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2001 JUL 27 P 1:32
AZ CORP COMMISSION
DOCUMENT CONTROL

July 26, 2001

DOCKET NO. L-00000BB01-0118

Nancy Cole, Supervisor
Docket Control
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

RE: Bowie Power Station, LLC
Application for Certificates of Environmental Compatibility

Dear Ms. Cole:

Enclosed are the original and 25 copies of the Application of Bowie Power Station, LLC for Certificates of Environmental Compatibility for (i) a nominal 1,000 MW electric generation station, with supplemental or "duct-firing" capability, and (ii) a double-circuit 345kV transmission line and interconnection. Also enclosed is a check in the amount of $10,000 in payment of the applicable filing fee.

Please arrange for transmittal of the Application to the Chair and other members of the Arizona Power Plant and Transmission Line Siting Committee.

Thank you for your assistance.

Sincerely,

Lawrence V. Robertson, Jr.

Lawrence V. Robertson, Jr.

Enclosures

cc: Bowie Power Station, LLC

NEW APPLICATION

RECEIVED

2001 JUL 27 P 1:52

AZ CORP COMMISSION
DOCUMENT CONTROL

Application for Certificates of Environmental Compatibility

Bowie Power Station Project

Prepared for:

State of Arizona Power Plant and Transmission Line Siting Committee

Submitted by:

Bowie Power Station, LLC

Date:
Case No.:

DOCKET NO. L-00000BB-01-0118

BEFORE THE
POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

In the matter of the Application of Bowie Power Station, LLC, in conformance with the requirements of Arizona Revised Statutes 40-360.03 and 40-360.06, for two Certificates of Environmental Compatibility authorizing construction of a 1,000 megawatt natural gas-fired, combined-cycle power plant, 345kV and 345kV/230kV switchyards, 345kV double-circuit transmission line and 230kV interconnection and related facilities in Cochise and Graham counties, Arizona. The proposed power station site is located in Sections 28 and 29, Township 12 South, Range 28 East, and the proposed transmission line route is located in Township 12 South, Range 28 East, Township 11 South, Range 28 East, Township 11 South, Range 27 East, and Township 11 South, Range 26 East, Gila and Salt River Base and Meridian.	Case No. L00000BB-01-0118

APPLICATION FOR CERTIFICATES OF ENVIRONMENTAL COMPATIBILITY

TABLE OF CONTENTS

Table of Contents (continued)

INTRODUCTION

INTRODUCTION

By means of this Application, Bowie Power Station, LLC and its assigns (Applicant) are requesting two separate Certificates of Environmental Compatibility (CEC) from the Arizona Power Plant and Transmission Line Siting Committee. The first CEC is for a nominal 1,000 megawatt (MW) combined-cycle power plant and 345 kilovolt (kV) switchyard, which will use high efficiency natural gas-fired combustion turbines. The second CEC is for a double-circuit 345kV transmission line and 345/230kV switchyard. The power plant and the transmission line/switchyard will have separate owners, with separate rights and obligations, and thus two CECs are appropriate.

The Applicant is an affiliate of Southwestern Power Group II, LLC, an independent power company engaged principally in the development of electrical power generation facilities in the western United States. Its staff has extensive experience in power plant and transmission line development and construction, facility siting, fuel procurement, and environmental engineering.

The proposed Bowie Power Station will be located in Cochise County, Arizona, approximately 2 miles north of the unincorporated community of Bowie and 80 miles east of Tucson (Figure 1). The Applicant proposes to own, construct and operate the power plant, which will be constructed in two 500 MW phases. The proposed transmission line will extend from the power plant site approximately 14.3 miles in a northwesterly direction into Graham County, Arizona, to interconnect with Tucson Electric Power Company's (TEP) existing Greenlee-Vail and Springerville-Vail 345kV transmission lines at a point located near U.S. Highway 191. In the final stage of development, a 345kV/230kV switchyard (Willow Switchyard) and a 230kV transmission interconnection with the existing Arizona Electric Power Cooperative (AEPCO) Red Tail-Dos Candados 230kV line will be installed at that location. The transmission lines and Willow Switchyard will be owned and operated by an Arizona transmission provider yet to be determined.

The proposed power plant will utilize state-of-the-art technology to attain the lowest achievable emissions and noise levels, and to generate efficient, low cost electrical power to meet Arizona needs. The power plant will also be designed as a zero-discharge facility. Final power plant and transmission line designs will be completed in conjunction with environmental studies, including air quality and water resource considerations.

The proposed power plant site was selected based upon the following considerations:

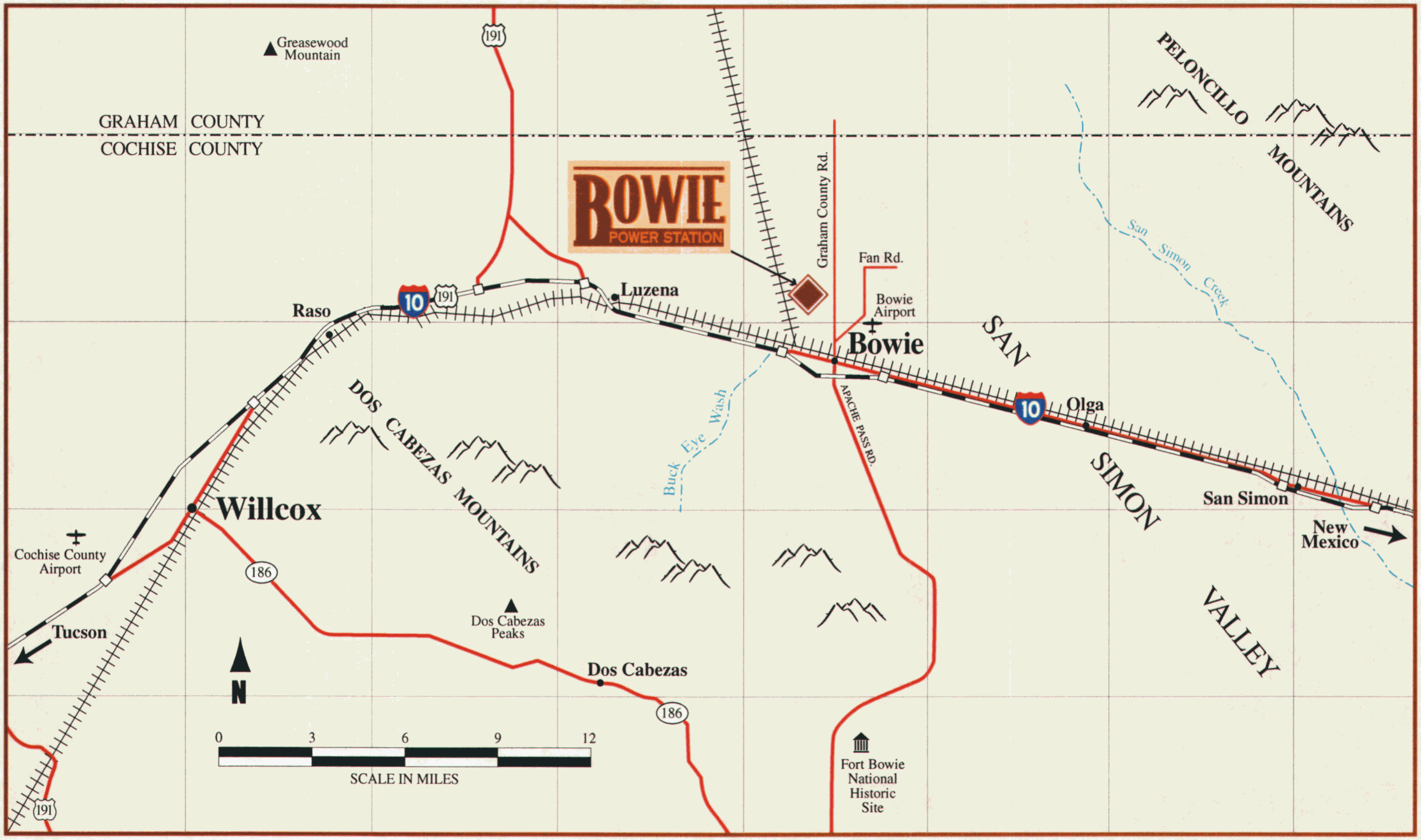
- Existing high-voltage electric transmission lines are located nearby within accessible corridors. The proposed interconnecting transmission lines and switchyard can be sited and constructed with low levels of environmental impact, and will support local and regional electrical system integrity.

- Adequate water supplies are available through on-site wells.

- An adequate natural gas supply will be available nearby.

- The proposed site is located adjacent to an existing railway line.
- The surrounding area has a low population density. The closest off-site residences are located approximately 1 mile away from the proposed generating facilities.
- Physical attributes include flat terrain, direct access and adequate acreage to achieve visual screening and buffer areas between the power plant and surrounding land uses.
- General community support for the project exists in the area.

This Application contains that information requested, and in the format prescribed by, A.A.C.R14-3-219. In addition, further information is set forth in Exhibits A through J to the Application. At the public hearing before the Committee, the Applicant will offer testimony and documentary evidence in support of this Application and the two CECs, which it is requesting.



Bowie Power Station Site Map
Figure 1

APPLICATION

MAP NEXT Page

APPLICATION FOR CERTIFICATES OF ENVIRONMENTAL COMPATIBILITY

1. *Name and address of the Applicant:*

Name:	Bowie Power Station, LLC
Address:	4350 E. Camelback Road, Suite B-175 Phoenix, Arizona 85018

Bowie Power Station, LLC may assign all or part of the project to other entities.

2. *Name, address, and telephone number of a representative of the Applicant who has access to technical knowledge and background information concerning this application, and who will be available to answer questions or furnish additional information:*

Name:	Tom C. Wray Project Development Manager SouthWestern Power Group II, LLC
Address:	4350 E. Camelback Road, Suite B-175 Phoenix, Arizona 85018
Phone:	(602) 808-2004
Fax:	(602) 808-2099
E-mail:	Twray@southwesternpower.com

3. *State each date on which Applicant has filed a ten-year plan in compliance with A.R.S. §40-360.02, and designate each such filing in which the facilities for which this application is made were described. If they have not been previously described in a ten-year plan, state the reasons therefore.*

Under the provisions of A.R.S. 40-360.02, Applicant is not required to file a 10-year plan with respect to the proposed Bowie Power Station. Applicant does not intend to construct, own, or operate the proposed transmission facilities, which are the subject of this Application. Accordingly, it is not required to file a 10-year plan with respect to those facilities. However, on June 8, 2001, Applicant made an informational filing with the Arizona Corporation Commission, which provided the same information with respect to the Bowie Power Station transmission facilities as would have been contained in a 10-year plan. Applicant subsequently revised its proposed transmission arrangements to those described in this Application; and on July 25, 2001 filed an amendment to its June 8, 2001 informational filing to reflect such revision.

4. *Description of the proposed facilities:*

4.1 *With respect to an electric generating plant:*

4.1.1 *Type of generating facilities:*

The Bowie Power Station is a natural gas-fired, combined-cycle electric generating plant. The plant will use current state-of-the-art, "F" combustion turbine technology in a highly efficient combined cycle. The plant will be designed to operate continuously in a base-loaded mode. Construction of the plant will be phased in two nominal 500 MW power blocks, with supplemental firing (also known as "duct burning") to produce a total of approximately 1,000 MW. Each power block consists of the following basic components:

- two combustion turbine generators (CTG)
- two heat recovery steam generators (HRSG)
- one steam turbine electric generator (STG)

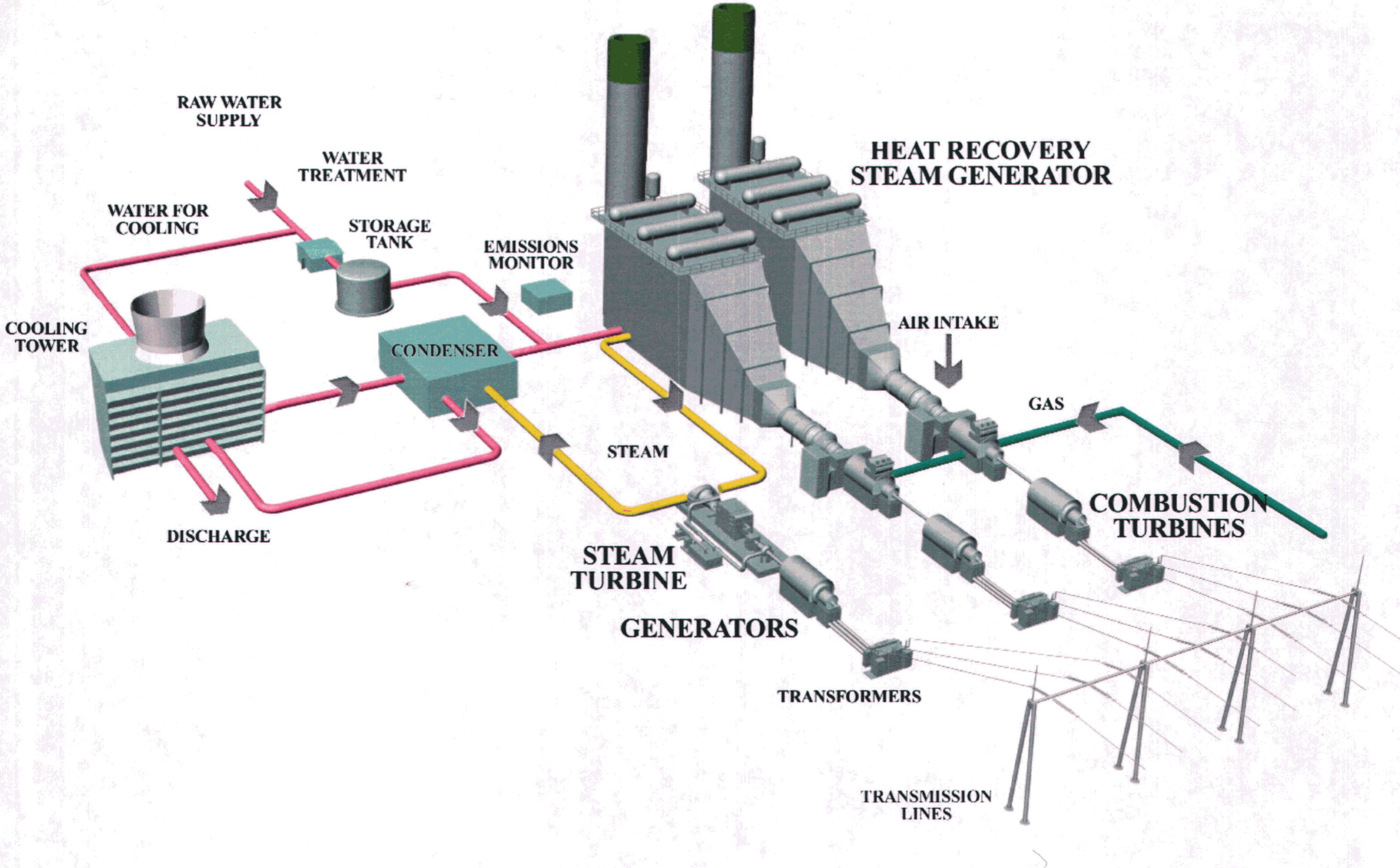
The circulating water will be cooled by a multi-cell, wet mechanical draft cooling tower. Groundwater wells will supply the makeup water. The plant will incorporate a zero discharge wastewater system. An evaporative cooling system or inlet fogging system will be used to reduce the combustion turbine air inlet temperature and increase the plant output and efficiency during warm weather.

The plant will be fueled by clean natural gas. Emissions control technology will be used to ensure compliance with air quality regulations (see Exhibit B-4, Air Quality). Nitrogen oxide (NO_x) emissions will be reduced via in-situ combustion controls and a post-combustion pollution control system. The supporting infrastructure includes vehicular access, water supply system, natural gas supply lines, transmission interconnection, and a switchyard.

An aerial photograph of the proposed power plant project location and site arrangement is included as Figure 2. Figure 3 provides a graphic of typical combined-cycle project components.

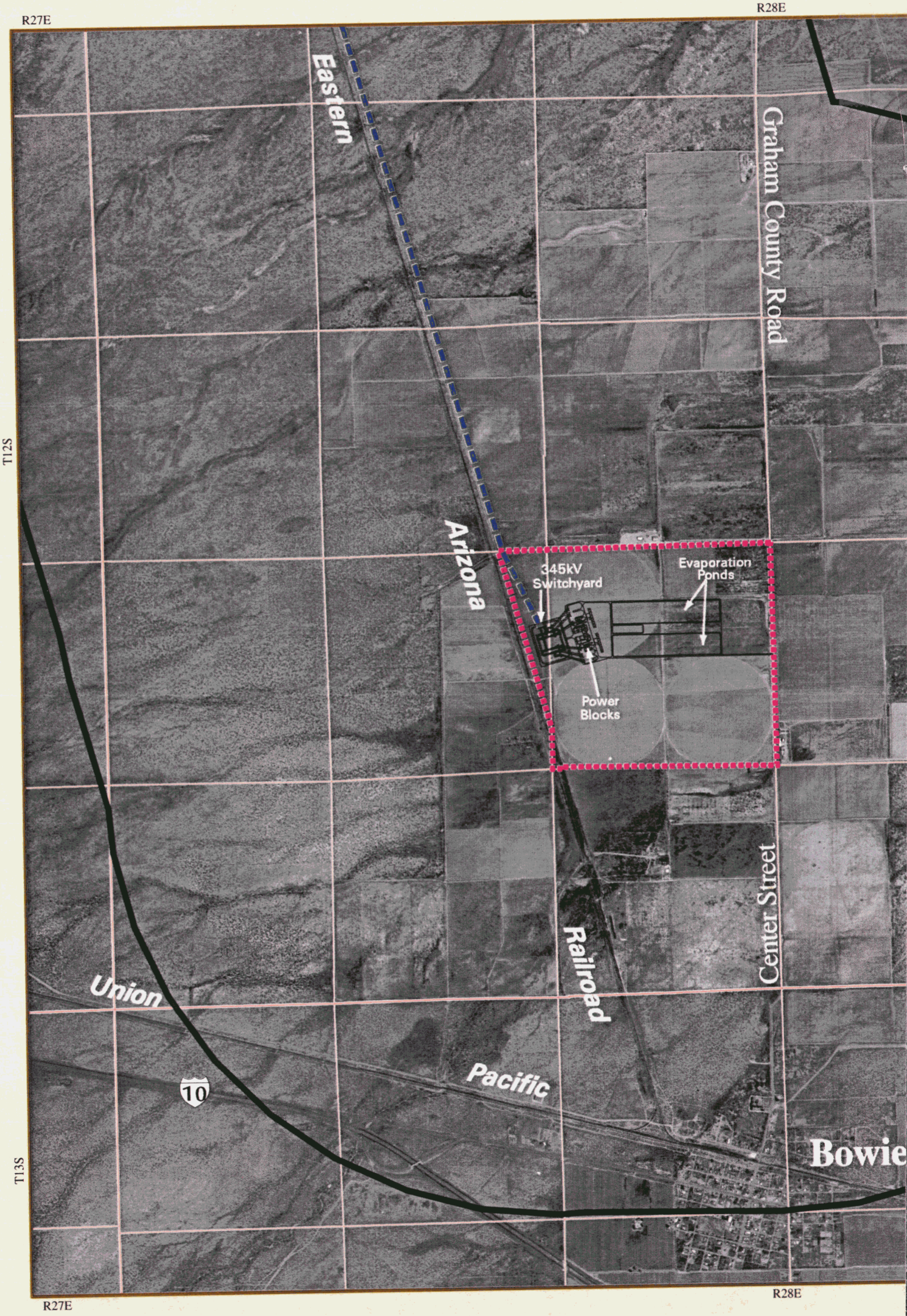
4.1.2 *Number and size of proposed units:*

The power plant project includes the major components and systems described below. An illustration of the general arrangement concept is provided in Exhibit G-1.



Typical Combined-Cycle Generating System Components:
One 500 MW Block

Figure 3



R27E
R28E
T12S
T13S
Eastern
Arizona
Railroad
Graham County Road
345kV Switchyard
Evaporation Ponds
Power Blocks
Center Street
Union
Pacific
10
Bowie
R27E
R28E

BOWIE POWER STATION

SITE LOCATION

Figure 2

Resource Inventory

- Study Area
- Bowie Power Station Site
- Proposed Double-Circuit 345kV Transmission Line Route

General Reference Features

- Section Line
- Township and Range Boundary

Source:
Aerial Photograph, Todd Photographic Services, 2000.

North

0 1500 3000 6000

Scale 1:36,000

m:/projects/swpg/bowietl/amls/map.aml Draft:July 26, 2001

4.1.2.1 *Combustion Turbine Generator*

In a CTG, air is compressed, heated through the direct combustion of fuel, and then expanded through a turbine to drive the compressor and an electric generator. The CTGs for this power station will utilize current, state-of-the-art, "F" combustion turbine technology in a highly efficient combined cycle. The CTGs will be General Electric Frame 7FA in a S207FA configuration (i.e., two Frame 7FA CTGs, two HRSGs, and one STG) and will be equipped with dry low NO_x (DLN) combustors. Each S207FA configuration generates approximately 500 MW and is referred to herein as a "power block." Two power blocks comprise the 1,000 MW power station. The CTGs will be fueled only by natural gas.

The plant will utilize an evaporative cooling system or inlet fogging system to reduce the CTG air inlet temperature and increase the plant output and efficiency during warm weather. CTG auxiliary equipment also includes self-cleaning inlet air filters, oil lubrication and cooling systems, natural gas fuel system, fire protection systems, sound attenuation equipment, and an instrumentation and control system.

4.1.2.2 *Heat Recovery Steam Generator*

The HRSG produces steam from the hot exhaust gases from the CTG. The high-pressure steam is expanded in the STG to produce more electricity and increase the overall cycle efficiency. The HRSG will be a natural circulation reheat unit with three steam pressure levels. High-pressure, superheated steam is generated in the first section of the HRSG and sent to the high pressure section of the STG. Intermediate-pressure steam from the STG is reheated in the HRSG and returned to the STG. Low-pressure steam from the HRSG is added to the low pressure section of the STG. The HRSG will be equipped with supplemental firing, which will be used to increase the output of the power station for peak output. There is one HRSG per CTG.

4.1.2.3 *Steam Turbine Generator*

As described above, the steam from the HRSG is expanded in the steam turbine, which drives an electrical generator to produce additional power. Each steam turbine generator will be designed for additional output from the supplemental firing. There is a factory-assembled combined high-pressure/intermediate-pressure casing and a field-assembled double-flow low pressure casing. Low-pressure steam exhausts from the STG and is condensed in a condenser cooled by circulating water system. The circulation water system also cools the generator and the STG lube oil system. The STG package includes a lube oil system, gland steam condenser, automatic sealing system, and control panel.

4.1.2.4 *Air Pollution Control System*

The CTGs will be equipped with DLN combustors to reduce NO_X emissions to 9 parts per million volumetric discharge (ppmvd). Post combustion, selective catalytic reduction (SCR) systems will further reduce CTG NO_X levels to 3.0 ppmvd. The SCR catalyst is installed in the HRSG. The process reagent, aqueous ammonia, is injected into the HRSG inlet upstream of the SCR catalyst. A Continuous Emission Monitoring System (CEMS) will be located in each exhaust stack and will continuously monitor the emissions from the CTG/HRSG.

The auxiliary boiler, which will operate when a power block is not online to allow for quick starting, will be equipped with low NO_X burners. Natural gas will fuel both combustion devices. Natural gas is inherently clean and low in sulfur and will provide the lowest achievable emission rates for sulfur dioxide and particulate emissions.

4.1.2.5 *Water Handling and Treatment Facilities*

Groundwater pumped from wells on the Bowie property will supply process water. The estimate of annual average water use is 5,500 acre feet per year.

The project sponsor is considering the following preliminary concept for a makeup water treatment system:

- chemically assisted direct filtration (with coagulant, coagulant aid, and sodium hypochlorite feeds)
- cartridge filtration
- chemical dechlorination
- reverse osmosis (with proper chemical feeds for scale control or pre-softening with sodium cycle softening)

- decarbonation
- electrodeionization

The filters (preceded by chlorine addition) will also effectively remove the ferrous iron from the well water supply.

Process Wastewater Treatment

A zero-discharge wastewater system will dispose of wastewater from the cooling tower blow-down, HRSG blow-down, and makeup water treatment system effluent. The wastewater will be directed to lined evaporation ponds approximately two feet deep with a total area of approximately 60 acres. The blow-down flow rate will be 68 gallons per minute (gpm) per power block when operating. For purposes of sizing the lined evaporation ponds, an average annual flow rate of 100 gpm has been assumed.

Stormwater

Site stormwater drainage and the clean oil/water separator effluent will be directed to an unlined five-acre retention pond with a depth of three to four feet. The retained runoff will either evaporate or percolate into the ground. Site drainage is assumed as being generated from developed areas of the site including generation islands, buildings, roadways, and electrical switchyards/substations.

Potable Water

The potable water for the work force needed to construct and operate the plant will come from treated groundwater.

Sanitary Sewer

The plant's domestic wastewater treatment system will be designed for an operating work force of 37 personnel. Domestic wastewater treatment will meet or exceed Arizona Department of Environmental Quality standards and will consist of a package sewage treatment plant or an extended aeration pond system with the treated effluent routed to the site runoff detention pond. The design may also incorporate wastewater reuse for site grounds irrigation.

4.1.2.6 *Fuel System*

The purpose of the fuel system is to meter, filter, and regulate pressure of the natural gas as it moves from the transmission pipeline interconnection to the combustion turbine combustors (and the HRSG duct burner systems). Natural gas (pipeline quality, low sulfur) will be obtained from a natural gas transmission line. The gas is piped underground from the line, where it is metered, to the combustion turbine area and split to the individual combustion turbines.

The natural gas fuel system delivers and conditions natural gas from the main pipeline to each CTG and boiler. A filter separator is supplied with the CTGs to remove particulate and liquids. The pressure of the gas will be regulated from the pipeline to meet the CTG requirements.

4.1.2.7 *Instrumentation and Control System*

A microprocessor-based, distributed control system will provide remote control capability from a central control room. The distributed control system provides supervisory control to system control packages (such as those for the CTGs STGs, HRSGs, and the water treatment system) and directly monitors and controls field instruments. The control room will be equipped with an operator console, printers, engineering workstations, CEMS monitor, and fire detection panels.

4.1.2.8 *Switchyard and Electrical Interconnection*

The 345kV plant switchyard will consist of a four-bay, air-insulated substation in a breaker and one-half configuration. This design will provide connections for four CTGs, two STGs, and two positions including dead-end structures for termination of the 345kV transmission lines.

An alternate power supply provided from the existing 12kV distribution line running along Graham County Road will be used initially as construction power.

The new Willow 345/230kV Switchyard will be constructed to interconnect the 345kV transmission lines with the TEP 345kV lines and the AEPCO Red Tail-Dos Candados 230kV transmission line (see Section 4.2.1.3).

4.1.2.9 *Site Improvements*

Construction access to the power plant site will be provided via Graham County Road from the south. Permanent access will also be from Graham County Road (see Figure 2). Roads will be improved Type 1 classification surfaced to accommodate construction and normal operation and maintenance truck loading, and to eliminate dust concerns. A construction staging area for equipment and materials storage will be located west of Graham County Road in Section 28.

Paved roadways will be constructed to and around the generation islands. Roadways will be of suitable widths for truck traffic, designed for highway truck loadings, and consist of a six-inch minimum gravel or crushed stone base course followed by a two-inch asphalt binder course and a two-inch asphalt wearing course.

Certain chemicals and petroleum products required for normal operation and maintenance will be stored on site in containers approved by the U.S. Department of Transportation.

High-pressure sodium vapor-type outdoor lighting with full cutoff luminares will provide illumination in areas of normal personnel traffic such as building exteriors, equipment areas, walkways and stairs, substation areas, roadways.

Wall-mounted battery pack-type emergency lighting will be used to provide adequate levels of illumination for building egress routes. The control room will have sufficient emergency lighting levels to allow plant personnel to monitor plant activities.

4.1.3 *The source and type of fuel to be used, including a proximate analysis of fossil fuels:*

The source of natural gas supply will be the El Paso Natural Gas (EPNG) system and will likely be from Line No. 2000 located south of the power plant site (All American Pipeline). This tap is expected to be located approximately 4 miles from the facility metering point.

A chromatograph sample provided by EPNG is included in the table on the following page.

NATURAL GAS ANALYSIS		
Component	**Mole %**	**GPM**
Methane	94.28000	0.00000
Ethane	2.77000	0.74080
Propane	0.49000	0.13500
Butane	0.11000	0.03470
Iso-Butane	0.06000	0.01960
Pentane	0.03000	0.01090
Iso-Pentane	0.03000	0.01100
Neo-Pentane	0.00000	0.00000
Hexane	0.04000	0.01750
Heptane	0.00000	0.00000
Octane	0.00000	0.00000
H_2S	0.00000	0.00000
CO_2	0.34000	0.00000
Nitrogen	1.85000	0.00000
Total	100.00000	0.96950
Dry BTU:	1026	
Wet BTU:	1008	
Gravity:	0.588	
Pressure Base:	14.73	
Sample Date: December 1, 2000	Source: El Paso Natural Gas 2001	
BTU = British thermal units		

4.1.4 *Amount of fuel to be utilized daily, monthly, and yearly:*

Following are estimated amounts of fuel that would be used when operating continuously in a base load configuration:

- Daily –200,000 million British thermal units (MMBtu)
- Monthly – 6,000,000 MMBtu
- Annually – 80,000,000 MMBtu

4.1.5 *Type of cooling to be utilized and the source of any water to be utilized:*

4.1.5.1 Type of cooling:

A multi-cell, wet, mechanical draft cooling tower will be used to reduce the temperature of the circulating water. The circulating water system will operate with a minimum of 15 cycles of concentration to decrease the makeup water use and the amount of blow-down to be discharged. A side-stream softening system will be used to achieve these higher cycles of concentration.

4.1.5.2 Source of water:

Makeup water for the power plant project will be obtained from the on-site groundwater supply wells. A side-stream softening will increase the circulating water system cycles of concentration thereby reducing the amount of blow-down and wastewater. Furthermore, condensed blow-down from the boilers will be used as makeup water for the circulating water system. This will also minimize the amount of groundwater pumped for makeup water and the amount of wastewater produced.

4.1.6 Proposed height of stacks and number of stacks, if any:

There will be one exhaust stack per HRSG for the total 1,000 MW project. The four HRSG stacks are anticipated to be between 130 and 160 feet high. Each of two auxiliary boiler stacks will be 45 feet high.

4.1.7 Dates for scheduled start-up and firm operation of each unit and date construction must commence in order to meet schedules:

The scheduled start-up and commercial operation for each 500 MW unit is as follows:

Unit	Start-up	Commercial Operation Date
1	mid 2003	2nd quarter 2004
2	mid 2005	4th quarter 2005

4.1.7.1 Power Plant Project Construction

A contractor will be retained to perform the engineering, procurement, and construction for the project. In order to meet the power plant project schedule, construction must commence in 2002. The actual construction in the field for the total 1,000 MW facility should be completed in approximately 36 months. During this period, the construction work force is expected to average approximately 250 people on site, peaking at 500. An area adjacent to the plant will be used temporarily for construction parking, work trailers, storage, and lay-down areas. Water and electrical power facilities are available at the site for use during construction.

The structural elements, water retaining structures, and infrastructure facilities will be designed and constructed to accommodate future potential subsidence and operate safely.

4.1.7.2 Power Plant Project Operation

The plant will be designed for base-load operations, but will have the ability to operate at part-load. The output of the facility will be determined by market factors, such as the growth in energy demands and daily wholesale energy prices.

The power plant is designed for base-load combined-cycle operation with supplemental fired peaking capability. The combustion turbines can be fired in 10 to 15 minutes and reach full-load output in less than two hours. The power plant will be capable of producing up to 1,000 MW (nominal). An additional 100 MW of peaking capability may be available from supplemental firing, depending on the ambient temperature conditions. As ambient temperatures increase, evaporative inlet air coolers will be used to reduce the CTG inlet air temperature to near the wet bulb temperature to maximize plant output.

The power plant project will include advanced control systems to monitor and control all of the plant operation systems. Approximately 37 full-time staff will perform routine operation and maintenance functions. In addition, the plant can be remotely monitored and dispatched. Some functions, including major turbine and generator maintenance, will be outsourced to other vendors.

4.1.8 *To the extent available, the estimated costs of the proposed facilities and site, stated separately:*

The estimate of probable facilities cost for the power plant is in excess of $400 million. The estimate includes construction and material costs of the generation facilities and power plant switchyard. The cost of the transmission lines and the Willow 345/230kV Switchyard is provided in Section 4.2. The land cost of the power plant site will be available upon closing of the option to purchase.

4.1.9 *Legal description of the proposed site:*

The power plant site is located in Section 28 and a portion of Section 29, Township 12 South, Range 28 East in Cochise County, Arizona.

4.2 *Description of the proposed transmission line(s):*

4.2.1 *General Description:*

4.2.1.1 Nominal voltage for which the lines are designed

345kV alternating current (AC) – double-circuit

4.2.1.2 Description of the proposed structures:

The proposed 345kV transmission lines will be designed for a double circuit with three-phase circuits (three bundles of two conductors per phase) and static wires on single pole structures (see Exhibit G-3, typical structure diagram). The 345kV transmission structures are typically 160 feet (maximum of 175 feet) in height with span lengths of between 800 feet and 1,100 feet. The heights of structures, span length, or other characteristics could vary based on the final design or in order to accommodate site-specific conditions and mitigation measures.

4.2.1.3 Description of proposed switchyards and substations:

The new Willow Switchyard (substation) will be constructed at a site located approximately 3 miles north of the Cochise/Graham County Line on State Trust Lands in Graham County, approximately .25-mile east of U.S. Highway 191. The switchyard site is located in Section 14, Township 11 South, Range 26 East. The purpose of the switchyard is to:

a. tie the two 345kV transmission lines from the Bowie Power Station into the existing TEP Greenlee-Vail and Springerville-Vail 345kV transmission lines; and

b. provide an interconnection with the AEPCO Red Tail-Dos Candados 230kV transmission line located adjacent to the switchyard site.

In addition to the breaker and one-half and dead end structures, a 230kV autotransformer and breakers will be installed within the fenced site area. The switchyard site will require approximately 23 acres. A conceptual plan is provided in Exhibit G-6.

4.2.1.4 Purpose for constructing said transmission line:

The proposed transmission line project will connect the Bowie Power Station to the Greenlee-Vail 345kV transmission line at a minimum. Connections to the Springerville-Vail 345kV transmission line and the AEPCO Red Tail-Dos Candados 230kV line will be determined from reliability and transmission rate analyses. From these points of interconnection, power generated at the Bowie Power Station would then flow through existing transmission lines (Figure 4). The Interconnection Power Flow Study is provided in Exhibit J-5.

4.2.2 General Location:

4.2.2.1 Description of the geographic points between which the transmission line will run:

The proposed 345kV transmission lines would extend from the Bowie Power Station switchyard in the northeast quarter of Section 29, Township 12 South, Range 28 East, in Cochise County, north of Bowie, Arizona, to the proposed Willow Switchyard to be located at the intersection of the existing TEP 345kV transmission lines and the AEPCO 230kV transmission line in Section 14, Township 11 South, Range 26 East, east of U.S. Highway 191 in Graham County (see Figure 4).

4.2.2.2 Straight-line distance between such geographic points:

The straight-line distance of the proposed 345kV transmission line between the Bowie Power Station switchyard and the proposed Willow Switchyard site is approximately 13 miles.

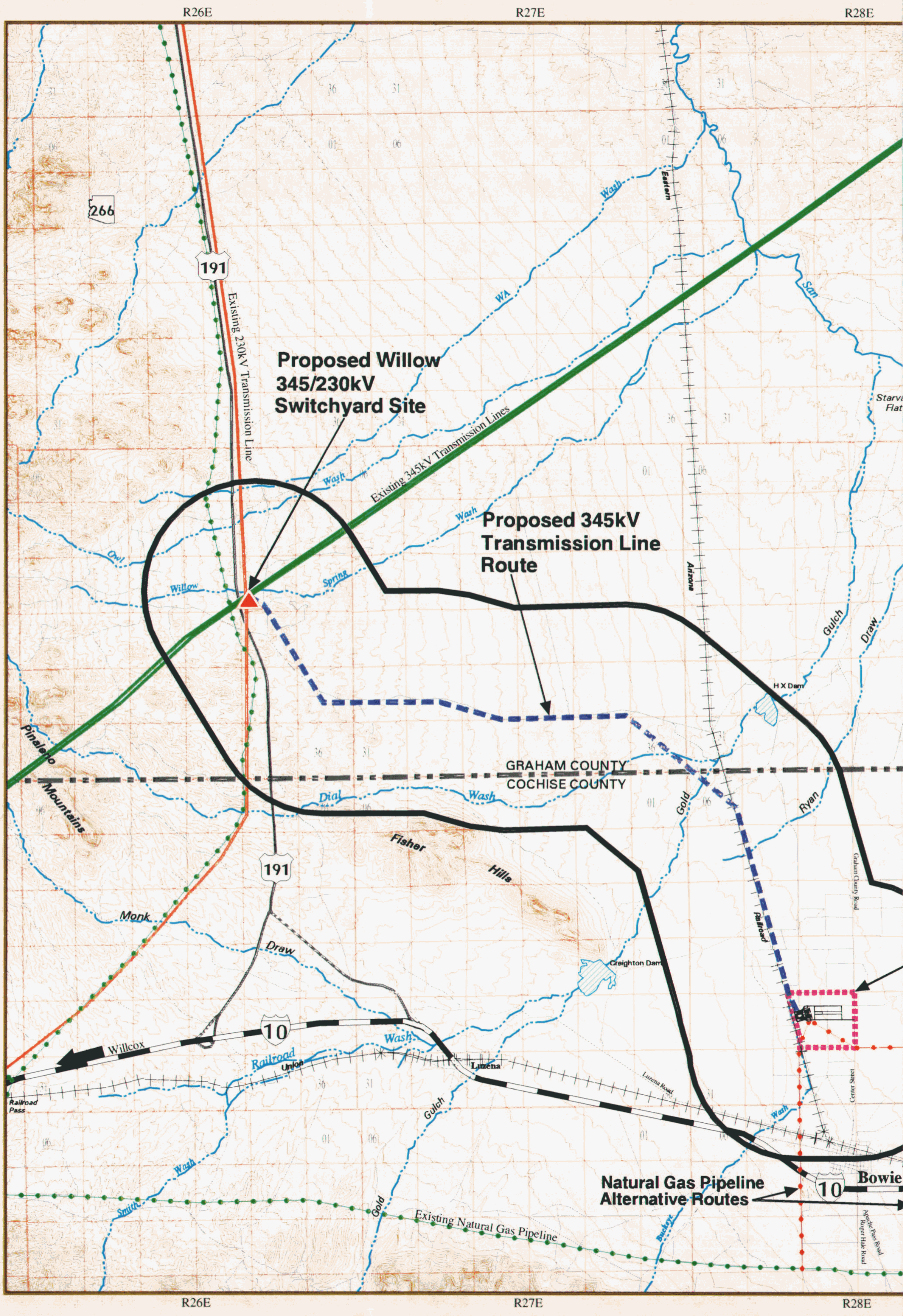
4.2.2.3 Length of the transmission line for each alternate route:

The approximate length of the proposed route is 14.3 miles. No other alternatives are proposed, but were initially considered by the Applicant.

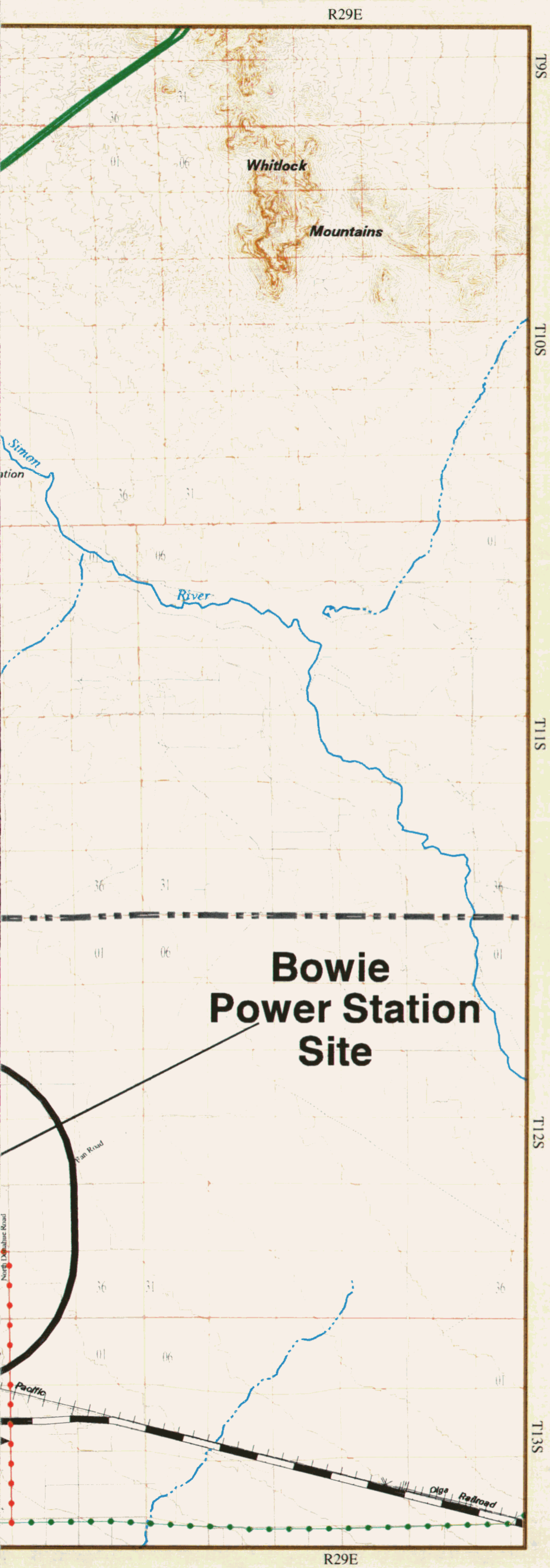
4.2.3 Detailed Dimensions:

4.2.3.1 Nominal width of right-of-way requested

A total right-of-way width of 250 feet is anticipated for the 345kV transmission line. It is requested that the right-of-way be located



R26E
R27E
R28E
T9S
T10S
T11S
T12S
T13S
266
191
Existing 230kV Transmission Line
Proposed Willow
345/230kV
Switchyard Site
Existing 345kV Transmission Lines
Proposed 345kV
Transmission Line
Route
GRAHAM COUNTY
COCHISE COUNTY
Pinaleno
Mountains
Fisher
Hills
Monk
Draw
Willow
Spring
Owl
Wash
Dial
Gold
Ryan
Gulch
Eastern
Arizona
Railroad
San
Starva
Flat
H X Dam
Creighton Dam
Graham County Road
Center Street
10
Willcox
Railroad
Union
Luzena
Luzena Road
Railroad Pass
Smith
Buckeye
Natural Gas Pipeline
Alternative Routes
Bowie
Existing Natural Gas Pipeline
Apache Pass Road
Roger Hale Road



BOWIE POWER STATION

PROJECT SITE AND PROPOSED TRANSMISSION LINE ROUTE

Figure 4

Resource Inventory

- Study Area
- Bowie Power Station Site
- Proposed Double-Circuit 345kV Transmission Line
- Natural Gas Pipeline Alternative Routes
- Proposed Willow 345/230kV Switchyard

General Reference Features

- 345kV Transmission Line
- 230kV Transmission Line
- Natural Gas Pipeline
- County Boundary
- Interstate
- Major Road
- Road
- Railroad
- River
- Wash
- Section Line
- Township and Range Boundary
- Contour
- Reservoir

Sources:
United States Geological Survey (USGS), Willcox AZ-NM 1994, 1:100,000-scale metric topographic maps.
Contours interpolated from USGS 1:24,000-scale digital elevation models at an interval of 40 feet.

North

0 1 2 4 Miles

m:/projects/swpg/bowietl/amls/map.aml Draft July 26, 2001 within a general corridor of 2,500 feet centered on the proposed route referenced in Figure 4 and Exhibit A-2b. The exact location of the alignment within the general corridor will ultimately be determined based on right-of-way considerations, site-specific design demands, and environmental requirements.

4.2.3.2 Nominal length of span:

It is anticipated that single pole structures will be used, typically requiring spans between approximately 800 feet to 1,100 feet for the 345kV line.

4.2.3.3 Maximum height of supporting structures:

Maximum of 175 feet above grade for 345kV lines; average height of tangent structures is 160 feet.

4.2.3.4 Minimum height of conductor above ground:

Estimated 25 feet for 345kV lines.

Final design of the transmission lines will ensure compliance with National Electrical Safety Code for the minimum height of conductors aboveground, and may vary due to site-specific circumstances.

4.2.4 Estimated costs of proposed transmission line and substations:

Proposed Willow 345/230kV Switchyard (substation): $8.1 million
Proposed transmission line: approximately $19 million

These estimates are based on typical costs for design and construction, and may vary based on final engineering, design, availability of materials, and potential mitigation requirements.

4.2.5 Description of the Proposed Route

<u>Proposed Route (see Figure 4 and Exhibit A-2b)</u>: This route travels north-northwest from the Bowie Power Station Switchyard along the east side of the Eastern Arizona Railroad right-of-way for 3.8 miles. At that point the route veers northwest for 2.6 miles to a road running roughly east/west from the railroad toward U.S. Highway 191. From the intersection with this access road, the route follows the road west 5.5 miles. At this point the route turns north-northwest for 2.4 miles to intersect with the existing

345kV transmission lines and proposed Willow Switchyard site in Section 14, Township 11 South, Range 26 East in Graham County.

4.2.6 Land Ownership:

The proposed route consists of approximately 2.5 miles of private land and 11.8 miles of Arizona State Trust land for a total distance of approximately 14.3 miles. The proposed Willow Switchyard site is located on Arizona State Trust land.

5. *Jurisdictions*:

5.1 Areas of jurisdiction (as defined in A.R.S. § 40-360) affected by this route or site:

All components of the power plant will be located in an unincorporated area of Cochise County. The transmission lines will be located within unincorporated areas of Cochise and Graham counties. The proposed Willow Switchyard will be located in an unincorporated area of Graham County.

5.2 *Designation of proposed sites or routes, if any, which are contrary to the zoning ordinances or master plans of affected areas of jurisdiction:*

The proposed power station site, transmission line route, and switchyard sites are not located contrary to master plans of any affected areas of jurisdiction. A zoning change from RU-4 to HI and Special Use Permit by Cochise County will be requested for the Bowie Power Station site.

6. *Description of the environmental studies the Applicant has performed.*

The Applicant contracted with the following consultants to perform environmental studies:

Consultant	Environmental Studies
Environmental Planning Group, Inc. (EPG)	Cultural, biological and visual resources; land use; public involvement coordination; land management and site planning
URS	Water resources
Wind River Environmental Group, LLC	Air resources
Michael Theriault Acoustics, Inc.	Noise

Results of the environmental studies for the proposed project are presented in Exhibits A through I of this application.

Environmental studies of the project areas began with the collection of existing environmental data including literature, maps, aerial photographs, and other agency data. Contacts were made with appropriate agencies and organizations. In addition to secondary data investigations, pedestrian surveys were completed for cultural and biological resources. Existing conditions were measured for noise while windshield surveys were conducted to verify land use and visual resources. Visual simulations also were prepared to assist in impact assessment and mitigation planning.

Biological studies have indicated that issues related to special status species are not anticipated for this project. Historically, the majority of the Bowie property and the plant site were cultivated for agriculture. An intensive pedestrian survey for cultural resources was conducted for the plant site and transmission line route, and results are summarized in Exhibit E. Overall, no adverse impacts to cultural or biological resources are anticipated as a result of the construction and operation of the proposed project.

The location of the plant site within the Bowie property allows for buffering from the nearest residential properties (approximately 1 mile away). This distance reduces immediate visual impacts to potentially sensitive viewers and potential noise effects. Simulations of the plant show expected views of the project (see Exhibits G-4 and G-5). Additional mitigation measures include a landscape plan, subject to Cochise County regulation.

A siting evaluation was conducted by EPG to identify possible alternative routes for the proposed 345kV transmission line to interconnect the proposed Bowie Power Station with the existing Springerville-Vail and Greenlee-Vail 345kV transmission lines. Routes were evaluated using environmental criteria, based on anticipated construction requirements for the proposed double-circuit line. Two routes were initially identified that could be constructed using existing access. Following additional analysis, one route was eliminated from further consideration based primarily on potential biological impacts. Furthermore, that alternate route would not have the advantage of a termination near the intersection of the AEPCO 230kV line for the proposed Willow Switchyard site, which could be provided directly by the proposed route.

A public involvement program has been integrated with the planning process, and will continue throughout the permitting and design phases. Public meetings were held on April 25 and 26, 2001 in Willcox and Bowie, respectively, to introduce the project to the public, answer questions, and request input on the project. A newsletter describing the project was mailed out in the early stages of project development. In addition, the project team has presented project updates to local communities and organizations, and county and state representatives throughout the process. Summaries of the public involvement process are included in Exhibit J.

CONCLUSION

Applicant believes that the foregoing information and that set forth in attached Exhibit Noumbers "A" through "J" satisfy the content and format requirements of A.A.C.R14-3-219. In addition, Applicant believes that its plans for siting and designing the proposed 1,000 MW (nominal) Bowie Power Station, double-circuit 345kV transmission line and 345kV/230kV switchyard are "suitable," when judged in light of the decision-making factors set forth in A.R.S. §40-36.06. Accordingly, Applicant hereby requests that the committee render a decision or decisions granting Applicant (i) a Certificate of Environmental Compatibility for the proposed 1,000 MW (nominal) Bowie Power Station; and (ii) a Certificate of Environmental Compatibility for the double-circuit 345kV transmission line, 345/230kV switchyard and 230kV transmission interconnection, which are the subjects of this Application.

BOWIE POWER STATION, LLC

By: Tom [illegible]

Authorized Officer

ORIGINAL and 25 copies of the foregoing hand delivered and filed with the Director of Utilities, Arizona Corporation Commission,

this 27th day of July, 2001.

EXHIBIT A
LOCATION AND LAND USE MAPS


NATIONAL FOREST
HELIOGRAPH PEAK
Ranger station
Turkey Flat
LADYBUG PEAK
Ranch
KANE SPRING MOUNTAIN
CIRCLE I HILLS
FISHER HILLS
Willow Spring Wash
Dial Wash
Railroad
Bowie
Willcox
Spike E Hills
Dos Cabezas
Hitching Post Store
Cotton Gin
WILLCOX PLAYA
Old RR grade
MAVERICK MOUNTAIN
GOVERNMENT PEAK
COOPER PEAK
Buckeye Apache Mine
Gold Farm Mine
Elma Mine
Mineral Park Mine
Mascot Mine
Dives Mine
Hyde Mine
Gold Prince Mines
Philadelphia Mine
Leroy Mine
Silverstrike Mine
FORT BOWIE N.H.S.
HELENS DOME
BOWIE MOUNTAIN
Stanyeout Well
Flowing Well
San Simon River
Timber Draw
Gold Gulch
Ryan Draw
Tangue
Water
Farm
Raso
Powerline Pass
Hay Flat Draw
Sycamore Spring
Sacaton Wash
Canyon
Apache Pass
Powe
20-Mile Ra

BOWIE
POWER STATION

20-MILE RADIUS

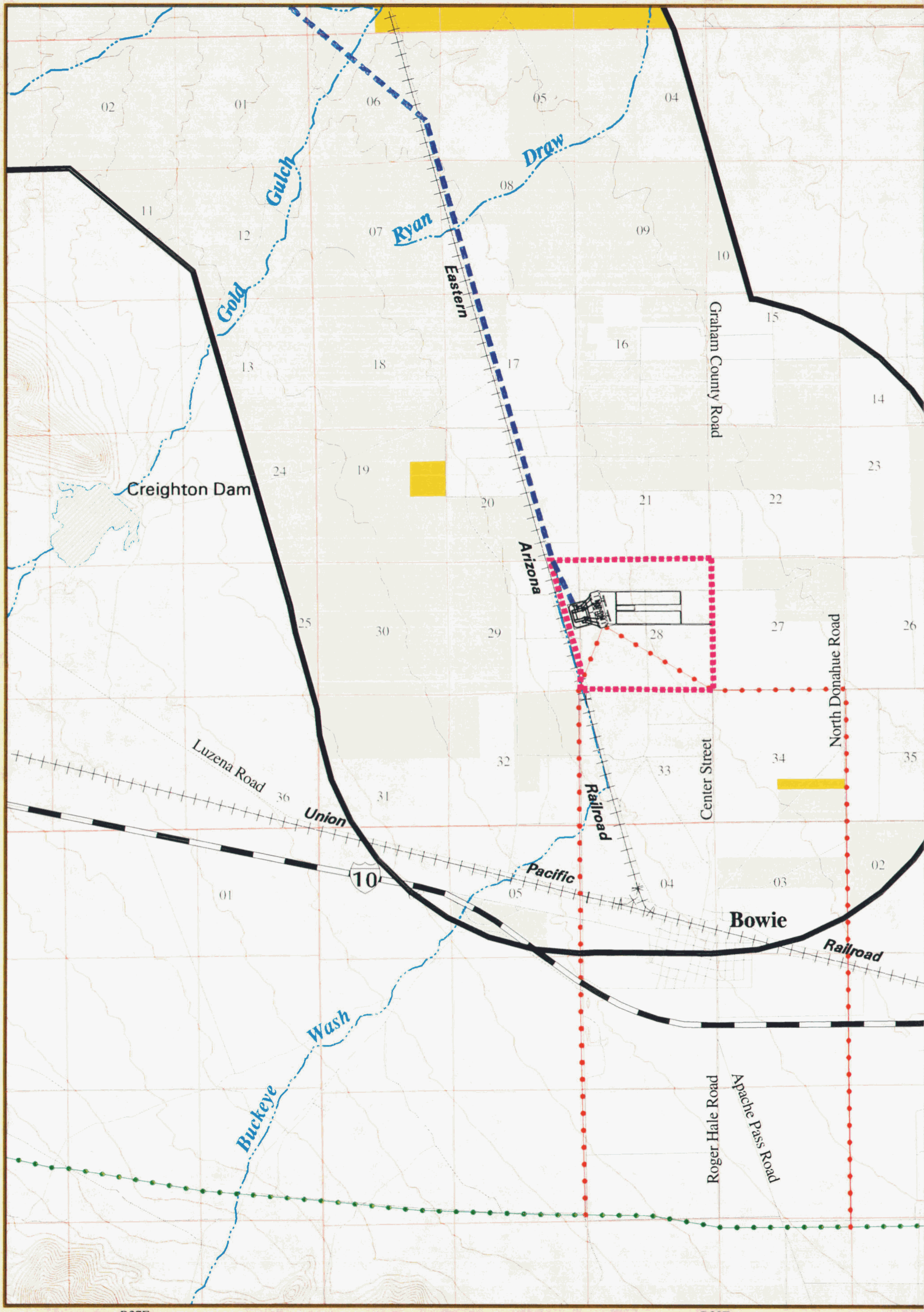
Exhibit A-1

Source:
United States Geological Survey (USGS), Silver City NM-AZ, 1970, 1:250,000-scale metric topographic map.

North

0 2.5 5 10

Scale 1:250,000



R27E
R28E
T12S
T13S
Creighton Dam
Gold Gulch
Ryan Draw
Eastern Arizona Railroad
Graham County Road
North Donahue Road
Center Street
Luzena Road
Union Pacific Railroad
10
Bowie
Buckeye Wash
Roger Hale Road
Apache Pass Road
02
01
06
05
04
11
12
07
08
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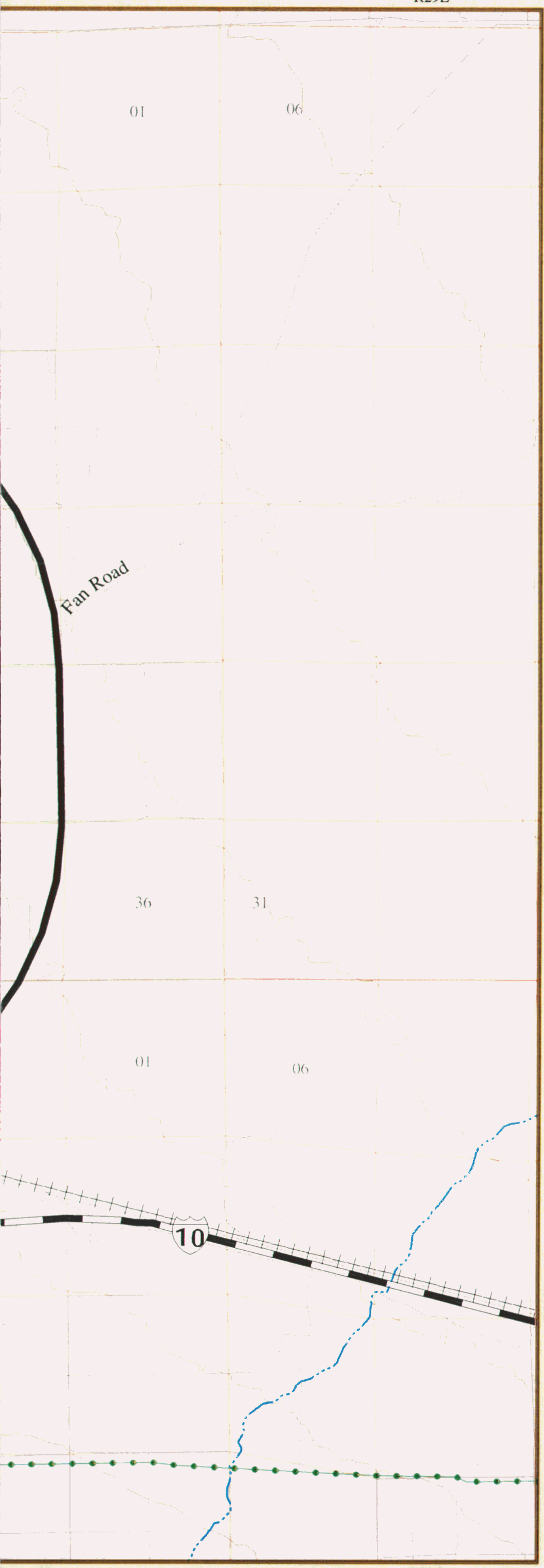
R27E
R28E



BOWIE
POWER STATION

LAND OWNERSHIP AND JURISDICTION

Exhibit A-2a

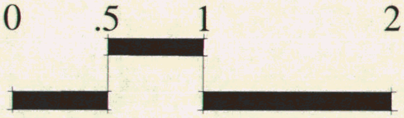
Resource Inventory

- Study Area
- Bowie Power Station Site
- Proposed Double-Circuit 345kV Transmission Line
- Natural Gas Pipeline Alternative Routes
- Private
- State Trust
- Bureau of Land Management

General Reference Features

- Natural Gas Pipeline
- Interstate
- Road
- Railroad
- Wash
- Section Line
- Township and Range Boundary
- Contour
- Reservoir

Sources:
Arizona State Land Department, Phoenix, AZ 2001.
United States Geological Survey (USGS), Willcox AZ-NM 1994, 1:100,000-scale metric topographic maps.
Contours interpolated from USGS 1:24,000-scale digital elevation models at an interval of 40 feet.



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OVERSIZED MAP

-Bowie Power Station
Land Ownership and Jurisdiction

Exhibit A-2b

<u>TO REVIEW SEE DOCKET SUPERVISOR</u>

DOCKET
L-00000BB-01-0118-00000

OVERSIZED MAP

-Bowie Power Station
Existing and Future Land Use

Exhibit A-3

<u>TO REVIEW SEE DOCKET SUPERVISOR</u>

DOCKET
L-00000BB-01-0118-00000

EXHIBIT B
ENVIRONMENTAL REPORTS

EXHIBIT B
ENVIRONMENTAL REPORTS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Attach any environmental studies which applicant has made or obtained in connection with the proposed site(s) or route(s). If an environmental report has been prepared for any Federal agency or if a Federal agency has prepared an environmental impact statement pursuant to Section 102 of the National Environmental Policy Act, a copy shall be included as part of this exhibit."

Exhibit B-1	Land Use Study
Exhibit B-2	Landscape Plan
Exhibit B-3	Water Supply Investigation Report
Exhibit B-4	Air Quality

EXHIBIT B-1
LAND USE STUDY

EXHIBIT B-1
LAND USE STUDY

INTRODUCTION

The purpose of the land use study is to inventory existing and future land uses, and identify potential impacts that could result from the construction and operation of the proposed project. This land use report includes discussion of:

- study area and inventory methods
- inventory results
- impact assessment and mitigation

The maps that illustrate the land use components are included in Exhibit A and are described below.

STUDY AREA AND INVENTORY METHODS

The study area is illustrated within a regional context in Exhibit A-1.

The proposed Bowie Power Station would be located in Sections 28 and 29 of Township 12 South, Range 28 East. A double-circuit 345kV transmission line is proposed to connect the power station to a proposed Willow Switchyard in Section 14 of Township 11 South, Range 26 East. The transmission line would extend north from the power station following the Eastern Arizona Railway to within three-quarters mile south of the Graham County Line and then bear westward to the Willow Switchyard site near U.S. Highway 191. The transmission line would pass through Township 12 South, Range 28 East, Township 11 South, Range 27 East, and Township 11 South, Range 26 East. The study area encompasses land within a 2-mile radius of the proposed power station site and a 4-mile corridor centered on the proposed transmission line.

The methods used to gather information for the land use inventory included review and interpretation of maps, aerial photographs, planning documents, and field verification. In addition, this study is based on communication with government agencies and private individuals.

INVENTORY RESULTS

Land Ownership and Jurisdiction

Land ownership is illustrated in Exhibit A-2a, A-2b.

The power station would be located on private land in Cochise County approximately 2 miles north of the unincorporated town of Bowie. The transmission line route crosses approximately 2.5 miles of private and 11.8 miles of Arizona State Trust lands in unincorporated Cochise and Graham counties.

Existing Land Use

Existing land use is illustrated in Exhibit A-3.

Residential - Residential land uses include single-family dwelling units associated with the town of Bowie and outlying farm and ranch residences. Bowie can be characterized as primarily medium density residential. Outlying residences include the following:

- a ranch one-half mile south of the plant site
- the Diamond Z Ranch subdivision (three residences) about 2 miles east
- a mobile home about 2 miles northeast

Commercial - There are several local businesses in the town of Bowie and travel services are offered at the east and west ends of the Interstate 10 (I-10) Business Route.

Industrial - There is a salvage yard north of I-10 at Roger Hale Road.

Agricultural - The majority of the agricultural lands in the Bowie area consist of cropland, orchards, and vineyards. Fallow land and pecan and walnut orchards are common throughout the study area. Chili peppers are currently grown on the proposed power station site. A 200-acre pecan orchard lies on the eastern boundary of the site and a 90-acre orchard lies immediately to the west of the site across the Eastern Arizona Railway.

Utilities - A 69kV substation exists approximately one-quarter mile northeast of the town of Bowie. One 69kV power line traverses the study area in an east to west direction, paralleling the Union Pacific Railroad, and connecting to the 69kV substation. A tower has been constructed to support communications facilities approximately one-quarter mile southeast of the power station site. Existing 345kV and 230kV transmission lines intersect near the proposed Willow Switchyard site in Graham County. El Paso Natural Gas Line (No. 2105), an 8 5/8-inch buried pipeline, runs north-south about one-half mile west of U.S. Highway 191.

Public/Quasi-public - The Desert Rest public cemetery is located approximately 1 mile south of the project property on Center Street. Two schools are located in the central portion of Bowie along with the town library and a county government building. There are three churches in Bowie.

Transportation - I-10 is approximately one-quarter mile south of the Bowie townsite. Major arterials in the study area may be paved or improved dirt roads. Paved arterials include the I-10

Business Route and Center Street. Unpaved roads include Fan Road, North Donahue Road, and Graham County Road.

The Union Pacific Railroad roughly parallels I-10 and passes through the north end of the town of Bowie. The Arizona Eastern Railroad branches from the Union Pacific Railroad northwest of Bowie and runs north to its terminus in Globe. It abuts the western boundary of the Bowie Power Station property for approximately 1.5 miles.

Grazing/Vacant Land - Large areas of land within the study area are vacant and often used for cattle grazing. The largest areas of vacant land are west of the Arizona Eastern Railroad and in the northern portions of the study area.

As noted, the majority of the Bowie Power Station site property is currently irrigated agricultural land. The transmission lines and Willow Switchyard site would be located on open range and fallow agricultural lands.

Future Land Use

Future land use is illustrated in Exhibit A-3.

The Cochise County Comprehensive Plan Growth Areas and Land Jurisdiction Map identifies a rural growth area extending northwest and east of the town of Bowie. Rural growth areas are anticipated to have a slow to moderate rate of growth consisting primarily of low and medium density residential development and a small percentage of local commercial and industrial uses. The land north of the rural growth area, including the location of the proposed power station, is identified as a rural area. This area is defined as sparsely populated lands for rural residences and agricultural areas. It is currently zoned RU-4, Rural Zoning according to the Cochise County Zoning Regulations, which permits rural uses, single household, and manufactured homes. A zoning change to HI, Heavy Industrial, and Special Use Permit will be requested for the 700-acre project site.

The Graham County General Plan identifies land within the study area as general use. Land in this category is used mainly for grazing, mining, recreation, and hunting. The accompanying zoning according to the Graham County Land Use Regulations is Zone A, General Land Use, which permits agriculture, grazing, and low density residences.

Neither Cochise nor Graham County report any pending major subdivisions or master planned developments in the study area.

IMPACT ASSESSMENT AND MITIGATION

Impacts to land use may be identified by the loss of or restrictions to an existing land use, or site incompatibility with existing land use plans. The proposed power station site is under private ownership and currently in agricultural use. Development will remove land from agricultural use, but will not conflict with existing plans for future development.

The proposed transmission line route follows railroad right-of-way and crosses state trust land. These lands, including the Willow Switchyard site, are leased for grazing and are not expected to be impacted as a result of construction and operation of the proposed power plant and transmission line.

Several mitigation measures are proposed for the power station and transmission lines to reduce possible impacts. During the first phase of the power station construction, farming will continue on the undeveloped portion of the site. When the site is fully developed, the land will be landscaped with low water use vegetation to achieve visual mitigation objectives and restore lands previously used for agriculture. Mitigation for the transmission lines and Willow Switchyard includes repairing or replacing any fences, gates, and watering facilities including tanks, wells, and water lines that are damaged during construction to their original pre-construction condition. Temporary gates will be installed only with the permission of the landowners or land management agency and the land would be restored after construction.

In conclusion, there will be minimal impacts to existing or future land uses as a result of construction and operation of the proposed power station, transmission line, and Willow Switchyard.

EXHIBIT B-2
LANDSCAPE PLAN

EXHIBIT B-2
LANDSCAPE PLAN

INTRODUCTION

The landscape plan for the Bowie Power Station is intended to serve several functions: (1) improve the aesthetics of the site and appearance of facilities, (2) provide for the reclamation of land and maintaining vegetation cover on site, and (3) assist in the integration of the facilities into the project setting.

The landscape plan is divided into three sections: Section 1, Existing Conditions, provides a description of the character of the project site and surrounding area; Section 2, Plan Objectives, outlines the general objectives of the plan; and Section 3, Conceptual Landscape Plan, describes the layout of facilities on the site, the plan concept and specific plan components, and the implementation of the plan.

SECTION 1 - EXISTING CONDITIONS

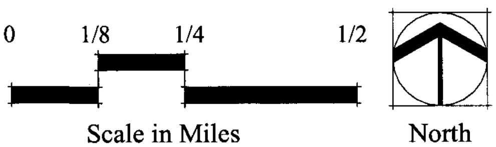
Project Site

The 700-acre project site is bordered by Graham County Road (Center Street) on the east and the Eastern Arizona Railroad on the west. The project area has been converted to agricultural use and no significant stands of native vegetation or residential uses are currently present on the site. Three agricultural irrigation pivot circles are present, one in the northwest quarter section, one in the southwest quarter section, and one in the southeast quarter section (Figure B-2.1). The northeast quarter section of the site consists of a 1/8 section of irrigated farmland and a 1/8 section of fallow farmland.

Surrounding Area

The landscape character of the overall region is primarily rural, including agricultural lands surrounded by Chihuahuan semidesert grassland and Chihuahuan desertscrub. A pecan orchard and processing facility are located immediately to the east of the property on the east side of Graham County Road. A second pecan orchard is located west of the property adjacent to the Eastern Arizona Railroad. With the exception of the orchards and a small portion of irrigated farmland to the south of the site, fallow agricultural land completely surrounds other portions of the property. This farmland extends from the property limits approximately 1½-mile to the north, 2 miles to the east, 1 mile to the south, and 1½-mile to the west. One residence is located approximately 1 mile south of the facility. A second is located 1½-mile north of the facility. A farm complex (farm out-structures) exist adjacent and immediately north of the site. The town of Bowie is located approximately 2 miles to the south.

EXISTING CONDITIONS
FIGURE B-2.1



SECTION 2 – PLAN OBJECTIVES

This section of the plan presents an overview of the plan objectives including improving the aesthetic quality of the site and appearance of the facilities, reclamation of the site and maintaining vegetative cover, and providing an overall design that is in context with the surrounding area and region.

Aesthetic Quality

Aspects contributing to the aesthetic quality of the landscape in this area include the elements of form, line, color, and texture, continuity, and scale. The aesthetic quality of the site has been addressed by (1) providing visual screening; (2) establishing landscape buffers and open space; (3) responding to the form, color, and texture of the surrounding landscape; (4) minimizing disturbance; and (5) helping to establish landscape treatments at an appropriate scale.

Site Reclamation and Vegetative Cover

The process of one plant community replacing another over time until a stable self-replicating community becomes established is called secondary succession. If a stable plant cover can be established prior to or shortly after the actual time of field retirement, the soil surface may be stabilized with an arid-adapted climax plant community. This established plant community can help prevent blowing soil and decrease tumbleweed establishment. In addition, the establishment of a stable plant community of native plant species will attract wildlife. The landscape plan for the Bowie project has taken these factors into account, and provides a reclamation and revegetation process that addresses these issues.

Area Context

Every place has characteristics that make it either unique or common. These characteristics are shaped by forms and patterns reflective of the history and the use of an area. Changes, such as the construction and operation of the Bowie facilities, will modify the characteristics of the area; however, the placement of the facilities on site, arrangement of vegetation and selection of plant material, and manipulation of grade all assist in the overall integration of facilities into the area.

SECTION 3 - CONCEPTUAL LANDSCAPE PLAN

This section describes the facility layout; plan concept and specific plan components, and implementation of the plan.

Facility Layout

The Bowie Power Station facility consists of three primary components: switchyard, power blocks and cooling towers, and evaporation ponds. As illustrated in Figure B-2.2, these components have been arranged on the site to maximize functional relationships, provide continuity and minimize visual clutter, and maximize buffer zones and open space around the facility. Following is a brief description of the layout of these components.

The switchyard is located on the western edge of the site. It will be placed 200 feet off of the property line and aligned with the Eastern Arizona Railroad and the transmission corridor. This location creates the most efficient and direct route from the generation facility to the transmission corridor reducing the length of transmission lines and establishing continuity by matching the alignment of the transmission lines with the railroad. The 200-foot buffer between the railroad and switchyard provides for screening to views from the west. The cooling towers are located and aligned to take advantage of the direction of prevailing winds and match the alignment of the switchyard.

The evaporation ponds have been rotated to align with the existing layout of the agricultural fields and provide the greatest buffer between the facility and the surrounding properties. The southern edge of the evaporation ponds has been aligned with the east/west midsection line of Section 28 facilitating continued cultivation of the southeast quarter section of the site during the first phase of the project. This location also establishes a ¼ mile buffer on the north and east sides of the facility and a ½ mile buffer on the south side of the facility.

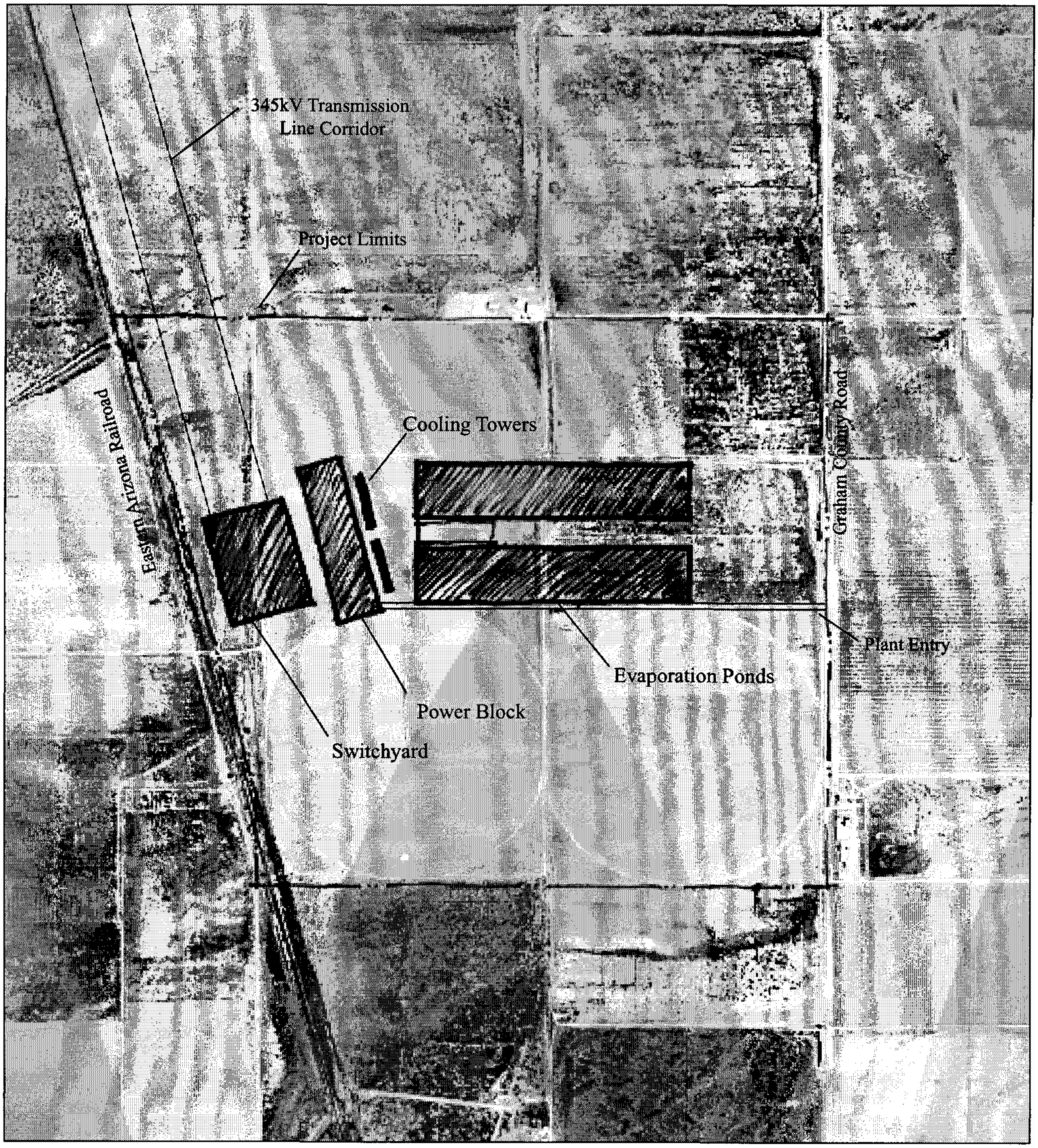
Plan Concept and Components

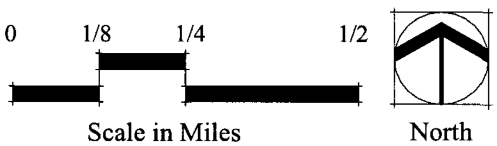
The project site and surrounding lands include a mixture of agricultural use that has transformed the natural desert setting of this area over time. The plan concept has considered this transition in the location of project facilities and arrangement of plan components as illustrated in Figure B-2.3.

The components of the conceptual landscape plan for the Bowie Power Station consist of three primary planting schemes (or zones) in conjunction with developed portions of the site as shown in Figures B-2.4 and B-2.5 (natural desert, agriculture/grassland, and orchard). Groves of trees arranged in rows similar to orchards, shrubs consistent with the natural desert, and grasses matching the surrounding area provide variety while helping to integrate the site into the surrounding area.

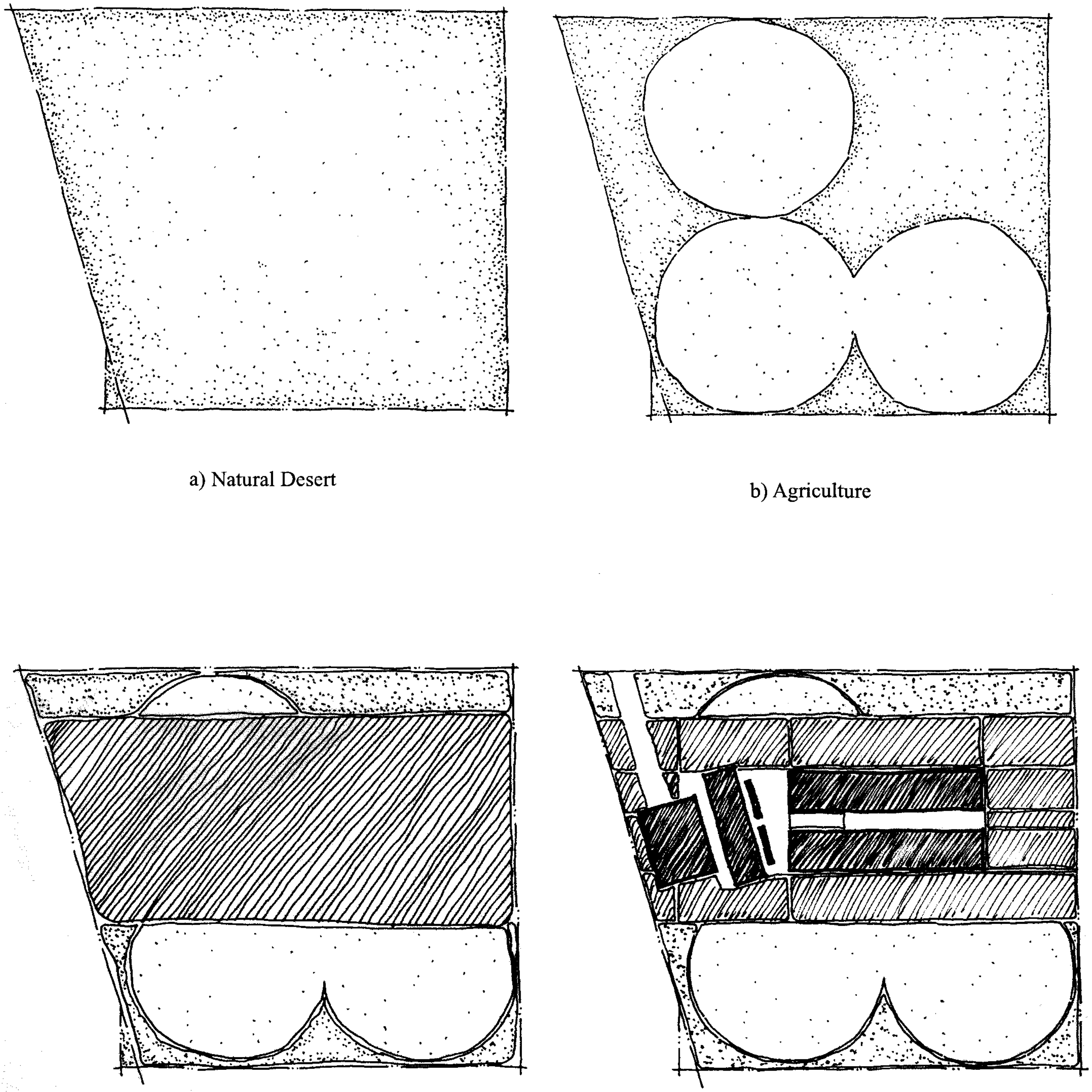
The first component, the natural desert component, is reflective of the region, primarily Chihuahuan semidesert grassland and Chihuahuan desertscrub. The plant material to be used is consistent with the plant material found in these biomes. Soaptree yucca (*Yucca elata*) will serve as the primary vertical element.

POWER FACILITY LAYOUT
FIGURE B-2.2





LANDSCAPE TRANSITION PROCESS
FIGURE B-2.3

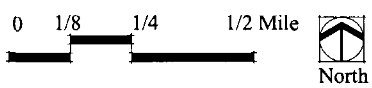


a) Natural Desert

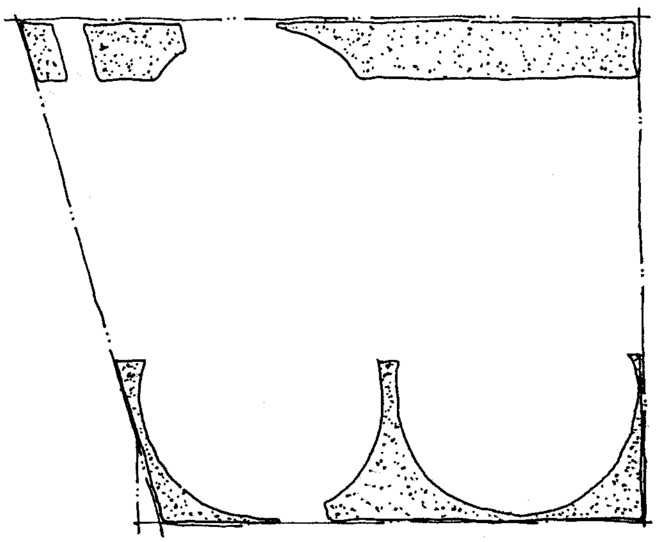
b) Agriculture

c) Orchards

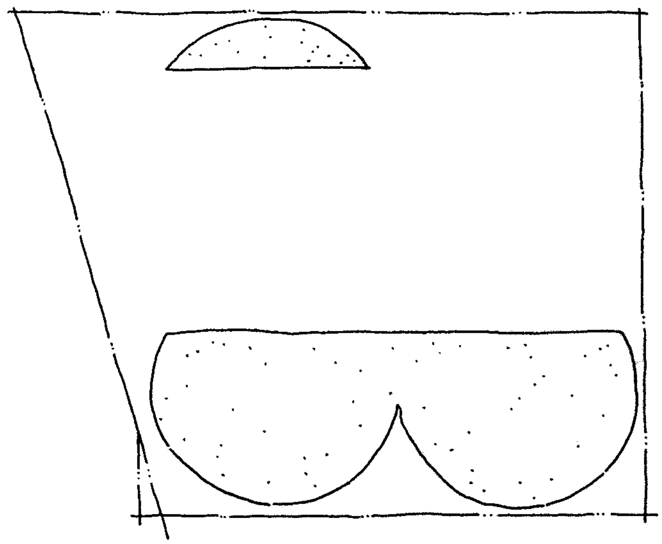
d) Industry



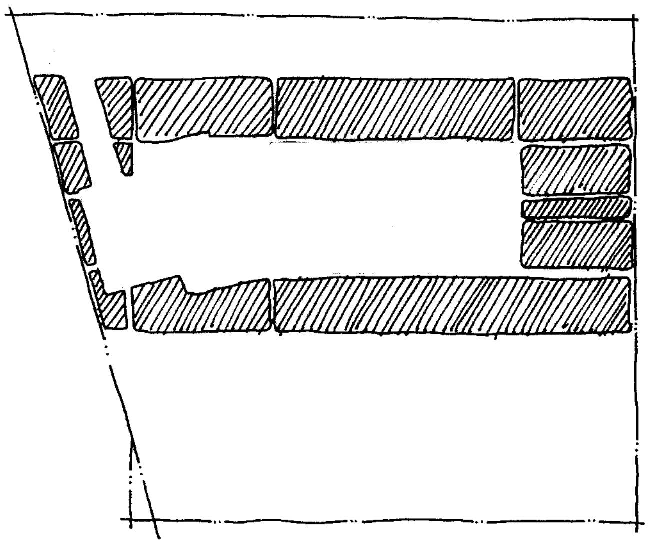
CONCEPTUAL LANDSCAPE PLAN COMPONENTS
FIGURE B-2.4



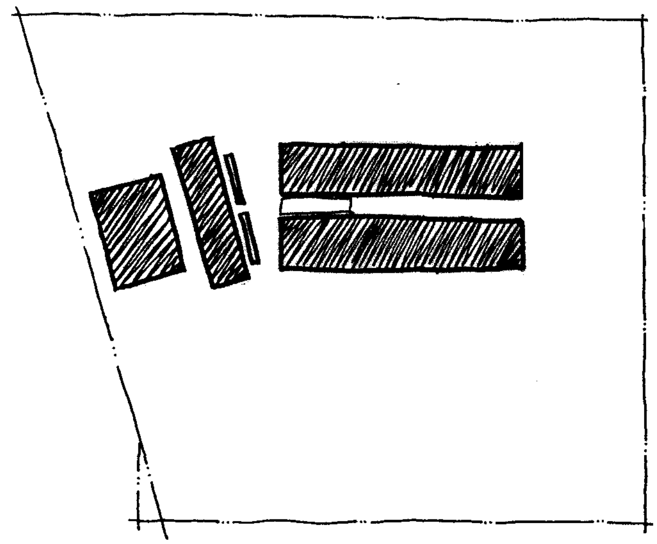
a) Natural Desert Component



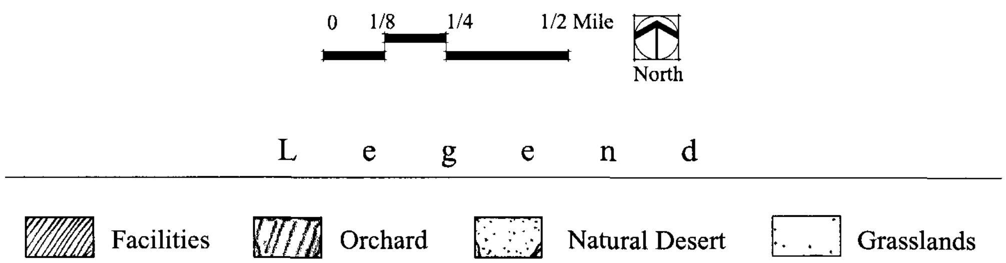
b) Agricultural/Grassland Component



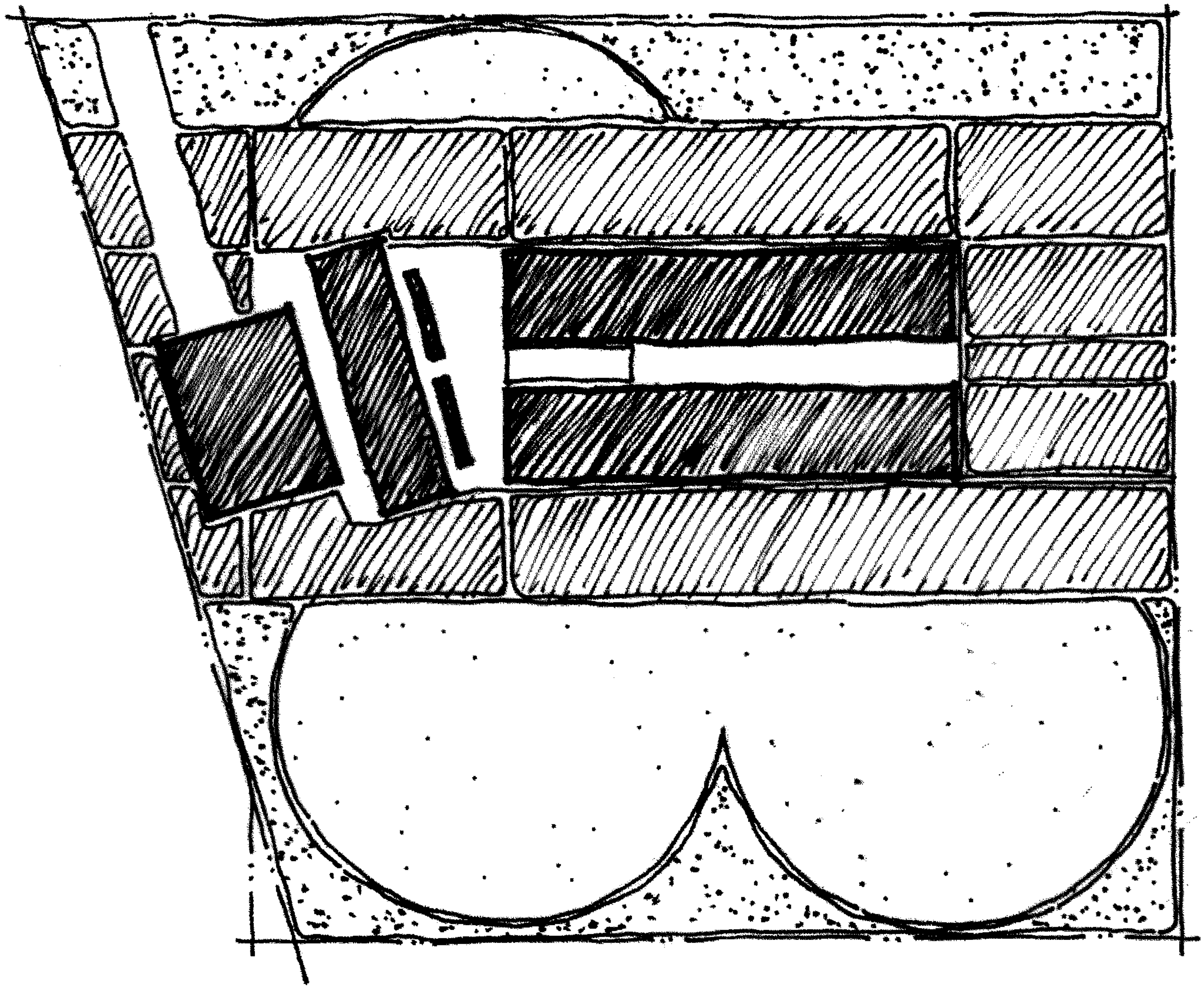
c) Orchard Component



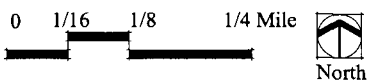
d) Plant Facilities



LANDSCAPE TRANSITION CONCEPT PLAN
FIGURE B-2.5



a) Landscape Transition Concept Plan



L e g e n d

Facilities   Orchard   Natural Desert   Grasslands

The agricultural/grassland component reflects the color and texture of the farm fields in this region that are typically low growing and yellow or green in color. Rather than continuing agricultural production in these areas, in order to establish a self-sustaining low water use landscape, natural desert grasses will be planted in the circular form created by irrigation pivot sprinklers.

The orchard has been designed to assist in screening and provide continuity with lands immediately to the east of the site and consistent with the region. Mesquite trees will be planted in rows in the form of an orchard. Although not considered an orchard tree, they have low water use requirements and are adaptable to the area. The soil excavated from the evaporation pond and retention basins will be spread out over the area designated for the orchard to raise the height of the trees and increase the screening of the facility. Desert grasses will be seeded under the trees to allow for revegetation and stabilization of the soil in this area.

