Border Environment Cooperation Commission

Wastewater System Improvements in Bisbee, Arizona

I. General Criteria

1. **Type of Project.**

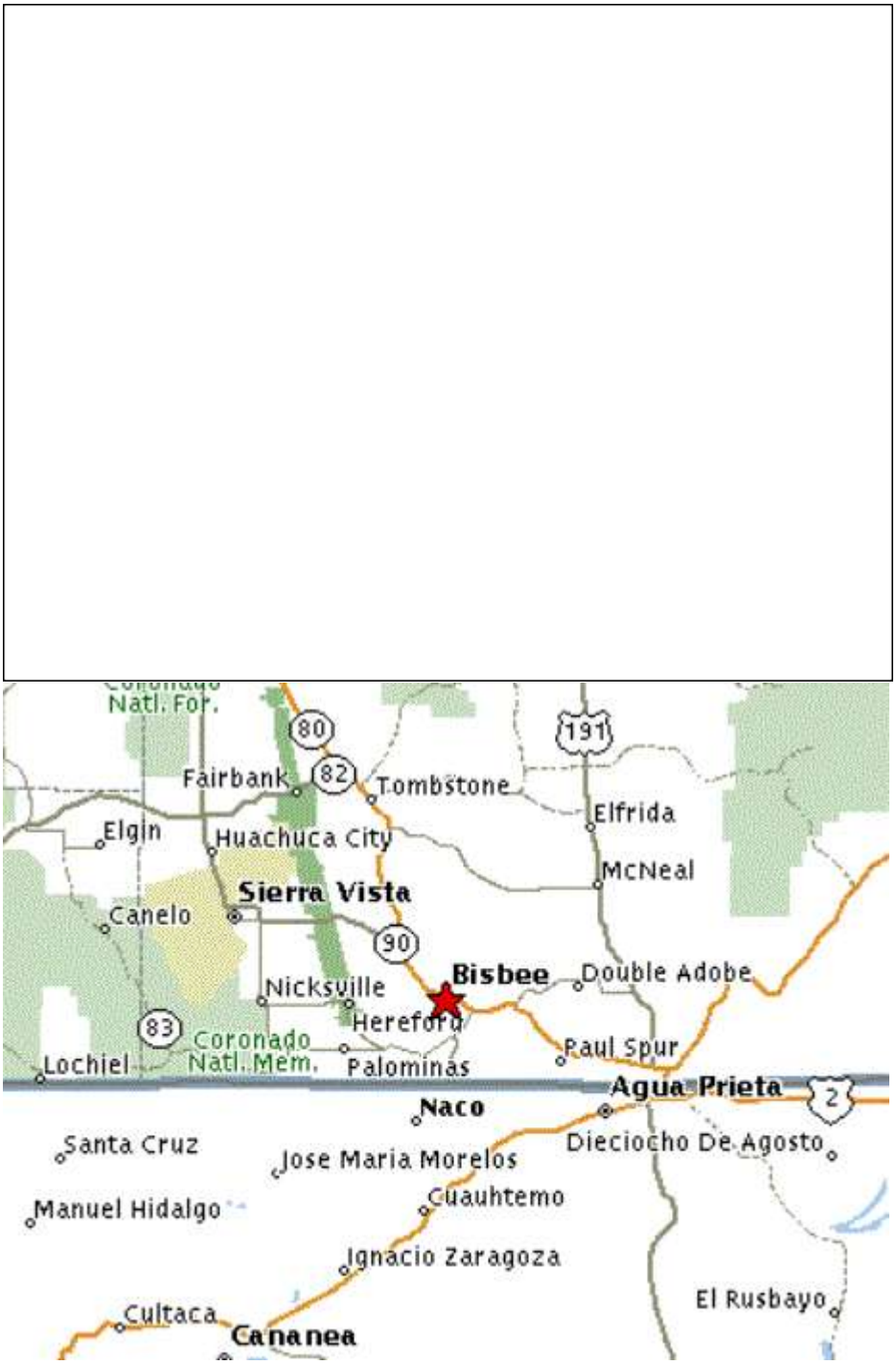
The project falls under BECC priority areas of wastewater treatment. A new wastewater treatment plant is under design and will be constructed to replace the existing wastewater treatment facilities. The units will expand the current treatment facilities' capacity and provide advanced treatment capabilities. The addition of a force main and gravity conveyance main will be necessary to enable the consolidation of all existing treatment facilities to one facility. The proposed upgrade and replacement of the existing treatment facilities is required due to the fact they are not capable of accomplishing the State of Arizona Aquifer Protection Program nutrient removal requirements. Collection system improvements other than the force main and conveyance main mentioned above, will consist of replacing or rehabilitating the most deteriorated sections of the system.

