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EXHIBIT A-1

Sempra Energy Resources

Joseph H. Rowley, P.E.
Director
Project Development

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San Diego, CA 92101-3017

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April 14, 2000

Ms. Deborah Scott
Director, Utilities Division
Arizona Corporation Commission
1200 West Washington Street
Phoenix, AZ 85007

Re: Application for a Certificate of Environmental Compatibility for the Mesquite Generating Station

Dear Ms. Scott:

Mesquite Power, LLC is pleased to submit the accompanying original and 25 copies of our Application for a Certificate of Environmental Compatibility (CEC). This CEC application is for the Mesquite Generating Station to be located near the unincorporated area of Arlington in Maricopa County, Arizona.

Pursuant to the provisions of A.R.S. § 40-360.09, enclosed is a check in the amount of $10,000.00.

We request that the public hearing before the Power Plant and Transmission Line Siting Committee for consideration of this CEC application be set on the first available date.

If you should have any questions concerning this CEC application, please do not hesitate to contact Mr. Marty Swartz at (619) 696-2943.

Sincerely,

Joseph H Rowley

Joseph H. Rowley

enclosures

Sempra Energy Resources is not the same company as the utility, SDG&E or SoCalGas, and Sempra Energy Resources is not regulated by the California Public Utilities Commission.

BEFORE THE

POWER PLANT AND TRANSMISSION LINE SITING COMMITTEE

In the matter of the Application of Mesquite Power LLC, or their assignee(s), in conformance with the requirements of Arizona Revised Statutes 40-360.01 et seq., for a Certificate of Environmental Compatibility authorizing construction of a natural gas-fired, combined cycle generating facility located south of Elliot Road, approximately one mile east of Wintersburg Road and approximately 37 miles west of the Phoenix metropolitan area, near Arlington in Maricopa County, Arizona.	)	Case No. _____

APPLICATION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY

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Introduction

Mesquite Power, LLC (Applicant, a subsidiary of Sempra Energy Resources), which will develop, own, and operate the Mesquite Generating Station, requests a Certificate of Environmental Compatibility (CEC) for a nominal 1,000 megawatt (MW) natural gas-fired, combined cycle power plant. The project site is located south of Elliott Road, approximately one mile east of Wintersburg Road and approximately 37 miles west of the Phoenix metropolitan area.

The project will be operated as a "merchant power plant." As such, it will sell power on the wholesale electricity market, and customers will purchase the power on a voluntary, wholesale basis. All economic costs of the project, including potential losses, will be borne by Mesquite Power, LLC.

The Mesquite Generating Station will be fueled by natural gas transported to the plant site by El Paso Natural Gas Company pipelines. The proposed facility will consist of the power plant and onsite supporting infrastructure, including an administration building, water treatment and storage facilities, and cooling towers. The source of water for the proposed facility will be local groundwater. The groundwater wells are located on property approximately 2 ½ miles west of the plant site.

The Mesquite Generating Station will occupy a portion of a 440 acre site adjoining the planned Palo Verde Satellite Switchyard. Figure 1.4-2 shows the site arrangement for the proposed facility. Topographic maps showing the site location are provided in Exhibit A. An artist's rendering and photo-simulations of the facility are provided in Exhibit G.

This application includes evaluations of relevant environmental matters associated with the plant site and outlines potential impacts and mitigation measures associated with the project. Environmental studies are provided in Exhibits B through J. These studies include a Phase I Environmental Site Assessment, Biological Description and Setting, Prevention of Significant Deterioration and Title V Air Permit Application and associated analyses, Pygmy Owl Survey, Geotechnical Investigations, Noise Survey, Traffic Study, Cultural Resources Survey, Water Study, and Development Plan. These evaluations conclude that no significant environmental impacts will result from the project.

The proposed project will not cause any significant direct, indirect, or cumulative adverse effects on land use, cultural resources, visual resources, wilderness areas, biological resources including special interest wildlife or plant species, socioeconomics, geological resources, air quality, groundwater or surface water quality, noise levels, or local traffic. No low income or minority groups will be disproportionately affected.

In addition to providing a safe, reliable, and clean source of electricity, the project will provide a short term economic benefit derived from the construction workforce. There will be a continuing benefit from the creation of approximately thirty full time jobs. The facility will also provide significant increases in contributions to the tax base, a significant portion of which can be used for area education and school improvements.

EXHIBIT
A - 2 1 of 2
admitted

1.0 Application

1.1 Name and Address of the Applicant

Mesquite Power, LLC
101 Ash Street
San Diego, CA 92101

1.2 Name, Address, and Telephone Number of a Representative of the Applicant

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:

Mr. Marty C. Swartz
101 Ash Street
San Diego, CA 92101
Phone (619) 696-2943
Fax (619) 696-2791

Mr. Cecil Sterling
101 Ash Street
San Diego, CA 92101
Phone (619) 696-2940
Fax (619) 696-2791

1.3 State Each Date on Which Applicant has Filed a Ten-Year Plan

State each date on which applicant has filed a ten-year plan in compliance with ARS Section 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.