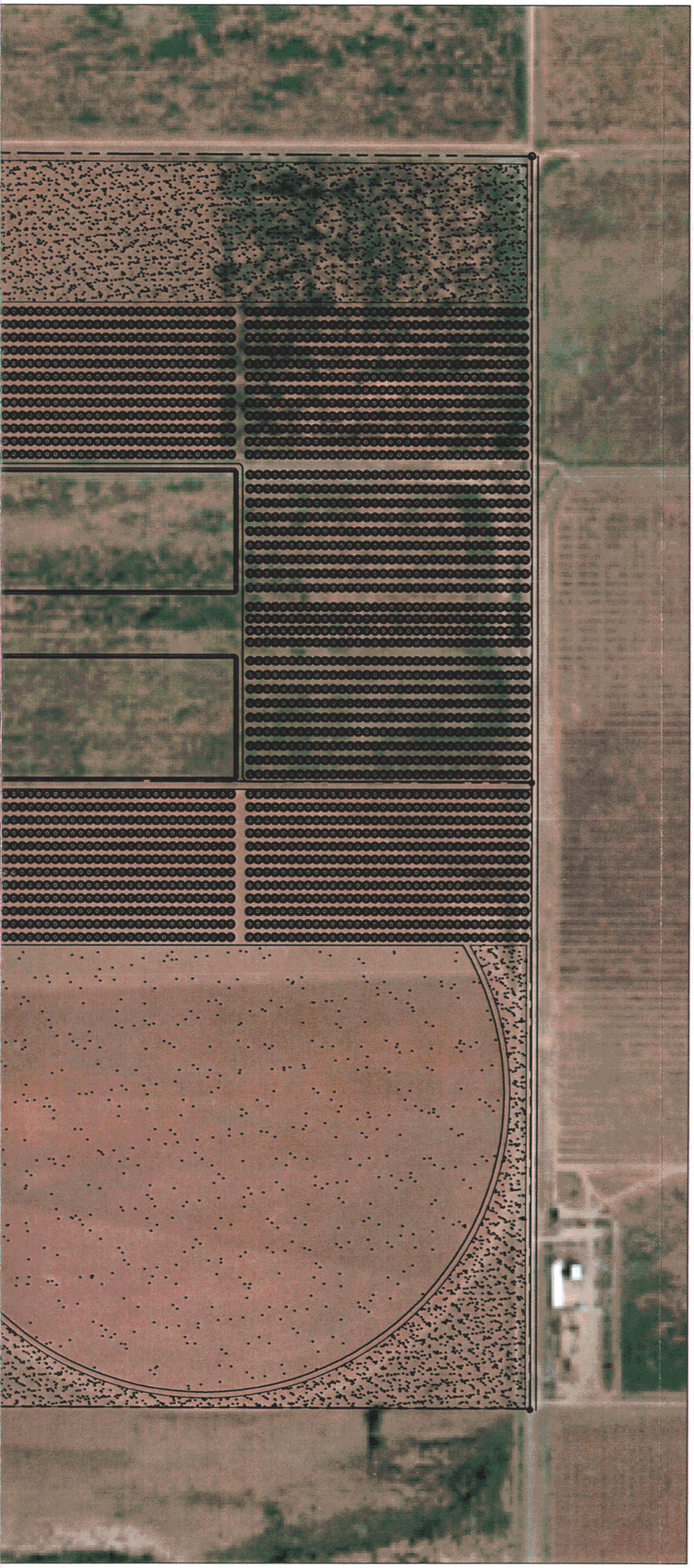
The landscape plan softens the industrial nature of the plant by placing landscape materials near project facilities. Colors of the facility will be carefully selected to assure that they compliment the landscape plan and do not detract from the surrounding area.

Implementation

The conceptual landscape plan (Figure B-2.6) illustrates how the landscape concept will be implemented and provides a list of plant material that may be selected in each of the three landscape zones previously described. Grassland/agricultural land will be seeded with native grasses in the circular form created by the existing irrigation pivots and under the orchard areas. Natural desert areas will be etablished with shrubs and grasses reflective of the Chihuahuan semidesert grassland and Chihuahuan desertscrub biomes.

Trees are to be planted in 15-gallon container size to facilitate the most effectively adaptation and success of the plant material. Accent shrubs (primarily yucca) are to be planted in 10-inch container size plants and inoculated with mycorrhiza, a microscopic fungi that has a symbiotic relationship with the plants and will increase the success rate from 10 to 20 percent to as much as 50 or 60 percent. Additional shrubs as well as groundcovers and grasses are to be established by preparing the seed bed, hydroseeding or drill seeding the appropriate seed mix, hydromulching where appropriate, and crimping with a grass hay mulch.

It is anticipated that the plantings will use supplementary irrigation from irrigation pivots and flood irrigation methods until established. Once established, the supplementary irrigation will be terminated and the species will rely on natural precipitation. Low water use and native plant material will be used exclusively.



BOWIE POWER STATION

Conceptual Landscape Plan

Figure B-2.6

Legend

Zone A - Natural Desert Theme

Zone B - Grassland / Agricultural Theme

Zone C - Orchard Theme

Plant List

Trees

Botanical Name	Common Name	Zone A	Zone B	Zone C
Cercidium floridum	*Blue Palo Verde*			○
Chilopsis linearis	*Desert Willow*			○
Prosopis alba	*Argentine Mesquite*			●
Prosopis alba 'Colorado'	*Colorado Mesquite*			●
Prosopis chilensis	*Chilean Mesquite*			○
Prosopis glandulosa	*Honey Mesquite*			○
Prosopis velutina	*Velvet Mesquite*			○

Shrubs

Botanical Name	Common Name	Zone A	Zone B	Zone C
Acacia constricta	*White Thorn Acacia*	●		
Acacia greggii	*Catclaw Acacia*	●		
Atriplex sp.	*Saltbush*	●		
Callindra eriophylla	*False Mesquite*	●		
Celtis pallida	*Desert Hackberry*	●		
Ephedra trifurca	*Mormon Tea*	●		
Larrea tridentata	*Creosote Bush*	●		
Lycium sp.	*Wolfberry*	●		
Opuntia spp.	*Prickly Pear / Cholla cacti*	●		
Parthenium incanum	*Mariola*	●		
Yucca beccata	*Banana Yucca*	●		
Yucca elata	*Soaptree Yucca*	●		

Groundcover/Grasses

Botanical Name	Common Name	Zone A	Zone B	Zone C
Agropyron smithii	*Western Wheat Grass*		●	●
Aristida sp.	*Three-on*	●	●	●
Bouteloua eriopoda	*Black Grama*	●	●	●
Bouteloua filiformis	*Slender Grama*	●	●	●
Datura meteloides	*Sacred Datura*	●		
Hilaria mutica	*Tobosa Grass*	●	●	●
Muhlenbergia porteri	*Bush Muhly*	●	●	●
Sporobolus wrightii	*Sacaton*		●	●
Tanicum obtusum	*Vine Mesquite Grass*	●	●	●
Trichachne californica	*Arizona Cottontop*	●	●	●
Tridens mudicus	*Slim Tridens*	●	●	●
Zinnia acerosa	*Desert Zinnia*	●		

Invading species

Botanical Name	Common Name	Zone A	Zone B	Zone C
Baccharis sarothroides	*Desert Broom*			
Bromus rubens	*Red Brome*			
Gutierrezia sarothrae	*Snakeweed*			
Isocoma tenuisecta	*Burroweed*			
Salsola iberica	*Russian Thistle*			
Salsola iberica	*Tumbleweed*			

Sources:
Arizona State Land Department, Phoenix, AZ 2001. United States Geological Survey (USGS), Wilcox AZ-NM 1994, Safford AZ-NM 1994, 1:100,000 scale metric topographic maps. Contours interpolated from USGS 1:24,000 scale digital elevation models at an interval of 40 feet.

Prepared for:
Bowie Power Station, L.L.C.

North

0 150 300 600

Scale: 1" = 300' - 0"

epg inc. environmental planning group

Phasing

It is anticipated that the landscape plan will be implemented over the course of a three-year period from the commencement of facility construction. In the first year the ground would be cleared and leveled, the evaporation pond and retention basins will be excavated, and the material from the basins spread over the area designated for orchards. The planting area will then be prepared including the addition of needed soil amendments. The site will be drilled or hydroseeded, and the seeded area will be covered with mulch and crimped. It is important that the seeding, mulching, and crimping be completed just prior to the monsoon season in order to take advantage of the monsoon precipitation. Once the understory planting is established (approximately two growing seasons) the trees and accent shrubs will be planted. It is anticipated that the southeast quarter-section may remain in agricultural production until the second 500 MW power block is under construction. A similar process, as outlined above, will follow at that time for the southeast quarter.

EXHIBIT B-3
WATER SUPPLY INVESTIGATION REPORT

WATER SUPPLY REPORT
FOR THE PROPOSED
BOWIE POWER STATION
BOWIE, ARIZONA

Prepared for

BOWIE POWER STATION, L.L.C.

URS Job No. E1-00001844.00
July 26, 2001

REGISTERED GEOLOGIST
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1.0 INTRODUCTION

1.1 BACKGROUND

Bowie Power Station, L.L.C. has acquired options to purchase approximately 1,640 acres of agricultural land about 2 miles north of Bowie, Arizona, for the construction of a nominal 1,000-megawatt combined-cycle power plant. At 1,000-megawatt base load operation, the Bowie Power Station is estimated to require a continuous water supply of about 3,410 gallons per minute (gpm), or an average of 5,500 acre-feet per year (ac-ft/yr). The only available source of water for the power plant is groundwater, which is currently used for agricultural irrigation. Central Arizona Project (CAP) water and other surface water supplies are not available, and there is an insufficient supply of treated wastewater effluent. The Bowie Power Station property is not located within an Arizona Department of Water Resources (ADWR) Active Management Area (AMA) or irrigation district.

This report presents the results of a water supply investigation for the Bowie Power Station property (Bowie property). Included in this report is an overview of groundwater availability and quality in the vicinity of the property, a review of current and historic pumpage, the results of a field investigation, and the results of water level drawdown modeling to project impacts of pumping after 30 years.

1.2 PROPERTY LOCATION

The Bowie property is located in the northeast portion of Cochise County, Arizona, about 2 miles north of the town of Bowie, Arizona (see Figure 1). The property boundary and the proposed Bowie Power Station site are shown on Figure 2. Wells on and near the property are also shown on Figure 2 and are listed in Table 1. The 1,640-acre property consists of approximately 2.5 square miles of agricultural land located in all or portions of sections 20, 21, 22, 27, 28, 29, and 33 of Township 12 South, Range 28 East, of the Gila and Salt River baseline and meridian. The proposed Bowie Power Station site encompasses approximately 703 acres in all of Section 28 and a portion of Section 29.

1.3 PURPOSE AND SCOPE

A water supply investigation of the Bowie property was conducted to characterize the availability, production potential, and quality of groundwater on the property, and to assess potential water level drawdown from groundwater pumping to supply the power plant. This consisted of characterizing groundwater conditions in the vicinity of the property using available information, completing a field investigation of the property, and analyzing the data obtained from the investigation. The scope of work included:

- compiling available information and performing an initial assessment of groundwater conditions in the area;
- compiling an inventory of existing wells on the property and selecting wells for aquifer testing and groundwater sampling;
- collecting drawdown data during irrigation events from two pumping wells and two observation wells on the property to characterize aquifer parameters and well yield;
- collecting and arranging for the analysis of groundwater samples from two irrigation wells on the property to characterize groundwater quality; and
- modeling water level drawdown to assess the incremental drawdown from pumping to supply the power plant.

2.0 GROUNDWATER CONDITIONS

2.1 HYDROGEOLOGIC SETTING

The Bowie property is located in the northwestern portion of the San Simon Valley sub-basin in southeastern Arizona (Barnes, 1991.) The area is part of the Basin and Range physiographic province, which is characterized by predominantly northwest-trending mountains separated by broad alluvial valleys. The San Simon Valley sub-basin is 6 to 25 miles wide and about 75 miles in length, covering approximately 1,930 square miles, and is bounded by the Chiricahua, Pinaleno, and Dos Cabeza Mountains on the west, and the Peloncillo Mountains on the east (Figure 1). The mountains that surround the sub-basin are composed of relatively impermeable granitic, metamorphic, and volcanic rocks that have produced the basin-fill sediments that comprise the regional aquifer.

The climate is typical of southeastern Arizona, and is characterized by low precipitation, high summer temperatures, and low humidity, which combine to cause high evaporation rates. Average annual rainfall is 8 to 10 inches.

The total thickness of the San Simon Valley sub-basin sediments may exceed 8,000 feet along the axis of the valley (Oppenheimer and Sumner, 1980). Younger alluvial fill occurs along modern stream channels, but is likely to be intermittently saturated and not hydraulically connected to the regional aquifer. The older alluvial fill of the San Simon Valley sub-basin has been subdivided into upper, middle, and lower units (Barnes, 1991). A marginal zone along the edges of the basin has been described where the middle unit is not present and the upper and lower units merge (White, 1963). The four units are described below, in descending order.

- The upper unit consists mainly of unconsolidated stream deposits of silt, sand, and gravel and forms a continuous geologic unit across the basin. The thickness of the upper unit ranges from 60 to 200 feet and driller's logs indicate that the upper unit is about 150 feet thick in the vicinity of the Bowie property. Where the upper unit is saturated in localized areas, the unit is designated as the upper aquifer.

- The middle unit (Barnes, 1991) or blue clay unit (White, 1963) underlying the upper unit consists of dense, blue clay formed by fine-grained sediments deposited during a period when a shallow lake occupied a large part of the San Simon Valley. The middle unit is about 600 feet thick along the axis of the valley, and acts as a confining layer. Near the basin margins, the middle unit pinches out and the upper and lower units merge to form the marginal zone. In the vicinity of the Bowie property, the middle unit is believed to be about 350 feet thick, extending to a depth of about 500 feet below ground surface (bgs).

- The lower unit consists of stream and lake-bed deposits of clay, silt, sand, and gravel that overlie bedrock and in places are interbedded with volcanic debris. The unit is continuous throughout the basin and merges with the upper unit along the basin margins in the marginal zone. Groundwater occurs under confined conditions in sand and gravel units interfingered with layers of dense clay to form the lower aquifer, which supplies most of the groundwater used in the San Simon Valley sub-basin and would be the source of groundwater for the power plant. The thickness of the lower unit is generally unknown, but may be as much as 8,000 feet along the valley axis (Oppenheimer and Sumner, 1980). The thickness of the lower unit in the vicinity of the Bowie property is unknown.

- The marginal zone occurs along the margins of the basin where the middle unit pinches out and the coarser materials of the upper and lower units merge. Within the marginal zone the upper and lower aquifers have merged to form a single, unconfined aquifer.

2.2 GROUNDWATER DEVELOPMENT

Groundwater from shallow wells in the upper aquifer was pumped for domestic uses and livestock watering beginning in about 1870; however, the groundwater was too deep to be used for irrigation with the pumping methods available at that time. In 1910, a deep well was drilled into the lower aquifer for the Southern Pacific Railroad and the discovery of artesian conditions led to agricultural development. Average artesian pressure measured for eight wells in 1913 was 31 feet above land surface (Barnes, 1991). By 1915, there were 127 flowing wells in the San Simon Valley, each with an average flow rate of about 50 gallons per minute, producing an estimated 11,000 acre-feet of water per year (Barnes, 1991). Average artesian head in 1915 was 19 feet above land surface.

Depressed economic conditions following World War I led to the abandonment of many farms, and uncapped wells were allowed to flow unused, resulting in year-round flow in San Simon Creek. By the 1950s, artesian head had declined to the point that most wells required pumping at least part of the time to meet irrigation needs. In 1991, there were ten flowing wells in the San Simon Valley sub-basin (Barnes, 1991); however, these wells are completed in deeper, older sediments than those originally tapped in 1910.

As artesian head declined in lower aquifer wells, and after the advent of deep-well turbine pumps and electrical power in the 1930s, the upper aquifer began to be used for irrigation. In 1987, water levels in the upper aquifer ranged from 30 to 80 feet and well yields were reported to range from 75 to 300 gpm (Barnes, 1991).

2.3 GROUNDWATER RECHARGE AND DISCHARGE

Both the upper and lower aquifers are recharged by infiltration of runoff along the mountain fronts. Due to high evaporation rates, recharge from infiltration of precipitation that falls on the valley floor is negligible. In addition to recharge from precipitation runoff, the upper aquifer receives as much as 15 percent of water applied for irrigation as recharge (Barnes, 1991). In the past, exchange occurred from the lower aquifer to the upper aquifer through well casings. Because the artesian pressure head has now dropped below the water level in the upper aquifer, it is likely that some exchange occurs today from the upper aquifer to the lower aquifer through wells. Irrigation pumpage is the major source of discharge from both the upper and lower aquifers in the San Simon Valley sub-basin.

2.4 DEPTH TO GROUNDWATER

Artesian pressure was measured for eight wells in 1913 and average head was about 31 feet above land surface (Barnes, 1991). Groundwater level hydrographs prepared using water level data from ADWR for wells located on and near the Bowie property are presented in Figures 3 and 4, respectively. The water level hydrographs show historic water levels from as early as 1947. Estimated decline from average artesian pressure measured in 1913 and 1915 is also shown on Figures 3 and 4. Well (D-12-28) 17 DDD is located about 1 mile north of the property, well (D-12-28) 25 DCC is about 2.5 miles east of the property, and well (D-12-28) 35 CDC2 is about 1.5 miles southeast of the property.

URS measured groundwater levels in selected wells on the site property where sounder access was available. Because an unknown thickness of lubrication oil from line-shaft pumping equipment was present in most wells, groundwater level measurements were erratic and should be considered to be approximate. Groundwater levels in lower aquifer wells on the Bowie property measured in April 2001 prior to the start of the irrigation season ranged from about 367 to 403 feet bgs. The following table summarizes groundwater level measurements collected prior to the start of the 2001 irrigation season.

Well ID	Well Use	Depth to Water (ft bgs)	Approximate Water Level Elevation (ft amsl)
(D-12-28) 28 ABC	Inactive	367	3349
(D-12-28) 28 CCC2	Active	403	3344
(D-12-28) 28 DCC	Active	388	3341
(D-12-28) 33 ABC	Inactive	394	3338

ft bgs = feet below ground surface

ft amsl = feet above mean sea level

2.5 GROUNDWATER USES

Most of the groundwater pumped in the San Simon Valley sub-basin is used for agricultural irrigation. Other uses, such as municipal and industrial, represent a relatively small percentage of total groundwater withdrawals.

2.6 GROUNDWATER QUALITY

Groundwater quality data for the northern portion of the San Simon Valley sub-basin were obtained from ADWR, the Arizona Department of Environmental Quality (ADEQ), and the United States Geological Survey (USGS). A summary of available groundwater quality data obtained from these agencies is presented in Table 2.

The results indicate that inorganic groundwater quality in the vicinity of the Bowie property is good. Review of the analytical results in Table 2 indicates only one sample with concentrations of inorganic constituents in excess of Arizona numeric Aquifer Water Quality Standards (AWQS). A 1986 groundwater sample from Well (D-13-28) 34 BBC2 had a total nitrate (nitrate plus nitrite) concentration of 11 milligrams per liter (mg/L), which exceeds the numeric AWQS of 10 mg/L. The observed nitrate exceedance is likely related to the use of nitrogen-based fertilizers and is typical for groundwater in established agricultural areas.

3.0 WELL INVENTORY AND GROUNDWATER PUMPAGE

3.1 SOURCES OF WELL DATA

Well data were obtained from the ADWR Groundwater Site Inventory (GWSI) and Well Registry databases and were used to develop a list of potential existing wells on and adjacent to the Bowie property. The ADWR well databases include information on well location, ownership, construction, water uses, production capacity, and water levels. Data for wells located on and immediately adjacent to the Bowie property are presented in Table 1. Copies of well registrations and driller's logs, if available, were obtained from ADWR for wells located on the Bowie property and are provided in Appendix A. Some records were modified based on information from recent video surveys reported by local pump contractors.

3.2 WELL INVENTORY

A search of the ADWR GWSI and Well Registry databases produced a total of 16 wells reportedly located within the Bowie property boundaries. All but three wells have ADWR registration numbers; two of the unregistered wells are capped. Table 1 lists the locations, registration numbers, water uses, construction data, and associated comments for wells located on and immediately adjacent to the Bowie property. The ADWR databases typically include well location, well registration number (if any), well construction date, well depth, screened interval (if any), casing diameter, water use, and owner information. However, records for well construction details in the Bowie area were limited.

A field inventory of the Bowie property was conducted to verify wells listed in the ADWR databases. The objective of the field inventory was to ascertain which wells were currently active and/or available for monitoring, testing or sampling. ADWR field-verifies some of the wells throughout the state on a periodic basis and updates the GWSI database with information concerning owner, water use, and well use, if known. The most recent basin-wide well inventory of the Bowie area was conducted by ADWR in 1987.

Field inspection of the Bowie property confirmed the existence of 16 wells, including:

- Two active irrigation wells with line-shaft pumps, gear drives, and natural gas powered engines: (D-12-28) 28 DCC and (D-12-28) 28 CCC2.
- Two inactive irrigation wells with line-shaft pumps, gear drives, and natural gas powered engines: (D-12-28) 33 ABC and (D-12-28) 27 BBC.

- Four wells with derelict pumping equipment.

- Two domestic wells with electric submersible pumps. Well (D-12-28) 21 CDD is active, and well (D-12-28) 22 DDC is inactive.

- Six capped wells, of which three are deep wells: (D-12-28) 21 DCC, (D-12-28) 22 CDC, and (D-12-28) 28 ABC. The other three wells are believed to be shallow. Well (D-12-28) 21 DCC was reported to produce sand, causing damage to pumping equipment.

3.3 HISTORICAL GROUNDWATER PUMPAGE

In the San Simon Valley sub-basin, no surface water supplies are available and irrigated agriculture relies entirely on groundwater. The San Simon Valley sub-basin is not within an AMA and there are no requirements for reporting groundwater pumpage. Estimated historic groundwater pumpage (Anning and Duet, 1994) is shown on figures 3 and 4. Pumpage increased dramatically after 1950 to a maximum of 139,000 acre-feet per year (ac-ft/yr) in 1980 (Anning and Duet, 1994). Subsequently, rising energy prices and agricultural market conditions resulted in decreased groundwater pumping, and by 1983 pumpage had decreased to about 42,000 ac-ft/yr. Prior to 1990, groundwater pumpage was estimated yearly from review of power consumption records. Groundwater pumpage was estimated by the USGS for 1995 using crop information and weather data, and was estimated to be about 50,000 ac-ft/yr for the San Simon Valley (personal communication S. Tadayon, USGS, June, 2001).

Prior to 1980, cotton was the principal crop but required rotation, mainly with grain crops. Rising energy costs and falling grain prices in the early 1980s resulted in allowing available land to lie fallow during alternate years rather than growing grain as a rotation crop with cotton. During the period from 1980 to present, most farms in the area typically had about 60 percent of available land in production at any one time, due to limitations of well capacity or crop rotation requirements (personal communication, R. Eastman, June 12, 2001).

In the area north of Bowie and west of Graham County Road, which includes the Bowie Power Station site, most of the available land was in production up until about 1998. Cotton was the principal crop, with smaller amounts of chiles, garlic, and alfalfa. Average consumptive use was reported to be about 6 acre-feet per acre per year (ac-ft/ac/yr) for row crops. Production resumed on about 250 acres in year 2000, growing chiles, sweet potatoes, garlic, and squash at an average rate of consumptive use of about 3.5 ac-ft/ac/yr, using pivot sprinkler systems that are more efficient than flood irrigation of row crops (personal communication, M. Cook, June 12, 2001).

In the area north of Bowie and east of Graham County Road, some land was retired from cotton in the 1960s. In the late 1970s and early 1980s about 400 acres were converted to pecan and pistachio trees using about 6 ac-ft/ac/yr. In the mid 1990s, another 320 acres of cotton were retired. In 1998, 32 acres of pecan trees were planted. In the near future, production may resume on an additional 330 acres using an average of 5 ac-ft/ac/yr (personal communication, P. Hogue, June 12, 2001).

USGS and U.S. Department of Agriculture (USDA) estimates of water requirements for various crops tend to be lower than those reported by Bowie-area farmers. The USGS estimates plant use by modeling evapotranspiration from temperature and humidity data. The USDA's estimates are also for plant use. Farmers have different criteria for determining pumpage schedules. Farmers irrigating row crops are required to pump long enough to get water to reach distant parts of the field, sometimes overwatering areas nearest the source. One well might be able to flood irrigate 20 acres of row crops in a 24-hour period. Using irrigation pivot sprinklers, the same well can irrigate 120 acres in a 24-hour period, with a uniform application (personal communication, R. Eastman, June 12, 2001). Landowners' estimates are based on approximations of unmetered pumping rates and number of irrigation days.

3.4 CURRENT AND FUTURE GROUNDWATER PUMPAGE

From the mid 1980s to the mid 1990s, estimated average annual groundwater pumpage in the San Simon Valley sub-basin was about 46,000 ac-ft/yr (Anning and Duet, 1994). The Bowie property covers an area of about 1,640 acres, of which about 703 acres will be used for the Bowie Power Station (see Figure 2). Most of the 703 acres planned for the power station is either currently in agricultural use or was in use until about 1998, and will be converted to industrial use. The remainder of the property consists of agricultural land which has been fallow for several years and will not be cultivated in the future. Assuming 60 percent of the 1,640-acre Bowie property was in production during the recent period from the mid 1980s to 2001 at an average consumptive use of 6 ac-ft/ac/yr results in a historical average consumptive use of about 3.6 ac-ft/ac/yr, or about 5,900 ac-ft/yr. The Bowie Power Station water requirement will be about 5,500 ac-ft/yr. Assuming that no current or former agricultural land will be placed into production, the average water use for the 1,640-acre property will be 3.35 ac-ft/ac/yr, resulting in a net decrease in pumpage for the Bowie Power Station compared to the reported historical average pumpage for the property.

3.5 LAND SUBSIDENCE AND EARTH FISSURES

Groundwater pumping in the San Simon Valley sub-basin has caused historic groundwater level declines and land subsidence in several areas, including Bowie. Holzer (1980) investigated subsidence in the San Simon Valley by comparing 1952 and 1974 leveling data along Interstate 10 from a point about 6 kilometers (3.7 miles) west of Bowie to a point a few kilometers east of Bowie. Holzer found subsidence along the entire interval with the maximum of 4.7 feet located at Bowie. The National Geodetic Survey (NGS) compared 1952 and 1980 leveling data for about 100 km (62 miles) along Interstate 10, near Bowie (Strange, 1983). The 1980 data indicated that subsidence had continued, with a maximum of 178 centimeters (5.9 feet) recorded near Bowie. Two survey stations showing maximum subsidence were located along the Southern Pacific Railroad about 1.5 miles south of the Bowie property. Near the town of San Simon, maximum subsidence was 39 centimeters (1.3 feet) in 1980.

The average rate of subsidence near Bowie for the 22-year period from 1952 to 1974 measured by Holzer (1980) was about 0.21 feet per year. For the 28-year period investigated by the NGS (Strange, 1983), the average rate of subsidence was also about 0.21 feet per year. For the 6-year period from 1974 to 1980, the average rate of subsidence was about 0.20 feet per year. Subsidence rates were last measured near the end of the period of extensive groundwater withdrawal and may have decreased in response to reductions in groundwater withdrawals. URS is currently compiling updated leveling data from the NGS, the USGS, and the Arizona Department of Transportation as part of an analysis of potential future subsidence.

Earth fissures were reported to have begun in the mid-1950s (Holzer, 1980). Holzer (1980) found a number of earth fissures near Bowie from investigation of 1978 aerial photography and field reconnaissance. The largest linear fissures intersect Interstate 10 about 6 miles east of Bowie. Another linear fissure is located about 4 miles east of Bowie and about 2 miles north of Interstate 10. Based on a review of published data, there are no known earth fissures near or on the Bowie property.

Although the Bowie Power Station will be located within an area of documented historic land subsidence, preliminary indications are that future subsidence on and in the vicinity of the property will not be of sufficient magnitude to cause concern, and that the power plant facilities and infrastructure can be engineered and constructed to accommodate future subsidence and operate safely. As indicated above, there are no known earth fissures near or on the Bowie property.

4.0 AQUIFER TESTING AND GROUNDWATER QUALITY SAMPLING

4.1 INTRODUCTION

Existing agricultural irrigation wells were selected for aquifer testing and groundwater sampling based on the results of the field inventory. Two wells were selected for testing and sampling: (D-12-28) 28 CCC2 and (D-12-28) 28 DCC. The wells are both equipped with operable, line-shaft turbine pumps. The wells are active irrigation wells and began pumping in late March 2001. Based on the driller's recollection from 1975, both wells are reported to be 1,000 feet deep and perforated from 700 to 1,000 feet bgs (personal communication from J. McBee, 2001). The GWSI database lists a total depth of 1,200 feet for well (D-12-28) 28 DCC. A third well on the property, (D-12-28) 33 ABC, with a total depth of 550 feet, is equipped and may be used later in the season for irrigation.

The irrigation wells are operated using line-shaft turbine pumps, driven by natural gas powered engines. Pump intake is reported to be about 540 feet bgs in both wells. Pumped water is currently conveyed via underground pipeline to two irrigation pivots with sprinkler nozzles designed for a flow rate of about 800 gpm at a pressure of 25 pounds per square inch (psi). The west pivot operates in a full circle, covering 120 acres; the east pivot covers 60 acres in a half circle. Either well can be piped to either pivot. Another area of less than 20 acres is sometimes planted in vegetables. Row crops of garlic are watered by decreasing engine speed and pumping to irrigation ditches. Fixed pipe sprinklers are also used for irrigating squash. Another 60 acres of pinto beans will likely be planted in July 2001.

Other wells on the property had derelict pumping equipment, reported problems, or were in unknown condition. No alternate water discharge options were available for the two active wells. Land was not available for discharge of the pumped water during a standard aquifer test.

4.2 AQUIFER TESTING FIELD PROCEDURES

The investigation was conducted by equipping two observation wells and the two active pumping wells with pressure transducers and dataloggers to record groundwater levels; a fifth pressure transducer and datalogger were used to measure changes in barometric pressure. Because testing was conducted at the start of the growing season, it was necessary to test the two wells in conjunction with agricultural irrigation activities. The wells are not equipped with flowmeters and do not have a sufficient length of straight pipe at the wellhead to install a flowmeter. Pumping rate is controlled by monitoring pressure gages and adjusting engine speed.

For periods when the wells supplied an irrigation pivot sprinkler, pumping rates were estimated using nozzle design formulas for pressure and flow rate. For periods when the wells discharged to an open irrigation ditch or fixed sprinklers, pumping rates were estimated based on drawdown in the wells, and specific capacity computed for the wells at other pumping rates. Specific capacity is defined as the ratio of the pumping rate divided by the drawdown and has units of gallons per minute per foot of drawdown (gpm/ft). Pumping rates were verified using a magnetic flowmeter temporarily installed at each irrigation pivot.

4.3 AQUIFER TEST RESULTS

Estimates of aquifer transmissivity and storativity were obtained by analyzing the relationship between time and drawdown during pumping, and between time and residual drawdown during recovery. Aquifer parameters were estimated using AQTESOLV™, a computer-based program for analyzing aquifer test data. Irrigation pumping started at well (D-12-28) 28 DCC on March 29, 2001, and at well (D-12-28) 28 CCC2 on April 2. Both wells were pumped on an irregular schedule during the month of April. Beginning on May 4, 2001, both wells were off for a period of about 6 days.

4.3.1 Well (D-12-28) 28 CCC2 Aquifer Test Results

Well (D-12-28) 28 CCC2 was pumped for a period of about 3 days beginning about 6:00 A.M. on May 10, 2001. Well (D-12-28) 28 DCC was not pumped during this period and was used as an observation well in addition to wells (D-12-28) 28 ABC and (D-12-28) 28 BCC. The pumping rate at well (D-12-28) 28 CCC2 was estimated to be about 650 gpm while watering row crops, about 850 gpm while discharging to the east pivot, and about 900 gpm while discharging to the west pivot. The average pumping rate was about 867 gpm. Well (D-12-28) 28 CCC2 was shut off at about 7:00 A.M. on May 13. Residual drawdown was measured in the pumped well and the four observation wells during the recovery period for about 1.5 days until well (D-12-28) 28 DCC was started at 6:00 P.M. on May 14.

Results for the May 10-14 aquifer test at well (D-12-28) 28 CCC2 are included in Appendix B and are summarized in Table 3. Estimates of transmissivity ranged from 34,000 to 71,000 gallons per day per foot (gpd/ft). Estimates of storage coefficient ranged from 0.0004 to 0.0007 (dimensionless). Results for recovery data from well (D-12-28) 28 BCC were not reported due to well interference from nearby well (D-12-28) 29 DBC.

4.3.2 Well (D-12-28) 28 DCC Aquifer Test Results

Well (D-12-28) 28 DCC was pumped for a period of about 6 days beginning at about 6:00 P.M. on May 14, 2001. Well (D-12-28) 28 CCC2 was not pumped during this period and was used as an observation well in addition to wells (D-12-28) 28 ABC and (D-12-28) 28 BCC. The pumping rate at well (D-12-28) 28 DCC was estimated to be about 650 gpm while watering row crops, about 850 gpm while discharging to the east pivot, and about 900 gpm while discharging to the west pivot. The average pumping rate was about 721 gpm. Well (D-12-28) 28 DCC was shut off at about 6:00 P.M. on May 18. Residual drawdown was measured in the pumped well and the four observation wells during the recovery period for about 1.5 days until well (D-12-28) 28 CCC2 was started at about 11:00 A.M. on May 20.

Results for the May 14-20 aquifer test at well (D-12-28) 28 DCC are included in Appendix B and are summarized in Table 3. Estimates of transmissivity ranged from 40,000 to 89,000 gpd/ft. Storage coefficient was estimated using data from observation well (D-12-28) 28 CCC2 to be about 0.0003 (dimensionless). Wells (D-12-28) 28 ABC and (D-12-28) 28 BCC had not recovered sufficiently prior to the May 14 test and results were not reported due to well interference effects.

4.3.3 Comparison with Published Values for Aquifer Parameters

Analysis of the aquifer test data indicates that estimates of transmissivity for the lower aquifer range from 34,000 to 89,000 gpd/ft and estimates of storage coefficient range from 0.0003 to 0.0007. For both tests, the highest values of transmissivity were estimated for well (D-12-28) 28 DCC. In addition, the specific capacity of well (D-12-28) 28 DCC was observed to be about twice as high as the specific capacity of well (D-12-28) 28 CCC2. A representative value of transmissivity for the lower aquifer in the vicinity of the Bowie Power Station is conservatively estimated to be approximately 40,000 gpd/ft. A representative value of storage coefficient for the lower aquifer is estimated to be approximately 0.0005.

No published values for aquifer parameters based on aquifer tests were located during review of hydrogeological records and documents. However, in the absence of more reliable aquifer test data, White (1965) used estimates of transmissivity for seven wells completed in the lower aquifer in the Bowie area to construct an electric analog model. Based solely on specific capacity data, estimates for transmissivity ranged from 8,000 to 34,000 gpd/ft; average estimated transmissivity was about 23,500 gpd/ft. For the seven wells reviewed by White, five were less than 660 feet deep. The deepest well was 1,040 feet and had an estimated transmissivity of 28,000 gpd/ft. Estimates of transmissivity made by White may have been influenced by shallower well depths and poor well efficiency. Transmissivity based solely on specific capacity for wells at the Bowie property is estimated to be about 22,000 gpd/ft for well (D-12-28) 28 CCC2 and about 35,000 gpd/ft for well (D-12-28) 28 DCC.

White also estimated storage coefficient to be 0.10 based on an analysis of the volume of dewatered sediments. White (1965) indicated that the large estimate of storage coefficient might have been influenced by interaction between the upper and lower units through vertical leakage and through wells completed in both units.

4.4 GROUNDWATER SAMPLING RESULTS

Two groundwater quality samples were collected from active irrigation wells during the field investigation. Well (D-12-28) 28 DCC was sampled at 12:56 P.M., March 30, 2001, after 21 hours of pumping at about 850 gpm. Well (D-12-28) 28 CCC2 was sampled at 7:20 A.M., April 3, 2001, after 19 hours of pumping at about 900 gpm. Groundwater samples from both wells were analyzed for indicator parameters, major ions, total petroleum hydrocarbons, and metals. The analytical results are presented in Table 4. The results indicate that most inorganic parameters, including nitrate, are present at concentrations that do not exceed numeric AWQS.

Concentrations of TDS, sulfate, chloride, manganese, silver, and zinc are all below the Federal Secondary Maximum Contaminant Levels (SMCLs). SMCLs are associated with the aesthetic quality of the water, such as taste, odor, or color, and are not enforceable. TDS concentrations in the groundwater samples were 230 and 250 mg/L. Concentrations of total nitrates (nitrate plus nitrite) were 0.87 to 0.82 mg/L.

Total coliform bacteria results for both wells were positive, indicating the presence of bacteria. Agricultural irrigation wells are not usually chlorinated and do not have surface seals that meet municipal water supply standards. Therefore, the presence of bacteria is common in irrigation wells.

Petroleum hydrocarbons were detected in the sample from well (D-12-28) 28 DCC at a concentration of 2.2 mg/L total petroleum hydrocarbons (TPH). There is no AWQS for TPH. Line-shaft turbine pumps use oil to lubricate the line-shaft bearings. Columns of oil as much as several feet thick, floating on the water column, are not uncommon in irrigation wells.

5.0 WATER LEVEL DRAWDOWN MODELING

Water level drawdown from the proposed groundwater production wellfield was modeled to estimate the incremental drawdown from the proposed wellfield for the projected 30-year life of the power plant. Water level drawdown was analyzed using an analytical groundwater flow model.

5.1 PROPOSED PRODUCTION WELLFIELD

The Bowie Power Station will require a water supply of approximately 5,500 ac-ft/yr or 3,410 gpm when fully developed and operating at base load. Assuming a typical groundwater production well will be capable of yielding between 800 and 1,200 gpm, a total of six wells will be needed to supply groundwater for the power plant. This arrangement will provide sufficient operational capacity, with four wells operating simultaneously and two wells down for maintenance or repair. Six wells were simulated for a plant life of 30 years using input values of transmissivity and storage coefficient obtained from analysis of aquifer test data.

5.2 ANALYTICAL METHOD

Water level drawdown was analyzed using DREAM (Bonn and Rounds, 1990), a computer-based, analytical groundwater flow model. DREAM is capable of simulating groundwater elevation, drawdown, velocity, and streamlines for up to 30 pumping wells. The drawdown option was selected for the well impact analysis. DREAM calculates transient drawdown data for each pumping well using the Theis equation (1935), which defines unsteady, radial flow in a confined aquifer.

The assumptions inherent in the Theis equation are as follows:

- The aquifer is homogeneous, isotropic, confined, of uniform thickness, and of infinite areal extent.
- The potentiometric surface is horizontal before pumping.
- The well is pumped at a constant rate.
- The pumped well penetrates the entire thickness of the aquifer, and flow within the aquifer is horizontal.
- Flow to the well is laminar.

- The well diameter is infinitesimal so that storage within the well can be neglected.
- Water removed from storage is discharged instantaneously with decline of head.

5.3 MODELING RESULTS

The DREAM analytical model was used to simulate the incremental drawdown from the proposed production wellfield for the projected 30-year life of the power plant. For purposes of comparing annual pumpage, using the 1,640-acre property as the analytical frame of reference results in a net decrease in pumpage for the Bowie Power Station of approximately 400 ac-ft/yr.

The Bowie Power Station wellfield will be located on 703 acres. For purposes of water level drawdown analysis, using the 703 acres as the analytical frame of reference and excluding retired pumpage from the remainder of the project acreage results in a net increase in pumpage of 2,970 ac-ft/yr, or about 1,840 gpm.

The incremental drawdown was simulated by distributing the additional 1,840 gpm equally among the six groundwater production wells. The model simulated pumping the six production wells at an average pumping rate of 307 gpm for each well for 10,950 days (30 years). A transmissivity value of 40,000 gpd/ft was used, which was toward the lower end of the range of transmissivity values derived from the aquifer tests (34,000 to 89,000 gpd/ft). This yields a projected drawdown of 50 feet in the immediate vicinity of the wellfield and about 40 feet near the town of Bowie (see Figure 5). The results of the water level drawdown analysis are considered to be conservative due to the aquifer transmissivity value used in the analysis.

Because drawdown is inversely proportional to transmissivity, a higher transmissivity value will result in less drawdown. Using a transmissivity value of 80,000 gpd/ft would yield a projected drawdown of about 25 feet in the immediate vicinity of the wellfield and about 20 feet near the town of Bowie.

The results of the analysis may also be conservative due to the underlying assumptions and limitations of the DREAM analytical model. Because the DREAM model derives pumped water solely from the instantaneous release of water from aquifer storage, the model does not account for underflow, vertical leakage, or aquifer recharge and discharge. Therefore, projected drawdown using the DREAM analytical model for a given set of aquifer parameters would be considered to be larger than expected for long-term conditions.

The Theis equation used in the DREAM analytical model assumes that the aquifer has uniform properties in all directions and that the aquifer has infinite boundaries. Lithologic logs (see

Appendix A) for wells near the Bowie property indicate that the extent and thickness of the middle unit is variable and that the thickness of the unit increases to the east in the direction of the center of the basin. If the cone of depression intercepts sediments of higher permeability, areas of recharge, or unconfined aquifer conditions in the marginal zone along the basin perimeter, actual drawdown may be smaller than projected using the model. Conversely, if long-term pumping results in a cone of depression that intercepts aquifer sediments of lower permeability, impermeable rocks, or cones of depression from other pumping wells, actual drawdown may be larger than projected using the DREAM analytical model.

6.0 SUMMARY OF GROUNDWATER AVAILABILITY AND QUALITY

The results of the water supply investigation described in this report indicate that there is sufficient groundwater of suitable quality beneath the Bowie property to meet the needs of the Bowie Power Station for the planned 30-year life of the facility. The basis for this conclusion is as follows:

- Groundwater levels in the Bowie area have been stable since the early 1980s. The Bowie Power Station water requirement will be about 5,500 ac-ft/yr. Average agricultural pumpage for the 1,640-acre Bowie property since 1980 is estimated to be about 5,900 ac-ft/yr. For purposes of comparing annual pumpage, using the 1,640-acre property as the analytical frame of reference results in a net decrease in pumpage for the Bowie Power Station property of approximately 400 ac-ft/yr.

- The results of aquifer testing indicate that the transmissivity of the lower aquifer is sufficient to allow groundwater to be extracted at a rate that will meet the water supply requirements of the project. A production well completed in the lower aquifer can be expected to yield between 800 and 1,200 gpm.

- Modeling results indicate that water level drawdown after 30 years of pumping will be about 50 feet in the immediate vicinity of the wellfield and about 40 feet near the town of Bowie. The results of the water level drawdown analysis are considered to be conservative due to the 40,000 gpd/ft aquifer transmissivity value used.

- Because drawdown is inversely proportional to transmissivity, a higher transmissivity value will result in less drawdown. Projected drawdown using a transmissivity value at the upper end of the range of 80,000 gpd/ft would be about 25 feet in the immediate vicinity of the wellfield and about 20 feet near the town of Bowie.

- The results of groundwater sampling and analysis confirm that the quality of groundwater beneath the Bowie property is excellent, with TDS concentrations of about 250 mg/L, and no exceedances of numeric AWQS. These results are consistent with publicly available groundwater quality data for the Bowie area.

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TABLES

TABLE 1
WELLS LOCATED ON AND ADJACENT TO THE BOWIE PROPERTY

Well Location	ADWR Registration Number	Well Depth (feet)	Water Use	Well Use	Casing Diameter (inches)	Well Completion Date	Data in Appendix A	Field Observations
Wells Located on the Bowie Property (data from Arizona Department of Water Resources, supplemented by field observations)								
(D-12-28) 20 ABC	55-606325	800	Irrigation	Inactive	16	01/01/65	X	Equipped with line-shaft pump and base.
(D-12-28) 20 DBD1		800	Irrigation	Inactive	16			Capped.
(D-12-28) 20 DBD2	55-606326		Irrigation	Inactive	20		X	Equipped with line-shaft pump and base.
(D-12-28) 20 DDD		800	Irrigation	Inactive				Equipped with line-shaft pump, base, and gear drive.
(D-12-28) 21 CDD	55-808137		Domestic	Active	10			Equipped with submersible pump.
(D-12-28) 21 DCC	55-808138	2000	Irrigation	Inactive	20	01/01/55		Capped with 55-gallon drum.
(D-12-28) 22 CDC	55-606328	660	Irrigation	Inactive	16	05/15/51		Capped.
(D-12-28) 22 DDC	55-606329		Domestic	Inactive	10			Equipped with submersible pump, no electrical hook-up.
(D-12-28) 27 BBC	55-808139	700	Irrigation	Inactive	16			Equipped with line-shaft pump, gear drive, and engine.
(D-12-28) 28 ABC	55-606331		Irrigation	Inactive	20		X	Capped with 55-gallon drum.
(D-12-28) 28 BCC	55-606336	1400	Irrigation	Inactive	20	01/01/65	X	Equipped with line-shaft pump and base.
(D-12-28) 28 CCC1		500	Irrigation	Inactive	16	01/01/53		Capped.
(D-12-28) 28 CCC2	55-606335		Irrigation	Active	18	01/01/65	X	Equipped with line-shaft pump, gear drive, and engine.
(D-12-28) 28 DCC	55-606332	1200	Irrigation	Active	16	01/01/65	X	Equipped with line-shaft pump, gear drive, and engine.
(D-12-28) 33 ABC1	55-606333	550	Irrigation	Inactive	16	08/14/51	X	Capped.
(D-12-28) 33 ABC2	55-606334		Irrigation	Inactive				Equipped with line-shaft pump, gear drive, and engine.
Wells Located Within One Mile of the Bowie Property (data from Arizona Department of Water Resources)								
(D-12-28) 14 AAA			Withdrawal	Irrigation		03/01/53		
(D-12-28) 14 CAA	55-509680		Withdrawal	Irrigation	16			
(D-12-28) 14 CAD			Withdrawal	Irrigation	16			
(D-12-28) 14 CDA			Withdrawal	Irrigation	16			
(D-12-28) 14 DBB			Unused	Unused	12			
(D-12-28) 15 BBC		2000	Withdrawal	Irrigation	18	01/01/71		
(D-12-28) 15 BCB	55-625831	2000	Unused	Irrigation	16	01/01/52		
(D-12-28) 15 BCC	55-625870		Withdrawal	Domestic	18			
(D-12-28) 15 BDB CDC?		1340	Withdrawal	Irrigation	20/16	01/01/68	X	
(D-12-28) 15 DCC	55-614580	700	Unused	Unused	16	05/01/53		
(D-12-28) 15 DDD			Withdrawal	Irrigation	16			
(D-12-28) 16 ACB	55-625832	830	Withdrawal	Irrigation	16	01/01/62		
(D-12-28) 16 CCB	55-615874	2000	Unused	Unused	20	01/01/65		
(D-12-28) 16 CCC	55-625833	750	Unused	Unused	16	03/01/53	X	
(D-12-28) 16 CDC	55-625834	800	Withdrawal	Irrigation	16	01/01/65		
(D-12-28) 16 CDD DCC?	55-625835	1900	Withdrawal	Irrigation	16	07/24/74	X	
(D-12-28) 17 DDD	55-609816	567	Unused	Unused	6			
(D-12-28) 20 BDC			Withdrawal	Irrigation				
(D-12-28) 20 CBA	55-606324	680	Withdrawal	Irrigation	16			

TABLE 1 (Continued)

Well Location	ADWR Registration Number	Well Depth (feet)	Water Use	Well Use	Casing Diameter (inches)	Well Completion Date	Data in Appendix A	Field Observations
(D-12-28) 20 CBB	55-606323	1000	Withdrawal	Irrigation	20			
(D-12-28) 23 CCC	55-625836	1600	Withdrawal	Irrigation	20	02/01/52	X	
(D-12-28) 25 DCC		1360			18/14	1955	X	
(D-12-28) 26 BCA1	55-627787	990	Withdrawal	Irrigation				
(D-12-28) 26 BCA2			Unused	Unused	6			
(D-12-28) 26 BCA3			Unused	Unused	12			
(D-12-28) 26 CCB	55-627785	1800	Withdrawal	Irrigation	16	3/01/79	X	
(D-12-28) 26 CCC	55-627786	1000	Unused	Unused	16			
(D-12-28) 26 CCD1			Unused	Unused				
(D-12-28) 26 CCD2			Unused	Unused	12			
(D-12-28) 26 CDC			Withdrawal	Irrigation				
(D-12-28) 26 DCC		687	Unused	Unused	16		X	
(D-12-28) 27 CCB	55-625837	655	Withdrawal	Irrigation	16	12/01/56		
(D-12-28) 27 CCC	55-625838	110	Withdrawal	Irrigation	14			
(D-12-28) 27 DCC			Withdrawal	Irrigation	16			
(D-12-28) 29 DBC	55-606337	560	Withdrawal	Irrigation	16			Well has turbine pump and natural gas engine.
(D-12-28) 32 DAA			Withdrawal	Irrigation				
(D-12-28) 32 ACC	55-615877	600	Irrigation	Inactive	18			Equipped with line-shaft pump, gear drive, and engine.
(D-12-28) 32 DCC1	55-606341	600	Irrigation	Inactive	12	01/01/65		Capped.
(D-12-28) 32 DCC2	55-606340		Irrigation	Inactive	20	01/01/65	X	Equipped with line-shaft pump, base, and derelict engine.
(D-12-28) 32 DCD	55-606342	1100	Irrigation	Inactive	16		X	Equipped with line-shaft pump and base.
(D-12-28) 33 ADA1			Withdrawal	Irrigation	10			Well has submersible pump; 4-inch discharge pipe.
(D-12-28) 33 ADA2			Unused	Unused	16			Well has submersible pump.
(D-12-28) 33 BCC	55-625843	758	Unused	Irrigation	16	11/20/67	X	
(D-12-28) 33 BCD		488	Unused	Unused	14		X	
(D-12-28) 33 BDD			Withdrawal	Domestic	6			
(D-12-28) 33 CCC		953	Unused	Unused	16		X	
(D-12-28) 33 DBB	55-625872		Unused	Unused	16			
(D-12-28) 34 ACB			Withdrawal	Irrigation	12			
(D-12-28) 34 BBC1	55-625841		Withdrawal	Irrigation				
(D-12-28) 34 BBC2	55-625842		Withdrawal	Irrigation	16			
(D-12-28) 34 BBC3	55-625840		Withdrawal	Irrigation	16			
(D-12-28) 34 BCA			Unused	Unused	12			
(D-12-28) 34 CCB			Withdrawal	Irrigation				
(D-12-28) 35 BDC	55-625869	640	Unused	Unused	12			

TABLE 2
HISTORICAL GROUNDWATER QUALITY DATA IN THE VICINITY OF THE BOWIE PROPERTY

Well Location	Sample Collection Date	Temp (°C)	Specific Conductance-field (umhos/cm)	Alkalinity-field (as CaCO3) (mg/L)	Nitrate + Nitrite, as N (mg/L)	Hardness, as CaCO3 - Total (mg/L)	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)
(D-12-28) 20ACB	1986	24	504	120	2	140	44	6.5	46
(D-12-28) 21DCC	1985	28	380	104	0.9	85	29	2.9	47
(D-12-28) 22CDC	1951	30	334	76	---	30	10	1.3	---
(D-12-28) 22CDC	1953	30.5	388	68	---	34	12	1	---
(D-12-28) 22CDC	1954	---	404	71	---	---	---	---	---
(D-12-28) 22CDC	1955	---	397	68	---	---	---	---	---
(D-12-28) 22CDC	1956	31.5	399	67	---	---	---	---	---
(D-12-28) 22CDC	1957	---	413	73	---	34	---	---	---
(D-12-28) 22CDC	1962	31	413	68	---	40	---	---	---
(D-12-28) 22CDC	1963	31.5	423	70	---	42	---	---	---
(D-12-28) 34BBC2	1986	21.5	1440	190	11	510	160	27	89
(D-12-28) 36CCC1	1956	30	362	93	---	---	---	---	---
(D-12-28) 36CCC1	1957	30	405	106	---	38	---	---	---
(D-13-28) 04DDB	1951	37	343	---	---	53	16	3.2	---
(D-13-28) 04DDB	1953	---	338	---	---	---	---	---	---
(D-13-28) 04DDB	1954	33.5	344	---	---	---	---	---	---
(D-13-28) 04DDB	1955	36.5	342	---	---	---	---	---	---
(D-13-28) 04DDB	1957	37	354	---	---	51	---	---	---
(D-13-28) 06DDC2	1992	18	3250	661	<0.1	1000	280	83	290
(D-13-28) 09BCC	1951	---	495	---	---	170	50	11	---
(D-13-28) 09BCC	1953	30.5	423	---	---	130	39	8.7	---
(D-13-28) 09BCC	1954	---	497	176	---	160	49	10	---
(D-13-28) 09BCC	1955	---	470	167	---	---	---	---	---
(D-13-28) 09BCC	1956	31	505	163	---	---	---	---	---
(D-13-28) 09BCC	1957	---	550	179	---	170	---	---	---
(D-13-28) 09BCC	1958	---	551	173	---	130	---	---	---
(D-13-28) 09BCC	1963	---	637	---	---	180	52	12	---
(D-13-28) 10BCC	1985	36	380	93	1.2	71	25	1.9	52
(D-13-28) 13CBC	1989	28	770	122	0.5	180	57	9.3	79
(D-13-28) 13CCC1	1989	---	---	---	0.2	310	95	17	120

mg/L = milligrams per liter
ug/L = micrograms per liter
"---" = constituent not analyzed
Data from the Arizona Department of Water Resources
°C = degrees Celcius

TABLE 2 (Continued)

Well Location	Sample Collection Date	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Silica, dissolved (mg/L)	Arsenic, dissolved (ug/L)	Barium, dissolved (ug/L)	Beryllium, dissolved (ug/L)	Boron, dissolved (ug/L)	Cadmium, dissolved (ug/L)
(D-12-28) 20ACB	1986	1.9	48	47	0.5	31	1	25	<0.5	50	<1
(D-12-28) 21DCC	1985	2.1	27	44	0.5	30	<1	53	<0.5	20	<1
(D-12-28) 22CDC	1951	---	24	49	1.4	22	---	---	---	---	---
(D-12-28) 22CDC	1953	---	33	64	0.8	24	---	---	---	---	---
(D-12-28) 22CDC	1954	---	35	---	---	---	---	---	---	---	---
(D-12-28) 22CDC	1955	---	36	---	---	---	---	---	---	---	---
(D-12-28) 22CDC	1956	---	36	---	---	---	---	---	---	---	---
(D-12-28) 22CDC	1957	---	37	---	---	---	---	---	---	---	---
(D-12-28) 22CDC	1962	---	40	---	0.8	---	---	---	---	---	---
(D-12-28) 22CDC	1963	---	41	---	0.9	---	---	---	---	---	---
(D-12-28) 34BBC2	1986	3.4	250	140	0.3	34	<1	81	<0.5	50	<1
(D-12-28) 36CCC1	1956	---	22	---	---	---	---	---	---	---	---
(D-12-28) 36CCC1	1957	---	24	---	---	---	---	---	---	---	---
(D-13-28) 04DDB	1951	---	24	34	0.8	32	---	---	---	---	---
(D-13-28) 04DDB	1953	---	24	---	---	---	---	---	---	---	---
(D-13-28) 04DDB	1954	---	25	---	---	---	---	---	---	---	---
(D-13-28) 04DDB	1955	---	24	---	---	---	---	---	---	---	---
(D-13-28) 04DDB	1957	---	26	---	---	---	---	---	---	---	---
(D-13-28) 06DDC2	1992	21	430	540	3.1	7.1	---	---	---	580	---
(D-13-28) 09BCC	1951	---	16	29	0.6	48	---	---	---	---	---
(D-13-28) 09BCC	1953	---	25	24	0.6	23	---	---	---	---	---
(D-13-28) 09BCC	1954	---	32	38	0.8	55	---	---	---	---	---
(D-13-28) 09BCC	1955	---	33	---	---	---	---	---	---	---	---
(D-13-28) 09BCC	1956	---	39	---	---	---	---	---	---	---	---
(D-13-28) 09BCC	1957	---	44	---	---	---	---	---	---	---	---
(D-13-28) 09BCC	1958	---	46	---	---	---	---	---	---	---	---
(D-13-28) 09BCC	1963	---	63	57	0.8	40	---	---	---	---	---
(D-13-28) 10BCC	1985	2.6	25	41	0.1	30	<1	38	<0.5	10	<1
(D-13-28) 13CBC	1989	4.9	69	140	0.7	34	1	15	<0.5	80	<1
(D-13-28) 13CCC1	1989	6.4	140	290	0.5	31	<1	31	<0.5	90	1

mg/L = milligrams per liter
ug/L = micrograms per liter
"---" = constituent not analyzed
Data from the Arizona Department of Water Resources
°C = degrees Celcius

TABLE 2 (Continued)

Well Location	Sample Collection Date	Chromium, dissolved (ug/L)	Cobalt, dissolved (ug/L)	Copper, dissolved (ug/L)	Iron, dissolved (ug/L)	Lead, dissolved (ug/L)	Lithium, dissolved (ug/L)	Manganese, dissolved (ug/L)	Molyb-denum, dissolved (ug/L)	Strontium, dissolved (ug/L)	Vanadium, dissolved (ug/L)	Zinc, dissolved (ug/L)
D-12-28 20ACB	1986	<1	<3	<10	<3	<10	29	1	<10	320	<6	7
D-12-28 21DCC	1985	3	<3	<10	6	<10	32	2	<10	290	7	<3
D-12-28 22CDC	1951	---	---	---	---	---	---	---	---	---	---	---
D-12-28 22CDC	1953	---	---	---	---	---	---	---	---	---	---	---
D-12-28 22CDC	1954	---	---	---	---	---	---	---	---	---	---	---
D-12-28 22CDC	1955	---	---	---	---	---	---	---	---	---	---	---
D-12-28 22CDC	1956	---	---	---	---	---	---	---	---	---	---	---
D-12-28 22CDC	1957	---	---	---	---	---	---	---	---	---	---	---
D-12-28 22CDC	1962	---	---	---	---	---	---	---	---	---	---	---
D-12-28 22CDC	1963	---	---	---	---	---	---	---	---	---	---	---
D-12-28 34BBC2	1986	<1	<3	10	5	<10	34	1	<10	1000	<6	4
D-12-28 36CCC1	1956	---	---	---	---	---	---	---	---	---	---	---
D-12-28 36CCC1	1957	---	---	---	---	---	---	---	---	---	---	---
D-13-28 04DDB	1951	---	---	---	---	---	---	---	---	---	---	---
D-13-28 04DDB	1953	---	---	---	---	---	---	---	---	---	---	---
D-13-28 04DDB	1954	---	---	---	---	---	---	---	---	---	---	---
D-13-28 04DDB	1955	---	---	---	---	---	---	---	---	---	---	---
D-13-28 04DDB	1957	---	---	---	---	---	---	---	---	---	---	---
D-13-28 06DDC2	1992	---	---	---	6700	---	---	390	---	---	---	---
D-13-28 09BCC	1951	---	---	---	---	---	---	---	---	---	---	---
D-13-28 09BCC	1953	---	---	---	---	---	---	---	---	---	---	---
D-13-28 09BCC	1954	---	---	---	---	---	---	---	---	---	---	---
D-13-28 09BCC	1955	---	---	---	---	---	---	---	---	---	---	---
D-13-28 09BCC	1956	---	---	---	---	---	---	---	---	---	---	---
D-13-28 09BCC	1957	---	---	---	---	---	---	---	---	---	---	---
D-13-28 09BCC	1958	---	---	---	---	---	---	---	---	---	---	---
D-13-28 09BCC	1963	---	---	---	---	---	---	---	---	---	---	---
D-13-28 10BCC	1985	<1	<3	<10	<3	<10	49	1	<10	230	6	3
D-13-28 13CBC	1989	4	0	1	6	<1	89	<1	1	710	5	4
D-13-28 13CCC1	1989	<1	0	1	7	<1	89	1	1	1200	7	5

mg/L = milligrams per liter
ug/L = micrograms per liter
"---" = constituent not analyzed
Data from the Arizona Department of Water Resources
°C = degrees Celcius

TABLE 3
SUMMARY OF AQUIFER TEST RESULTS

Pumped Well 28 CCC2		Theis Log-Log		Theis Recovery	
Well	Distance (ft)	T (gpd/ft)	S (dim.)	T (gpd/ft)	S (dim.)
(D-12-28) 28 CCC2	1	41,000		34,000	
(D-12-28) 28 DCC	2,500	71,000	0.0004	49,000	
(D-12-28) 28 ABC	4,500	43,000	0.0005	45,000	
(D-12-28) 28 BCC	2,400	63,000	0.0007	WI	
Pumped Well 28 DCC		**Theis Log-Log**		**Theis Recovery**	
Well	**Distance (ft)**	**T (gpd/ft)**	**S (dim.)**	**T (gpd/ft)**	**S (dim.)**
(D-12-28) 28 DCC	1	47,000		49,000	
(D-12-28) 28 CCC2	2,500	85,000	0.0003	40,000	
(D-12-28) 28 ABC	3,700	WI		60,000	
(D-12-28) 28 BCC	3,700	WI		WI	

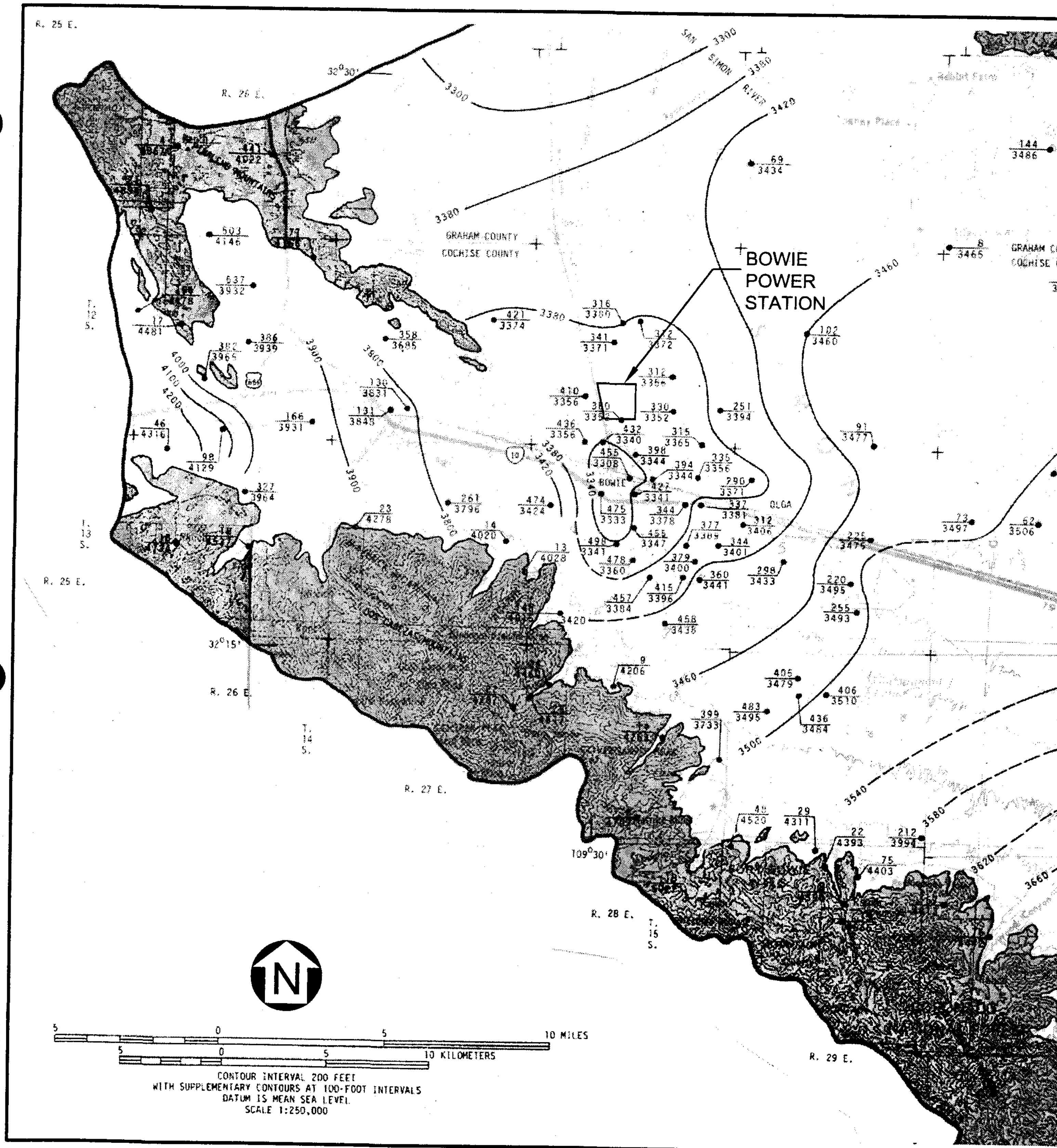
T = Transmissivity
S = Storage coefficient
ft = feet
gpd/ft = gallons per day per foot
dim. = dimensionless
WI = results not reported due to well interference

TABLE 4
SUMMARY OF GROUNDWATER QUALITY RESULTS FOR ONSITE WELLS

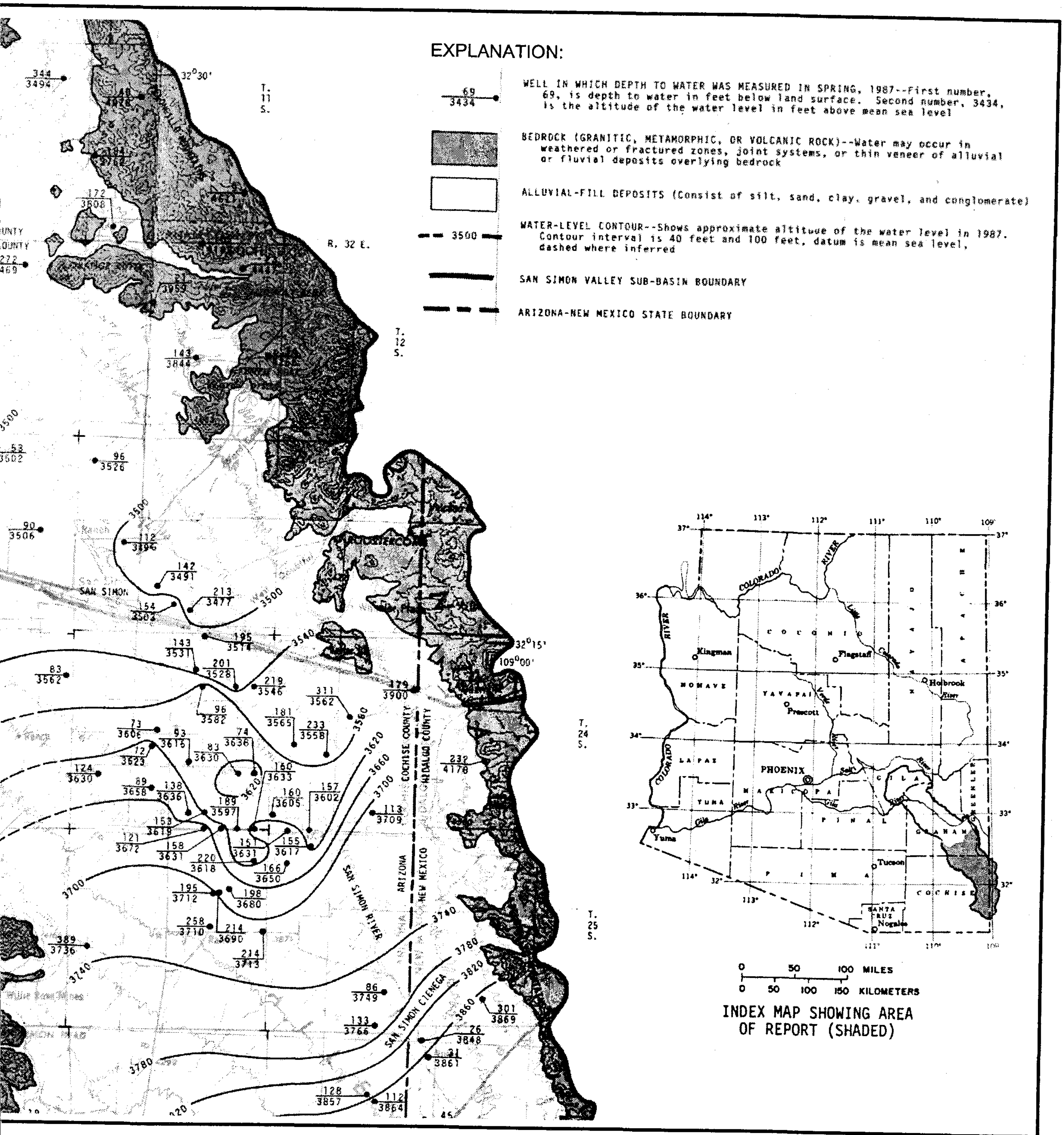
Well Location Sample Collection Date	(D-12-28)28CCC2 April 3, 2001	(D-12-28)28DCC March 28, 2001
Field Parameters		
Temperature (°C)	25.8	29.3
pH (Standard Units)	7.50	8.18
Specific Conductance (µmhos/cm)	387	327
Total Dissolved Solids	193	---
Indicator Parameters		
Total Dissolved Solids	250	230
Specific Conductance (µmhos/cm)	430	380
pH (Standard Units)	8.06	8.03
Major Ions		
Alkalinity, Bicarbonate (as CaCO3)	140	90
Alkalinity, Carbonate (as CaCO3)	<2.0	<2.0
Alkalinity, Hydroxide (as CaCO3)	<2.0	<2.0
Alkalinity, Total (as CaCO3)	140	90
Hardness, Total (as CaCO3)	110	61
Ammonia (as N)	<0.50	<0.50
Chloride	25	27
Fluoride	0.78	0.45
Nitrate (as N)	0.82	---
Nitrite (as N)	<0.01	---
Nitrate+Nitrite (as N)	---	0.87
Total Kjeldahl Nitrogen (TKN)	<0.50	<0.50
Total Phosphorous (as P)	<0.20	<0.20
Calcium	35	24
Magnesium	6.4	3.2
Potassium	<2.0	<2.0
Silica	41	34
Sodium	39	44
Sulfate	29	44
Total Petroleum Hydrocarbons	2.2	<2.0
Metals, Total Recoverable		
Aluminum	<0.10	<0.10
Antimony	<0.040	<0.040
Arsenic	<0.040	<0.040
Barium	0.071	0.062
Beryllium	<0.0010	<0.0010
Cadmium	<0.0010	<0.0010
Chromium	<0.010	<0.010
Copper	0.072	0.014
Iron	<0.050	<0.050
Lead	<0.015	<0.015
Manganese	<0.010	<0.010
Mercury	<0.00020	<0.00020
Nickel	<0.010	<0.010
Selenium	<0.040	<0.040
Silver	<0.010	<0.010
Strontium	0.22	0.22
Thallium	<0.040	<0.040
Vanadium	<0.010	0.011
Zinc	0.059	<0.050
Metals, Total Dissolved		
Iron	<0.050	<0.050
Manganese	<0.010	<0.010
Strontium	0.23	0.23
Coliform Bacteria Total/ Escherichia	Positive/Negative	Positive/Negative
Total Organic Carbon	Not Detected	Not Detected
Reactive Silica	41	32.1

Note: All results are in milligrams per liter unless otherwise indicated.
µmhos/cm = micromhos per centimeter
°C = degrees Celcius

FIGURES



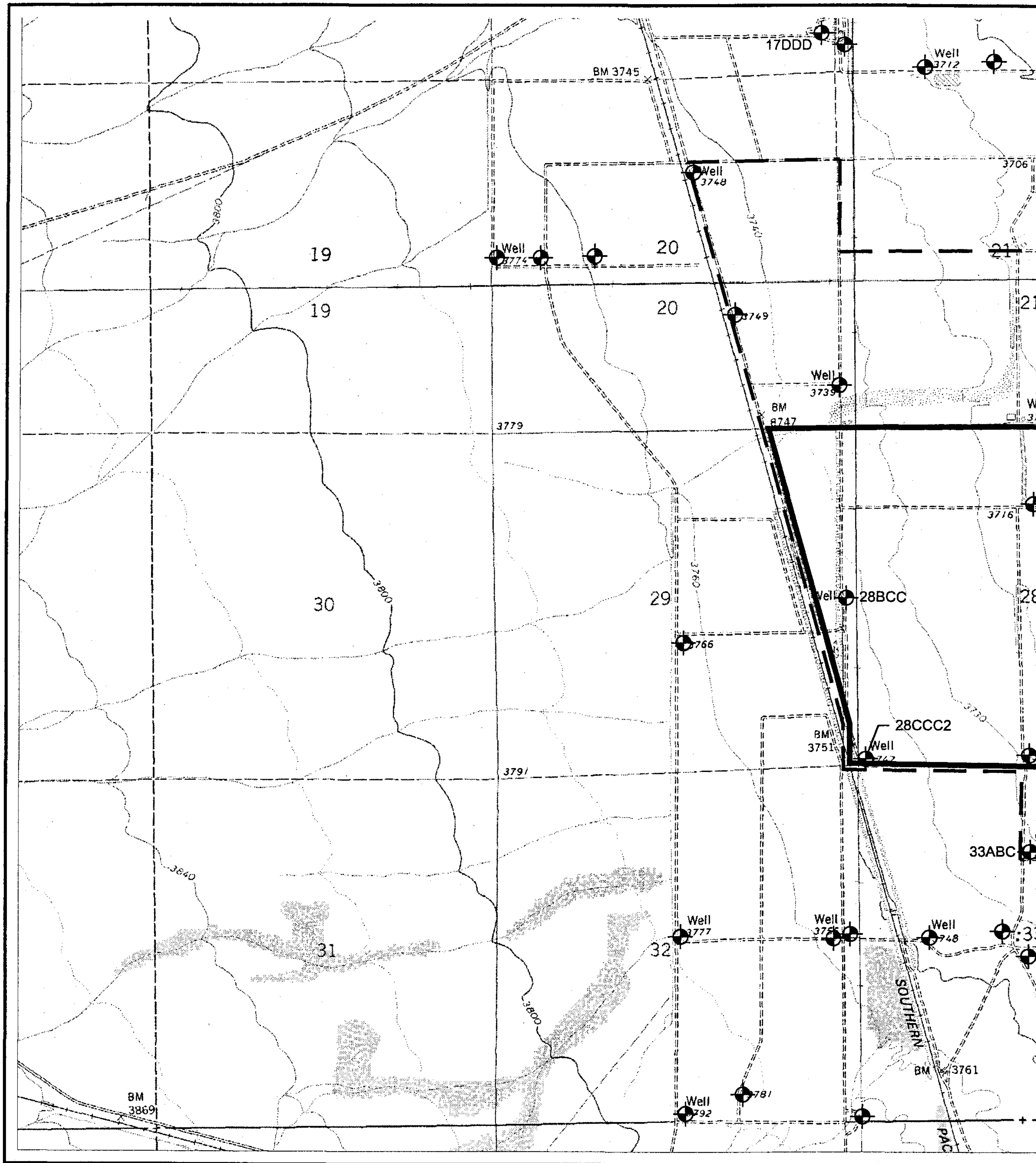
Source: Partial area of ADWR, Hydrologic Map Series, Report Number 19, Barnes, 1991.



GROUNDWATER LEVEL CONTOURS FOR 1987

Bowie Power Station

Figure 1



A14856.DWG 7-24-01 XREF:46866\001QUADS.DWG IMAGES:32109C5, 32109C4, 32109D4, 32109D5

Reference: USGS Topographic Quad
Fisher Hills, Az 1979
Ryan Draw, Az 1974
Bowie, Az 1974
Luzena, Az 1979

LEGEND:

EXISTING WELL

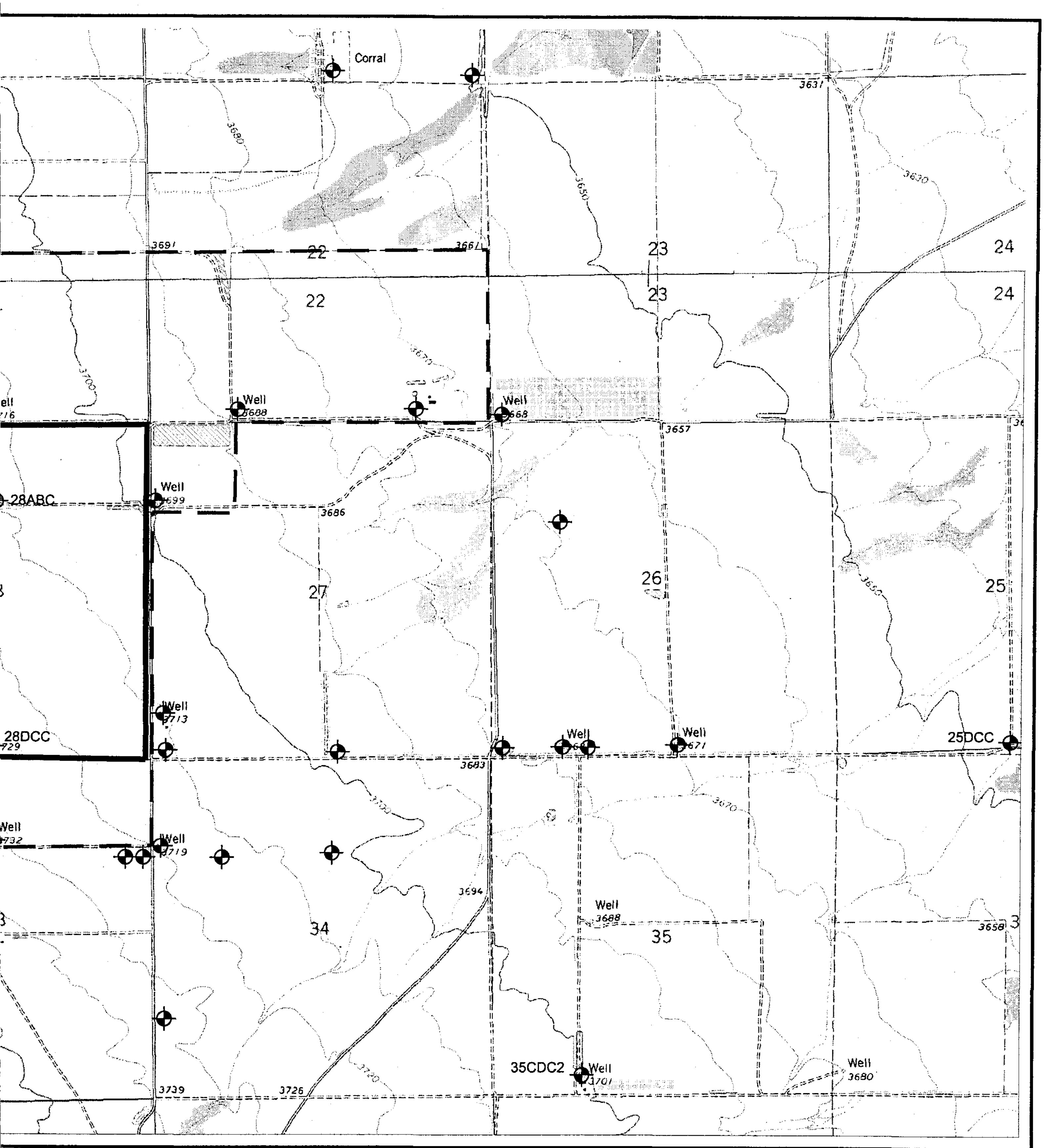
SITE BOUNDARY

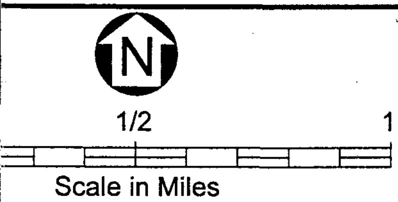
PROPERTY BOUNDARY

0

URS

E1-47034002.00





Well Location Map
Bowie Power Station

Figure 2

Figure 3. Historical Groundwater Levels for Bowie Property Wells and Estimated Annual Pumpage for the San Simon Sub-basin

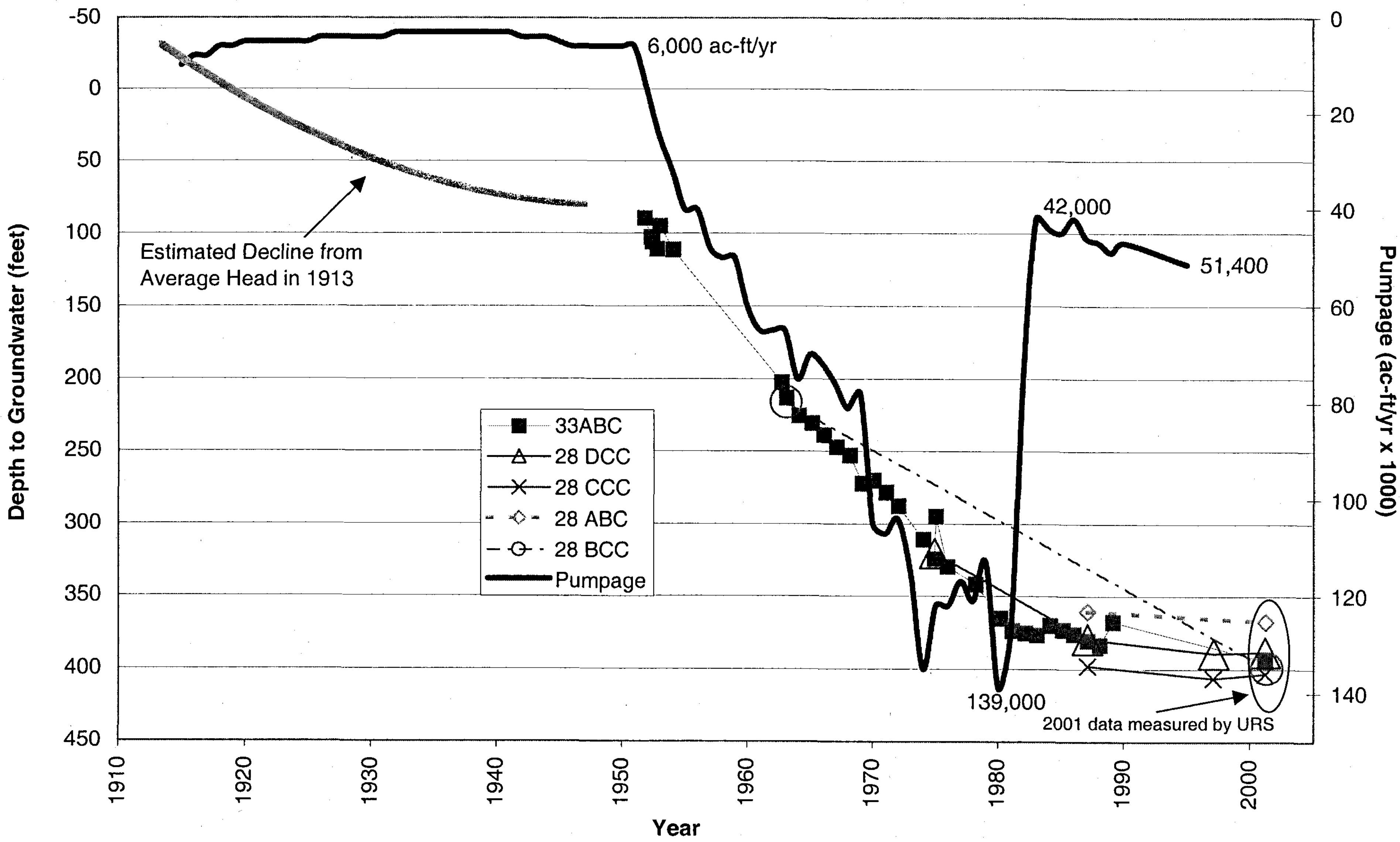


Figure 4. Historical Groundwater Levels for Nearby Wells and Estimated Annual Pumpage for the San Simon Sub-basin

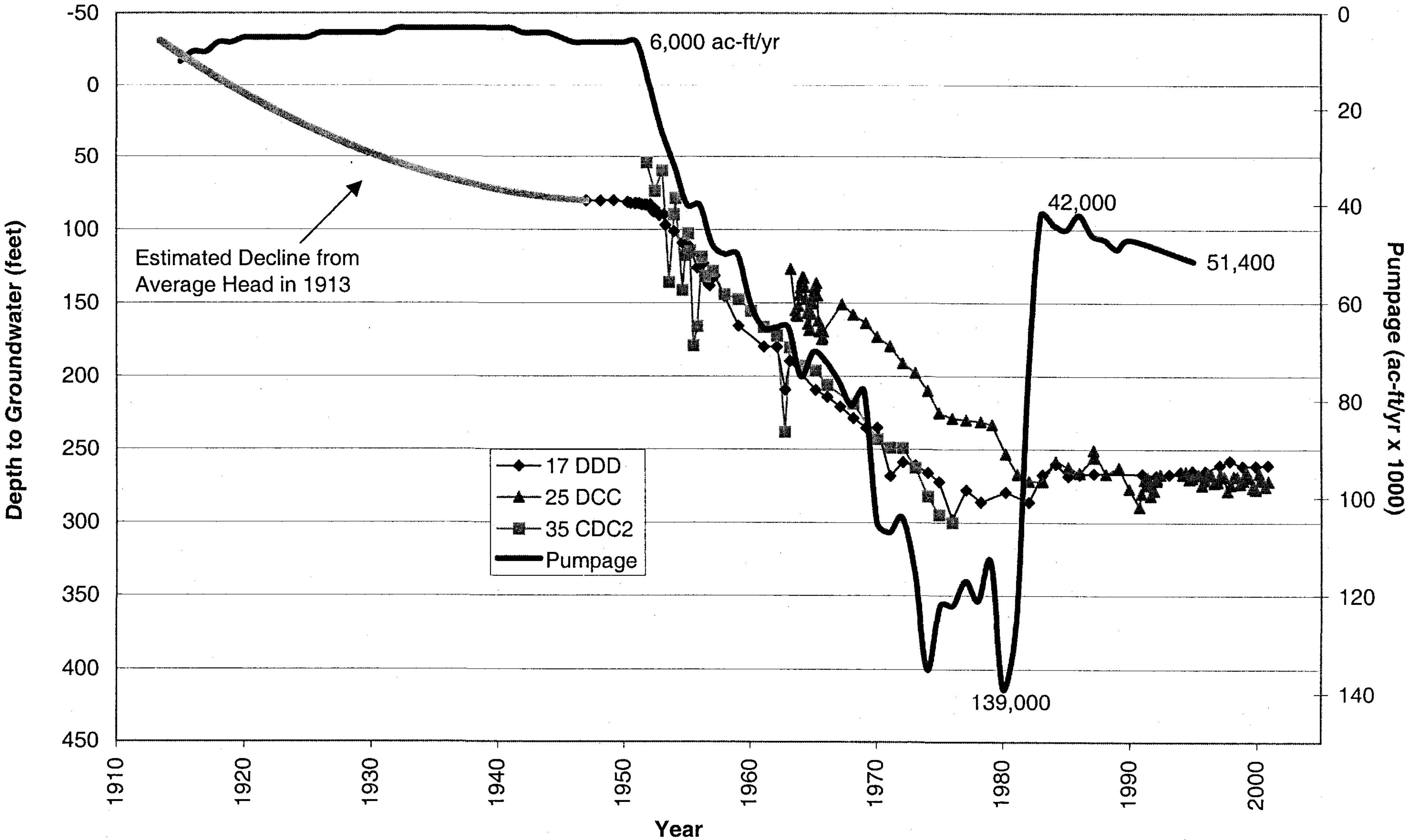
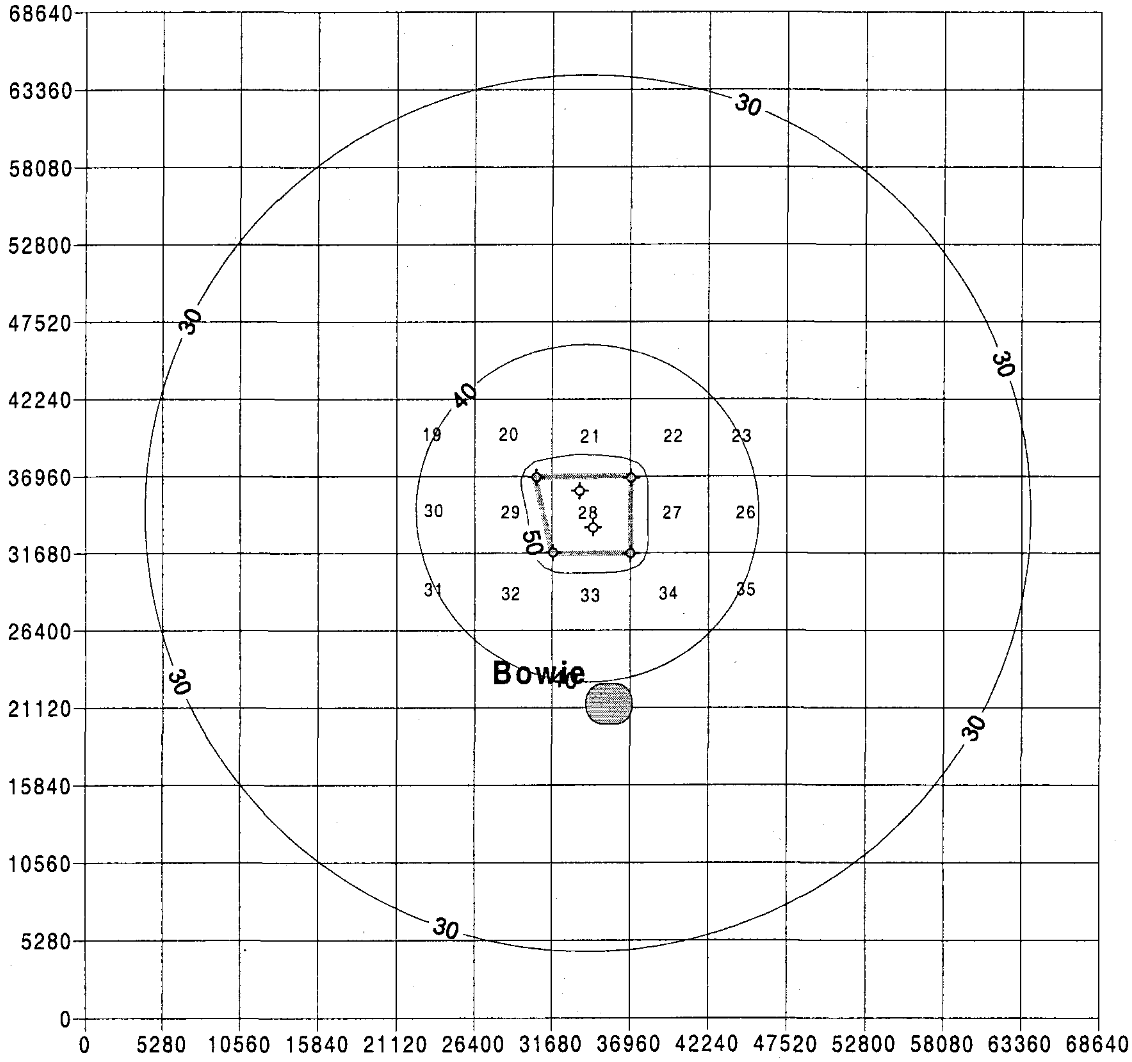


Figure 5. Model-Predicted Water Level Drawdown Contours

703 acres
Pumpage = 5,500 ac-ft/yr - (703 ac x 3.6 ac-ft/ac/yr) = 2970 ac-ft/yr = 1,840 gpm
6 wells each pumping at 307 gpm for 30 years
T = 40,000 gpd/ft
S = 0.0005



APPENDIX A

AVAILABLE WELL LOGS AND WELL REGISTRATIONS FOR WELLS LOCATED ON THE BOWIE PROPERTY

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

This report should be prepared by the driller in all detail and filed with the State Land Commissioner following completion of the well.