2. **Location of Project.**

Bisbee, Arizona is located in Cochise County, about four miles from the international border with Mexico. The City of Bisbee is located in the foothills and canyons of the Mule Mountains. The City limits encompass 5.4 square miles and include three main developed areas: Old Bisbee, Warren and San Jose and a number of smaller communities. Physical characteristics such as topography and geology separate the three developed areas from each other. The intersection of U.S. Highway 80 and State Highway 92 is southeast of Old Bisbee. Warren is southeast of Old Bisbee; U.S. Highway 80 runs through the northern portion of Warren. San Jose is directly south of Old Bisbee, and is divided by the Bisbee-Naco Highway.

Old Bisbee was developed within Tombstone Canyon and Brewery Gulch, and then up the steep Mule Mountain slopes. Retaining walls, networks of stairways and narrow winding roads are common in Old Bisbee. Many streets and alleys have grades over 30 percent. Warren was developed at the base of the Mule Mountains on gentler slopes (i.e., about 5 percent or less). Warren was developed as a neighborhood layout including parks. San Jose was developed in the prairie at the foothills of the Mule Mountains. This area is relatively flat and gradually slopes north up toward the Mule Mountains with an average grade of about 2 percent.

Based on information contained in the 1996-2006 General Plan, the Bisbee area has an annual mean temperature of 60.5 degrees Fahrenheit. Temperature extremes range from 15 to 99 degrees Fahrenheit. Heavy summer rains mark Bisbee' s climate with almost half of the area' s annual precipitation being in July and August. Precipitation averages about 17 inches per year, according to the Plan. The following figure presents the location of Bisbee, Arizona.



3. Description of Project and Tasks.

a. Project Description

The project evaluated the condition of the collection system in Bisbee and the course of action needed to replace or rehabilitate the sewer lines, depending on where the greatest needs for this existed. Four alternative courses of action and a no action alternative were evaluated for the wastewater treatment plants (WWTP), with accompanying capital and operation and maintenance (O&M) costs.

Generally the existing wastewater collection systems in Old Bisbee and Warren are in poor condition. They consist of sewers primarily constructed of vitrified clay pipe (VCP) in the early 1900's, and are past their useful life. Problems include: undersized, deteriorated pipes, sections of pipe at grades too steep or too flat, root intrusion, sediment or obstructions such as grout at the joints, significant numbers of reported back-ups and sanitary sewer overflows, improper location of manholes, and lack of manholes or cleanouts at change of grade and/or direction.

The existing collection system in San Jose was constructed in the mid 1980' s. The City has indicated the San Jose system operates well and without major or recurring problems compared to sewer systems in Old Bisbee and Warren.

An evaluation was performed on the Old Bisbee and Warren collection systems. Tasks included Closed Circuit Television (CCTV) condition assessment of the sewer lines, developing an electronic model of the sewer system to evaluate wet and dry weather flows, determining the priority and appropriate sizing of lines to be repaired and/or replaced, evaluation and recommendation of upgrade and consolidation of treatment facilities, and determining construction and O&M cost estimates for the project. The majority of the sewer systems in Old Bisbee and Warren have been documented with CCTV to analyze the extent of deterioration and prioritize future repairs.

The City' s collection system in the Old Bisbee and Warren areas experience excessive inflow and infiltration (I/I). The I/I condition results in sanitary sewer overflows and a violation of treatment plant quantity and quality capacities, culminating in releases of raw or partially treated sewage to the environment.

Wastewater treatment is conducted at three separate facilities, one for each of the three population centers. The treatment facilities vary in age and condition, and the City has difficulty maintaining compliance with permits and current regulatory standards. For example, the Mule Gulch WWTP is not designed to remove metals from the influent, and in the past the facility has been in violation of the allowable metals effluent mass loading or effluent concentrations for a variety of metals under its National Pollutant Discharge Elimination System (NPDES) permit. The City received a Finding of Violation and Order for Compliance from the Environmental Protection Agency (EPA) on June 8, 2000. The letter noted that violations consist of three unreported monitoring results for lead and copper and excess of the allowable discharge limits for selenium, chromium, lead, copper, mercury and cyanide. A new NPDES permit for the Mule Gulch WWTP was issued to the City effective June 24, 2002. In this permit, effluent standards for metals were adjusted to reflect the actual hardness of the wastewater stream. The facility is now generally in compliance with current NPDES permit requirements, however issues with concentration and mass loading for some metals remain, especially during periods of high I&I. Additionally, the Warren lagoons have no liners and the San Jose lagoons have damaged liners, which will allow percolation of

untreated sewage into the aquifer. Neither lagoon facility is permitted, which creates compliance issues with the Arizona Department of Environmental Quality (ADEQ) if left uncorrected.

Presently, the City is operating under a consent order issued by ADEQ to address the I/I problems. On September 9, 1996, the City entered into Consent Order P-96-96 with ADEQ to obtain approved Aquifer Protection Permits for the Warren WWTP and the San Jose WWTP as well as complete repairs on the collection and conveyance system to eliminate untreated or partially treated sewage discharges caused by excessive system I/I during periods of heavy precipitation. The order also placed a moratorium on connections of any type to the Mule Gulch and Warren Sewer Systems until corrective action on the I/I issues was taken. The Consent Order required completion of these tasks by September 9, 2001, and many tasks were completed however the City and ADEQ concluded in 1999 that the City did not have sufficient resources to fully meet the 2001 compliance deadline imposed by the order.

