SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

to the

PROPOSED IMROVEMENTS to the WASTE WATER TREATMENT PLANT and WASTEWATER COLLECTION SYSTEM SAN LUIS RIO COLORADO, SONORA, MEXICO

Prepared for:

BORDER ENVIRONMENT COOPERATION COMMISSION
Blvd. Thomas Fernandez 8069
Fraccionamiento Las Parques, CP 32470
Cd. Juarez, Chihuahua, Mexico
&
U.S. Environmental Protection Agency Region IX
75 Hawthorne Street
San Francisco, CA 94105

by:

Zia Engineering and Environmental Consultants, llC
755 S. Telshor Blvd., Suite F-201
Las Cruces, New Mexico 88011
Phone (505) 532-1526 Fax (505) 532-1587

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1.0 BACKGROUND

1.1 INTRODUCTION

This document supplements the Environmental Assessment (EA) of the Effect on San Luis, Arizona by the Proposed Construction of a Wastewater Treatment Plant and Improvements to the Wastewater Collection System for San Luis Rio Colorado, Sonora prepared by GeoMarine, Inc. in May 2000. The GeoMarine EA assessed the potential environmental impacts for the phases I, II, III & IV of the wastewater infrastructure projects proposed in the Water and Wastewater Master Plan for San Luis Rio Colorado prepared in 1999 by Construcción, Ingeniería, Estudios y Proyectos; S.A. de C.V. (CIEPSA), consisting of construction of wastewater collection lines, lift stations and a wastewater treatment plant (WWTP).

Phase I of the SLRC wastewater system improvements was certified by the Border Environment Cooperation Commission (BECC) on June 22, 2000. A North American Development Bank (NADB), Border Environment Infrastructure Fund (BEIF) subgrant agreement for construction of the Phase 1 improvements was signed on December 13, 2000. As of May 2006, 100% of the wastewater collection system and 98% of the wastewater treatment plant have been completed.

The purpose and scope of this Supplemental Environmental Assessment (SEA) is limited to cataloging the changes that have been made in the planning and design of Phases II, III & IV since the original Finding of No Significant Impact (FNSI) was issued on June 20, 2000, and detailing all potential impacts to the environment that may occur as a result of those changes. With the exception of the points described in the following sections, the original EA (available for public inspection at the EPA Region 9 offices in San Francisco, CA) accurately represents; the project's purpose and need; the analyses of the project's design alternatives, including the alternative of no action and the preferred alternative; and the potential environmental impacts associated with each alternative.

The proposed action, *Expansion of Wastewater Collection and Treatment Systems, San Luis Rio Colorado, Sonora, MX* (the project) under consideration for funding by the U. S. Environmental Protection Agency (EPA) consists of Phase II improvements, including expansion of the wastewater collection, pumping and conveyance system to areas within San Luis R.C., Sonora, Mexico that without service, and the expansion of the wastewater treatment plant from approximately 9 Million Gallons per Day (MGD) (400 liters per second (lps)) to approximately 13.8 MGD (600 lps) to treat the additional discharges projected to be produced by expansion of the wastewater collection system.

Changes to the project's wastewater collection system (WWCS) plan include changing the designation of and renaming the proposed collector and subcollector pipelines. In addition, the phasing has also changed in that a portion of the proposed subcollectors have now been shifted to Phase III; and Phase IV has been eliminated. The table below indicates the current WWCS pipeline construction phasing.

Current Wastewater Collection System Phasing Plan

Subcollector or elements	Average Flow	Population Served[1]	Actual residential water connections[2]	Existing Population	Approximate Cost[1] (U.S. Dollars) [3]
Phase II					
Zacatecas Subcollector	1.22 MGD (53.7 lps)	17,682	4,031	16,930	$2.29 million
Chihuahua Subcollector	0.93 MGD (41.0 lps)	13,482	2,413	10,135	$1.88 million
Guadalupe Victoria Subcollector	2.78 MGD (122 lps)	23,104	2,517	18,722	$1.45 million
SUMA		54,268		45,787	
Refurbishment of the south lift station[4]	9.12 MGD (400 lps)	124,062	8,961	45,787	$0.60 million
2nd Transmission Line to WWTP[4]	9.12 MGD (400 lps)	124,062	8,961	45,787	$3.81 million
3nd module WWTP	4.56 MGD (200 lps)	62,031	8,961	45,787	$5.02 million
Ifiltration basin 3 th (Module)	4.56 MGD (200 lps)	**62,031**	**8,961**	**45,787**	**0.78**
Phase III					
13th Street Subcollector	0.54 MGD (23.9 lps)	7,858	1,470	6,174	$0.97 million
18th Street Subcollector	0.56 MGD (24.6 lps)	8,098	1,350	5,670	$0.87 million
Ejido Poniente Subcollector	0.33 MGD (14.4 lps)	4,746	791	3,320	$0.58 million
Las Flores Subcollector	27.8 MGD (27.8 lps)	9,143	1,524	6,400	$0.81 million
Jazmin Subcollector	0.75 MGD (33.1 lps)	10,899	1,817	7,630	$1.18 million
Ejido Oriente Subcollector	1.24 MGD (43.7 lps)	14,385	2,393	10,050	$1.26 million
4th module WWTP	4.56 MGD (200 lps	62,031	9,190	39,244	$5.02 million
Ifiltration basin (4 th Module)	4.56 MGD (200 lps	62,031	9,190	39,244	0.78

Note: : MGD= Million Gallons per day lps = liters per second
(Source: Humberto Hernandez, 2006)
1. The "Population Served" was calculated as per design parameters, using actual amount of lots.
2. The actual residential water connections were obtained from the current users for data base.
3. Include taxes, contingencies and supervision. December 14, 2005 conversion rate; 10.7465 pesos per 1 U.S. dollar
4. Refurbishment of the south lift station and 2nd Transmission Line to WWTP was design using the population of Phases I and II of the PIMAS.

Some of the proposed subcollectors will function as replacements for the Parque Industrial, Tamaulipas and Mexico collectors listed in the CIEPSA Master Plan and GeoMarine EA. Phase IV, which included construction of service lines (atarjeas) has been incorporated into the phasing that includes the collectors or subcollectors with which they are associated.

The phasing of the WWTP modules construction remains unchanged from the previous plan. However, the treated effluent disposal method has been changed from discharge to an irrigation district canal for use in agriculture to use of infiltration basins for percolation of the effluent into the soil. This change was based on a determination by OOMAPAS that use of the effluent for irrigation was not feasible according to input from the farming community. In addition, OOMAPAS commissioned a feasibility study for the practice of disposal of the effluent through use of infiltration basins. The study, which was prepared in 2005 by the Universidad Autonoma de Baja California, concluded that this practice was feasible based on soil types in the vicinity of the proposed WWTP site. The study measured the percolation rates during pilot plant tests, indicating that significant pathogen reductions were achieved at both the 15 and 20 meter depths of soil and no degradation of the groundwater was identified.

1.2 ENVIRONMENTAL ASSESSMENT PROCESS

EPA has determined that it will follow the NEPA and EPA regulations contained in Title 40 Code of Federal Regulations (CFR) Part 6 for environmental impacts in the U.S. from projects located in the U.S. or Mexico (EPA 1997a). EPA follows the U.S. Agency for International Development (AID) approach as summarized at Title 22 CFR Part 216.1-216.10 as guidance for assessing environmental impacts in Mexico. The AID regulations envision collaboration with affected countries to the maximum extent possible in developing an EA. AID regulations authorize use of either a study prepared by an international body in which the U.S. is a participant, or a concise review of the relevant environmental issues, with appropriate documentation, as a substitute for an EA. A separate *Manifestacíon de Impacto Ambiental* (MIA) document prepared for this project evaluates the environmental impacts of the proposed federal action in Mexico.

This (S)EA was prepared using Council of Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) and EPA regulations (40 CFR Part 6) as guidance. This (S)EA documents the environmental consequences in the U.S. of the proposed federal action. Transboundary impacts to the U.S. are included in this (S)EA to satisfy AID regulations pertaining to environmental analysis outside the U.S. “

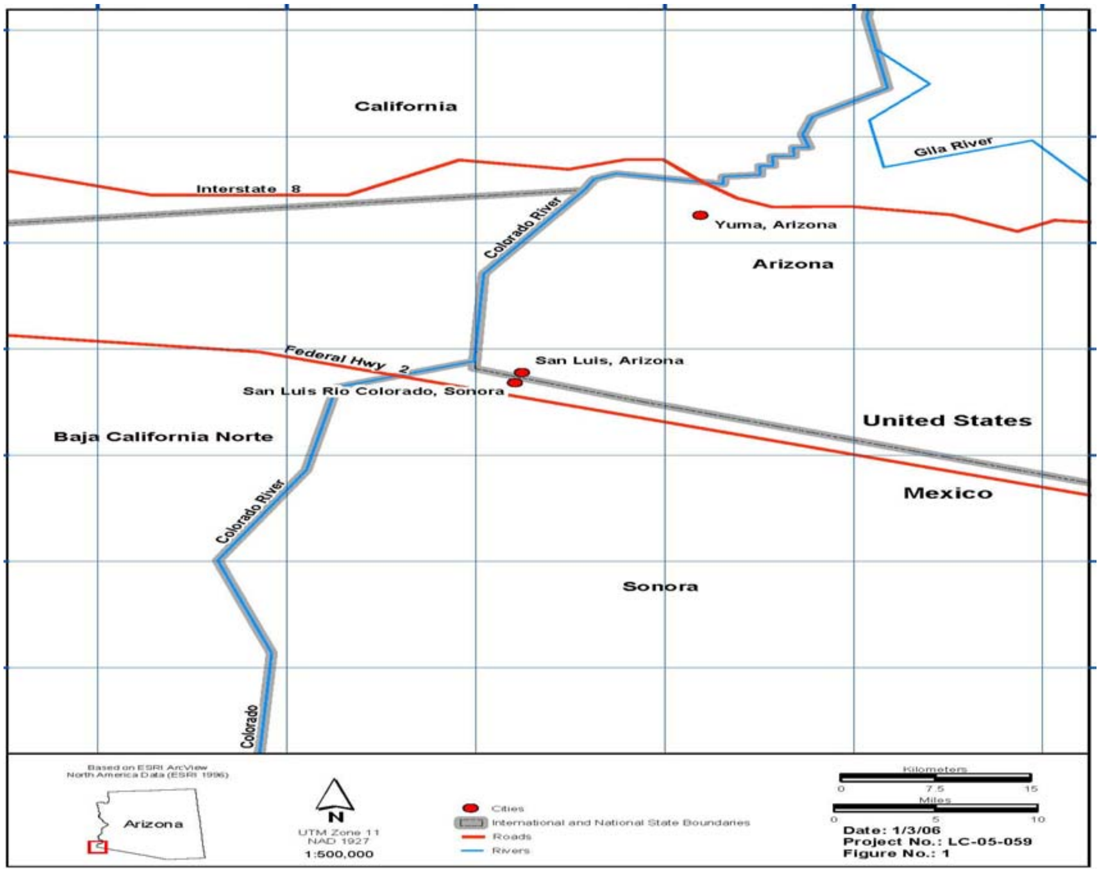
1.3 HISTORIC AND PRESENT PERSPECTIVES OF PROPOSED ACTION

1.3.1 San Luis, R.C., Sonora, Mexico

The City of San Luis Rio Colorado (R.C.), Sonora, Mexico is located in the northwestern part of the State of Sonora and is about 383 miles (616 kilometers [km]) from the city of Hermosillo, the capital of the state (Figure 1). The city is bordered on the west by Colorado River and to the north by the State of Arizona in the United States. In Mexico, the city is bordered by the municipalities of Puerto Peñasco and by the Gulf of California to the south and by the state of Baja California Norte to the west. San Luis R.C. is situated on the east bank of the Colorado River at an average elevation of 130 feet (40 meters) above mean sea level (amsl). The Colorado River flows adjacent to the city and generally southward through the Colorado River delta after which it discharges into the Gulf of California.

The area north of San Luis R.C. in the United States is located in Yuma County, Arizona, and includes the cities of San Luis, Gadsden, and the East Cocopah Indian Reservation within approximately six miles of the border. Further north in Yuma County are the cities of Somerton and Yuma. Yuma is the county seat and tenth largest city in the state of Arizona, with a population estimated at 88,775 as of July 1, 2005 by the Arizona Department of Economic Security as cited on the City of Yuma website.

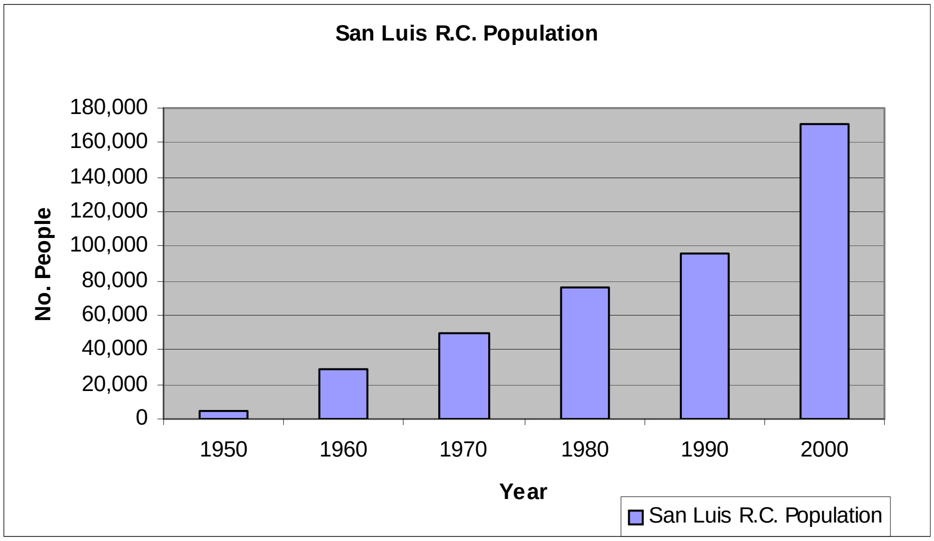
Figure1:ProjectLocationMap



1.3.2 Population

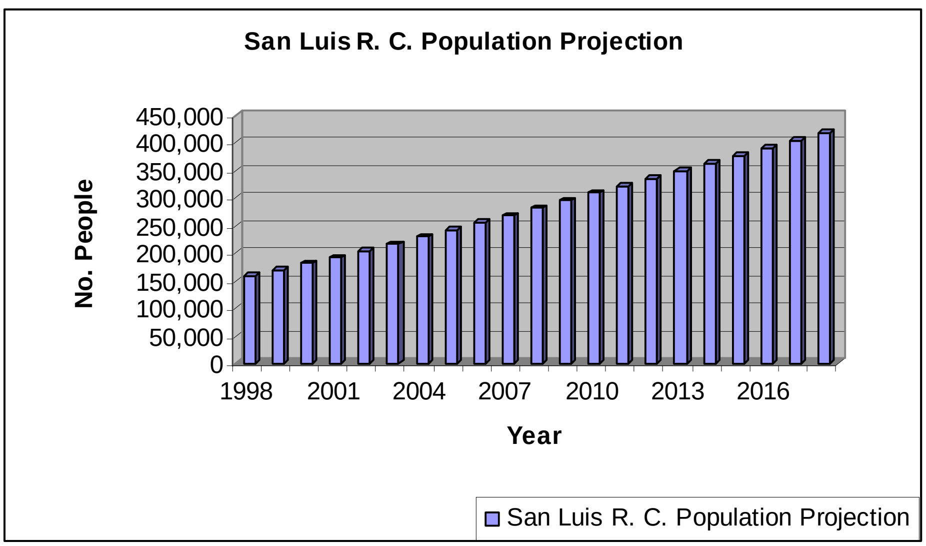
Within the last three decades the City of San Luis RC experienced a surge in population growth due to increased industrialization within the border region (Table 1-1). Based on this historical population growth it is projected that the population of San Luis, R.C. will continue to grow at a rapid rate (Table 1-2).