1. OWNER George Wake
Name
210 N. Cochise, Willcox, Arizona 85643
Address

2. Lessee or Operator
Name

Address

3. DRILLER Howell Drilling Company
Name
Box 771 Willcox, Arizona
Address

4. Location of well: Twp. 12-So Rge. 28 E Section SW ¼ SE ¼ SW ¼
10-acre sudivision

5. Intention to Drill File No. D(12-28)15 cdc 15 Permit No.

DESCRIPTION OF WELL

6. Total depth of hole 1340 ft.

7. Type of casing Steel - Welded

8. Diameter and length of casing 20 in. from 0 to 638 in. from to , 14" in. from ~~520~~ 550 to 1200

9. Method of sealing at reduction points

10. Perforated from 550 to 1200 from to , from to , from to

11. Size of cuts 3/16" X 4" Number of cuts per foot 32

12. If screen was installed: Length ft. Diam. in. Type

13. Method of construction Drilled - Cable Tools
drilled, dug, driven, bored, jetted, etc.

14. Date started 11 29 67
Month Day Year

15. Date completed 1 27 68
Month Day Year

16. Depth of water 115 from ft. ground -
If flowing well, so state.

17. Describe point from which depth measurements were made, and give sea-level elevation if available ground Level

18. If flowing well, state method of flow regulation

19. REMARKS:

DO NOT WRITE IN THIS SPACE OFFICE RECORD	
Received 3-6-68	by Jr
Filed 2-6-68	by Jr
File No. D(12-28)15 cdc	

(Well Log to Appear on Reverse Side)

WD FORM G-301
REV. 4-27-53

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	5	Soil
5	10	Clay
10	30	gravel
30	125'	Sand + gravel - Water @ 125'
125	190	Sand, gravel + Shale Streaks
190	600	Blue Clay
600	655	Red Clay
655	680	Red Clay + gravel
680	780	Red Clay + Gypsum
780	1000	Conglomerate + Clay
1000	1145	Conglomerate + Sand - Possable Water
		@ 1145
1145	1340	Conglomerate

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller Carl Howell
Name

Box 771 Hillock, Ariz
Address

Date 1-4-68

STATE LAND DEPARTMENT
GROUND WATER DIVISION
STATE OF ARIZONA

REGISTRATION OF WELL

1. OWNER Charles Wade
Name
Box 1195 Bowie, Arizona
Address

2. LESSEE OR OPERATOR (Same as above)
Name

Address

3. DRILLER David B. Graham
Name
1714 E. Indianola Ave. Phoenix, Arizona
Address

4. LOCATION OF WELL: Twp........ Rge........ Section........ ....¼........¼........¼
10-acre subdivision

DESCRIPTION OF WELL

5. Total depth of hole 750 ft.

6. Type of casing Stove Pipe 10 Ga.

7. Diameter and length of casing 16 in. from 0 to 750 ....in. from........to........, ...in. from........to........

8. Perforated from 750 to 300, from........to........, from........to........, from........to........

9. Size of cuts 5/8 by 4 Number cuts per foot 7 per 18" circle

10. If screen was installed: Length........ft. Diam........in. Type........

11. Date completed March 1953 (Month, Year) Deepened .... (Month, Year)

12. Depth of water when drilled 50 ft. ft. If flowing well, so state ——

13. Present depth to water from land surface 270 ft. ft. Date of measurement June of 1959

14. If flowing well, state method of flow regulation ——

DISCHARGE DATA

15. Well discharge 1250 gal. per Minute
gal. per min. or cu. ft. per sec. or miner's inches.

16. Method of discharge measurement Weir
weir, orifice, current meter, etc.

17. Drawdown 290 ft. ft.

18. Annual discharge in acre-feet or number of hours pumped: 1944........a.f. or........hrs. 1945........a.f. or........hrs.

19. Purpose of use Irrigation of Farm Land.

20. Place of use: Twp........Rge........Section........ .... Acres........
(See 21) Legal subdivision

Twp........Rge........Section........ .... Acres........
Legal subdivision

21. If well is part of irrigation system or Irrigation District, Association or Company, omit 20 and give name of project.

....
Name of Project

EQUIPMENT DATA

22. Kind of pump........
turbine, centrifugal, etc.

23. Kind of power Electric
electric, natural gas, etc.

24. Horsepower rating of motor 125 H.P.

DO NOT WRITE IN THIS SPACE

OFFICE RECORD

Received........ by........

Filed........ by........

File No. D(12-28)16 ccc

G-302 Rev.—5M—2-57

(See Other Side)

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	30	clay
30	300	blue shale
300	330	clay and gravel
330	400	gravel and shells
400 to	460	boulders
460	750	sand and gravel with cemented shells

706

RECEIVED
JAN 18

I hereby certify that I have read the foregoing statements, and that each and all of the items therein contained are true to the best of my knowledge and belief.

David B. Grako
Owner, Operator or Driller

Address

Date

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

This report should be prepared by the driller in all detail and filed with the State Land Commissioner following completion of the well.

1. OWNER Kent and Wanda Hillburn
Name
Address

2. Lessees or Operator Same
Name
Address

3. DRILLER Jim McBee
Name
Unknown
Address

4. Location of well: Twp 2-S Rge 28-E Section 16 SW ¼ SW ¼ SE ¼
10-acre subdivision

5. Intention to Drill File No. D(12-28)16 DCC Permit No.

DESCRIPTION OF WELL

6. Total depth of hole 1900' ft.

7. Type of casing 1000' – 16 inch, 600' – 14 inch.

8. Diameter and length of casing 16 in. from 0 to 1000, 14 in. from 1000 to 1600' ft in. from to

9. Method of sealing at reduction points

10. Perforated from 800 to 1600, from to , from to , from to

11. Size of cuts 2 inches long x ¼ inch wide Number of cuts per foot 3

12. If screen was installed: Length None ft. Diam. in. Type

13. Method of construction Rotary Drilled
drilled, dug, driven, bored, jetted, etc.

14. Date started June 20 1974
Month Day Year

15. Date completed July 24 1974
Month Day Year

16. Depth of water 275 ft.
If flowing well, so state.

17. Describe point from which depth measurements were made, and give sea-level elevation if available Elevation
Approx 3650 feet

18. If flowing well, state method of flow regulation — N/A

19. REMARKS:

DO NOT WRITE IN THIS SPACE
OFFICE RECORD

Received by
Filed by
File No.

(Well Log to Appear on Reverse Side)

LOG OF WELL

19__ NOV -3 PM 4:30

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	180	Overburden
180	550	Blue Clay
550	1900	Sand and Gravel

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Owner ~~Driller~~ .... Name

.... Address

Date 11/3/75

2-73

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

RECEIVED APR 29 1982 DEPT. OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE — FILE IN DUPLICATE

118

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 606325
FILE NO. D(12-28) 20abc
FILED 4-29-82 (DATE) AT 9— (TIME)
INA —
AMA —

REGISTRATION FEE (CHECK ONE)
EXEMPT WELL (NO CHARGE) ☐
NON-EXEMPT WELL — $10.00 ☒

WELL NO. 3
POWER : GAS

1. Name of Registrant: MUNNELL FARMS
9190 LA ALBA DRIVE (Address) WHITTIER (City) CA (State) 90603 (Zip)

2. File and/or Control Number under previous groundwater law:
(File Number) 35- (Control Number)

3. a. The well is located within the SW ¼ NW¼ NE ¼, Section 20, of Township 12 N/(S) Range 28 (E)/W, G & SRB & M, in the County of COCHISE , ARIZONA.
b. If in a subdivision: Name of subdivision N/A,
Lot No. N/A, Address N/A.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial)
CROP-IRRIGATION.

5. If for irrigation use, number of acres irrigated from well 160+ ACRES EST.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
(Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well N/A feet
b. Diameter of casing 18 inches
c. Depth of casing N/A feet
d. Type of casing STEEL.
e. Maximum pump capacity N/A gallons per minute.
f. Depth to water N/A feet below land surface.
g. Date well completed BEFORE 1965 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☐.
* ¼ * ¼ E½ ¼, Section 20 Township 12 Range 28
S½ ¼ S½ ¼ NE ¼, Section 17 Township 12 Range 28
* * N½ 21 12 28
Attach additional sheet if necessary.

Munnell Farms by

9. DATE 4-16-82 SIGNATURE OF REGISTRANT Wm. G. Munnell H/P.
PREPARED BY : LYLE HANZLICK A.S.C.S. Lyle Hanzlick

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

RECEIVED APR 29 1982 DEPT. OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE — FILE IN DUPLICATE

u. 8

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 606326
FILE NO. D(12-28)20 dbd
FILED 4-29-82 (DATE) AT 9- (TIME)
INA —
AMA —

REGISTRATION FEE (CHECK ONE)
EXEMPT WELL (NO CHARGE) ☐
NON-EXEMPT WELL — $10.00 ☒

WELL NO. 4
POWER : GAS

1. Name of Registrant:
MUNNELL FARMS
9190 LA ALBA DRIVE (Address) WHITTIER (City) CA (State) 90603 (Zip)

2. File and/or Control Number under previous groundwater law:
_____ (File Number) 35- (Control Number)

3. a. The well is located within the SE ¼ NW ¼ SE ¼, Section 20, of Township 12 N/S Range 28 E/W, G & SRB & M, in the County of COCHISE, ARIZONA.
b. If in a subdivision: Name of subdivision N/A, Lot No. N/A, Address N/A.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial)
CROP-IRRIGATION.

5. If for irrigation use, number of acres irrigated from well 160+ ACRES EST.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
_____ (Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well N/A feet
b. Diameter of casing 20 inches
c. Depth of casing N/A feet
d. Type of casing STEEL.
e. Maximum pump capacity N/A gallons per minute.
f. Depth to water N/A feet below land surface.
g. Date well completed BEFORE 1965 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☐.
* ¼ * ¼ S½ ¼, Section 20 Township 12 Range 28
* ¼ * ¼ W½ ¼, Section 21 Township 12 Range 28
NW ¼ 22 12 28
Attach additional sheet if necessary.

Munnell Farms by

9. DATE 4-16-82 SIGNATURE OF REGISTRANT [signature] V.P.
PREPARED BY: LYLE HANZLICK A.S.C.S. Lyle Hanzlick

Bowie Well #2 11565

FORM W-3—2M—3-50—S.P.CO.

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

EXCERPT OF 1945 GROUNDWATER LAW

Report of Well Driller must be prepared by the driller in all detail and filed with the State Land Commissioner as required by Section 7, Chapter 12, Senate Bill No. 3, First Special Session, 1945. This report should be in the mail within 30 days following completion of the well. Section 8 of the law provides: "Any person (includes any individual, firm, public or private corporation, or governmental agency) who shall fail or refuse to make any of the reports, give the notices required, or **fail to cooperate** with the State Land Commissioner or his representative, under the provisions of this Act, shall be guilty of a **misdemeanor** and shall be fined a sum not exceeding One Hundred Dollars."

1. OWNER Leland Jones (Name)
   Eloy, Arizona (Address)
2. Lessee or Operator ____ (Name)
   ____ (Address)
3. DRILLER David B. Graham (Name)
   1714 E. Independence Phoenix Arizona (Address)
4. Location of well: Twp. 12 S. Rge. 28 E. Section 23 SW ¼ SW ¼ SW ¼ (10-acre subdivision)
5. Intention to Drill File No. (D-12-28)23ccc

DESCRIPTION OF WELL

6. Total depth of hole 1,000 ft.
7. Type of casing slip joint double
8. Diameter and length of casing 20" in. from ____ to ____, ____ in. from ____ to ____, ____ in. from ____ to ____
9. Method of sealing at reduction points ____
10. Perforated from 980' to 500, from ____ to ____, from ____ to ____, from ____ to ____
11. Size of cuts 5/8 by5" Number cuts per foot 10
12. If screen was installed: Length ____ ft. Diam ____ in. Type ____
13. Method of construction drilled (drilled, dug, driven, bored, jetted, etc.)
14. Date completed Feb. 1952 (Month, Year)
15. Depth to water 46 ft. (If flowing well, so state.)
16. Describe point from which depth measurements were made, and give sea-level elevation if available ____
17. If flowing well, state method of flow regulation ____
18. REMARKS: ____

DO NOT WRITE IN THIS SPACE

OFFICE RECORD

Received 3-1-52 by lec

Filed 3-1-52 by lec

File No. (D-12-28)23ccc

(Well Log to Appear on Reverse Side)

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	5	top soil
5	14	clitche
14	70	clay
70	505	blue clay
505	535	red clay
535	539	gravel
539	560	clay and gravel
560	570	sand and gravel
570	600	sand and gravel with clay stratas
600	620	clay
620	645	sand and gravel with clay stratas
645	660	sand and gravel
660	820	sand and gravel with clay
820	826	cemented gravel
826	840	gravel cemented with clay
840	874	sand and gravel with clay stratas
874	1,000	conglomerate sand and gravel with clay

RECEIVED MAR 1 1952 STATE LAND DEPT.

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller David B. Graham
Name

1714 E. Independence
Address

Date Feb. 28, 1952

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

EXCERPT OF 1945 GROUNDWATER LAW

Report of Well Driller must be prepared by the driller in all detail and filed with the State Land Commissioner as required by Section 7, Chapter 12, Senate Bill No. 3, First Special Session, 1945. This report should be in the mail within 30 days following completion of the well. Section 8 of the law provides: "Any person (includes any individual, firm, public or private corporation, or governmental agency) who shall fail or refuse to make any of the reports, give the notices required, or fail to cooperate with the State Land Commissioner or his representative, under the provisions of this Act, shall be guilty of a misdemeanor and shall be fined a sum not exceeding One Hundred Dollars."

1. OWNER JONES RANCH ENTERPRISES, INC.
Name
P. O. Box 608, Eloy, Arizona
Address

2. Lessee or Operator
Name
Address

3. DRILLER David B. Graham
Name
1714 East Independence, Phoenix, Arizona
Address

4. Location of well: Twp. 12 S Rge. 28 E Section 25 SW ¼ ~~SE~~ SW ¼ SE ¼
10-acre subdivision

5. Intention to Drill File No. (D-12-28)25 dcc

DESCRIPTION OF WELL

6. Total depth of hole 1360 ft.

7. Type of casing

8. Diameter and length of casing 18 in. from 0 to 950 14 in. from 930 to 1360 in. from to

9. Method of sealing at reduction points

10. Perforated from 1340 to 720, from to, from to, from to

11. Size of cuts 5/8 by 5 Number of cuts per foot 8

12. If screen was installed: Length ft. Diam in. Type

13. Method of construction drilled
drilled, dug, driven, bored, jetted, etc.

14. Date started Sept. 1955
Month Day Year

15. Date completed
Month Day Year

16. Depth of water ft.
If flowing well, so state.

17. Describe point from which depth measurements were made, and give sea-level elevation if available

18. If flowing well, state method of flow regulation

19. REMARKS:

DO NOT WRITE IN THIS SPACE
OFFICE RECORD

Received 7-16-56 by RG
Filed 7-16-56 by RG
File No. (D-12-28)25 dcc

(Well Log to Appear on Reverse Side)

WD FORM G-301
REV. 4-27-53
2M 3-54

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	11	top soil
11	47	sandy clay
47	60	clay
60	90	sandy clay
90	98	clay
98	548	blue shale
548	646	gray shale
646	720	silt and clay
720	735	conglomerate
735	745	silt
745	750	fine sand
750	761	silt and clay
761	795	sand and clay
795	925	conglomerate
925	1186	sandy clay
1186	1348	conglomerate of clay and gravel
1348	1360	hard clay

RECEIVED JUL 16 1956 STATE LAND DEPT.

94

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller David B. Graham
Name

Address

Date

Page 1 of 2 B

B-J DRILLING CO.

Hole Log

26 CCB

CUSTOMER	LOCATION	HOLE NO.	DATE STARTED	DATE FINISHED
Barney Migliori	Bowie Ariz		1/28/79	/ /

DATE	DEPTH END OF RUN	FORMATION	REMARKS
1/30/79	30.0	Alluvium Sediments	Sand & Clay
	82.90		"
1-31-79	113.30		"
	142.80		"
	172.30		155' Blue Shale
	203.00		"
	233.60		"
	264.20		"
	294.60		"
	324.30		"
	354.70		"
	385.20		"
	414.70		"
	444.90		"
	475.30		"
	504.10		"
	534.80		"
	563.20		553 Course grain Sand
	563.20		"
	593.00		"
	623.70		"
	653.10		"

B-J DRILLING CO.

Hole Log

CUSTOMER	LOCATION	HOLE NO.	DATE STARTED	DATE FINISHED
Barney Miglieri	Bowie Arizona		1/28/79	/ /

DATE	DEPTH END OF RUN	FORMATION	REMARKS
1/31/79	683.00	Alluvium Sediments	Course grain Sand w/ bolders
	711.60		"
	740.70		"
	750.00		"

Page 1 of 2-A

Fax to Andy Messer

529-2449

B-J DRILLING CO.

Hole Log

CUSTOMER	LOCATION	HOLE NO.	DATE STARTED	DATE FINISHED
Barney Migliori	Bowie Arizona		1/28/79	/ /

DATE	DEPTH END OF RUN	FORMATION	REMARKS
	769	Alluvium Sediments	Conglomerate
	800		"
	828		"
	858		"
	888		"
	918		"
	947		"
	961		"
	1004		"
	1048		"
	1092		"
	1136		"
	1180		"
	1224	Volcanics	1195 Volcanics
	1268		"
	1312		"
2/29/79	1355		"
	1398		1360 Volcanic Conglomerate w/ clay
	1441		"
	1484		"
2/30/79	1527		"
	1571		"

B-J DRILLING CO.

Hole Log

CUSTOMER	LOCATION	HOLE NO.	DATE STARTED	DATE FINISHED
Barney Migliori	Bowie Ariz		1/28/79	/ /

DATE	DEPTH END OF RUN	FORMATION	REMARKS
	1614	Volcanics	" "
	1657		
2/22/79	1700		1680 Sand & Clay (Lt Brn)
	1743		"
	1786		"
	1800		"

B-J Drilling Company Inc.
P.O. Box 815
Benson, Arizona 85602

Phone: (520)586-3282
Fax: (520)623-1010

FAX TRANSMITTAL

DATE: 3/7/01

FAX NO: 529-2449

TO: Andy Messer

FROM: B J Drilling

ATTN:

RE: Hole Logs.

TOTAL NUMBER OF PAGES INCLUDING COVER 5

FORM W-3—1M—9-52

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

EXCERPT OF 1945 GROUNDWATER LAW

Report of Well Driller must be prepared by the driller in all detail and filed with the State Land Commissioner as required by Section 7, Chapter 12, Senate Bill No. 3, First Special Session, 1945. This report should be in the mail within 30 days following completion of the well. Section 8 of the law provides: "Any person (includes any individual, firm, public or private corporation, or governmental agency) who shall fail or refuse to make any of the reports, give the notices required, or fail to cooperate with the State Land Commissioner or his representative, under the provisions of this Act, shall be guilty of a misdemeanor and shall be fined a sum not exceeding One Hundred Dollars."

1. OWNER Glynn Knoll
Name
Bowie Ariz.
Address
2. Lessee or Operator Same
Name

Address
3. DRILLER H & H Drilling Co Walter McKinney
Name
B/1076, Bowie Ariz.
Address
4. Location of well: Twp 12 S Rge 28 E Section 26 SW¼ SW¼ SE¼ S½ 10-acre subdivision
5. Intention to Drill File No. D-12-28 26 Dcc.

DESCRIPTION OF WELL

6. Total depth of hole 687 ft.
7. Type of casing Welded
8. Diameter and length of casing 16 in. from 0 to 664-10 in. from ..... to ....., ... in. from ..... to .....
9. Method of sealing at reduction points Set on Shoulder
10. Perforated from 476 to 664 from ..... to ....., from ..... to ....., from ..... to .....
11. Size of cuts 3/16 Number cuts per foot 8
12. If screen was installed: Length ..... ft. Diam ..... in. Type .....
13. Method of construction Drilled
drilled, dug, driven, bored, jetted, etc.
14. Date completed 1 — 1953
Month Year
15. Depth to water 146 ft.
If flowing well, so state.
16. Describe point from which depth measurements were made, and give sea-level elevation if available
Rig Floor Measurements
17. If flowing well, state method of flow regulation

18. REMARKS:

DO NOT WRITE IN THIS SPACE
OFFICE RECORD

Received 3-23-53 by RC
Filed 3-23-53 by RC
File No. (D-12-28) 26 dcc

(Well Log to Appear on Reverse Side)

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL	
0	3	Soil	Dark
3	46	Chlechi & Hard Streaks	Light
46	105	Red Clay & Boulders	Red
105	127	Sand Boulders Water?	"
127	146	Blue Clay with sand streaks	Blue
146	160	Yellow & Blue Clay, Sand streaks	Grey
160	175	Sand & Gravel	"
175	385	Blue Clay with few Boulders	Blue
385	558	470 water sand & Grey clay mixed, sandy w.	Lt. Blue
558	640	Sand some Quartz	Lt. Red
640	678	Hard Cemented Sand with Boulders	Light
678	687	Hard fine sand	"

RECEIVED MAR 23 1953 STATE LAND DEPT.

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller H. H. Drlg. Co. / Walter Harkins
Name

Bx1076 - Bowie Ariz.
Address

Date 3 — 18 — 52.

Contractor License
10333

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

RECEIVED APR 29 1982 DEPT. OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE — FILE IN DUPLICATE

118

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 606331
FILE NO. D(12-28)28abc
FILED 4-29-82 AT 9- (DATE) (TIME)
INA —
AMA —

REGISTRATION FEE (CHECK ONE)
EXEMPT WELL (NO CHARGE) ☐
NON-EXEMPT WELL — $10.00 ☒

WELL NO. 9
POWER : GAS

1. Name of Registrant: MUNNELL FARMS
9090 LA ALBA DRIVE (Address) WHITTIER (City) CA (State) 90603 (Zip)

2. File and/or Control Number under previous groundwater law:
(File Number) 35- (Control Number)

3. a. The well is located within the SW ¼ NW ¼ NE ¼, Section 28, of Township 12 N/S Range 28 E/W, G & SRB & M, in the County of COCHISE , ARIZONA.
b. If in a subdivision: Name of subdivision N/A,
Lot No. N/A, Address N/A.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial)
CROP-IRRIGATION.

5. If for irrigation use, number of acres irrigated from well 160+ ACRES EST.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
(Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A) 1198 from video 9/00
a. Depth of Well N/A feet
b. Diameter of casing 20 inches
c. Depth of casing N/A feet
d. Type of casing STEEL.
e. Maximum pump capacity N/A gallons per minute.
f. Depth to water N/A feet below land surface.
g. Date well completed BEFORE 1965 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☐.

* ¼	NW ¼	NW ¼,	Section	28	Township	12	Range	28
* ¼	* ¼	SE ¼,	Section	21	Township	12	Range	28
*	*	N ½		28		12		28

Attach additional sheet if necessary.

Munnell Farms by
9. DATE 4-16-82 SIGNATURE OF REGISTRANT Wm. G. Munnell [illegible]
PREPARED BY : LYLE HANZLICK A.S.C.S. Lyle Hanzlick

(D-12-28) 28ABC

LONGMIRE WELL SERVICE

OFFICE - (602) 835-7725

P.O. BOX 761, CHANDLER, ARIZONA 85244

Date 9-8-00

Well Report Number 5950 P.O. Number

Customer Dick Eastman

Address

Well Number Location 11A

Casing Size 19½" ID Liner Size 18" @ 611', 16" @ 798'

Static Water Level 381' Breaks see results

Perforations 1st visable @ 524' mills Knife, sawcuts in both liners

Original Well Depth Well Depth Pump Depth

0" @ top of casing, Bands @ 16"

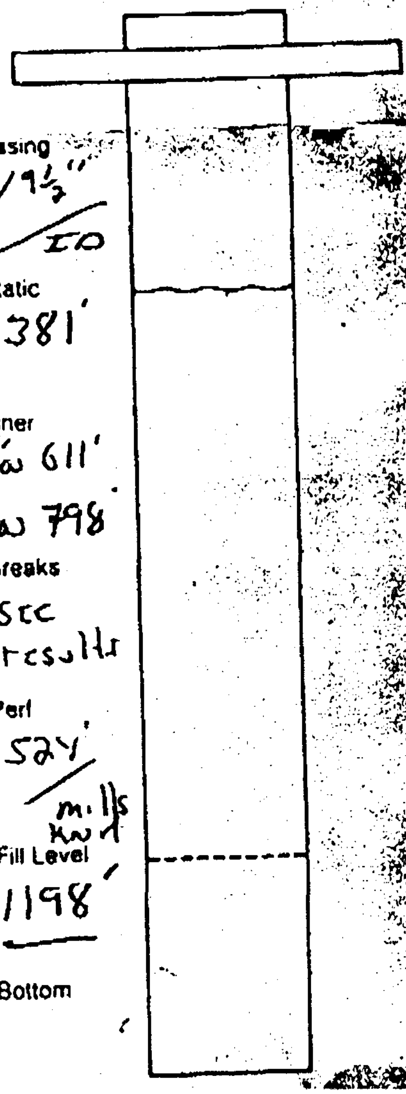
Results

380' - Break

422 - Break

436 - Break

Recommendations 3 - 4' patches @ 3 Breaks



Casing 19½" / ID

Static 381'

Liner 18" @ 611' 16" @ 798'

Breaks see results

Perf 524' / mills knif

Fill Level 1198'

Bottom

Operator Brian Rupert

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

RECEIVED APR 29 1982 DEPT. OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE – FILE IN DUPLICATE

u8

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 666336
FILE NO. D(12-28) 28 bcc
FILED 4-29-82 AT 9- (DATE) (TIME)
INA —
AMA —

REGISTRATION FEE (CHECK ONE)
EXEMPT WELL (NO CHARGE) ☐
NON-EXEMPT WELL – $10.00 ☒

WELL NO. 14
POWER : GAS

1. Name of Registrant: MUNNELL FARMS
9190 LA ALBA DRIVE WHITTIER CA 90603
(Address) (City) (State) (Zip)

2. File and/or Control Number under previous groundwater law:
(File Number) 35- (Control Number)

3. a. The well is located within the SW ¼ SW ¼ NW ¼, Section 28 of Township 12 N/S Range 28 E/W, G & SRB & M, in the County of COCHISE , ARIZONA.
b. If in a subdivision: Name of subdivision N/A, Lot No. N/A, Address N/A.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial) CROP-IRRIGATION.

5. If for irrigation use, number of acres irrigated from well 160+ ACRES EST.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
(Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well 1400 feet
b. Diameter of casing 20 inches
c. Depth of casing 1400 feet
d. Type of casing STEEL.
e. Maximum pump capacity N/A gallons per minute.
f. Depth to water N/A feet below land surface.
g. Date well completed BEFORE 1965 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☐.
* ¼ * ¼ * ¼, Section 28 Township 12 Range 28
* ¼ N½ NE ¼, Section 33 Township 12 Range 28
E½ E½ NE¼ 29 12 28
Attach additional sheet if necessary.

9. DATE 4-16-82 SIGNATURE OF REGISTRANT Munnell Farms by Wm G. Munnell ? [illegible]
PREPARED BY : LYLE HANZLICK A.S.C.S. Lyle Hanzlick

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

RECEIVED APR 29 1982 DEPT. OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE — FILE IN DUPLICATE

u8

FOR OFFICE USE ONLY
REGISTRATION NO. 55-606335
FILE NO. D(12-28)28ccc
FILED 4-29-82 (DATE) AT 9- (TIME)
INA —
AMA —

REGISTRATION FEE (CHECK ONE)
EXEMPT WELL (NO CHARGE) ☐
NON-EXEMPT WELL — $10.00 ☒

WELL NO. 13
POWER : GAS

1. Name of Registrant: MUNNELL FARMS
9190 LA ALBA DRIVE (Address) WHITTIER (City) CA (State) 90603 (Zip)

2. File and/or Control Number under previous groundwater law:
(File Number) 35- (Control Number)

3. a. The well is located within the SW ¼ SW ¼ SW ¼, Section 28,
of Township 12 N/S Range 28 E/W, G & SRB & M, in the
County of COCHISE , ARIZONA.
b. If in a subdivision: Name of subdivision N/A,
Lot No. N/A, Address N/A.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial)
CROP-IRRIGATION.

5. If for irrigation use, number of acres irrigated from well 160+ ACRES EST.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
(Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well N/A feet
b. Diameter of casing 20 inches
c. Depth of casing N/A feet
d. Type of casing STEEL.
e. Maximum pump capacity N/A gallons per minute.
f. Depth to water N/A feet below land surface.
g. Date well completed BEFORE 1965 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☐.
* ¼ * ¼ W ½ ¼, Section 28 Township 12 Range 28
E ½ ¼ E ½ ¼ NE ¼, Section 29 Township 12 Range 28

Attach additional sheet if necessary.

9. DATE 4-16-82 SIGNATURE OF REGISTRANT Munnell Farms by Wm. G. Munnell Jr. (P.)
PREPARED BY : LYLE HANZLICK A.S.C.S. Lyle Hanzlick

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

RECEIVED APR 29 1982 DEPT. OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE – FILE IN DUPLICATE

U8

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 606332
FILE NO. D(12-28)28dcc
FILED 4-29-82 (DATE) AT 9- (TIME)
INA —
AMA —

REGISTRATION FEE (CHECK ONE)
EXEMPT WELL (NO CHARGE) ☐
NON-EXEMPT WELL – $10.00 ☒

WELL NO. 10
POWER : GAS

1. Name of Registrant: MUNNELL FARMS
9190 LA ALBA DRIVE (Address) WHITTIER (City) CA (State) 90603 (Zip)

2. File and/or Control Number under previous groundwater law:
(File Number) 35- (Control Number)

3. a. The well is located within the SW ¼ SW ¼ SE ¼, Section 28, of Township 12 N/(S) Range 28 (E)/W, G & SRB & M, in the County of COCHISE , ARIZONA.

b. If in a subdivision: Name of subdivision N/A,
Lot No. N/A, Address N/A.

4. The principal use(s) of water (Examples: irrigation · stockwater · domestic · municipal · industrial)
CROP-IRRIGATION.

5. If for irrigation use, number of acres irrigated from well 160+ ACRES EST.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
(Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well N/A feet
b. Diameter of casing 20 inches
c. Depth of casing N/A feet
d. Type of casing STEEL.
e. Maximum pump capacity N/A gallons per minute.
f. Depth to water N/A feet below land surface.
g. Date well completed BEFORE 1965 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☐.
* ¼ * ¼ SE ¼, Section 21 Township 12 Range 28
* ¼ * ¼ S ½, Section 22 Township 12 Range 28
S ½ 28 12 28
Attach additional sheet if necessary.

9. DATE 4-16-82 SIGNATURE OF REGISTRANT Munnell Farms by Wm. G. Munnell Al P.
PREPARED BY : LYLE HANZLICK A.S.C.S. Lyle Hanzlick

(D-12-28) 29DBC

Hill Top Dev - Roberts

CUSTOMER Well 5

1-14-87

DATE

WELL #3002 REPORT

CASING
15½

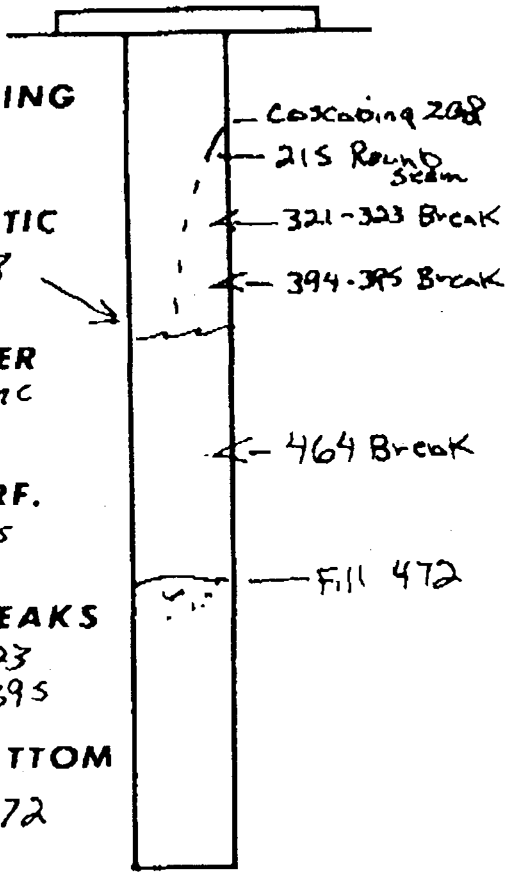
STATIC
408

LINER
None

PERF.
mills

BREAKS
321-323
394-395
464

BOTTOM
472



LONGMIRE WELL SERVICE

P.O. Box 761
Mobile Phone 836-3451
Office Phone 963-5165
Chandler, Az. 85224

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

RECEIVED APR 29 1982 DEPT. OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE – FILE IN DUPLICATE

118

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 606340
FILE NO. D(12-28)32dcc
FILED 4-29-82 AT 9- (DATE) (TIME)
INA —
AMA —

REGISTRATION FEE (CHECK ONE)
EXEMPT WELL (NO CHARGE) ☐
NON-EXEMPT WELL – $10.00 ☒

WELL NO. 18
POWER : GAS

1. Name of Registrant: MUNNELL FARMS
9190 LA ALBA DRIVE (Address) WHITTIER (City) CA (State) 90603 (Zip)

2. File and/or Control Number under previous groundwater law:
(File Number) 35- (Control Number)

3. a. The well is located within the SW ¼ SW ¼ SE ¼, Section 32, of Township 12 N/S, Range 28 E/W, G & SRB & M, in the County of COCHISE , ARIZONA.
b. If in a subdivision: Name of subdivision N/A,
Lot No. N/A, Address N/A.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial)
CROP-IRRIGATION.

5. If for irrigation use, number of acres irrigated from well 160+ ACRES EST.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
(Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well N/A feet
b. Diameter of casing 18 inches
c. Depth of casing N/A feet
d. Type of casing STEEL.
e. Maximum pump capacity N/A gallons per minute.
f. Depth to water N/A feet below land surface.
g. Date well completed BEFORE 1965 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☐.

* ¼	* ¼	NE ¼, Section	32	Township	12	Range 28
* ¼	* ¼	SE ¼, Section	32	Township	12	Range 28
*	*	SW¼	32		12	28

Attach additional sheet if necessary.

9. DATE 4-16-82 SIGNATURE OF REGISTRANT Munnell Farms by Wm. C. Munnell Jr. P
PREPARED BY : LYLE HANZLICK A.S.C.S. Lyle Hanzlick

DEPARTMENT OF WATER RESOURCES
99 EAST VIRGINIA AVENUE
PHOENIX, ARIZONA 85004

RECEIVED APR 29 1982 DEPT. OF WATER RESOURCES

REGISTRATION OF EXISTING WELLS

READ INSTRUCTIONS ON BACK OF THIS FORM BEFORE COMPLETING
PRINT OR TYPE — FILE IN DUPLICATE

FOR OFFICE USE ONLY
REGISTRATION NO. 55- 606342
FILE NO. D(12-28)32 dcc
FILED 4-29-82 (DATE) AT 9- (TIME)
INA —
AMA —

REGISTRATION FEE (CHECK ONE)
EXEMPT WELL (NO CHARGE) ☐
NON-EXEMPT WELL — $10.00 ☒

WELL NO.20
POWER : GAS

1. Name of Registrant: MUNNELL FARMS
9190 LA ALBA DRIVE (Address) WHITTIER (City) CA (State) 90603 (Zip)

2. File and/or Control Number under previous groundwater law:
(File Number) 35- (Control Number)

3. a. The well is located within the SE ¼ SW ¼ SE ¼, Section 32, of Township 12 N/S, Range 28 E/W, G & SRB & M, in the County of COCHISE , ARIZONA.
b. If in a subdivision: Name of subdivision N/A,
Lot No. N/A, Address N/A.

4. The principal use(s) of water (Examples: irrigation - stockwater - domestic - municipal - industrial)
CROP-IRRIGATION

5. If for irrigation use, number of acres irrigated from well 160+ ACRES EST.

6. Owner of land on which well is located. If same as Item 1, check this box ☒
(Address) (City) (State) (Zip)

7. Well data (If data not available, write N/A)
a. Depth of Well N/A feet
b. Diameter of casing 14 inches
c. Depth of casing N/A feet
d. Type of casing STEEL.
e. Maximum pump capacity N/A gallons per minute.
f. Depth to water N/A feet below land surface.
g. Date well completed BEFORE 1965 (Month) (Day) (Year).

8. The place(s) of use of water. If same as Item 3, check this box ☐.
* ¼ * ¼ NE ¼, Section 32 Township 12 Range 28
* ¼ * ¼ SE ¼, Section 32 Township 12 Range 28
* * SW ¼ 32 12 28
Attach additional sheet if necessary.

Munnell Farms by

9. DATE 4-16-82 SIGNATURE OF REGISTRANT Wm. G. Munnell Jr. VP
PREPARED BY : LYLE HANZLICK A.S.C.S. Lyle Hanzlick

Ms Dist. make form

FORM W-3—1M—10-51

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

EXCERPT OF 1945 GROUNDWATER LAW

Report of Well Driller must be prepared by the driller in all detail and filed with the State Land Commissioner as required by Section 7, Chapter 12, Senate Bill No. 3, First Special Session, 1945. This report should be in the mail within 30 days following completion of the well. Section 8 of the law provides: "Any person (includes any individual, firm, public or private corporation, or governmental agency) who shall fail or refuse to make any of the reports, give the notices required, or fail to cooperate with the State Land Commissioner or his representative, under the provisions of this Act, shall be guilty of a **misdemeanor** and shall be fined a sum not exceeding One Hundred Dollars."

1. OWNER Tom Clarke (Name)
Bowie Arizona (Address)
2. Lessee or Operator Same (Name)
(Address)
3. DRILLER H. H. Drilg Co (Name)
Bowie Ariz. Bx 1076 (Address)
4. Location of well: Twp 12 (S) Rge 28 (E) Section 33 SW 10 Ac ¼ NW ¼ NE ¼ (10-acre subdivision)
5. Intention to Drill File No.

DESCRIPTION OF WELL

6. Total depth of hole 550 ft.
7. Type of casing 16" welded new pipe
8. Diameter and length of casing 16 in. from 0 to 552 in. from ... to ..., ... in. from ... to ...
9. Method of sealing at reduction points Set on Bottom
10. Perforated from 403 to 550, from ... to ..., from ... to ..., from ... to ...
11. Size of cuts 3/16 Number cuts per foot 12
12. If screen was installed: Length ... ft. Diam ... in. Type ...
13. Method of construction Drilled, Rotary Rig (drilled, dug, driven, bored, jetted, etc.)
14. Date completed 8 (Month) 14 51 (Year)
15. Depth to water 124 ft. (If flowing well, so state.)
16. Describe point from which depth measurements were made, and give sea-level elevation if available. Ground Level
17. If flowing well, state method of flow regulation

18. REMARKS:

DO NOT WRITE IN THIS SPACE
OFFICE RECORD

Received 9-25-52 by lec
Filed 9-25-52 by lec
File No. (D-12-28)33 abc

(Well Log to Appear on Reverse Side)

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	9	Top Soil, Dark Color.
9	20	Sand and Clay Yellow
20	148	Sand and Boulders Yellow.
		(Some Water)
148	227	Blue Clay with Sand streaks.
227	247	Sand Hard Light
247	283	Blue Shale Blue
283	304	Sand & Gravel some Boulders, Red
~~304~~	~~338~~	and Some Water.
304	338	Clay Yellow
338	345	Sand & Gravel Light
345	355	Sand Stone Hard Grey.
355	358	Gravel & Sand, Yellow
358	381	Clay Soft. "
381	400	Sand & Boulders, "
400	550	Sand Yellow.

RECEIVED
SEP 25 1952
STATE LAND
DEPT.

RECEIVED
SEP 18 1952
STATE LAND
DEPT.

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller H. H. Drlg Co.
Name Walter Perkins
Address Bonita

Contractor
License M-10333

Date 5 - 29 - 52

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

This report should be prepared by the driller in all detail and filed with the State Land Commissioner following completion of the well.

1. OWNER Velma Lockwood
Name
Bowie, Arizona
Address
2. Lessee ~~or Operator~~ Dewain A. Lockwood
Name
P. O. Box 126, Bowie, Arizona 85605
Address
3. DRILLER Homer L. Redding DBA Redding Pump & Well Service
Name
P.O. Box 255 San Simon, Arizona 85632
Address
4. Location of well: Twp. 12 South Rge. 28 E. Section 33 SW ¼ SW ¼ NW ¼
10-acre subdivision
5. Intention to Drill File No. D(12-28)33 bcc Permit No.

DESCRIPTION OF WELL

6. Total depth of hole 758' ft.
7. Type of casing Welded
8. Diameter and length of casing 16 in. from 0 to 670, 12 in. from 652 to 758, in. from to
9. Method of sealing at reduction points Not sealed
10. Perforated from 270 to 758', from to, from to, from to
11. Size of cuts 3/16" x 12" Number of cuts per foot 3
12. If screen was installed: Length ft. Diam. in. Type
13. Method of construction Drilled
drilled, dug, driven, bored, jetted, etc.
14. Date started October 7 1967
Month Day Year
15. Date completed November 20 1967
Month Day Year
16. Depth of water 215' ft.
If flowing well, so state.
17. Describe point from which depth measurements were made, and give sea-level elevation if available ground level
18. If flowing well, state method of flow regulation
19. REMARKS:

DO NOT WRITE IN THIS SPACE
OFFICE RECORD

Received 1-17-69 by [illegible]
Filed 1-17-69 by [illegible]
File No. D(12-28)33 bcc

(Well Log to Appear on Reverse Side)

WD FORM G-301
REV. 4-27-53

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	105	top soil
105	106	water sand
106	155	brown clay
155	265	blue clay
265	292	brown clay
292	295	sand
295	312	brown clay
312	315	caliche
315	367	brown clay
367	370	hard sand rock
370	395	conglomerate
395	405	brown clay
405	408	sand
408	420	conglomerate
420	425	gravel
425	429	conglomerate
429	433	sand
433	448	brown clay
448	455	conglomerate
455	460	gravel
460	467	conglomerate
467	470	gravel
470	481	conglomerate
481	483	sand
483	496	conglomerate
496	500	sand
500	507	conglomerate
507	510	gravel
510	512	gonglomerate
512	516	gravel
516	524	conglomerate
524	526	gravel
526	534	conglomerate
534	565	conglomerate
565	568	gravel
568	570	sand
570	582	gravel
582	625	conglomerate
625	627	gravel
627	650	brown clay
650	655	gravel
655	758'	conglomerate

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller Homer L. Redding
Name

Box 255 San Simon, Arizona 85632
Address

Date January 16,1969

FORM W-3 2M 12-47 JAHN-TYLER

RECEIVED
LAND DEPARTMENT
WATER DIVISION
MAY 11 1948
STATE OF ARIZONA

WATER DIVISION
State Land Dep...

REPORT OF WELL DRILLER

Report of Well Driller is required to be made and filed with the State Land Commissioner as required by Section 7, Chapter 12, Senate Bill No. 3, Seventeenth Legislature, First Special Session, 1945. A separate report shall be made for each well and filed within 30 days after completion of the well.

1. Owner Clara M. Kaiser, property owner
Name
Box 636, Bowie, Arizona
Address

2. Lessee or Operator Lockwood Dairy, - Dewain + Velma Ann Lockwood
Name
P.O. Box 636, Bowie, Arizona.
Address

3. Driller John "Jack" Cameron
Name
P.O. Box 474, Willcox, Arizona
Address

4. Location of well: Twp. 12 S. Rge. 28 E. Section 33 SW 1/4 SE 1/4 NW 1/4
10-acre subdivision

DESCRIPTION OF WELL

5. Total depth of hole 488 ft.
6. Type of casing 1/4" wall, 6 ft welded Joints
7. Diameter and length of casing 14 in. from 0 to 488' ___ in. from ___ to ___, ___ in. from ___ to ___
8. Method of sealing at reduction points No Reduction
9. Perforated from 438' to 488', from ___ to ___, from ___ to ___, from ___ to ___
10. Size of cuts 6" X 5/16" Number cuts per foot 10
11. If screen was installed: Length ___ ft. Diam. ___ in. Type ___
12. Method of construction Drilled
drilled, dug, driven, bored, jetted, etc.
13. Date completed April 1948
Month Year
14. Depth to water 105 ft.
If flowing well, so state.
15. Describe point from which depth measurements were made, and give sea-level elevation if available ___
16. If flowing well, state method of flow regulation ___

DISCHARGE DATA

17. Well discharge 1200 gpm
gal. per min. or cu. ft. per sec. or miner's inches.
18. Method of discharge measurement ___
weir, orifice, current meter, etc.
19. Drawdown ___ ft.
20. Purpose of use Farming
21. Place of use: Twp. ___ Rge. ___ Section ___ ___ Acres ___
(See 22) Legal subdivision
22. Purpose of use ___
Twp. ___ Rge. ___ Section ___ ___ Acres ___
Legal subdivision
22. If well is part of irrigation system of Irrigation District, Association or Company, omit 23 and give name of project.
___
Name of Project

(D-12-28) 33 bdc

EQUIPMENT DATA

23. Kind of pump Turbine
turbine, centrifugal, etc.
24. Kind of power Deisel
electric, natural gas, etc.
25. Horsepower rating of motor ___

DO NOT WRITE IN THIS SPACE

OFFICE RECORD

Received 5-11-48 by lj
Filed 5-19-48 by lj
File No. (D-12-28)33 bdc
Cross-referenced (Name) ___ by ___
Cross-referenced (Basin) ___ by ___
Cross-referenced ___ by ___

(See Other Side)

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

From (feet)	To (feet)	Description of formation material
0	94	Red clay
94	205	blue clay
205	365	gray sandy clay
365	375	sand & gravel
375	380	red clay
380	385	sand & gravel
385	390	grey sticky clay
390	395	sand & boulders
395	400	grey sticky clay
400	405	packed sand
405	410	yellow sticky clay
410	415	sand & boulders
415	420	yellow sticky clay
420	425	packed sand
425	430	yellow sticky clay
430	445	packed sand
445	460	sand & boulders
460	465	yellow sticky clay
465	470	sand & boulders
470	475	yellow sticky clay
475	480	sand & boulders
480	482	yellow sticky clay
482	488	sand & boulders

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller Jack Cameron
Name

Box 474
Address

Date Willcox, Arizona

May 1, 1948

LAND DEPARTMENT
WATER DIVISION
STATE OF ARIZONA

REPORT OF WELL DRILLER

This report should be prepared by the driller in all detail and filed with the State Land Commissioner following completion of the well.

1. OWNER Dewain Lockwood
Name
Bowie ariz. Box 16 85605
Address

2. Lessee or Operator
Name

Address

3. DRILLER Homer L. Redding
Name
Box 255 San Simon ariz.
Address

4. Location of well: Twp 12 South Rge 28 East Section 33 SW ¼ SW ¼ SW ¼
10-acre subdivision

5. Intention to Drill File No. D(12-28)33 ccc Permit No.

DESCRIPTION OF WELL

6. Total depth of hole 953 ft.

7. Type of casing Seamless Welded casing

8. Diameter and length of casing ~~77~~ 16 in. from 0 to 777, 12 in. from 753 to 953, in. from to

9. Method of sealing at reduction points flared 12" top out to 15½"

10. Perforated from 376' to 953, from to, from to, from to

11. Size of cuts 3/16" X 6" Number of cuts per foot 4

12. If screen was installed: Length ft. Diam in. Type

13. Method of construction drilled
drilled, dug, driven, bored, jetted, etc.

14. Date started 7 17 74
Month Day Year

15. Date completed 10 21 74
Month Day Year

16. Depth of water Static 300 ft.
If flowing well, so state.

17. Describe point from which depth measurements were made, and give sea-level elevation if available
measurements from ground level approx 3600

18. If flowing well, state method of flow regulation

19. REMARKS:

DO NOT WRITE IN THIS SPACE
OFFICE RECORD

Received 1-14-75 by fmr
Filed by
File No. D(12-28)33 ccc
27979

(Well Log to Appear on Reverse Side)

LOG OF WELL

Indicate depth at which water was first encountered, and the depth and thickness of water bearing beds. If water is artesian, indicate depth at which encountered, and depth to which it rose in well.

FROM (FEET)	TO (FEET)	DESCRIPTION OF FORMATION MATERIAL
0	25	top soil & red sandy clay
25	36	dry gravel bed
36	90	red sandy clay
90	95	dry sand
95	150	red sandy clay
150	153	water gravel - wet
153	180	red clay
180	280	blue clay
280	290	red clay
290	292	fine sand
292	390	brown clay
390	490	brown conglimerate
490	953	sand, gravel & streaks of conglamerate

I hereby certify that this well was drilled by me (or under my supervision), and that each and all of the statements herein contained are true to the best of my knowledge and belief.

Driller Homer L. Redding
Name

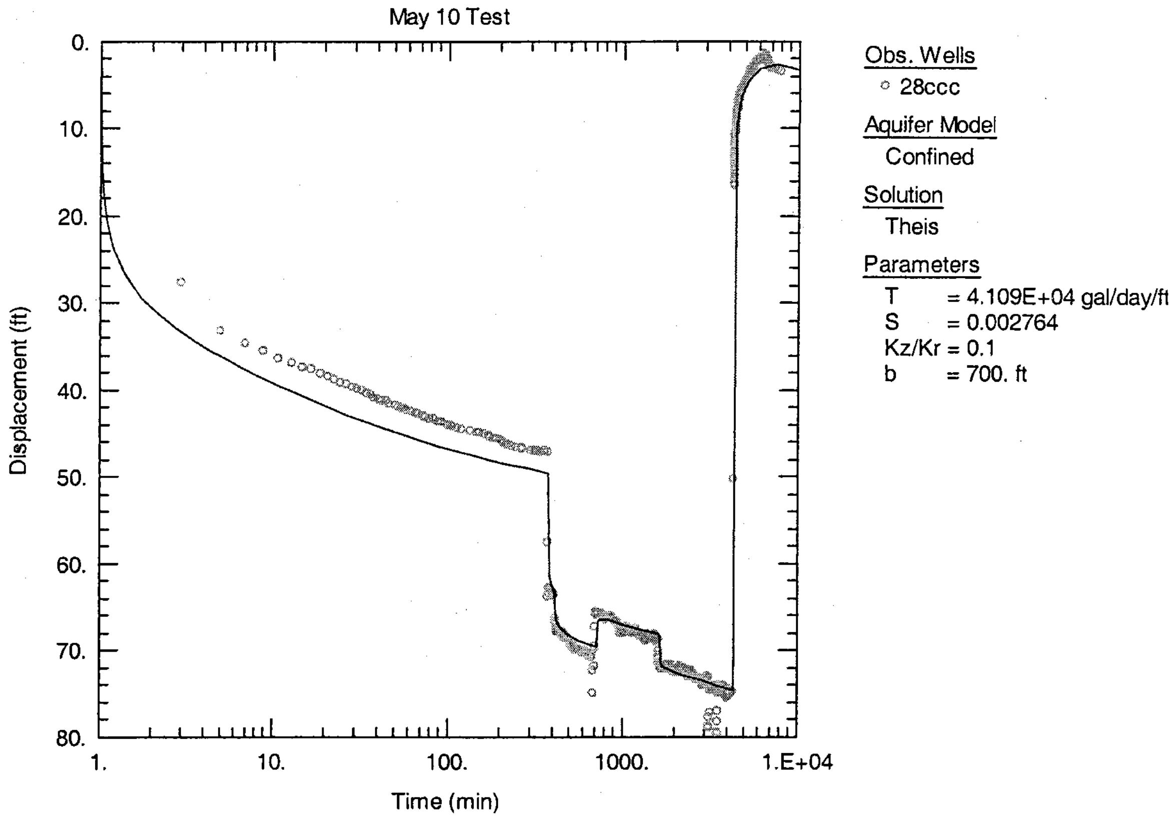
Box 255 San Simon Ariz
Address

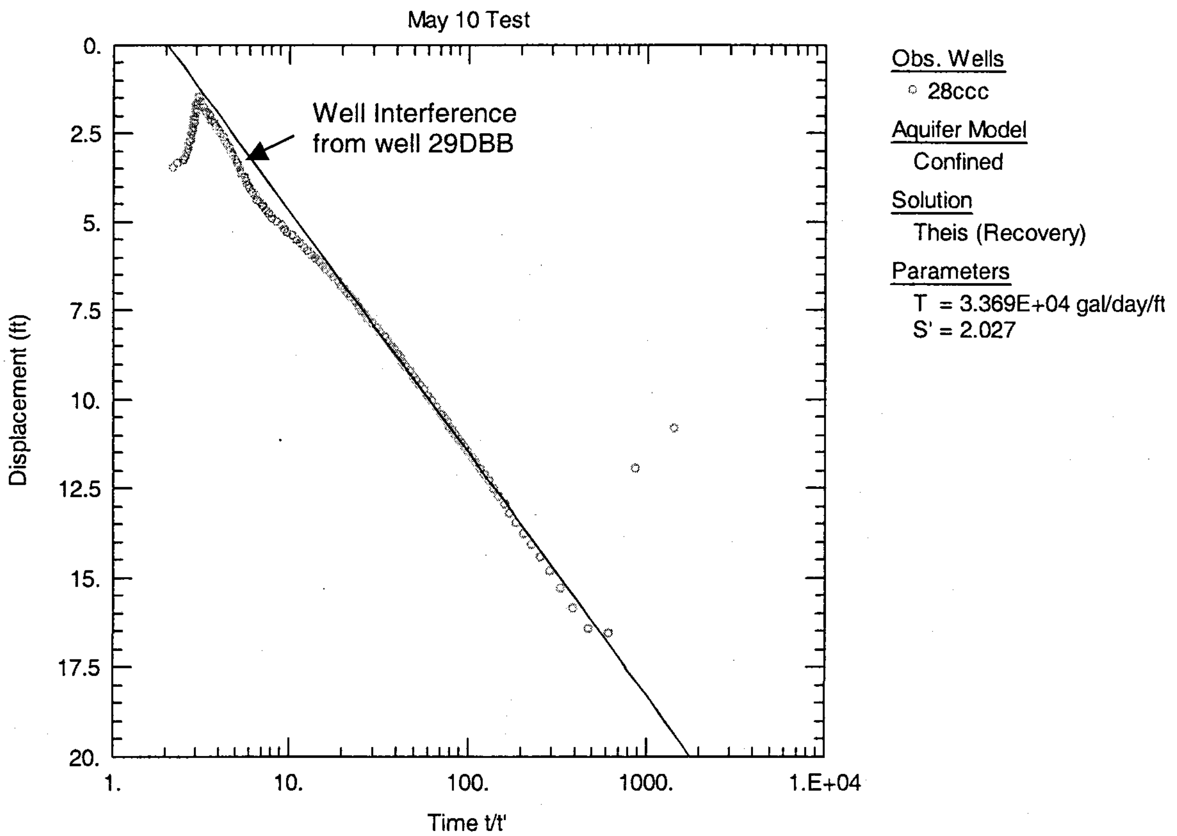
Date 1-10-75

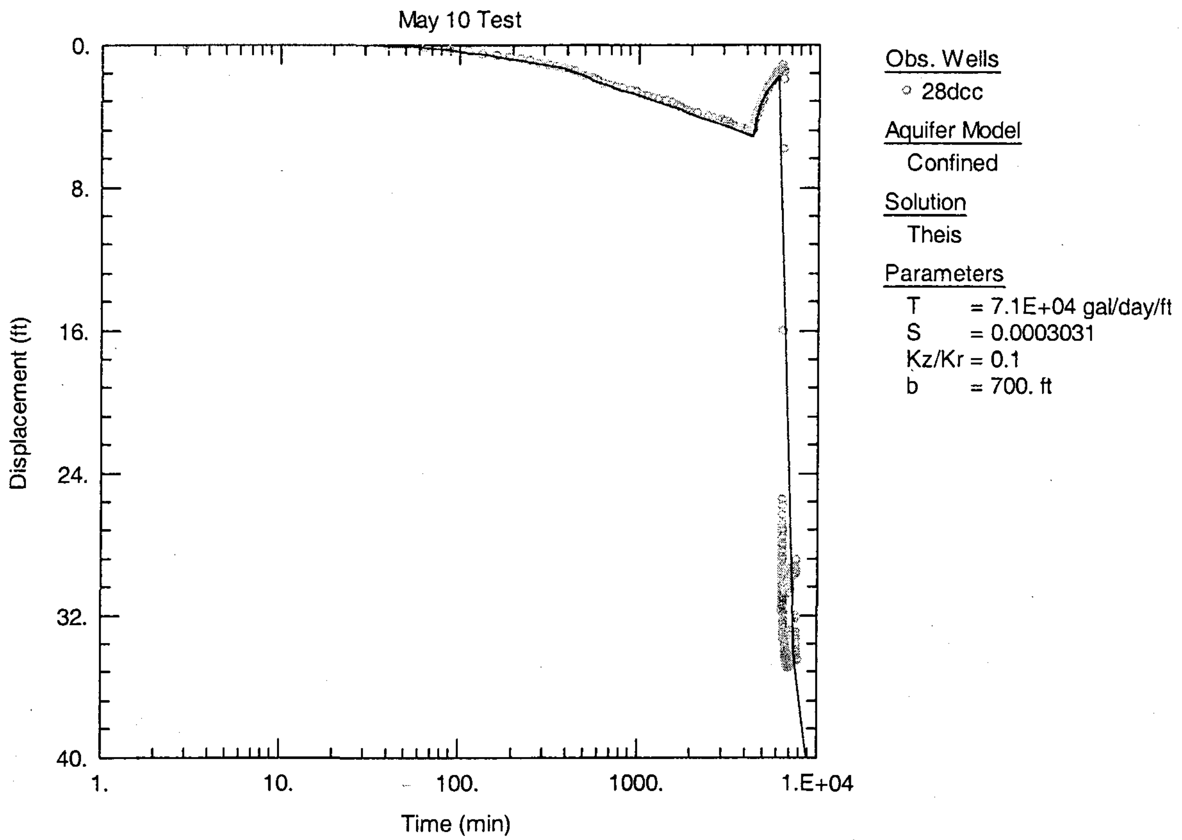
2-7

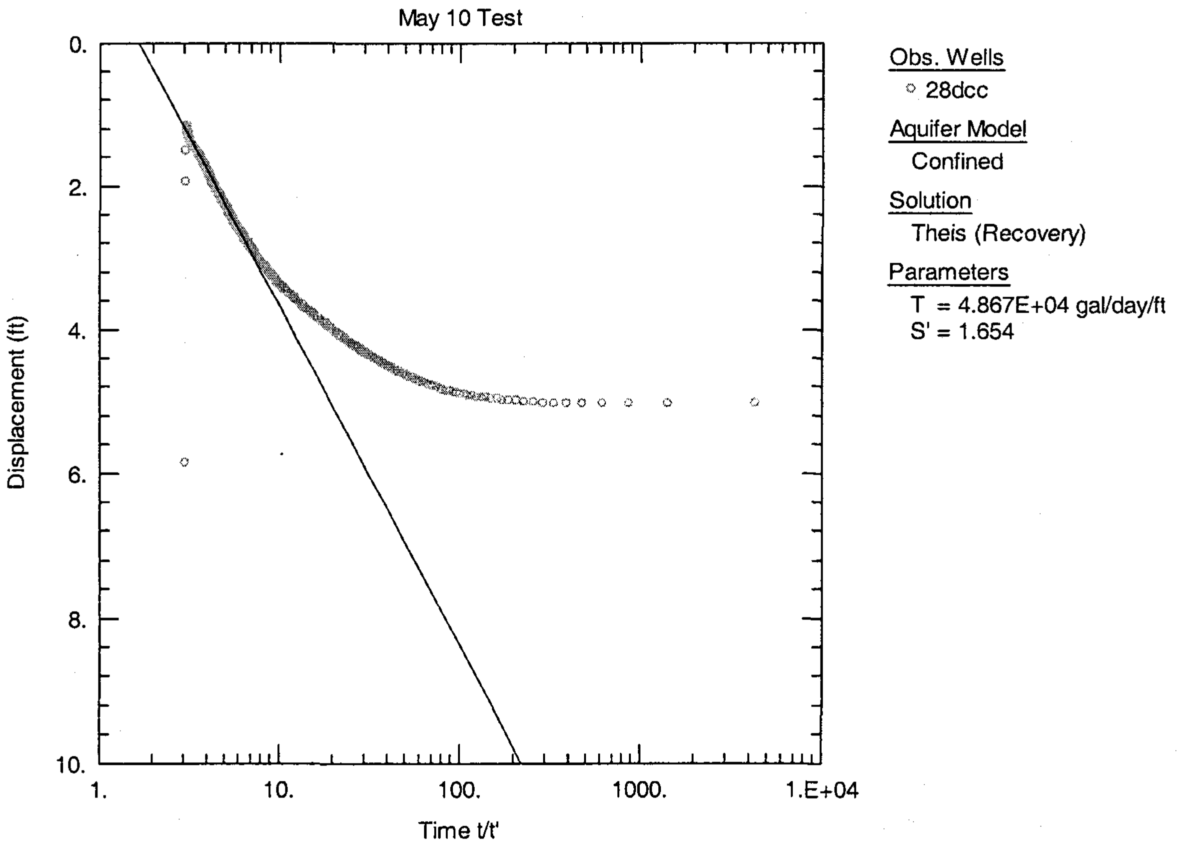
APPENDIX B

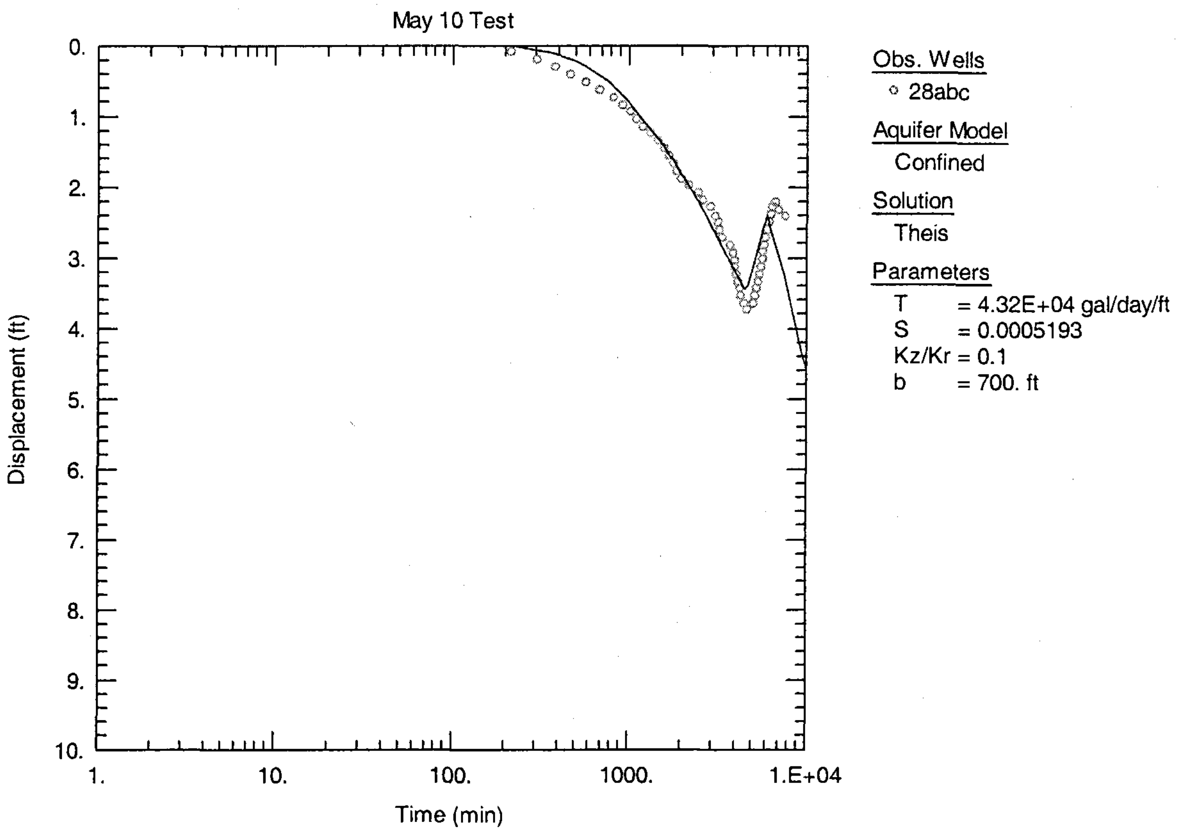
AQUIFER TEST DATA AND GRAPHS


May 10 Test
Displacement (ft)
Time (min)
Obs. Wells
28ccc
Aquifer Model
Confined
Solution
Theis
Parameters
T = 4.109E+04 gal/day/ft
S = 0.002764
Kz/Kr = 0.1
b = 700. ft

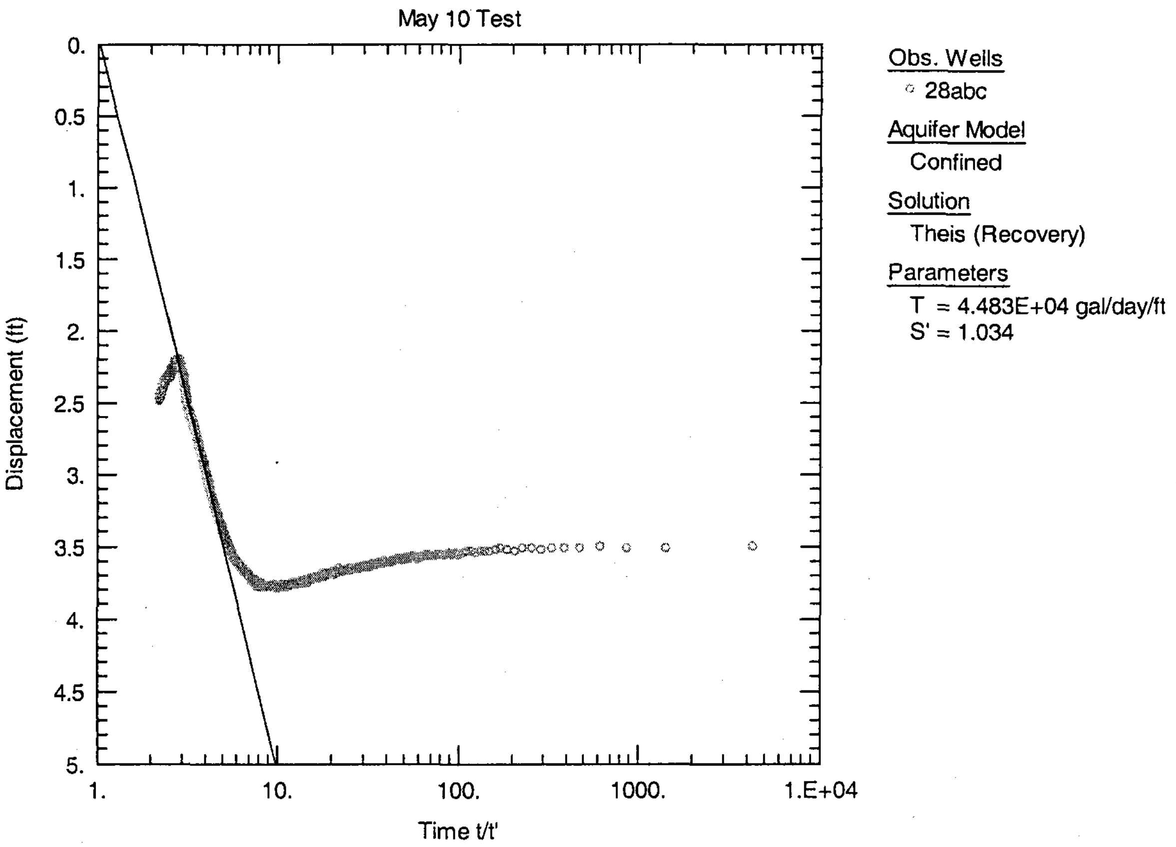

May 10 Test
Well Interference
from well 29DBB
Displacement (ft)
Time t/t'
Obs. Wells
28ccc
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 3.369E+04 gal/day/ft
S' = 2.027


May 10 Test
Displacement (ft)
0.
8.
16.
24.
32.
40.
1.
10.
100.
1000.
1.E+04
Time (min)
Obs. Wells
28dcc
Aquifer Model
Confined
Solution
Theis
Parameters
T = 7.1E+04 gal/day/ft
S = 0.0003031
Kz/Kr = 0.1
b = 700. ft

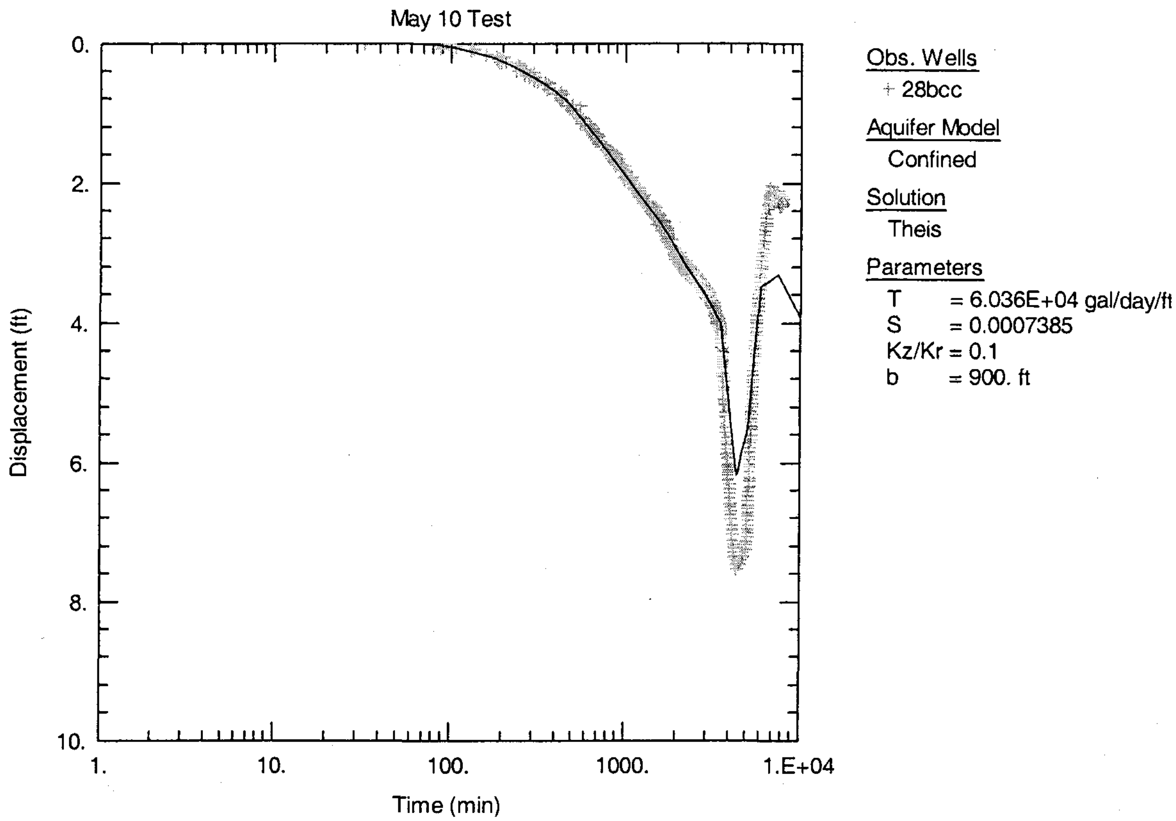

May 10 Test
Displacement (ft)
0.
2.
4.
6.
8.
10.
1.
10.
100.
1000.
1.E+04
Time t/t'
Obs. Wells
28dcc
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 4.867E+04 gal/day/ft
S' = 1.654



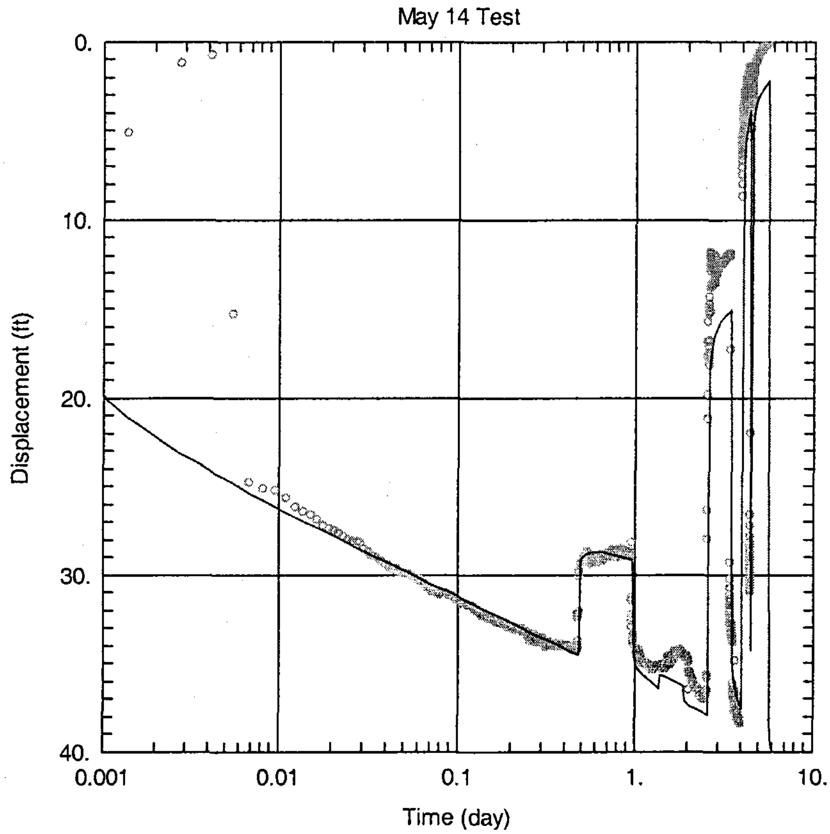
May 10 Test
Displacement (ft)
Time (min)
0.
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
1.
10.
100.
1000.
1.E+04
Obs. Wells
28abc
Aquifer Model
Confined
Solution
Theis
Parameters
T = 4.32E+04 gal/day/ft
S = 0.0005193
Kz/Kr = 0.1
b = 700. ft



May 10 Test
Displacement (ft)
Time t/t'
0.
0.5
1.
1.5
2.
2.5
3.
3.5
4.
4.5
5.
1.
10.
100.
1000.
1.E+04
Obs. Wells
28abc
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 4.483E+04 gal/day/ft
S' = 1.034



28BCC recovery data was invalidated by well interference from well 29DBB.

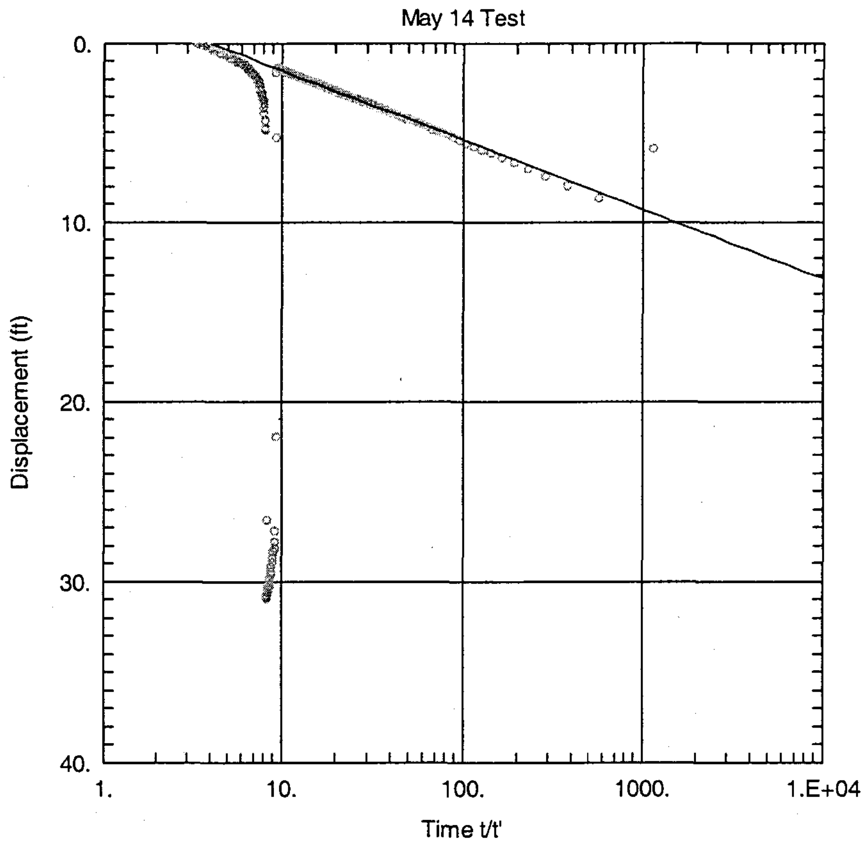


Obs. Wells
28dcc

Aquifer Model
Confined

Solution
Papadopulos-Cooper

Parameters
T = 4.737E+04 gal/day/ft
S = 0.0002742
Rw = 2.487 ft

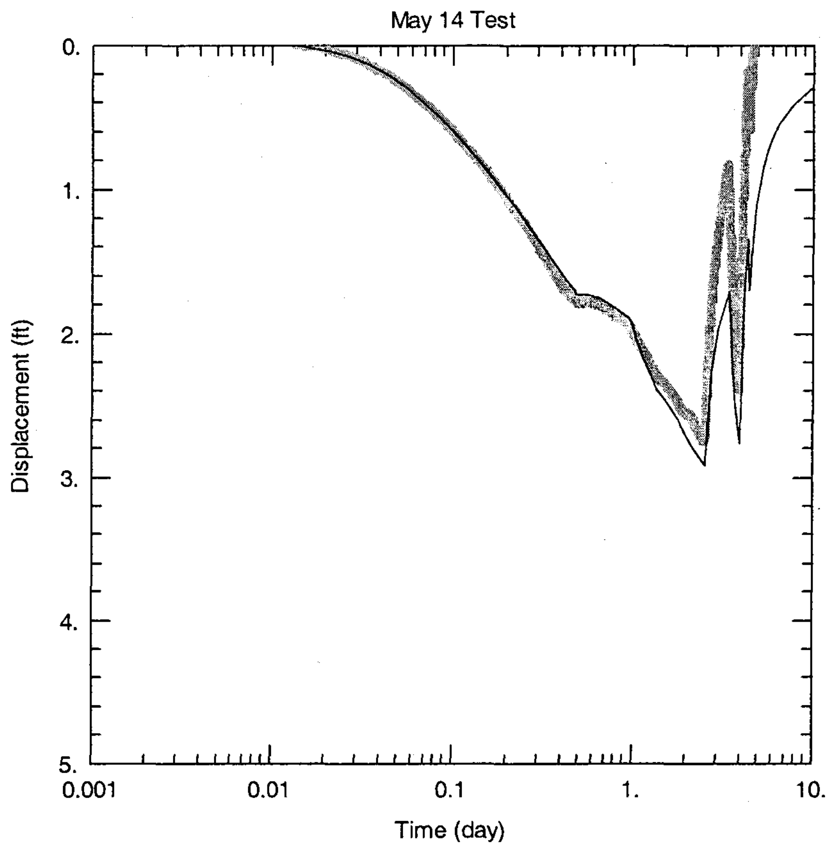


Obs. Wells
28dcc

Aquifer Model
Confined

Solution
Theis (Recovery)

Parameters
T = 4.893E+04 gal/day/ft
S' = 4.062

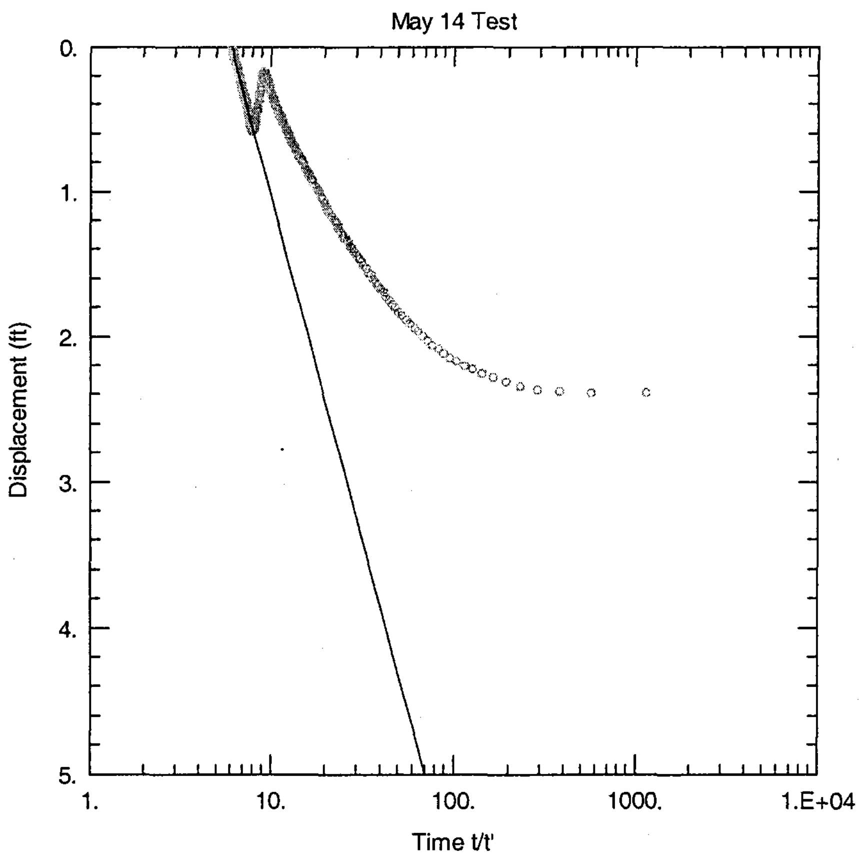


Obs. Wells
○ 28ccc

Aquifer Model
Leaky

Solution
Moench (Case 1)

Parameters
T = 8.518E+04 gal/day/ft
S = 0.0003317
r/B = 0.1
ß = 0.1
Sw = 0.
Rw = 1. ft

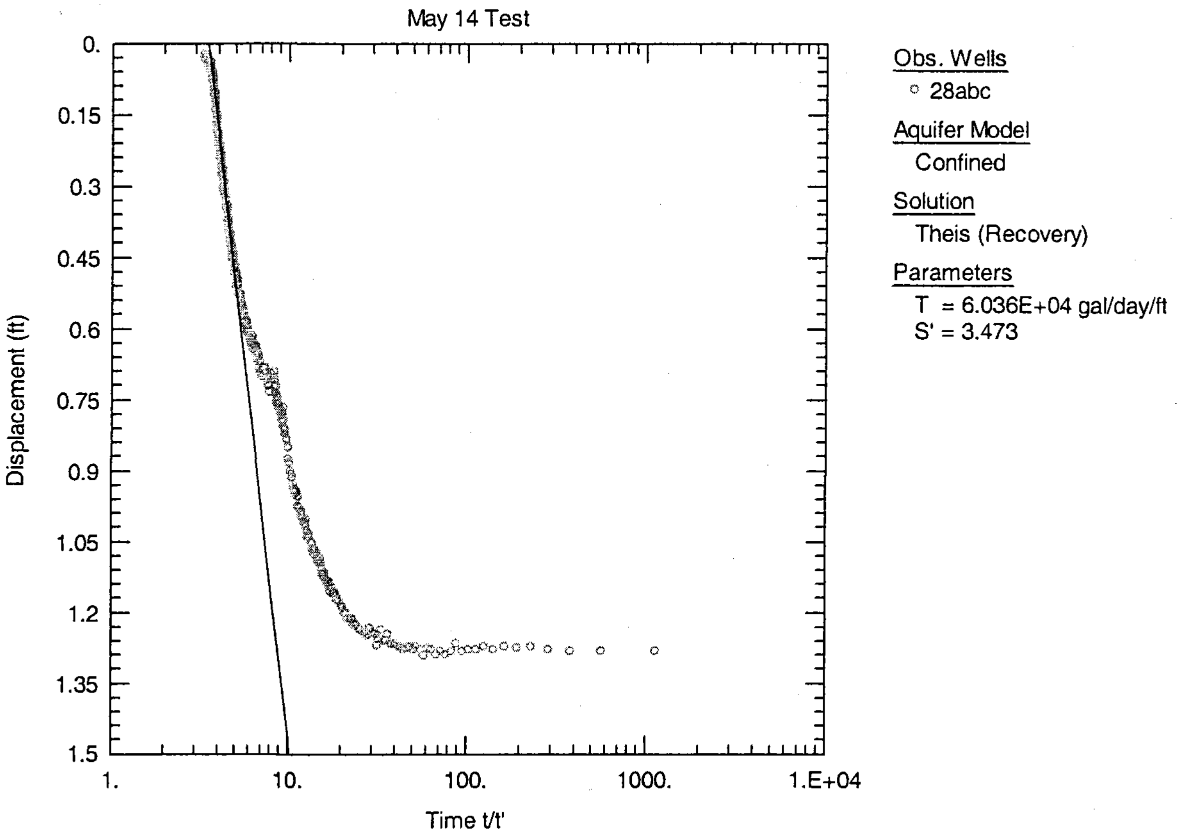


Obs. Wells
○ 28ccc

Aquifer Model
Confined

Solution
Theis (Recovery)

Parameters
T = 4.059E+04 gal/day/ft
S' = 6.062


May 14 Test
0.
0.15
0.3
0.45
0.6
0.75
0.9
1.05
1.2
1.35
1.5
Displacement (ft)
1.
10.
100.
1000.
1.E+04
Time t/t'
Obs. Wells
28abc
Aquifer Model
Confined
Solution
Theis (Recovery)
Parameters
T = 6.036E+04 gal/day/ft
S' = 3.473

APPENDIX C

LABORATORY REPORTS FOR GROUNDWATER SAMPLES

Data Validation Memorandum

URS

7720 North 16th Street
Suite 100
Phoenix, Arizona 85020
602 371 1100 Tel
602 371 1615 Fax

Action	Info	File
Karen Schwab, Project Manager		E1-00001844.00

From Marianne Burrus, Project Chemist

Date June 5, 2001

Subject Data Completeness Check for Bowie Power Plant
PAL Order No.: 0104026

This report summarizes the review of the analytical data for aqueous sample **28DCC**. The sample was collected March 30, 2001 by URS personnel and submitted to Precision Analytical Laboratories, Inc. (PAL) of Phoenix, Arizona. The sample was analyzed for total recoverable petroleum hydrocarbons - TRPH (EPA Method 418.1), total and dissolved metals (EPA Methods 200 series) and a variety of wet chemistry parameters. PAL subcontracted the analysis of reactive silica and total organic carbon (TOC) to West Coast Analytical Services, Inc and Test America, respectively.

The data were reviewed in accordance with the URS Standard Operating Procedures (SOPs). The SOPs are based on the principles given in the *USEPA National Functional Guidelines for Inorganic Data Review* (EPA, 1994).

The data was evaluated based on the following parameters:

- Data Completeness
- Holding Times
- Blanks
- Matrix Spikes/Matrix Spike Duplicate (MS/MSD)
- Laboratory Duplicate (DUP)
- Laboratory Control Sample (LCS)

The following presents an overview of the Summary Validation:

TRPH

- The sample was analyzed per the chain-of-custody.
- The method specified holding times were met.
- The associated method blank was reported as non-detect for the analytes of interest.
- PAL did not perform the MS analysis on a sample from this project therefore matrix effect could not be evaluated. The LCS was used to evaluate laboratory accuracy.
- The LCS percent recovery was within the laboratory established control limits.

TOTAL and DISSOLVED METALS

- The sample was analyzed per the chain-of-custody. The laboratory reporting limits for antimony and thallium were higher than the associated Aquifer Water Quality Standard. This anomaly may effect the data usability.
- The method specified holding times were met.
- The associated method blanks were reported as non-detect for the analytes of interest.
- The MS/MSD analyses were performed on project sample **28DCC**. The MS/MSD percent recoveries and relative percent difference (RPD) values were within the laboratory established control limits.
- The LCS percent recoveries were within the laboratory established control limits.

WET CHEMISTRY PARAMETERS

- The sample was analyzed per the chain-of-custody.
- The method specified holding times were met.
- The associated method blanks were reported as non-detect for the analytes of interest.
- The MS/MSD analyses were performed on project sample **28DCC**. The MS/MSD percent recoveries and RPD values were within the laboratory established control limits.
- The DUP analyses were performed on project sample **28DCC**. The DUP RPD values were within the laboratory established control limits.
- The LCS percent recoveries were within the laboratory established control limits.

Precision Analytical Laboratories, Inc.

A Subsidiary of Aerotech Laboratories, Inc.

April 18, 2001

Andy Messer
URS Corp.
1790 E. River Road.
Suite E-300
Tucson, AZ 85718
TEL: (520) 529-1141
FAX (520) 529-2449

RE: Bowie Power Plant/E1-47037002.00 Order No.: 0104026

Well 28dcc

Dear Andy Messer:

Precision Analytical Laboratories, Inc. received 1 sample on 4/2/01 for the analyses presented in the following report.

This report includes the following information:

- Case Narrative. The case narrative contains a listing of common method references, data qualifiers, and any comments that may be needed regarding the analytical results.

- Analytical Report. Analysis results are reported with the compound name first, followed by the test result, report limit (Limit), any required data qualifier (Qual), units, dilution factor (DF), and date analyzed.

- QC Summary Report. This section includes quality control results for some or all of the following: method blanks, sample duplicates, sample matrix spikes, sample matrix spike duplicates, laboratory control spikes, and laboratory control spike duplicates.

If you have any questions regarding these test results, please do not hesitate to call.

Sincerely,

J. Chavez

Jennifer Chavez
Laboratory Director - Tucson

CC:

Date: *18-Apr-01*

CLIENT: URS Corp.
Project: Bowie Power Plant/E1-47037002.00
Lab Order: 0104026
Date Received: 4/3/01

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date
0104026-01A	Well 28 dcc	2-103-262-01	3/30/01 12:56:00 PM

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Date: *19-Apr-01*

CLIENT: URS Corp.
Project: Bowie Power Plant/E1-47037002.00
Lab Order: 0104026

CASE NARRATIVE

Data Qualifiers
Listed below are data qualifiers which may be used in your analytical report to explain any analytical or quality control issues. If one or more of the following data qualifiers is associated with your analytical or quality control data it will be noted in your report under the column header "QUAL". Any quality control deficiencies that cannot be adequately described by these qualifiers will be addressed in the analytical comments section of this case narrative.

B1 Target analyte detected in method blank at or above the method reporting limit.
D1 Sample required dilution due to matrix interference.
D2 Sample required dilution due to high concentration of target analyte.
D3 Sample dilution required due to insufficient sample.
D4 Minimum reporting level (MRL) adjusted to reflect sample amount received and analyzed.
E2 Concentration estimated. Analyte exceeded calibration range. Reanalysis not performed due to sample matrix.
E3 Concentration estimated. Analyte exceeded calibration range. Reanalysis not performed due to holding time requirements.
E4 Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL).
E6 Concentration estimated. Internal standard recoveries did not meet method acceptance criteria.
E7 Concentration estimated. Internal standard recoveries did not meet laboratory acceptance criteria.
H1 Sample analysis performed past holding time. See case narrative.
H2 Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
H3 Sample was received and analyzed past holding time.
H4 Sample was extracted past required extraction holding time, but analyzed within analysis holding time. See case narrative.
K1 The sample dilutions set-up for the BOD analysis did not meet the oxygen depletion criteria of at least 2 mg/L. The reported result is an estimated value.
K2 The sample dilutions set up for the BOD analysis failed to meet the criteria of a residual dissolved oxygen of at least 1 mg/L. The reported result is estimated.
L1 The associated blank spike recovery was above laboratory acceptance limits. See case narrative.
L2 The associated blank spike recovery was below laboratory acceptance limits. See case narrative.
M1 Matrix spike recovery was high, the method control sample recovery was

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acceptable.

M2 Matrix spike recovery was low, the method control sample recovery was acceptable.

M3 The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable.

M4 The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable.

M5 Analyte concentration was determined by the method of standard addition (MSA).

N1 See case narrative.

Q1 Sample integrity was not maintained. See case narrative.

Q2 Sample received with head space.

Q3 Sample received with improper chemical preservation.

Q5 Sample received without chemical preservation, but preserved by the laboratory.

Q6 Sample was received above recommended temperature.

Q7 Sample inadequately dechlorinated.

Q8 Insufficient sample received to meet method QC requirements. QC requirements satisfy ADEQ policies 0154 and 0155.