On April 14, 2001, the City entered into a new Consent Order (P-54-01) with ADEQ. This action replaced the 1996 order and requires completion of collection system improvements identified in alternative 4 of the City 2001 Wastewater Master Plan (City of Bisbee 2001); construction of a new San Jose WWTP with secondary treatment, denitrification and permittable disposal capabilities (also identified in alternative 4 of the 2001 Wastewater Master Plan); and submittal of an Aquifer Protection Permit (APP) application for an expanded and improved San Jose WWTP. Consent Order P-54-01 also continues the moratorium on new connections to sewage collection systems in Old Bisbee and Warren areas enacted with the 1996 order.

The proposed project involves the rehabilitation or replacement of the existing Mule Gulch trickling filter WWTP, and Warren and San Jose lagoons, combined with the construction of a new activated sludge plant at the San Jose WWTP site. In addition to resolving the existing plants' deficiencies, the new plant will have increased capacity that can provide preliminary, secondary and advanced treatments to accommodate the needs of the community for a minimum of twenty years from the date of completion. Furthermore, the new facilities will provide an enhanced disinfecting process. The new treatment process will allow the plant to acquire an APP and to meet APP standards. The proposed treatment is intended to achieve the required reduction of polluting substances in the discharged effluent to within the anticipated permit limits not set yet by EPA and ADEQ. The proposed project will provide the City with wastewater treatment capabilities that meet local and regional environmental and human health standards as regulated by ADEQ. Rehabilitation of the most deteriorated sections of the existing collection system will also be achieved by this project.

b. Program of Project Work Tasks

Currently, final design for the wastewater treatment plant and collection system is underway. Seventy percent design has been completed to date. The 100 percent submittal will be completed in October 2003.

c. Description of the Community

i. Demographic Information – The resident population is composed of people that live year-round in Bisbee. The study area has seen rapid swings in its population. From 1930 to 1950, the population of Old Bisbee dropped from 8,023 to 3,801. In 1960, the Warren and San Jose areas were annexed, bringing the total City population to 9914. The 1980 Wastewater Master

Plan projected the population to be over 15,000 in 2000. However, the area population declined and recent population projections provided by the U. S. Bureau of Census show a relatively slow growth curve with the permanent population projected at 6,692 in 2020 and 6,856 in 2040. The most recent population estimate is 6,090 (April 2000).

In addition to its own historical significance, the area is well known for its scenic attractions and special events, including concerts, fine arts shows, and retirement opportunities. The City currently serves as a hub to other tourist attractions in the area. This, combined with the mild weather, makes it a popular place for tourists and seasonal " snowbirds" . An estimated 1,500 tourists and snowbirds visit the area each day with that number projected to increase to 2,500 by the year 2020.

ii. Local Environmental Services – The City of Bisbee owns its wastewater treatment facilities. The three wastewater facilities provide service to most of the community except those on individual septic systems. The City estimates that there are presently approximately 1,190 individual septic systems in the study area, most of which are located in the San Jose area. Water service is provided by Arizona Water Company (AWC). Water is supplied from groundwater wells located west of Naco, Arizona. Most residents are connected to the water system except for some private well owners. Solid waste is hauled to the Cochise County Western Regional Landfill.

iii. Project alternatives – Gannett Fleming, under contract to the BECC, prepared a Waste Water Master Plan to evaluate the condition of the collection system and four (4) treatment alternatives for the City' s WWTP' s.

Collection System

Various deficiencies in the collection system have been noted by ADEQ during site inspections since 1996. The most significant of these are excessive inflow and infiltration (I/I) in the two older areas of the City; Old Bisbee and Warren. As a result of the inspections, ADEQ issued a Consent Order for the City to address collection system deficiencies. ADEQ also noted various deficiencies in the three (3) wastewater treatment plants serving the City. Based on the noted deficiencies, EPA recently issued a Finding of Violation and Notice for Compliance to address effluent violations from the Mule Gulch treatment plant.

A condition assessment was performed on the collection system. The condition assessment consisted of obtaining and reviewing as-built maps of the existing system, performing CCTV of the sewer mains and inspection of manholes. Alternative methods for rehabilitation or replacement of the sewer mains and manholes were evaluated based on the condition and location of the facilities. Based on the evaluations, recommendations were made for the rehabilitation or replacement of the sewer mains and manholes. The recommendations for sewer mains and manhole rehabilitation were prioritized in four (4) phases over a ten-year period.

The San Jose sewer system has never been CCTV inspected. Therefore, as part of the Master Plan, an allowance was included for the CCTV inspection of the San Jose sewer system and for rehabilitation or replacement of sewer mains over a 20-year period.