Table 1-1: Historic Population of San Luis, R.C., Sonora Mexico



(CIEPSA Master Plan, 1999 Section 1 PoblacioSLRC)

Table 1-2: Project Population Growth of San Luis, R.C., Sonora Mexico



(CIEPSA Master Plan, 1999 Section 1 Tabla 2)

Section 23, page 24 of the Construcción, Ingeniería, Estudios y Proyectos; S.A. de C.V. (CIEPSA) Master Plan describes a review of the increase in the number of water system customers in San Luis RC from January 1998 through January 1999 done by OOMAPAS.

From this review, OOMAPAS calculated an annual growth rate of 3.12%. This rate contrasts with the annual growth rate of 4.5% determined by the City of San Luis RC. This difference is feasible considering potential illegal water system connections and multi-family use of the same connection. The population projections in Table 1-2 were developed in the CIEPSA Master Plan and represent annual growth rates beginning at 6.65% for 1999 and decreasing steadily to 3.5% for 2018. The justification for the selection of this range of population growth rates is detailed in Section 1 of the CIEPSA Master Plan and represents a "best assessment" of the growth rates in 1999 as compared with Comisión Federal de Electricidad (CFE: state-owned electric company), Catastro Municipal (register of deeds for the municipality) and OOMAPAS growth rate calculations. The table with the specific annual growth rates can be found on page 1-33 of Section 1 of that document.

The population projections provided on the Consejo Nacional de Población (CONAPO: National Population Council) website for San Luis RC from 2000 through 2030 represent a 4.01% annual growth rate over that period as compared with a growth rate of 3.3 % for the Republic of Mexico. The table below shows a comparison of the CIEPSA population projections versus the CONAPO projections for the years cited.

Actual census data from the 2005 enumeration has not been published due to a disagreement between the CONAPO projections from July 1, 2005 and the Instituto Nacional de Estadística Geografía e Informática (INEGI: National Institute of Statistics, Geography and Information) enumeration of October 17, 2005. (CONAPO, 2006) Humberto Hernandez, Project Coordinator for PIMAAS (Proyecto Integral de Mejoramiento de los Servicios de Agua Potable, Alcantarillado y Saneamiento) stated in correspondence received on April 12, 2006 that the 2005 population estimate for San Luis RC is 178,130. This value is based on the 1995 census enumeration, a 1999 update by Comisión Nacional de Agua (CNA: National Water Commission) and official projected growth rates provided for San Luis RC by INEGI.

Table 1-3 Comparison of Population Projections for San Luis RC, Sonora

Year	CIEPSA	CONAPO	CENSUS
2000	181,745	131,700	145,006
2001	192,650	135,992	Not Available
2002	204,209	140,286	Not Available
2003	216,462	144,593	Not Available
2004	229,449	148,880	Not Available
2005	243,216	153,150	Not Available

(Sources: CIEPSA, 1999; CONAPO website, 2006, for population projection at the middle of the year; INEGI, 2006)

1.3.3 History of the Wastewater System

The existing San Luis, R.C., wastewater collection system was originally constructed around 1972 to service about 25% of the area of the city, which provided sewer service to 36.7% of the approximately 50,000 inhabitants at that time. The boundaries of the area served by the collection system were Avenida Internacional to the north; Avenida Colima to the south; Calle 26 to the east and generally Calle 2 to the west. The system provided collection of raw wastewater from the area served and discharged it into the Colorado River via an open conveyance channel (CIEPSA, 1999, Section 25).

1.3.3.1 Existing System Description 1999

In 1999, at the time of publication of the CIEPSA Master Plan, the wastewater system included approximately 88,100 feet (26,855 meters) of collector and subcollector pipelines ranging in diameter from 20 inches to 91 inches. The system also included three lift stations, one at the industrial zone, one near the intersection of 24th Street and Oaxaca and a third one which pumped all of the collected wastewater for discharge into the Colorado River. No wastewater treatment facilities were in existence at that time.

The existing system experienced problems with low velocity flows, deposition of solids and generation of methane and hydrogen sulfide due to lack of adequate slope. The hydrogen sulfide which was generated by the anaerobic decomposition of the waste material reacts with the water vapor to form sulfuric acid, creating a very corrosive environment for concrete in pipes, manholes, and the lift station. In addition to corrosivity, this environment is extremely hazardous for workers required to enter the manholes or lift stations.

By the year 2000 the population of the city increased from approximately 50,000 to an estimated 170,410 persons. As a result of the population boom, the wastewater collection system built in 1972 was deficient and provided service to only a fraction of the population in 2000. The remainder of the wastewater generated in San Luis RC was disposed of using on-site methods such as cesspools and latrines. To address the wastewater handling and disposal needs, the City of San Luis R.C. started planning for expansion of the wastewater collection, treatment and disposal and initiated master planning efforts. (GeoMarine, 2005, CIEPSA, 1999)

1.3.3.2 CIEPSA- Water and Wastewater Master Plan

CIEPSA was contracted in 1999 by Border Environment Cooperation Commission (BECC) to prepare a Water and Wastewater Master Plan for the City of San Luis R.C. This Master Plan addressed the needs for collection and treatment of wastewater, beginning with an assessment of the existing wastewater system, discussion of alternatives for both collection and treatment and recommendations for capital projects to upgrade the entire wastewater system. The goals of the Master Plan were to eliminate the use of on-site sewer systems within San Luis RC and treatment of all the wastewater collected to eliminate discharge of untreated wastewater into the Colorado River.

The CIEPSA Master Plan presented three alternatives for expansion of the wastewater collection system (WWCS) and seven alternatives for treatment of the collected wastewater (Section 22). After analysis of the alternatives, the CIEPSA Master Plan recommended a modular WWTP consisting of preliminary treatment, a flow distribution box, anaerobic lagoons, facultative lagoons, maturation lagoons, a flow collection box and a disinfection system (CIEPSA, Master Plan, Section 25). The WWTP would ultimately have four treatment modules, each consisting of the anaerobic, facultative and maturation lagoons mentioned above. The WWCS recommendation called for upgrade and expansion of the collection system to the east and south from the existing system to provide service to areas not currently sewered. Additionally, the proposed WWCS alternative calls for construction of a new lift station and force main to convey the wastewater to the WWTP and discontinue the discharge of raw sewage into the Colorado River. The plan proposed that construction of the master planned WWTP facilities be completed in three phases. Phase I was to be completed in 2002, Phase II was to begin in 2002 with target completion by 2011. Finally, Phase III is scheduled to begin in 2011 with projected completion in 2018. (CIEPSA, 1999 Section 25, page 25-12)

1.3.3.2Wastewater Collection System

During the first five years of the WWCS capital program, the new south lift station was slated to be constructed including the force main from this station to the proposed WWTP site. In addition, the Los Pinos, Calle 9, Parque Industrial Tamaulipas and Mexico collector pipelines were to be constructed along with approximately 20% of the associated mains. Parallel to this work the existing north lift station was to be rehabilitated for continued use.

WWCS construction during years 6 through 10 of the project are to consist of collector lines Jalisco, Coahuila, Dalias and Jalapa in addition to approximately 25% of the associated mains.

The third five-year construction period is proposed to include construction of an additional 25% of the associated mains.

The final five-year construction period is planned to consist of completion of the remaining 30% of the mains to complete the projected WWCS. (CIEPSA, 1999 Section 25 page 25-7)

1.3.3.3 Wastewater Treatment Plant

Phase I: Construction of the WWTP was to commence simultaneously with the initial collection system expansion in 2000 and was to consist of the pretreatment system, flow distribution box, two treatment modules, each with a capacity of 4.5 MGD (200 lps), flow collection box and disinfection system.

Phase II: Phase II was slated to consist of constructing the third treatment module of the WWTP. This module would consist of one anaerobic lagoon, one facultative lagoon and one maturation lagoon and would increase the treatment capacity from 9 MGD (400 lps) to 13.7 MGD (600 lps). These lagoons would receive wastewater from the distribution box and discharge to the collection box constructed in Phase I. Phase II was scheduled to begin construction in 2002 but is part of the proposed project currently being considered.

Phase III: Phase III of the WWTP project is scheduled to begin in 2011 and include construction of the fourth and final treatment module. This module is planned to fit into the overall WWTP scheme and consist of the same infrastructure as described for Phase II above. Phase III would bring the capacity of the WWTP to the ultimate design capacity of 18.3 MGD (800 lps). (CIEPSA, 1999 Section 25 page 25-12).

1.3.3.4 Waste Stream Study

In order to develop design criteria for the WWTP, a waste stream study was conducted between June 1996 and September 1998. The results of the study formed the basis for characterization of the WWTP's projected influent quality (Table 1-3). Table 1-4 summarizes the projected quality of treated effluent from the proposed treatment processes. The parameters shown meet the federal water quality requirements for disposal into Mexican National water bodies. (GeoMarine, 2000)

From the Tables 1-3 and 1-4 it is apparent that approximately 2.8 MGD (123 lps) of wastewater flow is lost due to infiltration and evaporation as the wastewater moves through the collection system and treatment modules.

Table 1-3: Estimated WWTP Influent Parameters

Parameter	Value
Flow	18.3 MGD
Biological Oxygen Demand (BOD)	260 mg/L
Total Suspended Solids (TSS)	60 mg/L
Fecal Coliforms	1.15×10^7 cfu/100 mL
Helminth ord [sic]	1,000 eggs/L

Note: MGD = million gallons per day cfu = colony forming unit mg/L = miliigrams per liter
(Source GeoMarine EA 2000, Table 2-1)

Correspondence from Humberto Hernandez of OOMAPAS on April 12, 2006 indicated that the effluent fecal coliform concentrations were projected to be 960 cfu rather than the 1,000 listed in the GeoMarine EA.

Table 1-4: Anticipated WWTP Effluent Parameters

Parameter	Value
Flow	15.5 MGD
Biological Oxygen Demand (BOD)	31.2 mg/L
Total Suspended Solids (TSS)	25 mg/L
Fecal Coliforms	960 cfu/100 mL
Helminth ord [sic]	5 eggs/L

Note: MGD = million gallons per day cfu = colony forming unit mg/L = miliigrams per liter
(Source: GeoMarine EA 2000, Table 2-2 and correspondence from OOMAPAS, April 12, 2006)

1.1.1 GeoMarine, Inc. Transboundary Environmental Assessment (2000)

GeoMarine, Inc. (GeoMarine) was contracted to prepare an Environmental Assessment (EA) for the no action alternative and two alternatives to collect, treat and dispose of effluent from sanitary sewage in San Luis RC. The scope of this EA was to address only those potential impacts within the "area of concern" which is defined as being limited to an area on the United States side of the international boundary within 10 kilometers (approximately 6 miles) of the border in the vicinity of San Luis RC.

1.1.1.1 Proposed Project Assessed in GeoMarine EA

The proposed project assessed under the GeoMarine EA in 2000 is identified in Section 1.1 of that document as the construction and operation of a WWTP and the rehabilitation and expansion of the wastewater collection system in the City of San Luis R.C., Sonora, Mexico.

The proposed WWCS and WWTP projects identified were needed to:

- improve sewer and sanitation services in San Luis R.C.;
- decrease potential human health hazards associated with the contamination of additional aquifers or larger groundwater aquifers;
- improve water quality in the Colorado River;
- improve ground water quality;
- improve water quality for aquatic communities in the Colorado River and Delta; and
- eliminate environmental and health problems in the area resulting from disease causing bacteria, viruses, and protozoa in untreated wastewater.
  (GeoMarine, 2000)

1.1.3.1.1 Wastewater Collection System

The proposed WWCS upgrade and expansion was intended to increase sewer service from approximately 37% of the existing population "up to 85 percent of the existing population." The population was cited in this section as 170,410 at the time of the preparation of the EA. In addition, the upgrade of the WWCS would also serve to divert the sewage from discharge into the Colorado River to the WWTP proposed for construction south of San Luis RC. (GeoMarine, 2000, Section 1.3)

Phase I: Phase I of the WWCS rehabilitation and expansion was not specifically identified as to the location, length of piping or construction start date, but did indicate that completion was scheduled within three years.

Phase II: Phase II of the WWCS was described in similar terms as Phase I. Phase II was stated to begin at the end of Phase I and be completed in six years.

Phase III: Phase III of the WWCS was described in similar terms as Phases I and II. Phase III was stated to begin at the end of Phase II and be completed in twelve years. The total length of all three Phases was stated to be 111,340 linear feet (33,936 meters).

1.1.1.1.2 Wastewater Treatment Plant

The WWTP total capacity after completion of all phases was designed to be approximately 18.3 MGD (800 lps).

Phase I: Phase I WWTP construction was scheduled to begin in 2000 and be complete in 2002. The capacity to be constructed in Phase I was listed as 9.13 MGD (400 lps). This plant was to be placed in operation at the time of completion in 2002.

Phase II: Phase II, currently being considered, originally was scheduled to begin construction in 2002 and be completed by 2011. No capacity was listed for Phase II construction, although it could be assumed to be one of the modules described in the CIEPSA Master Plan which would equal an additional 4.58 MGD (200 lps).

Phase III: Phase III of the WWTP anticipated initiation of construction in 2011 with completion by 2018 bringing the ultimate capacity of the WWTP to 18.3 MGD (800 lps).

Disposal Options

The proposed disposal option in the GeoMarine EA was discharge of treated effluent from the WWTP into a concrete-lined irrigation canal for use in irrigation of agricultural lands.