ARS Section 40-360.02 requires that a ten-year plan be filed for "every person contemplating construction of any transmission line within the state..." Mesquite Power, LLC has not filed a ten-year plan because the project does not include a transmission line, as the power plant site adjoins the planned Palo Verde Satellite Switchyard, which is being constructed independent of the plant. The plant will be directly tied to the Palo Verde Satellite Switchyard as described in Section 1.5.

1.4 Description of Proposed Facilities

The following sections describe the power plant site arrangement and the processes, systems, and equipment that constitute the project. Project facilities will be designed, constructed, and operated in accordance with applicable laws, ordinances, regulations and standards.

1.4.1 Type of Generating Facility

This section describes the power generation process and associated components to be employed by the proposed project.

Process Description

The proposed Mesquite Generating Station will consist of a natural gas-fired combined cycle power plant and associated natural gas and water supply pipelines. The project will have a nominal electrical output of 1,000 MW and will be fueled exclusively with natural gas.

The power plant will be comprised of two combined cycled power blocks and associated support facilities. Each of the two power blocks will have two combustion turbine-generators (CTGs) equipped with dry low-NO_x combustors and inlet air coolers, two heat recovery steam generators (HRSGs) equipped with duct burners, a steam turbine-generator (STG), and associated auxiliary systems and equipment. Fuel for both the CTGs and duct burners will be natural gas.

With the duct burners out-of-service and the CTGs at full load without employing power augmentation, the HRSGs will produce sufficient steam to operate the STG at its base rated capacity. With the duct burners in-service, the HRSGs will produce additional steam that is injected into the CTGs for power augmentation and allows the STG to operate in a valves wide open, overpressure condition. This design feature enhances the power plant's ability to respond to electricity market demands.

The following paragraphs provide a brief description of the power plant's thermodynamic cycle:

Air flows through the inlet air filter and inlet air cooler of each CTG and is then compressed in the CTG compressor section. Natural gas fuel, which is supplied to the site at the requisite pressure, is admitted into the CTG combustor section and ignited. The hot combustion gases expand through the CTG turbine section to drive the entire CTG, including the compressor section and the electric generator. The hot combustion gases exit the turbine section and enter an HRSG dedicated to each CTG. Duct burners installed in each HRSG further heat the CTG exhaust gases at times when power augmentation and STG overpressure operation are employed.

In the HRSGs, heat from the combustion gases is transferred to water that is pumped into the HRSG pressure parts (economizers, evaporators, drums, etc.). The water is converted to superheated steam and is delivered to the STG at two pressures, high-pressure

(HP) and intermediate-pressure (IP). The use of multiple steam delivery pressures provides an increase in cycle efficiency. HP steam is admitted to the HP section of the STG, expands through the HP section to drive the STG, and exits the HP section as "cold reheat" steam. The cold reheat steam is delivered to the reheater section of the HRSG and leaves the reheater section as "hot reheat" steam. The hot reheat steam is delivered to the low-pressure (LP) section of the STG and expands through the LP section to assist in driving the STG. At the steam turbine stage that presents the appropriate pressure, IP steam from the HRSG is admitted to the LP section of the STG and expands through the downstream steam turbine stages to further assist in driving the STG. Steam leaving the LP section of the STG enters a surface condenser, gives up its latent heat to circulating water, is condensed to liquid and is then pumped back to the HRSG for reuse. The circulating water flows through a wet cooling tower where heat is rejected to the atmosphere, and the circulating water is then pumped back to the surface condenser.

A process flow diagram outlining the major components and energy flows is provided as Figure 1.4-1.

1.4.2 Number and Size of Proposed Units

As described in Section 1.4.1, the proposed facility will consist of four CTGs and two STGs. The facility design has base load and peak load generating capability.