Q10 Sample received in inappropriate sample container.

Q11 Sample is heterogeneous. Sample homogeneity could not be readily achieved using routine laboratory practices.

R2 RPD exceeded the laboratory control limit. See case narrative.

R3 Sample RPD between the primary and confirmatory analysis exceeded 40%. Per EPA Method 8000B, the higher value was reported.

R5 RPD exceeded the laboratory control limit. Recovery met acceptance criteria.

S2 Surrogate recovery was above laboratory and method acceptance limits.

S4 Surrogate recovery was above laboratory and method acceptance limits. No target analytes were detected in the sample.

S6 Surrogate recovery was below laboratory and method acceptance limits. Reextraction and/or reanalysis confirms low recovery caused by matrix effect.

S7 Surrogate recovery was below laboratory and method acceptance limits. Unable to confirm matrix effect.

S9 The analysis of the sample required a dilution such that the surrogate concentration was diluted below the laboratory acceptance criteria. The method control sample recovery was acceptable.

S10 Surrogate recovery was above laboratory and method acceptance limits. See case narrative (N1).

T2 Cited ADHS licensed method does not contain this analyte as part of method compound list.

T4 Tentatively identified compound. Concentration is estimated and based on the

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closest internal standard.

V1 CCV recovery was above method acceptance limits. This target analyte was not detected in the sample.

V5 CCV recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA Method 8000B.

Samples were analyzed using methods outlined in references such as:

Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992 and 19th Edition, 1995.

Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition.

40 CFR, Part 136, Revised 1995. Appendix A to Part 136- Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater.

NIOSH Manual of Analytical Methods, Fourth Edition, 1994.

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, 1999.

Precision Analytical Laboratories, Inc (PAL) holds the following certifications:
Arizona (certification no. AZ0610) and California (I-2410).
PAL- Tucson laboratory Arizona certification number: AZ0609.
PAL- North Phoenix laboratory Arizona certification number: AZ0611.

Analytical Comments:

All method blanks and laboratory control spikes met EPA method and/or laboratory quality control objectives for the analyses included in this report.

The TOC analysis was performed by Test America in Nashville, TN. A copy of their report is enclosed. The Reactive Silica analysis was performed by West Coast Analytical Service Inc. in Santa Fe Springs, CA. A copy of their report is enclosed.

Due to this sample being received in Tucson on a Friday, Total Nitrate-Nitrite and Total Phosphorous were analyzed instead of Nitrate, Nitrite, and ortho-Phosphate. By using a preserved sample, holding times were not compromised.

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Precision Analytical Laboratories, Inc.
A Subsidiary of Aerotech Laboratories, Inc.

Date: *18-Apr-01*

CLIENT:	URS Corp.	**Client Sample ID:**	Well 28 dcc
Lab Order:	0104026	**Tag Number:**	2-103-262-01
Project:	Bowie Power Plant/E1-47037002.00	**Collection Date:**	3/30/01 12:56:00 PM
Lab ID:	0104026-01A	**Matrix:**	GROUNDWATER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS, TOTAL RECOVERABLE		**E200.7**				Analyst: **MK**
Aluminum	< 0.10	0.10		mg/L	1	4/4/01 11:15:01 AM
Antimony	< 0.040	0.040		mg/L	1	4/4/01 11:15:01 AM
Arsenic	< 0.040	0.040		mg/L	1	4/4/01 11:15:01 AM
Barium	0.062	0.010		mg/L	1	4/4/01 11:15:01 AM
Beryllium	< 0.0010	0.0010		mg/L	1	4/4/01 11:15:01 AM
Cadmium	< 0.0010	0.0010		mg/L	1	4/4/01 11:15:01 AM
Calcium	24	2.0		mg/L	1	4/4/01 11:15:01 AM
Chromium	< 0.010	0.010		mg/L	1	4/4/01 11:15:01 AM
Copper	0.014	0.010		mg/L	1	4/4/01 11:15:01 AM
Hardness, Calcium (As CaCO3)	61	5.0		mg/L	1	4/4/01 11:15:01 AM
Iron	< 0.050	0.050		mg/L	1	4/4/01 11:15:01 AM
Lead	< 0.015	0.015		mg/L	1	4/4/01 11:15:01 AM
Magnesium	3.2	2.0		mg/L	1	4/4/01 11:15:01 AM
Manganese	< 0.010	0.010		mg/L	1	4/4/01 11:15:01 AM
Nickel	< 0.010	0.010		mg/L	1	4/4/01 11:15:01 AM
Potassium	< 2.0	2.0		mg/L	1	4/4/01 11:15:01 AM
Selenium	< 0.040	0.040		mg/L	1	4/4/01 11:15:01 AM
Silica (Silicon dioxide-SiO2)	34	0.21		mg/L	1	4/5/01 12:10:04 PM
Silver	< 0.010	0.010		mg/L	1	4/4/01 11:15:01 AM
Sodium	44	2.0		mg/L	1	4/4/01 11:15:01 AM
Strontium	0.22	0.10		mg/L	1	4/4/01 11:15:01 AM
Thallium	< 0.040	0.040		mg/L	1	4/4/01 11:15:01 AM
Vanadium	0.011	0.010		mg/L	1	4/4/01 11:15:01 AM
Zinc	< 0.050	0.050		mg/L	1	4/4/01 11:15:01 AM
ICP METALS, DISSOLVED		**E200.7**				Analyst: **MK**
Iron	< 0.050	0.050		mg/L	1	4/6/01 8:06:19 AM
Manganese	< 0.010	0.010		mg/L	1	4/6/01 8:06:19 AM
Strontium	0.23	0.10		mg/L	1	4/6/01 8:06:19 AM
MERCURY IN WATERS		**E245.1**				Analyst: **CU**
Mercury	< 0.00020	0.00020		mg/L	1	4/5/01 1:36:25 PM
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **LH**
Chloride	27	2.0		mg/L	1	4/11/01
Fluoride	0.45	0.40		mg/L	1	4/11/01
Sulfate	44	2.0		mg/L	1	4/11/01
PETROLEUM HYDROCARBONS, T/R		**E418.1**				Analyst: **VDB**
Petroleum Hydrocarbons, TR	< 2.0	2.0		mg/L	1	4/3/01
ALKALINITY		**M2320 B**				Analyst: **GL**
Alkalinity, Bicarbonate (As CaCO3)	90	2.0		mg/L CaCO3	1	4/5/01 11:00:00 AM

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
B - Analyte detected in the associated Method Blank
* - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
E - Value above quantitation range

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Precision Analytical Laboratories, Inc.

A Subsidiary of Aerotech Laboratories, Inc.

Date: *18-Apr-01*

CLIENT:	URS Corp.	**Client Sample ID:**	Well 28 dcc
Lab Order:	0104026	**Tag Number:**	2-103-262-01
Project:	Bowie Power Plant/E1-47037002.00	**Collection Date:**	3/30/01 12:56:00 PM
Lab ID:	0104026-01A	**Matrix:**	GROUNDWATER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
Alkalinity, Carbonate (As CaCO3)	< 2.0	2.0		mg/L CaCO3	1	4/5/01 11:00:00 AM
Alkalinity, Hydroxide (As CaCO3)	< 2.0	2.0		mg/L CaCO3	1	4/5/01 11:00:00 AM
Alkalinity, Total (As CaCO3)	90	6.0		mg/L CaCO3	1	4/5/01 11:00:00 AM
CONDUCTANCE		**M2510 B**				**Analyst: VDB**
Specific Conductivity	380	1.0		µmhos/cm	1	4/5/01 3:30:00 PM
NITROGEN, AMMONIA AS N		**E350.3**				**Analyst: GL**
Nitrogen, Ammonia (As N)	< 0.50	0.50		mg/L	1	4/10/01 2:00:00 PM
TOTAL NITRATE/NITRITE		**M4500-NO3 E**				**Analyst: GL**
Nitrogen, Nitrate-Nitrite	0.87	0.10	D2	mg/L	2	4/9/01 12:30:00 PM
TOTAL PHOSPHORUS AS P		**E365.3**				**Analyst: GL**
Phosphorus, Total (As P)	< 0.20	0.20		mg/L	1	4/11/01 4:10:00 PM
PH		**E150.1**				**Analyst: JF**
pH	8.03	0		pH units	1	3/30/01 4:50:00 PM
COLIFORM, TOTAL		**M9223 B**				**Analyst: JF**
Total Coliform (Colilert)	1	0		Pos/Neg	1	3/30/01 4:35:00 PM
Escherichia Coli	0	0		Pos/Neg	1	3/30/01 4:35:00 PM
TOTAL DISSOLVED SOLIDS		**M2540 C**				**Analyst: VDB**
Total Dissolved Solids	230	10		mg/L	1	4/6/01 2:00:00 PM
NITROGEN, TOTAL KJELDAHL AS N		**E351.4**				**Analyst: GL**
Nitrogen, Total Kjeldahl	< 0.50	0.50		mg/L	1	4/5/01

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

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Lab Order: 0104026
Client: URS Corp.
Project: Bowie Power Plant/E1-47037002.0

DATES REPORT

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	TCLP Date	Prep Date	Analysis Date
0104026-01A	Well 28 dcc	3/30/01 12:56:00 PM	Groundwater	ALKALINITY			4/5/01
				AMMONIA as N			4/10/01
				ANIONS by ION CHROMATOGRAPHY			4/11/01
				COLIFORM, Total			3/30/01
				CONDUCTANCE			4/5/01
				ICP METALS, DISSOLVED		4/5/01	4/6/01
				ICP METALS, DISSOLVED		4/5/01	4/9/01
				ICP METALS, TOTAL RECOVERABLE		4/3/01	4/4/01
				ICP METALS, TOTAL RECOVERABLE		4/3/01	4/5/01
				MERCURY IN WATERS		4/5/01	4/5/01
				PETROLEUM HYDROCARBONS, T/R			4/3/01
				pH			3/30/01
				pH			3/30/01
				TOTAL DISSOLVED SOLIDS			4/6/01
				TOTAL KJELDAHL NITROGEN			4/5/01
				Total Nitrate/Nitrite			4/9/01
				TOTAL PHOSPHORUS AS P IN WATER			4/11/01

Precision Analytical Laboratories, Inc.

Date: *19-Apr-01*

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT
Method Blank

Sample ID: **MB-3701** Batch ID: **3701** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/4/01 10:42:44 AM** Prep Date: **4/3/01**

Client ID: Run ID: **ICP001_010404B** SeqNo: **94724**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	< 0.10	0.1									
Antimony	< 0.040	0.04									
Arsenic	< 0.040	0.04									
Barium	< 0.010	0.01									
Beryllium	< 0.0010	0.001									
Cadmium	< 0.0010	0.001									
Calcium	< 2.0	2									
Chromium	< 0.010	0.01									
Copper	< 0.010	0.01									
Hardness, Calcium/Magnesium (As Ca	< 13	13									
Iron	< 0.050	0.05									
Lead	< 0.015	0.015									
Magnesium	< 2.0	2									
Manganese	< 0.010	0.01									
Nickel	< 0.010	0.01									
Potassium	< 2.0	2									
Selenium	< 0.040	0.04									
Silver	< 0.010	0.01									
Sodium	< 2.0	2									
Strontium	< 0.10	0.1									
Thallium	< 0.040	0.04									
Vanadium	< 0.010	0.01									
Zinc	< 0.050	0.05									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT
Method Blank

Sample ID: **MB-3701** | Batch ID: **3701** | Test Code: **E200.7** | Units: **mg/L** | Analysis Date **4/5/01 11:16:02 AM** | Prep Date: **4/3/01**
Client ID: | Run ID: **ICP001_010405B** | SeqNo: **95223**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Silica (Silicon dioxide-SiO2)	< 0.21	0.21									

Sample ID: **MB-3740** | Batch ID: **3740** | Test Code: **E200.7** | Units: **mg/L** | Analysis Date **4/6/01 7:59:56 AM** | Prep Date: **4/5/01**
Client ID: | Run ID: **ICP001_010406A** | SeqNo: **95684**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	< 0.050	0.05									
Manganese	< 0.010	0.01									
Strontium	< 0.10	0.1									

Sample ID: **MB-3734** | Batch ID: **3734** | Test Code: **E245.1** | Units: **mg/L** | Analysis Date **4/5/01 1:36:25 PM** | Prep Date: **4/5/01**
Client ID: | Run ID: **FIMS HG_010405A** | SeqNo: **95298**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	< 0.00020	0.0002									

Sample ID: **MB-R9163** | Batch ID: **R9163** | Test Code: **E300** | Units: **mg/L** | Analysis Date **4/11/01** | Prep Date:
Client ID: | Run ID: **IC 1_010410C** | SeqNo: **96975**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	< 2.0	2									
Fluoride	< 0.40	0.4									
Sulfate	< 2.0	2									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT
Method Blank

Sample ID: **MB-R8988** Batch ID: **R8988** Test Code: **E418.1** Units: **mg/L** Analysis Date **4/3/01** Prep Date:
Client ID: Run ID: **IR 1_010403A** SeqNo: **94755**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Petroleum Hydrocarbons, TR	< 2.0	2									

Sample ID: **MB-R9051** Batch ID: **R9051** Test Code: **M2320 B** Units: **mg/L CaCO3** Analysis Date **4/5/01 11:00:00 AM** Prep Date:
Client ID: Run ID: **BURET 1_010405A** SeqNo: **95616**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	< 2.0	2									
Alkalinity, Carbonate (As CaCO3)	< 2.0	2									
Alkalinity, Hydroxide (As CaCO3)	< 2.0	2									
Alkalinity, Total (As CaCO3)	< 6.0	6									

Sample ID: **MB-R9037** Batch ID: **R9037** Test Code: **M2510 B** Units: **µmhos/cm** Analysis Date **4/5/01 3:30:00 PM** Prep Date:
Client ID: Run ID: **COND 1_010405A** SeqNo: **95515**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductivity	< 1.0	1									

Sample ID: **MB-R9120** Batch ID: **R9120** Test Code: **E350.3** Units: **mg/L** Analysis Date **4/10/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **PH 2_010410A** SeqNo: **96520**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	< 0.50	0.5									

Sample ID: **MB-R9135** Batch ID: **R9135** Test Code: **M4500-NO3 E** Units: **mg/L** Analysis Date **4/9/01 9:40:00 AM** Prep Date:
Client ID: Run ID: **SPEC 1_010409C** SeqNo: **96705**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate-Nitrite	< 0.050	0.05									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT

Method Blank

Sample ID: **MB-R9175** Batch ID: **R9175** Test Code: **E365.3** Units: **mg/L** Analysis Date **4/11/01 4:10:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010411D** SeqNo: **97062**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	< 0.20	0.2									

Sample ID: **MB-R9131** Batch ID: **R9131** Test Code: **M2540 C** Units: **mg/L** Analysis Date **4/6/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **BL002_010406A** SeqNo: **96663**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Dissolved Solids	< 10	10									

Sample ID: **MB-R9053** Batch ID: **R9053** Test Code: **E351.4** Units: **mg/L** Analysis Date **4/5/01** Prep Date:
Client ID: Run ID: **PH 2_010405A** SeqNo: **95648**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Total Kjeldahl	< 0.50	0.5									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

Precision Analytical Laboratories, Inc.

Date: *19-Apr-01*

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT
Sample Duplicate

Sample ID: **0103648-01A DUP** Batch ID: **R9163** Test Code: **E300** Units: **mg/L** Analysis Date **4/11/01** Prep Date:
Client ID: Run ID: **IC 1_010410C** SeqNo: **96986**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	14.02	2	0	0	0	0	0	14.13	0.782	20	
Fluoride	< 0.40	0.4	0	0	0	0	0	0	0	20	
Sulfate	< 2.0	2	0	0	0	0	0	0	0	20	

Sample ID: **0103661-01A DUP** Batch ID: **R8988** Test Code: **E418.1** Units: **mg/L** Analysis Date **4/3/01** Prep Date:
Client ID: Run ID: **IR 1_010403A** SeqNo: **94762**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Petroleum Hydrocarbons, TR	146	20	0	0	0	0	0	121	18.7	25	D2

Sample ID: **0104095-01A DUP** Batch ID: **R9051** Test Code: **M2320 B** Units: **mg/L CaCO3** Analysis Date **4/5/01 11:00:00 AM** Prep Date:
Client ID: Run ID: **BURET 1_010405A** SeqNo: **95627**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As $CaCO_3$)	144	2	0	0	0	0	0	144	0	20	
Alkalinity, Carbonate (As $CaCO_3$)	< 2.0	2	0	0	0	0	0	0	0	20	
Alkalinity, Hydroxide (As $CaCO_3$)	< 2.0	2	0	0	0	0	0	0	0	20	
Alkalinity, Total (As $CaCO_3$)	144	6	0	0	0	0	0	144	0	20	

Sample ID: **0104026-01A DUP** Batch ID: **R9037** Test Code: **M2510 B** Units: **µmhos/cm** Analysis Date **4/5/01 3:30:00 PM** Prep Date:
Client ID: **Well 28 dcc** Run ID: **COND 1_010405A** SeqNo: **95521**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductivity	383	1	0	0	0	0	0	382	0.261	20	

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT

Sample Duplicate

Sample ID: 0104082-01A DUP | Batch ID: R9175 | Test Code: E365.3 | Units: mg/L | Analysis Date 4/11/01 4:10:00 PM | Prep Date:
Client ID: | Run ID: SPEC 1_010411D | SeqNo: 97070

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	< 0.20	0.2	0	0	0	0	0	0	0	20	

Sample ID: 0104026-01A | Batch ID: R9155 | Test Code: E150.1 | Units: pH units | Analysis Date 3/30/01 4:50:00 PM | Prep Date:
Client ID: Well 28 dcc | Run ID: PH TUCSON_010330A | SeqNo: 96881

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	8.04	0	0	0	0	0	0	8.03	0.124	10	

Sample ID: 0104082-01A DUP | Batch ID: R9131 | Test Code: M2540 C | Units: mg/L | Analysis Date 4/6/01 2:00:00 PM | Prep Date:
Client ID: | Run ID: BL002_010406A | SeqNo: 96675

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Dissolved Solids	266	10	0	0	0	0	0	253	5.01	10	

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Date: *20-Apr-01*

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT

Sample Matrix Spike

Sample ID: **0104017-01A MS** Batch ID: **3701** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/4/01 10:55:33 AM** Prep Date: **4/3/01**

Client ID: Run ID: **ICP001_010404B** SeqNo: **94728**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	2.488	0.1	2	0.1714	116	70	130	0			
Antimony	1.132	0.04	1	0	113	70	130	0			
Arsenic	0.8581	0.04	1	0	85.8	70	130	0			
Barium	1.047	0.01	1	0.04989	99.7	70	130	0			
Beryllium	1.023	0.001	1	0	102	70	130	0			
Cadmium	0.9798	0.001	1	0	98	70	130	0			
Calcium	77.61	2	21	59.21	87.6	70	130	0			
Chromium	0.9866	0.01	1	0	98.7	70	130	0			
Copper	1.08	0.01	1	0.01074	107	70	130	0			
Iron	1.078	0.05	1	0.1509	92.8	70	130	0			
Lead	0.9842	0.015	1	0.01565	96.9	70	130	0			
Magnesium	47.67	2	21	27.34	96.8	70	130	0			
Manganese	1.002	0.01	1	0	100	70	130	0			
Nickel	0.9478	0.01	1	0	94.8	70	130	0			
Selenium	1.047	0.04	1	0	105	70	130	0			
Silver	0.08411	0.01	0.09	0	93.5	70	130	0			
Sodium	180.3	2	20	150.6	148	70	130	0			M3
Strontium	1.699	0.1	1	0.7796	92	70	130	0			
Thallium	0.971	0.04	1	0.04327	92.8	70	130	0			
Vanadium	1.029	0.01	1	0	103	70	130	0			
Zinc	1.09	0.05	1	0	109	70	130	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT

Sample Matrix Spike Duplicate

Sample ID: **0104017-01A MSD** Batch ID: **3701** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/4/01 10:58:46 AM** Prep Date: **4/3/01**

Client ID: Run ID: **ICP001_010404B** SeqNo: **94729**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	2.487	0.1	2	0.1714	116	70	130	2.488	0.0217	20	
Antimony	1.162	0.04	1	0	116	70	130	1.132	2.61	20	
Arsenic	0.8699	0.04	1	0	87	70	130	0.8581	1.36	20	
Barium	1.045	0.01	1	0.04989	99.5	70	130	1.047	0.178	20	
Beryllium	1.022	0.001	1	0	102	70	130	1.023	0.0779	20	
Cadmium	0.9755	0.001	1	0	97.5	70	130	0.9798	0.449	20	
Calcium	77.56	2	21	59.21	87.4	70	130	77.61	0.0674	20	
Chromium	0.9823	0.01	1	0	98.2	70	130	0.9866	0.443	20	
Copper	1.078	0.01	1	0.01074	107	70	130	1.08	0.169	20	
Iron	1.083	0.05	1	0.1509	93.2	70	130	1.078	0.406	20	
Lead	0.9797	0.015	1	0.01565	96.4	70	130	0.9842	0.46	20	
Magnesium	47.58	2	21	27.34	96.4	70	130	47.67	0.196	20	
Manganese	0.9987	0.01	1	0	99.9	70	130	1.002	0.318	20	
Nickel	0.9524	0.01	1	0	95.2	70	130	0.9478	0.489	20	
Selenium	1.008	0.04	1	0	101	70	130	1.047	3.81	20	
Silver	0.08449	0.01	0.09	0	93.9	70	130	0.08411	0.455	20	
Sodium	178.9	2	20	150.6	142	70	130	180.3	0.761	20	M3
Strontium	1.718	0.1	1	0.7796	93.8	70	130	1.699	1.09	20	
Thallium	0.9868	0.04	1	0.04327	94.3	70	130	0.971	1.61	20	
Vanadium	1.023	0.01	1	0	102	70	130	1.029	0.54	20	
Zinc	1.083	0.05	1	0	108	70	130	1.09	0.715	20	

Sample ID: **0104017-01A MS** Batch ID: **3701** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/5/01 11:25:41 AM** Prep Date: **4/3/01**

Client ID: Run ID: **ICP001_010405B** SeqNo: **95227**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Silica (Silicon dioxide-SiO2)	28.45	0.21	10.7	17.2	105	70	130	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT
Sample Matrix Spike Duplicate

Sample ID: **0104017-01A MSD** Batch ID: **3701** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/5/01 11:29:20 AM** Prep Date: **4/3/01**
Client ID: Run ID: **ICP001_010405B** SeqNo: **95229**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Silica (Silicon dioxide-SiO2)	28.7	0.21	10.7	17.2	108	70	130	28.45	0.875	20	

Sample ID: **0104017-01A MS** Batch ID: **3701** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/9/01 7:23:10 AM** Prep Date: **4/3/01**
Client ID: Run ID: **ICP001_010409A** SeqNo: **96133**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Potassium	99.77	10	20	77.84	110	70	130	0			

Sample ID: **0104017-01A MSD** Batch ID: **3701** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/9/01 7:26:19 AM** Prep Date: **4/3/01**
Client ID: Run ID: **ICP001_010409A** SeqNo: **96134**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Potassium	100.8	10	20	77.84	115	70	130	99.77	1.03	20	

Sample ID: **0104026-01A MS** Batch ID: **3740** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01 8:09:35 AM** Prep Date: **4/5/01**
Client ID: **Well 28 dcc** Run ID: **ICP001_010406A** SeqNo: **95687**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	0.9811	0.05	1	0	98.1	70	130	0			
Manganese	1.008	0.01	1	0	101	70	130	0			
Strontium	1.205	0.1	1	0.2291	97.6	70	130	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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QC SUMMARY REPORT

Sample Matrix Spike Duplicate

Sample ID: **0104026-01A MSD** Batch ID: **3740** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01 8:13:02 AM** Prep Date: **4/5/01**
Client ID: **Well 28 dcc** Run ID: **ICP001_010406A** SeqNo: **95688**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	0.9548	0.05	1	0	95.5	70	130	0.9811	2.71	20	
Manganese	1.007	0.01	1	0	101	70	130	1.008	0.152	20	
Strontium	1.166	0.1	1	0.2291	93.7	70	130	1.205	3.29	20	

Sample ID: **0104026-01AMS** Batch ID: **3734** Test Code: **E245.1** Units: **mg/L** Analysis Date **4/5/01 1:36:25 PM** Prep Date: **4/5/01**
Client ID: **Well 28 dcc** Run ID: **FIMS HG_010405A** SeqNo: **95301**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.00539	0.0002	0.005	0	108	70	130	0			

Sample ID: **0104026-01AMSD** Batch ID: **3734** Test Code: **E245.1** Units: **mg/L** Analysis Date **4/5/01 1:36:25 PM** Prep Date: **4/5/01**
Client ID: **Well 28 dcc** Run ID: **FIMS HG_010405A** SeqNo: **95302**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.00537	0.0002	0.005	0	107	70	130	0.00539	0.372	20	

Sample ID: **0103648-01A MS** Batch ID: **R9163** Test Code: **E300** Units: **mg/L** Analysis Date **4/11/01** Prep Date:
Client ID: Run ID: **IC 1_010410C** SeqNo: **96987**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	36.29	2	20	14.13	111	80	120	0			
Fluoride	2.32	0.4	2	0	116	80	120	0			
Sulfate	20.78	2	20	0	104	80	120	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT
Sample Matrix Spike

Sample ID: **0103747-01A MS** Batch ID: **R8988** Test Code: **E418.1** Units: **mg/L** Analysis Date **4/3/01** Prep Date:
Client ID: Run ID: **IR 1_010403A** SeqNo: **94763**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Petroleum Hydrocarbons, TR	7.15	2	8	0	89.4	70	130	0			

Sample ID: **0104026-01A MS** Batch ID: **R9120** Test Code: **E350.3** Units: **mg/L** Analysis Date **4/10/01 2:00:00 PM** Prep Date:
Client ID: **Well 28 dcc** Run ID: **PH 2_010410A** SeqNo: **96542**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	9.68	0.5	10	0	96.8	80	120	0			

Sample ID: **0104026-01A MSD** Batch ID: **R9120** Test Code: **E350.3** Units: **mg/L** Analysis Date **4/10/01 2:00:00 PM** Prep Date:
Client ID: **Well 28 dcc** Run ID: **PH 2_010410A** SeqNo: **96544**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	9.44	0.5	10	0	94.4	80	120	9.68	2.51	20	

Sample ID: **0104137-03A MS** Batch ID: **R9135** Test Code: **M4500-NO3 E** Units: **mg/L** Analysis Date **4/9/01 6:40:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010409C** SeqNo: **96719**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate-Nitrite	11.7	1	4	6.98	118	80	120	0			D2

Sample ID: **0104137-03A MSD** Batch ID: **R9135** Test Code: **M4500-NO3 E** Units: **mg/L** Analysis Date **4/9/01 6:55:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010409C** SeqNo: **96720**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate-Nitrite	11.56	1	4	6.98	114	80	120	11.7	1.2	20	D2

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT

Sample Matrix Spike

Sample ID: 0104057-01A MS Batch ID: **R9135** Test Code: **M4500-NO3 E** Units: **mg/L** Analysis Date **4/9/01 4:35:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010409C** SeqNo: **96730**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate-Nitrite	1.68	0.25	1	0.59	109	80	120	0			D2

Sample ID: 0104057-01A MSD Batch ID: **R9135** Test Code: **M4500-NO3 E** Units: **mg/L** Analysis Date **4/9/01** Prep Date:
Client ID: Run ID: **SPEC 1_010409C** SeqNo: **96731**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate-Nitrite	1.665	0.25	1	0.59	108	80	120	1.68	0.897	20	D2

Sample ID: 0104082-01A MS Batch ID: **R9175** Test Code: **E365.3** Units: **mg/L** Analysis Date **4/11/01 4:10:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010411D** SeqNo: **97071**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	1.017	0.2	1	0	102	80	120	0			

Sample ID: 0104150-01A MS Batch ID: **R9053** Test Code: **E351.4** Units: **mg/L** Analysis Date **4/5/01** Prep Date:
Client ID: Run ID: **PH 2_010405A** SeqNo: **95671**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Total Kjeldahl	8.943	0.5	10	0.684	82.6	80	120	0			

Sample ID: 0104150-01A MSD Batch ID: **R9053** Test Code: **E351.4** Units: **mg/L** Analysis Date **4/5/01** Prep Date:
Client ID: Run ID: **PH 2_010405A** SeqNo: **95672**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Total Kjeldahl	8.834	0.5	10	0.684	81.5	80	120	8.943	1.23	20	

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Date: *20-Apr-01*

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT

Laboratory Control Spike - generic

Sample ID: **LCS-3701** Batch ID: **3701** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/4/01 10:45:55 AM** Prep Date: **4/3/01**

Client ID: Run ID: **ICP001_010404B** SeqNo: **94725**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	2.265	0.1	2	0	113	85	115	0			
Antimony	1.043	0.04	1	0	104	85	115	0			
Arsenic	0.937	0.04	1	0	93.7	85	115	0			
Barium	1.016	0.01	1	0	102	85	115	0			
Beryllium	1.04	0.001	1	0	104	85	115	0			
Cadmium	1.007	0.001	1	0	101	85	115	0			
Calcium	19.72	2	21	0	93.9	85	115	0			
Chromium	1.005	0.01	1	0	101	85	115	0			
Copper	0.9974	0.01	1	0	99.7	85	115	0			
Iron	0.9683	0.05	1	0	96.8	85	115	0			
Lead	0.9663	0.015	1	0	96.6	85	115	0			
Magnesium	20.98	2	21	0	99.9	85	115	0			
Manganese	1.014	0.01	1	0	101	85	115	0			
Nickel	0.9865	0.01	1	0	98.6	85	115	0			
Potassium	18.87	2	20	0	94.3	85	115	0			
Selenium	1.111	0.04	1	0	111	85	115	0			
Silver	0.08399	0.01	0.09	0	93.3	85	115	0			
Sodium	21.2	2	20	0	106	85	115	0			
Strontium	0.9518	0.1	1	0	95.2	85	115	0			
Thallium	0.9688	0.04	1	0	96.9	85	115	0			
Vanadium	1.032	0.01	1	0	103	85	115	0			
Zinc	1.057	0.05	1	0	106	85	115	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT
Laboratory Control Spike - generic

Sample ID: LCS-3701 | Batch ID: 3701 | Test Code: E200.7 | Units: mg/L | Analysis Date 4/5/01 11:27:55 AM | Prep Date: 4/3/01
Client ID: | Run ID: ICP001_010405B | SeqNo: 95228

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Silica (Silicon dioxide-SiO2)	11.7	0.21	10.7	0	109	85	115	0			

Sample ID: LCS-3740 | Batch ID: 3740 | Test Code: E200.7 | Units: mg/L | Analysis Date 4/6/01 8:03:08 AM | Prep Date: 4/5/01
Client ID: | Run ID: ICP001_010406A | SeqNo: 95685

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	0.9646	0.05	1	0	96.5	85	115	0			
Manganese	1.015	0.01	1	0	101	85	115	0			
Strontium	0.9662	0.1	1	0	96.6	85	115	0			

Sample ID: LCS-3734 | Batch ID: 3734 | Test Code: E245.1 | Units: mg/L | Analysis Date 4/5/01 1:36:25 PM | Prep Date: 4/5/01
Client ID: | Run ID: FIMS HG_010405A | SeqNo: 95299

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.00533	0.0002	0.005	0	107	85	115	0			

Sample ID: LCS-R9163 | Batch ID: R9163 | Test Code: E300 | Units: mg/L | Analysis Date 4/11/01 | Prep Date:
Client ID: | Run ID: IC 1_010410C | SeqNo: 96976

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	20.57	2	20	0	103	90	110	0			
Fluoride	2.16	0.4	2	0	108	90	110	0			
Sulfate	21.15	2	20	0	106	90	110	0			

Qualifiers: ND - Not Detected at the Reporting Limit | S - Spike Recovery outside accepted recovery limits | B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits | R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

QC SUMMARY REPORT
Laboratory Control Spike - generic

Sample ID: LCS-R8988 | Batch ID: R8988 | Test Code: E418.1 | Units: mg/L | Analysis Date 4/3/01 | Prep Date:
Client ID: | Run ID: IR 1_010403A | SeqNo: 94756

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Petroleum Hydrocarbons, TR	6.3	2	8	0	78.8	70	130	0			

Sample ID: LCS-R9051 | Batch ID: R9051 | Test Code: M2320 B | Units: mg/L CaCO3 | Analysis Date 4/5/01 11:00:00 AM | Prep Date:
Client ID: | Run ID: BURET 1_010405A | SeqNo: 95617

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	252	6	250	0	101	90	110	0			

Sample ID: LCS-R9037 | Batch ID: R9037 | Test Code: M2510 B | Units: µmhos/cm | Analysis Date 4/5/01 3:30:00 PM | Prep Date:
Client ID: | Run ID: COND 1_010405A | SeqNo: 95516

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductivity	1418	1	1417	0	100	90	110	0			

Sample ID: LCS-R9120 | Batch ID: R9120 | Test Code: E350.3 | Units: mg/L | Analysis Date 4/10/01 2:00:00 PM | Prep Date:
Client ID: | Run ID: PH 2_010410A | SeqNo: 96521

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	9.97	0.5	10	0	99.7	90	110	0			

Sample ID: LCS-R9135 | Batch ID: R9135 | Test Code: M4500-NO3 E | Units: mg/L | Analysis Date 4/9/01 10:35:00 AM | Prep Date:
Client ID: | Run ID: SPEC 1_010409C | SeqNo: 96706

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate-Nitrite	0.216	0.05	0.2	0	108	90	110	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

Precision Analytical Laboratories, Inc.

QC SUMMARY REPORT
Laboratory Control Spike - generic

CLIENT: URS Corp.
Work Order: 0104026
Project: Bowie Power Plant/E1-47037002.00

Sample ID: **LCS-R9175** Batch ID: **R9175** Test Code: **E365.3** Units: **mg/L** Analysis Date **4/11/01 4:10:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010411D** SeqNo: **97063**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	1.03	0.2	1	0	103	90	110	0			

Sample ID: **LCS-R9155** Batch ID: **R9155** Test Code: **E150.1** Units: **pH units** Analysis Date **3/30/01 4:50:00 PM** Prep Date:
Client ID: Run ID: **PH TUCSON_010330A** SeqNo: **96879**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	7.05	0	7	0	101	98.57	101.43	0			

Sample ID: **LCS-R9131** Batch ID: **R9131** Test Code: **M2540 C** Units: **mg/L** Analysis Date **4/6/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **BL002_010406A** SeqNo: **96664**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Dissolved Solids	992	10	1000	0	99.2	90	110	0			

Sample ID: **LCS-R9053** Batch ID: **R9053** Test Code: **E351.4** Units: **mg/L** Analysis Date **4/5/01** Prep Date:
Client ID: Run ID: **PH 2_010405A** SeqNo: **95649**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Total Kjeldahl	9.32	0.5	10	0	93.2	85	115	0			

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

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[ ] North Phoenix- 2020 West Lone Cactus Drive, Phoenix, AZ 85027 (623) 780-4800 FAX (623) 780-7695
[X] Tucson- 4455 South Park Avenue, Ste.110, Tucson, AZ 85714 (520) 807-3801 FAX (520) 807-3803
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LAB ID NUMBER: 2-103-262
Page 1 of 1

Client: URS Corporation
Address: 1790 E River Rd E-300
City, State, Zip: Tucson, AZ 85718
Contact: Andy Messer
Phone: 579-1141
Fax: 529-2449
Sampler: Bill Petroutson
P.O. Number:

E-Mail Address: Andrew_Messer@URSCorp.com
Fax Results: (Y) N
E-Mail Results: (Y) N

TAT Request
24 Hours | 48 Hours
72 Hours | 5 Day
Laboratory Approval Required for RUSH Analyses
~~Surcharges May Apply~~
(Standard 10 Day)

Sample Information

Lab #	Sample Type	Sample Identification	Date	Time	Qty	pH, NH3, Cl, F, SO4, NO2, NO3, Cond, TDS, FC	T Recoverable metals	418.1 TPH	TOC	Coliform	NH3, TKN	Reactive Silica	Metals (Filtered) 500ml
01	groundwater	Well 78 dec.	3/30/01	12:55	12	X	X	X	X	X	X	X	X

Project Name: Bowie Power Plant
Project Number: F1-4703 7002.00
Instructions/Special Requirements:

Date	Time	Relinquished By:	Company	Relinquished By:	Company
3/30/01	16:25	Bill Petroutson	URS Corp	Lorena Real CSO	PAL
4/3/01	0820	Lorena Real			PAL

TestAmerica
INCORPORATED

ANALYTICAL REPORT

PRECISION ANALYTICAL LAB 3058
LORENA LEAL
4455 S. PARK AVE. #110
TUCSON, AZ 85714

Project: E1-47037002.00
Project Name: URS-BOWIE POWER PLANT
Sampler: CLIENT

Lab Number: 01-A44100
Sample ID: WELL 28 DCC
Sample Type: Ground water
Site ID:

Date Collected: 3/30/01
Time Collected: 12:56
Date Received: 4/ 3/01
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
MISCELLANEOUS CHEMISTRY										
Total Organic Carbon	ND	mg/l	1.00	1.00	1	4/ 7/01	18:44	K. McLain	9060	7582

ND - Not detected at the report limit.
- Recovery outside Laboratory historical limits.

These results relate only to the items tested.
This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By: ______________ Report Date: 4/ 9/01

Paul E. Lane, Jr., Lab Director
Michael H. Dunn, M.S., Technical Director
Johnny A. Mitchell, Dir. Technical Serv.
Eric S. Smith, Assistant Technical Director

Gail A. Lage, Technical Serv.
Glenn L. Norton, Technical Serv.
Kelly S. Comstock, Technical Serv.
Pamela A. Langford, Technical Serv.

Laboratory Certification Number: AZ0473

End of Sample Report.

Precision Analytical Laboratories, Inc

TO SUBCONTRACT LABORATORY:

ALL TEST LABORATORIES
2960 Foster Creighton Dr.
Nashville Tennessee 37204 Telephone# (800) 765-0980

232308

Lab Number

Client	Precision Analytical Laboratories, Inc.	Project Name:	URS - Bowie Power Plant
Address	4455 S. Park Ave. #110 #3158	Project Number:	E1-47037002.00
City, State, Zip	Tucson AZ 85714	Sampler:	Client
Contact	Lorena Leal	P.O. Number:	
Phone	(520) 807-3801		
Fax	(520) 807-3803		

Page ____ of ____

Fax Results Y N

email Results Y N

email Address lleal@palabs.com

Sample Type Codes

DW - Drinking Water
S - Soil
WW - Waste Water
A - Air
HW - Hazardous Waste
Other GW Groundwater

NOTES:

Turn Around Time Request

- 24 Hours
- 48 Hours
- 72 Hours
- 5 Day
- Standard 10 Day

Sample Information / **ANALYSES REQUESTED**

#	Sample Identification	Date	Time	Type	TOC	# of sample containers
	Well 28 dcc 44100	8/30/01	1256	AW	X	

Instructions/Special Requirements:

Date	Time	Samples Relinquished By	Samples Received By
4/2/01		L Leal	UPS-Overnight
			M. Beale 4/3/01 4:00 9.0

WCAS
WEST COAST
ANALYTICAL
SERVICE, INC.
Analytical Chemists

April 16, 2001

Precision Analytical Laboratories
1725 West 17th Street
Tempe, AZ 85281

Attn: Jennifer Chavez

Job No: 52108 DL

LABORATORY REPORT

Samples Received: One (1) Sample
Date Received: 04/04/2001
Purchase Order No: 0-104-026

The sample was analyzed as follows:

Analysis	Page
Reactive Silica by SM 4500-Si ED4a	2

D.J. Northington, Ph.D. Quality Assurance Officer	Michael Shelton Senior Staff Chemist

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WEST COAST ANALYTICAL SERVICE, INC.

Precision Analytical Laboratories
Attn: Jennifer Chavez

Job No: 52108
April 16, 2001

Reference: Standard Methods 4500-Si ED4a

Sample ID: Well 28 dcc

Analysis	Result	DL
Reactive Silica	32.1 mg/L	0.05

Quality Control Summary

Sample ID: Batch QC

Analysis	Sample Result	Duplicate Result	RPD *
Reactive Silica	41.0 mg/L	39.4 mg/L	4%

*Limit has not been established

Date Analyzed: 04-11-01

Precision Analytical Laboratories, Inc.

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[ ] North Phoenix- 2020 West Lone Cactus Drive, Phoenix, AZ 85027 (623) 780-4800 FAX (623) 780-7695
[ ] Tucson- 4455 South Park Avenue, Ste.110, Tucson, AZ 85714 (520) 807-3801 FAX (520) 807-3803
www.palabs.com or call toll-free 1-866-7PALABS (1-866-772-5227)

LAB ID NUMBER:

Page____ of____

Client: PPI
Address:
City, State, Zip:
Contact: T. Chavez
Phone:
Fax:
Sampler:
P.O. Number:

E-Mail Address:
Fax Results: Y N
E-Mail Results: Y N

TAT Request

24 Hours 48 Hours
72 Hours 5 Day
Laboratory Approval Required for RUSH Analyses
Surcharges May Apply
Standard 10 Day

Sample Information

Lab #	Sample Type	Sample Identification	Date	Time	Qty	Reactive Silica													
	GW	well 78 dcc	3/30	1230		X								0104-076-01					

Project Name:
Project Number: 0104-076

Instructions/Special Requirements:

Date	Time	Relinquished By:	Company	Relinquished By:	Company
4/3/01	1700	[signature]		A. Corral	
				rec'd by: K.M. King 04-04-01 @ 11:00	WCMS

№ 52108

Data Validation Memorandum

URS

7720 North 16th Street
Suite 100
Phoenix, Arizona 85020
602 371 1100 Tel
602 371 1615 Fax

Action	Info	File
Karen Schwab, Project Manager		E1-00001844.00

From Marianne Burrus, Project Chemist

Date July 25, 2001

Subject Data Completeness Check for Bowie Power Plant
PAL Order No.: 0104082

This report summarizes the review of the analytical data for aqueous sample **Well 28CCC**. The sample was collected April 3, 2001by URS personnel and submitted to Precision Analytical Laboratories, Inc. (PAL) of Phoenix, Arizona. The sample was analyzed for total recoverable petroleum hydrocarbons - TRPH (EPA Method 418.1), total and dissolved metals (EPA Methods 200 series) and a variety of wet chemistry parameters. PAL subcontracted the analysis of reactive silica and total organic carbon (TOC) to West Coast Analytical Services, Inc and Test America, respectively.

The data were reviewed in accordance with the URS Standard Operating Procedures (SOPs). The SOPs are based on the principles given in the *USEPA National Functional Guidelines for Inorganic Data Review* (EPA, 1994).

The data was evaluated based on the following parameters:

Data Completeness
Holding Times
Blanks
Matrix Spikes/Matrix Spike Duplicate (MS/MSD)
Laboratory Duplicate (DUP)
Laboratory Control Sample (LCS)

The following presents an overview of the Summary Validation:

TRPH

- The sample was analyzed per the chain-of-custody.
- The method specified holding times were met.
- The associated method blank was reported as non-detect for the analyte of interest.
- The MS analysis was performed on project sample **Well 28 CCC**. The MS percent recovery was within the laboratory established control limits.
- The DUP analysis was performed on a non-project specific sample and the relative percent difference (RPD) value was within the laboratory established control limits.

- The LCS percent recovery was within the laboratory established control limits.

TOTAL and DISSOLVED METALS

- The sample was analyzed per the chain-of-custody. The laboratory reporting limits for antimony and thallium were higher than the associated Aquifer Water Quality Standard. This anomaly may effect the data usability.

- The method specified holding times were met.

- The associated method blanks were reported as non-detect for the analytes of interest.

- PAL did not perform the MS/MSD analyses on a sample from this project, therefore matrix effect could not be evaluated. The non-project MS/MSD and LCS were used to evaluate laboratory precision and accuracy.

- The LCS percent recoveries were within the laboratory established control limits.

WET CHEMISTRY PARAMETERS

- The sample was analyzed per the chain-of-custody.

- The method specified holding times were met.

- The associated method blanks were reported as non-detect for the analytes of interest.

- The MS/MSD analyses were performed on project sample **Well 28CCC**. The MS/MSD percent recoveries and RPD values were within the laboratory established control limits.

- The DUP analyses were performed on project sample **Well 28CCC**. The DUP RPD values were within the laboratory established control limits.

- The LCS percent recoveries were within the laboratory established control limits.

Precision Analytical Laboratories, Inc.

A Subsidiary of Aerotech Laboratories, Inc.

April 19, 2001

Andy Messer
URS Corp.
1790 E. River Road.
Suite E-300
Tucson, AZ 85718
TEL: (520) 529-1141
FAX (520) 529-2449

RE: Bowie Power Plant E1-47037002.00 05/54 Order No.: 0104082

Dear Andy Messer:

Precision Analytical Laboratories, Inc. received 1 sample on 4/3/01 for the analyses presented in the following report.

This report includes the following information:

- Case Narrative. The case narrative contains a listing of common method references, data qualifiers, and any comments that may be needed regarding the analytical results.

- Analytical Report. Analysis results are reported with the compound name first, followed by the test result, report limit (Limit), any required data qualifier (Qual), units, dilution factor (DF), and date analyzed.

- QC Summary Report. This section includes quality control results for some or all of the following: method blanks, sample duplicates, sample matrix spikes, sample matrix spike duplicates, laboratory control spikes, and laboratory control spike duplicates.

If you have any questions regarding these test results, please do not hesitate to call.

Sincerely,

J. Chavez

Jennifer Chavez
Laboratory Director - Tucson

CC:

Precision Analytical Laboratories, Inc.
A Subsidiary of Aerotech Laboratories, Inc.

Date: *19-Apr-01*

CLIENT: URS Corp.
Project: Bowie Power Plant E1-47037002.00 05/54
Lab Order: 0104082
Date Received: 4/3/01

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Tag Number	Collection Date
0104082-01A	Well 28 ccc	2-104-033-01	4/3/01 7:20:00 AM

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Date: *26-Apr-01*

CLIENT: URS Corp.
Project: Bowie Power Plant E1-47037002.00 05/54
Lab Order: 0104082

CASE NARRATIVE

Data Qualifiers

Listed below are data qualifiers which may be used in your analytical report to explain any analytical or quality control issues. If one or more of the following data qualifiers is associated with your analytical or quality control data it will be noted in your report under the column header "QUAL". Any quality control deficiencies that cannot be adequately described by these qualifiers will be addressed in the analytical comments section of this case narrative.

B1 Target analyte detected in method blank at or above the method reporting limit.
D1 Sample required dilution due to matrix interference.
D2 Sample required dilution due to high concentration of target analyte.
D3 Sample dilution required due to insufficient sample.
D4 Minimum reporting level (MRL) adjusted to reflect sample amount received and analyzed.
E2 Concentration estimated. Analyte exceeded calibration range. Reanalysis not performed due to sample matrix.
E3 Concentration estimated. Analyte exceeded calibration range. Reanalysis not performed due to holding time requirements.
E4 Concentration estimated. Analyte was detected below laboratory minimum reporting level (MRL).
E6 Concentration estimated. Internal standard recoveries did not meet method acceptance criteria.
E7 Concentration estimated. Internal standard recoveries did not meet laboratory acceptance criteria.
H1 Sample analysis performed past holding time. See case narrative.
H2 Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
H3 Sample was received and analyzed past holding time.
H4 Sample was extracted past required extraction holding time, but analyzed within analysis holding time. See case narrative.
K1 The sample dilutions set-up for the BOD analysis did not meet the oxygen depletion criteria of at least 2 mg/L. The reported result is an estimated value.
K2 The sample dilutions set up for the BOD analysis failed to meet the criteria of a residual dissolved oxygen of at least 1 mg/L. The reported result is estimated.
L1 The associated blank spike recovery was above laboratory acceptance limits. See case narrative.
L2 The associated blank spike recovery was below laboratory acceptance limits. See case narrative.
M1 Matrix spike recovery was high, the method control sample recovery was

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acceptable.

M2 Matrix spike recovery was low, the method control sample recovery was acceptable.

M3 The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable.

M4 The analysis of the spiked sample required a dilution such that the spike concentration was diluted below the reporting limit. The method control sample recovery was acceptable.

M5 Analyte concentration was determined by the method of standard addition (MSA).

N1 See case narrative.

Q1 Sample integrity was not maintained. See case narrative.

Q2 Sample received with head space.

Q3 Sample received with improper chemical preservation.

Q5 Sample received without chemical preservation, but preserved by the laboratory.

Q6 Sample was received above recommended temperature.

Q7 Sample inadequately dechlorinated.

Q8 Insufficient sample received to meet method QC requirements. QC requirements satisfy ADEQ policies 0154 and 0155.

Q10 Sample received in inappropriate sample container.

Q11 Sample is heterogeneous. Sample homogeneity could not be readily achieved using routine laboratory practices.

R2 RPD exceeded the laboratory control limit. See case narrative.

R3 Sample RPD between the primary and confirmatory analysis exceeded 40%. Per EPA Method 8000B, the higher value was reported.

R5 RPD exceeded the laboratory control limit. Recovery met acceptance criteria.

S2 Surrogate recovery was above laboratory and method acceptance limits.

S4 Surrogate recovery was above laboratory and method acceptance limits. No target analytes were detected in the sample.

S6 Surrogate recovery was below laboratory and method acceptance limits. Reextraction and/or reanalysis confirms low recovery caused by matrix effect.

S7 Surrogate recovery was below laboratory and method acceptance limits. Unable to confirm matrix effect.

S9 The analysis of the sample required a dilution such that the surrogate concentration was diluted below the laboratory acceptance criteria. The method control sample recovery was acceptable.

S10 Surrogate recovery was above laboratory and method acceptance limits. See case narrative (N1).

T2 Cited ADHS licensed method does not contain this analyte as part of method compound list.

T4 Tentatively identified compound. Concentration is estimated and based on the

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closest internal standard.

V1 CCV recovery was above method acceptance limits. This target analyte was not detected in the sample.

V5 CCV recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA Method 8000B.

Samples were analyzed using methods outlined in references such as:

Standard Methods for the Examination of Water and Wastewater, 18th Edition, 1992 and 19th Edition, 1995.

Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition.

40 CFR, Part 136, Revised 1995. Appendix A to Part 136- Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater.

NIOSH Manual of Analytical Methods, Fourth Edition, 1994.

Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, 1999.

Precision Analytical Laboratories, Inc (PAL) holds the following certifications:
Arizona (certification no. AZ0610) and California (I-2410).
PAL- Tucson laboratory Arizona certification number: AZ0609.
PAL- North Phoenix laboratory Arizona certification number: AZ0611.

Analytical Comments:

All method blanks and laboratory control spikes met EPA method and/or laboratory quality control objectives for the analyses included in this report.

The TOC analysis was performed by Test America in Nashville, TN. A copy of their report is enclosed. The Reactive Silica analysis was performed by West Coast Analytical Service Inc. in Santa Fe Springs, CA. A copy of their report is enclosed.

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Precision Analytical Laboratories, Inc.

A Subsidiary of Aerotech Laboratories, Inc.

Date: *26-Apr-01*

CLIENT:	URS Corp.	**Client Sample ID:**	Well 28 ccc
Lab Order:	0104082	**Tag Number:**	2-104-033-01
Project:	Bowie Power Plant E1-47037002.00 05/54	**Collection Date:**	4/3/01 7:20:00 AM
Lab ID:	0104082-01A	**Matrix:**	GROUNDWATER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
ICP METALS, TOTAL RECOVERABLE		**E200.7**				Analyst: **MK**
Aluminum	< 0.10	0.10		mg/L	1	4/6/01 10:08:50 AM
Antimony	< 0.040	0.040		mg/L	1	4/6/01 10:08:50 AM
Arsenic	< 0.040	0.040		mg/L	1	4/6/01 10:08:50 AM
Barium	0.071	0.010		mg/L	1	4/6/01 10:08:50 AM
Beryllium	< 0.0010	0.0010		mg/L	1	4/6/01 10:08:50 AM
Cadmium	< 0.0010	0.0010		mg/L	1	4/6/01 10:08:50 AM
Calcium	35	2.0		mg/L	1	4/6/01 10:08:50 AM
Chromium	< 0.010	0.010		mg/L	1	4/6/01 10:08:50 AM
Copper	0.072	0.010		mg/L	1	4/6/01 10:08:50 AM
Hardness, Calcium/Magnesium (As CaCO3)	110	13		mg/L	1	4/6/01 10:08:50 AM
Iron	< 0.050	0.050		mg/L	1	4/6/01 10:08:50 AM
Lead	< 0.015	0.015		mg/L	1	4/9/01 8:33:51 AM
Magnesium	6.4	2.0		mg/L	1	4/6/01 10:08:50 AM
Manganese	< 0.010	0.010		mg/L	1	4/6/01 10:08:50 AM
Nickel	< 0.010	0.010		mg/L	1	4/6/01 10:08:50 AM
Potassium	< 2.0	2.0		mg/L	1	4/6/01 10:08:50 AM
Selenium	< 0.040	0.040		mg/L	1	4/6/01 10:08:50 AM
Silica (Silicon dioxide-SiO2)	41	0.21		mg/L	1	4/12/01 6:54:13 AM
Silver	< 0.010	0.010		mg/L	1	4/6/01 10:08:50 AM
Sodium	39	2.0		mg/L	1	4/9/01 8:33:51 AM
Strontium	0.22	0.10		mg/L	1	4/6/01 10:08:50 AM
Thallium	< 0.040	0.040		mg/L	1	4/6/01 10:08:50 AM
Vanadium	< 0.010	0.010		mg/L	1	4/6/01 10:08:50 AM
Zinc	0.059	0.050		mg/L	1	4/6/01 10:08:50 AM
ICP METALS, DISSOLVED		**E200.7**				Analyst: **MK**
Iron	< 0.050	0.050		mg/L	1	4/6/01 8:16:02 AM
Manganese	< 0.010	0.010		mg/L	1	4/6/01 8:16:02 AM
Strontium	0.23	0.10		mg/L	1	4/6/01 8:16:02 AM
MERCURY IN WATERS		**E245.1**				Analyst: **CU**
Mercury	< 0.00020	0.00020		mg/L	1	4/5/01 1:36:25 PM
NITROGEN, NITRATE AS N		**E300**				Analyst: **LH**
Nitrogen, Nitrate (As N)	0.82	0.20		mg/L	1	4/4/01 7:29:00 PM
ANIONS BY ION CHROMATOGRAPHY		**E300**				Analyst: **LH**
Chloride	25	2.0		mg/L	1	4/16/01
Fluoride	0.78	0.40		mg/L	1	4/13/01
Sulfate	29	2.0		mg/L	1	4/13/01
PETROLEUM HYDROCARBONS, T/R		**E418.1**				Analyst: **LD**

Qualifiers:

ND - Not Detected at the Reporting Limit	S - Spike Recovery outside accepted recovery limits
J - Analyte detected below quantitation limits	R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank	E - Value above quantitation range
* - Value exceeds Maximum Contaminant Level	

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Precision Analytical Laboratories, Inc.

A Subsidiary of Aerotech Laboratories, Inc.

Date: *26-Apr-01*

CLIENT:	URS Corp.	**Client Sample ID:**	Well 28 ccc
Lab Order:	0104082	**Tag Number:**	2-104-033-01
Project:	Bowie Power Plant E1-47037002.00 05/54	**Collection Date:**	4/3/01 7:20:00 AM
Lab ID:	0104082-01A	**Matrix:**	GROUNDWATER

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
Petroleum Hydrocarbons, TR	2.2	2.0		mg/L	1	4/9/01 10:30:00 AM
ALKALINITY		M2320 B				Analyst: GL
Alkalinity, Bicarbonate (As CaCO3)	140	2.0		mg/L CaCO3	1	4/5/01 11:00:00 AM
Alkalinity, Carbonate (As CaCO3)	< 2.0	2.0		mg/L CaCO3	1	4/5/01 11:00:00 AM
Alkalinity, Hydroxide (As CaCO3)	< 2.0	2.0		mg/L CaCO3	1	4/5/01 11:00:00 AM
Alkalinity, Total (As CaCO3)	140	6.0		mg/L CaCO3	1	4/5/01 11:00:00 AM
CONDUCTANCE		M2510 B				Analyst: VDB
Specific Conductivity	430	1.0		µmhos/cm	1	4/5/01 3:30:00 PM
NITROGEN, AMMONIA AS N		E350.3				Analyst: GL
Nitrogen, Ammonia (As N)	< 0.50	0.50		mg/L	1	4/10/01 2:00:00 PM
NITROGEN, NITRITE AS N		M4500-NO2 B				Analyst: LD
Nitrogen, Nitrite	< 0.010	0.010		mg/L	1	4/4/01 4:10:00 PM
TOTAL PHOSPHORUS AS P		E365.3				Analyst: GL
Phosphorus, Total (As P)	< 0.20	0.20		mg/L	1	4/11/01 4:10:00 PM
PH		E150.1				Analyst: JF
pH	8.06	0		pH units	1	4/3/01 12:00:00 PM
COLIFORM, TOTAL		M9223 B				Analyst: JF
Total Coliform (Colilert)	1	0		Pos/Neg	1	4/3/01 2:15:00 PM
Escherichia Coli	0	0		Pos/Neg	1	4/3/01 2:15:00 PM
TOTAL DISSOLVED SOLIDS		M2540 C				Analyst: VDB
Total Dissolved Solids	250	10		mg/L	1	4/6/01 2:00:00 PM
NITROGEN, TOTAL KJELDAHL AS N		E351.4				Analyst: GL
Nitrogen, Total Kjeldahl	< 0.50	0.50		mg/L	1	4/5/01

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quantitation limits
- B - Analyte detected in the associated Method Blank
- * - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- E - Value above quantitation range

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Lab Order: 0104082
Client: URS Corp.
Project: Bowie Power Plant E1-47037002.0

DATES REPORT

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	TCLP Date	Prep Date	Analysis Date
0104082-01A	Well 28 ccc	4/3/01 7:20:00 AM	Groundwater	ALKALINITY			4/5/01
				AMMONIA as N			4/10/01
				ANIONS by ION CHROMATOGRAPHY			4/16/01
				ANIONS by ION CHROMATOGRAPHY			4/13/01
				COLIFORM, Total			4/3/01
				CONDUCTANCE			4/5/01
				ICP METALS, DISSOLVED		4/5/01	4/6/01
				ICP METALS, TOTAL RECOVERABLE		4/5/01	4/12/01
				ICP METALS, TOTAL RECOVERABLE		4/5/01	4/6/01
				ICP METALS, TOTAL RECOVERABLE		4/5/01	4/9/01
				MERCURY IN WATERS		4/5/01	4/5/01
				Nitrate by ION CHROMATOGRAPHY			4/4/01
				NITRITE IN WATER			4/4/01
				PETROLEUM HYDROCARBONS, T/R			4/9/01
				pH			4/3/01
				pH			4/3/01
				TOTAL DISSOLVED SOLIDS			4/6/01
				TOTAL KJELDAHL NITROGEN			4/5/01
				TOTAL PHOSPHORUS AS P IN WATER			4/11/01

Precision Analytical Laboratories, Inc.

Date: *26-Apr-01*

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Method Blank

Sample ID: **MB-3737** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010406A** SeqNo: **95717**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	< 0.10	0.1									
Antimony	< 0.040	0.04									
Arsenic	< 0.040	0.04									
Barium	< 0.010	0.01									
Beryllium	< 0.0010	0.001									
Cadmium	< 0.0010	0.001									
Calcium	< 2.0	2									
Chromium	< 0.010	0.01									
Copper	< 0.010	0.01									
Hardness, Calcium/Magnesium (As Ca	< 13	13									
Iron	< 0.050	0.05									
Magnesium	< 2.0	2									
Manganese	< 0.010	0.01									
Nickel	< 0.010	0.01									
Potassium	< 2.0	2									
Selenium	< 0.040	0.04									
Silver	< 0.010	0.01									
Sodium	< 2.0	2									
Strontium	< 0.10	0.1									
Thallium	< 0.040	0.04									
Vanadium	< 0.010	0.01									
Zinc	< 0.050	0.05									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Method Blank

Sample ID: **MB-3737** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/9/01** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010409A** SeqNo: **96162**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	< 0.015	0.015									

Sample ID: **MB-3737** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/12/01 6:40:09 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010412A** SeqNo: **97187**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Silica (Silicon dioxide-SiO2)	< 0.21	0.21									

Sample ID: **MB-3740** Batch ID: **3740** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01 7:59:56 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010406A** SeqNo: **95684**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	< 0.050	0.05									
Manganese	< 0.010	0.01									
Strontium	< 0.10	0.1									

Sample ID: **MB-3734** Batch ID: **3734** Test Code: **E245.1** Units: **mg/L** Analysis Date **4/5/01 1:36:25 PM** Prep Date: **4/5/01**
Client ID: Run ID: **FIMS HG_010405A** SeqNo: **95298**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	< 0.00020	0.0002									

Sample ID: **MB-R9121** Batch ID: **R9121** Test Code: **E300** Units: **mg/L** Analysis Date **4/4/01 6:20:00 PM** Prep Date:
Client ID: Run ID: **IC 1_010404B** SeqNo: **96556**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	< 0.20	0.2									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Method Blank

Sample ID: **MB-R9268** Batch ID: **R9268** Test Code: **E300** Units: **mg/L** Analysis Date **4/13/01** Prep Date:
Client ID: Run ID: **IC 1_010412B** SeqNo: **98156**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	< 2.0	2									
Fluoride	< 0.40	0.4									
Sulfate	< 2.0	2									

Sample ID: **MB-R9319** Batch ID: **R9319** Test Code: **E300** Units: **mg/L** Analysis Date **4/16/01** Prep Date:
Client ID: Run ID: **IC 1_010416A** SeqNo: **98776**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	< 2.0	2									
Fluoride	< 0.40	0.4									
Sulfate	< 2.0	2									

Sample ID: **MB-R9084** Batch ID: **R9084** Test Code: **E418.1** Units: **mg/L** Analysis Date **4/9/01 10:30:00 AM** Prep Date:
Client ID: Run ID: **IR 1_010409A** SeqNo: **96181**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Petroleum Hydrocarbons, TR	< 2.0	2									

Sample ID: **MB-R9051** Batch ID: **R9051** Test Code: **M2320 B** Units: **mg/L CaCO3** Analysis Date **4/5/01 11:00:00 AM** Prep Date:
Client ID: Run ID: **BURET 1_010405A** SeqNo: **95616**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	< 2.0	2									
Alkalinity, Carbonate (As CaCO3)	< 2.0	2									
Alkalinity, Hydroxide (As CaCO3)	< 2.0	2									
Alkalinity, Total (As CaCO3)	< 6.0	6									

Qualifiers: ND - Not Detected at the Reporting Limit
S - Spike Recovery outside accepted recovery limits
B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits
R - RPD outside accepted recovery limits

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CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Method Blank

Sample ID: **MB-R9037** Batch ID: **R9037** Test Code: **M2510 B** Units: **µmhos/cm** Analysis Date **4/5/01 3:30:00 PM** Prep Date:
Client ID: Run ID: **COND 1_010405A** SeqNo: **95515**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductivity	< 1.0	1									

Sample ID: **MB-R9120** Batch ID: **R9120** Test Code: **E350.3** Units: **mg/L** Analysis Date **4/10/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **PH 2_010410A** SeqNo: **96520**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	< 0.50	0.5									

Sample ID: **MB-R9046** Batch ID: **R9046** Test Code: **M4500-NO2 B** Units: **mg/L** Analysis Date **4/4/01 4:10:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010404E** SeqNo: **95586**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrite	< 0.010	0.01									

Sample ID: **MB-R9175** Batch ID: **R9175** Test Code: **E365.3** Units: **mg/L** Analysis Date **4/11/01 4:10:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010411D** SeqNo: **97062**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	< 0.20	0.2									

Sample ID: **MB-R9131** Batch ID: **R9131** Test Code: **M2540 C** Units: **mg/L** Analysis Date **4/6/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **BL002_010406A** SeqNo: **96663**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Dissolved Solids	< 10	10									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Method Blank

Sample ID: **MB-R9053** Batch ID: **R9053** Test Code: **E351.4** Units: **mg/L** Analysis Date **4/5/01** Prep Date:

Client ID: Run ID: **PH 2_010405A** SeqNo: **95648**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Total Kjeldahl	< 0.50	0.5									

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

Date: *26-Apr-01*

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Sample Duplicate

Sample ID: **0104084-01A DUP** Batch ID: **R9121** Test Code: **E300** Units: **mg/L** Analysis Date **4/4/01 9:31:00 PM** Prep Date:
Client ID: Run ID: **IC 1_010404B** SeqNo: **96558**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	< 0.20	0.2	0	0	0	0	0	0	0	20	

Sample ID: **0104250-01a dup** Batch ID: **R9268** Test Code: **E300** Units: **mg/L** Analysis Date **4/13/01** Prep Date:
Client ID: Run ID: **IC 1_010412B** SeqNo: **98166**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	32.76	2	0	0	0	0	0	32.8	0.122	20	
Fluoride	0.53	0.4	0	0	0	0	0	0.51	3.85	20	
Sulfate	19.64	2	0	0	0	0	0	19.8	0.811	20	

Sample ID: **0104232-01A DUP** Batch ID: **R9319** Test Code: **E300** Units: **mg/L** Analysis Date **4/16/01** Prep Date:
Client ID: Run ID: **IC 1_010416A** SeqNo: **98794**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	6.03	2	0	0	0	0	0	5.95	1.34	20	
Fluoride	< 0.40	0.4	0	0	0	0	0	0	0	20	

Sample ID: **0104045-01A DUP** Batch ID: **R9084** Test Code: **E418.1** Units: **mg/L** Analysis Date **4/9/01 10:30:00 AM** Prep Date:
Client ID: Run ID: **IR 1_010409A** SeqNo: **96187**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Petroleum Hydrocarbons, TR	11.3	2	0	0	0	0	0	11.7	3.48	25	

Qualifiers: ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Sample Duplicate

Sample ID: **0104095-01A DUP** Batch ID: **R9051** Test Code: **M2320 B** Units: **mg/L CaCO3** Analysis Date **4/5/01 11:00:00 AM** Prep Date:
Client ID: Run ID: **BURET 1_010405A** SeqNo: **95627**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Bicarbonate (As CaCO3)	144	2	0	0	0	0	0	144	0	20	
Alkalinity, Carbonate (As CaCO3)	< 2.0	2	0	0	0	0	0	0	0	20	
Alkalinity, Hydroxide (As CaCO3)	< 2.0	2	0	0	0	0	0	0	0	20	
Alkalinity, Total (As CaCO3)	144	6	0	0	0	0	0	144	0	20	

Sample ID: **0104026-01A DUP** Batch ID: **R9037** Test Code: **M2510 B** Units: **µmhos/cm** Analysis Date **4/5/01 3:30:00 PM** Prep Date:
Client ID: Run ID: **COND 1_010405A** SeqNo: **95521**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductivity	383	1	0	0	0	0	0	382	0.261	20	

Sample ID: **0104082-01A DUP** Batch ID: **R9175** Test Code: **E365.3** Units: **mg/L** Analysis Date **4/11/01 4:10:00 PM** Prep Date:
Client ID: **Well 28 ccc** Run ID: **SPEC 1_010411D** SeqNo: **97070**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	< 0.20	0.2	0	0	0	0	0	0	0	20	

Sample ID: **0104082-01A** Batch ID: **R9165** Test Code: **E150.1** Units: **pH units** Analysis Date **4/3/01 12:00:00 PM** Prep Date:
Client ID: **Well 28 ccc** Run ID: **PH TUCSON_010403A** SeqNo: **96991**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	8.07	0	0	0	0	0	0	8.06	0.124	10	

Sample ID: **0104082-01A DUP** Batch ID: **R9131** Test Code: **M2540 C** Units: **mg/L** Analysis Date **4/6/01 2:00:00 PM** Prep Date:
Client ID: **Well 28 ccc** Run ID: **BL002_010406A** SeqNo: **96675**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Dissolved Solids	266	10	0	0	0	0	0	253	5.01	10	

Qualifiers: ND - Not Detected at the Reporting Limit S - Spike Recovery outside accepted recovery limits B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

Date: *26-Apr-01*

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Sample Matrix Spike

Sample ID: **0104064-01A MS** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01 9:39:36 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010406A** SeqNo: **95706**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	2.258	0.1	2	0.1034	108	70	130	0			
Antimony	1.019	0.04	1	0	102	70	130	0			
Arsenic	0.91	0.04	1	0	91	70	130	0			
Barium	0.9847	0.01	1	0	98.5	70	130	0			
Beryllium	1.023	0.001	1	0	102	70	130	0			
Cadmium	0.9658	0.001	1	0	96.6	70	130	0			
Calcium	20.05	2	21	0	95.5	70	130	0			
Chromium	0.9672	0.01	1	0	96.7	70	130	0			
Copper	1.033	0.01	1	0.03908	99.4	70	130	0			
Iron	1.158	0.05	1	0.2248	93.3	70	130	0			
Magnesium	20.9	2	21	0	99.5	70	130	0			
Manganese	1.005	0.01	1	0	101	70	130	0			
Nickel	0.9591	0.01	1	0	95.9	70	130	0			
Potassium	21.15	2	20	0	106	70	130	0			
Selenium	1.064	0.04	1	0	106	70	130	0			
Silver	0.08568	0.01	0.09	0	95.2	70	130	0			
Strontium	0.9535	0.1	1	0	95.4	70	130	0			
Thallium	0.9898	0.04	1	0	99	70	130	0			
Vanadium	0.9963	0.01	1	0	99.6	70	130	0			
Zinc	1.023	0.05	1	0	102	70	130	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Sample Matrix Spike Duplicate

Sample ID: **0104064-01A MSD** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01 9:42:52 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010406A** SeqNo: **95707**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	2.288	0.1	2	0.1034	109	70	130	2.258	1.33	20	
Antimony	1.088	0.04	1	0	109	70	130	1.019	6.46	20	
Arsenic	0.932	0.04	1	0	93.2	70	130	0.91	2.38	20	
Barium	1.001	0.01	1	0	100	70	130	0.9847	1.63	20	
Beryllium	1.045	0.001	1	0	105	70	130	1.023	2.09	20	
Cadmium	0.982	0.001	1	0	98.2	70	130	0.9658	1.66	20	
Calcium	20.1	2	21	0	95.7	70	130	20.05	0.243	20	
Chromium	0.9838	0.01	1	0	98.4	70	130	0.9672	1.71	20	
Copper	1.037	0.01	1	0.03908	99.8	70	130	1.033	0.352	20	
Iron	1.177	0.05	1	0.2248	95.2	70	130	1.158	1.66	20	
Magnesium	20.96	2	21	0	99.8	70	130	20.9	0.272	20	
Manganese	1.008	0.01	1	0	101	70	130	1.005	0.245	20	
Nickel	0.9678	0.01	1	0	96.8	70	130	0.9591	0.91	20	
Potassium	21.47	2	20	0	107	70	130	21.15	1.51	20	
Selenium	1.094	0.04	1	0	109	70	130	1.064	2.79	20	
Silver	0.08763	0.01	0.09	0	97.4	70	130	0.08568	2.25	20	
Strontium	0.9638	0.1	1	0	96.4	70	130	0.9535	1.07	20	
Thallium	0.9862	0.04	1	0	98.6	70	130	0.9898	0.36	20	
Vanadium	1.013	0.01	1	0	101	70	130	0.9963	1.62	20	
Zinc	1.041	0.05	1	0	104	70	130	1.023	1.78	20	

Sample ID: **0104064-01A MS** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/9/01 8:44:22 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010409A** SeqNo: **96150**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.9778	0.015	1	0	97.8	70	130	0			
Sodium	19.73	2	20	0	98.6	70	130	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank
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Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Sample Matrix Spike Duplicate

Sample ID: **0104064-01A MSD** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/9/01 8:47:20 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010409A** SeqNo: **96151**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.9772	0.015	1	0	97.7	70	130	0.9778	0.0584	20	
Sodium	19.65	2	20	0	98.2	70	130	19.73	0.384	20	

Sample ID: **0104064-01A MS** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/12/01 6:47:13 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010412A** SeqNo: **97190**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Silica (Silicon dioxide-SiO2)	11.76	0.21	10.7	0.558	105	70	130	0			

Sample ID: **0104064-01A MSD** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/12/01 6:49:34 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010412A** SeqNo: **97191**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Silica (Silicon dioxide-SiO2)	11.66	0.21	10.7	0.558	104	70	130	11.76	0.914	20	

Sample ID: **0104026-01A MS** Batch ID: **3740** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01 8:09:35 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010406A** SeqNo: **95687**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	0.9811	0.05	1	0	98.1	70	130	0			
Manganese	1.008	0.01	1	0	101	70	130	0			
Strontium	1.205	0.1	1	0.2291	97.6	70	130	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Sample Matrix Spike Duplicate

Sample ID: **0104026-01A MSD** Batch ID: **3740** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01 8:13:02 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010406A** SeqNo: **95688**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	0.9548	0.05	1	0	95.5	70	130	0.9811	2.71	20	
Manganese	1.007	0.01	1	0	101	70	130	1.008	0.152	20	
Strontium	1.166	0.1	1	0.2291	93.7	70	130	1.205	3.29	20	

Sample ID: **0104026-01AMS** Batch ID: **3734** Test Code: **E245.1** Units: **mg/L** Analysis Date **4/5/01 1:36:25 PM** Prep Date: **4/5/01**
Client ID: Run ID: **FIMS HG_010405A** SeqNo: **95301**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.00539	0.0002	0.005	0	108	70	130	0			

Sample ID: **0104026-01AMSD** Batch ID: **3734** Test Code: **E245.1** Units: **mg/L** Analysis Date **4/5/01 1:36:25 PM** Prep Date: **4/5/01**
Client ID: Run ID: **FIMS HG_010405A** SeqNo: **95302**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.00537	0.0002	0.005	0	107	70	130	0.00539	0.372	20	

Sample ID: **0104084-01A MS** Batch ID: **R9121** Test Code: **E300** Units: **mg/L** Analysis Date **4/4/01 9:48:00 PM** Prep Date:
Client ID: Run ID: **IC 1_010404B** SeqNo: **96559**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	1.96	0.2	2	0	98	80	120	0			

Sample ID: **0104250-01a ms** Batch ID: **R9268** Test Code: **E300** Units: **mg/L** Analysis Date **4/13/01** Prep Date:
Client ID: Run ID: **IC 1_010412B** SeqNo: **98167**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Fluoride	2.89	0.4	2	0.51	119	80	120	0			
Sulfate	42.83	2	20	19.8	115	80	120	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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CLIENT: URS Corp.
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Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Sample Matrix Spike

Sample ID: **0104232-01A MS** Batch ID: **R9319** Test Code: **E300** Units: **mg/L** Analysis Date **4/16/01** Prep Date:
Client ID: Run ID: **IC 1_010416A** SeqNo: **98793**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	25.93	2	20	5.95	99.9	80	120	0			
Fluoride	2.32	0.4	2	0	116	80	120	0			
Sulfate	31.65	2	20	10.31	107	80	120	0			

Sample ID: **0104082-01A MS** Batch ID: **R9084** Test Code: **E418.1** Units: **mg/L** Analysis Date **4/9/01 10:30:00 AM** Prep Date:
Client ID: **Well 28 ccc** Run ID: **IR 1_010409A** SeqNo: **96186**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Petroleum Hydrocarbons, TR	9.11	2	8	2.2	86.4	70	130	0			

Sample ID: **0104026-01A MS** Batch ID: **R9120** Test Code: **E350.3** Units: **mg/L** Analysis Date **4/10/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **PH 2_010410A** SeqNo: **96542**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	9.68	0.5	10	0	96.8	80	120	0			

Sample ID: **0104026-01A MSD** Batch ID: **R9120** Test Code: **E350.3** Units: **mg/L** Analysis Date **4/10/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **PH 2_010410A** SeqNo: **96544**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	9.44	0.5	10	0	94.4	80	120	9.68	2.51	20	

Sample ID: **0104082-01A MS** Batch ID: **R9046** Test Code: **M4500-NO2 B** Units: **mg/L** Analysis Date **4/4/01 4:10:00 PM** Prep Date:
Client ID: **Well 28 ccc** Run ID: **SPEC 1_010404E** SeqNo: **95593**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrite	0.105	0.01	0.1	0	105	80	120	0	200	0	

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT
Sample Matrix Spike Duplicate

Sample ID: **0104082-01A MSD** Batch ID: **R9046** Test Code: **M4500-NO2 B** Units: **mg/L** Analysis Date **4/4/01 4:10:00 PM** Prep Date:
Client ID: **Well 28 ccc** Run ID: **SPEC 1_010404E** SeqNo: **95594**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrite	0.103	0.01	0.1	0	103	80	120	0.105	1.92	20	

Sample ID: **0104082-01A MS** Batch ID: **R9175** Test Code: **E365.3** Units: **mg/L** Analysis Date **4/11/01 4:10:00 PM** Prep Date:
Client ID: **Well 28 ccc** Run ID: **SPEC 1_010411D** SeqNo: **97071**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	1.017	0.2	1	0	102	80	120	0			

Sample ID: **0104150-01A MS** Batch ID: **R9053** Test Code: **E351.4** Units: **mg/L** Analysis Date **4/5/01** Prep Date:
Client ID: Run ID: **PH 2_010405A** SeqNo: **95671**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Total Kjeldahl	8.943	0.5	10	0.684	82.6	80	120	0			

Sample ID: **0104150-01A MSD** Batch ID: **R9053** Test Code: **E351.4** Units: **mg/L** Analysis Date **4/5/01** Prep Date:
Client ID: Run ID: **PH 2_010405A** SeqNo: **95672**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Total Kjeldahl	8.834	0.5	10	0.684	81.5	80	120	8.943	1.23	20	

Qualifiers: ND - Not Detected at the Reporting Limit S - Spike Recovery outside accepted recovery limits B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits R - RPD outside accepted recovery limits

Precision Analytical Laboratories, Inc.

Date: *26-Apr-01*

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Laboratory Control Spike - generic

Sample ID: **LCS-3737** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01** Prep Date: **4/5/01**

Client ID: Run ID: **ICP001_010406A** SeqNo: **95718**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aluminum	2.208	0.1	2	0	110	85	115	0			
Antimony	1.004	0.04	1	0	100	85	115	0			
Arsenic	0.9656	0.04	1	0	96.6	85	115	0			
Barium	1.003	0.01	1	0	100	85	115	0			
Beryllium	1.047	0.001	1	0	105	85	115	0			
Cadmium	0.9917	0.001	1	0	99.2	85	115	0			
Calcium	19.96	2	21	0	95	85	115	0			
Chromium	0.9881	0.01	1	0	98.8	85	115	0			
Copper	1.002	0.01	1	0	100	85	115	0			
Iron	0.9709	0.05	1	0	97.1	85	115	0			
Magnesium	20.98	2	21	0	99.9	85	115	0			
Manganese	1.01	0.01	1	0	101	85	115	0			
Nickel	0.9825	0.01	1	0	98.2	85	115	0			
Potassium	19.48	2	20	0	97.4	85	115	0			
Selenium	1.057	0.04	1	0	106	85	115	0			
Silver	0.08808	0.01	0.09	0	97.9	85	115	0			
Sodium	21.45	2	20	0	107	85	115	0			
Strontium	0.9765	0.1	1	0	97.6	85	115	0			
Thallium	0.9818	0.04	1	0	98.2	85	115	0			
Vanadium	1.018	0.01	1	0	102	85	115	0			
Zinc	1.047	0.05	1	0	105	85	115	0			

Sample ID: **LCS-3737** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/9/01** Prep Date: **4/5/01**

Client ID: Run ID: **ICP001_010409A** SeqNo: **96163**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	0.9735	0.015	1	0	97.3	85	115	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Laboratory Control Spike - generic

Sample ID: **LCS-3737** Batch ID: **3737** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/12/01 6:42:29 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010412A** SeqNo: **97188**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Silica (Silicon dioxide-SiO2)	11.29	0.21	10.7	0	106	85	115	0			

Sample ID: **LCS-3740** Batch ID: **3740** Test Code: **E200.7** Units: **mg/L** Analysis Date **4/6/01 8:03:08 AM** Prep Date: **4/5/01**
Client ID: Run ID: **ICP001_010406A** SeqNo: **95685**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	0.9646	0.05	1	0	96.5	85	115	0			
Manganese	1.015	0.01	1	0	101	85	115	0			
Strontium	0.9662	0.1	1	0	96.6	85	115	0			

Sample ID: **LCS-3734** Batch ID: **3734** Test Code: **E245.1** Units: **mg/L** Analysis Date **4/5/01 1:36:25 PM** Prep Date: **4/5/01**
Client ID: Run ID: **FIMS HG_010405A** SeqNo: **95299**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury	0.00533	0.0002	0.005	0	107	85	115	0			

Sample ID: **LCS-R9121** Batch ID: **R9121** Test Code: **E300** Units: **mg/L** Analysis Date **4/4/01 6:37:00 PM** Prep Date:
Client ID: Run ID: **IC 1_010404B** SeqNo: **96557**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrate (As N)	2.12	0.2	2	0	106	90	110	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Laboratory Control Spike - generic

Sample ID: **LCS-R9268** Batch ID: **R9268** Test Code: **E300** Units: **mg/L** Analysis Date **4/13/01** Prep Date:
Client ID: Run ID: **IC 1_010412B** SeqNo: **98157**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	20.49	2	20	0	102	90	110	0			
Fluoride	2.12	0.4	2	0	106	90	110	0			
Sulfate	20.67	2	20	0	103	90	110	0			

Sample ID: **LCS-R9319** Batch ID: **R9319** Test Code: **E300** Units: **mg/L** Analysis Date **4/16/01** Prep Date:
Client ID: Run ID: **IC 1_010416A** SeqNo: **98777**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Chloride	20.48	2	20	0	102	90	110	0			
Fluoride	2.19	0.4	2	0	110	90	110	0			

Sample ID: **LCS-R9084** Batch ID: **R9084** Test Code: **E418.1** Units: **mg/L** Analysis Date **4/9/01 10:30:00 AM** Prep Date:
Client ID: Run ID: **IR 1_010409A** SeqNo: **96182**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Petroleum Hydrocarbons, TR	6.94	2	8	0	86.8	70	130	0			

Sample ID: **LCS-R9051** Batch ID: **R9051** Test Code: **M2320 B** Units: **mg/L CaCO3** Analysis Date **4/5/01 11:00:00 AM** Prep Date:
Client ID: Run ID: **BURET 1_010405A** SeqNo: **95617**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Alkalinity, Total (As CaCO3)	252	6	250	0	101	90	110	0			

Sample ID: **LCS-R9037** Batch ID: **R9037** Test Code: **M2510 B** Units: **µmhos/cm** Analysis Date **4/5/01 3:30:00 PM** Prep Date:
Client ID: Run ID: **COND 1_010405A** SeqNo: **95516**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Conductivity	1418	1	1417	0	100	90	110	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank; J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Laboratory Control Spike - generic

Sample ID: **LCS-R9120** Batch ID: **R9120** Test Code: **E350.3** Units: **mg/L** Analysis Date **4/10/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **PH 2_010410A** SeqNo: **96521**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Ammonia (As N)	9.97	0.5	10	0	99.7	90	110	0			

Sample ID: **LCS-R9046** Batch ID: **R9046** Test Code: **M4500-NO2 B** Units: **mg/L** Analysis Date **4/4/01 4:10:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010404E** SeqNo: **95587**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Nitrite	0.1	0.01	0.1	0	100	90	110	0			

Sample ID: **LCS-R9175** Batch ID: **R9175** Test Code: **E365.3** Units: **mg/L** Analysis Date **4/11/01 4:10:00 PM** Prep Date:
Client ID: Run ID: **SPEC 1_010411D** SeqNo: **97063**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Phosphorus, Total (As P)	1.03	0.2	1	0	103	90	110	0			

Sample ID: **LCS-R9165** Batch ID: **R9165** Test Code: **E150.1** Units: **pH units** Analysis Date **4/3/01 12:00:00 PM** Prep Date:
Client ID: Run ID: **PH TUCSON_010403A** SeqNo: **96989**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
pH	7.04	0	7	0	101	98.57	101.43	0			

Sample ID: **LCS-R9131** Batch ID: **R9131** Test Code: **M2540 C** Units: **mg/L** Analysis Date **4/6/01 2:00:00 PM** Prep Date:
Client ID: Run ID: **BL002_010406A** SeqNo: **96664**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Total Dissolved Solids	992	10	1000	0	99.2	90	110	0			

Qualifiers: ND - Not Detected at the Reporting Limit; S - Spike Recovery outside accepted recovery limits; B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits; R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

CLIENT: URS Corp.
Work Order: 0104082
Project: Bowie Power Plant E1-47037002.00 05/54

QC SUMMARY REPORT

Laboratory Control Spike - generic

Sample ID: **LCS-R9053** Batch ID: **R9053** Test Code: **E351.4** Units: **mg/L** Analysis Date **4/5/01** Prep Date:

Client ID: Run ID: **PH 2_010405A** SeqNo: **95649**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrogen, Total Kjeldahl	9.32	0.5	10	0	93.2	85	115	0			

Qualifiers:
ND - Not Detected at the Reporting Limit
S - Spike Recovery outside accepted recovery limits
B - Analyte detected in the associated Method Blank
J - Analyte detected below quantitation limits
R - RPD outside accepted recovery limits

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Precision Analytical Laboratories, Inc.

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[ ] North Phoenix- 2020 West Lone Cactus Drive, Phoenix, AZ 85027 (623) 780-4800 FAX (623) 780-7695
[ ] Tucson- 4455 South Park Avenue, Ste.110, Tucson, AZ 85714 (520) 807-3801 FAX (520) 807-3803
www.palabs.com or call toll-free 1-866-7PALABS (1-866-772-5227)

LAB ID NUMBER: 2-104-033
Page 1 of 1

Client: URS Corporation
Address: 1790 E River Road E-300
City, State, Zip: Tucson AZ 85718
Contact: Andy Messer
Phone: 520-529-1141
Fax: 520-529-2449
Sampler: Bill Petersen
P.O. Number:

E-Mail Address: Andrew_Messer@urscorp.com
Fax Results: (Y) N
E-Mail Results: (Y) N

TAT Request
24 Hours 48 Hours
72 Hours 5 Day
Laboratory Approval Required for RUSH Analyses
Surcharges May Apply
Standard 10 Day

Sample Information

Lab #	Sample Type	Sample Identification	Date	Time	Qty	NO_2, NO_3, OPO_4, Alk, pH, EC, Cl, SO_4, F, TDS	Diss Metals (0.45 μm filtered)	Total Metals	Coliform Bacteria	Reactive Silica	TOC	TPH	NH_3, TKN
	gw	Well 28ccc	4/3/01	0720	12	X	X	X	X	X	X	X	X

Project Name: Bowie Power Plant
Project Number: E1-47020002.00 05154

Instructions/Special Requirements:
Field parameters: pH = 7.50, T = 25.8° C, EC = 382 umo/c

Date	Time	Relinquished By:	Company	Relinquished By:	Company
4/3/01	11:27	Bill Petersen	4-3	J. Fernandez	1130

TestAmerica
INCORPORATED

ANALYTICAL REPORT

PRECISION ANALYTICAL LAB 3058
LORENA LEAL
4455 S. PARK AVE. #110
TUCSON, AZ 85714

Project: 2-104-033
Project Name: URS CORP/BOWIE POWER
Sampler:

Lab Number: 01-A44537
Sample ID: WELL 28 CCC
Sample Type: Water
Site ID:

Date Collected: 4/ 3/01
Time Collected: 7:20
Date Received: 4/ 4/01
Time Received: 9:00

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
MISCELLANEOUS CHEMISTRY										
Total Organic Carbon	ND	mg/l	1.00	1.00	1	4/ 8/01	16:11	K. McLain	9060	7435

ND - Not detected at the report limit.
- Recovery outside Laboratory historical limits.

These results relate only to the items tested.
This report shall not be reproduced except in full and with permission of the laboratory.

Report Approved By: Report Date: 4/10/01

Paul E. Lane, Jr., Lab Director
Michael H. Dunn, M.S., Technical Director
Johnny A. Mitchell, Dir. Technical Serv.
Eric S. Smith, Assistant Technical Director

Gail A. Lage, Technical Serv.
Glenn L. Norton, Technical Serv.
Kelly S. Comstock, Technical Serv.
Pamela A. Langford, Technical Serv.

Laboratory Certification Number: AZ0473

End of Sample Report.

Precision Analytic: Laboratories, Inc

TO SUBCONTRACT LABORATORY:

ALL TEST LABORATORIES
2960 Foster Creighton Dr.
Nashville Tennessee 37204 Telephone# (800) 765-0980

Lab Number: 232406

Client	Precision Analytical Laboratories, Inc.
Address	4455 S. Park Ave. #110
City, State, Zip	Tucson AZ 85714
Contact	Lorena Leal
Phone	(520) 807-3801
Fax	(520) 807-3803

Project Name:	URS Corp/Bowie Power Plant
Project Number:	2-104-033
Sampler:	Client
P.O. Number:	

Page 1 of 1

Fax Results (Y) N
email Results Y N
email Address lleal@palabs.com

Sample Type Codes

DW - Drinking Water
S - Soil
WW - Waste Water
A - Air
HW - Hazardous Waste
Other

NOTES:

Turn Around Time Request

24 Hours
48 Hours
72 Hours
5 Day
Standard 10 Day

Sample Information / **ANALYSES REQUESTED**

#	Sample Identification	Date	Time	Type	TOC														# of sample containers
	Well 28 CCC	4/3/01	0720		X					4	4	5	3	7					

Instructions/Special Requirements:

Date	Time	Samples Relinquished By	Samples Received By
4/3		J. Fernandez	UPS
4/4	9:00	M. [illegible]	

WCAS
WEST COAST
ANALYTICAL
SERVICE, INC.
Analytical Chemists

April 16, 2001

Precision Analytical Laboratories
1725 West 17th Street
Tempe, AZ 85281

Attn: Jennifer Chavez

Job No: 52153 DL

LABORATORY REPORT

Samples Received: One (1) Sample
Date Received: 04/06/2001
Purchase Order No: 0-104-082

The sample was analyzed as follows:

Analysis	Page
Reactive Silica by SM 4500-Si ED4a	2

D.J. Northington, Ph.D. Quality Assurance Officer	Michael Shelton Senior Staff Chemist

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9840 Alburtis Avenue • Santa Fe Springs, CA 90670 • 562•948•2225 • FAX 562•948•5850 • wcaslab.com

Precision Analytical Laboratories
Attn: Jennifer Chavez

Job No: 52153
April 16, 2001

Reference: Standard Methods 4500-Si ED4a

Sample ID: Well 28 ccc

Analysis	Result	DL
Reactive Silica	41.0 mg/L	0.05

Quality Control Summary

Sample ID: Well 28 ccc

Analyte	Sample Result	Duplicate Result	RPD *
Reactive Silica	41.0 mg/L	39.4 mg/L	4

*Limit has not been established

Date Analyzed: 04-11-01

Precision Analytical Laboratories, Inc.