1.4 Status of Project Construction

Phase I of the SLRC wastewater system improvements was certified by Border Environment Cooperation Commission (BECC) on 22 de June, 2000. A North American Development Bank (NADB), with Border Environment Infrastructure Fund (BEIF) funds, subagreement for construction of improvements was signed on December 13, 2000. Facilities being constructed under Phase I include: Collector Los Pinos (PVC pipe, 42 36 y 30 inch diameters, length 18,786 feet -5,726 m), Force main (PVC pipe, 30 inch diameter, 9.2 MGD -400 lps- capacity, length 16,909 feet -5,154 m), lift station (includes three pumps of 4.6 MGD -200 lps-, mechanical bars screen, auxiliary electric plant and vortex type grid remover) and the First and Second modules of the WWTP, with a capacity of 4.6 MGD per module. As of May 2006, 100% of the wastewater collection system and 98% of the wastewater treatment plant have been completed.

The status of construction of the Phase I wastewater infrastructure listed as the proposed alternative in the GeoMarine EA differs somewhat from the schedule included in that report. The extent of construction completed to date is listed below, phase I. This status was obtained during the site visit by Zia staff during November 2005 and from communication with OOMAPAS staff subsequent to that visit, including correspondence received April 19, 2006.

1.4.1 Wastewater Collection System

In order to clarify differences in system descriptions between this section of the supplemental EA and the previous documents, collectors identified in the CIEPSA Master Plan as Parque Industrial, Tamaulipas and Mexico have been relocated and renamed. Figure 2 below, which was provided by OOMAPAS during the initial site visit to San Luis RC shows the current designations for the collectors and subcollectors proposed for the ultimate WWCS buildout conceived in the Master Planned area.

The following wastewater infrastructure facilities have been completed as of 2005:

- The Los Pinos collector and subcollectors associated with it (Laredo, Independencia, San Alberto, San Emeterio, Colombia, Bonfil, Jesús García) have been completed.
- The Calle Nueve collector has been completed.
- Construction of the south lift station has been completed. This lift station includes the preliminary treatment processes of bar screening and grit removal discussed as part of the WWTP.
- The force main from the south lift station to the WWTP site has been constructed (400 l/s).
- The first two modules of the WWTP (400 lps) are complete with the exception of the discharge facilities. The WWTP is not currently in operation.

Figure 2: Phases II and III Collection System Proposed Construction (OOMAPAS 2005)

1.5 Current Proposed Project

On October, 2004, the Organismo Operador Municipal de Agua Potable, Alcantarillado y Saneamiento de San Luis Rio Colorado (OOMAPAS-SLRC) applied for BECC for certification of Border Environment Infrastructure Fund (BEIF) assistance for continuation of expansion of the wastewater collection, pumping and conveyance system for areas within San Luis R.C., Sonora, Mexico that are currently not serviced by the existing collection system. The project also includes the expansion of the existing wastewater treatment plant to approximately 13.8 MGD from the previous 9 MGD capacity in order to handle the additional discharges produced by expansion of the wastewater collection system. (BECC)

This work represents Phase II of this proposed project. Phase II has been modified somewhat from the description in the CIEPSA Master Plan and the GeoMarine EA. The changes are in the locations, designations and names of the WWCS pipeline projects and the timing of their construction. OOMAPAS has changed the designation for the collectors named Parque Industrial, Tamaulipas and Mexico to subcollectors, relocated them somewhat and renamed them as listed in Table 1-5 below. The changes do not appear to change the purpose or function of these pipelines, since these subcollectors provide coverage for the remainder of San Luis RC.

1.5.1 Wastewater Collection System

The wastewater collection system infrastructure proposed to be constructed during Phase II according to OOMAPAS includes subcollectors associated with collector Calle Nueve (Guadalupe Victoria, Chihuahua and Zacatecas). These subcollectors will flow into the south lift station via the Calle Nueve collector. From the south lift station a 30 inch (76 cm) force main (pressurized pipe), which has already been constructed, will convey wastewater to the WWTP. Details of the collection system infrastructure to be installed during Phase II of the project are shown below in Table 1-5 and in the OOMAPAS drawing in Figure 2 above. In addition to the subcollectors listed above, Phase II will include construction of a parallel force main from the south lift station to the WWTP (400 l/s) and refurbishment of the south lift station.

Subcollectors Ejido Oriente, Jazmin, Ejido Poniente, Calle 13, Calle 18 and Las Flores are planned to be constructed during Phase III. Phase IV of the collection system has been incorporated into the initial three phases in that the service lines associated with each collector and subcollector will be constructed concurrently with those major pipelines. (OOMAPAS, 2005)

Although not part of the proposed project, OOMAPAS is replacing deficient existing WWCS pipelines as on-going system maintenance.

Table 1-5: Details of Proposed Collection System Infrastructure

Subcollector or elements	Average Flow	Population Served[1]	Actual residential water connections[2]	Existing Population	Approximate Cost[1] (U.S. Dollars) [3]
Phase II					
Zacatecas Subcollector	1.22 MGD (53.7 lps)	17,682	4,031	16,930	$2.29 million
Chihuahua Subcollector	0.93 MGD (41.0 lps)	13,482	2,413	10,135	$1.88 million
Guadalupe Victoria Subcollector	2.78 MMGD (122 lps)	23,104	2,517	18,722	$1.45 million
SUMA		54,268		45,787	
Refurbishment of the south lift station[4]	9.12 MGD (400 lps)	124,062	8,961	45,787	$0.60 million
2nd Transmission Line to WWTP[4]	9.12 MGD (384 lps)	124,062	8,961	45,787	$3.81 million
3nd module WWTP	4.56 MGD (189 lps)	62,031	8,961	45,787	$5.02 million
Ifiltration basin (3 th Module)	4.56 MGD (200 lps	**62,031**	**8,961**	**45,787**	**0.78**
Phase III					
13th Street Subcollector	0.54 MGD (23.9 lps)	7,858	1,470	6,174	$0.97 million
18th Street Subcollector	0.56 MGD (24.6 lps)	8,098	1,350	5,670	$0.87 million
Ejido Poniente Subcollector	0.33 MGD (14.4 lps)	4,746	791	3,320	$0.58 million
Las Flores Subcollector	27.8 MGD (27.8 lps)	9,143	1,524	6,400	$0.81 million
Jazmin Subcollector	0.75 MGD (33.1 lps)	10,899	1,817	7,630	$1.18 million
Ejido Oriente Subcollector	1.24 MGD (43.7 lps)	14,385	2,393	10,050	$1.26 million
4th module WWTP	4.56 MGD (200 lps	62,031	9,190	39,244	$5.02 million
Ifiltration basin (4 th Module)	4.56 MGD (200 lps	62,031	9,190	39,244	0.78

Note: gpm = gallons per minute lps = liters per second

(Source: Humberto Hernandez, 2006)

1. The "Population Served" was calculated as per design parameters, using actual amount of lots.
2. The actual residential water connections were obtained from the current users for data base.
3. Include taxes, contingencies and supervision. December 14, 2005 conversion rate; 10.7465 pesos per 1 U.S. dollar
4. Refurbishment of the south lift station and 2nd Transmission Line to WWTP was design using the population of Phases I and II of the PIMAS.

1.5.2 Wastewater Treatment Plant

The proposed project for which OOMAPAS is seeking BECC certification represents Phase II of the overall project consisting of construction of the third WWTP module. This construction would consist of one 4.6 MGD (200 lps) module bringing the total WWTP volume to approximately 13.8 MGD (600 lps). As mentioned in the previous sections, each module consists of an anaerobic lagoon, followed by a facultative lagoon and finally a maturation lagoon.

The need for construction of the third module is based on existing population and wastewater flow estimates. This 200 lps value was calculated based on the assumption that 75% of water consumed is discharged to the sewer system and the per capita water consumption of 350 liters per day with a population of 45,787 (table 1.5), the wastewater flow will be as approximately 3.18 MGD (139 lps). Thus the current residential wastewater contribution in San Luis RC is estimated to be approximately 7.1 MGD (310 lps). Adding the estimated 1.6 MGD (70 lps) of industrial wastewater contribution, brings the total estimated current wastewater flow to 8.7 MGD (380 lps).

1.5.3 Effluent Disposal Options

Based on information provided by OOMAPAS at the onset of this supplemental EA project, effluent disposal options that were discussed in the 2000 report are now deemed to be infeasible. Discharging to a local irrigation canal is no longer considered feasible since the farmers have indicated concern about use of effluent for irrigation, particularly food crops. In addition, the cost of irrigating with effluent, priced to recover WWTP costs, is more expensive than pumping groundwater at this time. Thus, direct use of effluent for irrigation is no longer the proposed option for disposal of effluent. (OOMAPAS, 2005)

1.5.3.1 Infiltration Basin Feasibility Study

OOMAPAS commissioned a hydrogeologic study by the Universidad Autonoma de Baja California (UABC) which was conducted in the fall of 2004 on the feasibility of use of infiltration basins for disposal (and thus eventual reuse) of effluent from the proposed WWTP for San Luis RC. The UABC report of the findings of this study was titled, "Estudio geohidrologico puntual para obtener las characteristicas hidraulicas del acuifero donde se pretende realizar el: 'Proyecto de recarga artificial de acuifero mediante la infiltration con agua residual tratada'" and was completed in early 2005. The study assessed conditions at the site and tested the feasibility of use of infiltration basins as a means of disposal.

The study determined that soils at the wastewater treatment plant site were sandy with high permeability rates providing favorable conditions for disposal through infiltration. In addition, the study analyzed the impact on bacteriological contamination through use of infiltration basins. The study determined that the infiltration process produced very high bacteriological reduction rates. Two types of wastewater were applied to the test basin: a 50/50 mix of raw wastewater with groundwater and treated wastewater. The results of the bacteriological research are provided in Table 1-6 below.

Table 1-6 Fecal Coliform Reductions Through Infiltration

Type of Wastewater Applied	Initial Concentration (cfu/100ml)	Concentration in 15 meter Monitoring Well	Concentration in 20 meter Monitoring Well	Concentration in water from surrounding aquifer (120 meter water well)
50/50 Mix of Raw Wastewater and Groundwater	2,400,000 (40,000,000 in raw wastewater)	2,400	120	No Data
Treated Wastewater	10,500,000	250	51	0

(Source: Estudio Geohidrologico de UABC, 2005 Appendix B pp B-2 and B-3)

OOMAPAS has, therefore, decided that infiltration basins will be used to discharge the treated effluent to the groundwater table which lies approximately 60 feet below the surface. Since the ponds will be open to the atmosphere significant evaporation will also occur aiding in effluent disposal. According to OOMAPAS, as of April 12, 2006, the design of the infiltration basins was nearing completion and will be submitted to CNA for approval. The design includes a total of eight infiltration basins with a total area of approximately 30 acres (12 hectares). The design also includes monitoring wells, but no additional data was provided by OOMAPAS regarding the number, location or depth of the monitoring wells. Additional information provided by Humberto Hernandez of PIMAAS on April 19, 2006 indicated that the infiltration basins for the first two modules will be completed within five months (September 2006) and the WWTP may be placed in operation at that time.

1.5.3.2 Co-Generation Power Plant

In addition to the infiltration basins, OOMAPAS will consider two additional options for disposal of treated effluent. Construction of a co-generation power plant by CFE is planned to be completed by the year 2007. This plant will be located approximately 5 miles (8 km) east of the WWTP. The CFE has expressed an interest in purchasing treated WWTP effluent for use as cooling water.

The power plant will potentially use approximately (200 lps) of water during the first phase of construction. Due to the timing of plant completion, this water will be diverted from the 3rd treatment module. If using the water for cooling during the first phase is successful, the plant has indicated that they may use an additional 3200 gpm (200 lps) of water for the second phase. After using the water, the co-generation plant will be responsible for its discharge which will most likely be through evaporation ponds. This effluent disposal option has the potential to generate income for the wastewater authority because OOMAPAS will charge the co-generation plant for the use of the water. This method of beneficial re-use of effluent also provides a valuable resource for meeting the cooling water demand by the cogeneration plant and preserving fresh water supply for more quality sensitive uses such as potable water. Some estimates made by OOMAPAS indicate that pumping groundwater for cooling purposes would cost the co-generation plant approximately twice as much as using wastewater effluent. (OOMAPAS, 2005)

1.5.3.3 Greenhouse

OOMAPAS plans to construct a small greenhouse along the northern edge of the wastewater treatment plant site. This greenhouse will be used to grow trees for use in landscaping throughout municipal properties in San Luis R.C. Approximately 50 gpm (3 lps) of treated effluent will be used for irrigation in the greenhouse. (OOMAPAS, 2000)

1.5.3.4 Sludge Disposal

Humberto Hernandez indicated in his correspondence of April 12, 2006 that the sludge would be allowed to accumulate in the anaerobic lagoon up to a level of about 8 inches (20 cm) over a period of eight years. At that time, the sludge will be removed from the bottom of the lagoon and dried and used as fertilizer or soil conditioner.

1.6 Scope of Supplemental Evnironmental Assessment

This SEA addresses the potential environmental impacts from implementation of any changes to Phase II (now under consideration for BEIF funding) and Phase III (planned future expansions) of the project considered in the GeoMarine Transboundary EA and is limited in scope to address relevant issues within the BECC-defined “area of concern” to “be limited to an area on the U.S. side of the United States/Mexico International Border within 6 miles (10 kilometers) of the border in the vicinity of San Luis, Arizona.” (BECC)

The project description for which this assessment is being made is listed in Section 1.1.5 above. The project proposed under the SEA differs from Phase II of the GeoMarine EA by combining the final two phases of the WWTP into construction of the final two modules in one phase and modifying the disposal method for the WWTP effluent. Subsequent to preparation of the GeoMarine EA, OOMAPAS determined that the proposed use of WWTP effluent for agricultural irrigation was not feasible due to the availability of less expensive sources of irrigation water and concern about irrigating with effluent by the farming community. Based on this information, OOMAPAS contracted with Universidad Autonoma de Baja California to conduct a hydrologic study of the feasibility of use of infiltration basins for disposal of the effluent. The study determined that the soils in the vicinity of the WWTP site were suitable for this use and that significant reductions in fecal coliform bacteria resulted from this practice without impact to groundwater. Thus the infiltration basin method of effluent disposal is proposed in the proposed project.

The description of the affected environment and potential impacts in the SEA will be limited to those environmental resources that will be affected in the United States by the proposed expansion of the WWCS and WWTP and change in disposal method from irrigation use to infiltration basins. The scope of this SEA includes expansion of the WWTP from its present capacity of approximately 9 MGD to approximately 13.8 MGD under Phase II and subsequently to 18.3 MGD under Phase III. Potential impacts of modification of the wastewater facility to the ultimate volume of approximately 36 MGD will not be addressed under this EA. Only BECC defined alternatives are reviewed under this SEA. Therefore, no discussion of alternatives relative to collection system expansion is contained hereinafter because they were adequately covered under the original EA. Coordination with relevant agencies will be limited to written communications and telephone calls to obtain comment regarding the proposed project. The SEA will be prepared using only existing information and does not entail field surveys, other types of field activities, and/or hydraulic, oceanographic, ecological modeling.