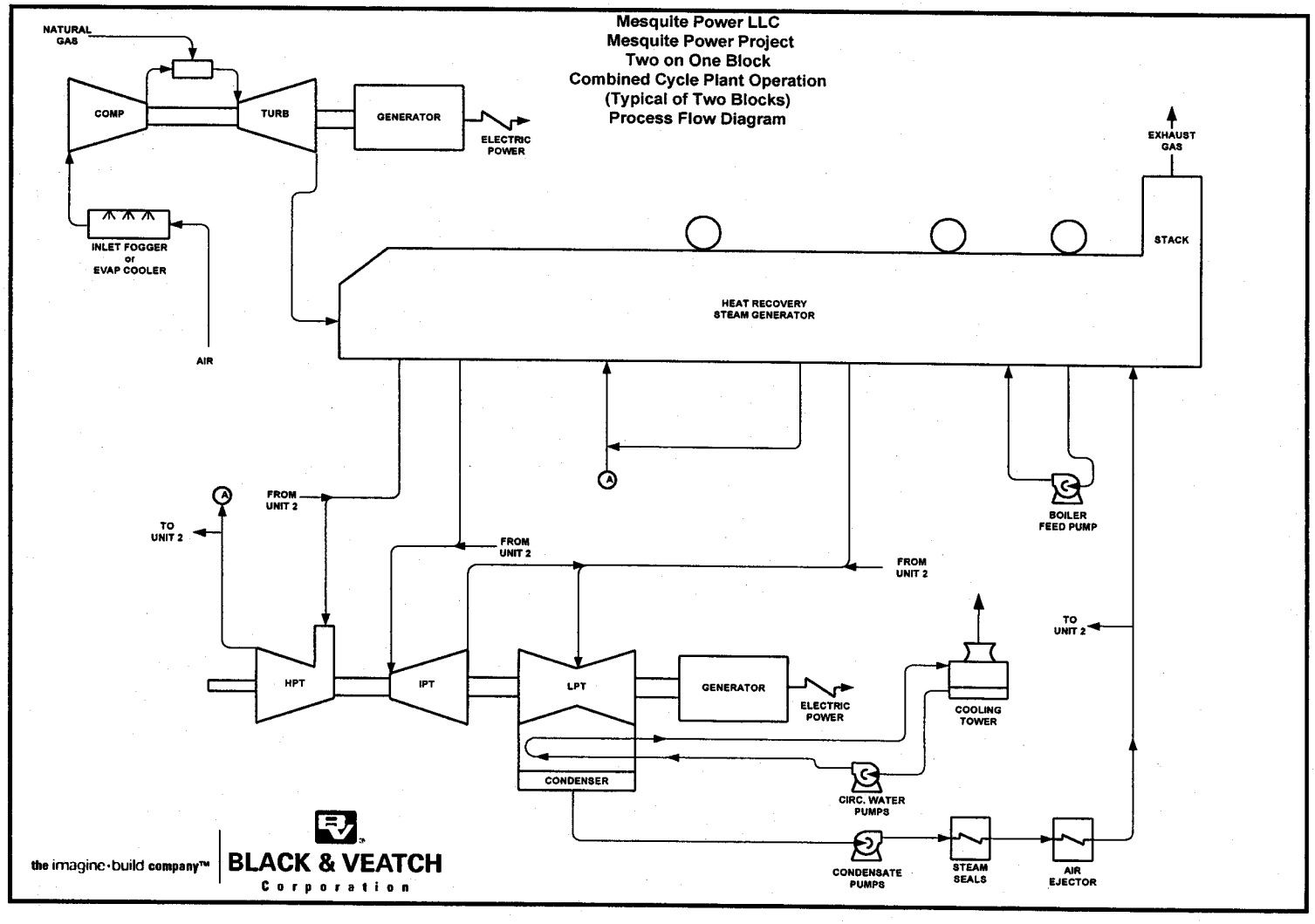
Each CTG generates approximately 165 MW at annual average ambient conditions without employing power augmentation. Heat from the CTGs' exhaust gases is used in the HRSGs to generate and reheat superheated steam. With the duct burners out-of-service, all of the steam exiting the HRSGs is directed to the STGs which generate approximately 182 MW each. The overall gross output of the power plant for this base load condition is approximately 1,024 MW.

Each CTG generates approximately 180 MW at annual average ambient conditions when employing maximum power augmentation. Heat from the CTGs' exhaust gases is used in the HRSGs to generate and reheat superheated steam. With the duct burners in-service, most of the steam exiting the HRSGs is directed to the STGs which generate approximately 265 MW each. Steam not directed to the STGs is injected into the CTGs for power augmentation. The overall gross output of the power plant for this peak load condition is approximately 1,250 MW.