The following options were evaluated for prioritizing the rehabilitation or replacement of the sewer mains:

1. Prioritize by drainage area and perform rehabilitation on all components within a drainage area.

2. Prioritize by drainage area and perform rehabilitation on selected components within a drainage area.

3. Prioritize by sanitary sewer segments and perform rehabilitation on upstream components.

4. Prioritize by sanitary sewer segments and perform rehabilitation on selected upstream components.

Options 1 and 3 were eliminated, as they require completion of a private sewer investigation program prior to performing the repairs to a majority of the public sewer components. Hence additional costs for developing, and time for implementing, a private sewer program combined with the delay of performing repairs to the public sewers, render these options detrimental to a cost-effective and timely rehabilitation program.

Option 2 was eliminated based on the widespread incidences of sanitary sewer overflows and the deteriorated condition of the sewer system throughout all drainage areas. While the selection of Option 2 would allow for effective rehabilitation of components within selected drainage areas, it would also delay rehabilitation of selected components in more-desperate need of repair, and possibly compound problems in downstream components that have not yet been rehabilitated.

Option 4 was selected since it most efficiently addresses system-wide priorities. This option of performing rehabilitation on sanitary sewer segments and selected upstream components should be taken several steps further. For instance, rehabilitation should be performed in phases, combining high priority sewer segments with high-ranking drainage areas. In addition, one or more areas should be designated as pilot areas for a private sewer investigation program. Observation tees would need to be installed in the vicinity of service laterals and a mini-camera used once tees are installed. Recommendations for private sewer rehabilitation would be made based on the outcome of the pilot study.

Wastewater Treatment

The no project, or do-nothing, alternative was evaluated and considered not to be a viable option due to the growing environmental and health risks, as well as the Notice of Violation and Consent Order from the State of Arizona and Finding of Violation from EPA.

The condition, operation and maintenance of the existing wastewater treatment and disposal facilities were evaluated and recommendations made for their abandonment, rehabilitation or replacement. The four alternatives were reviewed to meet the present and anticipated State and EPA permit requirements.

The four treatment options were developed, given the conditions that exist in Bisbee which create challenges that are not likely to be found in most other communities. Topography and geology have a great bearing on treatment alternatives. Other factors include age of the existing system, condition of the existing treatment facilities and the ability of the City to acquire necessary land, as well as issues brought up by the mining history of Bisbee, such as the sulfate plume in the San Jose area.

If none of the alternatives of this project are implemented, many adverse effects will occur to the community. The groundwater could potentially begin to deteriorate which will create a

public health issue as the City currently receives its water from a rather limited source. The condition of the collection system has possibly contributed to the Mule Gulch WWTP to violate its NPDES permit for some metals, which in turn deteriorates the surface water of Mule Gulch.

Alternative 1 – Maintain All Three Wastewater Treatment Facilities in Service

The purpose of alternative 1 is to evaluate the cost of keeping all three treatment facilities open while minimizing the need to expand the treatment facilities and/or disposal areas and the need to transfer wastewater between facilities. It assumes that the discharge permit limits for metals in Mule Gulch's NPDES permit can be increased or that the rehabilitation of the sewer mains reduces the metals entering the WWTP such that Mule Gulch is granted an APP by the State and the Finding of Violation is resolved so that the WWTP can continue to discharge to Mule Gulch.

Alternative 1 involves constructing a lift station at the Mule Gulch WWTP and a force main along Arizona Street to convey excess flows to the Warren system, and expanding the existing lagoons at Warren and San Jose to treat future flows. Effluent would be disposed of from the Mule Gulch WWTP to Mule Gulch and from Warren and San Jose by reuse systems.

Alternative 2 – Close Mule Gulch and Divert Flows to Warren; San Jose Remains in Service

The purpose of alternative 2 is to evaluate the impact of closing the Mule Gulch facility and pumping those flows to the Warren facility. The Warren and San Jose lagoons would be left in service and expanded to treat the respective additional wastewater flows. The additional flows would require purchase of additional land at Warren to dispose of the flows by reuse.

Alternative 3 – Treatment Plants at Warren and San Jose

Alternative 3 evaluates the wastewater treatment system with Mule Gulch taken out of service, flows diverted to Warren, and nitrification/denitrification activated sludge wastewater treatment facilities installed at the Warren and San Jose sites. The nitrification/denitrification process will remove the nitrogen from the wastewater. The resulting effluent will meet the requirements for surface disposal of the effluent because of the low nitrogen concentrations. Using surface disposal for the effluent allows more effluent per acre to be applied to the land than is allowed by reuse. This means less land is required. In addition, ADEQ does not require storage ponds when surface disposal is used. Even with surface disposal, additional land needs to be acquired for disposal of the effluent from the Warren facility.