2.0 ALTERNATIVES

The alternatives for this SEA have been modified to exclude discharge to the Irrigation District Canal and substitution of disposal through infiltration basins based on findings by OOMAPAS that the irrigation scenario is not feasible. OOMAPAS contracted with the Universidad Autonoma de Baja California for a hydrogeological feasibility study on use of infiltration basins for effluent disposal. The study indicated that this method was feasible based on soil characteristics, percolation rates and ability of the soil to serve as a disinfection method. Thus, the considered alternatives for the proposed facility, are summarized as follows:

- No Action Alternative
- Alternative 1 - Treatment of wastewater with anaerobic-facultative-maturation stabilization ponds treatment system with discharge to infiltration basins (Preferred Alternative)
- Alternative 2 - Treatment of wastewater with facultative-maturation stabilization ponds treatment system with discharge to infiltration basins

2.1 No Action Alternative

The no action alternative would result in San Luis R.C. proceeding with their current system of wastewater collection and treatment. Upon completion of improvements currently underway or completed, this would provide WWTP capacity. The infrastructure to be built during the phase I of PIMAAS will have a capacity of 18.24 MGD (400 laps) and will provide service to 50% of the population. The treated wastewater effluent will comply with the quality requirements for infiltration.

The infrastructure to be constructed during Phase II of PIMAAS will provide to the existing wastewater treatment plant 4.56 MGD (200 lps) of additional capacity and it will be possible to reach 75% of San Luis Rio Colorado Population. Upon completion of phase III, the wastewater treatment plant will have a capacity of 18.24 MGD and will provide service to 100 % of the population.
Assuming a consistent population density, the no action alternative would leave approximately 50% of the population without services of wastewater collection and treatment. Under this alternative a majority of the city's population would continue to discharge their wastewater into cesspools, latrines or other on-site disposal methods.

Untreated wastewater from cesspools and latrines would remain in the environment for the inhabitants without sewer service and has the potential to overwhelm the soil bacteria's natural ability to reduce organic contamination before it reaches the groundwater table. Groundwater will, therefore, remain at risk to contamination from high fecal coliform counts. This contamination will likely grow in severity as the population increases.

Human health concerns will continue as the San Luis R.C. population consumes water and food that is irrigated with water from shallow wells that draw from the fecal coliform-contaminated groundwater. The potential for waterborne illnesses and ingestion of contaminated food will increase. Because of the large numbers of Mexican citizens that commute daily across the border to work, these factors will increase the likelihood of contact within the "area of concern" in the United State with individuals that are carrying these illnesses. (GeoMarine, 2000)

2.2 Alternative 1 - (Preferred Alternative)

Under this alternative, the city's wastewater is collected at south lift station located in the southwest part of the city. Here, wastewater will move through a bar screen to remove large objects and through a grit settling basin. After the screenings and grit removal, wastewater will be pumped from the lift station through a 30-inch (76 cm) force main (pressurized pipe) and transported to the WWTP. The proposed WWTP project consists of construction of two additional lagoon modules. The initial two modules (total capacity of 9.13 MGD (400 lps)) are nearing completion as part of the initial phase I of construction. One additional module of 4.58 MGD (200 lps) will be constructed during the current proposed phase bringing the total WWTP capacity to 13.8 MGD. The modules installed under the initial phase are anticipated to be in use by September 2006.

Each treatment module consists of three lagoons (see Figure 3). The first step in each module is an anaerobic pond used for primary treatment. These ponds are designed to provide an anaerobic environment for the decomposition of organic matter. Treatment in these ponds is anticipated to reduce BOD loading by approximately 55 percent before the wastewater moves into the next treatment step. In addition to the reduction of organics, the anaerobic ponds will provide adequate residence time to settle a large portion of the suspended solids remaining after preliminary treatment and serve to stabilize hydraulic and organic concentration fluxes in the flow. This will help to equalize the flow quantity and quality entering the facultative treatment ponds. (GeoMarine, 2000)

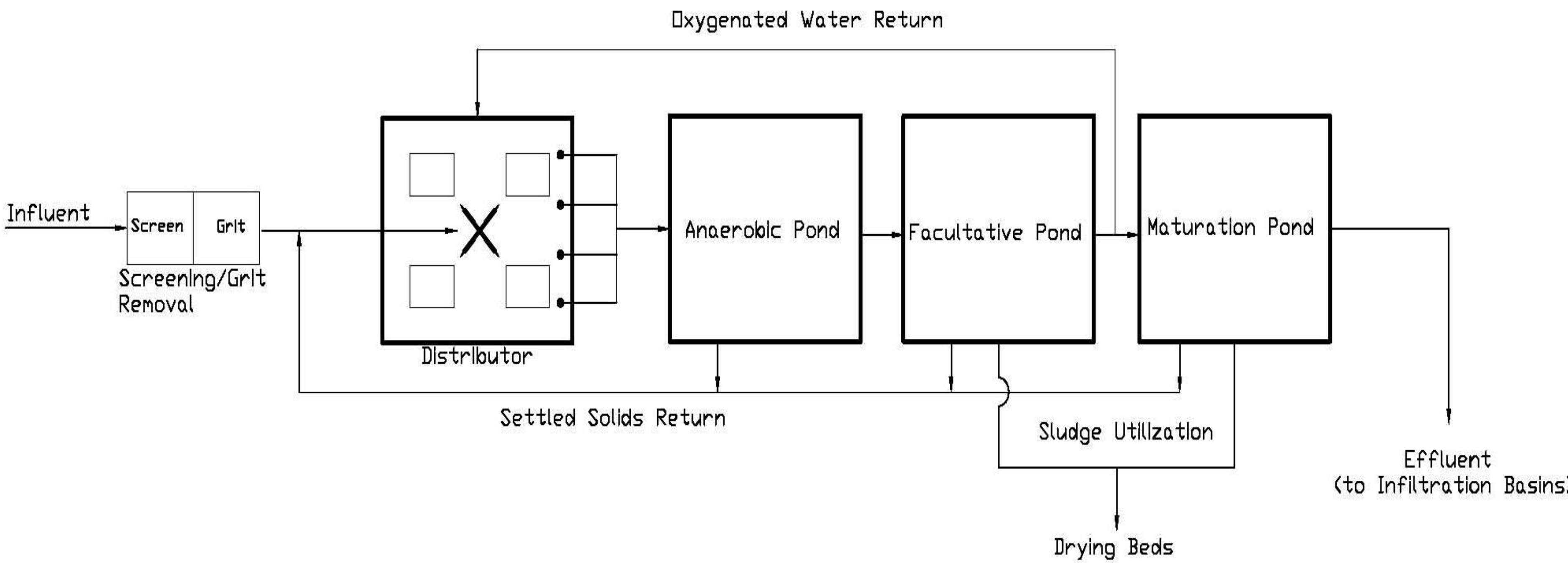
The facultative treatment ponds are designed with an aerobic environment in the upper layer of the ponds, and an anaerobic lower layer. It is expected that these ponds will reduce the overall BOD concentrations of the influent waste stream by 60 to 80 percent and remove nearly all of the suspended solids. The sludge digestion resulting in the bottom layers of the ponds is expected to minimize sludge production and reduce the need for frequent sludge handling. (GeoMarine, 2000)

The maturation stabilization ponds are designed for an average residence time of 10 to 15 days. These ponds are designed with a shallow depth to allow sunlight to penetrate the waters with intent to kill pathogens. (GeoMarine, 2000)

The primary mode of disposal of the effluent will be through infiltration basins. Each lagoon module will have four infiltration basins. Effluent will be rotated among those infiltration basins to maximize evaporation and infiltration. Secondary methods of effluent disposal will include use for equipment cooling by the co-generation plant and irrigation in the tree nursery which is sited just north of the treatment facility. (GeoMarine, 2000)

It is anticipated that sludge will need to be removed from the system once every eight years. At this time it is estimated that 7.9 in (20 cm) of sludge will coat the bottom of the treatment lagoons. The lagoons are designed with ample capacity to hold the sludge for the eight-year design duration. Sludge can be removed from one module at a time by diverting the flow to the other two modules and drying out the lagoons to be cleaned. Sludge will be removed from the lagoons and dried, on site, for one month. Dried sludge will be tested to ensure its safety and used as compost fertilizer for the tree nursery. (GeoMarine, 2000)

Figure 3: Anaerobic- Facultative- Maturation Stabilization Ponds



(Source: GeoMarine, 2000)

2.3 Alternative 2

Alternative 2 is similar to Alternative 1 with the exception that the primary treatment anaerobic ponds are excluded from the system (see Figure 4 below). This alternative is also described in detail in section 2.4.2 of the 2000 GeoMarine EA. As described above, wastewater will undergo preliminary treatment at the lift station and then be transported to the WWTP. At the WWTP the wastewater will enter the facultative ponds designed with aerobic upper layer and anaerobic lower layer. Algae and bacteria in the ponds work to oxidize most of the influent's BOD. Due to the absence of primary treatment (i.e., anaerobic ponds), Alternative 2 will require 55 more acres than Alternative 1 to increase the residence/treatment time of the wastewater in the system. This alternative will also use maturation ponds for the removal of bacteria. (GeoMarine, 2000)

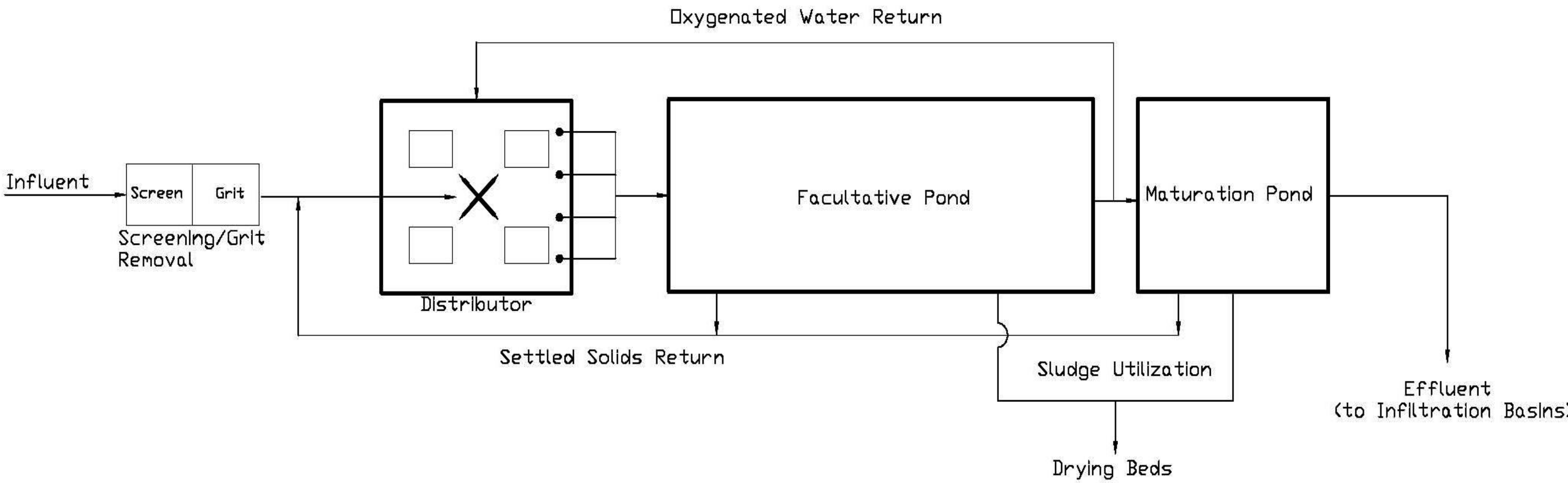
As described in Alternative 1, the primary means of effluent disposal under this alternative would be infiltration basins. Once again under Alternative 2 a fraction of the treated effluent will be used at the municipal tree nursery for growing trees. Also, use of the effluent as cooling water by the co-generation power plant as described above remains as a disposal option under Alternative 2 as well. Sludge would be collected as described above, dried, and used as compost fertilizer as mentioned for Alternative 1 above. (GeoMarine, 2000)

Table 2-1: Summary of Treatment Alternative Costs[2]

Alternative	Capital Costs	Annual Operation and Maintenance Costs	Cost per Cubic Meter of Treated Water (U.S. $)
Anaerobic-Facultative-Maturation Stabilization Ponds[1]	$6.5 million	$70,000	$0.062
Facultative-Maturation Stabilization Ponds[1]	$7.2 million	$60,000	$0.067

[1] Costs quoted from May 2000 GeoMarine Environmental Assessment
[2] Costs for the infiltration basins, nursery, and sludge handling are covered under other funding sources; detailed information on these costs was not available
(Source: GeoMarine, 2000)

Figure 4: Facultative- Maturation Stabilization Ponds



(Source: GeoMarine, 2000)

3.0 ENVIRONMENTAL SETTING

The City of San Luis R.C., Sonora, Mexico is located in the northwestern part of the State of Sonora and is about 383 miles (616 kilometers [km]) from the city of Hermosillo, the capital of the state. The city is bordered on the west by Colorado River and to the north by the State of Arizona in the United States. In Mexico, the city is bordered by the municipalities of Puerto Peñasco and by the Gulf of California to the south and by the state of Baja California Norte to the west. San Luis R.C. is situated on the east bank of the Colorado River at an average elevation of 130 feet (40 meters) above mean sea level (amsl). The Colorado River flows adjacent to the city and then into the Gulf of California, where it becomes part of the Colorado River delta. "The 'area of concern' for this EA was defined by the BECC to be limited to an area on the U.S. side of the United States/Mexico International Border within 6 miles (10 kilometers) of the border in the vicinity of San Luis, Arizona." (Appendix A) (GeoMarine, 2000)