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[ ] North Phoenix- 2020 West Lone Cactus Drive, Phoenix, AZ 85027 (623) 780-4800 FAX (623) 780-7695
[ ] Tucson- 4455 South Park Avenue, Ste.110, Tucson, AZ 85714 (520) 807-3801 FAX (520) 807-3803
www.palabs.com or call toll-free 1-866-7PALABS (1-866-772-5227)

LAB ID NUMBER:

Page ____ of ____

Client: PAL
Address:
City, State, Zip:
Contact: T. Chavez
Phone:
Fax:
Sampler:
P.O. Number:

E-Mail Address:
Fax Results: Y N
E-Mail Results: Y N

TAT Request

24 Hours 48 Hours
72 Hours 5 Day
Laboratory Approval Required for RUSH Analyses
Surcharges May Apply
Standard 10 Day

Sample Information

Lab #	Sample Type	Sample Identification	Date	Time	Qty	Particle Silica													
	GW	Well 28 CCC	4/3/01	72		X						12-104-082							

Project Name:

Project Number: 12-104-082

Instructions/Special Requirements:

Date	Time	Relinquished By:	Company	Relinquished By:	Company
4/4/01	1700	[illegible]	PAL	Airborne	
04/06/01	1102A	Airborne		Received by: Chad Fealy WCAS	№ 52153

EXHIBIT B-4
AIR QUALITY

EXHIBIT B-4
AIR QUALITY

SUMMARY

Prior to commencing construction, the Bowie Power Station Project must obtain a construction and operating permit from the Arizona Department of Environmental Quality (ADEQ). To obtain the permit, it must be demonstrated that the project will meet all applicable air quality requirements and that best available control technology (BACT) will be used to minimize emissions. An air quality impact analysis must be conducted and the results of that analysis must show that the project will not cause or contribute to an exceedance of any National Ambient Air Quality Standard (NAAQS) or Prevention of Significant Deterioration (PSD) increment. Further, the analysis must show that the project will not have an adverse impact on air quality related values such as visibility, wildlife, or vegetation in specially protected areas (Class I areas).

PROJECT EMISSIONS

The permitting requirements applicable to the Bowie Power Station are determined based on projected emissions. Such emissions will result from the combustion turbines, cooling towers, auxiliary boiler, and emergency fire pumps. Initial estimates of annual emissions from these sources have been made and are shown in Table B-4-1. These estimates include emissions expected from startups and shutdowns of the turbines, as well as from normal turbine operation.

TABLE B-4-1
ESTIMATED ANNUAL EMISSIONS

Pollutant	Estimated Annual Emissions (tons per year)
Oxides of Nitrogen	600.1
Carbon Monoxide	1,135.4
Volatile Organic Compounds	147.1
Sulfur Dioxide	104.3
Fine Particulate Matter	353.2

PERMITTING REQUIREMENTS

The project will emit more than 100 tons per year of each of the criteria pollutants shown in Table B-4-1. This makes the project a major source. Because the project will be a major source it must meet the requirements for Class I permits. The project is planned for construction in Cochise County, which is designated "attainment" or "unclassified" for all criteria pollutants. Because the area is an attainment area and the project is a major source, to obtain a permit from ADEQ, the PSD requirements must also be met.

Prior to issuing the construction and operating permit, ADEQ will verify that both the Class I and the PSD requirements have been met for the project. The application for the permit is currently being prepared and will be filed with ADEQ. The application will include a regulatory review, top-down BACT analyses, and the required air quality impact analyses. ADEQ will process the permit application and prepare a draft permit. The draft permit will be available for review by the public, the U.S. Environmental Protection Agency (EPA), the Federal Land Managers (FLMs), and the State of New Mexico.

BEST AVAILABLE CONTROL TECHNOLOGY

To obtain the necessary construction and operating permit, the permit applicant must install BACT on the emitting units that will make up the project. As indicted above, top-down BACT analyses will be included in the air quality permit application for the project. The top-down analysis method that must be used is set forth in EPA guidance. This method requires that each analysis identify all technically feasible control technologies available for use on the project. Each available control technology is then evaluated, beginning with the most effective technology, based on environmental, energy, and economic impacts. ADEQ will review the analyses presented in the application and will identify BACT for each pollutant. The combustion turbines to be installed at Bowie Power Station will be equipped with selective catalytic reduction (SCR) technology to minimize oxides of nitrogen emissions. The use of pipeline quality natural gas and good combustion practices will be used to minimize carbon monoxide, volatile organic compounds, sulfur dioxide, and fine particulate matter emissions.

AIR QUALITY IMPACTS

An air quality impact analysis is required for major sources subject to PSD review. As indicated above, the analysis will be included in the permit application submitted for the project. To qualify for the permit, the results of the analysis must show that the project will not cause or contribute to an exceedance of any NAAQS or PSD increment. The analysis must also show no adverse impact on air quality related values in Class I areas.

Prior to conducting the air quality impact analysis, a protocol detailing how the analysis will be performed will be submitted to the ADEQ for review. Typically the analysis involves two distinct phases. The objective of the first phase is to perform initial dispersion modeling to assess whether the proposed project triggers the need for pre-construction ambient monitoring, and whether predicted impacts are expected to be "significant." Predicted impacts are considered significant, with respect to PSD, if they equal or exceed the significance levels defined in the PSD regulations. If no significant ambient impacts are predicted for a particular pollutant, no further analysis for that pollutant is required. If significant ambient impacts are predicted, then a full impact analysis must be completed for that pollutant. This requires conducting a NAAQS analysis for the pollutant, in which other emission sources in the area are modeled, and conducting a PSD increment analysis for the pollutant, which incorporates emissions from other increment-consuming sources in the area. Such an analysis will be conducted for the project.

In addition to addressing the NAAQS and PSD increments, the air quality impact analysis must address impacts to soils and vegetation and impacts to air quality related values in Class I areas. Class I areas in the vicinity of the project site include Saguaro National Park, Chiricahua National Monument, Galiuro Wilderness Area, and Gila Wilderness Area (in New Mexico). Of special interest to the FLMs with responsibility for these Class I areas are the proposed project's impacts on visibility. As part of the air permit application, an analysis will be conducted using an appropriate visibility modeling method. The FLMs will advise ADEQ if the project would adversely affect any Class I area. In processing the permit application, ADEQ must consider the opinion of the FLMs regarding visibility and other Class I area impacts.

EXHIBIT C
AREAS OF BIOLOGICAL WEALTH

EXHIBIT C
AREAS OF BIOLOGICAL WEALTH

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Describe any areas in the vicinity of the proposed site or route which are unique because of biological wealth or because they are habitats for rare and endangered species. Describe the biological wealth or species involved and state effects, if any, the proposed facilities will have thereon."

BIOLOGICAL WEALTH

Letters with a current project description were sent to Arizona Game and Fish Department (AGFD) and Arizona Department of Agriculture (ADA) to request information on special status species in the vicinity of the proposed power plant site and transmission line route (and alternate route) that make up the project area. Responses are provided in Exhibit C-1. The U.S. Fish and Wildlife Service (USFWS) web site was accessed for information on special status species that may occur in the project area, as reported in Table C-1.

Biologists traveling by vehicle and on foot assessed the project area to determine whether surveys for threatened, endangered, or otherwise sensitive species of plants and animals were warranted. Vegetation communities and geography were carefully noted to help determine the biologically preferred route for the transmission line.

Species of Concern

The USFWS lists 19 different species of plants and animals in Cochise and Graham counties as threatened or endangered species. Several other species have been designated as species of concern. Table C-1 lists the subset of this group of listed species and species of concern that are most likely to be found in habitats similar to those of the project area.

The lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) is federally listed as an endangered species. Lesser long-nosed bats roost in caves and mine shafts and forage on the flowers and fruits of columnar cacti and the flowers of paniculate agaves. The project area may provide some limited foraging habitat in the form of paniculate agaves; however, the numerous soaptree yuccas in the project vicinity do not provide foraging substrate for this species and there are no columnar cacti in the region. Consequently, it is unlikely that robust populations of this species are present at the project site or in the general vicinity. No potential roost sites were observed at the plant site or along the alternate transmission line routes.

The cave myotis (*Myotis velifer*), a USFWS species of concern, roosts near the entrances to caves and mine tunnels in desertscrub habitat. They may also roost under bridges, and the species has been collected at old Fort Bowie as well as a number of other localities in Cochise and Graham counties. Cave myotis forage on insects and generally live near permanent water sources. It is likely that this species forages over desertscrub habitats in the project area. There are no known roost sites associated either with the plant site or the alternate transmission line routes.

The northern aplomado falcon (*Falco femoralis septentrionalis*), a federally listed endangered species, formally occurred as a fairly common summer, or possibly permanent, resident of grasslands of southeast Arizona, including Cochise County (Phillips et al. 1960). There are no records of this species in the state since 1940 and Monson and Phillips (1981) consider the species to be extinct in Arizona. Nevertheless, if the species should reinvade the state from northern Mexico, it would be in habitats similar to those in the vicinity of the project area.

The lowland leopard frog (*Rana yavapaiensis*) uses permanent water in springs, creeks, rivers, and stock tanks. This species is classified as wildlife of special concern by AGFD and as species of concern by USFWS. It may be present in the vicinity of the project area, but no suitable habitat for this frog was noted during site reconnaissance of the plant site and transmission line alternatives.

The plains leopard frog (*Rana blairi*) is classified as wildlife of special concern by AGFD. This species uses permanent and intermittent water in desert grassland and could be present in or near the project area, but no suitable habitat for this frog was noted during site reconnaissance of the plant site and transmission line alternatives.

Impacts

Potential impacts resulting from construction of the project include loss of habitat, direct mortality from construction equipment, and disturbance resulting from noise and human activity associated with construction. Operational impacts include noise from the plant site and potential direct mortality of individual animals caused by vehicles coming and going from the plant or during maintenance of the transmission line and switchyard.

In the case of sensitive species potentially occurring in the immediate project area, few or no impacts are anticipated due to a general absence of suitable habitat for the species in question. Construction of the transmission line will result in limited impact to habitat that could potentially be occupied in the future by aplomado falcons. However, since the species is not currently present in Arizona, this project will have not direct effects.

There are few, if any, paniculate agaves along the transmission line alternatives and none on the plant site. Similarly, there are no columnar (i.e., saguaro [*Cereus giganteus]*) cacti in the project area or associated region. Consequently, the possibility for impact to resources of value to lesser long-nosed bats is remote. In addition, there will be no impact to any roosting or nursery areas for this species.

Some desertscrub habitat will likely be impacted (removed) during transmission line construction. Access roads, spur roads, pulling and tensioning sites, and equipment storage and laydown areas will all witness some impact to desertscrub habitats. As a result, some habitat that could support prey species (insects) for the cave myotis will be lost. It is doubtful, however, that the magnitude of loss of desertscrub habitat could be translated into measurable impact to cave myotis.

Neither of the two frog species that could be present in the vicinity of the project will be affected by construction of the project because no suitable habitat for either species was found in the project area.

TABLE C-1
SPECIAL STATUS SPECIES LIKELY TO OCCUR IN THE PROJECT AREA

Common Name	Scientific Name	Habitat	Federal Status	State Status
MAMMALS				
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	Desertscrub with caves or mines for roosts	**E**	**WC**
Cave myotis	*Myotis velifer*	Desertscrub with caves or mine tunnels and water nearby	**SC**	**WC**
BIRDS				
Northern aplomado falcon	*Falco femoralis septentrionalis*	Semidesert grassland with *Yucca elata*	**E**	-
AMPHIBIANS				
Lowland leopard frog	*Rana yavapaiensis*	Permanent water in creeks, springs, rivers and stock tanks	**SC**	**WC**
Plains leopard frog	*Rana blairi*	Permanent and intermittent water in desert grasslands		**WC**

Sources: AGFD 2001; Hoffmeister 1986; National Geographic Society 1999; USFWS 2001

Key to Table:

Federal Status: E = Endangered T=Threatened
SC= Species of Concern

State Status: WC = Wildlife of Special Concern in Arizona

LITERATURE CITED

Arizona Game and Fish Department, Heritage Data Management System. 2001. Special status species by county for Arizona. Arizona Game and Fish Department, Habitat Branch, Phoenix, Arizona, May 10, 2001.

Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press, Tucson, Arizona. 602 pp.

Monson, G. and A.R. Phillips. 1981. Annotated checklist of the birds of Arizona. Second Ed. University of Arizona Press, Tucson 240 pp.

National Geographic Society. 1999. Field Guide to Birds of North America. Third edition. National Geographic Society, Washington, D. C. 480 pp.

Phillips, A.R., J.T. Marshall and G. Monson. 1964. The Birds of Arizona. Univeristy of Arizona Press, Tucson. 212 pp.

U.S. Fish and Wildlife Service. 2001. Endangered species lists for Cochise and Graham Counties, Arizona. http://ifw2es.fws.gov/EndangeredSpecies/lists/ListSpecies.cfm.

EXHIBIT C-1
RESPONSE LETTERS

THE STATE OF ARIZONA
GAME AND FISH DEPARTMENT
2221 WEST GREENWAY ROAD, PHOENIX, AZ 85023-4399
(602) 942-3000 • WWW.AZGFD.COM

May 8, 2001

Ms. Lisa Spahr
EPG
1430 E. Ft. Lowell Blvd.
Suite 304
Tucson, AZ 85719

Re: Special Status Species Information for **Township 12 South, Range 28 East, Section 28, New Electric Generating Power Plant near Bowie, AZ.**

Dear Ms. Spahr:

The Arizona Game and Fish Department (Department) has reviewed your letter, dated April 18, 2001, regarding special status species information associated with the above-referenced project areas. The Department's Heritage Data Management System (HDMS) has been accessed and current records do not indicate the presence of any special status species in the project vicinity. In addition this project does not occur in the vicinity of any Designated or Proposed Critical Habitats.

The Department's HDMS data are not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity.

Making available this information does not substitute for the Department's review of project proposals, and should not decrease our opportunities to review and evaluate new project proposals and sites. The Department is also concerned about other resource values, such as other wildlife, including game species, and wildlife-related recreation. The Department would appreciate the opportunity to provide an evaluation of impacts to wildlife or wildlife habitats associated with project activities occurring in the subject area, when specific details become available.

If you have any questions regarding this letter, please contact me at (602) 789-3618. General status information and county distribution lists for special status species are also available on our web site at http://www.azgfd.com/frames/fishwild/hdms_site/Home.htm.

Sincerely,

Sabra S. Schwartz

Sabra S. Schwartz
Heritage Data Management System, Coordinator

SSS:ss

cc: Bob Broscheid, Project Evaluation Program Supervisor
Joan Scott, Habitat Program Manager, Region V

AGFD# 04-27-01 (07)

JANE DEE HULL
Governor

SHELDON R. JONES
Director

Arizona Department of Agriculture

1688 W. Adams Street, Phoenix, Arizona 85007
(602) 542-4373 FAX (602) 542-5420

April 24, 2001

Lisa Spahr, Environmental Scientist
Environmental Planning Group
1430 East Fort Lowell Road, Suite 304
Tucson, Arizona 85719

Re: Bowie Power Station Project

Dear Ms. Spahr:

Arizona State Law requires that the Arizona Department of Agriculture be notified in writing, with confirmation, prior to the anticipated destruction of any protected native plants during land clearing activity. On privately owned land the notification period ranges from 20 days to 60 days. The notification period on state lands is 60 days. I recommend the leaving in place, and protection of, as much of the native vegetation as is possible. The preferred alternative route would be the one having the least negative impact on protected plants and native vegetation.

The protection and salvage of protected native plants is encouraged to the greatest extent feasible. You may want to consider having the project site surveyed for protected native plants.

Plant transportation permitting and tagging are required prior to the removal of protected native plants from a property. Transportation permitting is not required when the plants are being relocated on the same property.

Native plant permit application and notification forms, and *Appendix A*, the listings of protected native plants by category; as well as, general information on the Arizona Native Plant Law, Seed Law and Noxious Weed Regulations can be obtained at: http://agriculture.state.az.us

You can correspond with me at the address listed below. You may also contact me by telephone at: 520-628-6310, by FAX at 520-628-6961, or by email at: bill.kendall@agric.state.az.us

Sincerely Yours,

Bo

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EXHIBIT D
BIOLOGICAL RESOURCES

EXHIBIT D
BIOLOGICAL RESOURCES

As stated in Arizona Corporation Commission Rules of Practice and Procedure R14-3-219:

"List the fish, wildlife, plant life, and associated forms of life in the vicinity of the proposed site or route and describe the effects, if any, other proposed facilities will have thereon."

BIOLOGICAL RESOURCES

A biological field crew surveyed the proposed 345kV transmission line route, switchyard site, and power plant site (project site) to assess plant communities and associated fauna affected by the project. Plants and animals were identified and noted along with major geographic features. Lists of potentially occurring species of animals were assembled from standard references for the state.

Most of the power plant site is located on active agricultural land, either currently under cultivation or in a fallow rotation. This land has been carefully leveled for irrigated farming and there are no areas with native vegetation except for some weedy species around the borders of the agricultural fields. There are some areas to the west and north of the plant site that may have been cleared at one time. Plant species occupying these areas include scattered honey mesquite (*Prosopis glandulosa*), desert broom (*Baccharis sarothroides*), saltbush (*Atriplex sp.*), burroweed (*Isocoma tenuisecta*), snakeweed (*Gutierrezia sarothrae*), and tumbleweed (*Salsola iberica*).

The proposed transmission line route crosses areas that include agricultural lands and native vegetation of the Chihuahuan semidesert grassland and Chihuahuan desertscrub biomes (Brown 1994). The majority of the Chihuahuan desertscrub in the project area is dominated by creosote bush (*Larrea tridentata*) and honey mesquite. Velvet mesquite (*Prosopis velutina*) is also present, particularly along major drainages. Other plants include desert zinnia (*Zinnia acerosa*) and mariola (*Parthenium incanum*). Semidesert grassland plants include soaptree yucca (*Yucca elata*) and tobosa grass (*Hilaria mutica*). Like many sites in southern Arizona, this biome has also been invaded by burroweed. Prickly pear and cholla cacti (*Opuntia* spp.) are found in both biomes.

Portions of the proposed transmission line route (and alternate route) are crossed by washes supporting xeroriparian vegetation dominated by larger shrubs and trees. Plant species in these areas include some rather large velvet and honey mesquite, wolfberry (*Lycium* sp.), catclaw (*Acacia greggii*), desert broom datura (*Datura meteloides*), desert willow (*Chilopsis linearis*), and in one area adjacent to an agricultural field, Fremont cottonwood (*Populus fremontii*).

Both the proposed transmission line route and alternate route would parallel the railroad right-of-way as it heads north from the Bowie Power Station site. Approximately 3.8 miles north of the power station site, the routes split into two possibilities for tie-in with the existing 345kV transmission lines to the north. The alternative parallels the railroad right-of-way and is the shorter of the two. However, it crosses numerous small and medium-sized washes with concentrations of native vegetation. The proposed route is approximately 1 mile longer and travels to the northwest from the point of diversion from the railroad right-of-way. This route parallels the dominant drainages in the area, rather than crossing them, and ties into the existing 345kV transmission line within 1 mile of U.S. Highway 191.

For species of mammals, birds, and reptiles and amphibians that may occur in the region where the project area is located, refer to Tables D-1, D-2, and D-3 respectively.

Impacts

Impacts associated with the proposed power plant, 345kV transmission line, and 345kV/230kV switchyard will result from construction at the plant site and construction of access and spur roads along the transmission line. There will also be disturbance at transmission tower and switchyard sites, pulling and tensioning stations, and in material lay-down and storage areas.

Potential effects of the proposed project on wildlife and plants include vegetation clearing and associated habitat loss, as well as disturbance, injury, or mortality of wildlife due to construction activities. Regional species dependent on aquatic or wetland habitats will not be affected by the project since no aquatic or wetland habitats are present on the plant site or along the transmission line alternatives. Similarly, species dependent on cliffs, woodlands, and broadleaf riparian habitats will not be affected due to absence of such habitats within the project area.

In areas where native vegetation is cleared there will be a permanent loss of potential habitat for small mammals, reptiles, and birds. Construction activities may result in temporary disturbance of wildlife due to the presence of construction equipment and human activity. Vehicles and heavy equipment could displace or cause mortality in some fossorial species. The crossing of washes and other drainages would necessitate the removal of concentrations of vegetation found in these areas and could negatively impact populations of animals dependent on them. There is also greater potential for impacts to soil integrity in these areas.

The proposed transmission line route would result in lower impacts to biological resources because it parallels rather than crosses most major drainages. The exceptions are crossings at Dial Wash and Gold Gulch north of the point at which the proposed route leaves the railroad right-of-way. These fairly major washes can be effectively spanned to avoid adverse biological impacts.

TABLE D-1 MAMMAL SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Desert shrew	*Notiosorex crawfordi*	Any area with ample ground cover including plant debris, trash and lumber
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	Areas with agave and columnar cacti for foraging and mine tunnels or deep caves for roosts
Cave myotis	*Myotis velifer*	Desertscrub with caves, mines, or bridges and water nearby
California myotis	*Myotis californicus*	Desertscrub with rock faces containing crevices, occasionally caves and mines
Western pipistrelle	*Pipistrellus hesperus*	Areas with canyon walls or cliff faces for roosting, streambeds and tanks for foraging
Big brown bat	*Eptesicus fuscus*	Wooded areas, desertscrub
Spotted bat	*Euderma maculatum*	Rocky cliffs near riparian areas
Townsend's big-eared bat	*Corynorhinus townsendii*	Areas with caves or mines, structures for night roosts
Pallid bat	*Antrozous pallidus*	Desertscrub with caves, mine, cliffs, bridges or other structures for roosts
Brazilian free-tailed bat	*Tadarida brasiliensis*	Desertscrub and foothills with mines, caves, bridges or old buildings
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	Rocky cliffs and slopes, structures
Western mastiff bat	*Eumops perotis*	Rocky cliffs with crevices or shallow caves
Desert cottontail	*Sylvilagus audubonii*	Desertscrub, semi-desert grassland
Black-tailed jack rabbit	*Lepus californicus*	Desertscrub and other areas with open ground cover
Antelope jack rabbit	*Lepus alleni*	Creosote bush, mesquite, grasslands
Harris' antelope squirrel	*Ammospermophilus harrisii*	Rocky areas of creosote bush/saltbush/bursage
Rock squirrel	*Spermophilus variegatus*	Rocky areas above 1,600 feet
Round-tailed ground squirrel	*Spermophilus tereticaudus*	Creosote bush/saltbush desert with sandy or gravelly soil
Botta's pocket gopher	*Thomomys bottae*	Any area with soil suitable for digging burrows
Silky pocket mouse	*Perognathus flavus*	Mesquite, grassland
Long-tailed pocket mouse	*Perognathus formosus*	Rocky soils, often on slopes
Rock pocket mouse	*Chaetodipus intermedius*	Rocky areas of desertscrub
Desert pocket mouse	*Chaetodipus penicillatus*	Sandy areas of desertscrub with sparse vegetation
Bailey's pocket mouse	*Chaetodipus baileyi*	Flats and lower slope areas of desertscrub
Merriam's kangaroo rat	*Dipodomys merriami*	Sandy areas of desertscrub

TABLE D-1 MAMMAL SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Ord's kangaroo rat	*Dipodomys ordii*	Areas with grass, mesquite and/or cactus
Banner-tailed kangaroo rat	*Dipodomys spectabilis*	Sparse grassy areas with mesquite, catclaw, or cactus
Plains harvest mouse	*Reithrodontomys montanus*	Desertscrub with mesquite, creosote bush, and/or grass
Western harvest mouse	*Reithrodontomys megalotis*	Desertscrub or chaparral
Cactus mouse	*Peromyscus eremicus*	Desertscrub, rocky areas, chaparral
Deer mouse	*Peromyscus maniculatus*	Creek beds, desertscrub, agricultural areas
Northern pygmy mouse	*Baiomys tailori*	Desert grasslands
Northern grasshopper mouse	*Onychomys leucogaster*	Desert grasslands
Southern grasshopper mouse	*Onychomys torridus*	Desertscrub or semi-desert grassland with compact soil
Hispid cotton rat	*Sigmodon hispidus*	Desertscrub
Arizona cotton rat	*Sigmodon arizonae*	Mesquite scrub and weedy areas along canals and washes
White-throated wood rat	*Neotoma albigula*	Desertscrub, especially with *Opuntia*
Desert wood rat	*Neotoma lepida*	Desertscrub
Muskrat	*Ondatra zibethicus*	Irrigation canals, ponds
House mouse	*Mus musculus*	Weedy areas and cultivated fields, usually near human habitation
Coyote	*Canis latrans*	Cosmopolitan, from spruce forest to low desert
Kit fox	*Vulpes velox*	Desertscrub and desert grassland with sandy or softer clay soils
Gray fox	*Urocyon cinereoargenteus*	Open desertscrub, chaparral, lower elevation woodland
Raccoon	*Procyon lotor*	Areas with permanent water
Coati	*Nasua narica*	Medium elevation woodland and shrubby grassland, may migrate or wander through desert areas
Badger	*Taxidea taxus*	Flats and drainages adjacent to mountains, grasslands
Western spotted skunk	*Spilogale gracilis*	Low and middle elevations, often in rocky areas or around human habitation
Striped skunk	*Mephitis mephitis*	From spruce/fir belt to sea level, usually near permanent water
Bobcat	*Felis rufus*	Rocky upland areas interspersed w/ open desert, grassland or woodland
Collared peccary	*Tayassu tajacu*	Desertscrub, esp. thickets along creeks and streambeds
Mule deer	*Odocoileus hemionus*	Pine forest, oak woodland, chaparral, upland desert
Source: Hoffmeister 1986; Jones et al 1992		

TABLE D-2 BIRD SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Pied-billed grebe	*Podilymbus podiceps*	Lakes, ponds, streams, and canals
Eared grebe	*Podiceps nigricollis*	Lakes and ponds
Western grebe	*Aechmophorus occidentalis*	Lakes, ponds, and lagoons
Double-crested cormorant	*Phalacrocorax auritus*	Lakes, ponds, streams, and aqueducts
Great blue heron	*Ardea herodias*	Lakes, ponds, streams, canals, and marshes
Great egret	*Ardea alba*	Ponds, streams, and marshes
Snowy egret	*Egretta thula*	Ponds, streams, and marshes
Green heron	*Butorides virescens*	Lakes, ponds, streams, marshes, and canals
Black-crowned night heron	*Nycticorax nycticorax*	Lakes, ponds, marshes, and streams
White-faced ibis	*Plegadis chihi*	Lakes, ponds, streams, marshes, and fields
Turkey vulture	*Cathartes aura*	Open country, woodlands, farms
Canada goose	*Branta canadensis*	Lakes, ponds, and fields
Gadwall	*Anas strepera*	Lakes, ponds, and streams
American widgeon	*Anas americana*	Lakes, ponds, and streams
Mallard	*Anas platyrhynchos*	Lakes, ponds, streams, and canals
Blue-winged teal	*Anas discors*	Ponds
Cinnamon teal	*Anas cyanoptera*	Ponds, streams, and canals
Northern shoveler	*Anas clypeata*	Lakes, ponds, and streams
Northern pintail	*Anas acuta*	Lakes, ponds, and streams
Green-winged teal	*Anas crecca*	Lakes, ponds, and streams
Redhead	*Aythya americana*	Lakes and ponds
Ring-necked duck	*Aythya collaris*	Lakes and ponds
Lesser scaup	*Aythya affinis*	Lakes and ponds
Bufflehead	*Bucephala albeola*	Lakes, ponds, and streams
Ruddy duck	*Oxyura jamaicensis*	Lakes and ponds
Northern harrier	*Circus cyaneus*	Wetlands, open fields
Sharp-shinned hawk	*Accipiter striatus*	Generally distributed
Cooper's hawk	*Accipiter cooperii*	Broken woodlands or streamside groves
Harris's hawk	*Parabuteo unicinctus*	Semiarid woodland, brushland
Swainson's hawk	*Buteo swainsoni*	Fields and desert
Red-tailed hawk	*Buteo jamaicensis*	Plains, prairie groves, desert
Ferruginous hawk	*Buteo regalis*	Dry, open country
American kestrel	*Falco sparverius*	Open country, cities
Prairie falcon	*Falco mexicanus*	Dry, open country, prairies
Gambel's quail	*Callipepla gambelii*	Desertscrub and thickets
Scaled quail	*Callipepla squamata*	Desertscrub, mixed grasslands
Common moorhen	*Gallinula chloropus*	Streams, marshes, and ponds
American coot	*Fulica americana*	Lakes, ponds, streams, and marshes
Killdeer	*Charadrius vociferus*	Ponds, streams, and fields
Greater yellowlegs	*Tringa melanoleuca*	Lakes, ponds, streams, and flooded fields
Spotted sandpiper	*Actitis macularia*	Lakes, ponds, streams, and canals
Western sandpiper	*Calidris mauri*	Ponds and streams

TABLE D-2
BIRD SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT

Common Name	Scientific Name	Habitat
Least sandpiper	*Calidris minutilla*	Ponds and streams
Long-billed dowitcher	*Limnodromus scolopaceus*	Ponds and streams
Common snipe	*Gallinago gallinago*	Ponds, marshes, streams, and wet fields
Wilson's phalarope	*Phalaropus tricolor*	Lakes, ponds
Ring-billed gull	*Larus delawarensis*	Lakes, ponds, and streams
Rock dove	*Columba livia*	Parks, fields, urban settings
White-winged dove	*Zenaida asiatica*	Dense mesquite, mature groves, riparian woodlands
Mourning dove	*Zenaida macroura*	Wide variety of habitats
Inca dove	*Columbina inca*	Near human habitations
Common ground dove	*Columbina passerina*	Fields and hedgerows
Greater roadrunner	*Geococcyx californianus*	Scrub desert and mesquite groves
Barn owl	*Tyto alba*	Dark cavities in city and farm buildings, cliffs, trees
Western screech owl	*Otus kennicottii*	Open woodlands, streamside groves, deserts, suburban areas
Great horned owl	*Bubo virginianus*	Common in wide variety of habitats
Elf owl	*Micrathene whitneyi*	Desert lowlands, canyons, foothills
Burrowing owl	*Athene cunicularia*	Open country, golf courses, airports
Common nighthawk	*Chordeiles minor*	Woodlands, towns
Lesser nighthawk	*Chordeiles acutipennis*	Dry, open country, scrubland, desert
Common poorwill	*Phalaenoptilus nuttallii*	Sagebrush and chaparral slopes
White-throated swift	*Aeronautes saxatalis*	Mountains, canyons, and cliffs
Black-chinned hummingbird	*Archilochus alexandri*	Lowlands and low mountains
Anna's hummingbird	*Calypte anna*	Coastal lowlands, mountains, deserts
Costa's hummingbird	*Calypte costae*	Desert washes, dry chaparral
Rufous hummingbird	*Selasphorus rufus*	Suburban and riparian areas
Belted kingfisher	*Ceryle alcyon*	Streams, ponds and lakes
Gila woodpecker	*Melanerpes uropygialis*	Towns, scrub desert, cactus country, streamside woods
Ladder-backed woodpecker	*Picoides scalaris*	Dry brushlands, mesquite and cactus country, towns and rural areas
Northern flicker	*Colaptes auratus*	Open woodlands, suburban areas
Gilded flicker	*Colaptes chrysoides*	Low desert woodlands
Western wood-pewee	*Contopus sordidulus*	Riparian areas, wooded habitats, including suburban areas
Black phoebe	*Sayornis nigricans*	Woodlands, parks, suburbs, prefers to nest near water
Say's phoebe	*Sayornis saya*	Dry, open areas, canyons, cliffs
Vermilion flycatcher	*Pyrocephalus rubinus*	Streamside shrubs, bottomlands, near small wooded ponds
Ash-throated flycatcher	*Myiarchus cinerascens*	Wide variety of habitats
Brown-crested flycatcher	*Myiarchus tyrannulus*	Saguaro desert, river groves, lower mountain woodlands

TABLE D-2 BIRD SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Cassin's kingbird	*Tyrannus vociferans*	Varied habitats
Western kingbird	*Tyrannus verticalis*	Dry, open country
Loggerhead shrike	*Lanius ludovicianus*	Hunt in open or brushy areas
Bell's vireo	*Vireo bellii*	Riparian areas, especially in mesquite trees
Plumbeous vireo	*Vireo plumbeus*	Woodland habitats
Warbling vireo	*Vireo gilvus*	Deciduous woods
Chihuahuan raven	*Corvus cryptoleucus*	Deserts, scrubby grasslands
Common raven	*Corvus corax*	Mountains, deserts, coastal areas
Horned lark	*Eremophila alpestris*	Dirt fields, gravel ridges, shores
Tree swallow	*Tachycineta bicolor*	Streams, ponds, and lakes
Violet-green swallow	*Tachycineata thalassina*	Riparian areas, streams, ponds, and lakes
Northern rough-winged swallow	*Stelgidopteryx serripennis*	Banks of streams and canals, streams, ponds, and lakes
Cliff swallow	*Petrochelidon pyrrhonota*	Lakeside, cliffs, and canals; nesting under nearby bridges, buildings, and other overhangs; streams and ponds
Barn swallow	*Hirundo rustica*	Streams, ponds, lakes, and agricultural areas
Verdin	*Auriparus flaviceps*	Southwestern desert
Cactus wren	*Campylorhynchus brunneicapillus*	Cholla cactus habitat
Rock wren	*Salpinctes obsoletus*	Arid and semiarid habitats
Canyon wren	*Catherpes mexicanus*	Canyons and cliffs, often near water
Bewick's wren	*Thryomanes bewickii*	Wooded riparian areas
House wren	*Troglodytes aedon*	Dense, brushy areas
Ruby-crowned kinglet	*Regulus calendula*	Woodlands, thickets
Black-tailed gnatcatcher	*Polioptila melanura*	Desert, especially washes
Western bluebird	*Sialia mexicana*	Woodlands, farmlands, orchards, deserts, especially in mesquite-mistletoe groves
American robin	*Turdus migratorius*	Riparian and suburban areas, desertscrub
Northern mockingbird	*Mimus polyglottos*	Variety of habitats
Bendire's thrasher	*Toxostoma bendirei*	Open farmlands, grasslands, brushy desert
Curve-billed thrasher	*Toxostoma curvirostre*	Cholla deserts and suburban areas
Crissal thrasher	*Toxostoma crissale*	Riparian areas and washes
European starling	*Sturnus vulgaris*	Generally distributed
Cedar waxwing	*Bombycilla cedrorum*	Riparian and suburban areas
American pipit	*Anthus rubescens*	Fields, ponds, pastures, riparian areas
Phainopepla	*Phainopepla nitens*	Riparian & desertscrub areas, especially in trees with mistletoe
Loggerhead shrike	*Lanius ludovicianus*	Generally distributed
Lucy's warbler	*Vermivora luciae*	Mesquites and cottonwoods along watercourses
Yellow warbler	*Dendroica petechia*	Wet habitats, open woodlands, gardens, orchards
Yellow-rumped warbler	*Dendroica coronata*	Riparian and suburban areas
Townsend's warbler	*Dendroica townsendi*	Riparian and suburban areas during migration
Common yellowthroat	*Geothlypis trichas*	Marshes and suburban areas
Yellow-breasted chat	*Icteria virens*	Dense thickets and brush

TABLE D-2 BIRD SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Summer tanager	*Piranga rubra*	Riparian areas
Western tanager	*Piranga ludoviciana*	Transient in lowlands
Green-tailed towhee	*Pipilo chlorurus*	Brushy areas, riparian, and suburban areas
Spotted towhee	*Pipilo maculates*	Brushy areas, riparian and suburban areas
Canyon towhee	*Pipilo fuscus*	Desertscrub
Grasshopper sparrow	*Ammodramus savannarum*	Pastures, scrubby fields in winter
Chipping sparrow	*Spizella pallida*	Brushy edges and riparian areas
Brewer's sparrow	*Spizella breweri*	Deserts, field edges, and suburban areas
Black-chinned sparrow	*Spizella atrogularis*	Rocky hillsides in Desertscrub
Vesper sparrow	*Pooecetes gramineus*	Open weedy fields, roadsides, and grassy areas
Lark sparrow	*Chondestes grammacus*	Brushy, weedy areas, riparian areas, and field edges
Black-throated sparrow	*Amphispiza bilineata*	Desertscrub
Sage sparrow	*Amphispiza belli*	Saltbush desert
Lark bunting	*Calamospiza melanocorys*	Brushy desert and field edges
Savannah sparrow	*Passerculus sandwichensis*	Open fields, roadsides, and grassy areas
Song sparrow	*Melospiza melodia*	Riparian areas, marshes, and vegetated lakesides
Lincoln's sparrow	*Melospiza lincolnii*	Riparian areas, marshes, brushy fields, and hedgerows
White-crowned sparrow	*Zonotrichia leucophrys*	Suburban, riparian, and other brushy areas
Cassin's sparrow	*Aimophila cassinii*	Grassland with scattered shrubs, cactus, mesquite
Dark-eyed junco	*Junco hyemalis*	Desertscrub
Northern cardinal	*Cardinalis cardinalis*	Woodland edges, swamps, streamside thickets, suburban gardens
Pyrrhuloxia	*Cardinalis sinuatus*	Thorny brush, mesquite thickets, desert, woodland edges, ranchlands
Black-headed grosbeak	*Pheucticus melanocephalus*	Transient in lowlands
Blue grosbeak	*Guiraca caerulea*	Riparian areas
Red-winged blackbird	*Agelaius phoeniceus*	Riparian areas, irrigated fields, marshes, and feedlots
Western meadowlark	*Sturnella neglecta*	Fields and other open areas, deserts
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	Marshes, fields, feedlots
Brewer's blackbird	*Euphagus cyanocephalus*	Fields, farmyards, feedlots, ponds, and riparian areas
Great-tailed grackle	*Quiscalus mexicanus*	Riparian areas, marshes, ponds, farmyards, and suburban areas
Bronzed cowbird	*Molothrus aeneus*	Riparian and suburban areas
Brown-headed cowbird	*Molothrus ater*	Suburbs and agricultural areas
Scott's oriole	*Icterus parisorum*	Arid slopes
Hooded oriole	*Icterus cucullatus*	Riparian and suburban areas
Bullock's oriole	*Icterus bullockii*	Riparian areas
House finch	*Carpodacus mexicanus*	Riparian and suburban areas, farmland, desert
American goldfinch	*Carduelis tristis*	

TABLE D-2 BIRD SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Lesser goldfinch	*Carduelis psaltria*	Riparian areas
House sparrow	*Passer domesticus*	Associated with human presence
Sources: AOU 1998; National Geographic Society 1999		

TABLE D-3 REPTILE AND AMPHIBIAN SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Colorado River toad	*Bufo alvarius*	Ranges from arid mesquite-creosote bush lowlands and arid grasslands into the oak-sycamore-walnut groves in mountain canyons, often found near permanent water of springs, reservoirs, canals, and streams, but also frequents temporary pools
Great plains toad	*Bufo cognatus*	Inhabits prairies or deserts, often breeding after heavy rains in summer in shallow temporary pools or quiet water of streams, marshes, irrigation ditches, and flooded fields, frequents creosote bush desert, mesquite woodland, and sagebrush plains
Red-spotted toad	*Bufo punctatus*	Desert streams and oases, open grassland and scrubland, oak woodland, rocky canyons and arroyos, in crevices among rocks for shelter, breeds in rain pools, reservoirs, and temporary pools of intermittent streams
Southwestern woodhouse toad	*Bufo woodhousei australis*	Grassland, sagebrush flats, woods, desert streams, valleys, floodplains, farms, and city backyards, in sandy areas, breed in quiet water of streams, marshes, lakes, freshwater pools, and irrigation ditches
Canyon treefrog	*Hyla arenicolor*	Huddles in niches on sides of boulders or stream banks, favors intermittent or permanent streams with quiet pools that have a hard rocky bottom, frequents arroyos in semi-arid grassland, streams in piñon-juniper and pine-oak woodlands, and tropical scrub forest
Couch spadefoot	*Scaphiopus couchii*	Frequents shortgrass plains, mesquite savannah, creosote bush desert, thornforest, tropical deciduous forest, and other areas of low rainfall
Southern spadefoot	*Spea multiplicata*	Frequents desert grassland, shortgrass plains, creosote bush and sagebrush desert, mixed grassland and chaparral, piñon-juniper and pine-oak woodlands, and open pine forests, soil is often sandy or gravelly
Plains spadefoot	*Spea bombifrons*	Semidesert grassland with loose sandy or gravelly soil
Bullfrog	*Rana catesbeiana*	Highly aquatic, remaining in or near permanent water, frequents prairie, woodland, chaparral, forests, desert oases, and farmland, enters marshes, ponds, lakes, reservoirs, and streams – usually quiet water with thick growth of cattails or other aquatic vegetation. Introduced
Plains leopard frog	*Rana blairi*	Desert grassland, woodland, and farmlands with intermittent water
Lowland leopard frog	*Rana yavapaiensis*	Frequents desert, grassland, oak and oak-pine woodland, in permanent pools of foothill streams, overflow ponds and side channels of major rivers, permanent springs, and in drier areas – more or less permanent stock tanks
Sonoran mud turtle	*Kinosternon sonoriense*	Stream-dwelling turtle that frequents springs, creeks, ponds, and the water holes of intermittent streams, in foothill grasslands and desert

TABLE D-3 REPTILE AND AMPHIBIAN SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Western box turtle	*Terrapene ornata*	Completely terrestrial desert species requiring firm but not hard ground for construction of burrows, frequent desert oases, riverbanks, washes, and rocky slopes
Collared lizard	*Crotaphytus collaris*	Rock-dwelling lizard that frequents canyons, rocky gullies, limestone ledges, mountain slopes, and boulder-strewn alluvial fans, usually where vegetation is sparse
Long-nosed leopard lizard	*Gambelia wislizenii wislizenii*	Arid and semiarid plains grown to bunch grass, alkali bush, sagebrush, creosote bush, or other scattered low plants, ground may be hardpan, gravel, or sand
Western banded gecko	*Coleonyx variegatus*	Variety of habitats, often associated with rocks
Gila monster	*Heloderma suspectum*	Canyon bottoms and washes in desert or desert grassland
Zebra-tailed lizard	*Callisaurus draconoides*	Frequents washes, desert pavements of small rocks, and hardpan
Lesser earless lizard	*Holbrookia maculata*	Plains and mesquite with open sandy areas
Greater earless lizard	*Cophosaurus texanus*	Sandy gravelly soil, streambeds, occasionally rocky areas
Round-tailed horned lizard	*Phrynosoma modestum*	Frequents rocky and gravelly habitats of the arid and semiarid plains, hills, and lower slopes of mountains, often with cactus, mesquite, and creosote bush
Desert spiny lizard	*Sceloporus magister*	Arid and semiarid regions on plains and lower slopes of mountains, found in creosote bush and shad-scale deserts, mesquite-yucca grassland, juniper and mesquite woodland, subtropical thornscrub, and along rivers grown to willows and cottonwoods
Plateau lizard	*Sceloporus undulatus*	Scrub, farmlands, areas with discarded lumber and other debris
Tree lizard	*Urosaurus ornatus*	Frequents mesquite, oak, pine, juniper, alder, cottonwood, and non-native trees such as tamarisk and rough-bark eucalyptus, but also may occur in treeless areas, especially attracted to river courses
Side-blotched lizard	*Uta stansburiana*	Arid or semiarid regions with sand, rock, hardpan, or loam with grass, shrubs, and scattered trees, often found along sandy washes
Great Plains skink	*Eumeces obsoletus*	Open grassland habitat with shrubs, generally near intermittent or permanent water sources
Western whiptail	*Cnemidophorus tigris*	Inhabits deserts and semiarid habitats, usually where plants are sparse, also found in woodland, streamside growth, and in the warmer, drier parts of forests
Desert grassland whiptail	*Cnemidophorus uniparens*	Desert and mesquite grassland
Gila spotted whiptail	*Cnemidophorus flagellicaudus*	Upper elevation grasslands
Banded sand snake	*Chilomeniscus cinctus*	Loose soils in low desert or upland

TABLE D-3 REPTILE AND AMPHIBIAN SPECIES THAT MAY OCCUR IN THE VICINITY OF THE PROPOSED PROJECT		
Common Name	**Scientific Name**	**Habitat**
Western glossy snake	*Arizona occidentalis*	Below 6,000 feet in sparsely vegetated woodland, chaparral, grassland or desertscrub with loose soil
Western shovel-nosed snake	*Chionactis occipitalis*	Sparsely vegetated desert areas with pockets of loose soil
Ring-necked snake	*Diadophus punctatus*	Debris along watercourses
Night snake	*Hypsiglena torquata*	Various upland and desert habitats used
Common king snake	*Lampropeltis getulus*	Deserts, marshlands, chaparral
Sonoran whipsnake	*Masticophis bilineatus*	Grassland and desertscrub
Gopher snake	*Pituophis catenifer*	Various habitats from mountain to low desert and coastal
Long-nosed snake	*Rhinocheilus lecontei*	Desertscrub, prairie, tropical woodland to 5,500 feet
Western patch-nosed snake	*Salvadora hexalepis*	Piñon–juniper woodland to low deserts on variety of soil types
Ground snake	*Sonora semiannulata*	Wide range of habitats in loose soil with some subsurface moisture
Southwestern black-headed snake	*Tantilla hobartsmithi*	In loose soil or plant litter in desert grassland and wood land habitats
Black-necked garter snake	*Thamnophis cyrtopsis*	Pine-fir forest to upland desert and chaparral, generally in the vicinity of a water source
Checkered garter snake	*Thamnophis marcianus*	Low elevation rivers, streams, ponds, and canals, and adjacent areas.
Lyre snake	*Trimorphodon biscutatus*	From oak and juniper woodland to higher elevation desert and grasslands, particularly in rocky areas.
Western coral snake	*Micruroides euryxanthus*	Wide range of arid habitats including grassland, woodland, scrub and agricultural lands, particularly upland desert in washes and river bottoms
Western blind snake	*Leptotyphlops humilis*	Desertscrub and brush covered hillsides with lose soils
Texas blind snake	*Leptotyphlops dulcis*	Sandy or rocky desert areas with shrubs
Western diamondback rattlesnake	*Crotalus atrox*	Wide range of habitats below 7,000 feet
Mojave rattlesnake	*Crotalus scutulatus*	Mostly in upland desert and lower mountain slopes
Source: Prival 1999; Stebbins 1985		

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EXHIBIT E
SCENIC AREAS AND VISUAL RESOURCES, HISTORIC SITES AND STRUCTURES AND ARCHAEOLOGICAL SITES

EXHIBIT E
SCENIC AREAS AND VISUAL RESOURCES, HISTORIC SITES AND STRUCTURES AND ARCHAEOLOGICAL SITES

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Describe any existing scenic areas, historic sites and structures or archaeological sites in the vicinity of the proposed facilities and state the effects, if any, the proposed facilities will have thereon."

The following items are included as exhibits:

Exhibit E-1: Scenic Areas and Visual Resources
Exhibit E-2: Historic Sites and Structures and Archaeological Sites

EXHIBIT E-1
SCENIC AREAS AND VISUAL RESOURCES

EXHIBIT E-1
SCENIC AREAS AND VISUAL RESOURCES

The visual resource study considers the existing and planned conditions of the Bowie Power Station site (approximately 700 acres) and proposed transmission line route (approximately 14.3 miles). It identifies aesthetic impacts to the landscape's visual character, scenic quality, and sensitive viewers based on the introduction of the proposed facilities. Mitigation measures that address visual impacts resulting from new facilities are also described in this section. Specifically, the visual resource study includes a discussion of the following:

- inventory methods
- inventory results
- impact assessment
- mitigation and enhancement measures

INVENTORY METHODS

The visual inventory consisted of (1) characterizing the existing and future landscape; (2) determining landscape scenic quality; and (3) identifying sensitive viewing locations or key observation points (KOPs) from which the project would be visible. These KOPs included residences and major travel routes from which viewers may have a concern for scenic resources. The locations of these KOPs were identified through review of existing and secondary data, interpretation of aerial photography, and field review in conjunction with the land use investigations described in Exhibit A-3 and B-1. KOPs with potential distant views were also identified.

INVENTORY RESULTS

The landscape character, scenic quality of the study area, and identification of sensitive viewers are described below.

Landscape Character and Scenic Quality

Bowie Power Station and 345kV Switchyard

Existing Landscape Character - The existing character of the site is described as common or non-distinctive. Three-quarters of the project site consists of irrigated farmland using center-pivot irrigation. The remainder of the site consists of fallow farmland. Additional cultural modifications in the surrounding area include farm complexes and out-structures, pecan processing facilities, communication towers, irrigation equipment, utilities, and the Eastern Arizona Railroad which parallels the western boundary of the site.

Future Landscape Character - The area adjacent to the plant site is currently zoned RU-4, which permits rural uses, single household, and manufactured homes. There are no new approved residential developments located adjacent to the plant site at this time.

Future plans indicate a rural growth area established by Cochise County for the town of Bowie approximately 2.5 miles south of the project site. Rural growth areas are anticipated to have a slow to moderate rate of growth and are expected to consist primarily of low and medium density residential development and local commercial or industrial uses.

345kV Transmission Line and Willow 345kV/230kV Switchyard

Existing Landscape Character - The majority of the lands crossed by the proposed transmission line and switchyard are considered common with minimal diversity or variety. The landscape consists of mostly flat terrain with vegetation that is dominated by desert scrub with a low density of mesquite. Species of cholla, prickly pear, and soaptree yucca are also common.

Along the first 3.5 miles, the project runs through fallow farmland, which has evolved into grasslands. Areas of above average scenery are present along the final 1.5 miles of the project where rolling hills and ephemeral washes provide habitat for additional species of paloverde and mesquite and create variety in the landscape.

Cultural modifications in the area include the existing Eastern Arizona Railroad, which parallels the proposed project for approximately 3.5 miles, an existing two-track road that parallels the proposed transmission line for approximately 7 miles, and U.S. Highway 191, which runs approximately one-quarter mile west of the northern terminus of the project.

Future Landscape Character - Future plans and zoning indicates that areas in the vicinity of the project will remain rural in character.

Sensitive Viewers

The inventory of sensitive viewers focused on the identification and characterization of residential and transportation views within the immediate vicinity of the plant, 345kV transmission line and 345kV/230kV switchyard. Extended views were also considered including those from the town of Bowie (2.5 miles south of the plant site) and the I-10 West Bowie interchange (2.5 miles southwest of the plant site).

Bowie Power Station and 345kV Switchyard

Residential Viewers - The nearest residence is located approximately 1 mile south of the proposed generating facilities. The next nearest residences are located 1.5 miles to the north and east respectively. Generally, views from these residences are open. However, in some cases views will be screened by existing vegetation, including the pecan orchards to the east of the project site. Extended views from the town of Bowie (approximately 2.5 miles) will be partially screened by existing structures in the town and existing vegetation.

Transportation Views - The closest major road in the area is Graham County Road. This improved gravel road lies adjacent to the plant site and connects scattered rural residences to the north and east with the town of Bowie. Other major roads in the area consist of paved roads in the town of Bowie, including Center Street and Business Route 10. The primary travel route in the area, I-10, runs 2.5 miles to the south of the project site. The views from these roads to the site are partially screened due to development in the town of Bowie, the Union Pacific Railroad, and existing vegetation.

345kV Transmission Line and Willow 345kV/230kV Switchyard

Residential Viewers - There are three residences located within 1.5 miles of the planned transmission line. Two lie to the east, and one to the south. These residences will have open views to the project. However, these views will be partially screened by existing vegetation (pecan orchards) or back dropped by distant terrain. Views from the town of Bowie will also be limited given development in the town and the general north-south orientation of the transmission line.

Transportation Views - The major transportation routes in the area are U.S. Highway 191, located one-quarter mile west of the northern terminus of the transmission line and Willow Switchyard, and Graham County Road located near the southern terminus of the project. Views from U.S. Highway 191 may be blocked or partially screened by terrain or existing vegetation. Views from Graham County Road may also be partially screened by existing vegetation or back dropped by terrain in the distance. Views from I-10 to the transmission line and Willow Switchyard will be distant and partially screened by existing vegetation and development surrounding the town of Bowie.

IMPACT ASSESSMENT

Impacts to visual resources will result from the contrast (form, line, color, and texture) created by the introduction of the proposed project. Visual impacts to the landscape's scenic quality would result from landform modifications and/or removal of vegetation that are necessary to construct the project. Visual impacts from sensitive viewers would result from the introduction of the project within their viewshed.

Bowie Power Station and 345kV Switchyard

Visual Impacts to Landscape Scenic Quality

Visual impacts to landscape scenic quality are expected to be minimal given the lack of natural amenities (varied topography, rock outcroppings, presence of water, diversity of plant life, etc.) associated with the irrigated cropland on which the power station is sited.

Visual Impacts to Sensitive Viewers

Residential and transportation viewers within close proximity to the plant will have the greatest immediate impact (see simulation, Exhibit G-4). However, these views may be partially screened by the proposed conceptual landscape plan (Exhibit B-2). Viewers at locations of greater distance (including the town of Bowie and I-10) will primarily be confined to views associated with the stacks, tops of the HRSGs, cooling tower plumes, and switchyard structures. These views will be less dominant if they are back dropped by distant terrain or screened by existing vegetation in the area. A simulation depicting the site from the west exit of I-10 can be seen in Exhibit G-5. Stack height depicted is 150 feet.

345kV Transmission Line and Willow 345kV/230kV Switchyard

Visual Impacts to Scenic Quality

Impacts to landscape scenic quality along a majority the 345kV transmission line route and Willow Switchyard location are expected to be minimal. With the exception of limited areas, the transmission line is located on lands that are primarily considered common scenery. Since the proposed route parallels existing access, minimal vegetative removal and ground disturbance will be required for construction. In areas where new access traverses above-average scenery, mitigation methods such as selective clearing and landscape restoration will be used to reduce impacts.

Visual Impacts to Sensitive Viewers

Given the remote location of the project, and dispersed nature of rural residences, impacts to sensitive viewers are expected to be minimal. Impacts to the three residences in the southern portion of the study area would be greatest. However, these views may become less dominant as they will be back dropped by distant terrain, or mitigated through the use of dulled structures and non-specular conductors.

Minimal impacts are also expected to occur along U.S. Highway 191 where views of the proposed transmission line and switchyard are partially screened by the existing 345kV and

230kV transmission lines that traverse the landscape in all directions. In addition, variations in terrain and existing vegetation limit visibility to the project.

MITIGATION AND ENHANCEMENT MEASURES

Bowie Power Station and 345kV Switchyard

To reduce the visual impacts associated with the construction and operation of the plant, mitigation measures will be implemented. These mitigation measures will include landscaping and restoration of the project site. This landscape plan (Exhibit B-2) presents specific design measures to enhance the appearance and screening of the plant. In addition, the stacks, HRSGs, and switchyard structures will be painted using colors to reduce the contrast between the proposed facilities and the surrounding landscape.

345kV Transmission Line and Willow 345kV/230kV Switchyard

To minimize impacts associated with the construction of the proposed 345kV transmission line and Willow Switchyard, mitigation measures will be implemented. These measures will include selective clearing and landscape restoration in the areas where new access is required, the use of non-specular conductors, and the use of dulled steel single-pole transmission structures.

EXHIBIT E-2
HISTORIC SITES AND STRUCTURES AND ARCHAEOLOGICAL SITES

EXHIBIT E-2
HISTORIC SITES AND STRUCTURES AND ARCHAEOLOGICAL SITES

METHODS

A cultural resource investigation in support of the Bowie Power Station was initiated to determine whether any historic sites, historic structures, or archaeological sites are located in the vicinity of the proposed power plant site, transmission line corridor, and switchyard site and how they might be affected by the construction of the project. The analysis was based on a review of records maintained at a number of agencies and research institutions, including the following:

- Arizona State Historic Preservation Office
- Arizona State Museum
- Department of Anthropology at Arizona State University
- State Office of the Bureau of Land Management

The goal of this review was to identify any prior cultural resource surveys, recorded archaeological and historical sites, and any properties listed on either the State or National Register of Historic Places located within approximately 1 mile of the project area.

In addition, an intensive field survey of approximately 1,275 acres was conducted in accordance with Arizona State Museum guidelines. The survey areas included:

- approximately 780 acres encompassing the proposed plant site and adjacent parcels of land
- approximately 472 acres encompassing the proposed double-circuit 345kVtransmission line route
- approximately 23 acres encompassing the proposed 345/230kV switchyard site

This exhibit summarizes the results of the records review and field survey, as well as providing conclusions concerning the potential for the proposed project to affect cultural resources.

FINDINGS

Proposed Power Plant Site

The records review did not identify any previously conducted cultural resource studies or previously recorded sites within the area of the proposed plant site. The intensive field survey of the proposed plant site also did not find any historic structures or archaeological sites that would be affected by construction.

Proposed 345kV Transmission Line Route and Willow 345/230kV Switchyard Site

The records review identified five previously conducted cultural resource studies that had been conducted within 1 mile of the proposed transmission line (Table E-2-1). These include studies in support of various development and research projects. Two of these studies (Gilman 1989, 1990) were conducted as part of the San Simon Archaeological Project and they identified two prehistoric archaeological sites that fall within 1 mile of the proposed transmission line. These consist of one habitation area, site AZ CC:10:64 (ASM), and one artifact scatter, site AZ CC:10:84 (ASM). None of the previously recorded sites will be crossed by the proposed transmission line alignment or affected by related construction activities.

TABLE E-2-I
PRIOR CULTURAL RESOURCE STUDIES

Project Name	ASM Number	Quadrangle Location	Total Area Surveyed	Number of Sites	Reference
AEPCO II, Dos Condados to Apache	1977-06	Monk Draw	90.1 miles	27 sites identified, none in the project area	Westfall et al. 1979
CxC, Inc. Seismological Surveys	1979-048	Luzena	15 miles	3 sites identified, none in the project area	Gregonis 1979
San Simon Archaeological Project Survey	1988-210	Fisher Hills	420 acres	25 sites identified, one within the project area: AZ CC:10:84 (ASM)	Gilman 1989
San Simon Archaeological Project Phase II	1989-201	Fisher Hills	4925 acres	33 sites identified, one within the project area; AZ CC:10:64 (ASM)	Gilman 1990
US 191 I-10 to MP 98.0	1997-11	Monk Draw	485 acres	1 site identified, none within the project area	Brown 1999

The intensive field inspection of the proposed transmission line route identified two historic structures. These include the Gila Valley, Globe & Northern Railroad (GVG&N), also known as the Arizona Eastern, and an abandoned railroad siding associated with the GVG&N, site AZ CC:10:109 (ASM). The proposed transmission line will cross a short segment of the GVG&N; however, there is good potential to avoid direct impacts to both of these features by the careful placement of new transmission line structures.

The GVG&N Railroad was completed in 1899 and connected Bowie (and the Southern Pacific Transcontinental Railroad) with Globe (Garrison et al. 1989). The railroad transported minerals out of the Globe area and provided a mean of passenger travel between Bowie and Globe. Site AZ CC:10:109 (ASM) is an abandoned railroad siding that diverges from the GVG&N Railroad and runs parallel to the existing railroad for approximately 1.5 miles, ending just before Gold Gulch. Sidings on railroads are used to allow trains to pass one another on the track. No artifacts or associated features were found during the field inspection. Although written documentation on the siding has not been found, a local resident recounts the presence of a siding near Gold Gulch (Mr. Chano Jacquez, personal communication, 2001).

The GBG&N Railroad may be regarded as locally significant and thus eligible for listing on either the National or State Registers of Historic Place. Site AZ CC:10:109 (ASM), however, is probably not eligible for listing because it lacks any of its original materials and contains no associated artifacts. Further study of the siding is unlikely to provide any additional meaningful information concerning the site's function and temporal affiliation.

The intensive field survey of the 345/230kV switchyard site did not find any historic structures or archaeological sites that would be affected by construction.

CONCLUSIONS

The cultural resource study conducted in support of the Bowie Power Station Project indicates that the proposed project facilities are located in an area with a low-to-moderate potential to contain cultural resources. No prehistoric or historic sites are present within the area sited for the proposed power station. The proposed transmission line route will cross two historic structures, however there is excellent potential to avoid any direct impacts to these structures. There were no archaeological sites or historic structures identified at the location of the proposed 345/230kV switchyard.

Additional cultural resource surveys will need to be conducted if any portion of the proposed project is relocated outside of areas previously surveyed.

There is no indication that human remains or funerary objects are present within the project area. However, if such remains were to be unexpectedly discovered on private or state lands during construction, work in that area should be halted and the finds reported to the director of the Arizona State Museum in accordance with ARS §41-844 and ARS §41-865.

REFERENCES

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Gregonis, Linda

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Westfall, D.A., Ken Rozen, and H.M. Davidson

1979 *The AEPCO Project, Volume II: Dos Condado to Apache Survey and Data Recovery of Archaeological Resources.* Archaeological Series No. 117. Cultural Resource Management Section, Arizona State Museum, University of Arizona, Tucson.

EXHIBIT F
RECREATIONAL PURPOSES AND ASPECTS

EXHIBIT F
RECREATIONAL PURPOSES AND ASPECTS

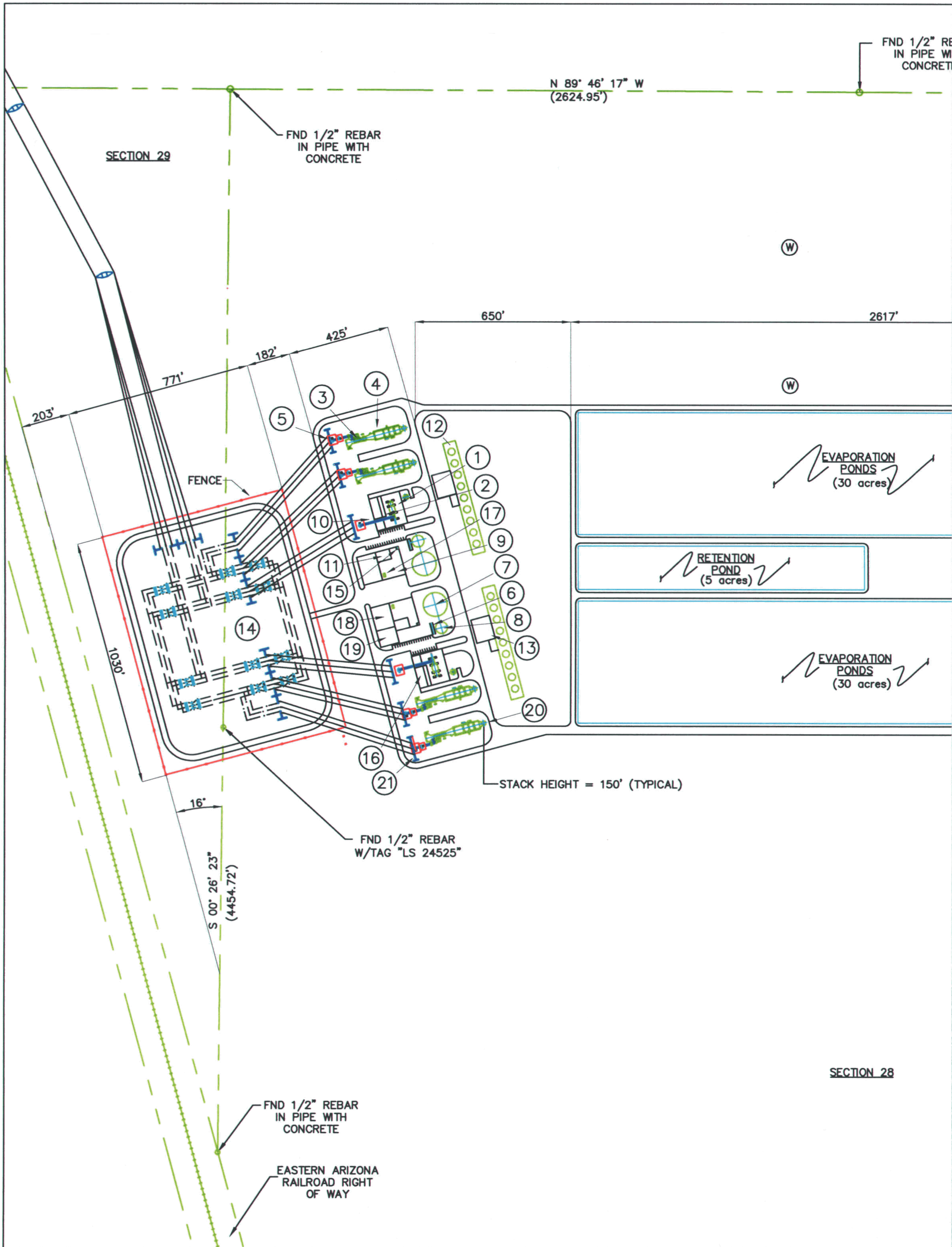
As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"State the extent, if any, the proposed site or route will be available to the public for recreational purposes, consistent with safety considerations and regulations and attach any plans the applicant may have concerning the development of the recreational aspects of the proposed site or route."

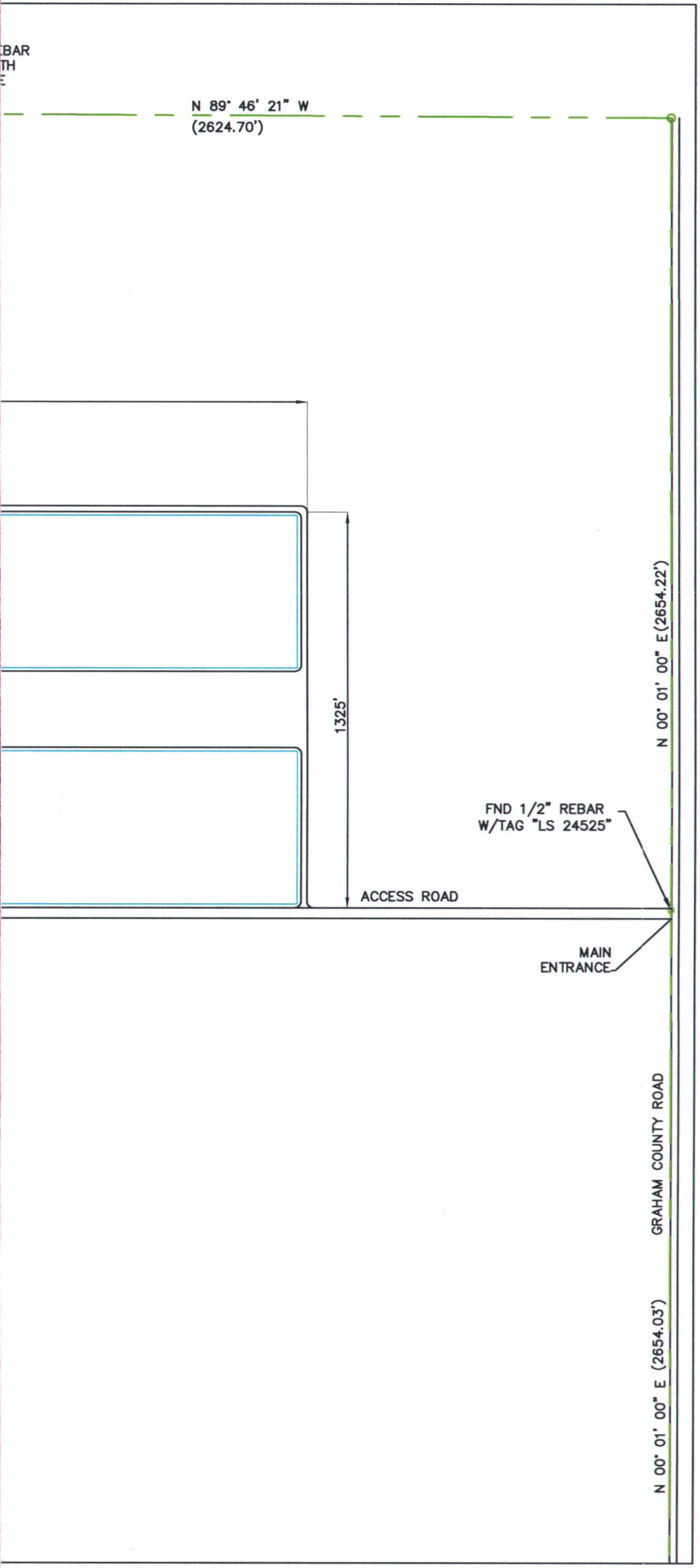
The power station facilities (generation units, switchyards, buildings) will be fenced and unavailable to public access.

State Trust Lands within the proposed transmission line corridor allow recreational activities such as hiking, horseback riding, and off-highway vehicle use. Operation of the transmission line would not restrict these activities. No plans currently exist to develop recreational facilities within the proposed right-of-way.

EXHIBIT G
CONCEPTS OF TYPICAL FACILITIES



FND 1/2" RE
IN PIPE WI
CONCRET
N 89° 46' 17" W
(2624.95')
FND 1/2" REBAR
IN PIPE WITH
CONCRETE
SECTION 29
650'
2617'
425'
182'
771'
203'
FENCE
EVAPORATION
PONDS
(30 acres)
RETENTION
POND
(5 acres)
EVAPORATION
PONDS
(30 acres)
1030'
STACK HEIGHT = 150' (TYPICAL)
16'
FND 1/2" REBAR
W/TAG "LS 24525"
S 00° 26' 23"
(4454.72')
SECTION 28
FND 1/2" REBAR
IN PIPE WITH
CONCRETE
EASTERN ARIZONA
RAILROAD RIGHT
OF WAY



BOWIE
POWER STATION

GENERAL ARRANGEMENT CONCEPT

Exhibit G-1

Legend

1. STEAM TURBINE GENERATOR
2. SWITCHGEAR, CONTROL, ELECTRICAL BUILDING (GROUND LEVEL)
3. GAS TURBINE GENERATOR
4. HEAT RECOVERY STEAM GENERATOR
5. STEP-UP TRANSFORMER
6. OIL-WATER SEPARATOR
7. RAW WATER STORAGE TANK
8. DEMINERALIZED WATER STORAGE TANK
9. WATER TREATMENT BUILDING
10. ISOLATED PHASE BUS
11. WATER TREATMENT, CONTROL, ELECTRICAL AREA
12. COOLING TOWER
13. CIRCULATING WATER PUMP BUILDING
14. 345KV SWITCHYARD
15. HYPOCHLORITE STORAGE TANK AND PUMPS
16. CONTROL ROOM, OFFICES (SECOND LEVEL)
17. AUXILIARY BOILER AND STACK
18. WAREHOUSE
19. ADMINISTRATION BUILDING
20. DEAD-END STRUCTURE
21. EXHAUST STACK

Notes

1. EXISTING GRADE = EL 3720'
FINISHED GRADE = EL 3721'
TOP OF CONCRETE = EL 3722'

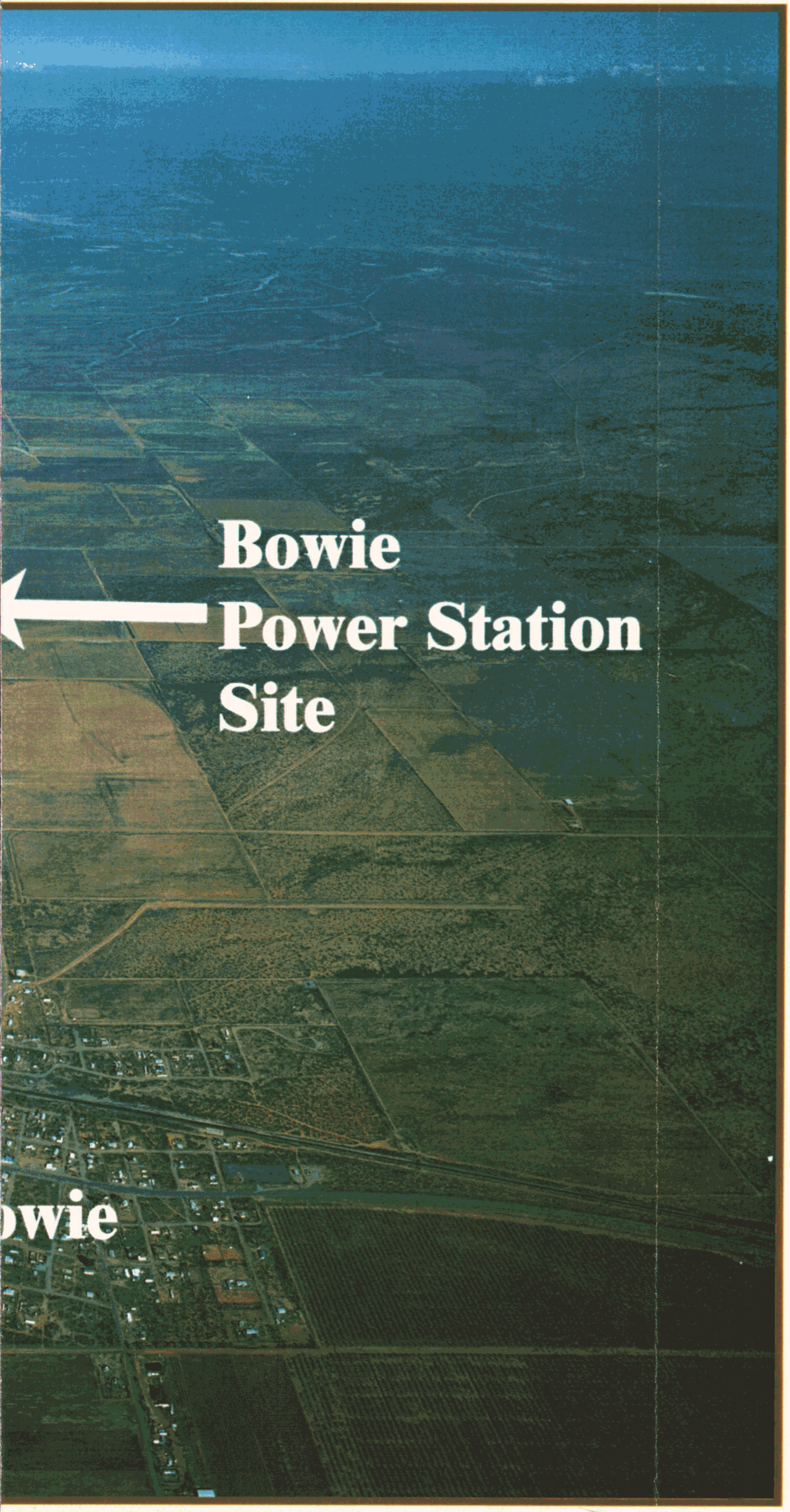
(W) = APPROXIMATE WELL LOCATION (FOR REFERENCE)

0 250 500 1000

Scale: 1" = 500' - 0"

North


I-10
Bo



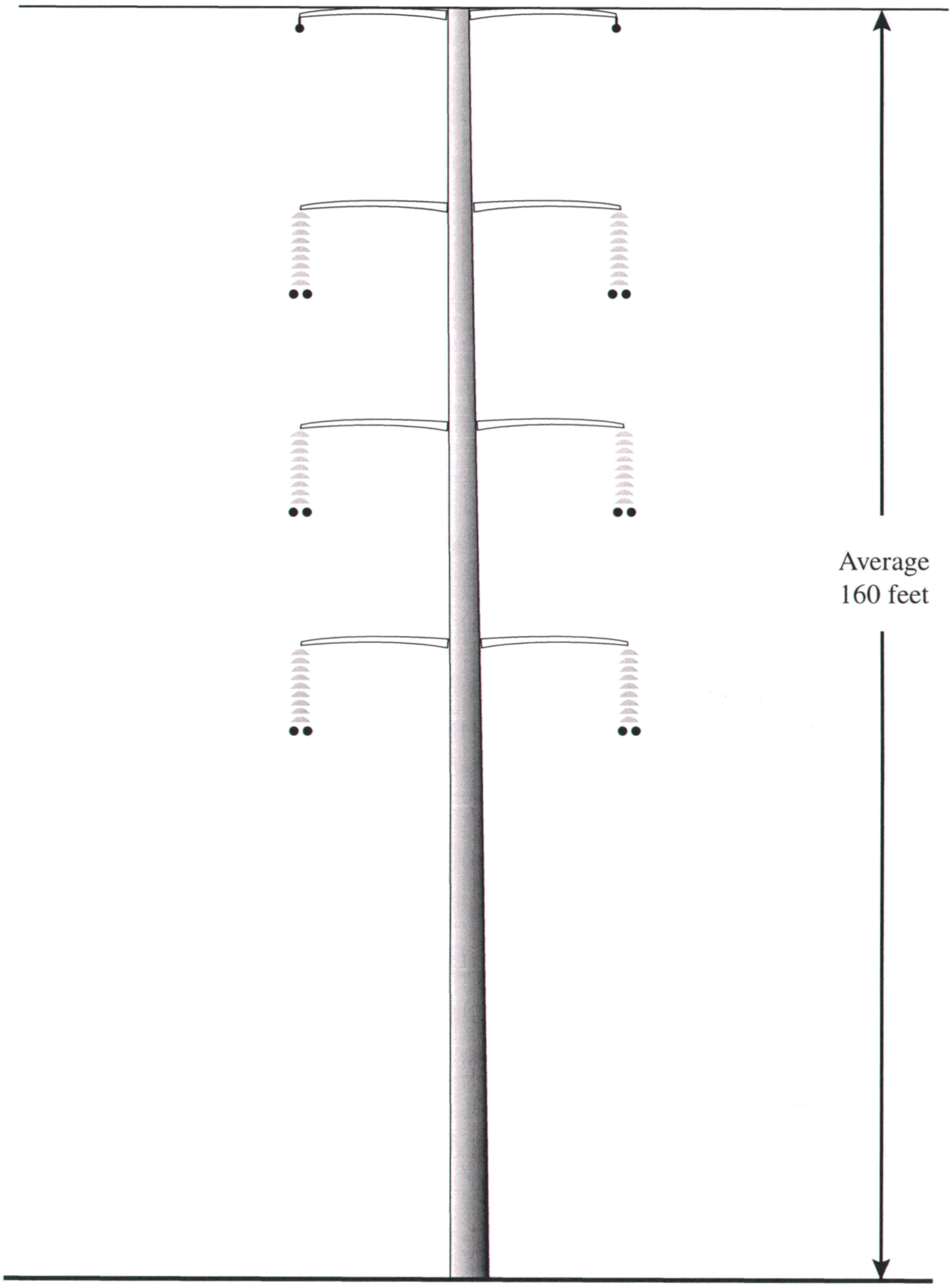
BOWIE POWER STATION

AERIAL VIEW OF PLANT SITE

Exhibit G-2

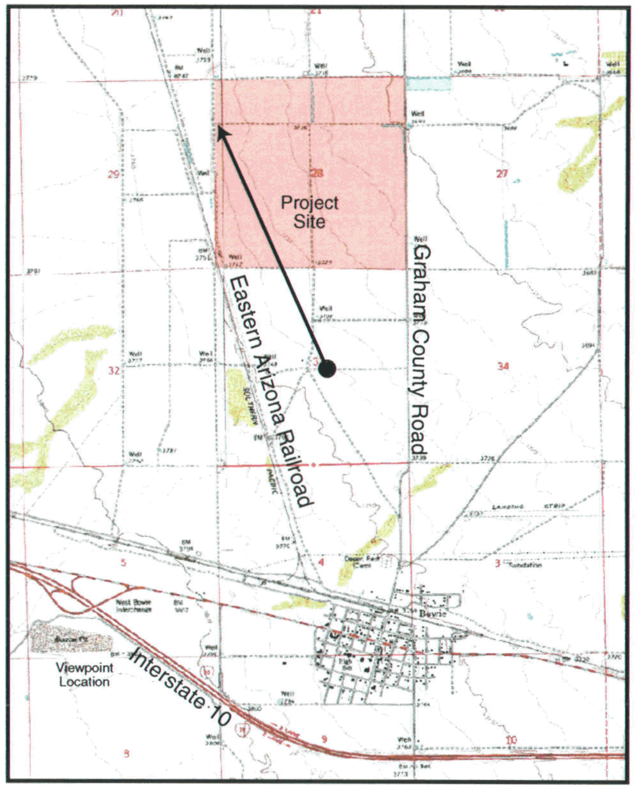
Source:
Aerial Photograph, Todd Photographic Services, 2000.

d:/projects/swpg/bowietl/oblique.ai



Typical 345kV Structure
Exhibit G-3


Simulation



Location Map

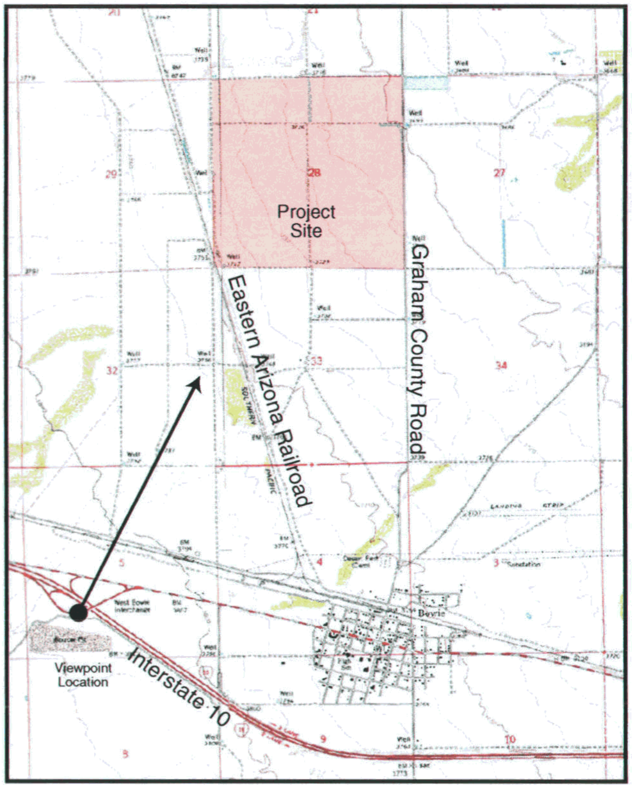

Existing Condition

Visual Simulation

View from Residence
Looking Northwest

Exhibit G-4

Simulation



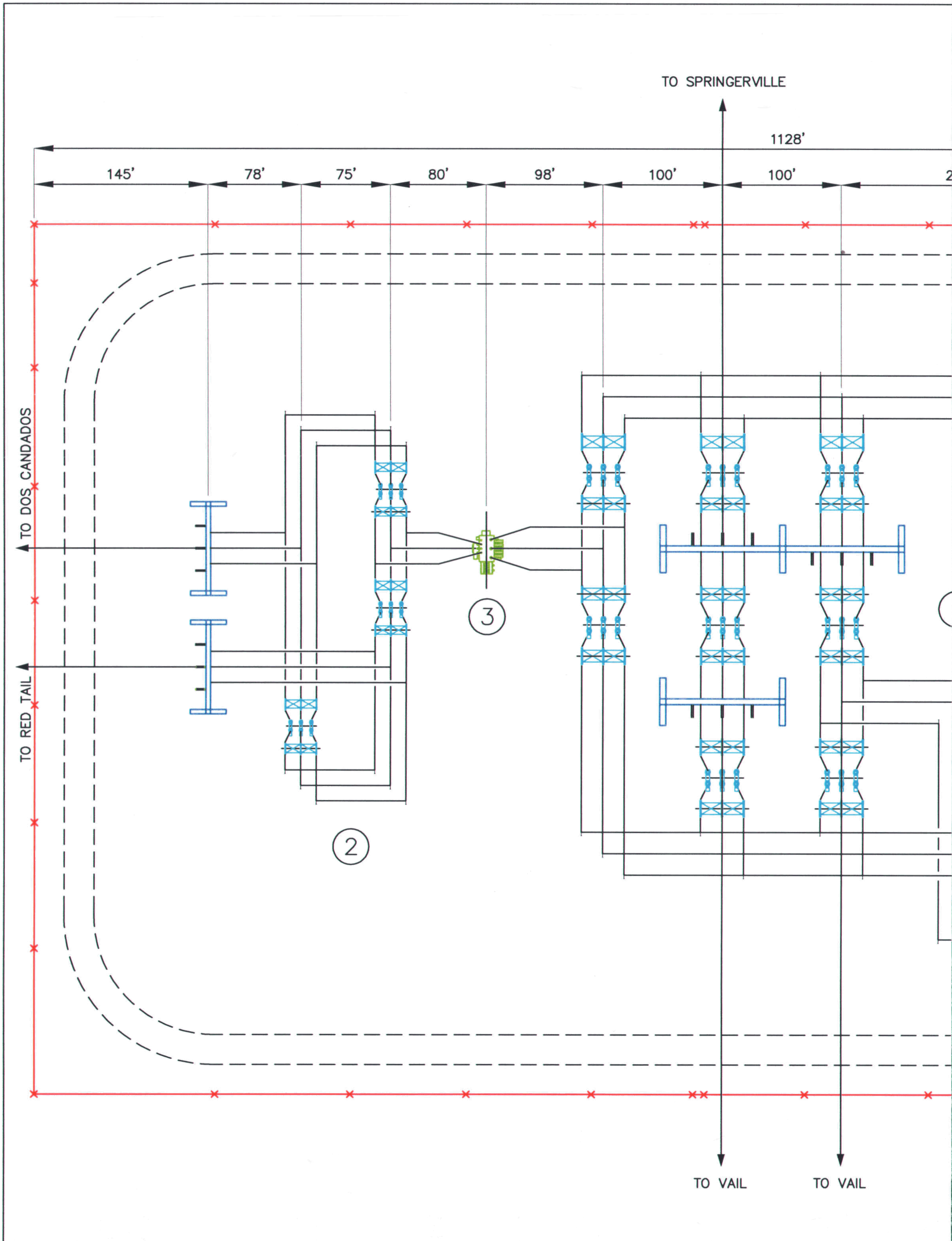
Location Map

Existing Condition

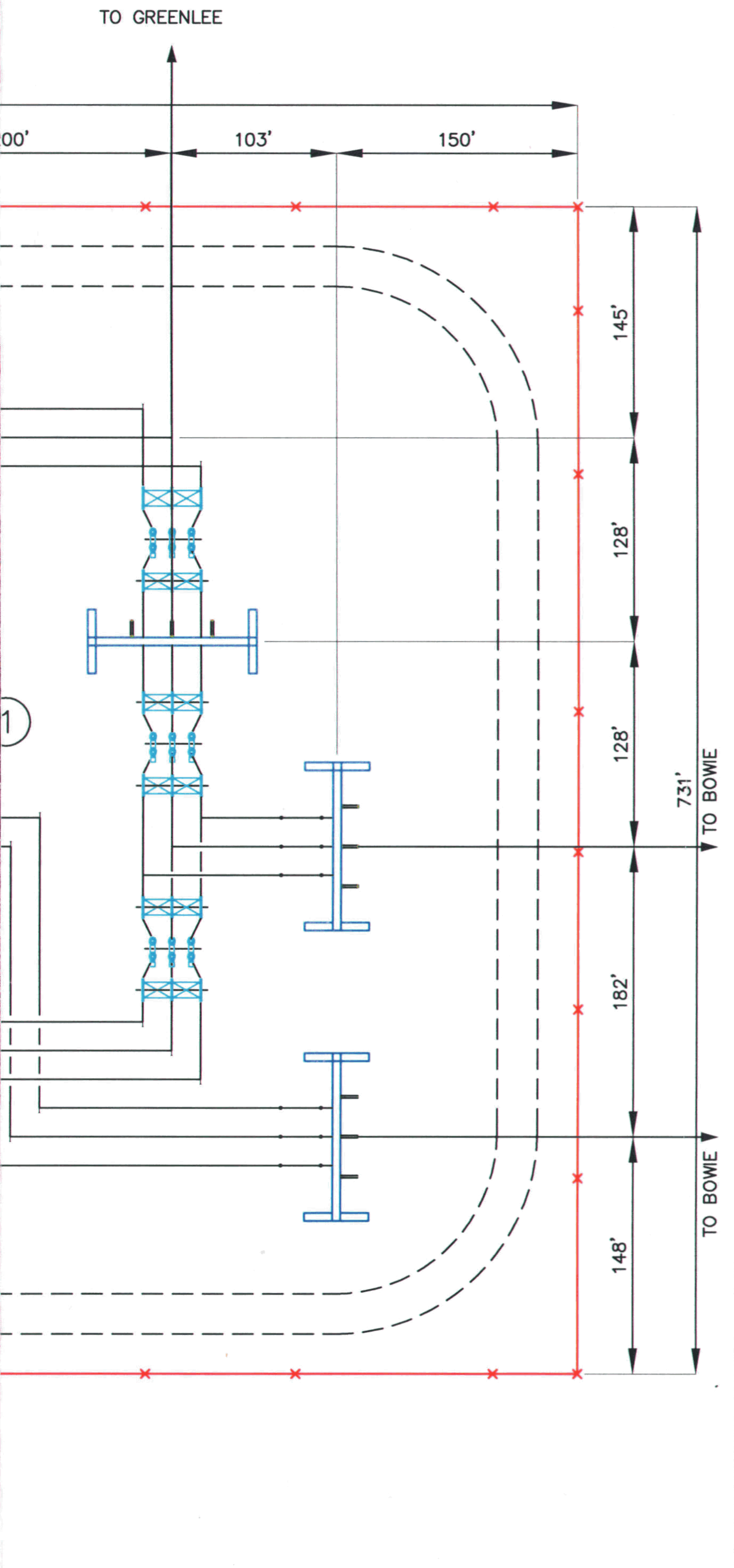
Visual Simulation

View from West Exit of I-10
Looking Northeast

Exhibit G-5



TO SPRINGERVILLE
1128'
145'
78'
75'
80'
98'
100'
100'
TO DOS CANDADOS
TO RED TAIL
3
2
TO VAIL
TO VAIL



BOWIE POWER STATION

WILLOW 345kV/230kV SWITCHYARD CONCEPT

Exhibit G-6

Legend

1. *345kV SWITCHYARD*
2. *230kV SWITCHYARD*
3. *345kV/230kV TRANSFORMER*

Notes

SOURCE: R.W. BECK, INC., COPYRIGHT 2001, ALL RIGHTS RESERVED

Scale: 1" = 100' - 0"

North

EXHIBIT H
EXISTING PLANS

EXHIBIT H
EXISTING PLANS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"To the extent applicant is able to determine, state the existing plan of the state, local government, and private entities for other developments at or in the vicinity of the proposed site or route."

Existing and planned land uses are described in Exhibit B and illustrated in Exhibit A-3. Planned land uses identified for the project are identified in Cochise and Graham counties planning documents. Neither Cochise nor Graham County reported any pending major subdivisions or master planned developments in the study area.

Letters were sent to federal, state, and local government agencies to request information on proposed developments within the vicinity of the project. Table H-1 lists the recipients of these letters and whether responses were received. Copies of the contact letter and response letters are provided in Exhibit H-1. Additional contacts that were made to inform potentially affected parties of the project are summarized in Exhibit J.

TABLE H-1
LETTER RECIPIENTS

Name and Affiliation	Date Letter Sent	Date of Response	Comments
Will Wright, Graham County Planning Director	04/18/01	04/20/01	
James Vlahovich, Cochise County Planning Director	04/18/01	05/10/01	Letters received from Louisa Garbo, Planner
Linda Small, Cochise County Economic and Community Development	04/18/01	06/12/01	Letter received from Patty Lewis, Grants Administration
Dr. T.R. Ellis, Superintendent Bowie USD #14	04/18/01	04/24/01	
Lynn Setterstedt-Jarrett, Ed.D., Superintendent Wilcox USD #13	04/18/01	05/02/01	
Michael Anable, Arizona State Land Director	04/18/01	05/24/01	Telephone response from Jim Gross, Right-of-way
Cindy Lester, U.S. Army Corps of Engineers	04/18/01	04/24/01	
Linda Bailey, Graham County Parks Director	04/18/01		
Terry Cooper, Graham County Manager	04/18/01		
Michael Reed, Superintendent San Simon USD	04/18/01		
Bowie Chamber of Commerce	04/18/01		
Ken Travous, Arizona State Parks Department	04/18/01		
Mary Lynn Tischer, ADOT Transportation Director	04/18/01		
Alan Cox, Superintendent Chiricahua National Monument	04/18/01		

EXHIBIT H-1

EXAMPLE

April 18, 2001

Bowie Chamber of Commerce
P.O. Box 287
Bowie, Arizona 85605

RE: Bowie Power Station Project

Dear Sir/Madam:

The SouthWestern Power Group (SWPG) is planning a new electric generating plant approximately 2 miles north of I-10 near Bowie, Arizona. The proposed project would include construction of a combined-cycle, natural gas-fueled power plant and transmission line. Bowie Power Station, LLC, formed by SWPG to develop the power station, will contract with a transmission service provider, such as a local utility, to construct the transmission lines.

The proposed Bowie Power Station will consist of a combined-cycle, natural gas-fueled power plant including two 500-megawatt units providing a total capacity of up to 1,000 megawatts. The project will be built in phases beginning in late 2002 with the first unit in operation by early 2004. An enclosed newsletter and map provide additional information.