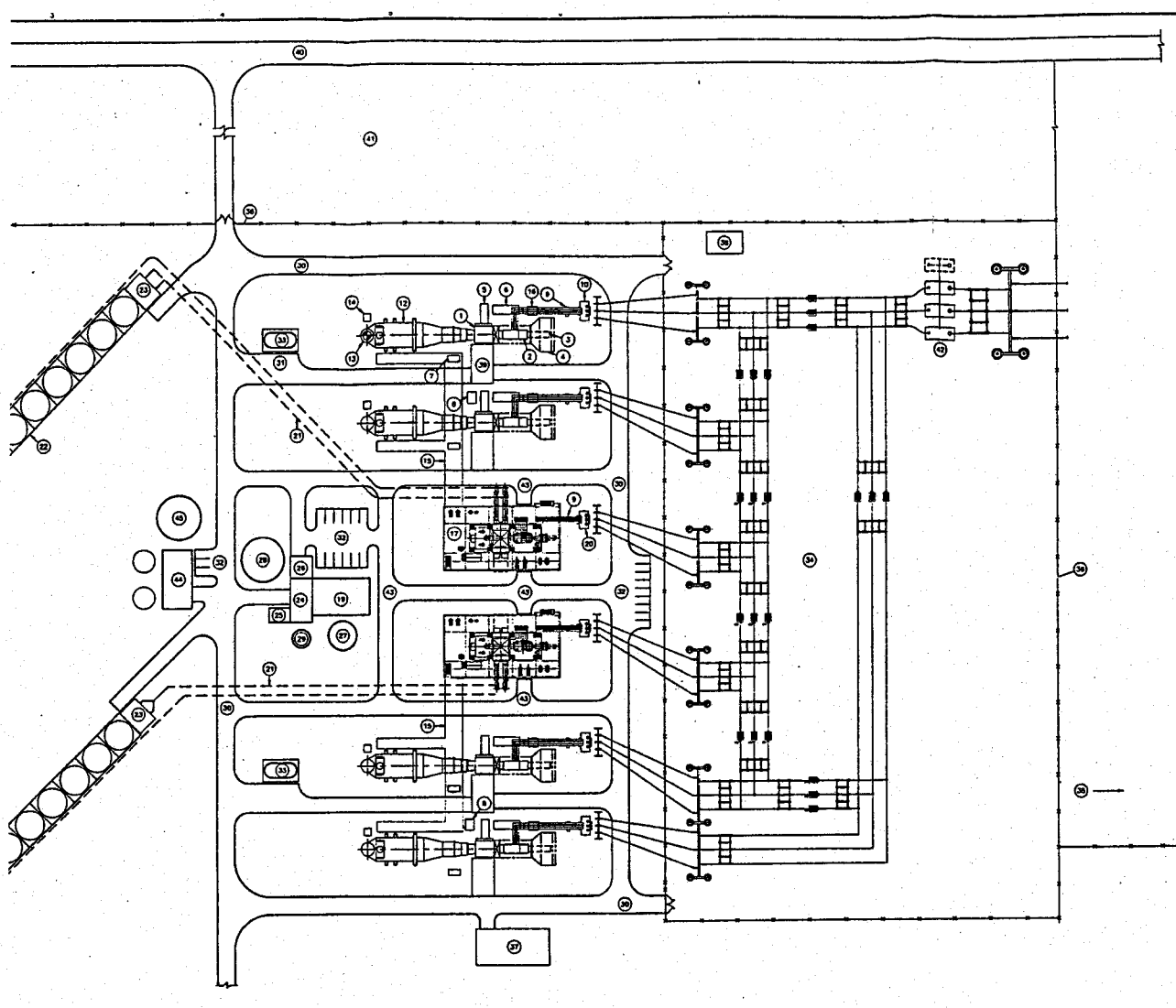
Plant Layout

The layout of the plant is shown in Figure 1.4-2. All power plant equipment will be configured for outdoor operation. The four CTGs and HRSGs will be unenclosed and will be arranged in pairs. Both STGs will be unenclosed and will be located between the two pairs of CTGs/HRSGs.

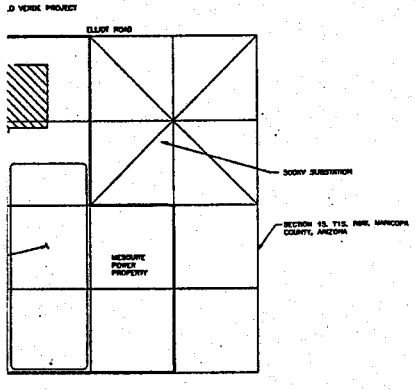
The CTG manufacturer's standard outdoor enclosure will be provided around each CTG for weather protection, thermal insulation, sound attenuation, and fire protection purposes. All other major CTG and HRSG equipment, including the inlet air filters, exhaust