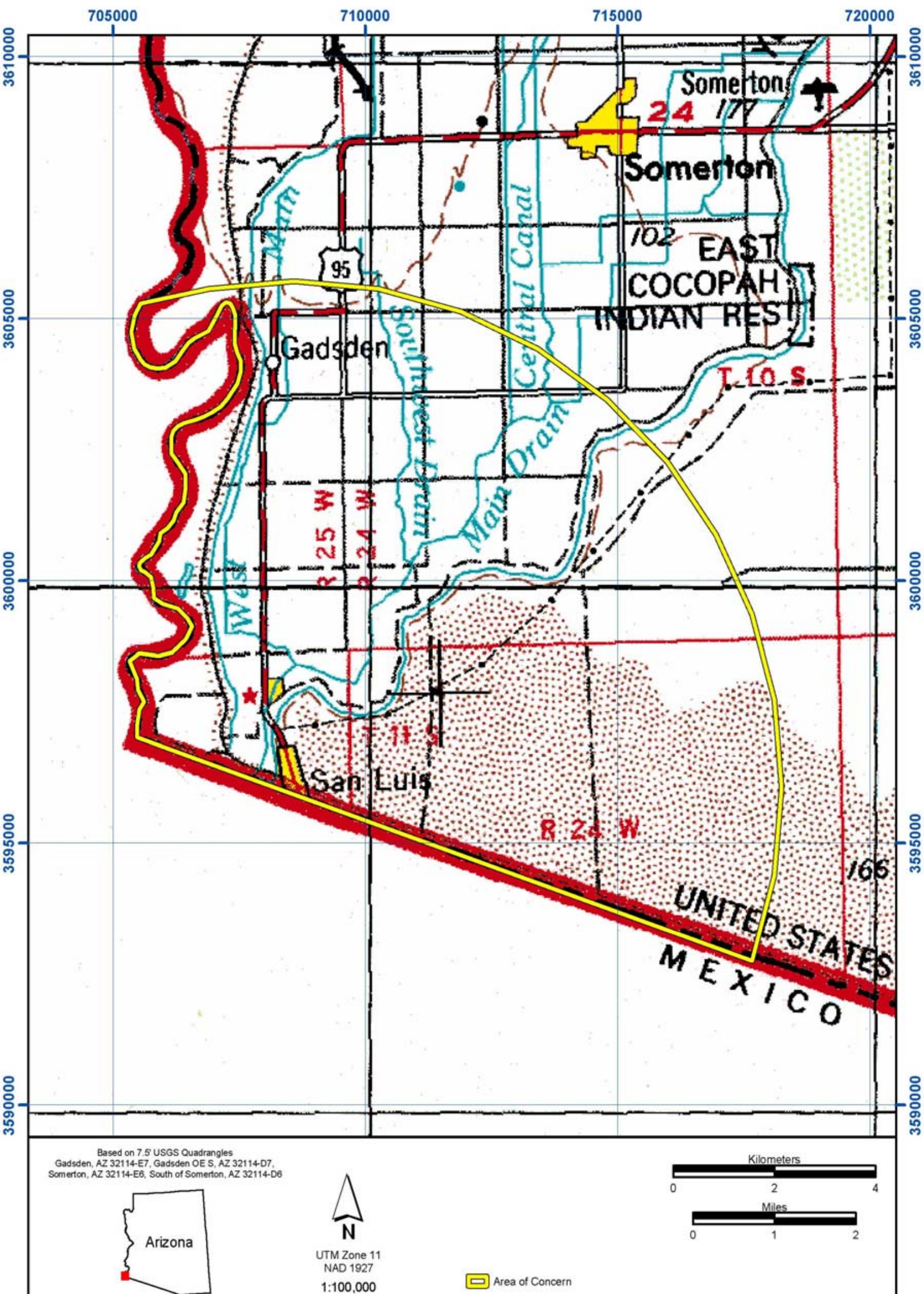
3.1 General Description of Area of Concern

3.1.1 Topography & Geomorphology

The "area of concern" is located within the Yuma Desert Plain portion of the greater Sonoran Desert east of the Colorado River. The main geographic features near the "area of concern" are the Colorado River to the west, the Yuma Mesa to the north and east and the Yuma valley to the north. The elevation for the "area of concern" ranges from 100 feet above mean sea level (amsl) to approximately 150 feet amsl (Figure 4).

According to the United States Geologic Survey (USGS), the "area of concern" lies within a zone 4 seismic hazard area (USGS, 1999). The Yuma region has the greatest risk of earthquake-induced ground shaking within the state of Arizona. The threat of ground shaking is due to the proximity of the southernmost portion of the San Andreas Fault system that runs through California. San Luis is roughly 30 miles (48 km) from the Imperial Fault in California, 70 miles (113 km) from the San Andreas Fault in California, 40 miles (64 km) from the Cerro Prieto Fault in Mexico, and 10 miles (16 km) from the Algodones Fault in Mexico. The risk of structural damage is due to the loose, sandy soil structure and relatively shallow water tables that cause liquefaction. Liquefaction occurs when ground shaking increases water pressure between soil pores, causing the soil to lose strength and behave as a liquid. (Baush and Brumbaugh, 1996)

Figure 5: Topographic Map



3.1.2 Climate

The “area of concern” lies within the Sonoran Desert. The Sonoran Desert has a continental climate with both diurnal and seasonal temperature cycles. Within areas of continental climate, temperatures change with both elevation and latitude. The continental effect is modified around the Sea of Cortez. Ground level temperatures may vary as much as 100 degrees Fahrenheit (°F) (38 degrees Celsius (°C)) within a twenty four (24) hour time period. The seasonal temperatures in the Sonoran Desert can range from below freezing in the northern portions of the region to highs of 134 °F (57 °C) in the shade at San Luis R.C., Sonora (Record high August 1933). Rainfall in the area is bimodal with a rainy season during the summer and winter months. The average rainfall ranges from three to 15 in/year (38 cm/year). (Dunbier, 1968)

3.1.3 Geology

Arizona has a complex geologic history that spans 1.8 billion years. The Basin and Range Province of southern and western Arizona is characterized by alternating mountain ranges and broad valleys, most of which were formed by block faulting during the last part of the Cenozoic Era (15 to 5 million years ago). The mountain ranges contain rocks of various types and ages that have been extensively folded and faulted during the Mesozoic and Cenozoic Eras (100 to 15 million years ago). The intervening valleys are generally underlain by thick sequences of consolidated sediments (mostly gravel, sand, and silt) that are the main aquifers for the region. (Reynolds, 1988)

The Geologic Map of Arizona shows the predominant geologic classification within the “area of concern” to be Young Alluvium and Surficial Deposits. Summary descriptions of each of these geologic types are provided below.

- *Young Alluvium (QY)*– deposits in present-day river and stream channels, flood plains and playas.

- *Surficial Deposits (Q)* – Alluvium in present day valleys and piedmonts, eolian deposits, and local glacial deposits.

3.1.4 Soils

According to data provided by the USDA Natural Resources Conservation Service (NRCS) Soil Survey of the Yuman-Wellton, Arizona and Imperial County, California, the soils within the “area of concern” may be generally classified as: Glenbar Silty Clay Loam, Holtville Clay, Indio Silt Loam, Indio-Lagunita-Ripley Complex, Superstition Sand, and Gadsden Clay. Summary descriptions of each of these soil types are provided below. (USDA 1980)

- *Glenbar Silty Clay Loam* is described as well-drained soil derived from alluvium deposited on the Palo Verde Valley floor by the Colorado River. The representative profile of these soils is greater than five feet deep. Permeability is slow. Runoff is slow or not present in fields that have irrigation borders. Erosion is not a hazard.

- *Holtville Clay* is light brown clay and described as well drained about two feet thick. Underlying these are stratified very pale brown silt loam and loamy very fine sand.

- *Indio Silt Loam* is formed in mixed alluvium. The permeability is moderate with a rooting depth of 64 inches or more, high water capacity, and medium surface runoff. This soil is used for irrigated alfalfa hay, small grains, cotton, sugar beets, grain sorghum, citrus fruit, vegetables, and Bermuda grass.

- *Indio-Lagunita-Ripley Complex* soils are typically deep and well drained. They form on flood plains, low terraces, alluvial fans and drainage ways.

- *Superstition Sand* is a light brownish-gray, loose-structured sand containing large quantities of both coarse and fine sand. The soil material is almost entirely devoid of organic matter since there is almost no vegetation on the ground. It absorbs moisture readily but has a low water retention capacity.

- *Gadsden Clay* is a deep stratified, coarse to fine-textured, nearly level to gently sloping soil found on floodplains and lower alluvial fans.

3.2 Air Quality

The "area of concern" is located within the Arizona-Mexico Southern Border Air Quality Control Region (AQCR) 12 (Yuma County). The 'area of concern" has been classified as for Non-Attainment for PM10 (only minor air quality degradation allowed) for particulate matter less than 10 microns in size in 1991. For the remaining criteria pollutants Yuma County has been designated as in Attainment (substantial degradation allowed) for sulfur dioxides (SOx), nitrogen dioxide (NO2), carbon monoxide (CO), and ozone (O3) (ADEQ 1992). The National Ambient Air Quality Standards (NAAQS) are presented in Table 3-1 below.

Table 3-1: National and State of Arizona Ambient Air Quality Standards (NAAQS)

POLLUTANT	AVERAGE TIME	STANDARD CONCENTRATIONS*
Ozone	1-hour	0.12 ppm
	8-hour	0.08 ppm
Carbon Monoxide	1-hour	35 ppm
	8-hour	9 ppm
Nitrogen Dioxide	Annual Average	0.053 ppm
Sulfur Dioxide	24-hour	365 µg/m^3
	Annual Average	80 µg/m^3
Suspended Particulate Matter (PM_{10})	24-hour	150 µg/m^3
	Annual Arithmetic Mean	50 µg/m^3
Lead	Calendar Quarter	1.5 µg/m^3

*National standards other than for ozone and those based on annual averages or annual arithmetic means are not to be exceeded more than once per year. The ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one.
ppm = parts per million   µg/m^3 = micrograms per cubic meter
(Source: Arizona Department of Environmental Quality, 1999)

There are no Class I Federal Areas within 100 miles of the project location. The nearest Class I area is the Joshua National Monument approximately 120 miles west of the project.

The Yuma PM10 State Implementation Plan (SIP) was submitted to the Environmental Protection Agency (EPA) Nov. 15, 1991. A revision to the PM10 SIP was submitted to EPA on July 12, 1994, and was determined by EPA to be complete but was never approved. The Arizona Department of Environmental Quality (ADEQ) began working with stakeholders in the Yuma area in July 2001 to develop a maintenance plan based on data that showed no exceedances of the National Ambient Air Quality Standards (NAAQS) for PM_{10}.

Achieving the goal of meeting the federal health-based standards requires three consecutive years with no monitoring violations. PM10 emissions were significantly reduced in the early 1990s as a result of actions taken by local and county governments, state and federal agencies, irrigation districts and farmers, but the levels of particulate pollution have been gradually increasing the past several years.

The county was on track to achieve compliance in 2004, but a wind storm in August 2002 resulted in a violation of the standard. As a result, state and local officials have developed a draft natural events action plan (NEAP) to account for weather conditions likely to cause poor air quality. The purpose of the plan is to control dust as much as possible and educate the public on ways to reduce their exposure to unhealthful air that may occur as a result of natural events like the August 2002 dust storm.

As shown in Table 3-2 below the Ozone (O3) and particulate matter (PM10) are the only current parameters measured by Yuma County. In 2003, there was only one exceedance of the 8-hour ozone standard. Short term and Long term NAAQS for PM10 indicated compliance with NAAQS (Yuma County 2003).

Table 3-2: Yuma County Monitoring Data in Comparison to (NAAQS)

Pollutant	Average Time	Standard Concentration*	Yuma Co. 2003 Highest Recorded Concentration	Yuma Co. 2003 2nd Highest Recorded Concentration	Yuma Co. 2003 NAQQS Exceedances
Ozone	1-hour	0.12 ppm	.10 ppm	.10 ppm	0
	8-hour	0.08 ppm	.09 ppm	.09 ppm	1
Suspended Particulate Matter (PM_{10})	24-hour	150 µg/m^3	127 µg/m^3	93 µg/m^3	0
	Annual Arithmetic Mean	50 µg/m^3	38 µg/m^3	0 µg/m^3	0

The NEAP was developed by the Yuma area stakeholders and ADEQ, and submitted to EPA in February 2004. A NEAP Implementation Report was submitted to EPA on Aug. 17, 2005.

ADEQ is now developing a Maintenance Plan for the Yuma area that upon EPA approval will allow the area to be considered for redesignation to attainment for PM10. Stakeholder meetings and progress on the development of the Maintenance Plan can be found on the ADEQ website at http://www.azdeq.gov/environ/air/plan/notmeet.html#yuma.

Zia contacted the Arizona Department of Environmental Quality requesting information or comments on the "area of concern." At the time of issuance of this report a response had not been received. No further evidence is available to suggest any changes to the findings in the GeoMarine EA.

3.3 Water Resources

The impact of the proposed alternative on the water resources of the area of concern within the United States will be minimal to none. The sources of surface water in the area are the Colorado River and the irrigation ditches that flow into and out of it. These water bodies flow south, out of the area of concern toward Mexico. Any impacts to these water sources will be south of the area of concern and be carried further south away from the U.S. – Mexico border. Impacts to the surface water of the area of concern are, therefore, non-existent. (GeoMarine, 2000)

Groundwater flow patterns in the San Luis, Arizona, USA – San Luis R.C., Sonora, Mexico region are toward the south to southwest. Water flows from the U.S. side of the border toward the Gulf of California. Impacts that could be caused from leaking of the collection system, leaking of the treatment ponds, or at the infiltration basins will be carried south away from the area of concern. OOMAPAS has indicated that they will maintain a groundwater monitoring program around the infiltration basins to ensure that groundwater impacts are kept within regulatory compliance and not negatively affecting the surrounding area. (GeoMarine, 2000, OOMAPAS, 2005)

The Geohydrological study prepared for OOMAPAS by Universidad Autonoma de Baja California assesses the feasibility of using infiltration basins for disposal of the WWTP effluent. This document provides data indicating no contamination of groundwater in a well associated with the infiltration basin pilot study.

Zia contacted the Arizona Department of Environmental Quality requesting information or comments on the "area of concern." At the time of issuance of this report a response had not been received. No further evidence is available to suggest any changes to the findings in the GeoMarine EA.

3.4 Vegetation and Wildlife

3.4.1 Vegetation

There are six major vegetation communities in Arizona. Of these communities Desert Scrubland, is the only one that is located within the "area of concern" (Brown 1982; Brown and Lowe 1983). Desert Scrub is classified by the BLM as a "Unique Natural Area and Feature". (BLM 1985). Succession rates in this habitat are slow due to dependence on scarce rainfall and competition for water resources. The sparse vegetation in this habitat is dominated by creosote bush (Larrea tridentate) and white bursage (Ambrosia dumosa). Other shrubs associated with this habitat include long leaf ephedra (Ephedra trifurca) and desert buckwheat (Eriogonum deserticola). The perennial grass big galleta (Hilaria rigida) commonly grows within this vegetation community (USDI, 1999).

