be obtained for this project.

The Final Report on Public Participation will be completed by late June 2004.

## **VI. Sustainable Development**

### **1. Definition and Principles**

According to the definition of Sustainable Development, the Urban Road Paving Project in Nogales, Sonora complies with the precept of conservation-oriented social and economic development that emphasizes the protection of natural resources.

A) Human Health Sustainability

- Road paving will eliminate dust, suspended particles, and/or will reduce the community exposure to these.
- The project will help reduce the incidence of respiratory diseases.
- The risk for air pollution will be reduced.
- The water quality required by applicable regulations will be maintained. This project does not consider any treatment system to improve the quality of water for human consumption, particularly for hardness and sulphate parameters.
- The project will increase road pavement coverage in the mid and long term, as part of future actions for Nogales, Sonora.

B) Environmental and Ecosystem Sustainability

- The quality of transboundary air will be improved.
- The project does not jeopardize any protected species.

C) Technical Sustainability

- The technology to be used by the project has been appropriately proved and there is certainty that it is both technically and economically feasible to be used and maintained by the project applicant.
- Project components (pavement) may be repaired or replaced with a minimal interruption of services.

D) Financial Sustainability

- The proposed technology is compatible with the community's long-term payment capacity.
- A collection system will be implemented to determine and collect payments by city residents.
- There is a fee structure that will reflect the different use and user levels.
- There is an Investment Plan to utilize the funds required by the project.
- The fee structure will be reviewed to ensure the city's repayment capacity for new financial commitments.

E) Socioeconomic Sustainability

- The project will help increase the city's institutional capacity.
- The project will help extend pavement coverage to a larger number of residents.
- The project seeks to build the first phase of the program throughout the entire city, in an effort to completely abate the city's current paving backlog.
- Community health conditions will improve by reducing the incidence of respiratory diseases caused by particle emissions.
- The project will not affect additional natural areas.



- The use of local contractors and labor will be favored in the development of the project.

F) Community Participation

- An aggressive community participation program will be implemented to prove the community's support for the project.
- A long-term community participation plan will be proposed.
- The project will be supported by local government agencies.
- Community awareness for the responsible use of the proposed infrastructure and the timely payment of services is proposed to be enhanced.

Institutional and Human Capacity Building

The actions considered by the project will help the municipality to gain strength in the following areas:

- The capacity to provide paving services and coverage will be increased.
- The city income will increase with the creation of a fee structure and by increasing coverage to face new financial commitments and future investment requirements.
- Additionally, concurrent to the project, the city will implement an operation and maintenance program.
- Work will be developed initially through the Directorate of Public Works of the City of Nogales and the agencies designated by the city, to define the strategies that will be followed for promoting paving in roads selected as part of the project, and to carry out the construction work without interfering with other programs to be developed by Public Works.
- This project does not interfere with the conservation of local natural resources, since it will be implemented on existing roadways and no land use changes are required.

**Community Development.**

Road paving coverage in Nogales is 35%, while the remaining 65% of the roads are covered with dirt. To address this, the municipality will implement a strategy to pave city roads, which will enable the city to enhance the quality of life of its residents, significantly reducing pollution levels, providing easier access to municipal safety services, the development of industries, and the reassessment of property values, etc.

### Available Documents

1. Rapid Evaluation Document for the Project for Air Quality Improvements through Urban Road Paving in Nogales, Sonora. Developed by BECC. December 2003.
2. Final Design for asphalt road paving in Nogales, Sonora. Developed by Arturo Fraire for the City of Nogales, Sonora. January 2004.
3. Air Quality Project Preventive Report. Comprehensive Urban Road Paving for Nogales, Sonora. Developed by the City of Nogales. October 2003.
4. Finding by the State Secretariat of Urban Development and Ecology on Air Quality Project Preventive Report, Comprehensive Urban Road Paving for Nogales, Sonora. November 5, 2003.
5. Final Design for reinforced concrete road paving in Nogales, Sonora. Developed by Arturo Fraire for the City of Nogales, Sonora. January 2004.
6. Minutes of the Nogales City Council meeting in which the creation of the Sistema de Desarrollo Municipal Adicional (SIDEMA) was approved. February 3, 2004.
7. 1994-2002 Study on Particle Concentrations (PM10) for Both Nogales. Prepared by Gerardo Monroy. Data provided by T. Rigne, S. Wardwell, Arizona Department of Environmental Quality. September 24, 2003
8. Debt Capacity Analysis for the City of Nogales, developed by the City of Nogales' Treasury Department in coordination with the North American Development Bank (NADB). February 2004.
9. Financial Analysis of the Paving Project for Nogales, developed by the City of Nogales' Treasury Department in coordination with NADB. May 2004.
10. Letter from the Sonora State Revenue Service [Hacienda], approving the contribution of \$30 million pesos to the Nogales paving project. June 11, 2004.