Process Flow Diagram
Figure 1.4-1



LEGEND	
1	COMBUSTION TURBINE
2	COMBUSTION TURBINE GENERATOR
3	CT GENERATOR ROTOR REMOVAL
4	COMBUSTION TURBINE INLET AIR FILTER
5	CT MECHANICAL ACCESSORY COMPARTMENT
6	CT ELECTRICAL/CONTROL CENTER
7	CT CO2 FIRE PROTECTION SKID
8	CT WATER WASH SKID
9	ISOLATED PHASE BUS DUCT
10	CT GENERATOR STEP-UP TRANSFORMER
11	NOT USED
12	HEAT RECOVERY STEAM GENERATOR
13	HRSG EXHAUST STACK
14	CONTINUOUS EMISSIONS MONITORING SKID
15	STEAM PIPING PIPERACK
16	GENERATOR EXCITATION COMPARTMENT
17	STEAM TURBINE AREA (UNENCLOSED)
18	NOT USED
19	CONTROL/ADMINISTRATION AREA
20	ST GENERATOR STEP-UP TRANSFORMER
21	CIRCULATING WATER PIPING CORRIDOR
22	COOLING TOWER
23	CRC WATER PUMP STRUCTURE
24	BOWN WATER TREATMENT BUILDING
25	WT CHEMICAL STORAGE
26	FIRE PUMP BUILDING
27	DEMINERALIZED WATER STORAGE TANK
28	RO PRODUCT/SUPWCZ/FIRE WATER STORAGE TANK
29	NEUTRALIZATION BASIN
30	SITE ACCESS ROADS
31	CHEMICAL UNLOADING AREA
32	PARKING
33	SCR AMMONIA STORAGE
34	230 KV SUBSTATION
35	500 KV SUBSTATION (BY OTHERS)
36	SITE PERIMETER FENCING AND GATES
37	GAS METERING STATION
38	SWITCHYARD CONTROL BUILDING
39	CT MAINTENANCE AREA
40	ELLIOT ROAD (EXISTING)
41	400 FT TRANSMISSION EASEMENT
42	500 KV TRANSFORMER
43	ACCESS FOR MAINTANENCE, MOBILE CRANE
44	CRC WATER TREATMENT BUILDING
45	RAW WATER STORAGE TANK



KEY PLAN
SCALE: 1"=700'

NOTES

1. CORRESPONDS TO AN APPROXIMATE COORDINATE OF LATITUDE 33°29'48", LONGITUDE 112°31'46".

Figure 1.4-2

NOT TO BE USED FOR CONSTRUCTION

REV	DATE	REVISIONS AND RECORD OF ISSUE	DRAWN	CHKD	APD
2	12-23-99	REVISED PER OWNER COMMENTS	CC	MDI	MD
1	12-06-99	GENERAL REVISIONS	CC	MDI	MD
0	11-22-99	ISSUED FOR OWNER REVIEW	CC	MDI	MD

60' 30' 0 60' 120'
1"=60'

I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF ARIZONA

SIGNED _____ REG NO. _____
DATE _____

BLACK & VEATCH
ENGINEER MDI DRAWN CC
CHECKED DATE

MESQUITE POWER LLC
MESQUITE GENERATING STATION
SITE ARRANGEMENT

PROJECT DRAWING NUMBER: 96210-CSTU-S1001
REV: 2
DATE
AREA

stacks, electrical transformers, and other auxiliary equipment will be of suitable design and construction to be located outdoors. Spacing and equipment positioning between the CTGs will be such that access for maintenance using mobile cranes will be provided. Steam piping between the HRSGs and STGs will be supported on pipe racks running alongside each HRSG and joining in a common pipe rack to each power block's STG area.

Each unenclosed STG area will include a STG, steam surface condenser, associated pumps and equipment, and common plant service equipment such as air compressors. The two STGs will be arranged in a mirror image configuration, with a central access roadway between the two STGs. Maintenance of the STGs will be by mobile crane.

The location of the Control/Administration Building will be centered on and west of the STGs. The building will house common control and electrical facilities for the entire plant as well as common administration areas.

A water treatment area will be located west of the Control/Administration Building. This area will include the plant water treatment and storage equipment. Enclosed buildings in this area will include a Water Treatment Building and a Fire Water Pump Building.

The two mechanical draft cooling towers will be located west of the power block area across the main site access road. Underground circulating water piping will connect each cooling tower to its respective condenser located beneath the associated STG. A circulating water pump structure will be located at the east end of each cooling tower basin.

An enclosed Circulating Water Treatment Building and associated equipment will be located between the cooling towers west of the main site access road. This equipment will treat the circulating water used for plant cooling.

The 230 kV to 525 kV power plant substation will be located east of the power block area and will be surrounded by a fence and accessible through gates. The plant substation will be directly tied to the adjoining 525 kV Palo Verde Satellite Switchyard as described in Section 1.5.

Pond(s) for the evaporation of cooling tower blowdown water will be located south of the cooling tower area. An additional pond for capturing and holding storm water will be located in the area of the cooling towers. The ponds will be surrounded by earthen berms and sized as required by the final design. Ponds will be lined to prevent percolation into or intrusion from groundwater.

A natural gas conditioning station will be located outdoors south of the power block area and will supply natural gas to a header supplying all four CTGs.