Table 3-2: Commonly Associated Plants Comprising the Sonoran Desert Scrub Vegetation

TYPE	COMMON NAME	SCIENTIFIC NAME
Trees:	Western honey mesquite	*Prosopis glandulosa Torr. var. torreyana*
	Ironwood	*Olneya tesota*
	Blue paloverde	*Cercidium floridum*
	Smoketree	*Cotinus coggygria*
	Desert willow	*Chilopsis linearis*
	Chuparosa	*Beloperone californica*

TYPE	COMMON NAME	SCIENTIFIC NAME
Shrubs	Catclaw acacia	*Acacia greggii*
	Creosotebush	*Larrea tridentata*
	White bursage	*Ambrosia dumosa*
	Ocotillo	*Foquieria splendens*
	Bricklebush	*Brickellia californica*
	Ironwood	*Olneya tesota*
	Foothills paloverde	*Cercidium microphyllum*
	Saltbush	*Atriplex* spp
	Goldenbush	*Ericameria* spp
	Fremont thornbush	*Lycium fremontii*
	Desert lavender	*Hyptis emoryi*
	Velvet mesquite	*Prosopis velutina*
	Triangle-leaf bursage	*Ambrosia deltoidea*
	Saguaro	*Carnegiea gigantea*
	Terry bear cholla	*Opuntia bigelovii*
	Desert agave	*Agave deserti*
	Silver cholla	*Cylindropuntia echinocarpa*
	Diamond Cholla	*Opuntia ramosissima*
	Beavertail	*Opuntia basilaris*
	Kunze cholla	*Corynopuntia stanlyi var. kunzei*
	Nightblooming cerus	*Peniocereus greggii*
	Engelman hedgehog cactus	*Echinocereus engelmannii*
	Compass Barrel Cactus	*Ferocactus cylindraceus*
	Cheatgrass brome	*Bromus tectorum*
Grasses	Arabian grass	*Schismus Poaceae Danthonioideae*
	Frankenia	*Frankenia spp*
	Bush Muhly	*Muhlenbergia porteri*
	Desert honeysuckle	*Anisacanthus thurberi*
Forbs	Canyon ragweed	Ambrosia ambrosioides
	Wooly plantain	Plantago patagonica
	Arrow-weed	Pluchea sericea
	Narrow-leaved wingscale	Atriplex canescens
	Coutler globmeallow	Sphaeralcea digitata
	Jimmy weed	Isocoma pluraflora
	Burrow-weed	Haplopappus heterophyllus
	Russian thistle	Salosa tragus
	Prickly lettuce	Lactuca serriola
	Tumble mustard	Sisymbrium altissimum
	Yellow rocket	Barbarea vulgaris arcuata

(Source: Table 3-6 Commonly Associated Plants Comprising the Sonoran Desert Scrub Vegetation, Geo-Marine, 2000)

3.4.2 Wildlife

Of the eight species of amphibians known to occur in southwestern Arizona, only two, the Sonoran desert toad and the red-spotted toad, are common. The most dominant and common reptiles that inhabit Yuma County include iguanid lizards, colubrid snakes, and rattlesnakes. The native faunal components of southwestern Arizona support 230 species of birds. Common species include sparrows and towhees (30 species); swans, geese, and ducks (22 species); wood warblers (22 species); tyrant flycatchers (18 species); and kites, and eagles and hawks (15 species). The majority of these bird species occur in spring and fall when neotropical migrants (e.g., flycatchers and warblers) pass through on their way to summer breeding grounds north of the "area of concern", on their way to wintering areas south of the "area of concern", and in the winter when summer resident birds (e.g., robins, kinglets, and sparrows) from the north arrive to spend the winter. The majority of the 62-mammalian species are bats and rodents (e.g., pocket mice, kangaroo rats, pocket gophers, ground squirrels, various mice and wood rats). Rodents are the most common mammals. The Lower Colorado River system supports 36 species of fish of which only four are native.

3.5 Threatened, Endangered and Sensitive Species

Table 3-3: Federal and State Listed or Proposed Threatened, Endangered, or Sensitive Species Potentially Occurring in Yuma County, Arizona

COMMON NAME/ SCIENTIFIC NAME	ESA	CRITICAL HABITAT	WSCA	NPL
Plants				
Parish Onion/ *Allum parishii*				SR
Grander's Cryptantha/ *Cryptantha ganderi*	SC			
Clustered Barrel Cactus/ *Echinocactus polycephalus* var *polycephalus*				SR
Dune Spurge/ *Euphorbia platysperma*	SC			
California Barrel Cactus/ *Ferocactus cylindraceus* var *cylindraceus*				SR
Dune Sunflower/ *Heliathus niveus ssp tephrodes*	SC			
Senita/ *Lophocereus schottii*				SR
Straw-top Cholla/ *Opuntia echinocarpa*				SR
Wiggin's Cholla/ *Opuntia wigginsii*				SR
Sand Food/ *Pholisma sonorae*	SC			HS
Kearney Sumac/ *Rhus kearneyi*				SR
Blue Sand Lily/ *Triteleiopsis palmer*i				SR
California Fan Palm/ *Washingtonia filifera*				SR

COMMON NAME/ SCIENTIFIC NAME	ESA	CRITICAL HABITAT	WSCA	NPL
Reptiles				
Desert Rosy Boa/ *Charina trivirgata gracia*	SC			
Sonoran Desert Tortoise/ *Gopherus agassizii*	SC		WSC	
Gila Monster/ *Heloderma suspectum*				
Flat-tail Horned Lizard/ *Phrynosoma m'callii*	SC		WSC	
Arizona Chuckwalla/ *Sauromalus ater*	SC			
Yuman Desert Fringe-toed Lizard/ *Uma rufopunctata*	SC		WSC	
Birds				
Great Egret/ Ardea alba			WSC	
Western Burrowing Owl/ *Athene cunicularia hypugaea*	SC			
Western Yellow-billed Cuckoo/ *Coccyzus americanus occidentalis*	C		WSC	
Snowy Egret/ *Egretta thula*			WSC	
Southwestern Willow Flycatcher/ *Empidonax traillii extimus*	LE	Y	WSC	
Cactus Ferruginous Pygmy-owl/ *Glaucidium brasilianum cactorum*	LE	P	WSC	
Least Bittern/ *Ixobrychus exilis*			WSC	
Loggerhead Shrike/ *Lanius ludovicianus*	SC			
California Black Rail/ *Laterallus jamaicensis coturnicullus*	SC		WSC	
Yuma Clapper Rail/ *Rallus longirostris yumanensis*	LE		WSC	
Mammals				
Sonoran Pronghorn/ *Antilocapra americana sonoriesis*	LE		WSC	
Pale Townsend's Big-eared Bat/ *Corynorhinus townsendii pallescens*	SC			
Spotted bat/ *Euderma maculatum*	SC		WSC	
Greater Western Bonneted Bat/ *Eumops perotis californicus*	SC			
Western Yellow Bat/ *Lasiurus xanthinus*			WSC	
California Leaf-nosed Bat/ *Macrotus californicus*	SC		WSC	
Yuma Myotis/ *Myotis yumanensis*	SC			
Yuma Hispid Cotton Rat/ *Sigmodon hispidus eremicus*	SC			
Fish				
Razorback Sucker/ *Xyrauchen texanus*	LE	Y	WSC	

HS = Highly Safeguard
SC = Species of Concern
NPL = Arizona Native Plant Law
WSC = Wildlife of Special Concern in Arizona
LE = Listed Endangered
P = Proposed
ESA= Endangered Species Act
Y = Yes
SR = Salvage Restricted

(Source: AZGFD, HDMS, 2006 – Special Status Species in Arizona Listed by County, by Taxon, by Scientific Name and USFWS, 2006-www.fws.gov/arizonaes/Documents/CountyLists/Yuma)

According to the Arizona Game and Fish Department's (AGFD) Heritage Data Management System (HDMS), eight special status species have been documented as occurring in the project vicinity (3-mile buffer) (Table 3-4). No critical habitats are located within the "area of concern." (AGFD, 2005)

Table 3-4: Special Status Species within 3 Miles of T10S, R24W, Section 7,8,16-22 and 26-25; T10S

COMMON NAME/ SCIENTIFIC NAME	ESA	USFS	BLM	STATE
Western Burrowing Owl/ *Athene cunicularia hypugaea*	SC		S	
Western Yellow-billed Cuckoo/ *Coccyzus americanus occidentails*	C	S		WSC
Snowy Egret/ *Egretta Thula*				WSC
Southwestern Willow Flycatcher/ *Empidonax trailii extimus*	LE	S		WSC
Sand Food/ *Pholisma sonorae*	SC		S	HS
Flat-tailed Horned Lizard/ *Phrynosoma mcallii*	SC			WSC
Yuma Clapper Rail/ *Rallus longirostris yumanensis*	LE			WSC
Yuma Hispid Cotton Rat/ *Signodon hispidus eremicus*	SC			

S = Species of Concern SC = Species of Concern HS = Highly Safeguard

WSC = Wildlife of Special Concern in Arizona LE = Listed Endangered

(Source: AGFD, 2005)

3.6 Socioeconomic Conditions

Population growth has been very steady in Yuma County over the last four years. Information on population, growth rates and median household income from the Arizona Department of Commerce and U.S. Census Bureau websites is provided in Table 3-5 below.

Table 3-5 Socioeconomic Indicators

City	Population[1]		Growth Rate	Unemployment Rate[2]	Median Household Income[2]
	2000	2004			
San Luis, AZ	15,322	21,180	8.43%	64.5%	$22,966
Yuma, AZ	77,515	86,070	3.39%	15.8%	$35,374
Yuma County	160,026	181,470	3.42%	22.9%	$32,182

[1] Arizona Dept. of Commerce website
[2] US Census Bureau website

The population growth rate in San Luis, Arizona is higher than the remainder of Yuma County and the projected growth rate projected over the same time period by CONAPO for San Luis RC of 3.41%. With regard to unemployment, San Luis, Arizona has a very high unemployment rate at approximately 64 percent compared to 16 percent for Yuma and almost 23 percent for Yuma County. The 2000 Median Household Income (MHI) in San Luis was $22,966, 65 percent of the Yuma MHI ($35,374), and 71 percent of the Yuma

County MHI ($32,182). The unemployment rates and median household income have both improved in San Luis, Arizona relative to the values reported in the GeoMarine EA.

Socioeconomic indicators suggest that the socio-economy in the "area of concern", as represented by San Luis, Arizona, is more closely related to San Luis R.C., Sonora, than to Yuma, Yuma County, or Arizona. (GeoMarine 2000)

3.6.1 Archeological, Cultural and Historical Resources

3.6.2 File Review

Zia conducted a file review of the "area of concern" at the Arizona State Museum on December 20, 2005 and the Yuma Bureau of Land Management Field Office (BLM) on December 19, 2005. According to the file search, Zia documented fourteen (14) previously recorded archaeological sites within the "area of concern". Of the fourteen previously recorded sites, twelve are considered eligible to the NRHP by the recording agencies. None of the previously recorded sites located within the "area of concern" are currently listed on the NRHP. According to files at the Yuma BLM Field Office none of the sites are located within BLM lands. A brief summary of each previously recorded archaeological site is included below. (BLM, 2005; ASM, 2005)

Table 3-4: Previously Recorded Archaeological Sites Near San Luis, Arizona Within the "Area of Concern"

Site No.	Site Type	Eligibility Status	Date Recorded
X:5:14	Check and culvert features	Eligible	04/1992
X:5:18	Historic residential structure	Not Eligible	11/28/1994
X:5:19	Historic commercial and residential structures	Not Eligible	11/28/1994
X:5:20	Historic commercial structures	Potentially Eligible	11/29/1994
X:5:21	Historic commercial structures	Eligible	11/28/1994
X:5:22	Historic sidewalk	Eligible	11/29/1994
X:5:23	Historic residential structure	Eligible	11/29/1994
X:5:24	Historic landfill	Eligible	09/30/1998
X:6:15	Historic levee	Eligible	04/1992
X:6:39	Historic canal	Eligible	04/1992
X:6:43	Historic railroad	Eligible	04/1992
X:6:63	Historic canal	Eligible	04/1992
X:6:65	Historic canal	Eligible	04/1992
X:9:6	Historic pumping plant	Eligible	04/1992

3.6.2.1 AZ X:5:14

On April 1, 1992, Bureau of Reclamation (BOR), conducted an archaeological survey of the various historic sites around Yuma and recorded AZ X:5:14. AZ X:5:14 is a historic check and culvert structure. The site is in good condition. This site is considered to be eligible to the National Register of Historic Places (NHRP) by the recording agency. (BOR, 1992)

3.6.2.2 AZ X:5:18

On November 28, 1994, Archaeological Research Services, Inc., conducted a cultural resource survey of a twenty (20) mile long segment of U.S. Highway 65, between San Luis and Yuma (milepost 0.0 - 20.0) in Southwestern Yuma County, Arizona and recorded AZ X:5:18. AZ X:5:18 is a historic single story residential structure and associated features located within a fenced property. This structure appeared to be circa 1930s. The structure and associated features are not considered eligible to the NHRP by the recording agency. (ARS, 1994)

3.6.2.3 AZ X:5:19

On November 28, 1994, Archaeological Research Services, Inc., conducted a cultural resource survey of a twenty (20) mile long segment of U.S. Highway 65, between San Luis and Yuma (milepost 0.0 - 20.0) in Southwestern Yuma County, Arizona and recorded AZ X:5:19. X:5:19 is the remains of the Gadsden Market and attached residence. The site is in fair to poor condition. The site is not considered eligible to the NHRP by the recording agency. (ARS, 1994)

3.6.2.4 AZ X:5:20

On November 29, 1994, Archaeological Research Services, Inc., conducted a cultural resource survey of a twenty (20) mile long segment of U.S. Highway 65, between San Luis and Yuma (milepost 0.0-20.0) in Southwestern Yuma County, Arizona and recorded AZ X:5:20. AZ X:5:20 is three historic standing structures and a concrete surface. The site represent a 1950s - 1960s Phillips 76 [sic] Service Station. The site is considered by the recording agency to be potentially eligible for inclusion to the NRHP based upon its potential for subsurface cultural deposits (Criterion D). (ARS, 1994)

3.6.2.5 AZ X:5:21

On November 28, 1994, Archaeological Research Services, Inc., conducted a cultural resource survey of a twenty (20) mile long segment of U.S. Highway 65, between San Luis and Yuma (milepost 0.0 - 20.0) in Southwestern Yuma County, Arizona and recorded AZ X:5:21. AZ X:5:21 is a historic poured concrete foundation/pad and the footings for two interconnected brick. The two buildings once housed the Gadsden Bank and Drug Store. The site is considered to be in fair to good condition and is considered eligible to the NRHP by the recording agency. (ARS, 1994)

3.6.2.6 AZ X:5:22

On November 29, 1994, Archaeological Research Services, Inc., conducted a cultural resource survey of a twenty (20) mile long segment of U.S. Highway 65, between San Luis and Yuma (milepost 0.0 - 20.0) in Southwestern Yuma County, Arizona and recorded AZ X:5:22. AZ X:5:22 is a 390-foot historic poured concrete walkway is considered to be in good to excellent condition. The site is considered by the recording agency to be eligible to the NRHP. (ARS, 1994)