The transmission line will consist of a double-circuit 345kV line connecting the proposed power plant to one of the two existing 345kV lines running southwest to northeast, north of the proposed power plant site. The new transmission line would originate at the Bowie Power Station switchyard and connect with one of the existing lines, at one of two alternate points located 13 miles north or 14 miles north-northwest of the Bowie power plant site. The alternative routes are shown on the enclosed map.

Two alternative routes for a proposed pipeline to supply natural gas to the Bowie Power Station are also shown on the map. The pipeline will tap into an existing El Paso Natural Gas pipeline located south of I-10.

The purpose of this letter is to request information regarding development plans in the vicinity of the power plant site, and alternative transmission line and pipeline routes. Your response will be evaluated in preparation of the application for a certificate of environmental compatibility. Submittal of this application to the Arizona Power Plant and Transmission Line Siting

Committee of the Arizona Corporation Commission is in compliance with the Arizona Revised Statutes, Section 40-360.03.

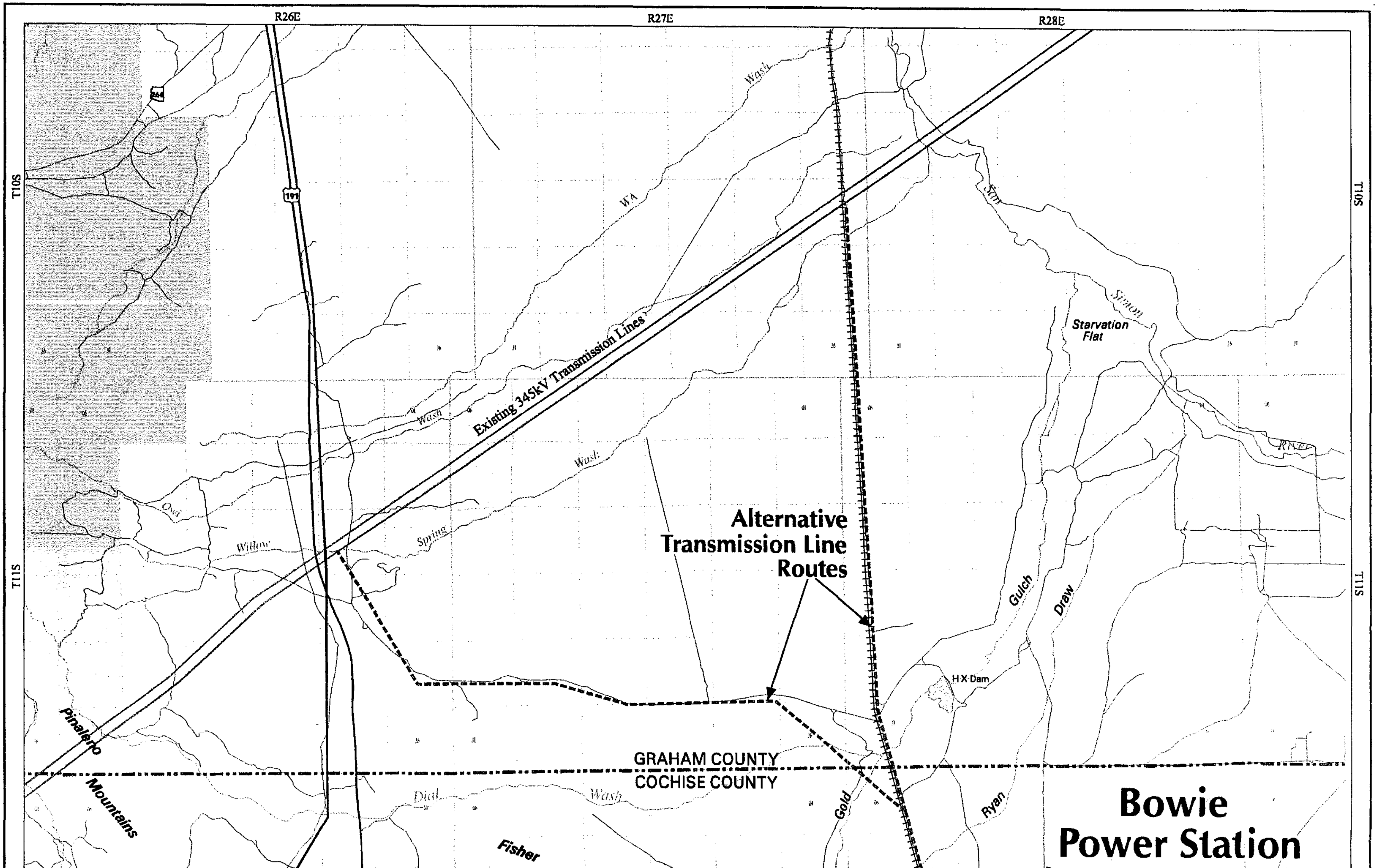
The Environmental Planning Group, Inc. (EPG) is assisting with environmental studies, siting, and permitting activities for this project. We respectfully request your response in writing as to whether you are aware of any planned developments or activities in the vicinity of the project.

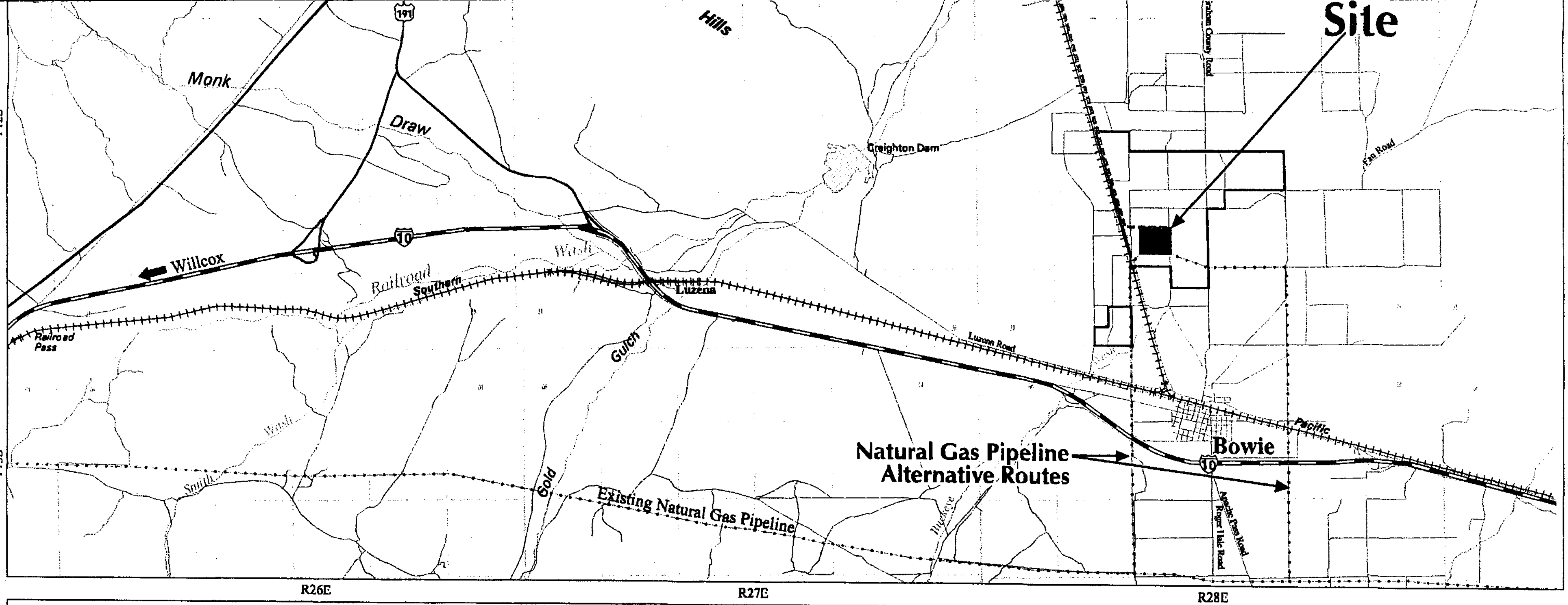
We would appreciate your response by May 15, 2001 so that we can evaluate the information prior to the submittal of the application. Please send your response to me at EPG (address on front page letterhead). Thank you in advance for your reply. Should you have any questions, please do not hesitate to call me at (602) 956-4370.

Sincerely,

Mickey Siegel
Project Manager

Enclosures


R26E
R27E
R28E
T10S
T11S
Existing 345kV Transmission Lines
Alternative Transmission Line Routes
Starvation Flat
San Simon River
Wash
WA
Spring
Willow
Owl
Gulch
Draw
H X Dam
Gold
Ryan
Dial Wash
Fisher
Pinaleno Mountains
GRAHAM COUNTY
COCHISE COUNTY
191
266
Bowie Power Station



PROJECT LOCATION

Bowie Power Station, LLC

General Reference Features

- 345kV Transmission Line
- 230kV Transmission Line
- Natural Gas Pipeline
- County Boundary
- Interstate
- Major Road
- Road
- Railroad
- River
- Wash
- Section Line
- Township and Range Boundary
- Contour
- Reservoir

Resource Inventory

- Bowie Project Property Boundary
- Proposed Double-Circuit 345kV Transmission Line
- Proposed Natural Gas Pipeline
- Bowie Power Station Site
- Private
- State Trust
- Bureau of Land Management
- USDA Forest Service

1 .5 0 1 2 3 MILES

Sources:
Arizona State Land Department, Phoenix, AZ 2001.
United States Geological Survey (USGS), Willcox AZ-NM 1994, Safford AZ-NM 1994, 1:100,000-scale metric topographic maps.
Contours interpolated from USGS 1:24,000-scale digital elevation models at an interval of 40 feet.

BOWIE POWER STATION

m:/projects/mp/bowie/aml/exh.aml Draft Revised May 03, 2001

GRAHAM COUNTY PLANNING & ZONING / COMMUNITY DEVELOPMENT

921 THATCHER BOULEVARD • SAFFORD, ARIZONA 85546
PHONE: (520) 428-0410 • FAX: (520) 428-5951

WILL WRIGHT
PLANNING DIRECTOR
COMMUNITY DEVELOPMENT COORDINATOR

April 20, 2001

MR. MICKEY SIEGEL, Project Manager
Environmental Planning Group, Inc.
4350 East Camelback Road, Suite G-200
Phoenix, AZ 85018

Dear Mr. Siegel:

This letter is written in response to your April 18, 2001 request for any knowledge that we may have of any 'planned developments or activities in the vicinity of the project', known as the (Bowie Power Station, LLC). A map was included with this letter, which I assume incorporates all the area that you want me to address in this review as to any known activities as described above in Graham County. The map of the project site includes a relatively small area in Graham County that runs in an east to west direction for about twenty (20) miles along the southern border between Graham and Cochise Counties. The map area then runs about ten (10) miles in a northerly direction into Graham County.

The area shown on the map is intersected two major highways both U.S. Highway 191 (north to south corridor) and a very small section of U.S. Highway 266. Interstate Highway 10 (east to west corridor) is also shown and lies totally in Cochise County. The map also shows a major electrical transmission line and a natural gas pipeline as well as the Southern Pacific railroad line running east to west with both the gas and railroad lines being located in Cochise County.

The land shown on this map located in Graham County is almost exclusively held by public entities, including the BLM, the State Trust and the U.S. Forest Service. Since there is a relatively small amount of private property in that part of Graham County, there is little development activity to report for that area. It should be noted, however that the area west of where the map ends in known as Bonita and that there has been significant development of hydroponic green houses for tomatoes with Eurofresh having over 100 acres under glass for their business with Mr. Johan Van den Berg at (480) 384-4621 managing that operation.

Graham County, along with Cochise County, is working with Arizona Department of Transportation (ADOT) to upgrade this section of U.S. Highway 191 to improve safety for this stretch of highway. Mr. Ron Casper the District Engineer for the Safford has been of great assistance in developing some preliminary ideas and plans for these proposed improvements and can be contacted at (520) 428-5470 in Safford.

I hope this letter adequately addresses your questions and would be happy to provide any further assistance that you may need.

RECEIVED
APR 24 2001

Sincerely,

Will Wright
Planning Director

COCHISE COUNTY PLANNING DEPARTMENT

1415 W. Melody Lane, Bisbee, Arizona 85603 (520) 432-9450
Fax 432-9429

James E. Vlahovich, Director

May 10, 2001

Mickey Siegel
Project Manager
4350 E. Camelback Road
Suite G-200
Phoenix, AZ 85018

Dear Mr. Siegel,

Thank you for your interest in Cochise County. In response to your inquiry, as per our telephone conversation yesterday, the proposed transmission and pipe lines are exempt from the Cochise County Zoning Regulations. However, as I pointed out in our conversation, it is the applicant's (South Western Power Group) responsibility to obtain any permits, or meet any additional conditions, if any, that may be applicable to the proposed activity pursuant to federal, state or any other local laws or regulations.

I also referred you to a letter previously sent to SouthWestern Power group, in which I informed that a special use permit or rezoning would be required for the power plant. For your information, the SouthWestern Power Group has not submitted any Rezoning or Special use applications to the office, therefore, whether the proposed power plant will be approved is not yet certain as a public hearing is involved. For your information, I am enclosing a handout and the criteria that we use to review special uses.

In regard to your inquiry on existing or proposed major commercial developments or subdivisions within the vicinity of the proposed site, I checked with our Department and confirmed that the only development is a communication tower, which is very near to the proposed site. If I recall correctly, you mentioned that the proposed site is in section 28 of the county's survey map. There are also two to three mobile homes near the proposed section. (Please see attached map). Aside from the tower and the existing mobile homes, we are not anticipating any major development proposals in this area in the near future.

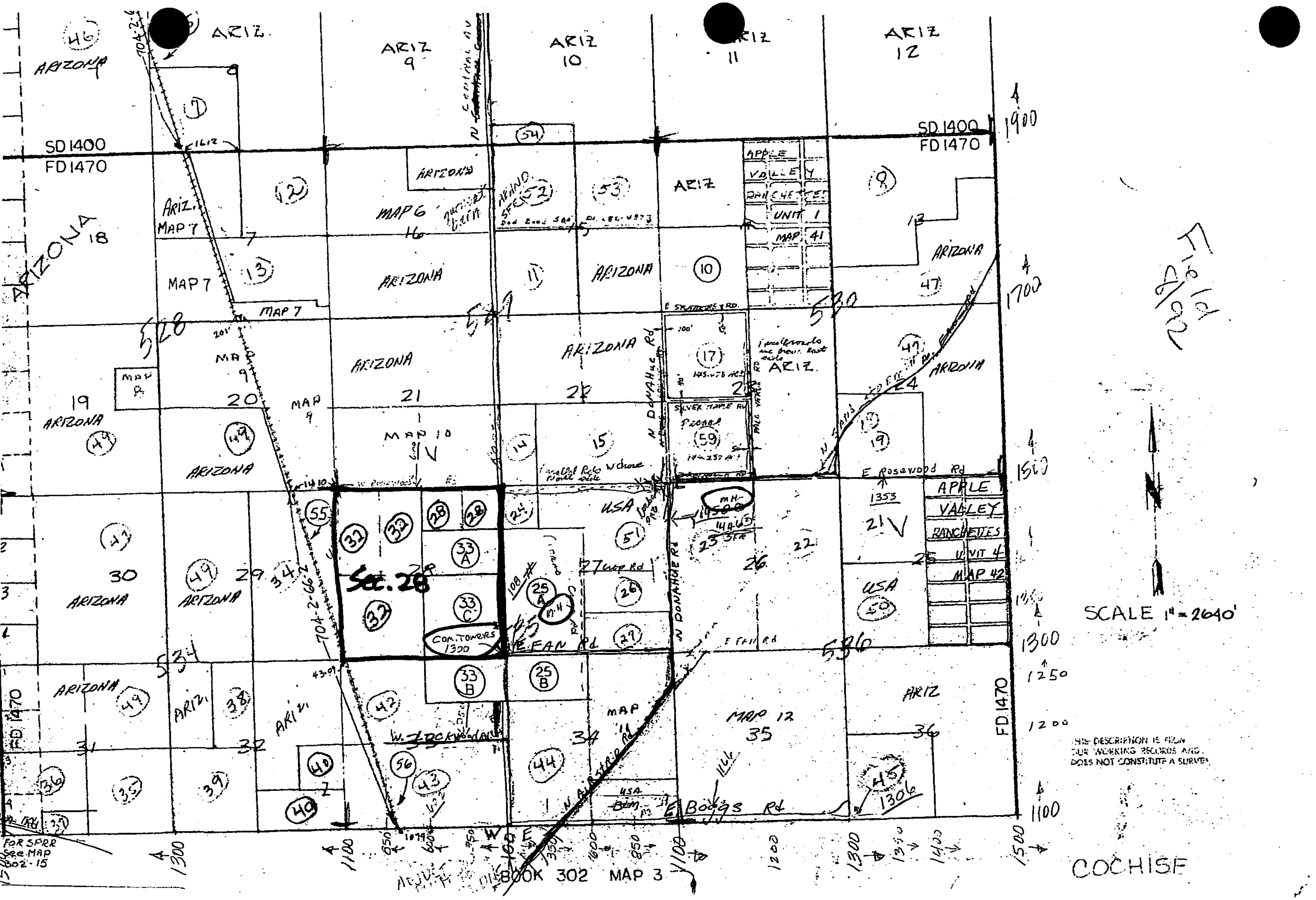
I hope this letter addresses your concerns. If you have further questions, do not hesitate to contact us.

Yours truly,

Louisa Garbo, Planner

Xc: James E. Vlahovich, Director

RECEIVED
MAY 16 2001



SD 1400
FD 1470
ARIZ 9
ARIZ 10
ARIZ 11
ARIZ 12
APPLE VALLEY RANCHETTES UNIT 1 MAP 41
APPLE VALLEY RANCHETTES UNIT 4 MAP 42
Sec. 28
COM. TOWERS 1300
E Rosewood Rd
N DONAHUE Rd
E FAN Rd
E Boggs Rd
N AIRSTRIP Rd
W LOCKWOOD LN
MAP 7
MAP 9
MAP 10
MAP 11
MAP 12
USA
ARIZONA
704-2-66-Z
SCALE 1" = 2640'
Field 8/92
THIS DESCRIPTION IS FROM OUR WORKING RECORDS AND DOES NOT CONSTITUTE A SURVEY
COCHISE
BOOK 302 MAP 3
FOR SPRR See MAP 302-15

Board of Supervisors

Leslie E. Thompson
Chairman,
District 3

Paul Newman
District 2

Patrick Call
District 1

Jody N. Klein
County Administrator

Nadine Parkhurst
Clerk

VIA FAX
(520) 795-2025
Hard Copy to Follow

June 12, 2001

Mr. Mickey Siegel, Project Manager
Environmental Planning Group
1430 E. Ft. Lowell Blvd. Suite 304
Tucson, AZ 85719

Re: Bowie Power Station Project

Dear Mr. Siegel:

This is in response to your letters dated April 18 and May 16, 2001, which were addressed to Ms. Linda Small. The Office of Economic and Community Development has been reorganized under the Cochise County Board of Supervisors and Ms. Small left her position with the County last year.

In regards to your request for information concerning development plans in the vicinity of the power plant site, the County Planning and Zoning Department recently provided land use and property development standards for the proposed project.

The Environmental Planning Group and the SouthWestern Power Group should continue to coordinate with the Cochise County Planning and Zoning Department concerning further development of this project. If you have further questions please contact Ms. Louisa Garbo at (520) 432-9450.

Sincerely,

Patty Lewis

Patty Lewis
Grants Administrator

Cochise County • 1415 W. Melody Lane, Building B • Bisbee, Arizona 85603
(520) 432-9200 • FAX (520) 432-5016 • e-mail: board@co.cochise.az.us
http://www.co.cochise.az.us

Bowie USD #14
315 West 5th Street
Bowie, Arizona 85605

April 24, 2001

Mickey Siegel, Project Manager
Environmental Planning Group
4350 East Camelback Road, Suite G-200
Phoenix, AZ 85018

Dear Mr. Siegel:

In response to your request, Bowie School officials can think of no plans for development in the vicinity of the planned Bowie Power Station Project.

Best of luck in your efforts.

Sincerely,

Dr. T. R. Ellis, Superintendent

WUSD Vision: Making A Difference In Our Children's Future!

WILLCOX UNIFIED SCHOOL DISTRICT NO. 13
480 NORTH BISBEE AVENUE
WILLCOX, ARIZONA 85643
(520) 384-4211
e-mail: lynnsj@qwest.net

Lynn Setterstedt-Jarrett, Ed. D., Superintendent

May 2, 2001

Mickey Siegel
Project Manager
Environmental Planning Group
4350 E. Camelback Rd.
Suite G-200
Phoenix, AZ 85018

RE: Bowie Power Station Project

Dear Mickey Siegel:

I am writing in response to your inquiry as to any knowledge I might have regarding planned developments in the vicinity of the power plant site and alternative transmission line and pipeline routes. At this time I do not know of anything that would impede your project.

Sincerely,

Lynn Setterstedt-Jarrett, Ed. D.
Superintendent

WUSD Mission: Every Student Successful; Every Student Meets or Exceeds Arizona State Standards

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
ARIZONA-NEVADA AREA OFFICE
3636 NORTH CENTRAL AVENUE, SUITE 760
PHOENIX, ARIZONA 85012-1936
April 24, 2001

REPLY TO
Office of the Chief
Regulatory Branch

Mr. Mickey Siegel
Project Manager
Environmental Planning Group
4350 E Camelback Rd., Suite G-200
Phoenix, Arizona 85018

File Number: 2001-00888-SDM

Dear Mr. Siegel:

It has come to our attention that Southwestern Power Group is planning to construct a new combined-cycle natural gas-fueled electric generating station, with associated transmission lines and gas pipelines, approximately 2 miles north of Interstate-10 at (Section 28, T12S, R28E), Bowie, Cochise County, Arizona.

This activity may require a Department of the Army permit issued under Section 404 of the Clean Water Act. A Section 404 permit is required for the discharge of dredged or fill material into the "waters of the United States," including adjacent wetlands. Examples of activities requiring a permit are placing bank protection, temporary or permanent stock-piling of excavated material, grading roads, grading (including vegetative clearing operations) that involves the filling of low areas or leveling the land, constructing weirs or diversion dikes, constructing approach fills, and discharging dredged or fill material as part of any other activity.

We have searched our database and to the best of our knowledge, there are no activities or planned development in the Bowie, Arizona area.

Enclosed you will find a permit application form and a pamphlet that describes our regulatory program. If you have questions, please contact Sallie D. McGuire at (602) 640-5385 x 221. Please refer to file number 2001-00888-SDM in your reply.

Sincerely,

Cindy Lester

Cindy Lester
Chief, Arizona Section
Regulatory Branch

Enclosures

EXHIBIT I
ANTICIPATED NOISE LEVELS, AND INTERFERENCE WITH COMMUNICATION SIGNALS

EXHIBIT I
ANTICIPATED NOISE AND INTERFERENCE WITH COMMUNICATION SIGNALS

As stated in Arizona Corporation Commission Rules of Practice and Procedure R-14-3-219:

"Describe the anticipated noise emission levels, and any interference with communication signals which will emanate from the proposed facilities."

A study was conducted by Michael Theriault Acoustics, Inc. to evaluate noise levels for the Bowie Power Station. The sound level evaluation results are included in this exhibit, below.

Certain effects associated with electric power facilities such as transmission lines include corona and audible noise, radio/television/electronic equipment interference, and interference with cardiac pacemakers. A summary of potential corona and audible noise, equipment and cardiac pacemaker interference, and a description of electrical and magnetic fields (EMF) is also included in this exhibit.

SOUND LEVEL EVALUATION

As part of the evaluation, an ambient noise level survey was performed in June 2001 to establish baseline (L90) levels prior to power station operation. Results showed that the average background noise level (L90) for the 26-hour monitoring period was approximately 31 decibels, A-weighted (dBA). A detailed, three-dimensional acoustical model of the facility was developed to predict noise levels at nearby receptors and site property boundaries. Results showed that noise from the plant would range from about 41 to 46 dBA at nearby homes, and would fully conform to noise level guidelines established by federal bureaus such as the Department of Housing and Urban Development (HUD) and the EPA.

An acoustical model of construction operations and equipment was also developed to predict noise levels at the nearest residences, which are about 1 mile south of the proposed facility. Surrounding land use consists of large open farming areas and low population density. Results showed that construction activities would range in level from the low-30s to mid-40s (dBA) at nearby homes.

Noise Metric Descriptions

Noise can be described using various scales, similar to Fahrenheit and Celsius scales for temperature or pound and gram scales for weight. Moreover, noise can be described using a variety of statistical metrics. The following section briefly reviews these commonly used noise descriptors. The human ear responds to a frequency range from about 20 Hertz to 20,000 Hertz. Since the ear is not equally sensitive to low and high frequencies, sound level meters are equipped with "A-Weighting" filters which approximate this irregular response. The measurements are called A-weighted levels and reported in units of decibels, dB(A).

Percentile Levels

Because community sound levels continually change over time, percentile or "exceedance" measurements are often used to quantify them. These measures take into account the amount of time an environment is at a given loudness, and allow us to separate loud, intrusive noises, from steady state or background sounds. For example:

- L10 (L-Ten) is the level exceeded 10 percent of the time, that is, only 10 percent of the measurement time are levels higher than this value. The L10 typically represents the loudest noise events occurring in the environment, such as car and truck pass-bys.
- L50 (L-Fifty) is the sound level exceeded 50 percent of the time. Levels will be above and below this value exactly one-half of the measurement time, and therefore the L50 is sometimes referred to as the "median" sound level.
- L90 (L-Ninety) is the sound level exceeded 90 percent of the time and is often called the "background" sound level. Ninety percent of the time, measured levels are higher than this value, and therefore the L90 represents the environment at its quietest periods.

Another metric used to assess community noise is called the *Day-Night Level*, or LDN. The LDN represents a 24-hour measurement of sound within a community, and is calculated by adding a 10-decibel "penalty" to noises, which occur between 10 p.m. and 7 a.m. This accounts for the potential of increased annoyance when people are resting, relaxing and sleeping. The *Day-Night Level* is the preferred metric of federal bureaus such as HUD and the EPA.

Ambient Noise Level Survey

An ambient noise level survey was conducted from June 5, 2001 through June 7, 2001 to acoustically characterize the environment near the site. Specifically, sound level measurements were collected at the nearest residences, at site property boundaries, and at off-site locations in order to establish baseline levels (L90) prior to construction and operation of the facility.

Procedures

The surrounding area was surveyed to identify potentially noise-sensitive receptors, such as residences, cemeteries, schools, hospitals, churches, etc. Measurement locations considered spatially representative of the project area were established for obtaining ambient noise readings. Numerous sound level readings were manually collected over 15 to 20 minute periods during daytime and nighttime hours, for a three-day, two-night period. Percentile (Ln) sound levels were reported, and observations of predominant noise sources and weather conditions were noted. In addition, an unattended long-term sound level monitor was deployed at Location 2 for a 26-hour period, to capture the diurnal *(day-night)* variation in sound levels.

Instrumentation

All attended short-term sound level measurements were collected with a Brüel & Kjær Model 2260 Sound Level Meter. This meter complies with Type 1 tolerance requirements of the American National Standards Institute (ANSI) and was field calibrated before and after each measurement set with a Brüel & Kjær Model 4231 Acoustic Calibrator.

All unattended long-term sound level measurements were collected with a Brüel & Kjær Model 2238 Sound Level Meter. This meter complies with Type 2 tolerance requirements of ANSI, when fitted with the Model 4198 Outdoor Microphone Probe, and was also field calibrated before and after the 26-hour deployment. A calibration laboratory qualified the equipment within the preceding 12-month period using references traceable to the National Institute of Standards and Technology.

Monitoring Results

Background sound levels were generally controlled by insect and animal noises, mechanical noise from farm equipment, and distant traffic on I-10. As shown in Table I-1, short-term background (L90) measurements typically ranged from the mid-20s to mid-50s (dBA) and average background levels ranged from the mid-20s to the low-40s (dBA). At Location 2, long-term background ambient sound levels (L90) averaged about 31.

TABLE I-1 BACKGROUND SOUND LEVELS					
Ambient Survey Location	Description	Sound Level (L_{90}, dBA)			Audible Noise Sources
		Daytime	Nighttime	Average	
1	Nearest northeastern residence	23 – 26	26 – 27	25	Insect and animal noises
2	East	27 – 53	30 – 54	43	Mechanical noise from water pump at horse stables, insect and animal noises
3	Property line	27 – 37	36 – 42	34	Insect and animal noises, distant traffic on I-10, farm equipment
4	Nearest southern residence	40 – 44	32	38	Insect noises, railway passbys, distant traffic on I-10
5	West	25 – 30	37 – 41	33	Insect noises, distant traffic on I-10, distant railway passbys

Acoustical Modeling

The power station will utilize four combined-cycle gas turbine power trains and two steam turbines to generate a nominal electrical output of 1,000 MW. For purposes of this analysis, General Electric Frame 7FAs were modeled based on a conceptual general arrangement. The three-dimensional acoustical model of the facility was developed using SoundPlan Version 5.0 to predict noise levels at offsite receptors and along property boundaries. Far-field levels for modeled equipment were estimated using octave band sound power level data from General Electric, in-house measurement data and industry-standard prediction algorithms (Edison Electric Institute 1978). (Sound power levels provide a convenient means to describe the total amount of noise generated by a piece of equipment.)

Equipment power levels were adjusted for the reduction of sound with distance *(geometrical spreading),* absorption of sound by air *(air absorption*), and absorption and reflection of sound by the ground *(ground effect).* Sound levels were further adjusted by shielding effects (i.e., via tank farms, equipment, etc.) to predict far-field levels.

Results

Plant noise levels are predicted to be about 46 dBA at the nearest southern residence, 41 dBA at the nearest northeastern residence, and 38 dBA at the Desert Rest Cemetery. Similarly, levels at the property lines of the facility are predicted to range from 45 to 61 dBA.

Operational Sound Level Assessment

The Applicant is not aware of any quantitative noise ordinances, regulations or codes limiting the amount of noise generated during operation of the facility. In the absence of such standards, it is useful to compare expected plant sound levels to guidelines established by federal bureaus such as HUD and the EPA.

HUD Guidelines

HUD considers sites where day-night sound levels do not exceed 65 dBA, to be acceptable for housing. The day-night sound level, or LDN, represents a 24-hour measurement of noise within a community. More specifically, the LDN adds a 10 decibel penalty to all noises that occur from 10 p.m. to 7 a.m., to account for the potential of increased annoyance when people are relaxing, resting, and sleeping. Since the plant is a constant sound source that will operate 24 hours a day, the LDN is calculated by adding approximately seven decibels to the predicted plant sound level. Because the highest predicted plant sound level at nearby residences is 46 dBA, the estimated LDN becomes 53 dBA, (46 dBA + 7 dBA = 53 dBA) or significantly below the recommended HUD criteria (65 dBA) for acceptable sound levels.

EPA Guidelines

The EPA indicates that exposure to sound levels at or below LDN = 55 dBA is satisfactory to *"protect the public health and welfare with an adequate margin of safety,"* since it will not produce significant speech interference either indoors or outdoors, and will lead to negligible community reaction, complaints or annoyance in average communities. Given a plant LDN of 53 dBA, Facility noise levels at the nearest homes will fully conform to EPA guidelines.

Construction Sound Level Assessment

An acoustical model of construction operations and equipment was also developed using SoundPlan and industry standard algorithms (ESEERC 1977), to predict noise levels at nearby receptors. Five construction phases were considered, namely (1) grading and excavation, (2) concrete pouring, (3) steel erection, (4) equipment installation, and (5) finishing (assumes use of blow-down silencing during plant clean out). As shown in Table I-2, levels are predicted to range from the high-20s to mid-40s (dBA) at nearby receptors.

TABLE I-2 CONSTRUCTION SOUND LEVELS AT NEAREST RESIDENCES	
Southern Residence	36 to 46 dBA
Northeastern Residence	30 to 40 dBA
Desert Rest Cemetery	28 to 38 dBA

The average individual is likely to tolerate sounds associated with construction, given their temporary nature. Moreover, the majority of construction typically takes place during daytime hours, when acceptance towards noise is higher, and the risk of sleep disturbance and interference with relaxation activities is lower.

CORONA AND AUDIBLE NOISE

Corona is the breakdown of air very near conductors and occurs when the electric field is locally intensified by irregularities on the conductor surface such as scratches or water drops. Corona, as an issue for transmission lines, is most notable during rain or fog conditions. The physical manifestations of corona include a crackling or hissing noise and very small amounts of light. Besides the nuisance aspects of corona, it results in undesirable power loss over a transmission line. Therefore the design of transmission lines incorporates conductor and equipment, which limit corona. There are no standards or regulations pertaining to corona levels on electric power facilities.

RADIO/TELEVISION/ELECTRONIC EQUIPMENT INTERFERENCE

Although corona can generate high frequency energy, which may interfere with broadcast signals or electronic equipment, this is generally not a problem for transmission lines. The Institute of Electrical and Electronic Engineers (IEEE) has published a design guide (Radio Noise Subcommittee 1971) which is used to limit conductor surface gradients so as to avoid electronic interference.

Gap discharges or arcs can also be a source of high frequency energy. Gap discharges occur when an arc forms across a gap in loose or worn line hardware. It is estimated that over 90 percent of interference problems for electric transmission lines are due to gap discharges. Line hardware is designed to be problem-free, but wind motion, corrosion and other factors can create a gap discharge condition. Gap discharges can be located and when they occur can be remedied by utilities.

There are no local, state or federal regulations with specific limits on high frequency emissions from electric power facilities. Federal Communication Commission (FCC) regulations require that transmission lines be operated so that no harmful interference is produced (FCC regulations, Section 15.25).

CARDIAC PACEMAKERS

An area of public concern related to electric fields from transmission lines has been the possibility of interference with cardiac pacemakers. There are two general types of pacemakers: asynchronous and synchronous. The asynchronous pacemaker pulses at a predetermined rate. It is practically immune to interference because it has no sensing circuitry and is not exceptionally complex. The synchronous pacemaker, however, pulses only when its sensing circuitry determines that pacing is necessary. Interference from transmission line electric field may cause a spurious signal on the pacemaker's sensing circuitry. However, when these pacemakers detect a spurious signal, such as a 60 Hertz (Hz) signal, they are programmed to revert to an asynchronous or fixed pacing mode of operation, returning to synchronous operation within a specified time after the signal is no longer detected. Cardiovascular specialists do not consider prolonged asynchronous pacing a problem. As mentioned before, some pacemakers are designed to operate that way. Periods of operation in this mode are commonly induced by cardiologists to check pacemaker performance. So, while transmission line electric fields may interfere with the normal operation of some of the older model pacemakers, the result of the interference is generally not harmful, and is of short duration (EPRI 1985 and 1979).

REFERENCES

Edison Electric Institute. 1978. Electric Power Plant Environmental Noise Guide.

Electric Power Research Institute. 1985. Evaluation of the Effects of Electric Fields on Implanted Cardiac Pacemakers, EA-3917.

______. 1979. The Effects of 60 Hz Electric and Magnetic Fields on Implanted Cardiac Pacemakers, EA-1174.

Empire State Electric Energy Research Corporation. 1977. Power Plant Construction Noise Guide, BBN Report No. 3321.

Federal Communications Commission. Rules and Regulations, Part 15, Section 15.25.

Institute of Electrical and Electronics Engineers, Radio Noise Subcommittee. 1971. Radio Noise Design Guide for High-Voltage Transmission Lines, 70TP631-PWR.

EXHIBIT J
SPECIAL FACTORS: PUBLIC INVOLVEMENT

EXHIBIT J
SPECIAL FACTORS

PUBLIC INVOLVEMENT PROGRAM

Public involvement is a vital part of the environmental planning process, and will be integrated throughout the life of the Bowie Power Station Project. The primary objectives of the public involvement program are to establish and maintain communication, inform and educate, accurately identify and consider the issues and concerns of the community through the gathering of public comment, and ensure that public input is considered in the overall decision-making process.

A combination of informational materials, media contacts, and meeting formats was used to disseminate information and gather comment. The primary methods used are discussed below and included (1) community leader packets, (2) project newsletter and mailing list, (3) voice message telephone information line, (4) website, (5) media releases and paid display advertisements, (6) local official briefings and small group meetings, and (7) public open houses.

INFORMATIONAL MATERIALS

A variety of informational materials were developed to acquaint local community leaders and residents with the project, and to provide access to project information and team members. Materials were compiled into "leader" packets, which were distributed to local, county, state, and federal government officials and relevant agencies. A newsletter was developed for distribution to the general public, and a telephone information line and project website were established.

Leader Packet

Early in the project, a contact list of local and regional government and community leaders with a potential interest in the project was developed. Also included in this list were federal and state agencies, property owners, chambers of commerce, schools, and irrigation districts. Members of this list were identified based on their knowledge of the local community, professional position, and/or proximity to the proposed site.

The leader packet contents included a letter announcing the project, a fact sheet, site location map, as well as a listing of frequently asked questions and answers. These packets were distributed concurrently with a media release announcing the project and provided a team contact list as well. The leader packet materials and a list of recipients can be found in Exhibit J-1.

Project Newsletter and Mailing List

A newsletter was mailed in April 2001 to the residents of Bowie, Willcox, and San Simon, in addition to the members of the community leader list and an internal project mailing list. Addresses for these communities were purchased from a local mail house based on resident/occupant status and zip code. The internal mailing list was developed based on feedback from local community members who requested that they receive project information. In total, the newsletter was mailed to approximately 4,670 people.

The first newsletter introduced the project to the general public, and announced public open houses that would be held in April 2001. It provided a description of the proposed plant, as well as a concept depicting how it might appear. Environmental studies and public involvement opportunities that would occur throughout the project were also described. A comment form was included to solicit public feedback.

A second newsletter is planned for distribution in late summer or early fall 2001 to update the public on resource studies and other project developments. A copy of the first project newsletter can be found in Exhibit J-1.

Telephone Information Line

A toll free telephone information line, (877) 576-7477, regularly includes project updates and meeting dates. Callers have the opportunity to request to be added to the mailing list, express comments or questions, and/or request that a project team member return the call. The information line number has been advertised in the project newsletter and in paid advertisements. In total, nine telephone calls (as of July 24) have been received.

Website

A website, www.southwesternpower.com, was established to provide another avenue for the public to gather information. This website allows viewers to access the project newsletter, fact sheet, frequently asked questions sheet, and a graphic of a typical combined-cycle 500 MW block.

MEDIA CONTACTS

Early in the project, local, regional, and industry media contacts and publications were identified. Information was regularly provided to these contacts in an effort to keep the public informed of project activities. By distributing media releases and paid display advertisements, the project team attempted to ensure that interested citizens would have access to information and be notified about public meetings.

Media Releases

As of July 2001, two media releases have been distributed to the identified media contacts. The first was distributed in January 2001 and introduced the Applicant and the project to the public. It also summarized the project description and the local community benefits that are expected.

The second release, distributed in April 2001, announced the public open houses that would be held that month. A third release is expected at the time of the CEC application filing. Copies of the January and April releases can be found in Exhibit J-2. Related newspaper articles can also be found in this exhibit.

Paid Display Advertisements

To provide adequate time for the community to learn of and attend the April 25 and 26, 2001 public open house meetings, a paid display advertisement announcing the meetings was placed in two local papers. The ad was carried in the *Arizona Range News* and the *Eastern Arizona Courier* on April 18 and 25. The advertisement was also provided as a flyer to the Bowie Unified School District, which received 120 copies; Willcox School District, which received 500 copies; and San Simon School District, which received 130 copies. These flyers were distributed to inform student's parents of the open house meeting. A copy of the advertisement can be found in Exhibit J-2.

MEETINGS

A variety of meetings were held with elected officials, community members, agencies, and the public to relay information and gather comments. These meetings allowed the Applicant to become familiar with the community and be responsive to concerns and suggestions.

Local Official Briefings and Presentations

Early in the planning process, local elected and appointed officials were briefed on the proposed plant. These meetings offered an opportunity to identify the most effective methods of communicating with the public, additional key community members to brief, and possible issues regarding the Project. Based upon requests from local groups, additional presentations and meetings were held. A table detailing these meetings can be found in Exhibit J-3.

Public Open Houses

One set of open houses was held at two different locations to inform the public about the project and gather input. The first was held at the Willcox Community Center in Willcox on April 25,

2001. The second was held at the Bowie High School in Bowie on April 26, 2001. Both meetings were advertised through the project newsletter, telephone information line, media releases, and paid advertisements.

The open houses began with an open house format followed by a one-hour presentation and question and answer session. A total of 103 people attended and were provided with the opportunity to review informational displays and ask questions of team members. The presentation addressed topics such as project description, benefits, transmission requirements, and environmental studies. Questions from the public were recorded, and comment forms were available for attendees to provide written feedback. Through these meetings and public responses, the project team was able to identify community issues and concerns. Copies of the open house materials and displays can be found in Exhibit J-3.

ISSUE IDENTIFICATION AND PUBLIC FEEDBACK

Overall, the community has been very supportive of the project because of the economic boost and assistance it will provide towards revitalizing Bowie and neighboring communities. Questions have been received on natural gas supply reliability, water usage and source, financial backing of the project, employment opportunities, and the project's affect on utility prices. Other questions that were received or issues raised are summarized below.

- impact on the AEPCO plant
- history and ownership of SWPG and potential partnerships with other firms
- possibility of converting from natural gas to another type of fuel
- benefits the area will receive from the Project (the possibility of job opportunities, when those opportunities will be available, and if the local community will be given priority for the benefits)
- when the influx of workers will begin and where they will stay
- quantity of proposed power plants in Arizona
- affect of air quality from emissions
- what transmission corridors will be used and if any will cross BLM land
- if training will be provided to local residents to prepare for job opportunities
- where evaporative pond residue will go and if the ponds will be lined

EXHIBIT J-1
LEADER PACKET AND NEWSLETTER

LEADER PACKET

CONTACT LIST

Governor Hull's Office

Rick Collins, Chief of Staff

U.S. Senate

Senator John McCain
Senator Jon Kyl

U.S. House of Representatives

Congressman Jim Kolbe
Congressman Ed Pastor
Congressman J.D. Hayworth
Congressman Bob Stump
Congressman John Shadegg
Congressman Jeff Flake

Arizona State Senate

Senator Marsha Arzberger

Arizona House of Representatives

Representative Mark Maiorana
Representative Bobby Lugo
Representative Gail Griffin

Cochise County

Supervisor Les Thompson
Supervisor Paul Newman
Supervisor Mike Palmer
James Vlahovich, Director, Planning and Zoning
Linda Small, Director, Economic and Community Development

Graham County

Supervisor Terry Bingham
Terry Cooper, County Manager
Linda Bailey, Parks and Recreation Director
Will Wright, Planning and Zoning

City of Willcox

Mayor Marlin Easthouse

Arizona Corporation Commission

Commissioner Bill Mundell
Commissioner Jim Irvin
Commissioner Marc Spitzer
Deborah Scott, Director, Utilities Division

Chambers of Commerce

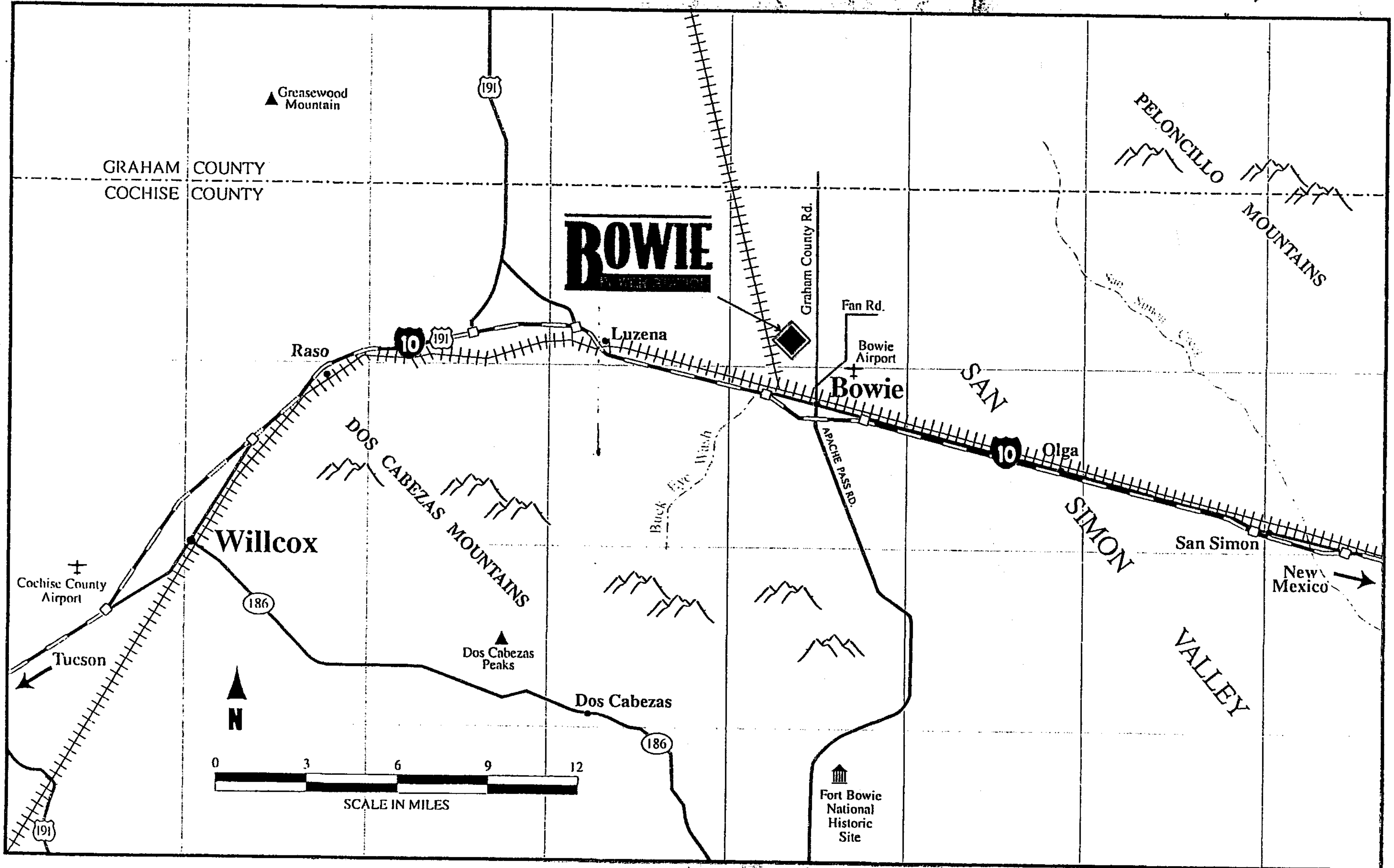
Bowie Chamber of Commerce
Eddie Browning, Executive Director, Willcox Chamber of Commerce & Agriculture

School Districts

T. Ellis, Bowie Unified School District, Superintendent
Lynn Setterstedt-Jarrett, Willcox Unified School District, Superintendent
Michael Reed, San Simon Unified School District, Superintendent

Utilities

Jack Davis, Executive Vice President, APS
Mark Bonsall, General Manager, Commercial and Customer Services, SRP
Jim Pignatelli, Chairman, President, CEO, TEP
Donald Kimball, Executive Vice President and GM, AEPCO
Steve Oldham, Sierra Pacific Resources



BOWIE POWER STATION

Bowie Power Station

Site Map

January 2001

BOWIE POWER STATION

Facility:
- *Power plant using combined-cycle, natural gas-fueled generation technology*

Specifications:
- *Up to 1,000 megawatts total capacity, enough electricity to serve approximately 250,000 homes*
- *Two 500 megawatt units, each configured with two combustion turbines supporting one steam turbine*
- *Two exhaust stacks per unit for proper air dispersion. Four total stacks - each approximately 130 to 160 feet tall*
- *Electricity will be delivered to the transmission grid via a connection with the existing Greenlee-Vail 345 kilovolt transmission line located to the north of Bowie Power Station site*

Location:
- *Approximately 2 miles north of Bowie, Arizona, in northern Cochise County (see map on back)*

Developer:
- *SouthWestern Power Group (SWPG) develops, constructs, owns, and operates natural gas-fueled power plants in the United States. SWPG staff has extensive experience in a variety of environmental engineering, power plant siting and construction, transmission line, and fuel procurement projects.*

Cost:
- *Up to $600 million*

Project Schedule:
- *Construction planned to begin in early 2002*
- *First unit expected to be in operation in early 2004*

Employment:
- *During construction - An average of 200 jobs up to 300 at peak periods*
- *Following construction - Up to approximately 45 full-time, permanent jobs will be created*
- *Payroll projected to be approximately $2 million annually*

Property Taxes:
- *Substantial tax revenues will benefit local schools and communities*

Environmental:
- *Groundwater use will be less than existing agricultural operation*
- *Air emissions in compliance with EPA and Cochise County limits*
- *State-of-the-art plant technology with lowest achievable emissions*
- *Sound reduction methods to minimize noise*

Site Advantages:
- *Proximity to natural gas pipeline*
- *Proximity to established electrical transmission*
- *Adequate water supplies on site*
- *Located on an existing railway*

More Information:
- *Contact SWPG at (602) 808-2004 or toll free at (888) 332-4599*

SOUTHWESTERN
Power Group II, LLC
An Energy Company - Alliance Builder

January 2001

BOWIE POWER STATION

F.A.Q.

Frequently Asked Questions

Project Description

Q: What is the project?

A: SouthWestern Power Group (SWPG) and Bowie Power Station, LLC have announced plans to build a combined-cycle, natural gas-fueled power generating station. The project will be constructed in phases to provide up to 1,000 megawatts (MW) total capacity.

Q: Where would the new facility be located?

A: In Cochise County, Arizona, approximately 2 miles north of the Bowie town center and Interstate 10, and 80 miles east of Tucson. The project site and surrounding area are primarily agricultural.

Q: Why was that location chosen?

A: There is a large amount of land available, providing a sufficient buffer area around the site, as well as adequate water and natural gas supplies to support the power station. Also, this location will enable SWPG to use energy generated at the Bowie facility to supply the existing electrical grid, supporting area industrial loads, Tucson power needs, or other power needs in Arizona.

Q: What is a combined-cycle plant?

A: Fueled by clean burning natural gas, today's combined-cycle plants generate inexpensive electricity utilizing the most innovative and efficient technology available. As the natural gas is burned, a combustion process turns a turbine connected to a primary generator. The resulting heat generates steam which turns a second turbine, essentially using the same heat energy twice (see attached diagram).

Q: When would the plant be built?

A: Construction is anticipated to begin in late 2002, with the first unit expected to be in operation in early 2004.

Q: What would the plant look like?

A: The plant will include two 500 MW power blocks. Each 500 MW block will consist of one steam turbine generator, two combustion turbine electric generators, two heat recovery steam generators, and two exhaust stacks. The project also includes plans for a switchyard, cooling towers, storage tanks, and other related facilities. Various types of site enhancements and landscape plans will be considered.

Q: How high would the "stacks" be? How many would there be?

A: The exhaust stacks will be up to approximately 160 feet tall. This height will be adjusted as necessary to allow for proper air dispersion. There will be two stacks for each of the two generating units, four stacks in all at the 1,000 MW level.

Q: Are there other combined-cycle, natural gas-fueled plants like this in Arizona?

A: Yes. Recent deregulation of the utility market has resulted in a number of proposed and approved gas-fueled power plant projects, many of which are combined-cycle.

SouthWestern Power Group II, LLC
An Energy Company - Alliance Builder.

Need

Q: Why is SWPG planning new generation?

A: *To meet the increasing electricity demands of current and forecasted growth in Arizona, new sources of power are needed. Deregulation of the utility industry has created a competitive market for the provision of that power. This is particularly the case in growing residential, commercial, and industrial loads in southern and southeastern Arizona.*

Q: Are any other new power plants planned for Cochise County?

A: *No new projects besides the Bowie Power Station have been announced in Cochise County. There is one existing power station in Cochise County southeast of Tucson. This 520 MW facility, known as the Apache Generating Station, is owned by the Arizona Electric Power Cooperative.*

Project Participants

Q: Who are SWPG and the Bowie Power Station, LLC? What experience do they have?

A: *SWPG is a developer of power plants throughout the United States and is headquartered in Phoenix, Arizona. The Bowie Power Station project is owned by Bowie Power Station, LLC; SWPG owns this entity. SWPG staff has extensive experience in a variety of environmental engineering, siting, fuel procurement, power plant construction, and transmission line projects. The firm currently has projects in development in Arizona and other states, including a 2,000 MW facility near Eloy, Arizona, known as the Toltec Power Station.*

Q: Will SWPG partner with any other energy companies on this project?

A: *Although no partner has been identified to date, other entities that can add strength to the project may be asked to join SWPG as project development progresses toward completion.*

Environmental

Q: What will be done to determine if the plant will cause environmental impacts?

A: *Extensive studies will be completed to evaluate potential impacts on air, water, visual, and noise resources. Biological and cultural resource studies will also be conducted. While minimal impacts are expected, detailed analyses will be performed to determine the best ways to further mitigate, or lessen, environmental effects.*

Air

Q: How would the plant affect local air quality? Would emissions meet air quality regulatory requirements?

A: *Fueled by clean natural gas and utilizing advanced air emissions control equipment, the plant's emissions will have a minimal impact on air quality. Both the U.S. Environmental Protection Agency (EPA) and Cochise County air quality requirements will be met and the ability to accomplish that must be demonstrated prior to receiving air quality permits. Emissions will be reduced to levels well within acceptable health standards established and enforced by local and federal agencies.*

Q: What components are in the air emissions?

A: *The emissions will contain nitrogen oxides, carbon monoxide, and fine particulate matter. However, the presence of these substances will not exceed any of the National Ambient Air Quality Standards.*

Water

Q: Does a combined-cycle plant use a significant amount of water? What would be the source for water?

A: *Combined-cycle plants typically use less water than other types of generating plants. Groundwater will supply the facility. The proposed plant would use no more water than the agricultural operations the plant would replace. It is SWPG's intent to allow some agricultural activities to continue on site for the life of the Bowie Power Station Project.*

Q: Will local agricultural and residential wells be affected by the groundwater drawdown?

A: *Since pumping for plant operations will be less than agricultural operations, negative impacts are not expected. However, an aquifer impact study will be performed by a qualified hydrological engineering firm to examine the potential effects.*

Q: What will happen to the plant wastewater?

A: *Lined evaporation ponds will be used to contain all plant wastewater. The plant is designed for zero discharge off the plant site.*

Visual

Q: What could be done to lessen the visual impacts of the plant?

A: *Possible mitigation measures include coloring the facilities to harmonize, to the extent possible, with existing landscape. A landscape plan that will adhere to county design standards will be developed.*

Noise

Q: How much noise would come from the plant?

A: *Audible noise from the plant will be mitigated with noise control technology, and will meet U.S. Department of Housing and Urban Development standards at property boundaries.*

Transmission Needs

Q: Will new transmission lines be needed?

A: *Yes, two alternative routes are being considered for one double-circuit 345 kilovolt (kV) line needed to connect the plant to the existing power grid. The transmission line will extend approximately 10 to 15 miles north to connect with an existing 345kV line in Graham County. These routes will be evaluated in conjunction with other studies in progress. Right-of-way needed for the transmission line will be acquired after the final route is selected.*

Financial

Q: Who would own the plant?

A: *Bowie Power Station, LLC will be the owner of the plant; SWPG owns Bowie Power Station, LLC.*

Q: How much would it cost? Who would pay for it?

A: *The proposed facility could cost up to $600 million phased in over time, and will be funded with SWPG earnings, borrowed capital, and other financial sources.*

Q: Would this project affect local electrical rates?

A: *Over time, the addition of the Bowie Power Station is expected to have the effect of reducing average retail rates due to greater generation supplies and competition.*

Community Benefits

Q: Would the community benefit from taxes paid on the plant?

A: *Yes. Substantial tax revenues would be generated each year for local schools and communities.*

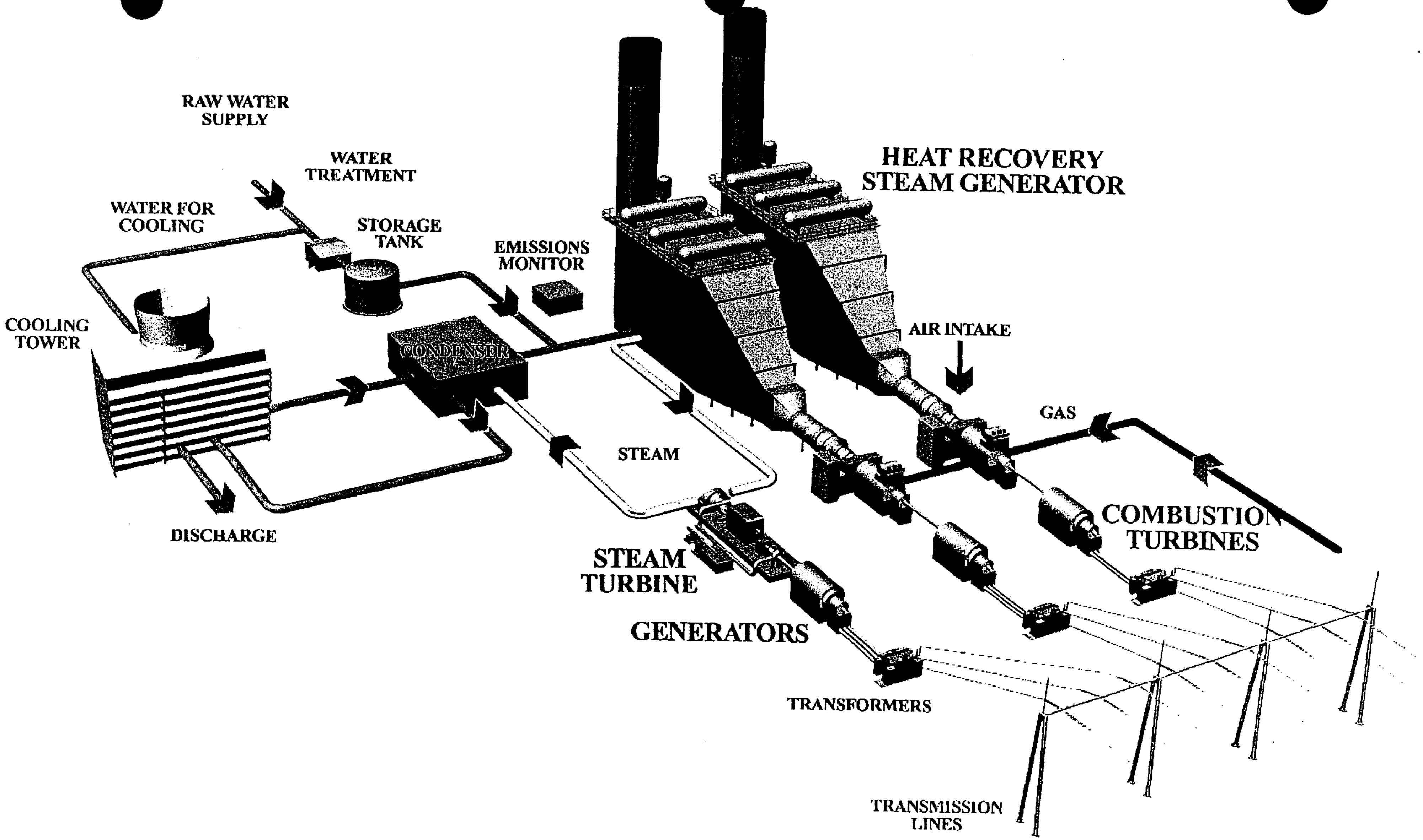
Q: How many jobs would be created for plant construction? For on-going operation?

A: *During construction an average of approximately 200 jobs, up to 300 at peak periods, will be created. Following construction approximately 45 full-time, permanent jobs will be created.*

Q: What would be the other benefits of this facility?

A:

- *It would meet the growing demand for power by using efficient, environmentally sound technology.*
- *Currently, California is experiencing critical power shortages and rolling blackouts, and Arizona came close to facing a similar situation last summer. New supplies would lessen the likelihood of similar negative impacts in Arizona.*



Typical Combined Cycle
Generating System Components: One 500 MW block

BOWIE POWER STATION

NEWSLETTER

BOWIE POWER STATION
NEWSLETTER #1 • APRIL 2001

Please join us at your choice of Public Open House locations to learn more about the Bowie Power Station!

Willcox, Arizona
Wednesday
April 25, 2001
Willcox Community
Center-Ballroom
312 W. Stewart

Bowie, Arizona
Thursday
April 26, 2001
Bowie
High School Gym
315 E. 5th Street

Times for both meetings:

5:30 p.m. - 6:00 p.m.
open house

6:00 p.m. - 7:00 p.m.
presentation/Q&A

7:00 p.m. - 7:30 p.m.
open house continues

New Power Generating Facility Planned Near Bowie, Arizona

SouthWestern Power Group II (SWPG) and Bowie Power Station, LLC have announced plans to develop the "Bowie Power Station," a natural gas-fueled, electric generating facility that will be located in Cochise County approximately 2 miles north of Bowie. Expected to generate 1,000 megawatts (MW) at total capacity, this plant will produce enough electricity to serve an estimated 250,000 homes. With the high rate of growth in southeastern Arizona, this new resource will significantly contribute to meeting the state's increasing energy needs. To link the power to the existing electricity grid, a new 345 kilovolt (kV) line will be built, extending 10 to15 miles north of the plant. **For more project information, see the "Quick Facts" on page 2.**

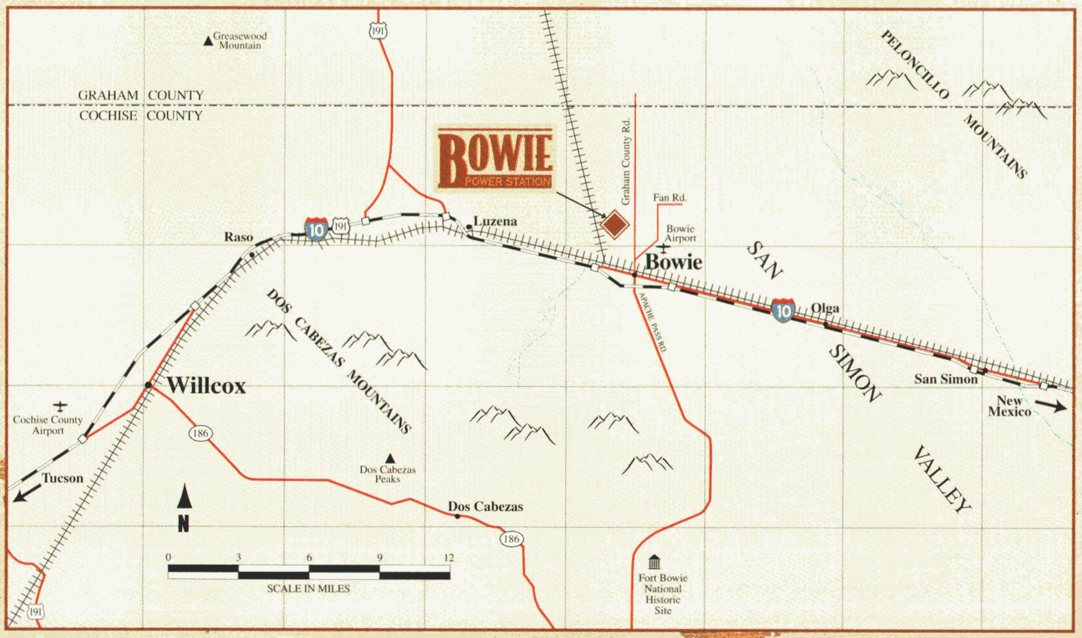
Project Offers Important Benefits for Local Community

SWPG makes every effort to establish strong relationships with local communities to ensure that they have the opportunity to share the economic benefits offered by a project like Bowie.

Because the proposed site is part of the Bowie community and lies within the Bowie Unified School District, the substantial tax revenues generated by the project each year will greatly benefit the school district and will reduce the rate of property taxes currently paid by residents.

In addition to tax revenues, regional businesses will be the recipients of an expected $2 to $4 million in purchases annually, once operation has begun. During construction of the facility, businesses will experience a growth in sales and secondary employment opportunities caused by the influx of workers, contributing to overall economic growth in the area.

In addition to the Bowie community, other neighboring communities such as San Simon, Willcox, and Safford will share in the benefits of this project, largely because of the number of employment opportunities generated by a project of this magnitude. During construction, an average of 200 jobs will be created, and about 45 permanent, full-time positions will be available during operation.



BOWIE POWER STATION

QUICK FACTS

- Two 500 megawatt blocks, each built with two combustion turbines supporting one steam turbine generator
- Up to 1,000 megawatts total capacity (phased in over time)
- Fueled by clean-burning natural gas
- Construction expected to begin in late 2002
- First unit expected to be in operation in late 2004
- Air emissions in compliance with Environmental Protection Agency (EPA) and Arizona Department of Environmental Quality (ADEQ) standards
- State-of-the-art plant technology with lowest achievable emissions
- Sound reduction methods to minimize noise
- Groundwater use will be less than existing agricultural water rights
- Average of 200 jobs created, up to 300 at peak, during construction
- 45 full-time, permanent jobs and support services created for plant operation
- Substantial tax revenues for local schools and communities
- One double-circuit 345kV transmission line extending 10 to 15 miles north of the plant will be required

Environmental Studies in Progress

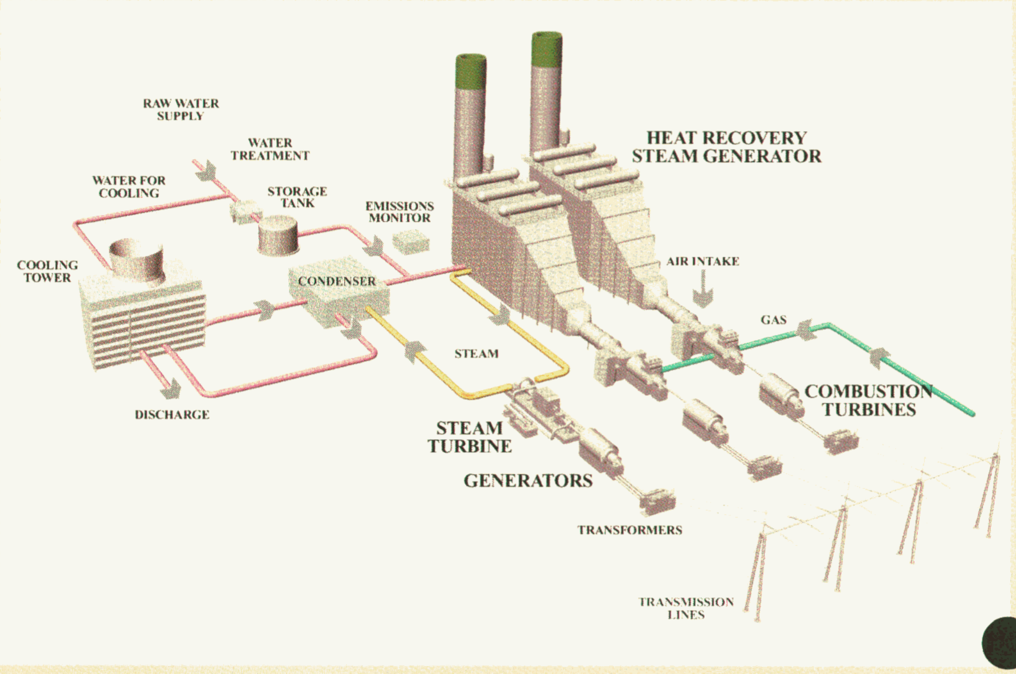
SWPG has retained environmental consultants to evaluate potential impacts on air, water, and visual resources. Biological and cultural resource studies and a noise analysis will also be conducted. Detailed analyses will be performed to determine the best ways to lessen environmental effects. Before the plant is built, several environmental permits must be granted by various agencies. These permits include air quality (ADEQ and EPA), zoning (Cochise County), and a certificate of environmental compatibility (Arizona Corporation Commission).

Opportunities for Public Involvement

Input from the community is vital to the planning process, and your participation is encouraged. A voice message information line (877-576-7477) has been established to provide project updates and offers callers the opportunity to ask questions, provide comments, or request to be added to the project mailing list.

Comments and questions may also be relayed by using the comment form inserted in this newsletter, or by attending the public open house meetings. These meetings offer a "drop-in" format for attendees to review displays and speak individually to project team members. A brief presentation and question/answer session will also be held. Please see page 1 for open house dates, locations, and times.

Typical Combined Cycle Generating System Components: One 500 MW block



BOWIE POWER STATION

APRIL 2001

COMMENT FORM

We want to hear your thoughts on the Bowie Power Station project. Your comments are important in helping us to identify ideas and issues associated with the project.

COMMENTS: ______________________________

MAILING LIST

If you would like to be included on the project mailing list, please clearly print your name and address below. If you would like a return call to discuss any questions or concerns you may have on the project, please note your questions above and include your phone number.

Name: ______________________________

Address: ______________________________

City, State, Zip: ______________________________

E-mail (optional): ______________________________

Phone Number (optional): ______________________________

BOWIE
POWER STATION

PLACE
POSTAGE
HERE

SOUTHWESTERN POWER GROUP II, LLC
4350 E. Camelback Road
Suite B175
Phoenix, AZ 85018

Frequently Asked Questions

Who is SWPG? Who would own the plant?

Headquartered in Phoenix, SWPG is a developer of power plants throughout the United States. Currently, the firm is in the process of permitting a 2,000 MW plant near Eloy, Arizona.

The Bowie Power Station project is owned by the Bowie Power Station, LLC; SWPG owns Bowie Power Station, LLC. Visit the SWPG website at www.southwesternpower.com for more information about the company.

Why is water needed? How much water will the plant use?

Combined-cycle facilities need water for cooling and steam production. Utilizing an internal recycling and treatment system, plant discharges are minimized and water is conserved. A sufficient groundwater supply exists to meet the demands of the Bowie Power Station. In fact, the facility will use less water than the agricultural water rights allocation for lands acquired for the project.

How will this facility affect air quality?

Because this facility will use advanced air emissions control equipment and clean-burning, natural gas fuel, minimal impacts on air quality are expected. In addition, to permit the facility, emissions must meet levels established and enforced by federal and state agencies. The facility must demonstrate the ability to adhere to these standards before any air quality permits will be granted.

How much noise will be heard?

Discernible noise depends largely on the proximity of local residences and the presence of existing sound levels. An acoustics specialist will gather information about the project and the surrounding area to determine the project noise level and compliance with U.S. Housing and Urban Development guidelines.

What will the power plant look like?

The conceptual image on page 2 shows what the facility could look like. Included in this image are the stacks, which will be approximately 130 to 160 feet tall, and the heat recovery steam generators.

How do the evaporative ponds work?

After the water is cycled several times through the cooling system, it is discharged into lined ponds. The pond water has a high mineral content, but would not contain any toxic chemicals.

Will new transmission lines be needed?

Yes, two alternative routes are being considered for one double-circuit 345kV line needed to connect the plant to the existing power grid. The transmission line will extend approximately 10 to 15 miles north to connect with an existing 345kV line in Graham County. The route alternatives, which will be shown at the April public open houses, will be evaluated in conjunction with other studies in progress. Right-of-way needed for the transmission line will be acquired after the final route is selected.

Where will the natural gas come from?

A new underground natural gas pipeline will be constructed to serve the plant site. The pipeline will connect with an existing El Paso Natural Gas main line located approximately 4½ miles south of the plant site.

SOUTHWESTERN
Power Group II, LLC
An Energy Company – Alliance Builder

4350 E. Camelback Road
Suite B175
Phoenix, AZ 85018

• Newsletter #1 •

Please join us at a Public Open House to learn more about the proposed Bowie Power Station (see page 1 for details)

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IMPORTANT NEWS ABOUT THE BOWIE POWER STATION!

BOWIE
POWER STATION

EXHIBIT J-2
MEDIA RELEASES, NEWSPAPER ARTICLES, PAID DISPLAY ADVERTISEMENTS

MEDIA RELEASES

SouthWestern
Power Group II, LLC
An Energy Company - Alliance Builder

NEWS RELEASE

Date: April 18, 2001
Contact: Tom Wray, Project Manager
(602) 808-2004
toll free (888) 332-4599

COMMUNITY INVITED TO BOWIE POWER STATION PUBLIC OPEN HOUSE MEETING

(PHOENIX) April 18, 2001 – SouthWestern Power Group II (SWPG), a Phoenix-based energy resource development company, and Bowie Power Station, LLC, will hold a set of two public open house meetings regarding the proposed Bowie Power Station. Each meeting will offer the opportunity for the public to learn more about the project and provide input into the planning process.

The first open house will be held Wednesday, April 25, 2001, at the Willcox Community Center, 312 W. Stewart, in Willcox. The second is scheduled for Thursday, April 26, 2001, at the Bowie High School gymnasium, 315 E. 5th Street, in Bowie. Both meetings offer an informal, "drop in" open house format beginning at 5:30 p.m. At approximately 6:00 p.m. a brief presentation will be given, followed by a question/answer period. Following the presentation portion, the meeting will return to the open house format to offer community members time to review informational displays and speak individually with project team members.

The Bowie Power Station, a generation facility planned to be located approximately 2 miles north of the community of Bowie in Cochise County, is expected to produce 1,000 megawatts at full capacity—enough electricity to serve 250,000 homes. Using state-of-the-art combined cycle, natural gas-fueled technology, the facility is planned to be in operation in late 2004, with construction beginning in late 2002.

A toll-free voice message information line, 877-576-7477, has been established to provide brief project updates and a method for the public to request more information. The first project newsletter was recently mailed to area residents; copies may be requested by calling the phone line noted above.

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4350 East Camelback Road · Suite B175 · Phoenix, Arizona 85018
P.O. Box 15491 · Phoenix, Arizona 85060
888.332.4599 · Tel 602.808.2004 · Fax 602.808.2099
www.southwesternpower.com

SOUTHWESTERN
Power Group II, LLC
An Energy Company - Alliance Builder

NEWS RELEASE

Date: January 31, 2001
Contact: Tom Wray, Project Manager
(602) 808-2004
toll free (888) 332-4599

SOUTHWESTERN POWER GROUP II ANNOUNCES DEVELOPMENT OF 1,000 MEGAWATT BOWIE POWER STATION

Approximately $600 Million Energy Project Planned for Cochise County --- Will Generate New Jobs, Enhance Local and School Tax Revenues

(PHOENIX) January 31, 2001 – SouthWestern Power Group II (SWPG), a Phoenix-based energy resource development company, announced plans today to develop the "Bowie Power Station," a new generation facility to be located approximately 2 miles north of Bowie, Arizona in northern Cochise County. Expected to produce 1,000 megawatts at full capacity, the power plant will utilize state-of-the-art combined cycle, natural gas-fueled technology.

With the high growth in southern Arizona, this new resource will significantly contribute to meeting increasing electricity needs. Construction is planned to begin in late 2002, with the first of two units in operation in early 2004. New jobs will be created and millions of dollars in property tax revenues will be generated, offering significant benefits to local schools and communities.

Supervisor Les Thompson of the Cochise County Board of Supervisors said, "The Bowie power plant would be a welcome addition to Cochise County. I look forward to working with SWPG and I will do what I can to help this project become a reality."

Larry Raines, Willcox City Manager, expressed a similar view. "It is extremely exciting when an economic development project of this magnitude arises. The impact to our community through assessed valuation and job creation will be well received," he said.

"SWPG looks forward to a growing and beneficial relationship with the community and to participate in and enhance the existing local business economy," said Maurice Richard, SWPG General Manager. "The planned technology and investment by SWPG will increase the asset base of the region, generate direct and indirect growth and revenue to the County, as well as provide 'state of the art' type employment opportunities during construction and throughout the expected 40-year operation of the facility."

Environmental studies have recently begun and public outreach efforts are planned to inform community members as well as encourage their participation throughout the planning process.

SWPG develops, constructs, and owns natural gas-fueled power plants in the United States. By forming alliances with customers and other service providers, SWPG is able to bring successful projects to the market. The company recently announced a similar generation project near Eloy, Arizona and has several projects under review in other states.

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NEWSPAPER ARTICLES

ARTICLES PUBLISHED ON PROJECT		
Article Title	**Publication**	**Date**
Proposed SWPG power plant to be located in Bowie	Arizona Range News	January 31, 2001
Developer plans 1,000-MW unit in Arizona	Megawatt Daily	February 1, 2001
SouthWestern Power puts spark in Cochise County with new plant	The Business Journal	February 16, 2001
Chamber meeting features Bowie Power Plant	Arizona Range News	March 28, 2001
Bowie Power Station Open House today in Willcox, Thursday in Bowie	Arizona Range News	April 25, 2001

ARIZONA
Range News
Willcox • San Simon • Sunsites • Bowie • Cochise • Dragoon
Willcox, Arizona

Proposed SWPG power plant to be located in Bowie in in

Arizona Range News
January 31, 2001

01/31/01
Ainslee S. Wittig

In the wake of a string of power shortages and rolling blackouts in California, Southeast Arizona is preparing for the future. Construction of a new power generation facility in Bowie, capable of producing 1,000 megawatts at full capacity, will begin in late 2002, said Project Manager Tom Wray of SouthWestern Power Group II, a Phoenix-based energy resource development company. The 'Bowie Power Station' is to be located about two miles north of Bowie on Graham County Road, but within Cochise County. Wray said SouthWestern Power Group (SWPG) chose the site for its optimum proximity to gas pipelines and electrical transmission lines and well as other "optimum perspectives." The plant, which will cost about $600 million, will use "state-of-the-art combined cycle, natural gas-fueled technology," instead of coal, which neighboring Arizona Electric Power Cooperative's Apache Generating Station uses, Wray said Friday. Wray said he does not think the new facility will "have any negative impact, or any impact at all" on AEPCO's plant, especially with the high demand for power. The facility, when completed, will generate enough energy (1,000 megawatts) to serve about 250,000 homes. The Apache Generating Station is a 520-megawatt facility. AEPCO's Apache Station, which has the capability of both coal and natural gas-fueled generation, has a contract with Sulphur Springs Valley Electric Cooperative (because SSVEC has partial ownership of AEPCO), and therefore the new plant will not be in direct competition with it, said Wayne Crane of SSVEC. Dennis Criswell, AEPCO assistant general manager of marketing and customer service, had just learned about the proposed project, and said, "We're looking forward to finding out more about the project." Crane, SSVEC's public relations director, said, "It won't be competition here, but the silver lining here is the economic benefit for this valley. But if it's a tight market in the next few years, and deregulation changes and makes a sudden turnaround, you never know what can happen." Bowie, Willcox and the surrounding areas will benefit from the project through the generation of millions of dollars in property tax revenues as well as other sales-type tax revenues, such as the transaction privileges tax on natural gas purchases and taxes on other needed materials. These tax revenues will benefit the Bowie School District and the Northern Cochise Community Hospital district, Wray said. About 45 full-time permanent jobs will be created when the plant is in operation, with an annual payroll of about $2 million; and 200 to 300 jobs will be available during the year to year and a half period of construction, Wray said. Willcox City Manager Larry Rains said, "It is extremely exciting when an economic development project of this magnitude arises. The impact to our community trough assessed valuation and job creation will be well received." "We believe there will be from 45 or more good-paying jobs, that may be hired from the Willcox and Bowie communities, and these employees will be spending their money in our communities. I think the Bowie plant will have a similar impact as AEPCO has had on our community," Rains said. Rains said SWPG has been discussing the project for about nine months; and Wray said SWPG began negotiations with two Bowie landowners, Tom Cooke and Dick Eastman, about three months ago. Willcox Chamber of Commerce and Agriculture Executive Director and Economic Development Director Eddie Browning said the project must go through the permitting process with Cochise County, which will include public hearings. "There has been a lot of work going on behind the scenes up to this point; and now there will be a lot of questions that need to be answered and an open house will be helpful," Browning said. He added, "One thing this does tell me is that you never know who, where or when people are looking at our community, and we must be doing economic development all the time. They (SWPG) didn't get this farwithout seeing the positives of the area." Cochise County Supervisor Les Thompson said, "The Bowie power plant would be a welcome addition to Cochise County. I look forward to working with SWPG and I will do what I can to help this project become a reality." Wray said SWPG planned the new facility, among others in the state and nationwide, to meet increasing electricity demands and those of current and forecasted growth in Arizona. Deregulation of the utility industry has created a competitive market for the provision of this power, especially in higher growth areas such as southern and southeastern Arizona, he said. SWPG is also planning to open a 2,000-megawatt facility near Eloy, named the Toltec Power Station, for which they have two informational open houses set for Tuesday, Jan. 30 and Wednesday, Jan. 31, in the Eloy area. Wray said the company would like to have open houses in at least Willcox and Bowie sometime within the next 60 days to make presentations, answer questions and hear concerns. "We'd rather have reactions from the community sooner rather that later, before we get to far into the development process. We pride ourselves on working closely with the local communities," he said. Environmental studies to help determine the orientation of the plant have already begun at the site. Wray said meteorological towers about nine meters tall have been installed to collect data including air chemistry and weather data, which will help determine how the plant will be set up. He said SWPG's facility will have minimal impact on air quality and U.S. Environmental Protection Agency and Cochise County air quality requirements

Protection Agency and Cochise County air quality requirements will be met, with emissions reduced to levels well within acceptable health standards. "We don't emit sulfur dioxide as coal plants do. Our most prominent emission is nitrous oxide (NO2), and we mitigate that with the use of selective catalytic reduction until it is less than three parts per million to meet air quality standards," Wray said. He added that groundwater will supply the plant, and the proposed facility will use no more water than the agricultural operations it is replacing. The proposed combined-cycle plant will be made up of two 500-megawatt power blocks, each consisting of a steam turbine generator, two electric generators, two heat recovery steam generators and two exhaust stacks, up to 160-feet tall each. Wray said the first of the two units is expected to be in operation by early 2004. Public hearings and presentations will occur during the development process, as applications for the Air Quality Permit and Certification of Environmental Compatibility are submitted. And Wray said questions and concerns may be brought to his attention anytime by calling (602) 808-2004 or toll free, 1-888-332-4599.

Megawatt Daily
February 1, 2001

Developer plans 1,000-MW unit in Arizona

Arizona-based power developer Southwestern Power Group II said yesterday it is planning a 1,000-MW generating unit in Cochise County, Ariz., its second project in the state.

The two-unit Bowie Power Station is expected to begin commercial operation in 2004, Southwestern officials said. Construction is expected to begin late next year.

Southwestern has under development the 2,000-MW Toltec Power Station, which it announced in November. Previously, the group began initial development on an Arizona project it sold to Panda Energy. ML

The Business Journal
February 16, 2001

SouthWestern Power puts spark in Cochise County with new plant

BY RANDI WEINSTEIN
THE BUSINESS JOURNAL

SouthWestern Power Group II, a Phoenix energy resource development company, plans to build a 1,000-megawatt power plant in northern Cochise County.

The Bowie Power Station, about 200 miles southeast of the Valley, will use combined-cycle, natural-gas fueled technology.

Tom Wray, project development manager for the plant, said about 250 jobs will be created at peak construction of the facility, with 45 long-term positions.

The facility also will raise between $2 million and $4 million a year in property taxes that will go to the Cochise County school district, he said.

"The Bowie power plant would be a welcome addition to Cochise County," said Les Thompson, a member of the county board of supervisors. "I look forward to working with SWPG and I will do what I can to help this project become a reality."

In addition to the proposed Bowie plant, SouthWestern Power Group has about five other facilities in the works.

The company is wrapping up the permitting process on its proposed Toltec Power Station south of Eloy, about 70 miles south of Phoenix.

Wray said he expects to have all the necessary permits for the facility by the end of this year so the company can move ahead with construction by the first quarter of 2002.

The other plants are planned for out of state, he said.

The permitting process for the Bowie plant, however, has just begun. The company must receive numerous permits from environmental, zoning and land use agencies, as well as final approval from the Arizona Corporation Commission before that facility can move forward.

Construction is planned to begin in late 2002, with the first of two units in operation by early 2004.

FOR MORE

- **SouthWestern Power Group II:** www.southwesternpower.com

SouthWestern Power Group is a 3-year-old company with plans to enter into the wholesale power market.

California is not likely to see any of the power generated by SouthWestern Power's plants, Wray said.

"Plants around Palo Verde are in much better position to sell to California than we would be," he said. "Our power will likely stay in state."

Chamber meeting features Bowie Power Plant

Arizona Range News
March 28, 2001

CAROL BROEDER
AINSLEE S. WITTIG
Arizona Range News

Tom Wray, project development manager of the Southwestern Power Group II, LLC was the featured speaker at the Willcox Chamber of Commerce and Agriculture meeting March 6.

Wray told Chamber members that SWPG has a 1,000 megawatt (MW) facility proposed near Bowie, and a 2,000 MW facility in development near Eloy, known as the Toltec Power Station, among other power stations.

SWPG has plans to build a combined-cycle, natural gas-fueled power generating station two miles west of Bowie, with an entrance off Graham County Road.

SWPG will hold two public meetings, including short presentations about the proposed project: one at Bowie High School and one at the Willcox Community Center in late April, a couple of days apart, so that people have a chance to ask questions and air concerns. Wray said he'd like to file an application for the Bowie project with the Arizona Corporation Commission in May.

He said the project has been sited in such a way to be able to expand, and will be constructed in two phases of 500 MW each, to provide up to 1,000 MW total capacity.

The power plant will include two 500 MW, each of which will consist of one steam turbine generator, two combustion turbine electric generators, two heat recovery steam generators, and two exhaust stacks, according to Wray.

Wray said the plant will have a combined cycle configuration, which means that as the natural gas is burned, a combustion process turns a turbine connected to a primary generator. The resulting heat generates steam, which turns a second turbine, which Wray explained is a way to collect waste heat and re-use it.

The project is estimated to cost up to $600 million, he said.

Wray said the air emissions will contain nitrogen dioxide and carbon monoxide, but the presence of these substances will not exceed any of the National Ambient Air Quality Standards.

It will be very much like Apache Generation station, owned by Arizona Electric Power Cooperative (AEPCO), he added, except the SWPG power station will run only using natural gas and not by coal, as AEPCO can use.

Wray said it will take at least 14 months to get the more than 50 permits required for licensing. Permits take a long time, according to Wray, and the longest time is for the air quality permit. Wind River is their environmental consultant.

Wray said another of the permits to be obtained is the aquifer protection permit. An aquifer impact study will be performed by a hydrological engineering firm and lined cooling (evaporation) ponds will be used to contain all plant waste water, according to Wray.

The project is subject to the approval of the Arizona Corporation Commission. Wray said numerous reports go into the application, and the commission has 60 days to approve it, remand it, or reject it entirely.

Construction is scheduled to begin in late 2002, with the first unit operational in early 2004.

It should take 18 months to construct one 500 MW plant, employing 200-300 people. The plant expects to employ about 40 to 50 full-time permanent jobs following construction of both facilities, Wray said.

Wray said the firm will hire any local people they can to work at the plant, which has a $2 million projected payroll annually.

"We'd like to train local people to transition to operate the plant — it requires training, but it does wonders for acceptance to have your neighbors working in the plant," Wray said.

Property taxes will benefit the

See POWER, page 6

Bowie and San Simon school and Willcox hospital districts with about $2.5 to $3.5 million per year.

In addition, workers coming from out of town will need temporary housing. Many workers will live in recreational vehicles and put their children in local schools, Wray said.

Schools may need temporary buildings during construction, according to Wray. The effected school districts will be San Simon, Willcox and Bowie. "At Toltec, we have placed temporary portable buildings at the schools during construction to help out," he said.

La Donna Burgess, from Sulphur Springs Valley Electric Cooperative (SSVEC), asked about long-term gas supplies, which Wray replied would be natural gas from El Paso Natural Gas company.

Wray added that besides its proximity to a natural gas pipeline, other advantages to the Bowie site include a railway nearby.

Earl Moser of Willcox Real Estate asked if any of the power would go locally. Wray said the vast majority of the power could

See POWER, page 12

Power

continued from page 6

go to Tucson and Phelps Dodge in Clifton-Morenci.

Moser replied it would be local if you consider Southeastern Arizona to be local.

Wray added that the Bowie Power Station plans to join the Willcox Chamber of Commerce and work with the community.

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Carol Broeder/Range News

Tom Wray of the SWPG, LLC, standing, fields questions from Chamber of Commerce and Agriculture members at their Quarterly Membership meeting March 6.

ARIZONA
Range News
Willcox, Arizona

Arizona Range News
April 25, 2001

Bowie Power Station Open House today in Willcox, Thursday in Bowie

04/25/01
Email this story to a friend

SouthWestern Power Group II (SWPG), a Phoenix-based energy resource development company, and Bowie Power Station, LLC, will hold a set of two public open house meetings regarding the proposed Bowie Power Station. Each meeting will offer the opportunity for the public to learn more about the project and provide input into the planning process.

The first open house will be held today, Wednesday, April 25, at the Willcox Community Center, 312 W. Stewart, in Willcox. The second is scheduled for Thursday, April 26, at the Bowie High School gymnasium, 315 E. 5th Street, in Bowie. Both meetings offer an informal "drop in" open house format beginning at 5:30 p.m. At about 6 p.m., a brief presentation will be given, followed by a question/answer period. Following the presentation portion, the meeting will return to the open house format to offer community members time to review informational displays and speak individually with project team members.

The Bowie Power Station, a generation facility planned to be located approximately 2 miles north of the community of Bowie in Cochise County, is expected to produce 1,000 megawatts at full capacity — enough electricity to serve 250,000 homes. Using state-of-the-art combined cycle, natural gas-fueled technology, the facility is planned to be in operation in late 2004, with construction beginning in late 2002.

A toll-free voice message information line, 1-877-576-7477, has been established to provide brief project updates and a method for the public to request more information. The first project newsletter was recently mailed to area residents; copies may be requested by calling the phone line noted above.

PAID DISPLAY ADVERTISEMENTS

PUBLIC INFORMATION OPEN HOUSE

SouthWestern Power Group (SWPG), a Phoenix-based energy development firm, and Bowie Power Station, LLC, invite the community to a public meeting regarding the Bowie Power Station, a proposed power plant to be located approximately 2 miles north of Bowie.

WILLCOX	BOWIE
Wednesday, April 25, 2001	Thursday, April 26, 2001
Willcox Community Center - Ballroom	Bowie High School - Gym
312 W. Stewart	315 E. 5th Street

The schedule for both meetings is as follows:

- **5:30 p.m. - 6:00 p.m.** • **open house**
- **6:00 p.m. - 7:00 p.m.** • **presentation**
- **7:00 p.m. - 7:30 p.m.** • **open house continues**

The meeting will begin with an informal "drop in" open house format to offer the opportunity for community members to review project maps and displays, provide comments, and speak individually with project team members. At 6:00 p.m., a brief presentation will be held followed by a question/answer session.

For additional information, please call the project voice message information line (toll-free) at (877) 576-7477.