The buildings, exhaust stacks, and other large outdoor equipment will be painted in neutral color tones to minimize visual impact to the surrounding area. The improved portion of the overall site, including the evaporation pond(s), will be surrounded by a security fence. Access to the site will be controlled by manually- or automatically-operated gates. Onsite

roads will be provided to all facilities on the improved site. Exhibit G is an artist's rendering of the power plant and depicts the major equipment and buildings.

Combustion Turbine Generators (CTGs)

The facility will include four General Electric Model 7FA or Siemens-Westinghouse 501F CTGs equipped with dry low NO_x combustors. Each CTG will include the following systems: inlet air filter, inlet air cooler, inlet guide vanes, natural gas fuel combustion system, control system, starting system, fire protection system, generator coolers, lubrication oil system including coolers, and other support equipment. Two water wash skids, each servicing a pair of CTGs, will also be provided.

The CTGs will be housed in enclosures that provide weather protection, thermal insulation, sound attenuation, and fire extinguishing media containment. The CTG enclosures will allow access for routine inspections and maintenance.

Heat Recovery Steam Generators (HRSGs)

The facility will include four HRSGs, one dedicated to each CTG. Heat from the CTG exhaust gases will convert the water circulating through the HRSGs to steam. The HRSGs will be triple-pressure, reheat, natural-circulation units, with supplemental natural gas firing (duct burners) to increase steam generating capability for peak plant output. Each HRSG will include various economizer, evaporator, and superheater sections.

Each HRSG will be furnished with a selective catalytic reduction (SCR) system to control NO_x and an oxidation catalyst to control CO in the exhaust gases. The SCR and oxidation catalyst will be contained within each HRSG. Ammonia will be used in the SCR system for NO_x control.

Steam Turbine-Generators (STGs) and Condensers

The facility will include two STGs, with each receiving steam produced by two HRSGs. Each STG will be a reheat turbine designed for overpressure operation. STG operation is described under Process Description in Section 1.4.1.

Each STG will include the following systems: control system, generator coolers, lubrication oil system including coolers, and other support equipment. The STGs will be housed in enclosures that provide weather protection, thermal insulation, and sound attenuation. The STG enclosures will be removable for inspection and maintenance.

A steam surface condenser cooled by circulating water will be provided for each STG to condense the steam exhausted from the STG, as described under Process Description in Section 1.4.1. The circulating water will flow inside the condenser tubes, and the steam will be contained by the condenser box and condensed on the outside surface of the tubes. The resulting water (condensed steam) will collect in the hotwell located at the bottom of the condenser and will then be pumped back to the HRSG for reuse.

Instrumentation and Control

The plant will use a digital process control system suitable for power plants. The control interface will be located in the Control/Administration Building. The control system will be a programmable system designed to achieve maximum availability and reliability.

Substation and Electrical Systems

The generator for each CTG and STG will be connected to the power plant 230 kV substation bus via a step-up transformer dedicated to each generator. Breakers will be provided in the substation to connect each generator to the electrical grid (via the 230/525 kV power plant transformer and direct connection to the adjoining new 525 kV Palo Verde Satellite Switchyard, as described in Section 1.5).

Auxiliary power for the plant will be tapped from the generator bus of each CTG. These taps will supply power to the plant switchgear via auxiliary transformers. A generator breaker will be provided between each generator and the tap to allow the grid to supply auxiliary power to the plant via the generator step-up transformers when the CTGs are not operating. The generator breaker will also be used to synchronize the CTG to the grid. The plant switchgear will be arranged so that all plant auxiliaries can be supplied from any CTG.

Balance of Plant

In addition to the plant systems identified above, additional balance of plant systems and components are required to support the operation of the facility, including the following:

- Potable water system.
- Demineralized water system.
- Aboveground storage tanks.
- Water treatment systems.

1.4.3 Fuel Type and Source

The fuel will be low-sulfur natural gas transported to the plant site by El Paso Natural Gas Company (EPNG) pipelines. A new pipeline will extend to the plant from the existing EPNG pipelines located approximately 3.5 miles southwest of the plant site. The new pipeline will be installed by EPNG.

Proximate Analysis of Fuel

A proximate analysis of the natural gas that will be used is provided in Table 1.4-1.

Natural Gas Conditioning Station

The natural gas conditioning station will include fuel gas meters and pressure regulators for measurement and control of the gas being supplied. In addition, if required by final design and the quality of the natural gas being supplied, gas conditioning equipment such as scrubbers and/or filter separators will be included in the natural gas conditioning station. The gas conditioning equipment, if required, will remove moisture and particulates from the natural gas supplied to the CTGs and duct burners.