3.6.2.7 AZ X:5:23

On November 29, 1994, Archaeological Research Services, Inc., conducted a cultural resource survey of a twenty (20) mile long segment of U.S. Highway 65, between San Luis and Yuma (milepost 0.0-20.0) in Southwestern Yuma County, Arizona and recorded AZ X:5:23. AZ X:5:23 is a historic residential structure exhibiting several post-construction room additions located within a fenced property. The property is considered to be potentially eligible for inclusion to the NRHP by the recording agency. (ARS, 1994)

3.6.2.8 AZ X:5:24

On September 30, 1998, Archaeological Consulting Services, Ltd., conducted a archaeological survey of a proposed road right-of-way of the Gadsden School District, in San Luis, Yuma County, Arizona and recorded AZ X:5:24. AZ X:5:24 is a large historic landfill located west of the survey area extended into the eastern edge of the survey area. The site is considered potentially eligible for inclusion to the NRHP by the recording agency. (ACS, 1998)

3.6.2.9 AZ X:6:15

In April of 1992, the BOR conducted an archaeological survey of historic sites around Yuma and recorded AZ X:6:15. AZ X:6:15 is a historic levee named the “Valley Levee” and is in good condition. This site is considered to be eligible to the NHRP by the recording agency. On July 12, 2004 the Arizona State Museum assigned the AZ X:6:15 site number to include all segments of the Valley Levee. (BOR, 1992)

3.6.2.10 AZ X:6:39

In April of 1992, the BOR conducted an archaeological survey of historic sites around Yuma and recorded AZ X:6:39. AZ X:6:39 is a historic canal named The “Main Drain” and is in good condition. This site is considered to be eligible to the NHRP by the recording agency. On July 1, 2004 the Arizona State Museum assigned the AZ X:6:39 site number to include all segments of the Main Drain. (BOR, 1992)

3.6.2.11 AZ X:6:43

In April of 1992, the BOR conducted an archaeological survey of historic sites around Yuma and recorded AZ X:6:43. AZ X:6:43 is a historic railroad named the “Yuma Valley Railroad” and is in good condition. This site is considered to be eligible to the NHRP by the recording agency. On July 12, 2004 the Arizona State Museum assigned the AZ X:6:43 site number to include all segments of the historic railroad. (BOR, 1992)

3.6.2.12 AZ X:6:63

In April of 1992, the BOR conducted an archaeological survey of historic sites around Yuma and recorded AZ X:6:63. AZ X:6:63 is a historic canal named the “West Main Canal” and is in good condition. This site is considered to be eligible to the NHRP by the recording agency. On July 12, 2004 the Arizona State Museum assigned the AZ X:6:63 site number to include all segments of the West Main Canal. (BOR, 1992)

3.6.2.13 AZ X:6:65

In April of 1992, the BOR conducted an archaeological survey of historic sites around Yuma and recorded AZ X:6:65. AZ X:6:65 is a historic canal named the “East Main Canal” and is in good condition. This site is considered to be eligible to the NHRP by the recording agency. On July 12, 2004 the Arizona State Museum assigned the AZ X:6:65 site number to include all segments of the East Main Canal. (BOR, 1992)

3.6.2.14 AZ X:9:6

In April of 1992, the BOR conducted an archaeological survey of historic sites around Yuma and recorded AZ X:9:6. AZ X:9:6 is a irrigation feature named the “Boundary Pumping Plant” and is in good condition. This site is considered to be eligible to the NHRP by the recording agency. (BOR, 1992)

3.6.3 Cultural History

The earliest cultural tradition in the “area of concern” is the Malpais Phase of the San Dieguito Complex. The San Dieguito stone technology is essentially analogous to that of the preceding Malpais Phase. The dietary importance of plant foods during these early phases is unclear. Ground stone artifacts - the basic indicators of plant processing - have not been dated to the Malpais or San Dieguito phases. To date, only the most basic facets of these early desert cultures are understood and the economy was probably a mixture of hunting and gathering, though hunting probably played a more significant role compared to later periods. (Rogers 1939, 1966)

The early Malpais and San Dieguito traditions disappear by 7,000 BC when they are replaced by Archaic traditions that incorporated stone grinding implements such as metates, manos, mortars, and pestles. Archaic occupations of Arizona's western deserts were originally designated as the Amaragosa Tradition. (Rogers, 1939). It was later divided into three distinct phases; Amaragosa I, II, and III. (Hayden, 1976)

- Amaragosa I (7500 – 5000 BC): Stone tool kits are distinguish by crudely made, basally notched, stemmed projectile points. Rarer finds during this period include grinding implements made of thin, flat schist slabs. (Hayden, 1976)
- Amaragosa II (5000 – 2000 BC): Metates, manos and pinto-and gypsum style projectile points were produced. (Hayden, 1976)
- Amaragosa III (2000 BC – AD 1): This phase is characterized by the elaboration of projectile-point styles, diversification of bifacially flaked tools, and the possible production of plain brown ware ceramics. (Hayden, 1976)

The ceramic period culture of the Lower Colorado River is also poorly understood. Rogers defined the phases of the ceramic period as: Yuman I, II, and III. (Rogers, 1939, 1966)

- Yuman I (700-1000 AD): Earliest accepted ceramic stage. People traveled and traded extensively during the Yuman I stage, this is represented by the Californian shell and steatite artifacts recovered from sites along the Lower Gila River. (Rogers 1939, 1966)
- Yuman II (1000 – 1500 AD): Ceramic exchanged or production expanded up the Gila River into the Californian deserts. (Rogers 1939, 1966)
- Yuman III (1500 AD to Historic Period): Witnessed refinement in vessel shape and quality and the zenith of ceramic exchange. (Rogers 1939, 1966)

The native peoples who occupied the lower Colorado River during the Historic Period were Yuman speakers – a subgroup of the Hokan language family (Kroeber 1943). Yuman speakers historically occupied western Arizona, southern California, and northwest Mexico. Linguistically the Yuman-speaking peoples are classified as belonging to one of the four geographic groups:

- Colorado River-delta Yumasn (Cocopa, Kohuana, and Halyikwamai),
- River Yumans along the Colorado and Gila Rivers (Yuma or Quechan, Mohave, Halchidhoma, and Maricopa,
- Upland Yumans in western Arizona (Yavapai, Walapai, and Havasupai), and
- Western Yumans of the Californa deserts (Diegueno, Kamia, Kailiwa, and Papi). (Kroeber, 1943)

Zia contacted the Arizona Historic Preservation Office requesting information or comments on the “area of concern.” At the time of issuance of this report a response had not been received. No further evidence is available to suggest any changes to the findings in the GeoMarine EA.

3.7 Environmentally Sensitive Areas

Four biotic provinces occur in Arizona: 1) Navahonian, 2) Mohavian, 3) Sonoran, and 4) Apachian (Dice 1943). The “area of concern” lies within the Sonoran biotic province characterized by extensive plains with isolated small mountains and buttes. (Dice, 1943)

3.7.1 Public Health

San Luis, Arizona is located on the United States side of the U.S.-Mexican border immediately adjacent to San Luis, Rio Colorado, Sonora. The City of San Luis, Arizona provides water and wastewater service to residents within this “area of concern”. As such, these utilities are required to meet all USEPA Clean Water Act (CWA) and Safe Drinking Water Act (SDWA) requirements The following section exerted from Section 3.8 of the GeoMarine EA 2000 describes the potential public health affects of discharge of untreated wastewater in San Luis, R.C. upon the populace in San Luis, Arizona and also residents within the remainder of the area of concern:

> In the "area of concern" the highest known potential health concerns is that all of the wastewater generated in neighboring San Luis R.C. is not treated. Most of the untreated wastewater flows into the Colorado River via open partially unlined canals, is diluted and used for irrigation, or is drained into open cesspools. Although prevailing winds, and ground and surface water direction carry odors and contaminants away from the “area of concern”, untreated wastewater has the potential to support a variety of microscopic and submicroscopic organisms and parasites that cause infectious and communicable diseases, many of which are potentially fatal. Among the most common organisms or parasites found in untreated wastewater are E. coli (Escherichia coli), cholera (Vibrio cholerae), hepatitis A (Enterovirus ssp), Giardia (Giardia lamblia), Cryptosporidium (Cryptosporidium parvum), and helmint eggs. People can become ill by drinking water contaminated with these organisms or parasites, by eating raw or undercooked foods that have been in contact with contaminated water, and by poor personal sanitation that allows the spread of diseases either directly or indirectly through interhuman contact. As recently as 1998 water quality tests in San Luis R.C. indicated groundwater was contaminated with fecal coliforms (CNA 1998). The groundwater contamination was deemed a risk to public health.

> Helmintiasis, an intestinal disease caused by helminth eggs, is the most common disease worldwide. In rural areas of Mexico, where untreated wastewater is used for irrigation, a study has shown that 43 to 94 percent of the population has intestinal helmintiasis (Cisneros et al. 1996). Although the Cisneros study was conducted in rural areas near Mexico City, the same potential exists in San Luis R.C. where crops are irrigated with diluted untreated wastewater. Wastewater provides organic matter and nutrients to the soil, increasing crop yields. However, the risk to public health is increased due to the potential of transmitting parasites and protozoa such as helminth eggs and fecal coliforms to agricultural workers as well as consumers.
>
> The close association between the populace of the “area of concern” (as represented by San Luis, Arizona) and San Luis R.C. is indicative that communicable infectious diseases originating in untreated wastewater and contaminated groundwater in San Luis R.C. would affect the residents of San Luis, Arizona. Approximately 7 percent of the working population of San Luis R.C. crosses the border regularly to work in the “area of concern” (Torres 1999). Up to 2,000 people farm laborers cross the border daily. Figures from the United States Customs Service indicate that pedestrian traffic crossing into the “area of concern” from San Luis R.C. increase from 978,920 in 1986 to 2,824,681 in fiscal 1999. During the same period passenger vehicle crossings increased from 1,491,627 to 2,801,240. A diagnosis frequency analysis from Sunset Community Health Center indicated that no specific diseases in patients from September, 1998 through August, 1999 in the “area of concern” were attributed to waterborne causation (Sunset Community Health Center 1999). However, the potential risk to human health in the “area of concern” is exhibited by data that indicates residents of San Luis R.C., between 1990 and 1994, were almost three times as likely to die from communicable diseases as residents of Yuma (Pan Amercian Health Organization l999). Yuma, only 24 miles from the border, has demographics that are markedly different than those evident by the cross-border relationships between San Luis R.C. and the “area of concern”. (GeoMarine, 2000)

At the time of Zia’s site visit to San Luis, RC in November 2005 none of the four proposed wastewater treatment modules was on-line, untreated wastewater continued to be discharged and therefore the same public health issues mentioned in the GeoMarine EA in 2000 remain.

Zia contacted the Arizona Department of Environmental Quality requesting information or comments on the “area of concern.” At the time of issuance of this report a response had not been received. No further evidence is available to suggest any changes to the findings in the GeoMarine EA.

3.7.2 Wetlands/ Floodplain

The Colorado River lies immediately adjacent to the western edge of the “area of concern” and its waters are heavily utilized for agricultural irrigation.

Letters were sent to the FEMA Region IX requesting information regarding Wetlands/ Floodplains in the “area of concern”. At the issuance of this report a response has not been received.

Zia also attempted to contact the US Army Corps of Engineers requesting information or comments on the “area of concern.” At the issuance of this report a response has not been received.

3.7.3 Farmland

The proposed project site is located approximately 6 miles south of the “area of concern”. BLM controls a significant amount of the agricultural and undeveloped land in the vicinity of the “area of concern” and agriculture is one of the major economic drivers in the area, however there are no unique farmlands within the “area of concern” (GeoMarine 2000).

A letter was sent to the National Resource Conservation Services (NRCS) on January 9, 2006 requesting information regarding farmland. NRCS responded via telephone on January 18, 2006 indicating that the NRCS does not have comments at this time, however they would like a copy of the final EA.

3.7.4 Wild and Scenic Rivers

This project would not involve wild and scenic rivers or adversely impact wild and scenic rivers. Zia reviewed the, 7.5-minute series quadrangle published by the United States Geological Survey (USGS) which includes the subject site and the National Parks Services Wild and Scenic Rivers website at www.nps.gov/rivers/wildriverslist.html. The topographic map and websites did not indicate Wild and Scenic Rivers on or near the subject site. (NPS, 2005)

3.7.5 Floodplain Management

The Colorado River lies immediately adjacent to the western edge of the “area of concern” and its waters are heavily utilized for agricultural irrigation (GeoMarine 2000).

Letters were sent to the FEMA Region IX requesting information regarding flood determinations. The letter included various maps. At the issuance of this report a response has not been received.

3.7.6 Coastal Zone

This project would not involve coastal resources or adversely impact coastal resources.