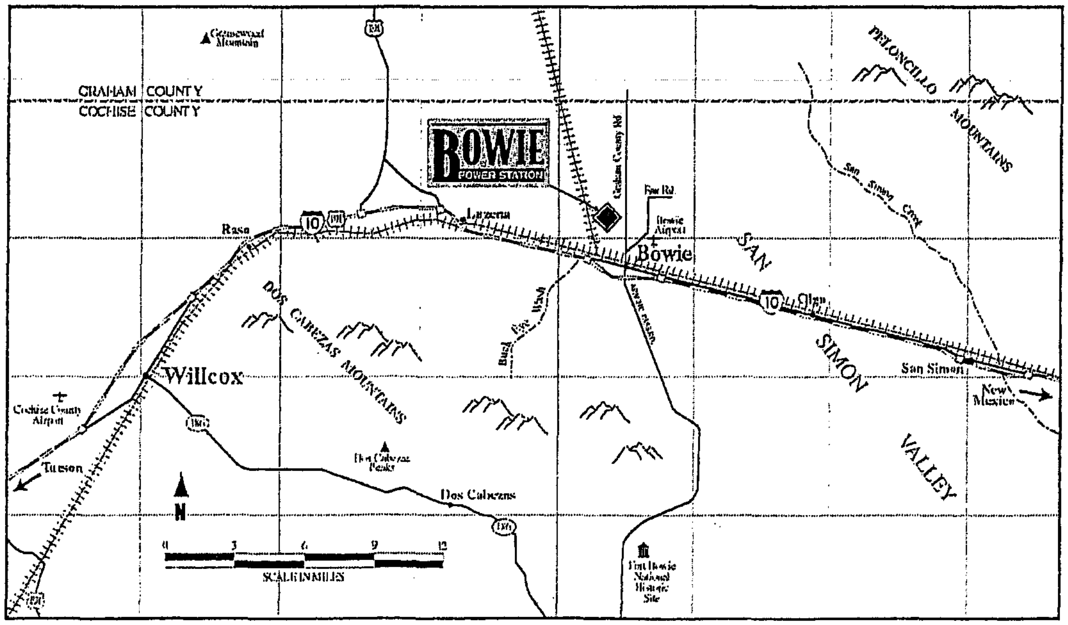

EXHIBIT J-3
LOCAL BRIEFINGS AND PUBLIC MEETINGS

LOCAL BRIEFINGS

BOWIE POWER STATION PROJECT
GOVERNMENT AND COMMUNITY MEETINGS AS OF JUNE 22, 2001

Date	Group or Person	Organization/Affiliation	Comments/Notes
2/20/01	Les Thompson, Chairman and Jody Klein, County Administrator	Cochise County Board of Supervisors	General project overview. County asked SWPG to keep P&Z informed. They also had general questions about employment.
2/21/01	Dick Eastman	Land owner	General project overview. SWPG asked permission to place a meteorological tower on property; it was okayed.
2/21/01	Mark Cook	Land owner	General project overview. SWPG asked permission to place a meteorological tower on property; it was okayed.
2/21/01	Calvin Allred	Attorney	General project overview.
2/21/01	Michael Bobee, Chief	Bowie Fire Department	General project overview. Mr. Bobee noted that plant may put stress on his staff during construction. He is supportive of the project.
2/21/01	Jody Johnson	Bowie Unified School District	General project overview. Discussed possibility of unifying San Simon/Willcox/Bowie school districts.
2/21/01	Mick Easthouse, Mayor; Larry Raines, City Manager	City of Willcox	General project overview. City noted they are in the running for a federal prison that would add construction jobs at about the same time that Bowie construction jobs would be needed.
2/21/01	Eddie Browning, Executive Director	Willcox Chamber of Commerce & Agriculture	General project overview.
2/21/01	Chris Cronberg, CEO	Northern Cochise Community Hospital	General project overview.
2/27/01	Lynn Setterstedt-Jarrett, Superintendent	Willcox Unified School District	Project introduction and discussion of the impact to the school district. General questions were received on classroom impact and the accommodation of new students during construction and operation.
3/6/01	Chamber members	Willcox Chamber of Commerce & Agriculture	General project overview; announced public open houses. Question asked about long-term gas supplies and where the power will go.
3/7/01	T.R. Ellis, Superintendent	Bowie Unified School District	General project overview. Discussed impact to school district.
3/8/01	Dr. Lynn Setterstedt-Jarrett, Superintendent	Willcox Unified School District	General project introduction. Questions about classroom impact and the accommodation of new students during construction and operation.
3/8/01	Michael Reed, Superintendent	San Simon Unified School District	General project introduction. Discussion of the impact to the school district. Questions were about the classroom impact and job possibilities.
06/05/01	Chamber members	Willcox Chamber of Commerce	Monthly chamber meeting, presented checks to Cowboy Hall of Fame and Economic Development fund.

PUBLIC MEETINGS

BOWIE POWER STATION

PROJECT PARTICIPANTS

Bowie Power Station, LLC (owned by SouthWestern Power Group II, LLC)

- project sponsor

Consultants and Advisors

Environmental Planning Group (EPG)

- conduct and facilitate environmental planning process and public involvement activities

RW Beck

- project design engineering and electrical system planning studies

Wind River Environmental Group

- air quality studies and permit applications

Michael Theriault Acoustics

- sound level analysis and noise control engineering

URS

- water resources studies

SOUTHWESTERN Power Group II, LLC
An Energy Company - Alliance Builder

APRIL 2001

BOWIE
POWER STATION

PROJECT DESCRIPTION/ SITE ATTRIBUTES

Project Description

- up to 1,000 MW total capacity (two 500 MW blocks)
- natural gas-fueled, high efficiency, low emission technology
- combustion and steam turbines
- interconnection to existing 345 kilovolt transmission lines
- location: 2 miles north of Bowie

Site Attributes

- ample land and water supply
- existing land area "buffer" surrounding plant site
- near both rail and interstate highway for equipment delivery
- close to existing transmission lines

SOUTHWESTERN
Power Group II, LLC
An Energy Company – Alliance Builder

APRIL 2001


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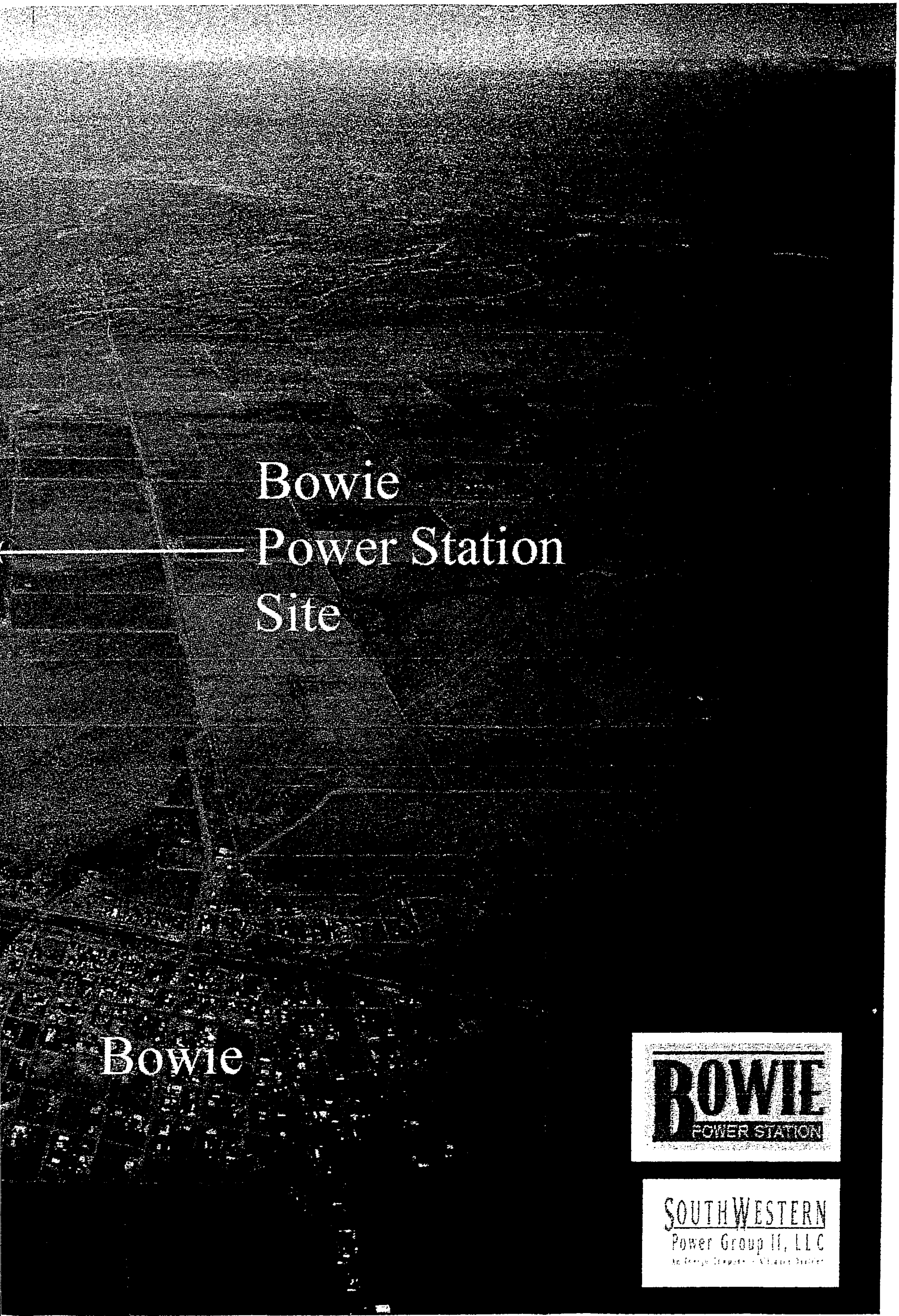
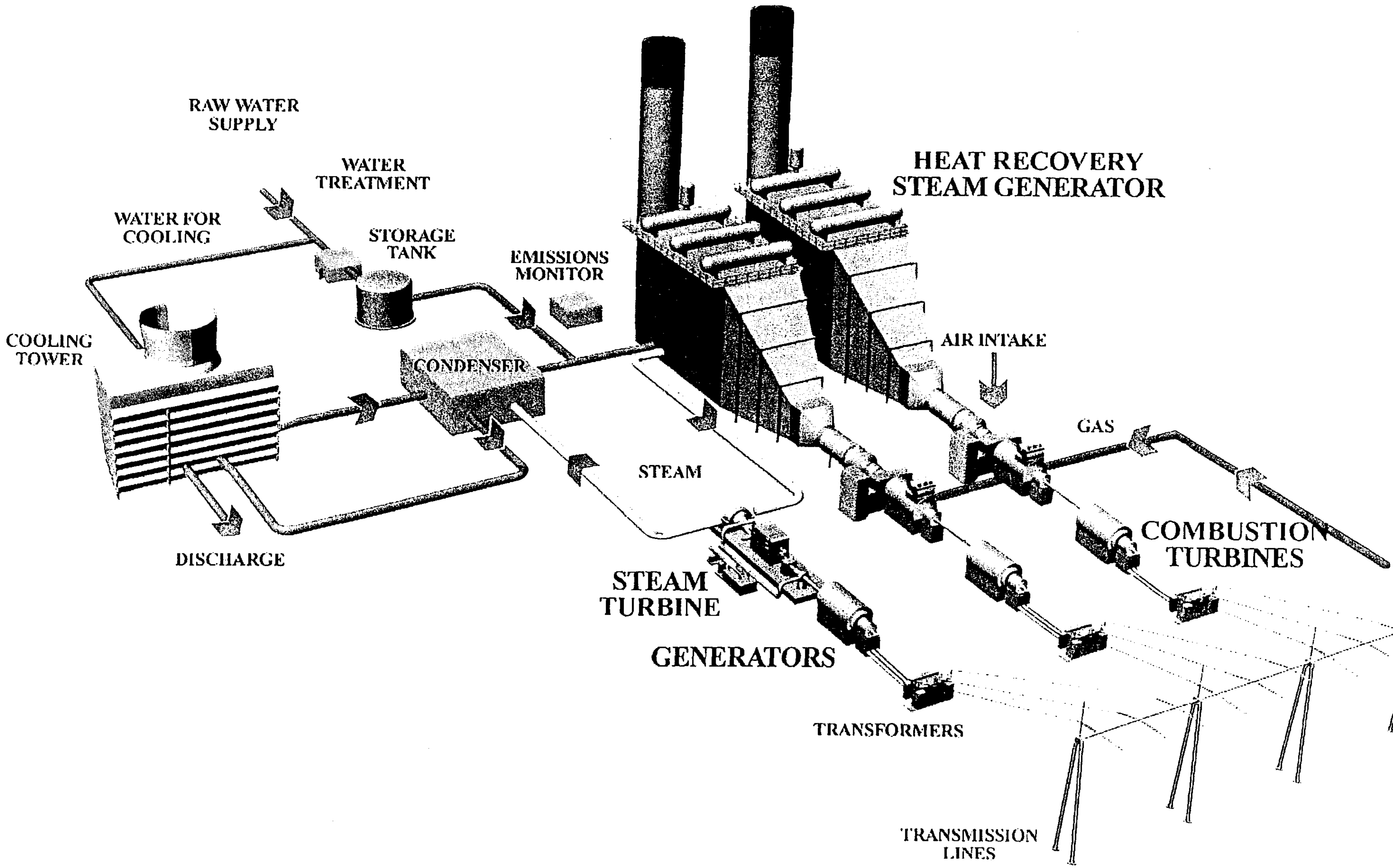
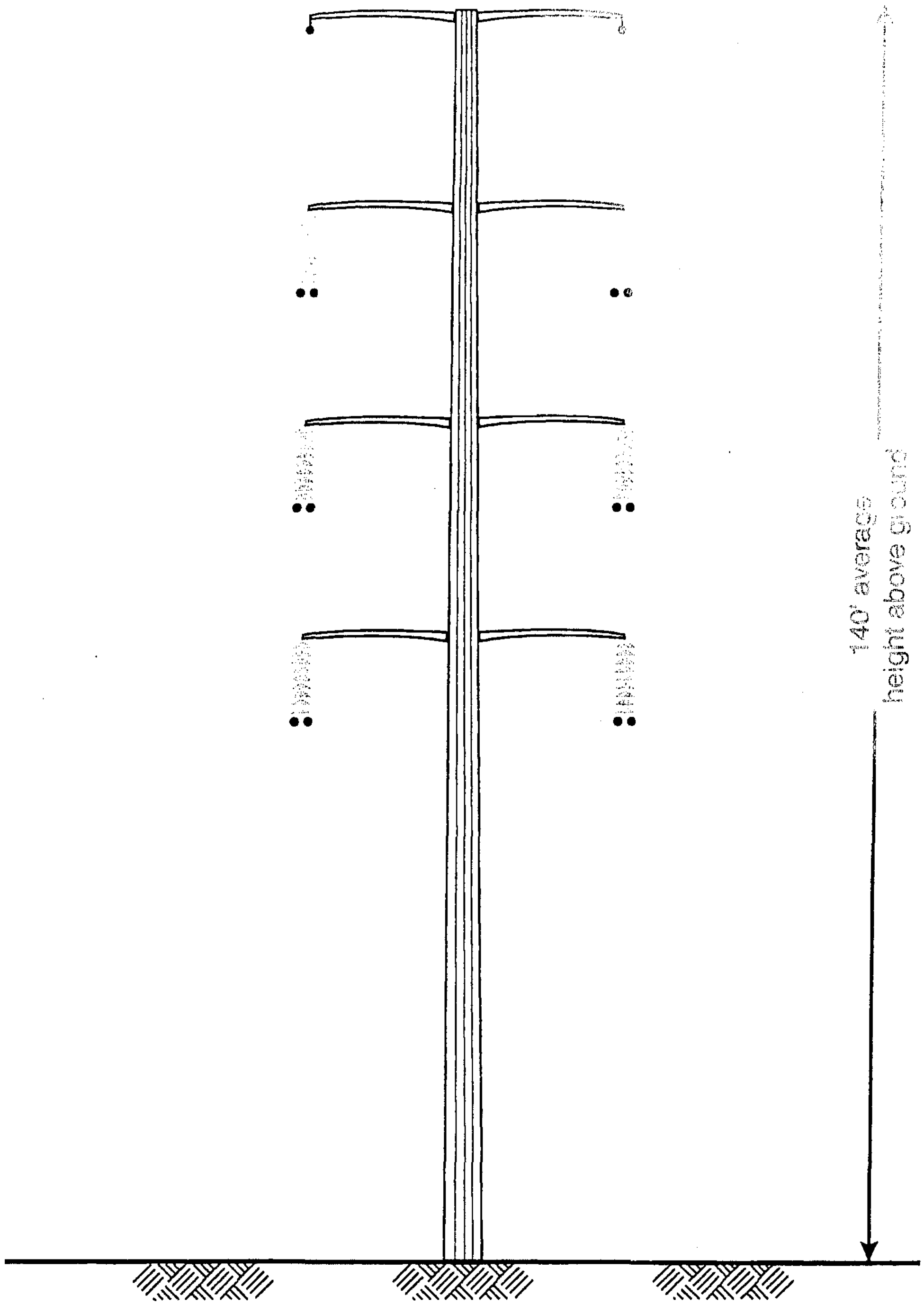

Bowie
Power Station
Site
Bowie
BOWIE
POWER STATION
SOUTHWESTERN
Power Group II, LLC



Typical Combined Cycle
Generating System Components: One 500 MW block

BOWIE POWER STATION

TYPICAL STRUCTURES



Typical Single Pole 345kV Structure double-circuit

BOWIE POWER STATION

BOWIE
POWER STATION

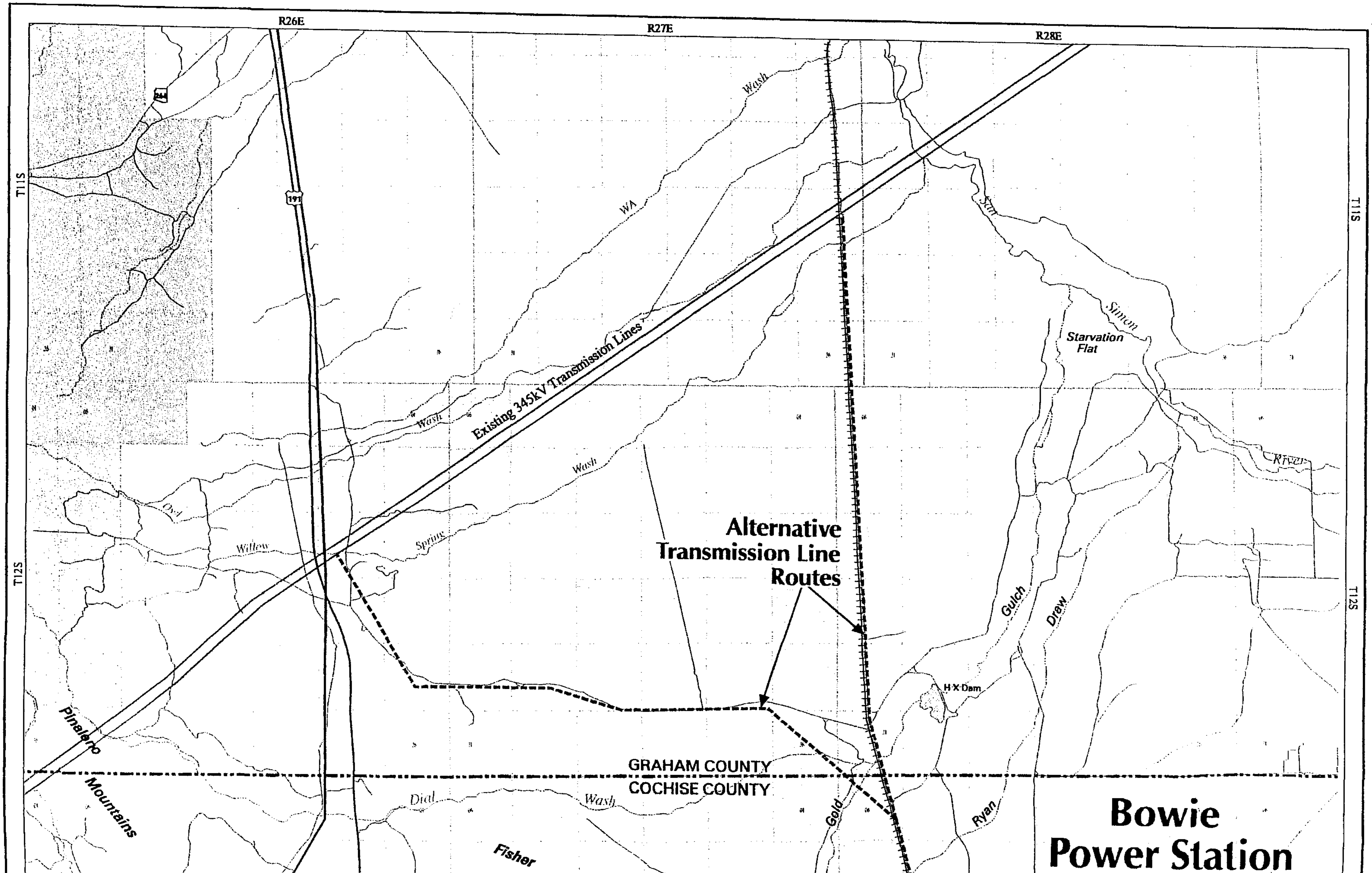
WHERE WILL THE POWER GO?

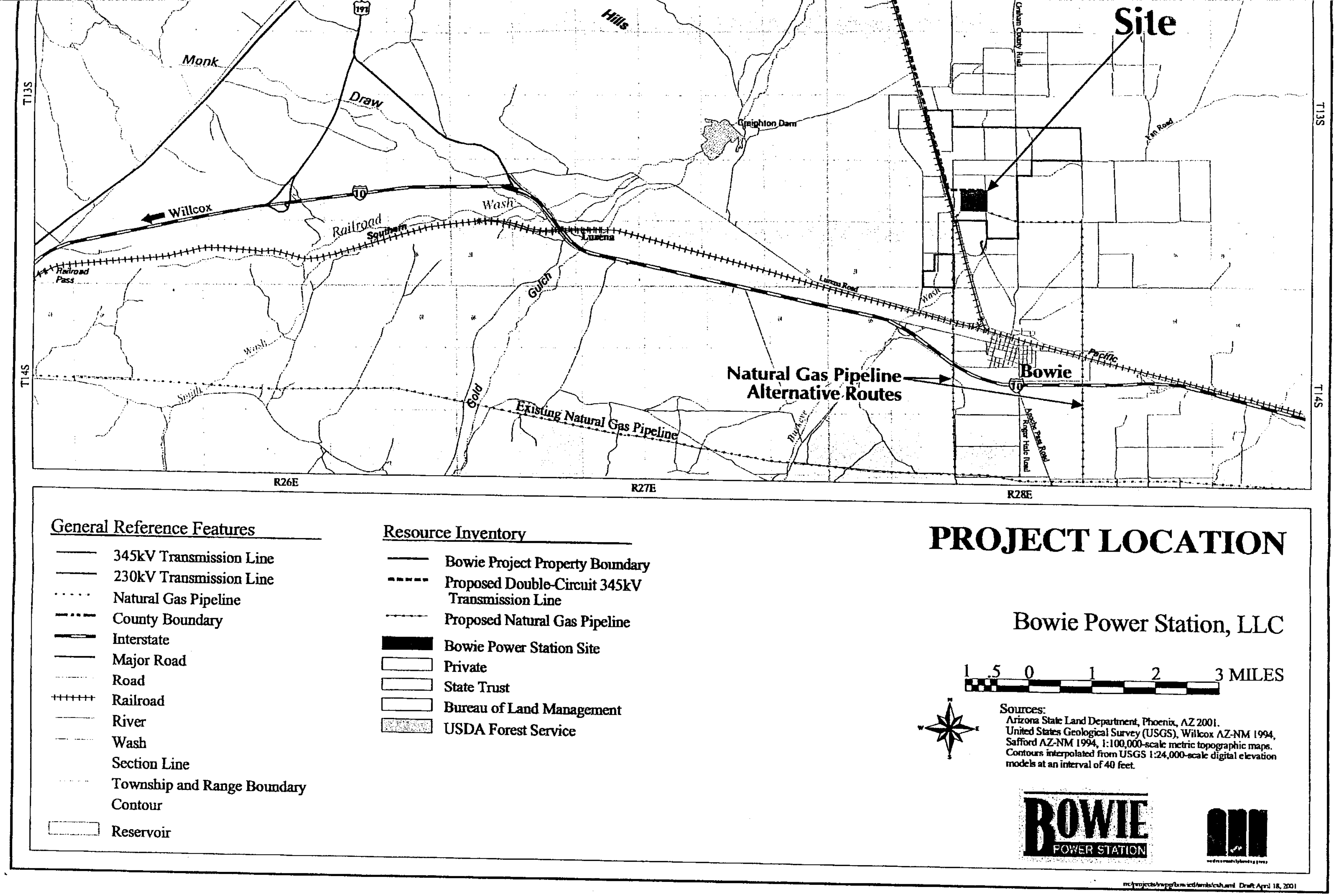
Areas to be served by Bowie Power Station:

- Local electric cooperatives
- Metropolitan Tucson
- Local mining loads
- Other areas in Arizona
- Loads in other states

SOUTHWESTERN
Power Group II, LLC
An Energy Company – Alliance Builder

APRIL 2001


R26E
R27E
R28E
T11S
T12S
191
266
Wash
WA
Existing 345kV Transmission Lines
Wash
Wash
Owl
Willow
Spring
San
Simon
Starvation Flat
River
Alternative Transmission Line Routes
Gulch
Draw
H X Dam
Pinaleno
Mountains
GRAHAM COUNTY
COCHISE COUNTY
Dial
Wash
Gold
Ryan
Fisher
Bowie Power Station


Site
Hills
Monk
Draw
Willcox
Wash
Railroad
Southern
Luzena
Gulch
Railroad Pass
Graighton Dam
Graham County Road
Lunna Road
Pacific
Bowie
Natural Gas Pipeline
Alternative Routes
Existing Natural Gas Pipeline
Gold
Wash
Apache Pass Road
Roger Hale Road
T13S
T14S
R26E
R27E
R28E
General Reference Features
345kV Transmission Line
230kV Transmission Line
Natural Gas Pipeline
County Boundary
Interstate
Major Road
Road
Railroad
River
Wash
Section Line
Township and Range Boundary
Contour
Reservoir
Resource Inventory
Bowie Project Property Boundary
Proposed Double-Circuit 345kV Transmission Line
Proposed Natural Gas Pipeline
Bowie Power Station Site
Private
State Trust
Bureau of Land Management
USDA Forest Service
PROJECT LOCATION
Bowie Power Station, LLC
1 .5 0 1 2 3 MILES
Sources:
Arizona State Land Department, Phoenix, AZ 2001.
United States Geological Survey (USGS), Willcox AZ-NM 1994, Safford AZ-NM 1994, 1:100,000-scale metric topographic maps.
Contours interpolated from USGS 1:24,000-scale digital elevation models at an interval of 40 feet.
BOWIE
POWER STATION
Draft April 18, 2001

BOWIE
POWER STATION

Project Benefits

- The Bowie Power Station would help meet the growing demand for power by using efficient, environmentally sound technology
- Economic Benefits
  - Average of 200 jobs created during construction and up to 300 at peak
  - Up to approximately 45 full-time permanent jobs created following construction
  - Payroll projected at $2 million annually
  - $2 to $4 million annually in tax revenues for local schools and communities
  - $7 to $10 million in purchases of local materials and services during construction
  - $3 to $5 million in purchases during operation
  - Approximately 150 additional secondary jobs during construction and operation

SOUTHWESTERN
Power Group II, L.L.C
An Energy Company - Alliance Builder

APRIL 2001

BOWIE POWER STATION

ENVIRONMENTAL STUDIES

- Air quality
- Water resources
- Noise
- Land use
- Visual resources
- Cultural resources
- Biological resources

SOUTHWESTERN
Power Group II, LLC
An Energy Company - Alliance Builder

APRIL 2001

BOWIE
POWER STATION

AIR QUALITY

- conduct analysis using air dispersion model
- install cleanest technology available
- must meet Arizona Department of Environmental Quality and U.S. Environmental Protection Agency standards

CRITERIA POLLUTANT AIR QUALITY STANDARDS APPLICABLE TO THE BOWIE POWER STATION PROJECT

Pollutant	Prevention of Significant Deterioration Threshold Emissions (tons per year)	Averaging Period	National Ambient Air Quality Standards (micrograms per cubic meter)	Class II Increment Level (micrograms per cubic meter)
NO_2 or NO_x (Nitrogen dioxide or other N compound)	40	Annual	100	25
PM_{10} (fine particulate matter)	15	Annual	50	17
		24-hour	150	30
SO_2 (Sulfur dioxide)	40	Annual	80	20
		3-hour	1,300	512
		24-hour	365	91
CO (Carbon monoxide)	100	1-hour	40,000	NA
		8-hour	10,000	NA
Lead	—	Quarterly	1.5	NA
PM (Particulate matter)	25			
VOC (volatile organic compounds)	40			

Source: U.S. Environmental Protection Agency

SOUTHWESTERN
Power Group II, L.L.C
An Energy Company - Alliance Builder

APRIL 2001

BOWIE POWER STATION

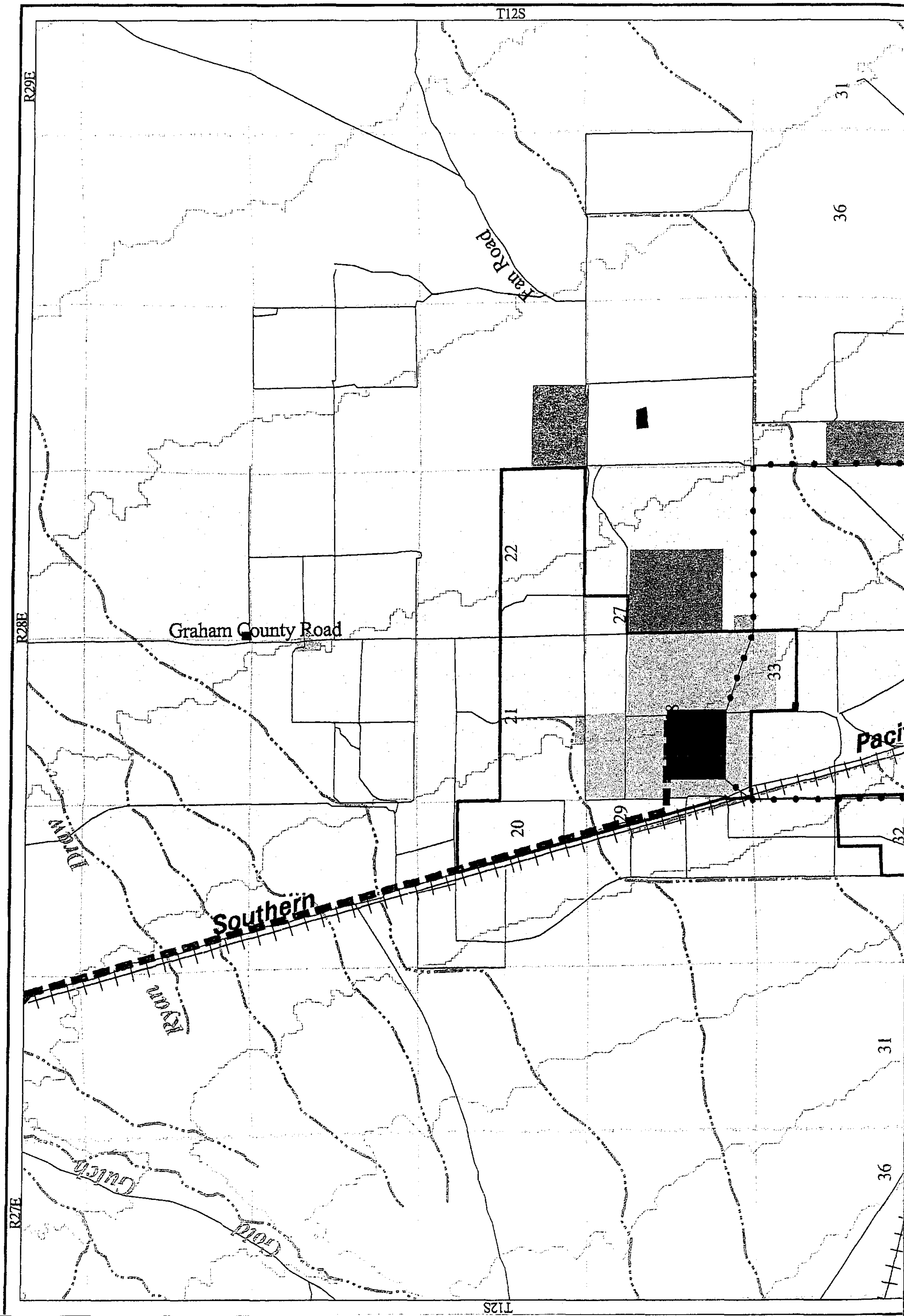
BOWIE PROJECT SCHEDULE

Sept. - Dec. 2000	Project Feasibility Studies and Planning • site identification • natural gas supply • electric transmission interconnection plan • water supply
Ongoing	Environmental Resource Studies and Project Design • air • water • visual • land use • vegetation and wildlife • cultural resources • acoustics
January 2001	Public announcement
Feb. - April 2001	Initial agency and community briefings
April 2001	- Project newsletter #1 - Public Open Houses
July 2001*	Application to Arizona Power Plant and Transmission Line Siting Committee for Certificate of Environmental Compatibility
September 2001*	- Project newsletter #2 - Siting Committee and Arizona Corporation Commission Hearings
Fall 2002*	Secure other permits and financing
End 2003*	Construction begins - first phase
2004*	Commercial operation

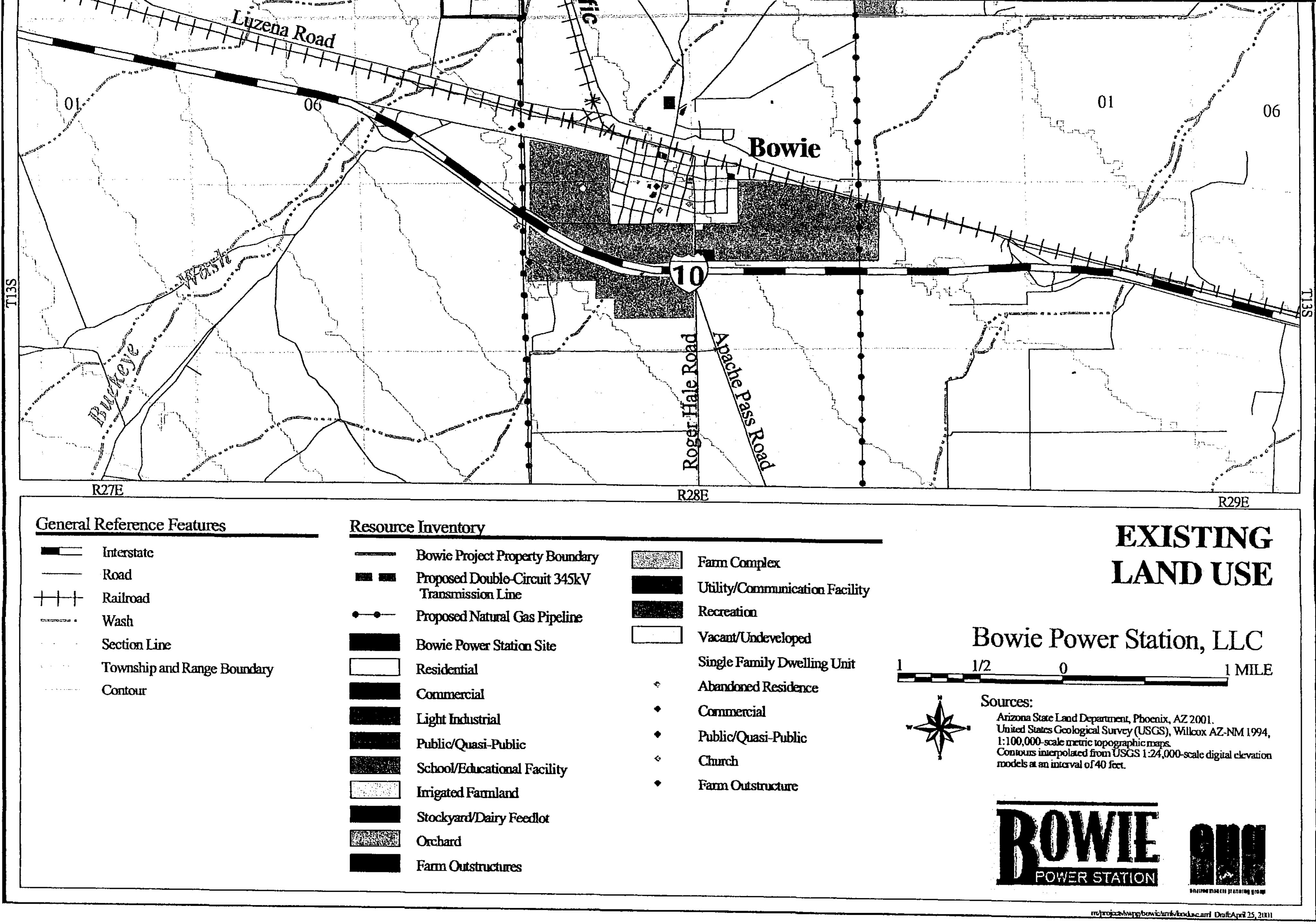
*** Projected Dates**

SOUTHWESTERN
Power Group II, LLC
n Energy Company - Alliance Builder

April 2001



T12S
R29E
31
36
Pan Road
22
27
Graham County Road
R28E
33
21
Paci
20
29
32
Southern
Draw
Ryan
31
36
Gulch
Cold
R27E
T12S



Luzena Road
fic
01
06
01
06
Bowie
10
Wash
Buckeye
Roger Hale Road
Apache Pass Road
T13S
T13S
R27E
R28E
R29E
General Reference Features
Interstate
Road
Railroad
Wash
Section Line
Township and Range Boundary
Contour
Resource Inventory
Bowie Project Property Boundary
Proposed Double-Circuit 345kV Transmission Line
Proposed Natural Gas Pipeline
Bowie Power Station Site
Residential
Commercial
Light Industrial
Public/Quasi-Public
School/Educational Facility
Irrigated Farmland
Stockyard/Dairy Feedlot
Orchard
Farm Outstructures
Farm Complex
Utility/Communication Facility
Recreation
Vacant/Undeveloped
Single Family Dwelling Unit
Abandoned Residence
Commercial
Public/Quasi-Public
Church
Farm Outstructure
EXISTING LAND USE
Bowie Power Station, LLC
1 1/2 0 1 MILE
Sources:
Arizona State Land Department, Phoenix, AZ 2001.
United States Geological Survey (USGS), Willcox AZ-NM 1994, 1:100,000-scale metric topographic maps.
Contours interpolated from USGS 1:24,000-scale digital elevation models at an interval of 40 feet.
BOWIE POWER STATION
Draft April 25, 2001

BOWIE
POWER STATION

PUBLIC INVOLVEMENT ACTIVITIES AND TOOLS

- Agency and community briefings
- Newsletters
- Public open houses
- Toll-free telephone voice message information line (877-576-7477)
- News releases
- Open house newspaper advertisements
- Frequently Asked Questions sheet
- Comment Forms
- SWPG website - www.southwesternpower.com

SOUTHWESTERN
Power Group II, LLC
An Energy Company - Alliance Builder

APRIL 2001

BOWIE POWER STATION

April 2001

PUBLIC OPEN HOUSE
COMMENT FORM

We want to hear your views on the Bowie Power Station project. Your comments are important to help us identify ideas and issues for the project.

COMMENTS: ______________________________

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MAILING LIST:

If you would like to be included on the project mailing list, please print your name and address below. If you would like a return call to discuss any questions or concerns you may have on the project, please note your questions above and include your phone number.

Name: ______________________________

Address: ______________________________

City, state, zip: ______________________________

E-Mail (optional): ______________________________

Phone Number (optional): ______________________________

Thank you for your input!

BOWIE
POWER STATION

PLACE
POSTAGE
HERE

SouthWestern Power Group II
4350 E. Camelback Rd - Suite B175
Phoenix, Arizona 85018

EXHIBIT J-4
INTERCONNECTION POWER FLOW STUDY

Issue Date – 07/26/01

Bowie Power Station
Interconnection Power Flow Study

Bowie Power Station, LLC

July 2001

R·W·BECK

2201 E. Camelback Road, Suite 115B Phoenix, AZ 85016-3433 Phone (602) 957-2888

BOWIE
GENERATION INTERCONNECTION
POWER FLOW STUDY

Table of Contents

This report summarizes the results of the study to examine the potential impacts on the transmission system of interconnecting the proposed Bowie Power Station, LLC ("Client") 500/1100 MW plant ("Project") addition to the Tucson Electric Power ("TEP") and for Alternatives 2 and 4, the Arizona Electric Power Cooperative ("AEPCO"), Western Systems Coordinating Council ("WSCC") transmission grid approximately 40 miles south of the Greenlee 345 kV substation.

The Interconnection Power Flow Study was prepared by R. W. Beck at the request of Bowie Power Station, LLC to address alternative interconnection scenarios for power delivery from the proposed nominal 1,000 MW Bowie Power Station to the WSCC grid. The alternatives considered Project dispatch at both the 500 MW and 1,100 MW levels to provide interconnection at a range of potential output capacities.

Four different interconnection alternatives, corresponding to those requested in the CEC application, are evaluated herein. Where the power flow analysis identifies facilities that are loaded beyond the applicable facility ratings defined in the load flow case model, whether or not the facility requires upgrade to interconnect the Project to the system and/or to acquire transmission service from the Project will be dependent on specific utility criteria.

The study indicates that the Project can deliver its full output to the transmission grid with few to no transmission upgrades depending upon the interconnection Alternative selected.

Alternative 1 shows no loading violations based on the criteria used for either a 500 or an 1100 MW Project.

Alternative 2 has two 230 kV line violations for the loss of the Willow to Vail 345 kV line (the original Greenlee – Vail 345 kV line). Loss of this line forces the Project output down to the 230 kV system resulting in the 230 kV overloads shown in the table. However, based on the results of Alternative 1 (without the 230 kV interconnection) the violation would be alleviated by transfer tripping the 345/230 kV transformer at Willow for the loss of the identified line.

Alternatives 3 and 4 may require upgrade to the Vail 2 345/138 kV transformer unless a higher shorter term rating can be utilized. Additionally, connections to both 345 kV lines resulted in a violation of the Willow to Vail 2 345 kV (originally the Springerville to Vail 345 kV line) line rating. It is noted however, that this line has a much lower rating than the Greenlee to Vail 345 kV line. The line is identified in TEP's FERC Form 1 data as having twin bundled 954 ACSR for a portion of the line and 954 ACSR Rail for another portion. It is possible that an upgrade of this line could be required to integrate the Project into both 345 kV Vail lines.

All four Alternatives had little to no impact on the listed WSCC transmission paths. Additionally, it is noted that flow on the Springville to Vail 345 kV line is greater than the output of Springerville Unit 2 in all cases evaluated, i.e., in line with the TEP Two County bond tax restrictions.

PROJECT DESCRIPTION

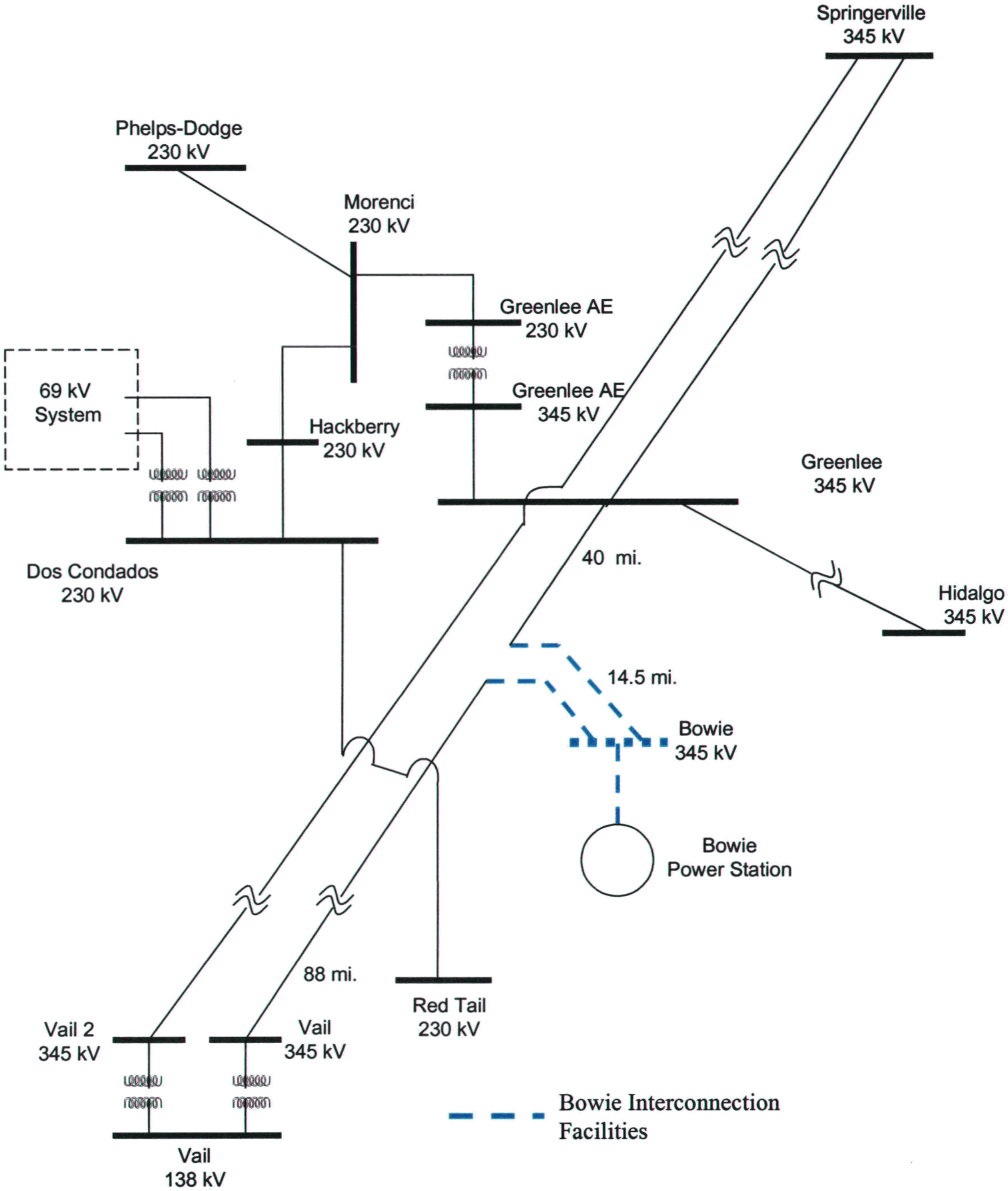
The following lists the Project assumptions used in the analyses.

Project Name:	Bowie
Maximum Summer Capability (MW):	500/1100
Interconnection Voltage:	345 kV (and 230 kV for Alts 2 and 4)
Interconnection Location:	40 miles south of Greenlee 345 kV substation
Interconnection Alternatives:	• Alt 1 – Greenlee – Vail 345 kV • Alt 2 – Greenlee – Vail 345 kV & Red Tail – Dos Condados 230 kV • Alt 3 – Greenlee – Vail 345 kV line & Springerville – Vail 345 kV • Alt 4 – Greenlee – Vail 345 kV line, Springerville – Vail 345 kV line, Red Tail – Dos Condados 230 kV
Host Transmission Utility:	TEP (and AEPCO for Alts 2 and 4)
Reliability Council/RTO:	WSCC
Plant Configuration:	One or Two 2 on 1 GE7FA/Steam Turbnie Combine Cycle with duct firing

Four separate interconnection alternatives were evaluated as shown in the following figures.

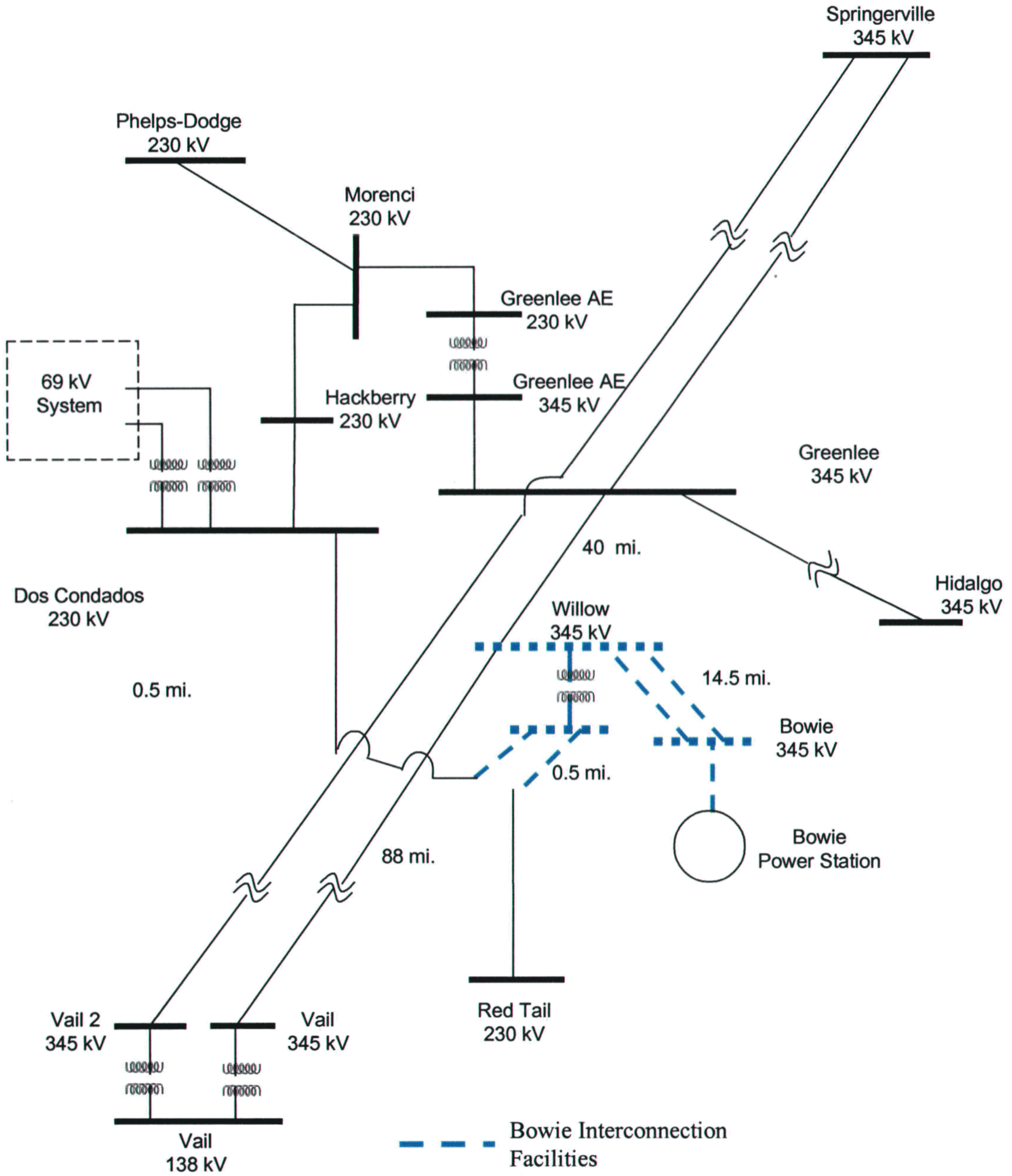
1. Alternative 1: An interconnection to the TEP system via a new 14.5 mile double circuit 345 kV loop in and out of the Greenlee – Vail transmission line approximately 40 miles south of Greenlee.

ALTERNATIVE 1 INTERCONNECTION CONFIGURATION



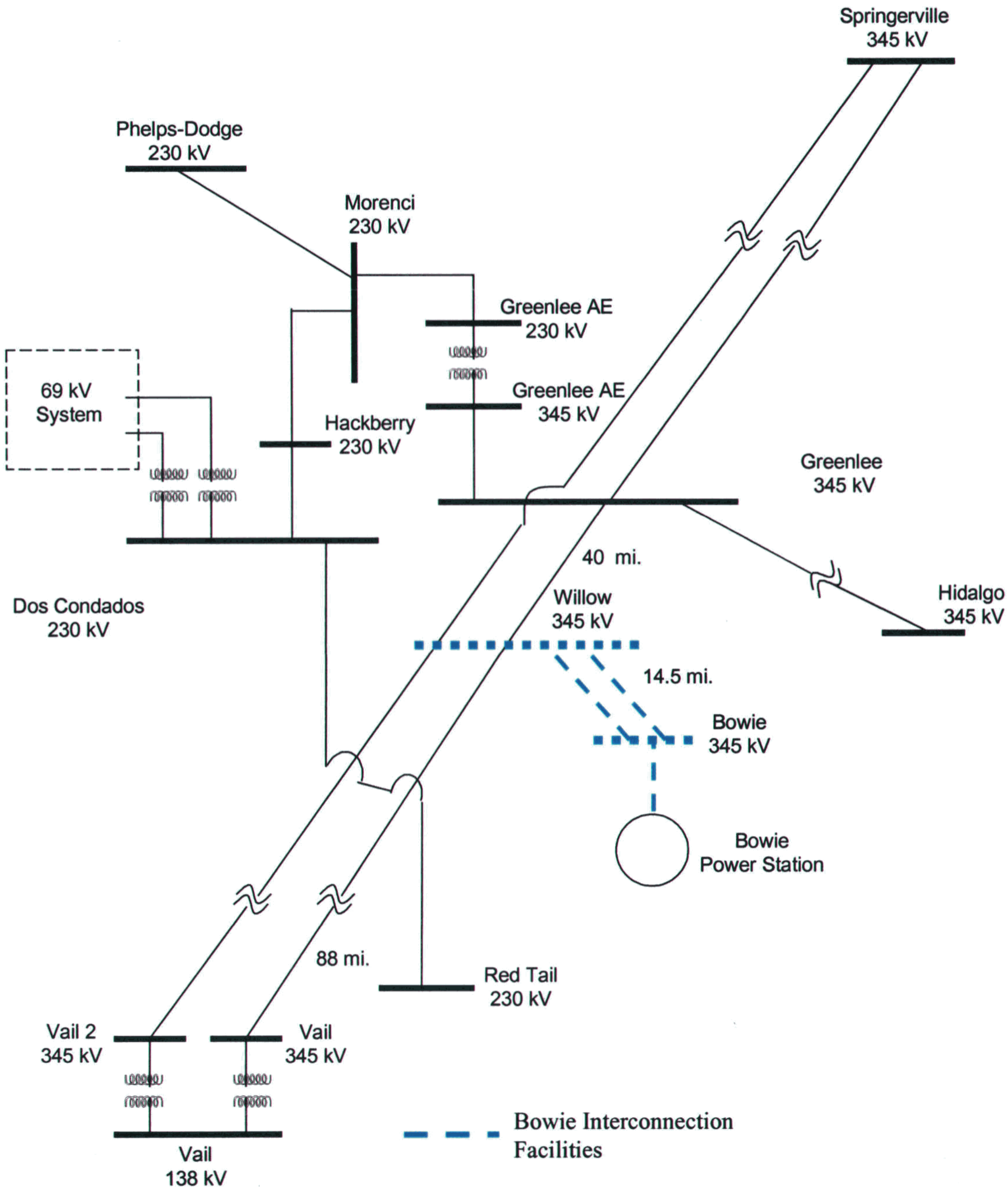
2. Alternative 2: A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV line also connects to the new substation. Additionally, a 345/230 kV transformer will also be located at the substation with a 0.5 mile double circuit in and out loop of the AEPCO's Dos Condados to Red Tail 230 kV line.

ALTERNATIVE 2 INTERCONNECTION CONFIGURATION



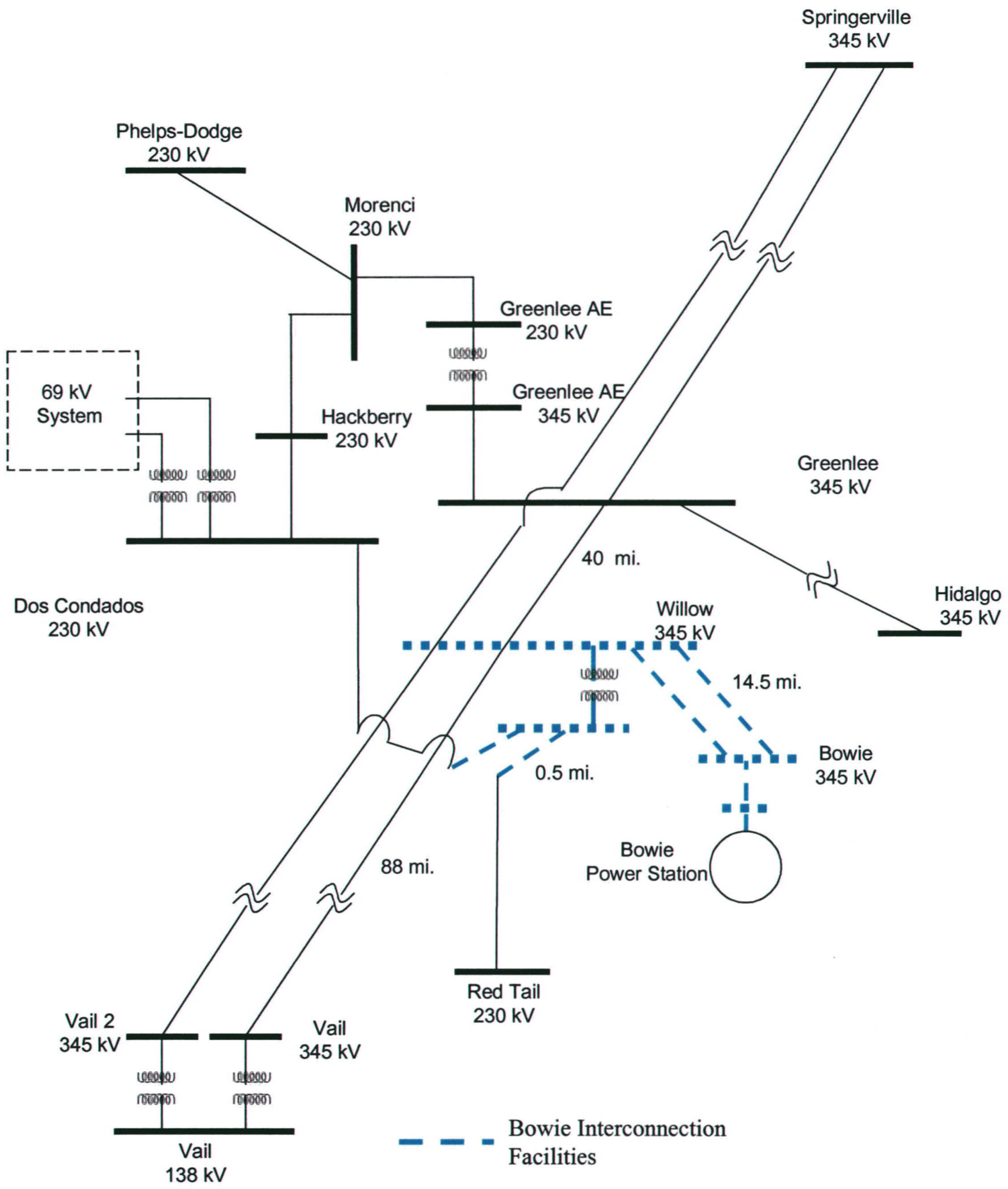
3. Alternative 3: A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV and the Springerville to Vail 345 kV lines also connect to the new substation.

ALTERNATIVE 3 INTERCONNECTION CONFIGURATION



4. Alternative 4: A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV and the Springerville to Vail 345 kV lines also connect to the new substation. Additionally, a 345/230 kV transformer will be located at the substation with a 0.5 mile double circuit in and out loop of the AEPCO's Dos Condados to Red Tail 230 kV line.

ALTERNATIVE 4 INTERCONNECTION CONFIGURATION



NEW GENERATION MODELED IN BASE CASE

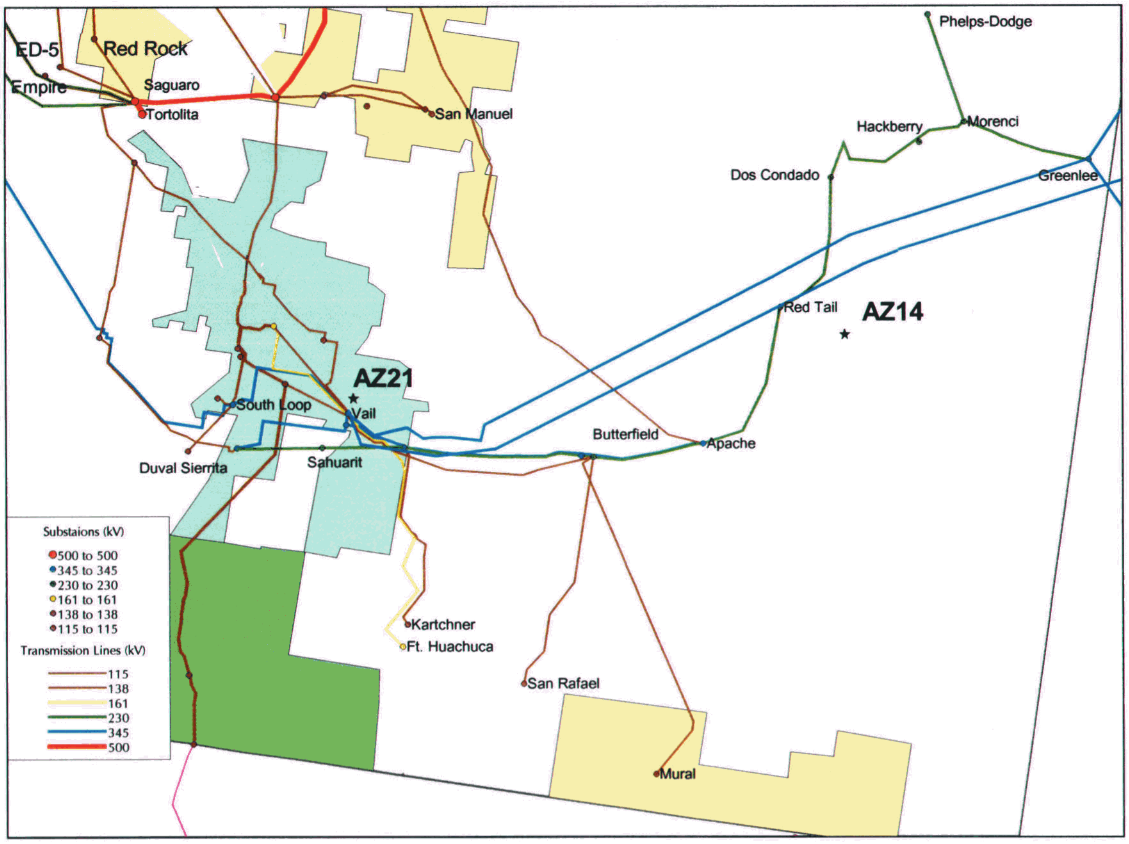
The dispatch of generation in a region impacts transmission system power flows. While it is not possible to evaluate all possible operational impacts, for planning purposes, it is necessary to assume a certain level of generation to meet the projected load. In this regard, assumptions need to be made as to which new generation projects should be included in the Base Case model used. For this analysis, plants that will be operating by 2002, additional CEC approved combined cycle plants in the Phoenix/East Valley/Tucson areas and a portion of the Palo Verde hub generation have been included in the model. Additionally, due to the proximity of the site location to New Mexico, the 500 MW Duke plant at Luna has been included in the Base Case. New projects included in the Base Case are summarized below:

1. Red Hawk 1000 MW Project (added to Base Case dispatched at 886 MW)
2. Santan 850 MW Project (already in 2001 series WSCC Case dispatched at 726 MW)
3. Desert Basin 500 MW Project (already in 2001 series WSCC Case dispatched at 460 MW)
4. Calpine West Phoenix 500 MW Project (already in 2001 series WSCC case dispatched at 300 MW)
5. Griffith Energy 650 MW Project (already in 2001 series WSCC case dispatched at 540 MW)
6. Calpine Southpoint 520 MW Project (already in 2001 series WSCC case dispatched 420 MW)
7. Panda Gila River 2080 MW Project (added to Base Case and dispatched 900 MW)
8. Other PV area new generation dispatched at 35 MW
9. Toltec Power Station 2000 MW Project (added to Base Case and dispatched at 1000 MW)
10. Duke Luna 550 MW Project in New Mexico (added to Base Case and dispatched at 500 MW)

TRANSACTION SCENARIOS

Based on the location of the Project, primary markets are located in southeast Arizona, an area shown on the following figure.

Southeast Arizona Region



Proposed Generation Table in Southeastern Arizona

#	Developer	Plant Name	Location	State	MW	ISDN	Comments
AZ14	Bowie Power Station, LLC.	Bowie Power Station	Bowie	AZ	1000	2004	Planned – Announced 1/31/01
AZ21	Tucson Electric Power Co	Vail Generating Station	Rita Ranch	AZ	150	2002	Peaking Facility

The transaction schedules shown in Table 2 were simulated in the load flow case models to examine the potential impact on the transmission system of delivery to the primary markets.

Table 2
Transaction Schedules in MW

Region	"a" (Alt 1 Only) AEPCO	"b" (Alt 1 Only) TEP	"c" (All Alternatives) AEPCO/ TEP
Southeastern AZ	500	0	500
Southeastern AZ/Tucson	0	500	600

RESULTS

The following table summarizes the results for the integration Project under all four Alternatives. For lines where only one rating is identified, we have assumed that an emergency rating of 110% of continuous rating would apply based on assumptions made in the Southeast Arizona Transmission Study report as discussed under the evaluation criteria section. Loadings above the 110% of continuous rating limit have been highlighted in the table.

Tp	Overloaded Element	Rating N/E (MVA)	AC Power Flows % of E Rating						
			Base	Alt 1 Single 345 kV Connection			Alt 2 Single 345 kV & 230 kV Connection	Alt 3 Double 345 kV Connection	Alt 4 Double 345 kV & 230 kV Connection
				"a" 500	"b" 500	"c" 1100	"c" 1100	"c" 1100	"c" 1100
L	Apache To Red Tail 230kv[1]	351	29%	N.O.	N.O.	N.O.	109%	N.O.	N.O.
X	Bicknell To Bicknell 230/345kv[1]	150/193	65%	1%	100%	43%	88%	N.O.	N.O.
L	Buterfld To Pantano 230kv[1]	268	75%	23%	101%	51%	N.O.	N.O.	N.O.
L	Red Tail To Willow 230kv[1]	351	27%	-	-	-	111%	-	N.O.
L	Sag.East To Oracle 115kv[2]	120	93%	110%	90%	106%	103%	107%	104%
X	Tortolit To Tortolit 500/138k[1]	600/672	64%	66%	93%	102%	100%	91%[3]	92%
L	Vail2 To Willow 345kv[1] (originially Springerville – Vail)	666/806	42%	-	-	-	-	121%	113%
X	Vail2 To Vail 345/138kv[1]	600/720	49%	58%	73%	88%	87%	135%	126%

1. Loss of Project Bus (Alt 1) or Willow (Alts 2, 3 and 4) to Vail 345 kV line (originally Greenlee – Vail 345 kV line)
2. Loss of Saguaro West to San Manuel 115 kV line
3. Loss of Willow to Vail 345 kV line (originally Springerville – Vail 345 kV line)

Alternative 1 shows no loading violations based on the criteria used for either a 500 or an 1100 MW Project with the exception of a slight overload of the Tortolita 500/138 kV transformer which reached 102% of emergency rating. It is expected that this violation could be handled via operational means. All other facilities are within their identified emergency ratings or within 110% of their continuous ratings.

Alternative 2 has two 230 kV line violations for the loss of the Willow to Vail 345 kV line (the original Greenlee – Vail 345 kV line). Loss of this line forces the Project output down to the 230 kV system resulting in the 230 kV overloads shown in the table. However, based on the results of Alternative 1 (without the 230 kV interconnection) the violation would be alleviated by transfer tripping the 345/230 kV transformer at Willow for the loss of the identified line.

Alternatives 3 and 4 may require upgrade to the Vail 2 345/138 kV transformer unless a higher shorter term rating can be utilized. Additionally, connections to both 345 kV lines resulted in a violation of the Willow to Vail 2 345 kV (originally the Springerville to Vail 345 kV line) line rating. It is noted however, that this line has a much lower rating than the Greenlee to Vail 345 kV line. The line is identified in TEP's FERC Form 1 data as having twin bundled 954 ACSR for a portion of the line and 954 ACSR Rail for another portion. It is possible that an upgrade of this line could be required to integrate the Project under the Alternatives 3 and 4 configuration, i.e., connected to both 345 kV Vail lines.

Interface Impact

Impact on key interface limitations are a consideration. The following tables show the contribution of the Project on the defined transmission paths.

Power Flow over Defined Paths and Regional Facilities

WSCC Path #	Path/Facility Description	Rating	Path/Facility Flows Base	“1a” AEPCO 500 MW	“”1b” TEP 500 MW	“1c” AEPCO/TEP 1100 MW	“2c” AEPCO/TEP 1100 MW	“3c” AEPCO/TEP 1100 MW	“4c” AEPCO/TEP 1100 MW
			MW	MW	MW	MW	MW	MW	MW
22	Southwest of Four Corners	2325 (E – W)	1751	1767	1777	1797	1790	1795	1793
47	Southern New Mexico (NM1)	925 (S)[1] 1048 (NS)[2]	589	590	589	590	590	590	590
49	East of the River (EOR)	7550 (E – W) Not rated (W – E)	5011	5009	5007	5006	5005	5005	5005
50	Cholla to Pinnacle Peak	1200 (E – W)	1096	1107	1094	1103	1101	1105	1103
NA	Springerville – Greenlee 345 kV line	745/1010	378	335	261	195	220	342	328
NA	Greenlee – Vail 345 kV line	896/1210	190	-	-	-	-	-	-
NA	Greenlee – Project Bus 345 kV line	896/1210	-	-73	20	-278	-	-	-
NA	Project Bus – Vail 345 kV line	896/1210	-	419	508	790	-	-	-
NA	Greenlee – Willow 345 kV line	896/1210	-	-	-	-	-106	-75	15
NA	Willow – Vail 345 kV line	896/1210					754	619	584
NA	Springerville – Vail 345 kV line	666/806	322	318	390	402	395	-	-
NA	Springerville – Willow 345 kV line	666/806	-	-	-	-	-	215	240
NA	Willow – Vail 345 kV line	666/806	-	-	-	-	-	586	566
NA	Greenlee 230/345 kV xfmr #1	150/193	39	-64	26	-78	-9	-69	-17
NA	Greenlee 230/345 kV xfmr #2	150/193	37	-68	28	-83	-10	-73	-18
NA	Dos Condados – Red Tail 230 kV line	350/438	-126	80	-105	108	-	90	-
NA	Dos Condados – Willow 230 kV line	350/438	-	-	-	-	-32	-	-15
NA	Willow – Red Tail 230 kV line	350/438	-	-	-	-	180	-	155

1. Simultaneous
2. Non-Simultaneous

All four Alternatives had little to no impact on the listed WSCC transmission paths. Additionally, it is noted that flow on the Springville to Vail 345 kV line is greater than the output of Springerville Unit 2 in all cases evaluated, i.e., in line with the TEP Two County bond tax restrictions.

Section 1

INTRODUCTION AND METHODOLOGY

Introduction

This report summarizes the results of the study to examine the potential impacts on the transmission system of interconnecting the proposed Bowie Power Station, LLC ("Client") 500/1100 MW plant ("Project") addition to the Tucson Electric Power ("TEP") and for Alternatives 2 and 4, the Arizona Electric Power Cooperative ("AEPCO"), Western Systems Coordinating Council ("WSCC") transmission grid approximately 40 miles south of the Greenlee 345 kV substation.

The Interconnection Power Flow Study was prepared by R. W. Beck at the request of Bowie Power Station, LLC to address alternative interconnection scenarios for power delivery from the proposed nominal 1,000 MW Bowie Power Station to the WSCC grid. The alternatives considered Project dispatch at both the 500 MW and 1,100 MW levels to provide interconnection at a range of potential output capacities.

Four different interconnection alternatives, corresponding to those requested in the CEC application, are evaluated herein.

Purpose of Study

The study uses "N-1" contingency load flow analyses in examining the potential impact of integration of the Project on the transmission system. To examine the effects (i.e., power flow changes) of adding generation, it is common practice to use power flow analyses to compare power flows on the transmission system with and without the added generation. It is important, however, when performing power flow comparisons, to recognize the difference between "typical" effects and "detrimental" effects on an AC transmission grid.

Where the power flow analysis identifies facilities that are loaded beyond the applicable facility ratings defined in the load flow case model, whether or not the facility requires upgrade to interconnect the Project to the system and/or acquire transmission service from the Project will be dependent on specific utility criteria.

Additionally, the results are based on the assumptions used in creating the power flow case model(s). Therefore, it is necessary to not only document the assumptions used but to evaluate a series of cases based on reasonable assumptions. The assumptions used for the analyses, discussed herein, are in line with common utility practices. However, the study is not intended to reflect detailed design of generation and system modification assumed for the purpose of the study, nor does it assess operational issues associated with the day to day operation of the power grid.

Characteristics of AC Transmission Grid

Recognizing the difference between typical and detrimental effects requires an understanding of certain characteristics of an AC transmission system. In particular, there are two important characteristics of AC transmission that are relevant to this understanding. The first is that, for any given configuration of generators, power is delivered from generation to load in precisely the most efficient manner possible. Sometimes, this inherent and beneficial feature is referred to as "taking the path of least resistance". A second characteristic of AC transmission is that, when a circuit goes off-line unexpectedly (i.e., trips), power transfers automatically and instantaneously to parallel circuits on the grid. This capability greatly enhances the reliability of interconnected transmission grids.

These beneficial characteristics come with a consequence, namely that power flowing over AC transmission systems obeys the laws of physics and, therefore, follow the "paths of least resistance" without regard for ownership or corporate boundaries. Thus, on an integrated transmission, all generators will have an effect on the entire transmission grid and not just the transmission system to which they are interconnected. Moreover, the effects of generators on adjacent systems is dynamic, in that actual power flows on the transmission system are continually changing as generation is dispatched to serve load that changes hour-by-hour throughout each day and throughout the year.

When using a power flow program to evaluate the transmission system, it must be remembered that each power flow case represents only a single snapshot in time; i.e., an assumed load level, VAr schedule, system configuration and generation dispatch to serve the load at one instant in time. Evaluating potential impacts of the Project means adding new generation to an original configuration or "base case" and requires that a corresponding amount of existing generation be removed or reduced (presumably at another plant location) in order to maintain the necessary load and resource balance (or alternately an increase in load). The potential impacts of the changed case or "change case" are evaluated by comparing it to the "base case". When the "change case" is compared to the "base case", power flows on the system will be observed to change. Such changes are neither positive nor negative in and of themselves and, instead, may simply be indicative of normal operating changes which the transmission grid was designed to accommodate. Therefore, the analysis must attempt to determine when the changes caused by adding new generation, such as the Project, are perceived as being detrimental and/or beneficial to the transmission grid.

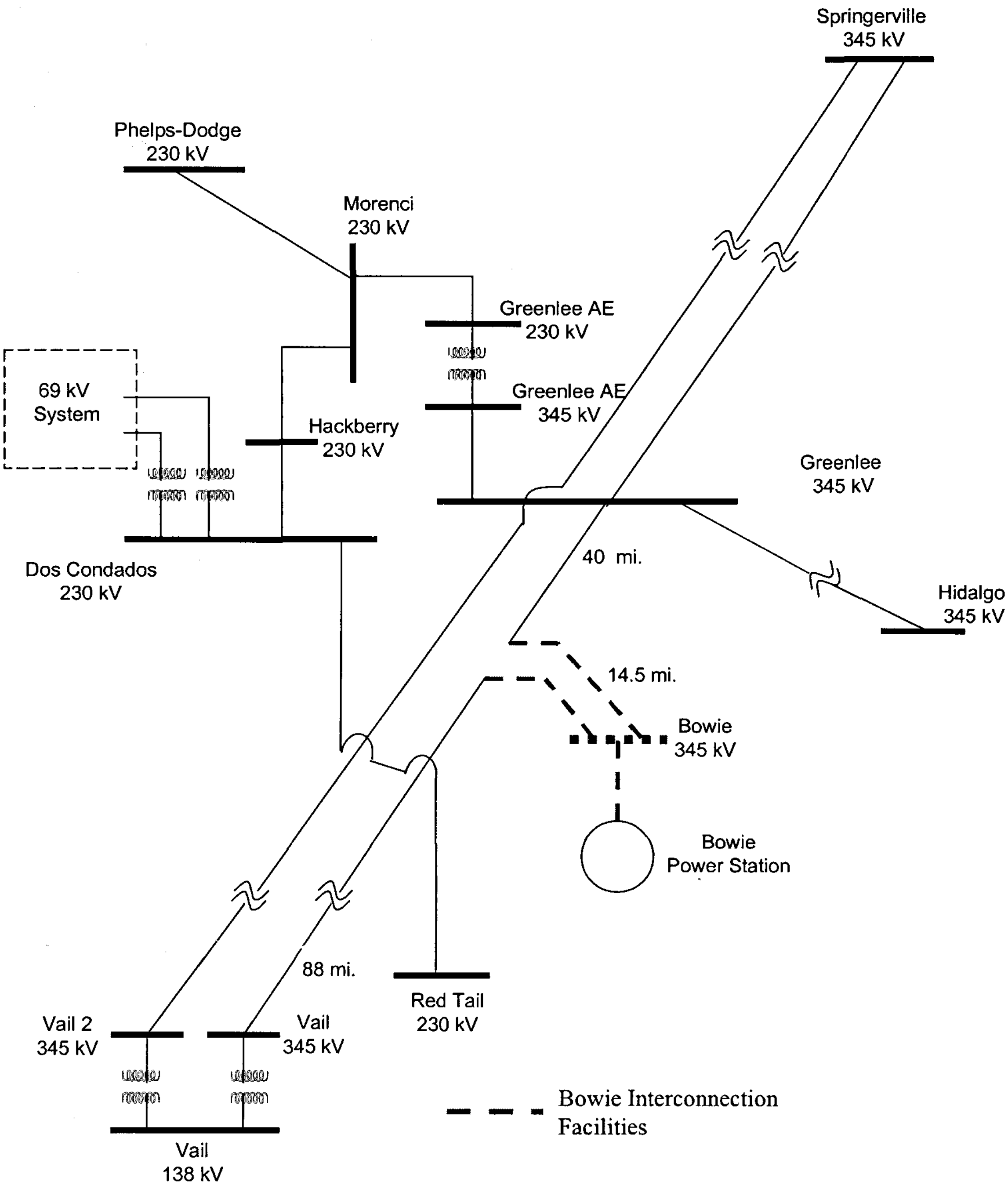
Project Description

The following lists the Project assumptions used in the analyses.

Project Name:	Bowie
Maximum Summer Capability (MW):	500/1100
Interconnection Voltage:	345 kV (and 230 kV for Alts 2 and 4)
Interconnection Location:	40 miles south of Greenlee 345 kV substation
Interconnection Alternatives:	• Alt 1 – Greenlee – Vail 345 kV • Alt 2 – Greenlee – Vail 345 kV & Red Tail – Dos Condados 230 kV • Alt 3 – Greenlee – Vail 345 kV line & Springerville – Vail 345 kV • Alt 4 – Greenlee – Vail 345 kV line, Springerville – Vail 345 kV line, Red Tail – Dos Condados 230 kV
Host Transmission Utility:	TEP (and AEPCO for Alts 2 and 4)
Reliability Council/RTO:	WSCC
Plant Configuration:	One or Two 2 on 1 GE7FA/Steam Turbnie Combine Cycle with duct firing

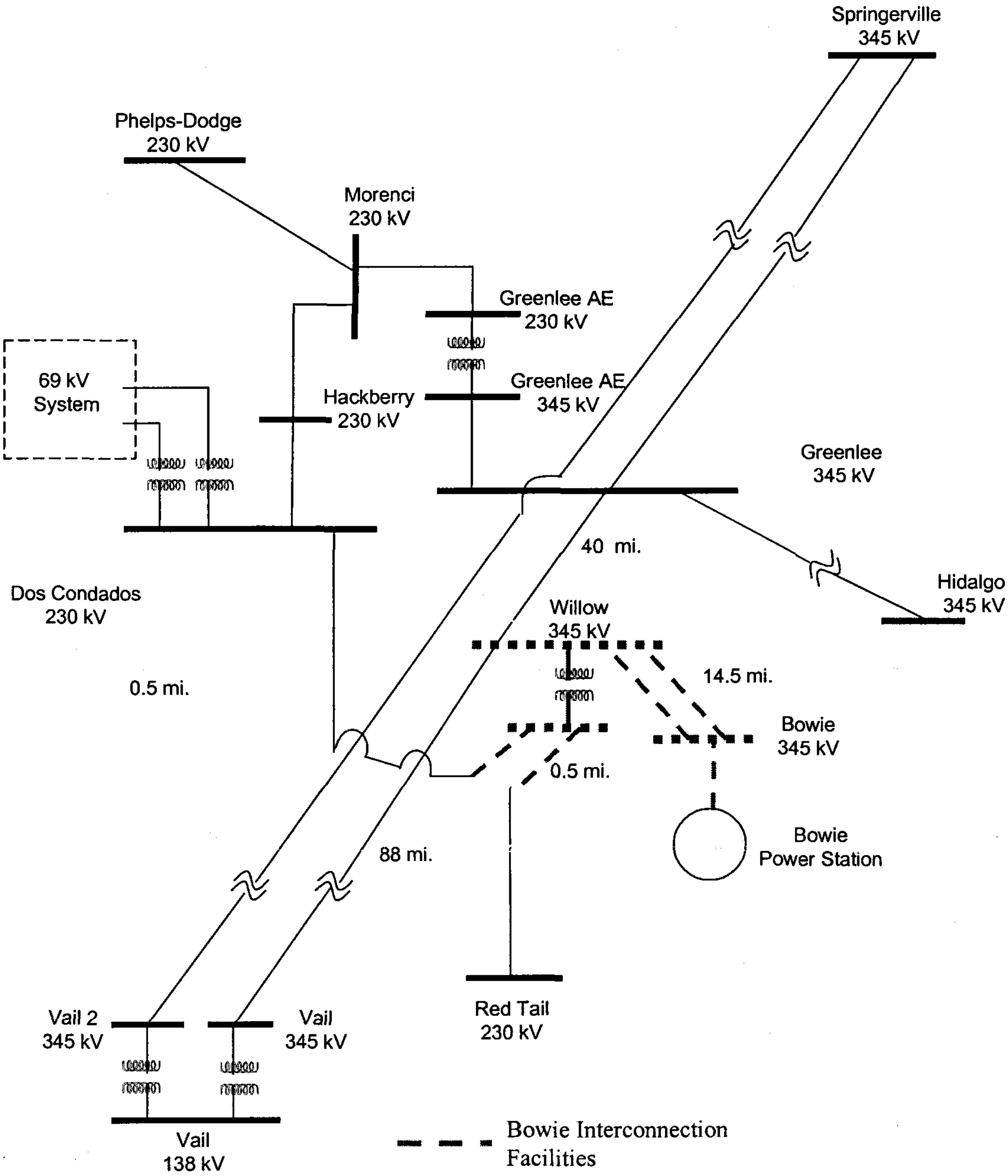
1. Alternative 1: An interconnection to the TEP system via a new 14.5 mile double circuit 345 kV loop in and out of the Greenlee – Vail transmission line approximately 40 miles south of Greenlee.

ALTERNATIVE 1 INTERCONNECTION CONFIGURATION



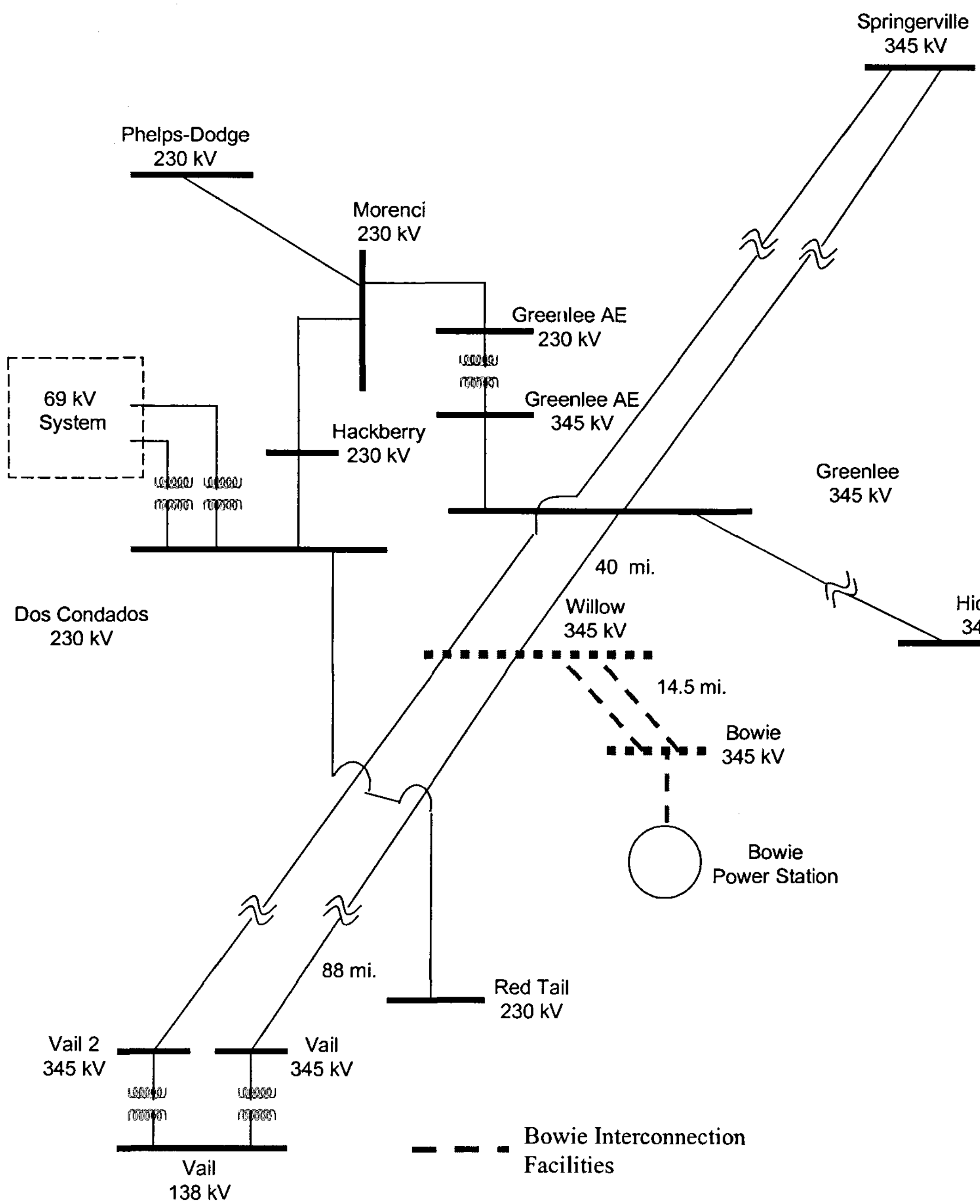
2. Alternative 2: A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV line also connects to the new substation. Additionally, a 345/230 kV transformer will also be located at the substation with a 0.5 mile double circuit in and out loop of the AEPCO's Dos Condados to Red Tail 230 kV line.

ALTERNATIVE 2 INTERCONNECTION CONFIGURATION



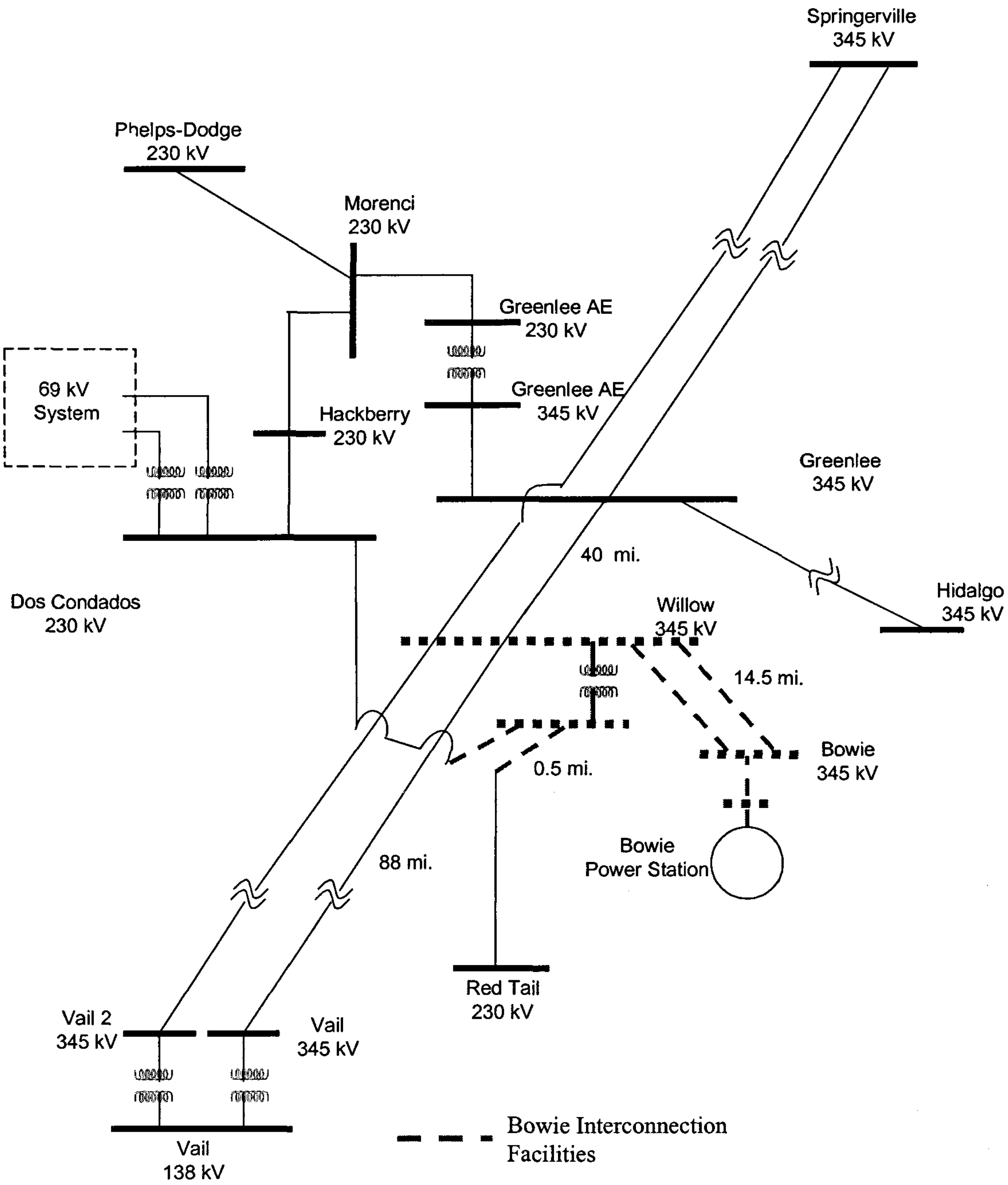
3. Alternative 3: A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV and the Springerville to Vail 345 kV lines also connect to the new substation.

ALTERNATIVE 3 INTERCONNECTION CONFIGURATION



4. Alternative 4: A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV and the Springerville to Vail 345 kV lines also connect to the new substation. Additionally, a 345/230 kV transformer will be located at the substation with a 0.5 mile double circuit in and out loop of the AEPCO's Dos Condados to Red Tail 230 kV line.

ALTERNATIVE 4 INTERCONNECTION CONFIGURATION



"N-1" Analysis Goals and Methodology

The goal of the Load Flow "N-1" Contingency Analysis is to perform an evaluation of the incremental impact of the Project on the loading of the regional transmission system. To achieve this goal, Beck uses the following process:

1. Examine level and location of existing and planned generation in the vicinity of the Project.
2. A Base Case is developed to establish a baseline performance of the system before the Project. The Base Case may include other proposed generating project or transmission system additions/modifications in the region.
3. "Change" Case(s) are then developed which include the Project. These cases may represent various interconnection configurations, transactions or Project sizes. Common approaches include:
    - The examination of a single project size with multiple transactions. The approach can be used when assessing the ability to deliver from the Project to particular markets and can be coupled with more detailed transmission service evaluations.
    - The examination of separate plant sizes at the same location. This approach can be useful in narrowing the Project size to that which results in the fewest loading violations on the system.
    - The examination of different interconnection alternatives from the same site. Project sites may have several different lines, substations or interconnection voltages in the vicinity, providing interconnection options. As with the previous approach, this approach presents which interconnection may result in the fewest loading violations.
    - The examination of different injection points on the system. This approach may help to narrow the list of physical sites to those which appear to have the least loading violations.
4. Single contingency ("N-1") analysis is then performed on each scenario.
5. Results from the change case(s) are compared to the results from the Base Case to evaluate the incremental impact of the Project on the loading of the transmission system.
6. The results are analyzed and presented.