Alternative 4 – One Treatment Plant at San Jose

In alternative 4, both Mule Gulch and the Warren treatment facilities are taken out of service and the corresponding flows diverted to the San Jose site. The Mule Gulch flows would be conveyed to Warren via a lift station and force main along Arizona Street. The Warren flows would be conveyed to the San Jose site via a pipeline along the Airport Highway. Nitrification/denitrification activated sludge wastewater treatment facilities would be installed at the San Jose site. As in alternative 3, the nitrification/denitrification process will remove the nitrogen from the wastewater. The resulting effluent will meet the requirements for surface disposal of the effluent because of the low nitrogen concentrations. Using surface disposal for effluent disposal allows more effluent per acre to be applied to the land than is allowed during effluent disposal by reuse. This means less land

is required. In addition, ADEQ does not require storage ponds when surface disposal is used. This alternative allows the evaluation of the cost to combine the flows for treatment and disposal at one treatment plant. Discharge to Green Brush Draw was included as an optional or emergency disposal method.

Alternative 4 was proposed as part of the Gannett Fleming Master Plan and accepted by the City of Bisbee.

iv. Project Justification:

This project is crucial for the City in order to address the present and future environmental and public health issues associated with its wastewater treatment and disposal. The proposed facilities will greatly minimize the possibilities for contaminating groundwater supplies. The project will assist the City in complying with state and federal regulatory agencies, and will accommodate the City' s future wastewater treatment needs as developed in the Master Plan. The existing facilities threaten public health and the environment by allowing insufficiently treated wastewater to discharge to the subsurface and possibly the groundwater, and by discharging partially treated wastewater into Mule Gulch during rain events. High levels of nitrates in drinking water raise significant human health concerns, especially for infants since it can cause brain damage or death of infants. This potential exists whenever nitrate levels exceed U.S. Public Health Service standards (10 milligrams per liter). The anticipated APP will require removal of nitrogen to within the allowable limits, and without the new facility, the human health and environmental issues associated with nitrogen will remain.

The total cost of the project, based on the 70 percent engineer' s probable construction cost is $30,068,000, including administrative, engineering, legal, value engineering, bond counseling, and contingency fees. Construction costs are broken down as follows: collection system improvements: $13,333,000; clean closure of existing facilities: $255,000; Mule Gulch lift station and force main: $967,000; San Jose wastewater treatment plant: $8,399,000.

4. Conformance with International Treaties and Agreements

This project conforms to international treaties and agreements. Furthermore, there will be no transboundary effects from this project, as discharges will be within U.S. territory.

II. Human Health and the Environment

1. Human Health/Environmental Needs.

The City of Bisbee has a deteriorated wastewater collection system, and the three existing wastewater treatment plants are not complying with the Arizona Department of Environmental Quality standards.

2. Environmental Assessment.

The Region IX EPA prepared an environmental assessment for the project. The environmental review did not find any significant impacts resulting from the rehabilitation of the wastewater collection system or the construction of a new wastewater treatment plant in San Jose. A consultation with the Arizona State Historic Preservation Office and with the Arizona Tribes was completed. Letters of concurrence were received from both the SHPO and the Arizona Tribes. EPA issued a Finding of No Significant Impact (FNSI) on April 2003. The FNSI will be adopted in August 2003.

The EA includes the following elements:

· Discussion of the direct, indirect, cumulative and short-term positive and negative effects of the project on the environmental components of the affected area (e.g. ecosystem integrity, biological diversity, sensitive environmental habitats, and human health);

· Description of unavoidable negative impacts and actions to be taken to mitigate these impacts;

· Discussion of the environmental benefits, risks, and costs of the proposed project as well as the environmental standards and objectives of the affective area.

Since the project is located in the United States in the San Pedro River watershed, transboundary impacts are not expected.

3. Compliance with Ecology and Cultural Laws and Regulations.

A consultation with the Arizona State Historic Preservation Office and with different Arizona tribes was performed as part of the environmental assessment process. The environmental evaluation of the process indicated that there are no potential impacts, direct or indirect, to any historical, cultural, and/or archaeological resources in the area.

III. Technical Feasibility

1. Appropriate Technology.

This section provides a description and an evaluation of the reasonable alternatives that were considered to meet the City of Bisbee' s needs.

a) Collection and Conveyance System

Brown and Caldwell reviewed videotapes of CCTV inspections and came with the following recommendations based on the following criteria:

i. relative cost of rehabilitation versus replacement

ii. condition of the sewer

iii. location of the sewer relative to structures

iv. location of sewer relative to historic areas and features

v. location of sewer relative to commercial districts

vi. suitability for rehabilitation. maximum slopes, minimum sewer diameters, minimum cover requirements, maximum manhole spacing, minimum water line and sewer separations, and manhole construction methods.)