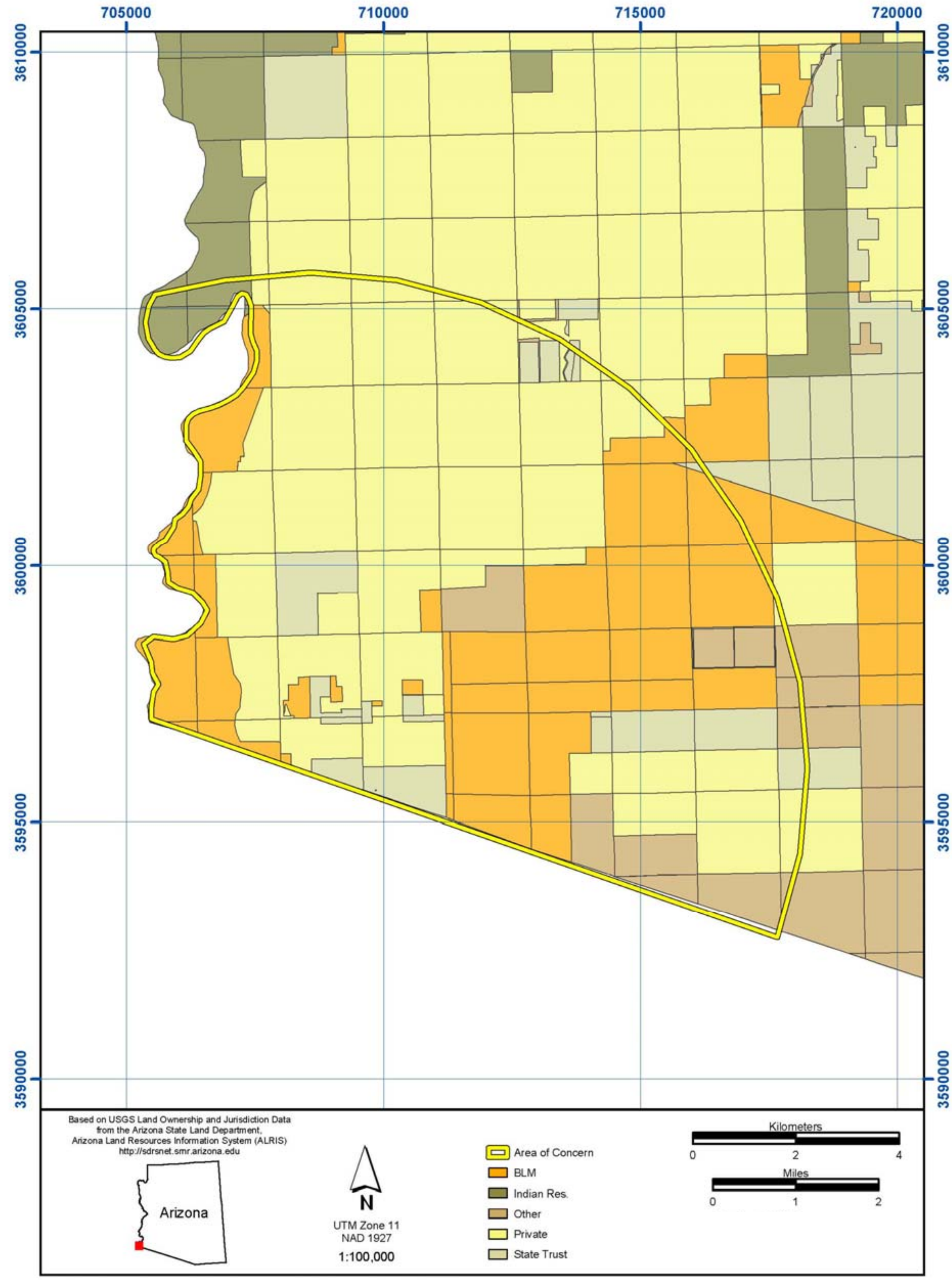
3.7.7 National Landmarks, Parks, Forests, Refuges

There are no national landmarks, parks, forest or refuges are located in the “area of concern”. The proposed project would not obstruct national landmarks, parks, forest or refuges. Zia reviewed the 7.5-minute series quadrangle published by the USGS which includes the subject site and the National Landmarks and Wilderness Areas website at www.wilderness.net/index.cfm?fuse=NWPS. The topographic map and websites did not indicate National Landmarks, Parks, Forest or Refuges on or near the subject site. (NLWA, 2005)

3.7.8 Land Use

The Yuma Valley of the Colorado River is a major agricultural area. The Bureau of Land Management (BLM) controls a significant amount of the agricultural and undeveloped land in the vicinity of the “area of concern” (Figure 5). Industrially zoned property is primarily located along the border with Mexico in an industrial park managed by the City of San Luis, Arizona in the “area of concern”. The local non-profit development agency El Comité de Bienestar has purchased a 160-acre tract of state owned land to develop into residential subdivisions. Opportunities for municipal expansion to the west of San Luis are minimal due to the proximity of the Mexican border, and the lack of land, other than that held by the BLM.

Figure 6: Land Ownership Map



The majority of long-term development is expected to be northwest, northeast, and north of San Luis. The property to the northwest is privately owned agricultural land in the Yuma Valley. Directly north of San Luis the land consists of both state owned and privately owned agricultural land (City of San Luis Master Wastewater Master Plan 1997). A detailed account of the land ownership and land use is included in section 3.1 of the 2000 Geo-Marine EA.

3.7.9 Alteration of Existing Residential Areas

The proposed WWTP is located approximately 6 miles south of the “area of concern” therefore there will be no alteration of existing residential areas.

4.0 ENVIRONMENTAL CONSEQUENCES/ ANALYSIS OF ALTERNATIVES

4.1 No Action Alternative
The environmental consequences of implementation of the No Action Alternative were adequately considered in the original EA and will not reconsidered in this report.
4.2 Alternative 1 (Preferred Alternative) & Alternative 2
The environmental consequences of the two ‘Action Alternatives’, I (the preferred Alternative) and II, will be considered together because all changes since the issuance of the Geomarine EA are reflected equally in both Action Alternatives.

4.2.1 Air Quality

Minor impacts on air quality are anticipated during the construction phase of the project due to dust generated from earthwork associated with construction. The level of impact could be minimized due to the implementation of best management dust control measures. These controls may include best management practices such as watering soils piles and/or soil erosion and sediment controls.

Based on the distance from the facility location (approximately 6 miles [11 km]), minimal controls, and the prevailing wind direction (SSE), no significant impact will occur to the ambient air quality adjacent to or near the resources within the “area of concern”.

Increased noise levels will be temporary during construction and will be limited to those areas in the immediate proximity of construction. Based on the distance from the facility location (approximately 6 miles [11 km]), no significant impact from noise will affect the “area of concern” (GeoMarine 2000).

4.2.2 Water Resources

Effluent from the WWTP would be disposed of by infiltration and irrigation of trees. This action will not impact surface waters in the “area of concern” because drainage would return to groundwater in Mexico. As a result, surface water in the “area of concern” would not be affected by implementation of Alternative 1. In addition, any effluent that permeates through the soil into the groundwater would not impact the “area of concern” because the groundwater flows southwest away from United States toward the Gulf of California. (Campoy 1999, Flores 1999)

Implementation of the action alternatives therefore is not expected to result in direct or indirect impacts to water resources in the “area of concern”. Based on the findings in the Hydrogeological Study sponsored by OOMAPAS regarding the feasibility of use of infiltration basins as the method of effluent disposal, no negative impacts are anticipated as a result of the action alternatives. In addition, monitoring wells are planned to be placed around the infiltration basins to monitor for signs of groundwater contamination, even though the results of the study indicated that no contamination of the groundwater was found in the vicinity of the pilot infiltration basin. Construction of additional WWTP capacity will have the positive impact of continuing to provide an alternative to discharge of untreated sewage flows to the Colorado River as flows increase. This would improve overall water quality downstream from San Luis R.C.

These improvements to ground and surface water quality will preserve these resources for the inhabitants of San Luis RC and reduce the potential need to tap into aquifers that are connected to groundwater supplies in the “area of concern”.

4.2.3 Vegetation and Wildlife

Vegetation and wildlife communities in the “area of concern” would not be directly affected by the action alternatives because the construction and operation activities would occur only in Mexico; therefore, implementation of the action alternatives is not expected to result in direct or indirect impacts to vegetation or wildlife in the “area of concern”.

4.2.4 Threatened, Endangered and Sensitive Species

No threatened, endangered or sensitive species listed by Arizona Department of Game and Fish or U.S. Fish & Wildlife Service as in the “area of concern” would be directly affected because the activities would occur only in Mexico not in the area of concern; therefore implementation of the action alternatives is not expected to result in direct or indirect impacts to biological and botanical resources in the “area of concern”.

4.1 Socioeconomic Conditions

Socioeconomic conditions in the “area of concern” could be positively impacted indirectly through increase in temporary jobs in San Luis RC during the construction phase and permanent jobs for operations and maintenance of the WWTP. Therefore implementation of the proposed alternative is expected to result in minor indirect short-tern and long term positive impacts to the “area of concern”.

4.2 Archeological, Cultural and Historic

The action alternatives will have no adverse effect on any of the previously recorded sites located within the “area of concern”. The proposed project is located six miles (11 km) to the south of the U.S. – Mexico border and vibratory effects will be negligible. Site setting is not considered to be a contributing element to NRHP status among the twelve previously recorded sites. Visual impacts from the proposed project will have no adverse effect to the overall eligibility of any of the previously recorded sites

4.3 Environmentally Sensitive Areas

Environmentally Sensitive Areas within the “area of concern” include wetlands/floodplains, farmland, wild and scenic rivers, floodplain management, coastal zones, national landmarks, park, forests and refuges, land use and residential areas. Except for residential areas, these resources, would not be directly affected; therefore, implementation of the action alternatives is not expected to result in direct or indirect negative or positive impacts on the “area of concern”.

4.3.1 Public Health

Public health within San Luis RC will be positively impacted by the proposed wastewater collection and treatment project. As exposure to raw wastewater is reduced in San Luis RC, those crossing the border to work, shop, or engage in other activities will be less likely to be a conduit for diseases spread by this method.

4.3.2 Residential Areas

The “area of concern” would not be directly impacted by the action alternatives since construction activities would occur only in San Luis Rio Colorado, Sonora, Mexico. However, the general population growth in the area of San Luis, AZ and San Luis R.C. are driving changes in land use toward residential development on both sides of the border, independent of the proposed project .

4.4 Traffic

The proposed project location is approximately six miles (11 km) to the south of the "area of concern". Based on the distance from the facility location to the "area of concern" no significant traffic disruption is anticipated during construction.

4.5 Erosion and Sedimentation

The San Luis R.C. WWTP is located approximately six miles south of the "area of concern", therefore the "area of concern" would not be affected by erosion and sedimentation from the proposed alternative.

4.6 Visual Resources

The San Luis Rio Colorado WWTP is located approximately 6 miles south of the "area of concern", therefore visual resources would not be affected by the proposed alternative.

4.7 Utilities and Services

Water, wastewater, electric, natural gas and solid waste service are provided to San Luis, R. C. by OOMAPAS or by other local and federal Mexican agencies or firms. Thus the wastewater treatment improvements proposed under the action alternatives will not impact utility service within the "area of concern" in the United States. The project will have a definite positive impact on the wastewater utility services in San Luis RC by providing wastewater collection and treatment to existing residences currently without service.

4.8 Cumulative Impacts

There are no cumulative impacts to the "area of concern" resulting from the implementation of the proposed alternative.

4.9 Compliance with Regulatory Requirements

All works associated with the expansion of the wastewater collection and treatment system proposed under the action alternatives are located in Mexico, approximately 6 miles (11 km) from the "area of concern." Therefore, there are no anticipated permits and/or regulatory coordination required within the U.S. for construction of the project.

4.11 Conclusion

There is not anticipated to be any negative direct or indirect impacts of significance from implementation of the preferred alternative. Numerous positive cumulative impacts are anticipated as a result of implementation of the Action Alternatives. The positive impacts within San Luis RC are anticipated to include reduction in ground and surface water contamination from raw wastewater discharge, improvement of public health through collection and treatment of wastewater and recharge of the aquifer with treated effluent for potential reuse. During construction, the project will temporarily improve socioeconomic conditions by providing construction jobs. The wastewater treatment plant will require operators and maintenance personnel, which will also create jobs.

Although the majority of the positive impacts occur within Mexico and thus are outside of the "area of concern" across the border in Arizona, these positive impacts will have secondary positive impacts, particularly in the case of public health. The Action Alternatives also represent an improvement in the quality of life in San Luis RC and thus may serve to improve socioeconomic conditions on both sides of the border.

5.0 MITIGATION MEASURES

No mitigation measures are recommended to be implemented during the design and construction of this project.

6.0 COORDINATION AND DOCUMENTATION

6.1 Agencies Consulted

The following agencies were consulted. Comments and responses- adverse or otherwise- are included in Appendix B.

- FEMA Region IX
- Arizona State Historic Preservation Office
- US Bureau of Indian Affairs
- US Bureau of Land Management
- City of San Luis
- US EPA Region 9
- Arizona Department of Environmental Quality
- International Boundary and Water Commission
- National Resource Conservation Service
- US Army Corp of Engineers
- US Fish and Wildlife
- Arizona Department of Game and Fish

6.2 Responsiveness Summary

Responses obtained from both the agency coordination process are summarized and included in Appendix B.

Table 6-1: Responsiveness Summary Correspondence Log

AGENCY	ADDRESSED	SENT	RESPONSE DATE	COMMENTS
FEMA Region IX	1111Broadway Suite 1200 Oakland, CA 94607	1/9/2006 4/24/2006	NR* Pending	
Arizona State Historic Preservation	1300 W. Washington Phoenix, AZ 85007	1/9/2006 4/24/2006	NR Pending	
US Bureau of Indian Affairs	P.O. Box 11000 Yuma, AZ 85366	1/9/2006	3/2/2006	Letter: Ms. Amy Hauslein indicated that the BIA is interested in the project and would like to review and provide comments on the Draft Supplemental EA. Please provide a copy of the report via regular mail for review.
US Bureau of Land Management	2555 E. Gila Ridge Road Yuma, AZ 85365	1/9/2006	1/25/06	Phone Call: At the present they have no comments however they will hold their monthly staff meeting and she will discuss this with others in the office.
City of San Luis	P.O. Box 1170 San Luis, AZ 5349	1/9/2006 4/24/2006	NR Pending	
US EPA Region 9	75 Hawthorne Street San Francisco, CA 94105	1/9/2006	1/23/2006	Attached comments/ corrections for the Supplemental EA.
Arizona Department of Environmental Quality	1110 W. Washington Street Phoenix, AZ 85007	1/9/2006 4/24/2006	NR Pending	
International Boundaries and Water Commission	P.O. Box 537 Yuma, AZ 85366	1/9/2006 4/24/2006	NR Pending	
National Resource Conservation Service	230 N. First Avenue, Suite 509 Phoenix, AZ 85003	1/9/2006	1/18/2006	Phone Call: At this time the NRCS does not have a comment however they would like a copy of the Final EA.
US Army Corps of Engineers	911 Wilshire Boulevard Las Angeles, CA 90017	1/9/2006 4/24/2006	NR Pending	
US Fish and Wildlife Service	500 Gold Avenue, SW Albuquerque, NM 87012	1/9/2006 4/24/2006	NR Pending	
Arizona Department of Game and Fish	2221 W. Greenway Road Phoenix, AZ 85023	11/25/2005	11/30/2005	Letter: Special Status Information and Database information was included.

*NR = No response to date

6.3 Preparers

The following table lists preparers of this EID.

Name	Affiliation	Title	Responsibilities
Mr. Edward Martinez	Zia	President/ Principal Engineer	Senior Reviewer
Mr. A.K. Khera	Zia	Vice-President	Quality Control/ Quality Assurance
Dr. Fenton Kay	Zia	Senor Scientist	Project Manager and Prepared Biological Resources Review
Mr. William McKinney	Zia	Associate Scientist	Prepared Supplemental EA Report
Mr. Miguel Martinez	Zia	Senor Engineer	Prepared Water Resources Review and Document Translation
Ms. Stephanie Johnson	Zia	Staff Engineer	Prepared Water Resources Review
Mr. David Reynolds	Zia	Staff Scientist	Conducted Cultural Resources File Review
Ms. Megan Quenzer	Zia	Staff Scientist	GIS Mapping Figures Coordination
Ms. Victoria Trujillo	Zia	Staff Scientist	Prepared Supplemental EA Report and Cultural Resources Review
Mr. David Winnett	Zia	Staff Scientist	Prepared Biological Resources Review

7.0 REFERENCES

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