1.4.4 Amount of Fuel to be Utilized Daily, Monthly and Yearly

The maximum projected natural gas usage by the plant is estimated to be 213,000 MMBtu per day, 5,330,000 MMBtu per month, and 64,000,000 MMBtu per year. This estimate is based on 5424 hours per year of base load operation (without duct firing) and 3000 hours per year of peak load operation (with duct firing for maximum output employing both CTG power augmentation and STG overpressure operation).

Table 1.4-1

Proximate Analysis of Natural Gas

Gas Constituent	Formula	Percent Content (by volume)	Higher Heating Value Fraction (Btu/cubic ft)
Methane	CH_4	97.05	983.3
Ethane	C_2H_6	1.02	18.3
Propane	C_3H_8	0.10	2.6
i-Butane	C_4H_{10}	0.01	0.3
n-Butane	C_4H_{10}	0.02	0.7
i-Pentane	C_5H_{12}	0.00	0.0
n-Pentane	C_5H_{12}	0.00	0.0
Hexane	C_6H_{14}	0.02	1.0
Carbon Dioxide	CO_2	1.36	0.0
Nitrogen	N_2	0.42	0.0
Water	H_2O	0.00	0.0
Total		100.00	1006.1

1.4.5 Type of Cooling and Water Source

Type of Cooling

Exhaust steam exiting each STG will be condensed within a steam surface condenser cooled by circulating water. Steam cycle heat will thus be rejected to the circulating water passing through the condenser tubes. The condensed steam (water) will be pumped from the condenser hotwells back to the HRSGs and then reused to generate steam. Heat rejected to the circulating water will be removed by the cooling towers and rejected to the atmosphere.

Each STG will be equipped with a 100 percent steam turbine bypass system that will bypass steam to the condenser during startup or in the event of a sudden load rejection.

The facility will use two cooling towers, one for each STG/condenser. The cooling towers will be of the multi-cell, mechanical draft, counter-flow type. A circulating water pump structure will be located at the end of each cooling tower basin. Circulating water pumps will pump circulating water from the cooling tower basin, through the condenser, and back to the cooling tower.

Water Source

Sempra Energy Resources has optioned 2,990 acres of land located about 2 ½ miles west of the power plant site. Approximately 15,000 acre-ft per year of grandfathered agricultural groundwater rights are associated with this property. Conversion of the agricultural water rights in accordance with Arizona Department of Water Resources (ADWR) policies and procedures results in a reduction to approximately 8,000 acre-ft per year of Type 1 industrial groundwater rights. Mesquite Power, LLC has filed and received ADWR's approval of a Development Plan, which describes conversion of the agricultural water rights to Type 1 rights and use of the groundwater for the Mesquite Generating Station. The [redacted] is provided in [redacted]

The total water usage by the plant is estimated to be 7490 acre-ft per year. This estimate is based on 5424 hours per year of base load operation and 3000 hours per year of peak load operation.

Water Supply Alternatives

Local groundwater was chosen as the water supply for the proposed facility based on evaluation of potentially available water sources:

- Central Arizona Project (CAP) water.
- Effluent from the 91st Avenue Treatment Plant ("Effluent").
- Local groundwater.

An evaluation of these potential water sources was conducted to determine the water supply for the proposed facility. The evaluation considered such factors as quality of the water, reliability and long term availability of the water supply, impact of the water use, and location of the water source relative to plant site. A summary of the evaluation is presented below.

Quality of the Water

In terms of total dissolved solids (TDS), the local groundwater (up to 3000 mg/l) is of significantly poorer quality then either the CAP water (500 to 550 mg/l) or the Effluent (800 to 1000 mg/l). Despite its elevated TDS, the local groundwater is still usable for power plant cooling.

Use of local groundwater for the proposed facility allows the lower TDS CAP water and Effluent to be saved for other purposes. Management of water resources in this manner keeps the CAP water and Effluent available for purposes which cannot otherwise use groundwater or which would require greater quantities of groundwater because of its poorer quality. For example, Effluent is used by the Buckeye Irrigation District and is also used to assist in maintenance of habitat in the Gila River channel, as noted below.

Water Availability and Impact of Water Use

The estimated life of the facility is 30 years, requiring a long term and reliable supply of water. This is a concern for all three water sources, but unlike CAP water and Effluent, the long term availability of groundwater can be determined by analysis and modeling of the aquifer considering the expected withdrawals. The long term availability of CAP water and Effluent are restricted by contractual, legal, environmental, and other factors outside the control of Mesquite Power.

Contracts for CAP water are available, but these contracts do not guarantee water deliveries. The standard contract language for delivery of CAP water reads as follows:

> "... The determination of whether Excess Water is available for delivery in any Year, and if so, the amount of such Excess Water that is available for delivery under this Agreement in any Year, is a determination within the exclusive discretion of the CAWCD; provided, however, that delivery of Excess Water under this agreement shall be subject to the prior satisfaction of all water deliveries scheduled pursuant to a contract with the United States or a subcontract with the United States and CAWCD providing for Project Water service for a period of 50 year or more."