The following methods will be used for rehabilitation of the collection system: Cured In-Place (CIPP) and pipe bursting. CIPP rehabilitation consists of installing a resin impregnated sock in an existing sewer. The sock is typically inserted into the sewer through a manhole with water pressure. After insertion, the sock (liner) is cured-in-place with circulated hot water. After curing, the ends are cut off the cured liner and lateral and service connections are opened with robotic cutters. In the pipe bursting process, flexible pipe, typically High Density Polyethylene (HDPE) is pulled through an existing sewer with a winch. Pipe bursting is typically used to upsize the host sewer. To accomplish the upsizing, the flexible pipe is connected to a pneumatic bursting head that shatters the host pipe as it is pulled through. Re-establishment of lateral and service connections is typically done through the dig-and-replace method. Another construction technique will be replacement through open trench.

In addition to the rehabilitation or replacement of the sewer lines, approximately 800 manholes will be replaced or rehabilitated.

	All units in linear feet		
Pipe Diameter (inches)	New	Rehab	Total
Collection and Conveyance to Treatment Plant			
4	-	-	-
6	-	-	-
8	92,268	2,939	95,207
10	3,235	676	3,911
12	4,661	487	5,148
15	21,516	-	21,516
18	8,246	-	8,246
Total	129,926	4,102	134,028
Effluent System From Treatment Plant			
15	3,034	-	3,034
18	9,785	-	9,785
Total	12,819	-	12,819
Total System	142,745	4,102	146,847

b) Interceptor installation

In addition to the sewer lines identified in the previous section, the following interceptors will be constructed or rehabilitated: Warren Interceptor, Airport Road Interceptor, and the San Jose WWTP Effluent Outfall.

The Warren Interceptor serves as the main trunk line for the community of Warren. The Airport Road Interceptor conveys sewage from the southern part of Warren to the south along Airport Road approximately 11,000 feet before heading to the west approximately 8,000 where it ties into the existing San Jose Interceptor. The effluent from the proposed San Jose WWTP will be conveyed through the proposed San Jose WWTP Effluent Outfall approximately 2,500 feet to the south where it heads west along Purdy Lane. The interceptor heads approximately 8,000 feet to the west along Purdy Lane to a point approximately 2000 feet west of the the intersection with Naco Highway where the alignment changes direction to the south. After another 3,500 feet, the interceptor discharges into Green Bush Draw.

c) Lift Station and Force Main

The following table presents the design criteria for the proposed Mule Gulch Lift Station and force main. The proposed alignment would parallel the Warren Cutoff Road south to the Arizona Street Interceptor in Warren. The Mule Gulch Lift Station will consist of a self-cleaning wet well with pumps provided in a duty/standby configuration.

d) Wastewater Treatment Plant

The project consists in consolidating the existing three wastewater treatment plants (Mule Gulch, Warren, and San Jose) and constructing one extended aeration wastewater treatment plant at the existing San Jose lagoons site.

The following table presents the design parameters for the proposed wastewater treatment plant.

PARAMETER	**VALUE**	**UNITS**
Average Daily Dry-Weather Flow	0.81	MGD (gallons x 10^6)
Peak Dry-Weather Design Flow	1.75	MGD
Peak Wet-Weather Design Flow	2.45	MGD
Maximum Monthly Flow	1.22	MGD
Total BOD	245	mg/l
Total COD	638	mg/l
TSS	224	mg/l
TKN	54	mg/l
Nitrogen (as ammonia)	34	mg/l
Soluble COD	187	mg/l
Soluble BOD	85	mg/l

Copper and lead have been detected in wastewater samples from each of the three WWTP basins and appear to be regional and cannot be isolated to a single source or area of Bisbee. The sample results indicate a correlation between wet-weather flow and an increase in the mass loading rate of copper and lead.

The following table presents the effluent quality goals for the proposed WWTP.

Effluent Parameter	Value
Biochemical Oxygen Demand (BOD_5)	<15 mg/l (design goal) <30 mg/l (monthly average) <45 mg/l (weekly average) >85% removal (monthly average)
Total Suspended Solids (TSS)	<15 mg/l (design goal) <30 mg/l (monthly average) <45 mg/l (weekly average) >85% removal (monthly average)
Fecal Coliforms	<200 cfu/100 ml (four of seven samples) <800 cfu/100 ml (single sample maximum)
Total Nitrogen	<10 mg/l (regulatory requirement) 8 mg/l (alert level and design goal)
pH (standard units)	6.5 to 9.0
Total Residual Chlorine	<5.0 μg/l (monthly average) <11 μg/l (daily maximum)

Effluent will be treated to meet anticipated NPDES requirements associated with discharge to Green Bush Draw, and also to meet the State of Arizona Class B+ standards for re-use of effluent for irrigation purposed on golf courses.

The extended aeration process is a long sludge retention time (SRT) activated sludge process. It is a non-proprietary process that offers design flexibility and custom design geared toward local wastewater needs. The flow from the preliminary treatment process is split between two trains of the extended aeration activated sludge system. The flow enters the extended aeration system by gravity. The activated sludge system is divided in two zones: the first zone is unaerated and therefore anaerobic or anoxic depending on the degree of recycle and it has the dual purpose of denitrification and selecting against bulking organisms; the second zone is aerated and provides BOD removal and nitrification.