Beck uses General Electric's PSLF program to run the load flow cases.

The results of the analyses may not reflect (i) operating limitations and (ii) loading violations that result from different assumptions used to create the cases. Additionally, the analysis "forces" the plant to be dispatched and therefore does not reflect the competitive aspects of the Project. The purpose of the analyses is to identify transmission facilities that have the potential to limit the dispatch of the Project and/or other generators in the local region under heavy load conditions (when power is most needed to serve load). Whether or not upgrade of the facilities is required for integration of the Project will depend on many factors such as the local utilities Generation Interconnection procedures.

The interconnection/deliverability studies are typically performed using summer peak load cases. A peak load "N-1" analysis adheres to what has traditionally been considered good utility practice. The analyses are used to demonstrate the ability to serve load under heavy load conditions when flexibility of generation resource dispatch is reduced. Additionally, for new generation interconnections, peak load analyses are used to demonstrate the ability of the Project to deliver power to the grid at the point in time where market prices are likely highest. However, for a more rigorous system impact or integration study, light load (approx. 40-50%) and "shoulder" load (approx. 60-70%) load flow cases should also be evaluated, often in conjunction with a market price/economic dispatch study. When studying generation export conditions worst case conditions may occur at lighter load levels. The transmission system in close proximity to the Project frequently has the most severe loading under minimum conditions when more power has to be exported from the immediate vicinity as opposed to serving regional load. "Shoulder" load periods (generally 60-70% of peak load) often represent the worst case conditions for the bulk transmission system in the region due to more economic transactions occurring over large regions.

In addition, studies other than the load flow analysis (e.g., stability and/or short circuit analysis) will frequently be performed as part of a System Impact or Facilities Study, to fully measure the impact of the Project on the interconnected power system.

MARKET BACKGROUND

Market Structure

The structure of the market will play a major role in many factors that will affect the operation, expansion and liquidity of the market (e.g., how congestion is managed, how transmission expansion costs are allocated).

With the exception of California, the west has not yet transitioned to Regional Transmission Organizations ("RTO's") or even tightly operated pools. Although filings have been made in that regard (specifically Desert STAR and RTO-West), progress has been slow. As with other regions of the country, the region is composed of many different utility systems that have integrated transmission facilities. The Project is located near Bowie, Arizona and will interconnect with the TEP and for Alternatives 2 and 4 to the AEPCO transmission system(s), which in turn connect(s) to the surrounding systems. In an integrated AC transmission network, changes on one system will affect power flows on another. In that regard, coordinated planning is performed across regions as opposed to only examination of a single company in isolation.

While planning for regions has generally been coordinated by the NERC Regional Reliability Councils (e.g., WSCC, SERC, MAPP, MAIN), the council regions divisions are blurring with the FERC directed establishment of RTOs, given that participants of several established reliability councils are splitting between different RTOs.

Organizations applicable to this region in particular are:

- The Federal Energy Regulatory Commission ("FERC").
- The Western Systems Coordinating Council ("WSCC")
- Desert STAR

Organizational Entities

The WSCC territory covers all the western states including western Canada.

All public utilities (except those participating in an approved regional transmission entity that conforms to the Commission's RTO principles) that own, operate or control interstate transmission facilities were required to file with the Commission by October 15, 2000 a proposal for an RTO with the minimum characteristics and functions adopted in the Final Rule, or, alternatively, a description of efforts to participate in an RTO, any existing obstacles to RTO participation, and any plans to work toward RTO participation.

FERC RTO'S

FERC has taken several steps in re-emphasizing its position on the development of large, independent, transmission organizations in order to fulfill the goals outlined in Order No. 888. Steps include the May 1999 notice of proposed rulemaking (NOPR), the subsequent FERC Order 2000, and several precedent setting orders to individual utility or RTO/ISO filings. In June 2001, FERC recommended the establishment of four large RTO's that would cover most of the United States.

The Commission identifies the following minimum characteristics and functions that must be met in order to qualify as an RTO.

- Independence from market participants;
- Appropriate scope and regional configuration;
- Possession of operational authority for all transmission facilities under the RTO's control; and
- Exclusive authority to maintain short-term reliability.

Seven Minimum Functions an RTO must perform:

1. Administer its own tariff and employ a transmission pricing system that will promote efficient use and expansion of transmission and generation facilities;
2. Create market mechanisms to manage transmission congestion;
3. Develop and implement procedures to address parallel path flow issues;
4. Serve as a supplier of last resort for all ancillary services required in Order No. 888 and subsequent orders;
5. Operate a single OASIS site for all transmission facilities under its control with responsibility for independently calculating TTC and ATC;
6. Monitor markets to identify design flaws and market power; and
7. Plan and coordinate necessary transmission additions and upgrades.

DESERT STAR

The following is the December 28, 2000 FERC Compliance filing (Docket No. RTO1-44-000) filed reporting on the status of Desert Star:

"On October 16, in Arizona Public Service Co. Docket No. RO1-44-000, Desert STAR, Inc., ("Desert STAR") together with six utilities subject to the Commission's jurisdiction –Arizona Public Company, El Paso Electric Company, Public Service Company of Colorado, Public Service Company of New Mexico, Texas-New Mexico Power Company and Tucson Electric Power Company (the "Jurisdictional Utilities") – filed a detailed report on their efforts to establish a Regional Transmission Organization ("RTO") ("October 16 Filing"). The RTO is expected to encompass all or portions of Arizona, New Mexico, Colorado, Eastern Wyoming and West Texas.

By mid-October the Jurisdictional Utilities, Desert STAR, Numerous non jurisdictional transmission owners in the region and other stakeholders representing wholesale and retail customers, generators, marketers and utility commissions had made substantial progress in developing an RTO. Since then the stakeholders have intensified their efforts.

Numerous issues have been resolved. Others remain, not the least of which is the development of a suitable transmission rate design. The task is especially difficult in light of the fact that approximately one-half of the transmission facilities in the region are owned by entities, such as Federal power marketing administrations, tax-exempt utilities and cooperatives, that are not subject to the Commission's jurisdiction. Moreover, the current transmission rates differ markedly among the various entities. The jurisdictional Utilities and Salt River Project Agricultural Improvement & Power District ("Salt River Project") made a transmission rate design proposal and are working with non-jurisdictional transmission owners (such as Western Area Power Administration, Tri-State Generation and Transmission Association, Southwest Transmission Cooperative, Inc. and Colorado Springs Utilities) to further develop and refine the proposal for presentation to the stakeholders and Board of Directors. Other issues remain to be resolved.

The stakeholders are continuing to develop the documentation that will be necessary for a more complete and better developed filing. The utilization of a collaborative process involving substantial stakeholders input should produce a better end product, with fewer issues to be resolved by the Commission, but such process is necessarily time-consuming."

Transmission Interconnection Requirements

Transmission Interconnection requirements can vary from utility to utility. FERC Order 888 outlined equal access to transmission service but did not address the ability to interconnect to a utility's transmission system without requesting firm transmission service. FERC precedence, however, has provided for two distinct types of service, and therefore two study paths, i.) Interconnection Service and ii.) Transmission Service. This is an important consideration and distinction – Interconnection Service allows the facility addition to interconnect to the power system, but does not grant the right to transmit power to the ultimate consumers (deliverability). In order to obtain the right to transfer power to the ultimate consumer, Transmission Service needs to be procured. Most transmission providers limit non-Load Serving Entities (LSE's) to Point to Point Transmission Service, and therefore, a merchant generation developer must also specify a Point of Delivery, or "sink" when requesting Transmission Service. This requirements makes it difficult to request firm transmission service, and pay the substantial associated reservation fee, prior to firm power sale contracts being in place.

The initial step of the response by the host to both the transmission service and/or interconnection request is a study, if required, completed at the expense of the requestor.

In addition to electrical interconnection requirements, merchant power providers will require significant interface with local regulatory bodies.

Regional Background

The proposed site is located in eastern Arizona and interconnects to the regional 345 kV system (and the 230 kV system in Alts 2 and 4). The Greenlee 345 kV substation is co-owned by TEP and AEPCO and ties to the Springerville 345 kV substation in the north, TEP's Vail 345 kV substation near Tucson and the Hidalgo 345 kV substation in New Mexico. The Greenlee 345 kV substation also ties to 230 kV system, which steps down to the AEPCO 69 kV system.

There are two main transmission paths to southeastern Arizona from the Project site. The first path includes the Greenlee – Vail and Springerville – Vail 345 kV lines. The Vail 345 kV substation is one of the three main delivery points for Tucson. The second is AEPCO's Dos Condados to Red Tail 230 kV line that ties to the 345 kV system at Greenlee and at Bicknell substations.

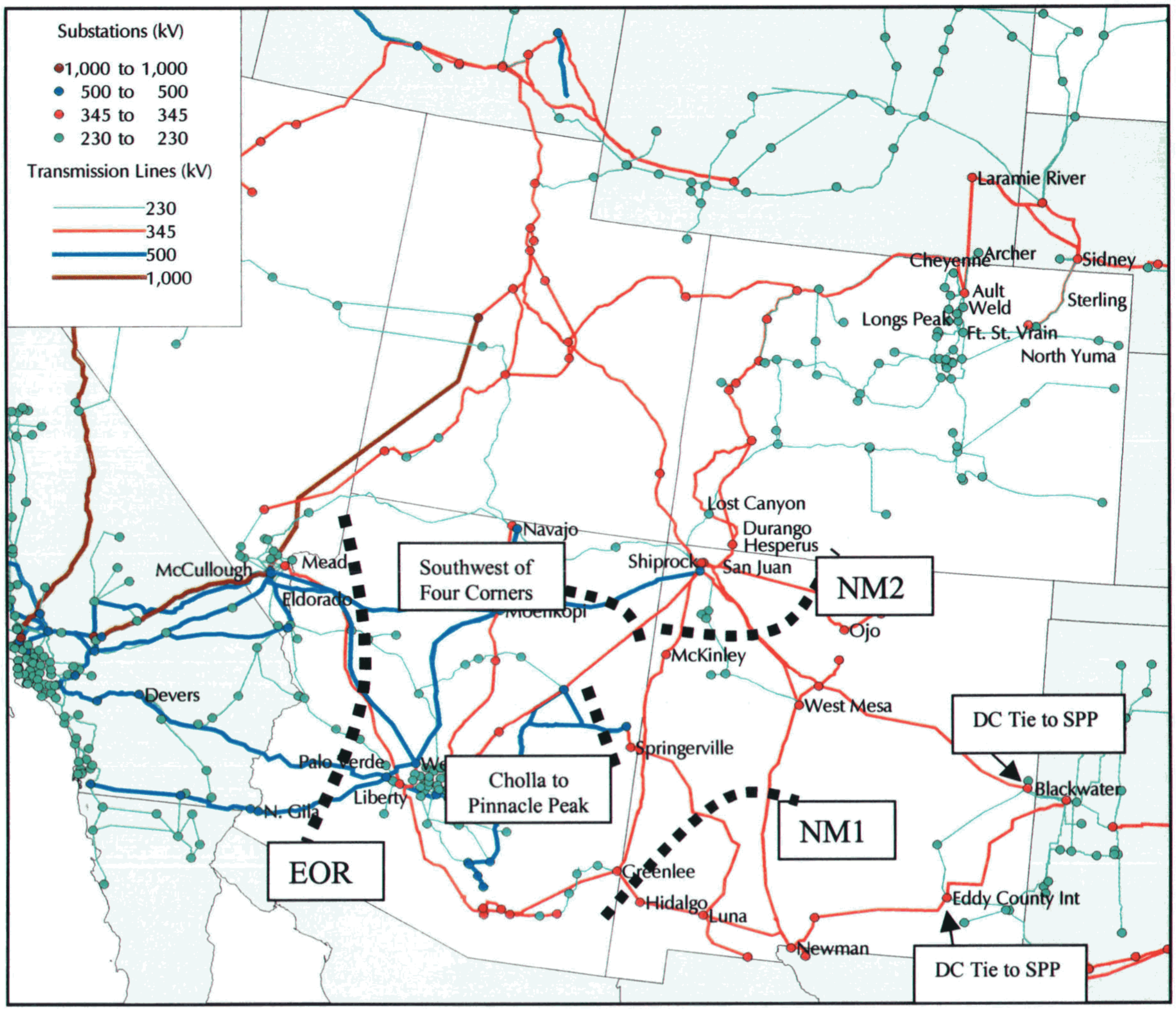
Infrastructure and Constraints

The Extra High Voltage ("EHV") transmission system in the region includes 345 kV and 230 kV. Many of these facilities are proposed to be placed under the operational control of the Desert STAR.

For Arizona, flow is constrained from the Four Corners region, the Navajo plant and the Cholla plant into Phoenix. The Springerville lines into Tucson are not currently identified in the WSCC Path Rating Catalog as constrained. The predominant power flow across Arizona is from the coal generation in the north/northeast to the west into Southern Nevada/California and south southwest into the Tucson/ Phoenix markets. Additionally, there is significant power flow from Arizona over the East of the River ("EOR") path into Southern California. New generation construction to date has been predominantly located in the west/northwest portions of Arizona with the largest amount under construction near the Palo Verde Nuclear generating station located west of Phoenix. As new plants are constructed around Palo Verde, it is likely that without new transmission additions this EOR path will become more congested and that transmission will also be constrained from the Palo Verde hub into the Phoenix area.

Paths are included in the WSCC Path Rating Catalog and the descriptions of selected paths are included in Appendix C.

ARIZONA/NEW MEXICO REGION WSCC TRANSMISSION PATHS



Several of the existing transmission constraints are identified on the figure above.

Path #	Path Description	Rating (MW)
22	Southwest of Four Corners	2325 (East – West)
47	Southern New Mexico (NM1)	925 (S) [1] 1048 (NS) [2]
49	East of the River (EOR)	7550 (East – West) Not rated (West – East)
50	Cholla to Pinnacle Peak	1200 (East – West)

Regional Generation

Dispatch of generation in the region of the Project affects the results of the analyses. Therefore, an important factor in evaluating the Project is the dispatch of existing generation and the proposed or "announced" generation in the region.

For the existing generation, an economic dispatch order was derived from the filed FERC Form 1 data. The data is presented in the order of highest to lowest capacity factor of the units as opposed to the fuel type or variable costs.

Table 1
Summary of Existing Regional Generation

Ownership	Plant Name	Prime Mover	Prime Fuel	Year(s) Built	Cap Factor (%)	Net Generation (MWh)	Total Production $/MWh	Maximum Capability (MW)	Base Case Dispatch (MW)
APS	Palo Verde	NU	Nuclear	1986-88	92.0	13970770	18.21	4186	4186
TEP	Springerville	ST	Coal	1985/90	87.6	5829792	32.56	760	760
Jointly	Four Corners	ST	Coal	1970	82.1	3478408	12.56	2060	2060
Jointly	Navajo	ST	Coal	1974/76	65.8	10581100	16.38	2415	2415
SRP	Stewart Mt.	HY	Hydro	1929	61.4	33565	27.81	13	13
AEPCO	Apache	ST	Coal/Gas	1964/79	54.0	UNK	UNK	425	425
APS	Cholla	ST	Coal	1962/81	51.7	3845135	20.11	995	995
WAPA	Parker – Davis	HY	Hydro	1951	48.8	UNK	UNK	366	310
SRP	Coronado	ST	Coal	1979/80	46.4	5039392	25.24	736	736
WAPA	Glen Canyon	HY	Hydro	1964/66	39.1	UNK	UNK	1304	960
SRP	Roosevelt	HY	Hydro	1972	31.5	70299	26	34	34
TEP	Irvington	ST	Coal/Gas	1967	29.9	1104485	45.7	425	415
SRP	Mormon Flat	HY	Hydro	1920/71	27.3	109749	15.18	51	51
APS	West Phoenix CC	CC	Gas (Old)	1976	27.0	602590	36.09	380	380
SRP	Agua Fria	ST	Gas/Oil (Old)	1961	24.6	888092	32.86	386	149
SRP	Horse Mesa	HY	Hydro	1927/72	24.4	207372	16.75	125	124
APS	Ocotillo	ST	Gas	1960	15.9	319380	45.43	230	230
APS	Saguaro	ST	Gas/Oil	1955	9.7	178262	46.47	209	209
SRP	Santan	CC	Gas (Old)	1974-5	9.7	714062	35.11	307	201
SRP	Kyrene	ST	Gas/Oil	1954	5.4	50072	76.48	106	0
APS	West Phoenix	GT	Gas	1973	5.2	50903	53.92	281	206
APS	Ocotillo	GT	Gas	1972-3	3.4	33501	62.81	187	112
APS	Saguaro GT	GT	Gas/Oil (Old)	1973	2.7	26142	65.35	109	109
SRP	Agua Fria GT	GT	Gas	1975	2.2	42223	196.66	226	132
APS	Yucca	GT	Gas/Oil (Old)	1971-4	2.0	25551	63.14	223	203
AEPCO	Apache CT	GT	Gas/Oil (Old)	1975	1.2	UNK	UNK	130	130
SRP	Kyrene GT	GT	Gas/Oil (Old)	1973	1.2	18990	75.2	158	0
TEP	Irvington GT	GT	Gas/Oil (Old)	1973	0.8	5161	72.68	60	50
TEP	North Loop	GT	Gas/Oil (Old)	1973	0.7	5631	70.64	310	205
TEP	DeMoss Petrie	GT	Gas/Oil (Old)	1973	0.1	569	441.7	130	130
District Owned	New Waddell	HY	Hydro	1993	UNK	UNK	UNK	46	30
Non-utility	Yuma	CC	Gas (Old)	1994	UNK	UNK	UNK	56	56
AEPCO	Apache CC	CC	Gas (Old)	1963	NA	UNK	UNK	30	28
UNK	Vail CT	UNK	Gas/Oil (Old)	UNK	NA	UNK	UNK	130	130

Proposed Regional Generation

Since dispatch of other generating resources affects power flows in the region, it may be necessary to add some level of "new" generation to the Base Case. As such, the following table lists proposed generation in the region and that which has been selected to include in the Base Case model.

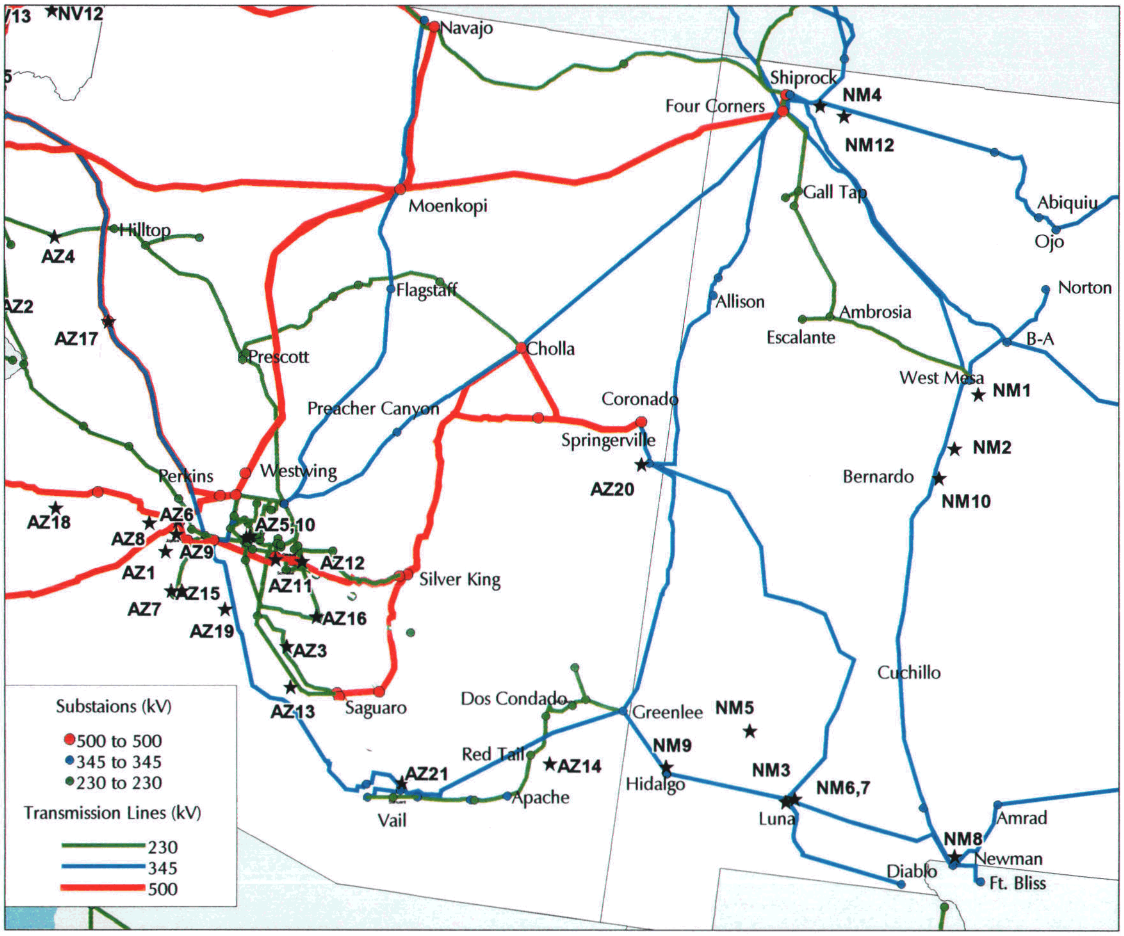
Proposed Generation Table

#	Developer	Plant Name	Location	State	MW	ISDN	Comments
AZ1	Duke Energy Power Services L.L.C.	Arlington Valley	SW of Buckeye	AZ	500	2002	CEC approval - Under Construction
AZ2	Calpine Mojave	South Point	Bullhead City	AZ	500	2001	Operating
AZ3	Reliant Energy Power Generation, Inc.	Desert Basin	Casa Grande	AZ	550	2001	Operating
AZ4	Griffith Energy/Duke/PPL	Griffith	Kingman	AZ	540	2001	Operating
AZ5	Arizona Public Service Company	West Phoenix	West Phoenix	AZ	130	2001	Operating
AZ6	Pinnacle West Energy	Red Hawk	Palo Verde	AZ	1000	2002	Under Construction
AZ7	Panda Energy International	Gila River	Gila River	AZ	2000	2003	CEC approval – Under Construction
AZ8	PG&E Generating	Harquahala	Harquahala	AZ	1000	2003	CEC approval – Under Construction
AZ9	Sempra Energy Resources	Mesquite	Near Palo Verde	AZ	1000	2003	CEC Approval –Under Construction
AZ10	Pinnacle West Capital Corp./Calpine	43rd Avenue	West Phoenix	AZ	511	2001	CEC approval
AZ11	Salt River Project	Kyrene	Kyrene	AZ	250	2002	CEC Approval –Under Construction
AZ12	Salt River Project	Santan	Santan (Gilbert)	AZ	825	2004	CEC approval
AZ13	Toltec Power Station, LLC.	Toltec Power Station	Eloy (Toltec)	AZ	1000	2003	CEC Pending
	Toltec Power Station, LLC.	Toltec Power Station	Eloy (Toltec)	AZ	1000	2004	CEC Pending
AZ14	Bowie Power Station, LLC.	Bowie Power Station	Bowie	AZ	1000	2004	Planned – Announced 1/31/01
AZ15	Gila Bend Power Partners	Gila Bend	Gila Bend	AZ	750	2003	CEC approval
AZ16	PP&L	PPL Sundance Energy	Coolidge	AZ	600	2002	CEC approval – Peaking unit
AZ17	Caithness Big Sandy LLC		Wikieup	AZ	720	2002	Status of CEC unknown
AZ18	Allegheny Energy Supply Co	La Paz	La Paz county	AZ	1080	2005	Status of CEC unknown
AZ19	AES	Montezuma Energy	Mobile	AZ	520	2003?	Status of CEC unknown
AZ20	Unisource/Bechtel	Springerville	Springerville	AZ	380	2005	Announced 02/05/2001
AZ21	Tucson Electric Power Co	Vail Generating Station	Rita Ranch	AZ	150	2002	Peaking
NM1	Delta Power Corporation	Cobisa Person	Albuquerque	NM	140	2000	In operation
NM2	Cobisa Corp	Cobisa – Rio Puerci	Belen	NM	220	2003	Planned
NM3	Deming Power Partners I		Deming	NM	250	N/A	Planned
NM4	Navajo Tribal Utility Authority		Farmington	NM	20	2001	Planned
NM5	Phelps Dodge Corp.	Chino Mines	Hurley	NM	50	Jul-01	Advanced Development
NM6	Duke Energy	Duke Energy Luna	Deming	NM	550	Jun-03	Facilities Study Completed
NM7	Unknown – Phase 1		Luna	NM	587	N/A	Facilities Study Completed
NM7	Unknown – Phase 2		Luna	NM	1200	N/A	Facilities Study Completed
NM8	Unknown		Vicinity of Newman	NM	250	N/A	Facilities Study Completed
NM9	Tri-state G&T Association, Inc.	Lordsburg	Lordsburg	NM	160	N/A	Facilities Study in Progress
NM10	Unknown		West Mesa-Arroyo	NM	120	N/A	Facilities Study in Progress
NM11	Unknown		Eddy	NM	80	N/A	Facilities Study in Progress
NM12	Ameramex	Bloomfield	Bloomfield	NM	50	N/A	Early development
NV12a	Duke Energy North America	Duke Energy Moapa	Clark County	NV	1080	Jun-02	Early development
NV12b	Duke Energy North America	Duke Energy Moapa	Clark County	NV	90	Jul-02	Early development
NV13	Nevada Power Co.	Harry Allen	Las Vegas	NV	500	Jun-04	Early development

Blue Highlight	Indicates the plant was already modeled in the WSCC Summer Peak Case
Yellow Highlight	Indicates the plant was modeled in the Base Case and may or may not be dispatched
No Highlight	Indicates the plant was not added to the Base Case

The following figure provides a geographic representation of the proposed and planned generation plants.

Proposed Generation Figure



CASE DEVELOPMENT AND ASSUMPTIONS

As with all load flow analyses, the results of the study are driven by the assumptions used in developing the load flow case. To minimize the impact of these assumptions, Beck starts the process with a filed load flow case model or another model supplied by the Client, and then details the changes made to the model in evaluating the Project. Although the filed cases are often part of the FERC 715 Filing, RTO or Multi-Regional Modeling Working Group ("MMWG") cases may also be used when available.

Case Development

The Base Case was created from the FERC-715 Filing 2001 Series WSCC Summer Peak Case, as modified by the CA-ISO for load and generation dispatch in California. The Arizona load level was assumed to be reflective of the 2003 time frame. The WSCC cases are filed with FERC as part of the annual 715 filing requirement. Beck relies upon these load flow models but does not independently verify all of the data in the models.

The Base Case is then used to create the Change Case(s) by adding the Project. For generating project additions, the generation is re-dispatched to accommodate the generation addition(s). The method used to re-dispatch the generation and a table showing the modifications to the dispatch are shown under Dispatch Assumptions.

The cases developed for this analysis are described below:

- Base Case – WSCC Summer Peak load flow case modified, if applicable to include proposed generation in the region with a dispatch as shown in Table 3.
- Alternative 1 – An interconnection to the TEP system via a new 14.5 mile double circuit 345 kV loop in and out of the Greenlee – Vail transmission line approximately 40 miles south of Greenlee.
- Alternative 2 – A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV line also connects to the new substation. Additionally, a 345/230 kV transformer will be located at the substation with a 0.5 mile double circuit in and out loop of the AEPCO's Dos Condados to Red Tail 230 kV line.
- Alternative 3 – A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV and the Springerville to

Vail 345 kV lines also connect to the new substation.

- Alternative 4 – A new substation, Willow, is constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV and the Springerville to Vail 345 kV lines also connect to the new substation. Additionally, a 345/230 kV transformer will also be located at the substation with a 0.5 mile double circuit in and out loop of the AEPCO's Dos Condados to Red Tail 230 kV line.

New Generation Projects in Base Case

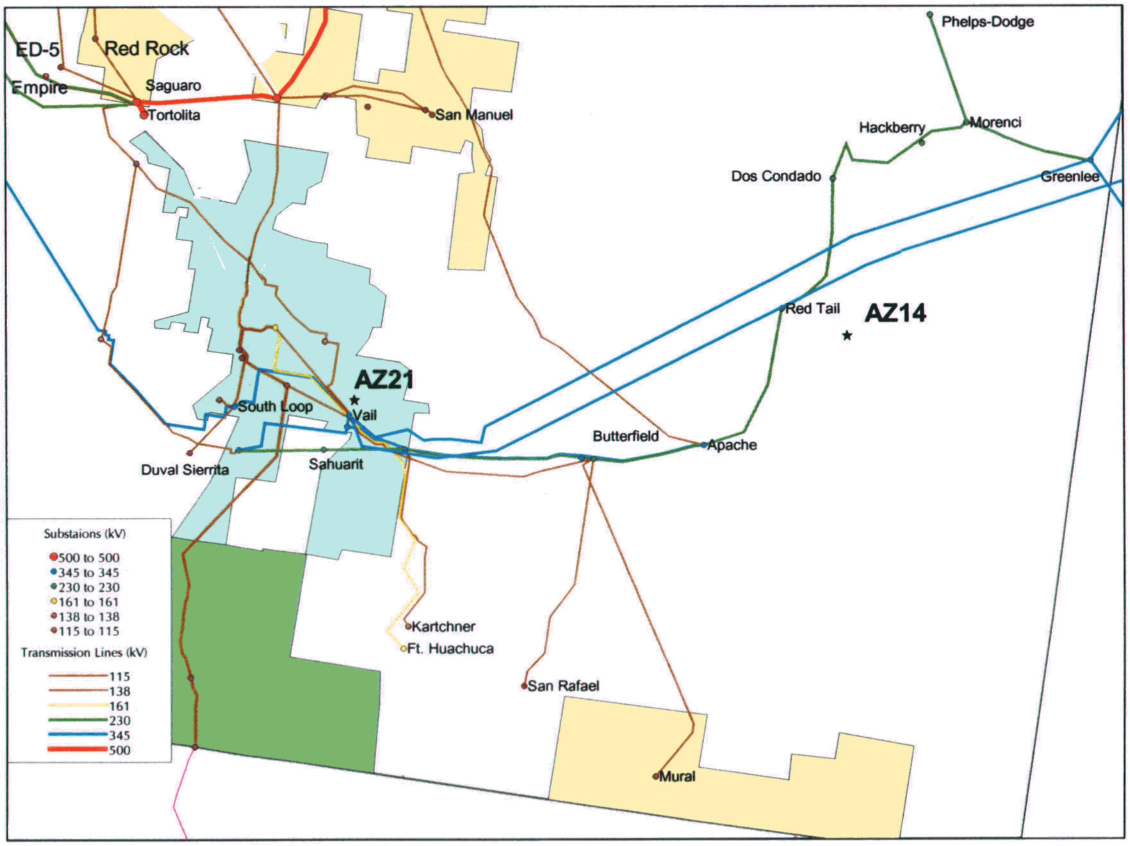
The dispatch of generation in a region impacts transmission system power flows. While it is not possible to evaluate all possible operational impacts, for planning purposes, it is necessary to assume a certain level of generation to meet the projected load. In this regard, assumptions need to be made as to which new generation projects should be included in the Base Case model used. For this analysis, plants that will be operating by 2002, additional CEC approved combined cycle plants in the Phoenix/East Valley/Tucson areas and a portion of the Palo Verde hub generation have been included in the model. Additionally, due to the proximity of the site location to New Mexico, the 500 MW Duke plant at Luna has been included in the Base Case. New projects included in the Base Case are summarized below:

1. Red Hawk 1000 MW Project (added to Base Case dispatched at 886 MW)
2. Santan 850 MW Project (already in 2001 series WSCC Case dispatched at 726 MW)
3. Desert Basin 500 MW Project (already in 2001 series WSCC Case dispatched at 460 MW)
4. Calpine West Phoenix 500 MW Project (already in 2001 series WSCC case dispatched at 300 MW)
5. Griffith Energy 650 MW Project (already in 2001 series WSCC case dispatched at 540 MW)
6. Calpine Southpoint 520 MW Project (already in 2001 series WSCC case dispatched 420 MW)
7. Panda Gila River 2080 MW Project (added to Base Case and dispatched 900 MW)
8. Other PV area new generation dispatched at 35 MW
9. Toltec Power Station 2000 MW Project (added to Base Case and dispatched at 1000 MW)
10. Duke Luna 550 MW Project in New Mexico (added to Base Case and dispatched at 500 MW)

Transaction Scenarios

Based on the location of the Project, primary markets are located in southeast Arizona, an area shown on the following figure.

SOUTHEAST ARIZONA REGION



Proposed Generation Table in Southeastern Arizona

#	Developer	Plant Name	Location	State	MW	ISDN	Comments
AZ14	Bowie Power Station, LLC.	Bowie Power Station	Bowie	AZ	1000	2004	Planned – Announced 1/31/01
AZ21	Tucson Electric Power Co	Vail Generating Station	Rita Ranch	AZ	150	2002	Peaking Facility

The transaction schedules shown in Table 2 were simulated in the load flow case models to examine the potential impact on the transmission system of delivery to the primary markets.

Table 2
Transaction Schedules in MW

Region	"a" (Alt 1 Only) AEPCO	"b" (Alt 1 Only) TEP	"c" (All Alternatives) AEPCO/ TEP
Southeastern AZ	500	0	500
Southeastern AZ/Tucson	0	500	600

Dispatch Assumptions

Generation is adjusted to accommodate, where applicable, other new generation projects assumed in the study to create the Base Case. Generation is further adjusted to accommodate the proposed Project to create the Change Case(s). Generation is adjusted considering the following factors:

- Other new generating projects added to the Base Case are generally assumed sold on an approximated economic dispatch to the utility (or power pool) to which the competing plant is interconnected.
- Transactions to primary markets (see Table 2);
- Capacity factors of existing generating units within the region where the proposed plant's power is to be sold, e.g., reducing the dispatch of low capacity factor units to accommodate the Project;
- A general philosophy of stressing the transmission interface by increasing the region's export.

Table 3 shows the generation dispatch used to simulate the transactions for the analysis for each dispatch level.

Table 3
Generation Dispatch Summary

Area: Generating Units (Bus #)	Capacity Factor	Base Case	Generation Dispatch Modifications (MW) Transaction Scenarios "a" AEPCO	"b" TEP	"c" AEPCO/ TEP
AZ: Santan (19521,4))	9.69%	0	0	0	0
AZ: Apache CT (17024-7)	1.23%	158	0	158	0
AZ: Apache ST (17028-30)	54.04%	425	83	425	83
AZ: North Loop CT (16510,5-6)	0.68%	205	205	0	0
AZ: Irvington CT (16504)	0.81%	50	50	0	0
AZ: Vail CT (16517)	NA	130	130	0	0
AZ: Irvington GT (16503,7-9)	29.88%	415	415	300	200
NM: Rio Grande	35.68%	243	243	243	243
NM: Person	New	140	140	140	140
AZ: Gila River (90001-12)	New	900	900	900	900
AZ: Remaining PV Area Generation	New	35	35	35	35
AZ: Toltec (93000)	New	1000	1000	1000	1000
NM: Duke Luna	New	500	500	500	500
Project (94000)	New	0	500	500	1100
Total Dispatched (Selected units)		4201	4201	4201	4201

Contingencies Evaluated

Beck evaluated the system for single contingency (N-1) outages (and possibly selected N-2 contingencies) as identified in Appendix A.

For the Base Case and Contingency analyses, Beck monitored flows and voltages on regional facilities.

Evaluation Criteria

Criteria are necessary to evaluate the performance of the transmission system within this analysis. This section describes the applicable criteria used for evaluation in this analysis.

WSCC Planning Criteria

(WSCC, under their Reliability Criteria for Transmission System Planning, requires its members to comply with standards set forth by the organization. WSCC, however, acknowledges the need for planning criteria to reflect "practical considerations such as the geography, type of load being served, system configuration, weather, local acceptance, or political and regulatory oversight." Therefore, the organization believes each individual member's planning criteria should "complement the reliability of the Western Interconnection with the practical needs of each individual system" and states "each individual system may use its internally applied reliability criteria to plan its internal system" as long as they meet WSCC criteria.

The following evaluation criteria are used for the analysis:

- During normal operation (e.g., prior to any contingency), line and transformer loading should not exceed the specified Normal Rating ("N" or Rating 1 within the load flow case).

- During contingency operation, line and transformer loading should not exceed the specified Emergency Rating ("E" or Rating 2 in the load flow case). Additionally, since some systems supply only one rating, for the facilities with only one rating identified, 110% of continuous rating has been assumed for N-1 contingency loadings.

According to the "Southeast Arizona Regional Transmission Study" published in March 2000, transmission lines without an Emergency Rating in southeastern Arizona use the following criterion under Emergency Operating Conditions, defined as single contingency outages:

"Transmission lines should not be loaded greater than 110% of the thermal rating of the conductors."

The "Southeast Arizona Regional Transmission Study" was jointly prepared by AEPCO, Arizona Public Service, Citizens Utilities, Public Service Company of New Mexico, Tucson Electric Power, and Western Area Power Administration. The study analyzed the interactions and reliability between the different transmission providers in Southeastern Arizona.

The results of the contingency analyses for the Change Case(s) are compared with the Base Case loadings for the same contingency to determine if integration of the Project resulted in any new overloads. The Results section details the overloads occurring in the Alternative Case(s) both with and without contingencies.

RESULTS

There are several considerations when examining the impact of a particular project on the grid. Discussed within this section is the impact on facilities where the loading exceeds the rating of the facility. Loading violations such as these may indicate that (1) transmission system upgrades are necessary, (2) special protection schemes need to be implemented in conjunction with the Project, (3) other system configuration change(s) is(are) warranted or (4) that staging of integration of various output levels of the Project requires coordination with future transmission expansion plans.

The power flow analysis results have two key components, an AC analysis to identify facilities that are overloaded in any of the cases examined and a Linear, DC, analysis which projects the Project output level at which loading violation occurs ("FCITC"). In conjunction with these results are the presentation of the distribution and participation factors ("TDF" and "TPF" respectively) of the Project on these same facilities.

Interface and Facility Impact

Impact on key interface limitations are a consideration. The following tables show the contribution of the Project on the defined transmission paths.

Power Flow over Defined Paths and Regional Facilities

WSCC Path #	Path/Facility Description	Rating	Base	"1a" AEPCO 500 MW	""1b" TEP 500 MW	"1c" AEPCO/TEP 1100 MW	"2c" AEPCO/TEP 1100 MW	"3c" AEPCO/TEP 1100 MW	"4c" AEPCO/TEP 1100 MW
			MW	MW	MW	MW	MW	MW	MW
22	Southwest of Four Corners	2325 (E – W)	1751	1767	1777	1797	1790	1795	1793
47	Southern New Mexico (NM1)	925 (S) 1 1048 (NS) 2	589	590	589	590	590	590	590
49	East of the River (EOR)	7550 (E – W) Not rated (W – E)	5011	5009	5007	5006	5005	5005	5005
50	Cholla to Pinnacle Peak	1200 (E – W)	1096	1107	1094	1103	1101	1105	1103
NA	Springerville – Greenlee 345 kV line	745/1010	378	335	261	195	220	342	328
NA	Greenlee – Vail 345 kV line	896/1210	190	-	-	-	-	-	-
NA	Greenlee – Project Bus 345 kV line	896/1210	-	-73	20	-278	-	-	-
NA	Project Bus – Vail 345 kV line	896/1210	-	419	508	790	-	-	-
NA	Greenlee – Willow 345 kV line	896/1210	-	-	-	-	-106	-75	15
NA	Willow – Vail 345 kV line	896/1210					754	619	584
NA	Springerville – Vail 345 kV line	666/806	322	318	390	402	395	-	-
NA	Springerville – Willow 345 kV line	666/806	-	-	-	-	-	215	240
NA	Willow – Vail 345 kV line	666/806	-	-	-	-	-	586	566
NA	Greenlee 230/345 kV xfmr #1	150/193	39	-64	26	-78	-9	-69	-17
NA	Greenlee 230/345 kV xfmr #2	150/193	37	-68	28	-83	-10	-73	-18
NA	Dos Condados – Red Tail 230 kV line	350/438	-126	80	-105	108	-	90	-
NA	Dos Condados – Willow 230 kV line	350/438	-	-	-	-	-32	-	-15
NA	Willow – Red Tail 230 kV line	350/438	-	-	-	-	180	-	155

3. Simultaneous
4. Non-Simultaneous

All four Alternatives had little to no impact on the listed WSCC transmission paths. Additionally, it is noted that flow on the Springville to Vail 345 kV line is greater than the output of Springerville Unit 2 in all cases evaluated, i.e., in line with the TEP Two County bond tax restrictions.

Power Flow Summary

The load flow results are summarized below. Complete results tables are included in Appendix B.

Both Normal and Outage Conditions are presented in separate tables.

Table description:

Column 1: FCITC, i.e., First Contingency Incremental Transfer Capability (This column identifies the level of Project dispatch for which the applicable overload element occurs. Negative FCITC numbers represent pre-existing Base Case loading violations. Although pre-existing, the negative FCITC elements must be examined closely to determine if integration of the Project reduces the Base Case loading or increases the Base Case loading. Increases in Base Case loading could result in cost sharing of upgrades, if applicable.)

Column 2: TDF, i.e., Normal "N" or Outage "O" Transaction Distribution Factor. (The percent of the transaction that flows over the overloaded element under either normal or outage conditions. In utility Interconnection/Transmission Service evaluations, a threshold percentage may apply.) Positive or negative designation corresponds to the direction of the flow.

Column 3: TPF, i.e., Normal "N" or Outage "O" Transaction Participation Factor. (The incremental flow due to the transaction divided by the facility rating.) Positive or negative designation corresponds to the direction of the flow.

Column 4: Type "Tp" (Designation of overloaded element as either a line "L" or transformer "X".)

Column 5: Overloaded Element (Element that overloads at the Project output identified in the FCITC column)

Column 6: Area (Area designation of the overloaded element)

Column 7: Contingency (Outage resulting in the overloaded element)

Column 8: Rating (Normal/Emergency rating of the overloaded element)

Columns 9 –10: Base and Change loading of the element considering the Project at maximum output. (These correspond with the levels presented in the Maximum Project Output Analysis section.)

For the analyses "Normal Condition" or "continuous loading" is defined as all facilities normally in-service. "Post-Contingency" is defined as a single contingency (N-1), i.e., one line or transformer out of service.

The results are presented as follows:

1. Alternative 1a: Project at 500MW, Sale to AEPCO
2. Alternative 1b: Project at 500MW, Sale to TEP
3. Alternative 1c: Project at 1100MW, Sale to AEPCO/TEP
4. Alternative 2c: Project at 1100MW, Sale to AEPCO/TEP
5. Alternative 3c: Project at 1100MW, Sale to AEPCO/TEP
6. Alternative 4c: Project at 1100MW, Sale to AEPCO/TEP

The following Normal Condition pre-existing facility violations were present in all cases. Integration of the Project had no impact on the loading of these facilities.

All Alternatives

Normal (Pre-Contingency) Summary

Project Full Output: 500/1100 MW							Rating	AC Power Flow	
FCITC	NTDF	NTPF	Tp	Overloaded Element	Area	Contingency	N/E	% of N Rating	
							(MVA)	Base	Chg
-	-	-	L	Irving To Westms_T 115kv	Nm	No Outage	134	111%	111%
-	-	-	L	Lenkurt To Sandia_1 115kv	Nm	No Outage	108	112%	112%
-	-	-	L	Person To Wesmecot 115kv	Nm	No Outage	120	110%	110%
-	-	-	L	Westms_1 To Westms_T 115kv	Nm	No Outage	134	118%	118%
-	-	-	L	Mesa__# To Rio_Gran 115kv	Nm	No Outage	144/196	100%	100%
-	-	-	L	Clapham To Rosebud 115kv	Nm	No Outage	60	102%	102%
-	-	-	L	Hollywo# To Alamogcp 115kv	Nm	No Outage	40	106%	106%
-	-	-	X	Socorrop To Socorrop 69/115kv	Nm	No Outage	17	103%	103%

Alternative 1: Project Connection to 345 kV

Alternative 1 models an interconnection to the TEP system via a new 14.5 mile double circuit 345 kV loop in and out of the Greenlee – Vail transmission line approximately 40 miles south of Greenlee.

Three separate scenarios were evaluated for this interconnection alternative.

Alternative 1a: 500 MW Sale to AEPCO

Alt 1a Post-Contingency Summary

Project Full Output : 500 MW							Rating	AC Power Flow	
FCITC	TDF	TPF	Tp	Overloaded Element	Area	Contingency	N/E	% of E Rating	
							(MVA)	Base	Chg
-	-64.2%	-119.8%	L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	7%
-	10.4%	52.5%	L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	115%	47%
-	0.8%	2.0%	X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	102%	100%
-	-	-	L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
-750	0.4%	1.7%	L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	104%
-	1.2%	1.2%	X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	107%
-	1.4%	1.4%	X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	106%	108%
-1167	0.6%	2.2%	L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	106%
0	0.4%	1.7%	L	Sag.East To Red Rock 115kv	AZ	Coronado To Silverkg 500kv	120	99%	101%
525	4.0%	3.3%	X	Westwing To Ww.3wp 345/500kv	AZ	Saguaro To Toltec 500kv	600	98%	101%
571	4.2%	17.5%	L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	110%
667	0.6%	2.5%	L	Ed-5 To Ed-4 115kv	AZ	Coronado To Silverkg 500kv	120	99%	101%

Integration of the Project results in no new emergency rating violations, i.e., no loading exceeds the identified emergency rating or 110% of continuous rating if an emergency rating was not identified.

Alternative 1b: 500 MW Sale to TEP

Alt 1b Post-Contingency Summary

Project Full Output : 500 MW							Rating	AC Power Flow	
FCITC	TDF	TPF	Tp	Overloaded Element	Area	Contingency	N/E (MVA)	% of E Rating Base	Chg
-	1.4%	3.5%	X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	102%	98%
-	-0.6%	-2.5%	L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	100%
-	-1.4%	-1.4%	X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	104%
-	-1.4%	-1.4%	X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	106%	105%
-	-0.4%	-0.7%	L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	113%
-	-	-	L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
-500	1.4%	5.2%	L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	110%
151	12.6%	23.5%	L	Apache To Buterfld 230kv	AZ	Bowie To Vail 345kv	268	91%	116%
500	-0.6%	-3.0%	L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	115%	119%
508	12.4%	23.1%	L	Buterfld To Pantano 230kv	AZ	Bowie To Vail 345kv	268	75%	101%
516	12.8%	33.2%	X	Bicknell To Bicknell 230/345kv	AZ	Bowie To Vail 345kv	150/193	65%	100%
						Saguaro To Tortolit 500kv		-	Div

Integration of the Project results in no new emergency rating violations, i.e., no loading exceeds the identified emergency rating or 110% of continuous rating if an emergency rating was not identified. While the Apache to Buttefield 230 kV line did overload for the loss of Butterfield to Apache, this same line had a pre-existing loading violation for the loss of Apache to Red Tail 230 kV line in the Base Case.

Alternative 1c: 1100 MW Sale to AEPCO/TEP

Alt 1b Post-Contingency Summary

Project Full Output : 1100 MW							Rating	AC Power Flow	
FCITC	TDF	TPF	Tp	Overloaded Element	Area	Contingency	N/E (MVA)	% of E Rating Base	Chg
-	-29.1%	-119.4%	L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	11%
-	4.3%	47.5%	L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	115%	52%
-	1.3%	7.0%	X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	102%	95%
-	-0.2%	-1.7%	L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	100%
-	-0.5%	-1.0%	X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	104%
-	-0.5%	-1.0%	X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	106%	106%
-	-	-	L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
-700	1.0%	8.2%	L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	113%
1082	-10.8%	-106.3%	X	Apache To Apache 115/230kv #2	AZ	Apache To Apache 230/115kv	100/112	14%	102%
1091	-10.7%	-105.4%	X	Apache To Apache 115/230kv	AZ	Apache To Apache 230/115kv #2	100/112	14%	101%
1091	22.3%	36.5%	X	Tortolit To Tortolit 500/138kv	AZ	Bowie To Vail 345kv	600/672	64%	102%
1553	1.5%	14.2%	L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	106%
2689	-0.8%	-1.5%	X	Westwing To Ww.3wp 500/345kv	AZ	Saguaro To Toltec 500kv	600	99%	101%
						Saguaro To Tortolit 500kv		-	Div

The Apache 230/115 kV transformers slightly overload for the loss of the parallel Apache 230/115 kV transformer. The violation is likely caused by the re-dispatch of power to offset the output of the Project, where generation was taken offline at the Apache Generating Station to accommodate a portion of the 1100 MW Project. It is assumed that this violation can be corrected via operational means.

Integration of the Project results in no new additional emergency rating violations, i.e., no loading (with the exception of the Apache transformers) exceeds the identified emergency rating or 110% of continuous rating if an emergency rating was not identified.

Alternative 2: Project interconnection to 345 kV and 230 kV

Alternative 2 includes a new substation, Willow, constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV line also connects to the new substation. Additionally, a 345/230 kV transformer will be located at the substation with a 0.5 mile double circuit in and out loop of the AEPCO's Dos Condados to Red Tail 230 kV line.

Only an 1100 MW Project output level was evaluated.

Alternative 2c: 1100 MW Sale to AEPCO/TEP

Alt 2c Post-Contingency Summary

Project Full Output: 1100 MW							Rating	AC Power Flow	
FCITC	TDF	TPF	Tp	Overloaded Element	Area	Contingency	N/E (MVA)	% of E Rating Base	Chg
-	-29.1%	-119.4%	L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	11%
-	3.5%	39.4%	L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	114%	62%
-	1.2%	6.5%	X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	103%	96%
-	-0.5%	-1.2%	X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500/0	105%	104%
-	-0.5%	-1.2%	X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500/0	107%	106%
-	-0.2%	-1.7%	L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	101%
-	-	-	L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
-660	0.9%	7.5%	L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	111%
880	2.3%	9.3%	L	Apache To Buterfld 230kv	AZ	Willow2 To Vail 345kv	268	91%	103%
927	-12.7%	-125.0%	X	Apache To Apache 115/230kv	AZ	Apache To Apache 230/115kv #2	100/112	14%	120%
927	-12.7%	-125.0%	X	Apache To Apache 115/230kv #2	AZ	Apache To Apache 230/115kv	100/112	14%	120%
999	-44.6%	-139.9%	L	Red Tail To Willow3 230kv	AZ	Willow2 To Vail 345kv	351	27%	111%
1028	-44.2%	-138.5%	L	Apache To Red Tail 230kv	AZ	Willow2 To Vail 345kv	351	29%	109%
1167	21.0%	34.4%	X	Tortolit To Tortolit 500/138kv	AZ	Willow2 To Vail 345kv	600/672	63%	100%
2200	1.1%	10.0%	L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	103%
4675	-0.4%	-0.7%	X	Westwing To Ww.3wp 500/345kv	AZ	Saguaro To Toltec 500kv	600	100%	101%
						Saguaro To Tortolit 500kv		-	Div

With the exception of the Apache 230/115 kV transformers discussed under Alternative 1c, the integration of the 1100 MW Project resulted in only one slight emergency violation of the Red Tail to Willow 3 230 kV line. While the loading on this facility reached 111% of continuous rating, it is assume that this violation could be alleviated via operational means, such as transfer tripping the Willow 345/230 kV transformer for the Willow2 to Vail 345 kV outage.

Alternative 3: Project Interconnection to Dual 345 kV Lines

Alternative 3 includes a new substation, Willow, constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV and the Springerville to Vail 345 kV lines also connect to the new substation.

Only an 1100 MW Project output level was evaluated.

Alternative 3c: 1100 MW Sale to AEPCO/TEP

ALTERNATIVE 3C: POST-CONTINGENCY CONDITION

Project Full Output: 1100 MW							Rating	AC Power Flow	
FCITC	TDF	TPF	Tp	Overloaded Element	Area	Contingency	N/E (MVA)	% of E Rating Base	Chg
-	-29.0%	-119.0%	L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	9%
-	4.6%	51.5%	L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	114%	48%
-	1.3%	7.0%	X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	103%	96%
-	-0.1%	-0.8%	L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	101%
-	-0.3%	-0.6%	X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	107%	106%
-	-0.3%	-0.6%	X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	105%
-	-0.2%	-0.3%	X	Westwing To Ww.3wp 500/345kv	AZ	Saguaro To Toltec 500kv	600	100%	100%
-	-	-	L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
-2200	0.3%	2.2%	L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	106%
638	53.0%	81.0%	X	Vail2 To Vail 345/138kv	AZ	Willow2 To Vail 345kv	600/720	52%	135%
800	-53.0%	-72.3%	L	Vail2 To Willow1 345kv	AZ	Willow2 To Vail 345kv	666/806	46%	121%
1141	-12.3%	-39.2%	L	Irvngtn To Vail 138kv	AZ	South To So.3wp2 345/138kv	287/344	58%	100%
1467	1.6%	15.0%	L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	107%
						Saguaro To Tortolit 500kv		-	Div

Interconnection Alternative 3 may require upgrade to the Vail 2 345/138 kV transformer unless a higher shorter term rating can be utilized. The transformer loading increased from 52% in the Base Case to 135% in the Alt 3 for the loss of the Willow 2 to Vail 345 kV line. Additionally, this interconnection configuration (a connection to both Springerville – Vail and Greenlee – Vail 345 kV lines) resulted in a violation of the Willow to Vail 2 345 kV (originally the Springerville to Vail 345 kV line) line rating. The line loading increased from 46% of its Emergency Rating in the Base Case to 121% in Alt 3. Under this configuration, transactions into AEPCO and TEP may potentially be limited at 800 MW based on the identified FCITC value (i.e., the Project output at which the violation occurs). It is noted however, that this line has a much lower rating than the Greenlee to Vail 345 kV line. The line is identified in TEP's FERC Form 1 data as having twin bundled 954 ACSR for a portion of the line and 954 ACSR Rail for another portion. It is possible that an upgrade of this line could be required to integrate the Project under the Alternative 3 configuration, i.e., a connected to both 345 kV Vail lines.

Alternative 4: Interconnection to Dual-345kV Lines and 230kV

Alternative 4 includes a new substation, Willow, constructed near the intersection of TEP's Greenlee to Vail 345 kV line and AEPCO's Dos Condados to Red Tail 230 kV line. The 14.5 mile double circuit 345 kV Bowie lines will terminate into the new breaker and a half substation. The Greenlee to Vail 345 kV and the Springerville to Vail 345 kV lines also connect to the new substation. Additionally, a 345/230 kV transformer will also be located at the substation with a 0.5 mile double circuit in and out loop of the AEPCO's Dos Condados to Red Tail 230 kV line.

Only an 1100 MW Project output level was evaluated.

Alternative 4c: 1100 MW Sale to AEPCO/TEP

ALTERNATIVE 4C: POST-CONTINGENCY CONDITION

Project Full Output: 1100 MW							Rating	AC Power Flow	
FCITC	TDF	TPF	Tp	Overloaded Element	Area	Contingency	N/E	% of E Rating	
							(MVA)	Base	Chg
-	-29.0%	-119.0%	L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	9%
-	3.9%	43.4%	L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	114%	57%
-	1.2%	6.5%	X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	103%	96%
-	-0.2%	-1.7%	L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	101%
-	-0.4%	-0.8%	X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	107%	106%
-	-0.4%	-0.8%	X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	105%
-	0.2%	0.3%	X	Westwing To Ww.3wp 500/345kv	AZ	Saguaro To Toltec 500kv	600	100%	99%
-	-	-	L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
-1650	0.4%	3.0%	L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	106%
710	47.6%	72.8%	X	Vail2 To Vail 345/138kv	AZ	Willow2 To Vail 345kv	600/720	52%	126%
890	-47.6%	-65.0%	L	Vail2 To Willow1 345kv	AZ	Willow2 To Vail 345kv	666/806	46%	113%
983	-12.0%	-117.9%	X	Apache To Apache 115/230kv	AZ	Apache To Apache 230/115kv #2	100/112	14%	112%
983	-12.0%	-117.9%	X	Apache To Apache 115/230kv #2	AZ	Apache To Apache 230/115kv	100/112	14%	113%
1886	1.3%	11.7%	L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	104%
						Saguaro To Tortolit 500kv		-	Div

While overloads are slightly reduced, the results for Alt 4 are in line with that of Alt 3. Additionally, however, the Apache 230/115 kV transformers overload as discussed under Alt 2. It is expected that this loading violation could be alleviated via operational means.

Interconnection Alternative 3 may require upgrade to the Vail 2 345/138 kV transformer unless a higher shorter term rating can be utilized. In addition, it is possible that an upgrade of the Willow to Vail 2 (formerly the Springville – Vail 345 kV line could be required for transaction greater than 890 MW schedule south, as indicated by the FCITC value for this loading violation.

Appendix A
CONTINGENCY LIST

Contingency List

C- 1	Line	16101	GREENLEE	345kV	to	11080	HIDALGO	345kV	Ckt	1
C- 2	Line	16101	GREENLEE	345kV	to	16104	SPRINGR	345kV	Ckt	1
C- 3	Line	16101	GREENLEE	345kV	to	17010	GREEN-AE	345kV	Ckt	1
C- 4	Line	16105	VAIL	345kV	to	16103	SOUTH	345kV	Ckt	1
C- 5	Line	16105	VAIL	345kV	to	17005	BICKNELL	345kV	Ckt	1
C- 6	Transformer	16105	VAIL	345kV	to	16308	VAIL.3WP	100kV	Ckt	1
C- 7	Line	11080	HIDALGO	345kV	to	11093	LUNA	345kV	Ckt	1
C- 8	Line	16103	SOUTH	345kV	to	93001	TOLTC345	345kV	Ckt	1
C- 9	Line	16104	SPRINGR	345kV	to	16102	MCKINLEY	345kV	Ckt	1
C- 10	Line	16104	SPRINGR	345kV	to	16102	MCKINLEY	345kV	Ckt	2
C- 11	Line	16104	SPRINGR	345kV	to	11093	LUNA	345kV	Ckt	1
C- 12	Line	16104	SPRINGR	345kV	to	16100	CORONADO	345kV	Ckt	1
C- 13	Transformer	17005	BICKNELL	345kV	to	17004	BICKNELL	230kV	Ckt	1
C- 14	Transformer	17010	GREEN-AE	345kV	to	17009	GREEN-AE	230kV	Ckt	1
C- 15	Transformer	17010	GREEN-AE	345kV	to	17009	GREEN-AE	230kV	Ckt	2
C- 16	Transformer	16103	SOUTH	345kV	to	16306	SO.3WP2	100kV	Ckt	1
C- 17	Transformer	16308	VAIL.3WP	100kV	to	16220	VAIL	138kV	Ckt	1
C- 18	Transformer	16100	CORONADO	345kV	to	15001	CORONADO	500kV	Ckt	1
C- 19	Line	16102	MCKINLEY	345kV	to	10292	SAN_JUAN	345kV	Ckt	1
C- 20	Line	16102	MCKINLEY	345kV	to	10292	SAN_JUAN	345kV	Ckt	2
C- 21	Line	93001	TOLTC345	345kV	to	16107	WESTWING	345kV	Ckt	1
C- 22	Line	17004	BICKNELL	230kV	to	17102	SAHUARIT	230kV	Ckt	1
C- 23	Line	17009	GREEN-AE	230kV	to	17014	MORENCI	230kV	Ckt	1
C- 24	Transformer	17004	BICKNELL	230kV	to	17006	BICKNELL	115kV	Ckt	1
C- 25	Line	16220	VAIL	138kV	to	16204	IRVNGTN	138kV	Ckt	1
C- 26	Line	16220	VAIL	138kV	to	16211	ROBERTS	138kV	Ckt	1
C- 27	Line	16220	VAIL	138kV	to	16213	S.TRAIL	138kV	Ckt	1
C- 28	Line	16220	VAIL	138kV	to	16222	LITTLE	138kV	Ckt	1
C- 29	Line	16220	VAIL	138kV	to	16223	LOSREALS	138kV	Ckt	1
C- 30	Transformer	16306	SO.3WP2	100kV	to	16216	SOUTH	138kV	Ckt	1
C- 31	Line	15001	CORONADO	500kV	to	14000	CHOLLA	500kV	Ckt	1
C- 32	Line	15001	CORONADO	500kV	to	15041	SILVERKG	500kV	Ckt	1
C- 33	Line	17014	MORENCI	230kV	to	17011	HACKBRRY	230kV	Ckt	1
C- 34	Line	17016	PANTANO	230kV	to	17007	BUTERFLD	230kV	Ckt	1
C- 35	Line	17016	PANTANO	230kV	to	17102	SAHUARIT	230kV	Ckt	1
C- 36	Line	16202	E. LOOP	138kV	to	16208	NE.LOOP	138kV	Ckt	1
C- 37	Line	16202	E. LOOP	138kV	to	16211	ROBERTS	138kV	Ckt	1
C- 38	Line	16202	E. LOOP	138kV	to	16224	R.BILLS	138kV	Ckt	1
C- 39	Line	16202	E. LOOP	138kV	to	16213	S.TRAIL	138kV	Ckt	1
C- 40	Line	16202	E. LOOP	138kV	to	16215	SNYDER	138kV	Ckt	1
C- 41	Line	16204	IRVNGTN	138kV	to	16201	DREXEL	138kV	Ckt	1
C- 42	Line	16204	IRVNGTN	138kV	to	16216	SOUTH	138kV	Ckt	1
C- 43	Line	16204	IRVNGTN	138kV	to	16218	TUCSON	138kV	Ckt	1
C- 44	Line	16204	IRVNGTN	138kV	to	16222	LITTLE	138kV	Ckt	1
C- 45	Line	16204	IRVNGTN	138kV	to	16214	SN.CRUZ	138kV	Ckt	1
C- 46	Line	16216	SOUTH	138kV	to	16206	MIDVALE	138kV	Ckt	1
C- 47	Line	16223	LOSREALS	138kV	to	16224	R.BILLS	138kV	Ckt	1
C- 48	Line	17006	BICKNELL	115kV	to	17022	THREEPNT	115kV	Ckt	1

C-	49	Line	14000	CHOLLA	500kV	to	14004	SAGUARO	500kV	Ckt	1	
C-	50	Line	14004	SAGUARO	500kV	to	16000	TORTOLIT	500kV	Ckt	1	
C-	51	Transformer	14004	SAGUARO	500kV	to	14356	SAG.EAST	115kV	Ckt	1	
C-	52	Transformer	14004	SAGUARO	500kV	to	14357	SAG.WEST	115kV	Ckt	1	
C-	53	Transformer	15041	SILVERKG	500kV	to	15042	SILVERKG	100kV	Ckt	1	
C-	54	Transformer	14101	FOURCORN	345kV	to	14001	FOURCORN	500kV	Ckt	1	
C-	55	Line	17007	BUTERFLD	230kV	to	17002	APACHE	230kV	Ckt	1	
C-	56	Line	17008	DOSCONDO	230kV	to	17011	HACKBRRY	230kV	Ckt	1	
C-	57	Line	16208	NE.LOOP	138kV	to	16210	RILLITO	138kV	Ckt	1	
C-	57	Line	17008	DOSCONDO	230kV	to	17018	RED TAIL	230kV	Ckt	1	Alt 1&3 Only
C-	58	Line	16208	NE.LOOP	138kV	to	16215	SNYDER	138kV	Ckt	1	
C-	59	Line	16214	SN.CRUZ	138kV	to	16200	DMP	138kV	Ckt	1	
C-	60	Line	16218	TUCSON	138kV	to	16221	WESTINA	138kV	Ckt	1	
C-	61	Line	10206	MIMBRES	115kV	to	12014	CABALLOT	115kV	Ckt	1	
C-	62	Line	17022	THREEPNT	115kV	to	17003	AVRA	115kV	Ckt	1	
C-	63	Transformer	16309	WW.3WP	100kV	to	14005	WESTWING	500kV	Ckt	1	
C-	64	Line	17002	APACHE	230kV	to	17018	RED TAIL	230kV	Ckt	1	
C-	65	Transformer	17002	APACHE	230kV	to	17001	APACHE	115kV	Ckt	1	
C-	66	Transformer	17002	APACHE	230kV	to	17001	APACHE	115kV	Ckt	2	
C-	67	Line	16200	DMP	138kV	to	16207	N. LOOP	138kV	Ckt	1	
C-	68	Line	16210	RILLITO	138kV	to	16207	N. LOOP	138kV	Ckt	1	
C-	69	Line	16210	RILLITO	138kV	to	16205	LACANADA	138kV	Ckt	1	
C-	70	Line	16221	WESTINA	138kV	to	16207	N. LOOP	138kV	Ckt	1	
C-	71	Transformer	14356	SAG.EAST	115kV	to	14225	SAGUARO	230kV	Ckt	1	
C-	72	Line	12014	CABALLOT	115kV	to	12041	HOT_SPRG	115kV	Ckt	1	
C-	73	Line	12059	PICACHO	115kV	to	12028	EL_BUTTE	115kV	Ckt	1	
C-	74	Line	14356	SAG.EAST	115kV	to	14357	SAG.WEST	115kV	Ckt	1	
C-	75	Line	14356	SAG.EAST	115kV	to	19057	ORACLE	115kV	Ckt	1	
C-	76	Line	14356	SAG.EAST	115kV	to	17013	MARANATP	115kV	Ckt	1	
C-	77	Line	14357	SAG.WEST	115kV	to	14358	SNMANUEL	115kV	Ckt	1	
C-	78	Line	14357	SAG.WEST	115kV	to	19048	EMPIRE	115kV	Ckt	1	
C-	79	Line	17003	AVRA	115kV	to	17012	MARANA	115kV	Ckt	1	
C-	80	Transformer	15042	SILVERKG	100kV	to	15215	SILVERKG	230kV	Ckt	1	
C-	81	Line	14004	SAGUARO	500kV	to	93000	TOLTEC	500kV	Ckt	1	
C-	82	Line	94003	WILLOW2	345kV	to	16101	GREENLEE	345kV	Ckt	1	Alt 2 – 4 Only
C-	83	Line	94003	WILLOW2	345kV	to	16105	VAIL	345kV	Ckt	1	Alt 2 – 4 Only
C-	83	Line	94000	BOWIE	345kV	to	16101	GREENLEE	345kV	Ckt	1	Alt 1 Only
C-	84	Line	94002	WILLOW1	345kV	to	16104	SPRINGR	345kV	Ckt	1	Alt 3&4 Only
C-	84	Line	94000	BOWIE	345kV	to	16105	VAIL	345kV	Ckt	1	Alt 1 Only
C-	85	Line	94002	WILLOW1	345kV	to	16106	VAIL2	345kV	Ckt	1	Alt 3&4 Only
C-	86	Transformer	94003	WILLOW2	345kV	to	94001	WILLOW3	230kV	Ckt	1	Alt 2&4 Only
C-	87	Line	94001	WILLOW3	230kV	to	17008	DOSCONDO	230kV	Ckt	1	Alt 2&4 Only
C-	88	Line	17018	RED TAIL	230kV	to	94001	WILLOW3	230kV	Ckt	1	Alt 2&4 Only

Appendix B

LOAD FLOW RESULTS TABLES

All Alternatives

Normal (Pre-Contingency) Summary

Project Full Output: 500/1100 MW							Rating	AC Power Flow	
FCITC	NTDF	NTPF	Tp	Overloaded Element	Area	Contingency	N/E	% of N Rating	
							(MVA)	Base	Chg
-	-	-	L	Irving To Westms_T 115kv	Nm	No Outage	134	111%	111%
-	-	-	L	Lenkurt To Sandia_1 115kv	Nm	No Outage	108	112%	112%
-	-	-	L	Person To Wesmecot 115kv	Nm	No Outage	120	110%	110%
-	-	-	L	Westms_1 To Westms_T 115kv	Nm	No Outage	134	118%	118%
-	-	-	L	Mesa___# To Rio_Gran 115kv	Nm	No Outage	144/196	100%	100%
-	-	-	L	Clapham To Rosebud 115kv	Nm	No Outage	60	102%	102%
-	-	-	L	Hollywo# To Alamogcp 115kv	Nm	No Outage	40	106%	106%
-	-	-	X	Socorrop To Socorrop 69/115kv	Nm	No Outage	17	103%	103%

ALTERNATIVE 1A: POST-CONTINGENCY SUMMARY

Tp	Overloaded Element	Area	Contingency	Rating N/E (MVA)	AC Power Flow % of E Rating Base	Chg
L	Apache To Buterfld 230kv	AZ	Doscondo To Red Tail 230kv	268	112%	8%
L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	7%
L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	106%	108%
X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	107%
L	Ed-5 To Ed-4 115kv	AZ	Coronado To Silverkg 500kv	120	99%	101%
L	Haydenaz To Apache 115kv	AZ	Doscondo To Red Tail 230kv	99	104%	31%
L	Haydenaz To Apache 115kv	AZ	Apache To Red Tail 230kv	99	105%	32%
L	Haydenaz To Apache 115kv	AZ	Pantano To Sahuarit 230kv	99	106%	38%
L	Haydenaz To Apache 115kv	AZ	Bicknell To Sahuarit 230kv	99	105%	37%
L	Haydenaz To Apache 115kv	AZ	Pantano To Buterfld 230kv	99	109%	41%
L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	115%	47%
L	Haydenaz To Apache 115kv	AZ	Coronado To Silverkg 500kv	99	104%	60%
L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	106%
L	Hidalgo To Turquois 115kv	NM	Springr To Luna 345kv	134	101%	101%
L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	110%
L	Sag.East To Red Rock 115kv	AZ	Coronado To Silverkg 500kv	120	99%	101%
L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	104%
X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200/0	102%	100%
X	Westwing To Ww.3wp 345/100kv	AZ	Saguaro To Toltec 500kv	600	98%	101%
X	Westwing To Ww.3wp 500/100kv	AZ	Saguaro To Toltec 500kv	600	99%	102%

ALTERNATIVE 1B: POST-CONTINGENCY SUMMARY

Tp	Overloaded Element	Area	Contingency	Rating N/E (MVA)	AC Power Flow % of E Rating Base	Chg
L	Apache To Buterfld 230kv	AZ	Bowie To Vail 345kv	268	91%	116%
L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	113%
L	Apache To Buterfld 230kv	AZ	Doscondo To Red Tail 230kv	268	112%	111%
L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
X	Bicknell To Bicknell 230/345kv	AZ	Bowie To Vail 345kv	150/193	65%	100%
L	Buterfld To Pantano 230kv	AZ	Bowie To Vail 345kv	268	75%	101%
X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	106%	105%
X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	104%
L	Haydenaz To Apache 115kv	AZ	Doscondo To Red Tail 230kv	99	104%	104%
L	Haydenaz To Apache 115kv	AZ	Apache To Red Tail 230kv	99	105%	105%
L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	115%	119%
L	Haydenaz To Apache 115kv	AZ	Pantano To Buterfld 230kv	99	109%	114%
L	Haydenaz To Apache 115kv	AZ	Bicknell To Sahuarit 230kv	99	105%	109%
L	Haydenaz To Apache 115kv	AZ	Pantano To Sahuarit 230kv	99	106%	110%
L	Haydenaz To Apache 115kv	AZ	Coronado To Silverkg 500kv	99	104%	106%
L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	110%
L	Hidalgo To Turquois 115kv	NM	Springr To Luna 345kv	134	101%	101%
L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	100%
X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	102%	98%
			Saguaro To Tortolit 500kv		-	div

ALTERNATIVE 1C: POST-CONTINGENCY SUMMARY

Tp	Overloaded Element	Area	Contingency	Rating N/E (MVA)	AC Power Flow % of E Rating Base	Chg
X	Apache To Apache 115/230kv	AZ	Apache To Apache 230/115kv #2	100/112	14%	101%
X	Apache To Apache 115/230kv #2	AZ	Apache To Apache 230/115kv	100/112	14%	102%
L	Apache To Buterfld 230kv	AZ	Doscondo To Red Tail 230kv	268	112%	12%
L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	11%
L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	106%	106%
X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	104%
L	Haydenaz To Apache 115kv	AZ	Doscondo To Red Tail 230kv	99	104%	29%
L	Haydenaz To Apache 115kv	AZ	Apache To Red Tail 230kv	99	105%	30%
L	Haydenaz To Apache 115kv	AZ	Bicknell To Sahuarit 230kv	99	105%	42%
L	Haydenaz To Apache 115kv	AZ	Pantano To Sahuarit 230kv	99	106%	43%
L	Haydenaz To Apache 115kv	AZ	Pantano To Buterfld 230kv	99	109%	47%
L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	115%	52%
L	Haydenaz To Apache 115kv	AZ	Coronado To Silverkg 500kv	99	104%	62%
L	Hidalgo To Turquois 115kv	NM	Springr To Luna 345kv	134	101%	101%
L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	113%
L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	106%
L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	100%
X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	102%	95%
X	Westwing To Ww.3wp 500/345kv	AZ	Saguaro To Toltec 500kv	600	99%	101%
			Saguaro To Tortolit 500kv		-	div

ALTERNATIVE 2C: POST-CONTINGENCY SUMMARY

Tp	Overloaded Element	Area	Contingency	Rating N/E (MVA)	AC Power Flow % of E Rating Base	AC Power Flow % of E Rating Chg
X	Apache To Apache 115/230kv	AZ	Apache To Apache 230/115kv #2	100/112	14%	120%
X	Apache To Apache 115/230kv #2	AZ	Apache To Apache 230/115kv	100/112	14%	120%
L	Apache To Buterfld 230kv	AZ	Willow2 To Vail 345kv	268	91%	103%
L	Apache To Buterfld 230kv	AZ	Red Tail To Willow3 230kv	268	112%	12%
L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	11%
L	Apache To Buterfld 230kv	AZ	Willow3 To Doscondo 230kv	268	112%	39%
L	Apache To Red Tail 230kv	AZ	Willow2 To Vail 345kv	351	29%	109%
L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	107%	106%
X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	104%
L	Haydenaz To Apache 115kv	AZ	Red Tail To Willow3 230kv	99	104%	30%
L	Haydenaz To Apache 115kv	AZ	Apache To Red Tail 230kv	99	105%	31%
L	Haydenaz To Apache 115kv	AZ	Willow3 To Doscondo 230kv	99	104%	55%
L	Haydenaz To Apache 115kv	AZ	Bicknell To Sahuarit 230kv	99	104%	56%
L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	114%	62%
L	Haydenaz To Apache 115kv	AZ	Pantano To Buterfld 230kv	99	109%	59%
L	Haydenaz To Apache 115kv	AZ	Pantano To Sahuarit 230kv	99	105%	57%
L	Haydenaz To Apache 115kv	AZ	Coronado To Silverkg 500kv	99	103%	73%
L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	111%
L	Hidalgo To Turquois 115kv	NM	Springr To Luna 345kv	134	101%	101%
L	Red Tail To Willow3 230kv	AZ	Willow2 To Vail 345kv	351	27%	111%
L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	103%
L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	101%
X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	103%	96%
X	Tortolit To Tortolit 500/138kv	AZ	Willow2 To Vail 345kv	600/672	63%	100%
X	Westwing To Ww.3wp 500/345kv	AZ	Saguaro To Toltec 500kv	600	100%	101%
			Saguaro To Tortolit 500kv			div

ALTERNATIVE 3C: POST-CONTINGENCY SUMMARY

Tp	Overloaded Element	Area	Contingency	Rating N/E (MVA)	AC Power Flow % of E Rating Base	AC Power Flow % of E Rating Chg
L	Apache To Buterfld 230kv	AZ	Willow3 To Doscondo 230kv	268	112%	10%
L	Apache To Buterfld 230kv	AZ	Red Tail To Willow3 230kv	268	112%	10%
L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	9%
L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	107%	106%
X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	105%
L	Haydenaz To Apache 115kv	AZ	Willow3 To Doscondo 230kv	99	104%	30%
L	Haydenaz To Apache 115kv	AZ	Red Tail To Willow3 230kv	99	104%	30%
L	Haydenaz To Apache 115kv	AZ	Apache To Red Tail 230kv	99	105%	31%
L	Haydenaz To Apache 115kv	AZ	Bicknell To Sahuarit 230kv	99	104%	38%
L	Haydenaz To Apache 115kv	AZ	Pantano To Sahuarit 230kv	99	105%	39%
L	Haydenaz To Apache 115kv	AZ	Pantano To Buterfld 230kv	99	109%	43%
L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	114%	48%
L	Haydenaz To Apache 115kv	AZ	Coronado To Silverkg 500kv	99	103%	60%
L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	106%
L	Hidalgo To Turquois 115kv	NM	Springr To Luna 345kv	134	101%	101%
L	Irvngtn To Vail 138kv	AZ	South To So.3wp2 345/100kv	287/344	58%	100%

Tp	Overloaded Element	Area	Contingency	Rating N/E (MVA)	AC Power Flow % of E Rating Base	Chg
L	Irvngtn To Vail 138kv	AZ	So.3wp2 To South 100/138kv	287/344	58%	100%
L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	107%
L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	101%
X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	103%	96%
X	Vail2 To Vail 345/138kv	AZ	Willow2 To Vail 345kv	600/720	52%	135%
X	Vail2 To Vail 345/138kv	AZ	Vail To Vail.3wp 345/100kv	600/720	48%	100%
X	Vail2 To Vail 345/138kv	AZ	Vail.3wp To Vail 100/138kv	600/720	48%	100%
L	Vail2 To Willow1 345kv	AZ	Willow2 To Vail 345kv	666/806	46%	121%
X	Westwing To Ww.3wp 500/345kv	AZ	Saguaro To Toltec 500kv	600	100%	100%
			Saguaro To Tortolit 500kv		-	div

ALTERNATIVE 4C: POST-CONTINGENCY SUMMARY

Tp	Overloaded Element	Area	Contingency	Rating N/E (MVA)	AC Power Flow % of E Rating Base	Chg
X	Apache To Apache 115/230kv	AZ	Apache To Apache 230/115kv #2	100/112	14%	112%
X	Apache To Apache 115/230kv #2	AZ	Apache To Apache 230/115kv	100/112	14%	113%
L	Apache To Buterfld 230kv	AZ	Red Tail To Willow3 230kv	268	112%	10%
L	Apache To Buterfld 230kv	AZ	Apache To Red Tail 230kv	268	114%	9%
L	Apache To Buterfld 230kv	AZ	Willow3 To Doscondo 230kv	268	112%	33%
L	Avra To Marana 115kv	AZ	Bicknell To Bicknell 230/115kv	57	109%	109%
X	Cholla To Cholla 500/345kv	AZ	Coronado To Silverkg 500kv	500	107%	106%
X	Cholla To Cholla 500/345kv #2	AZ	Coronado To Silverkg 500kv	500	105%	105%
L	Haydenaz To Apache 115kv	AZ	Red Tail To Willow3 230kv	99	104%	29%
L	Haydenaz To Apache 115kv	AZ	Apache To Red Tail 230kv	99	105%	31%
L	Haydenaz To Apache 115kv	AZ	Pantano To Buterfld 230kv	99	109%	54%
L	Haydenaz To Apache 115kv	AZ	Bicknell To Sahuarit 230kv	99	104%	51%
L	Haydenaz To Apache 115kv	AZ	Willow3 To Doscondo 230kv	99	104%	51%
L	Haydenaz To Apache 115kv	AZ	Buterfld To Apache 230kv	99	114%	57%
L	Haydenaz To Apache 115kv	AZ	Pantano To Sahuarit 230kv	99	105%	52%
L	Haydenaz To Apache 115kv	AZ	Coronado To Silverkg 500kv	99	103%	69%
L	Hidalgo To Turquois 115kv	NM	Hidalgo To Luna 345kv	134	104%	106%
L	Hidalgo To Turquois 115kv	NM	Springr To Luna 345kv	134	101%	101%
L	Sag.East To Oracle 115kv	AZ	Sag.West To Snmanuel 115kv	120	93%	104%
L	Sag.West To Ed-5 115kv	AZ	Coronado To Silverkg 500kv	120	103%	101%
X	Saguaro To Sag.East 230/115kv	AZ	Coronado To Silverkg 500kv	200	103%	96%
X	Vail2 To Vail 345/138kv	AZ	Willow2 To Vail 345kv	600/720	52%	126%
L	Vail2 To Willow1 345kv	AZ	Willow2 To Vail 345kv	666/806	46%	113%
X	Westwing To Ww.3wp 500/345kv	AZ	Saguaro To Toltec 500kv	600	100%	99%
			Saguaro To Tortolit 500kv		-	Div

Revised February 2000

22. Southwest of Four Corners (Unscheduled Flow Qualified Path)

Accepted Rating ☐
Existing Rating ☒
Other ☐

Location:	Northeastern Arizona
Definition:	Sum of the flows on the following transmission lines: Line — Metered End Four Corners-Moenkopi 500 kV — Four Corners Four Corners-Cholla 345 kV #1 — Four Corners Four Corners-Cholla 345 kV #2 — Four Corners
Transfer Limit:	East-West: 2325 MW nominal West-East: Not rated The 2325 MW nominal operating limit is limited by the thermal rating of the Four Corners-Cholla 345 kV lines and voltage deviation at Pinnacle Peak following the critical disturbance. The actual rating is defined by the diagonal on the attached nomogram.
Critical Disturbance that limits the transfer capability:	The critical disturbance is loss of the Four Corners-Moenkopi 500 kV line.
When:	The transfer rating was established in the mid 1980's by the Four Corners Technical Studies Task Force. The task force is comprised of members from the following companies: Arizona Public Service Company El Paso Electric Company Public Service Company of New Mexico Salt River Project Southern California Edison Company Tucson Electric Power Company Verified by 1999 OTC studies.
System Conditions:	Flows on this transfer path have historically been east to west due to the large amount of generation located in northwestern New Mexico. This generation is partly owned by entities west of the New Mexico border. The 2325 MW nominal limit was determined due to voltage deviation, and thermal constraints.
Study Criteria:	Same as WSCC Reliability Criteria for Transmission System Planning.
Remedial Actions Required:	None

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Formal Operating Procedure:	None
Allocation:	The transfer capability is divided among the following utilities: Arizona Public Service Company owns all rights on the Four Corners-Cholla 345 kV lines. Southern California Edison Company owns all the rights on the Four Corners-Moenkopi 500 kV line.
Interaction w/Other Transfer Paths:	None
Contact Person:	Rex Stulting Arizona Public Service Company P. O. Box 53999, Station 2259 Phoenix AZ 85072-3999 (602) 250-1644 (602) 250-1155 - fax rstultin@apsc.com

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47. Southern New Mexico (NM1)

Accepted Rating ☒
Existing Rating ☐
Other ☐

Location:	Southern New Mexico
Definition:	Sum of the flows on the following transmission lines: Line — Metered End West Mesa-Arroyo 345 kV — West Mesa 345 kV Springerville-Luna 345 kV — Springerville 345 kV Greenlee-Hidalgo 345 kV — Greenlee 345 kV West Mesa-Belen 115 kV — West Mesa 115 kV
Transfer Limit:	Simultaneous firm: 925 MW Non-simultaneous: 1048 MW
Critical Disturbance that limits the transfer capability:	Either the Springerville-Luna 345 kV or Greenlee-Hidalgo 345 kV lines.
When:	Simultaneous firm accepted rating established by Post-PST New Mexico Operating Procedure and non-simultaneous accepted rating established by WSCC Peer Review Group in 1995.
System Conditions:	Ratings are independent of transfer levels between major WSCC areas. Ratings were established for a heavy summer system and are dependent upon Arroyo phase shifter schedules, generation levels, area power factors and reactor levels in southern New Mexico.
Study Criteria:	Local New Mexico pre-disturbance voltage levels between 0.95 p.u. and 1.05 p.u. Post-transient voltage deviation no greater than 7% from base case levels on southern New Mexico 345 kV buses and 6% on northern New Mexico 345 kV buses. WSCC criteria applied for systems outside New Mexico area.
Remedial Actions Required:	For double contingencies on the 345 kV lines defined above, WSCC Operating Procedure EPE-1 is implemented.
Formal Operating Procedure:	Post-PST New Mexico Operating Procedure, effective 9/1/95.
Allocation:	EPE, PEGT, PNM, TNP
Interaction w/Other Transfer Paths:	Interaction with Northern New Mexico Transfer Path (NM2) is controlled with the Arroyo phase shifter.
Contact Person:	Dennis Malone El Paso Electric Company P. O. Box 982 El Paso, TX 79960 (915) 543-5757 (915) 521-4763 - fax dmalone@whc.net

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48. Northern New Mexico (NM2)

Accepted Rating ☒
Existing Rating ☐
Other ☐

Location:	Northern New Mexico
Definition:	Sum of flows on the following transmission elements: Element — Metered End Four Corners-West Mesa 345 kV line — Four Corners San Juan-BA 345 kV line — San Juan San Juan-Ojo 345 kV line — San Juan McKinley/Yah-Ta-Hey 345/115 kV trans — Yah-Ta-Hey Bisti-Ambrosia 230 kV line — Bisti Less the following flows: Belen-Bernardo 115 kV line — Belen West Mesa-Arroyo 345 kV line — West Mesa
Transfer Limit:	The transfer import limit is 1450 MW to 1692 MW. This limit is dependent upon operating parameters described in the 1995 Northern New Mexico Heavy Summer Contingency Study.
Critical Disturbance that limits the transfer capability:	Four Corners-West Mesa or San Juan-BA 345 kV lines.
When:	The rating was established in 1995 by joint operating studies of the New Mexico Power Pool. A subsequent accepted path rating request accompanied by a comprehensive study, date May 31, 1996, mailed to PCC and TSS for approval, established the NM2 base and incremental ratings. Series compensation was the subject of that path rating request. By letter dated November 8, 1996, PCC granted an accepted rating to the Rio Puerco Series Capacitor Project.
System Conditions:	The transfer limit is independent of transfer levels between major WSCC areas. Limits were developed on a heavy summer system and are dependent upon several operating parameters including generation levels, capacitor and reactor configurations, Arroyo phase-shifting transformer flows, and overall system VAR demand.
Study Criteria:	Local New Mexico criteria included pre-disturbance voltage levels between 0.95 and 1.05 p.u., post transient voltage deviation no greater than 6% in northern New Mexico and 7% in southern New Mexico, or not less than a 5% reactive margin at critical 345 kV buses in northern New Mexico.
Remedial Actions Required:	An operating procedure called the N-H procedure exists to relieve overloads on certain northern New Mexico transmission elements. A PLC controlled reactor tripping scheme is utilized to improve post-transient voltage stability. The transfer limits are dependent upon these actions.
Formal Operating Procedure:	Post-PST New Mexico Transmission Operating Procedure, effective September 1, 1995.

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Allocation:	PNM and PGT. Several entities have the rights to use the transfer capability on this path.
Interaction w/Other Transfer Paths:	Interacts with transfers over path NM1, but is controlled by the Arroyo phase-shifting transformer.
Contact Person:	Gregory C. Miller Public Service Company of New Mexico Alvarado Square, MS 0604 Albuquerque, NM 87158 (505) 241-4570 (505) 241-4363 - fax gmiller@mail.pnm.com

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49. East of the Colorado River (EOR)

Accepted Rating ☒
Existing Rating ☐
Other ☐

Location:	Western Arizona
Definition:	Sum of the flows on the following transmission lines: Line — Metered End Navajo-Crystal-McCullough 500 kV — Navajo Moenkopi-Eldorado 500 kV — Eldorado Liberty-Mead 345 kV — Liberty Palo Verde-Devers 500 kV — Palo Verde Palo Verde-North Gila 500 kV — Palo Verde Perkins-Mead 500 kV — Perkins
Transfer Limit:	East to West: 7550 MW (Non-simultaneous) West to East: Not rated The present east to west, non-simultaneous EOR rating is 7550 MW and assumes a 'normal' operating system with all lines in service and full series compensation levels in the Navajo, Palo Verde, and Mead-Phoenix Project (MPP) transmission systems. The rating increased from 7365 MW to 7550 MW subsequent to achieving an accepted rating for the 7550 MW East-of-the-River Path Rating project.
Critical Disturbance that limits the transfer capability:	The 7550 MW non-simultaneous limit is due to the continuous rating of the series capacitors at the Palo Verde end of the Palo Verde-Devers and Palo Verde-N.Gila 500 kV lines. The transfer capability is limited under normal (all-lines-in-service) conditions. However, various EOR line outages may result in 97-99% loading of emergency ratings on various EOR lines.
When:	The non-simultaneous transfer rating was established in 1996 by the Western Arizona Transmission Systems (WATS) Task Force. The Task Force was comprised of members from the following companies: Arizona Public Service Company El Paso Electric Company DOE-Western Area Power Administration Imperial Irrigation District Los Angeles Department of Water and Power Nevada Power Company Public Service Company of New Mexico Salt River Project San Diego Gas and Electric Company Southern California Edison Company Southern California Public Power Authority Tucson Electric Power Company SDG&E sponsored studies conducted within a WSCC Review Group that led to approval of the Accepted Rating Report, and was granted Accepted Rating Status by the August 5, 1996 letter from the PCC Chairman.

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System Conditions:	Flows on this transfer path have historically been east to west due to the large amount of joint participation plants located in Arizona and New Mexico which are partly owned by southern California and Nevada entities.
Study Criteria:	WSCC Reliability Criteria for Transmission System Planning
Remedial Actions Required:	None
Formal Operating Procedure:	None
Allocation:	The 7550 MW transfer capability allocation can be shown in parts according to the previous 5700 MW rating, the 1300 MW increase, and the subsequent 365 MW and 185 MW increases. The 5700 MW portion of the transfer capability is divided among the following entities: Southern California Edison Co. 2232 MW Los Angeles Dept. of Water & Power 1229 MW Western Area Power Administration 527 MW Nevada Power Company 353 MW San Diego Gas & Electric Co. 914 MW Salt River Project 160 MW Imperial Irrigation Project 153 MW Arizona Public Service Co. 132 MW 5700 MW The 1300 MW transfer capability is divided among the following entities: Southern California Public Power Authority 238 MW Salt River Project 236 MW Arizona Public Service 236 MW Modesto-Santa Clara-Redding 150 MW Vernon 28 MW Western 412 MW 1300 MW Allocation of the 365 MW and 185 MW increases are not yet finalized.
Interaction w/Other Transfer Paths:	The simultaneous transfer limit into southern California is governed by the Southern California Import Transmission (SCIT) Nomogram, and is partly a function of the EOR flow. The SCIT Nomogram varies seasonally and is limited by post transient and transient conditions.
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50. Cholla - Pinnacle Peak

Accepted Rating ☐
Existing Rating ☒
Other ☐

Location:	Northern Arizona
Definition:	Sum of the flows on the following transmission lines: Line — Metered End Cholla-Pinnacle Peak 345 kV #1 — Cholla Cholla-Pinnacle Peak 345 kV #2 — Cholla
Transfer Limit:	East to West: 1200 MW West to East: Not rated
Critical Disturbance that limits the transfer capability:	The critical disturbance is loss of one of the Cholla-Pinnacle Peak 345 kV lines which causes the remaining Cholla-Pinnacle Peak 345 kV line to reach the emergency rating.
When:	The 1200 MW rating was established in the early 1980's by the Four Corners Technical Studies Task Force. The task force is comprised of members from the following companies: Arizona Public Service Company El Paso Electric Company Public Service Company of New Mexico Salt River Project Southern California Edison Company Tucson Electric Power Company Verified by 1999 OTC studies.
System Conditions:	Flows on this transfer path have historically been east to west due to the large amount of generation located in northwestern New Mexico and Cholla.
Study Criteria:	Same as the WSCC Reliability Criteria for Transmission System Planning.
Remedial Actions Required:	None
Formal Operating Procedure:	None
Allocation:	The transfer capability is wholly owned by APS.
Interaction w/Other Transfer Paths:	None
Contact Person:	Rex Stulting Arizona Public Service Company P. O. Box 53999, Station 2259 Phoenix AZ 85072-3999 (602) 250-1644 (602) 250-1155 - fax rstultin@apsc.com