After aeration in the second zone, mixed liquor then discharges to a splitter box, which splits flow between the secondary clarifiers. The operating SRT of the extended aeration system is approximately 25 days, which is sufficient to produce a stable biosolids end product suitable for final disposal. The clarified effluent flows to the disinfection process.

Disinfection will be achieved through a Ultraviolet (UV) system. Ultraviolet light comprises the band of the electromagnetic spectrum with wavelengths between 100 and 400 nm. The wavelengths between 200 and 300 nm are considered to be the most effective germicidal wavelengths, with 253.7 nm as the optimal wavelength. UV disinfection is a physical process that uses radiation to penetrate microorganism cell walls. Cell DNA and RNA are damaged by the absorbed radiation, which can prevent reproduction and destroys the viability of bacteria and viruses.

2. Operation and Maintenance

The O&M manual for the treatment plant as a whole should include the following elements:

Plan Element	Description
Start-Up Operation Plan	The Operation Plan will be developed by the design engineer to ensure that Treatment plant staff understand how to properly start-up and operate the facility. Traditionally, the contractor and equipment supplier conduct the initial start-up of plant equipment to permit the detection that equipment is installed and started properly. Start-up operations and training of the permanent staff should be part of this activity.
Contingency Plan	The Contractor will be required to submit an emergency response and contingency plan covering the construction and start-up phase, upon the issuance of the contract award notice. This plan will be updated and maintained by Public Works Division personnel to cover any emergency that might occur during normal operation.
Safety Plan	A safety and health plan will be developed by the WWTP Superintendent and implemented by all Public Works Division personnel involved with plant operation and maintenance. It should include safety training before start-up, with periodic refresher training.
Quality Assurance Plan	The quality assurance plan should be developed during the start-up
Pollution Prevention Plan	The construction operator will provide a Pollution Prevention Plan, including a Storm Water Pollution Prevention Plan required by the NPDES permit.
Facility Closure Plan and Post-Closure Plan	The existing lagoons will be decommissioned during and after the start-up of the new facilities. A closure plan will be submitted to ADEQ with the facility closure application.

3. Compliance with applicable design norms and regulations.

Currently, Brown and Caldwell is under contract to the City of Bisbee, Arizona to prepare final design for the wastewater treatment plant. Seventy percent design has been completed. Also, a Value Engineering was performed to the final design. The project is being designed according to the State of Arizona Construction Code (ACC) (formerly known as Bulletins 11 and 12). The ACC establishes parameters that must be followed during design of wastewater collection and treatment systems. The Arizona Department of Environmental Quality will review 100 percent design drawings and specifications once they are complete in order to grant a Construction Permit.

1. **Financial Feasibility**.

A financial model was prepared by Economist.com and was reviewed by the NADB to determine the adequate financial structure for the project. The project costs are presented in the table below.

Concept	**Cost**
Planning and Design	4,066,000
Project Management	500,000
Financial Council	313,000
Easements/Land Acquisition	135,000
WWTP *	8,399,000
Lift Station and Force Main*	967,000
Wastewater Collection System*	13,333,000
Construction Phase Services	2,100,000
Closure of Existing WWTP	255,000
TOTAL	**30,068,000**

* Includes a 10 percent contingency;

The following funding sources were identified to cover the project costs:

Funding Source	**Amount**
USDA Rural Development Loan	3,050,000
Arizona Water Infrastructure Finance Authority Loan	11,250,000
Border Environmental Infrastructure Fund Grant	10,213,000
USDA Rural Development Grant	3,050,000
Border Environment Cooperation Commission Grant	505,000
City of Bisbee Contribution	2,000,000
TOTAL	**30,068,000**

The project also includes a $1,100,187 grant from the Border Environment Infrastructure Fund as transition assistance to be applied directly to subsidize user fees.

2. User Fees

The proposed residential user fee structure resulting from this project is as follows:

Year	User Fee (in dollars per month)
2003 (Current)	24.64
2004	25.87
2005	26.91
2006	27.85
2007	28.82
2008	29.83
2009	31.03
2010	32.58
2011-2019	34.21

3. Project Management.

The project implementation will be responsibility of the City of Bisbee. The City will also be responsible for operation of the infrastructure.

V. Public Participation

1. Comprehensive Public Participation Plan.

The project' s public participation plan was submitted and approved in early 2001. It was developed in coordination by the City of Bisbee, project steering committee. It includes the elements required for public participation such as a developing a steering committee, contacting local organizations, providing public access to project information and holding public meetings. A summary of these activities is presented below.

2. Steering Committee

The project steering committee was formed in January 2001 with local citizens and members the Wastewater Advisory Committee who helped guide the successful ½ % sales tax in November 2000. Its membership includes: Jim Burke, Curator, Bisbee Mining & Historical Museum; John Charley; City Councilperson; Luche Giacomino, City Councilperson; Carrie Gustavson, Director, Bisbee Mining & Historical Museum; Bill Jenning, citizen (retired); Donna Harris, Director, Bisbee Chamber of Commerce; Dennis Nelson, City Councilperson; Charlie Sotelo, a local realtor; Bob Downing of the Planning and Zoning Commission; and Stanley Stern a Financial Consultant. The committee decided to have four facilitators/leaders for the Committee: Donna Harris, Carrie Gustavson, Dennis Nelson, and Charlie Sotelo. Jim Burke served as the recording secretary. The Technical Work Group consisted of Suzanne Price, WIFA outreach coordinator; Dan Beauchamp, mayor, City of Bisbee; Susan Keith, SE Arizona Community Liaison, ADEQ; Alan O' Brien, consulting engineer and Susan Zeloznicki, Public Participation consultant to City of Bisbee.

3. Local Organizations

The following key organizations were identified and approached to support the wastewater improvements project: the Bisbee Women' s Club; Bisbee Repertory Company; Bisbee Arts Council; Boys and Girls Club; Chamber of Commerce; Church Council and other church groups; Copper Queen Hospital Association; Council of Arts and Humanities; County Board of Health; County Board of Supervisors; Democratic Club; Design Review Board; Kiwanis; Parks & Recreation Commission; Phelps Dodge; Planning & Zoning; Rotary Club; the Bisbee Unified School District #2; Bisbee Senior Association and St. Patrick' s Church. Twelve letters of support were received.

5. Project information

The official documents were available at the local library, Chamber of Commerce and City Hall 30-days prior to the first meeting during normal business hours until 7PM including Saturdays an Sundays. A media and information campaign was carried out which included contacting local and regional TV stations, radio and newspapers; mail out of fact sheets and brochures and outreach activities at public events.

5. Public Meetings

Public meetings were held on April 10, 12, 18 and March 6, 2001 where technical and financial components of the project and debt authorization election were discussed. Videotapes of these public meetings were aired on public access television. A final public meeting was held on August 6, 2003 to present the rates to the community.

6. Debt Authorization Election

The debt authorization election was held on May 15, 2001. More than 30% of the town' s voters went to the polls. The measure was approved by 95% of the voters.

1. Definition and Principles

The project is consistent with BECC's definition of sustainable development: "*conservation oriented social and economic development that emphasizes the protection and sustainable use of resources, while addressing both current and future needs, and present and future impacts of human actions*" and with the four principles:

a) "Human beings are at the center…they are entitled to a healthy and productive life in harmony with nature". This principle is addressed by the purpose of the project, which is to address health risks associated with the present inadequate capacity of the existing City of Bisbee facilities. Healthier lives and better living conditions will result from this project.

b) "The right to development…equitably meet…needs of present and future generations." The construction, expansion and upgrading of the City of Bisbee facilities will accommodate growth projected through the year 2020, while addressing a critical need today.

c) "…environmental protection shall constitute an integral part of the development process…" All environmental parameters have been met. The City of Bisbee has been careful to ensure that natural resources are protected, plant and animal species of concern are not impacted, and cultural heritage issues are recognized. Also, the City of Bisbee in cooperation with the AWC has implemented a reuse program where treated effluent will be used for golf course irrigation.

d) "The stakeholders…must be part of any related activity." Stakeholders have been a part of the process since the early part of the project development. Public participation and outreach programs have ensured that public input has been received, considered and employed.

2. Institutional and Capacity Building

The new expansion will allow the City of Bisbee facilities to provide necessary quality of life services for its residents. In order to minimize the additional operational burden to the Community, the technology chosen is the required of typical facilities in use today. The project will allow the City of Bisbee to meet all regulatory requirements relative to wastewater treatment to comply with the State of Arizona APP. Additionally, the project includes the review and update of necessary tariffs for the efficient operation of the utility.

3. Conformance with Applicable Local and Regional Conservation and Development Plans

The project will assist the City in complying with state and federal regulatory agencies, and will accommodate the City's future wastewater treatment needs as developed in the Master Plan. Furthermore, this project is of high priority for ADEQ since it has been way long time since any improvements on sewer services took place for the City of Bisbee resulting on the backwardness on wastewater infrastructure mainly caused for a service connection

moratorium that last for years and with the proposed action implementation will be reactivated. The project also is consistent with the City' s General Plan in relationship to providing adequate wastewater collection and treatment.

4. Natural Resource Conservation

The implementation of the project will enable the City of Bisbee to keep collecting and treating adequately the wastewater generated in the community, it will minimize the risk of polluting soil and groundwater. Also, the reuse program will be improved by providing recycled water for the golf course that will contribute to the natural resources conservation.

5. Community Development

The new wastewater treatment plant can have a positive impact for the City of Bisbee by helping to provide improved services and environmental conditions that can attract new businesses and allowing new connections to the wastewater collection system.

In sum, the economic activity will increase and the quality of life will improve due to the implementation of the project.