The lack of guaranteed delivery of CAP water leads to the need for a back-up water supply. This back-up supply would become the primary water supply as excess CAP water allocations decrease in the future because of increasing industrial and non-industrial demands for CAP water.

Effluent from the 91st Avenue Treatment Plant is currently delivered to the Palo Verde Nuclear Generating Station (PVNGS) under contractual terms, and a fixed allocation of Effluent is also delivered to Buckeye Irrigation District. Effluent in excess of that used by PVNGS and that allocated to Buckeye Irrigation District is discharged to the Gila River channel. However, based on discussions with the City of Phoenix and Buckeye Irrigation District, it is Mesquite Power's understanding that excess Effluent from the 91st Avenue Treatment Plant is often not available in the summer when the proposed facility's water

needs are the most critical. Furthermore, we understand that Buckeye Irrigation District has first rights to water that is discharged from the 91st Avenue Treatment Plant into the Gila River channel. Because Effluent received by Buckeye Irrigation District is conveyed via the Gila River channel, such water serves to assist in maintenance of the riparian habitat in the channel. We understand from our discussions that this habitat has already suffered damage at times due to the lack of Effluent discharged from the 91st Avenue Treatment Plant into the Gila River channel during high summer usage by PVNGS.

In addition, the long term availability of Effluent is uncertain because of concerns with long term maintenance of the approximately forty miles of pipeline between the 91st Avenue Treatment Plant and PVNGS, long term maintenance of the treatment facilities at PVNGS, and the competing interests of other parties for use of the Effluent.

The long term availability of groundwater is contingent upon the expected withdrawal rates, the quantity of water contained in the aquifer (about 40 million acre-feet), and expected recharge rates. Mesquite Power, in cooperation with ADWR and existing as well as prospective water users in the area, has initiated a detailed water study to determine the long term availability of groundwater and the impact of withdrawals on surrounding wells.

The water study is organized into three phases. The first phase involves review of historical data (e.g. well logs and other information sources which provide withdrawal rates and well levels), local geological data, and other hydrological data to determine the potentially affected area. Based on the information collected in the first phase, this area is being modeled in the second phase to simulate the aquifer's response to projected water withdrawals. In the third phase, well pumping tests are being conducted, wells are being monitored, and the results are being input to the model to further refine the model and the results it provides.

The first phase of the water study has been completed and the second and third phases are in progress. A report on the first phase and initial results of the second phase are contained in Exhibit B-5.

Location of the Water Source

The project would use about five of the fourteen wells currently in place on the 2,990 acres optioned by Sempra. This acreage is located approximately 2 ½ miles west of the proposed facility. In contrast, CAP water would have to piped from approximately 20 miles away, and Effluent would have to be conveyed approximately 40 miles via the existing PVNGS pipeline from the 91st Avenue Treatment Plant. As noted previously, long term maintenance of the PVNGS pipeline over the 30 year life of the proposed project represents a significant uncertainty.

1.4.6 Stack Heights and Number

Exhaust gases from each CTG/HRSG will discharge through a stack with an inside diameter of approximately 19 feet and a height of 170 feet.

1.4.7 Construction, Startup, Operation Dates

A primary contractor will perform the majority of the engineering, procurement, and construction for the project. Construction activities will be initiated in the second quarter of 2001 and are expected to continue until commercial operation in the fourth quarter of 2002.

During the construction period, the work force will average about 300 people. An onsite area will be used temporarily for construction parking, storage, materials and equipment laydown, and construction trailers. Primary access to the project site will be from an access road entering the site from Elliot Road. The rail spur on the eastern portion of the site will be used for major equipment deliveries when practical.

The proposed design of the plant will allow for part load, base load, and peak load operation. The plant output will be determined by energy demands and wholesale energy prices. Commercial operation of the facility will provide employment for approximately thirty full time personnel.

1.4.8 Estimated Costs of Proposed Facility

The estimated cost of the proposed facility is approximately $480,000,000. The plant site consists of property owned by Mesquite Power, LLC as shown in Appendix A-1.

1.4.9 Legal Description of Proposed Property

Mesquite Power, LLC purchased a total of 440 acres for the plant site. The approximate coordinates of the plant site are latitude 33 degrees 20 minutes north, longitude 112 degrees 51 minutes east. The site location is shown on the topographical maps provided in Exhibit A-1 and Exhibit A-2. The 440 acre site consists of 13 parcels with the following legal descriptions:

Parcel No. 1

The East half of the Southeast quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 2

The East half of the Northwest quarter of the Southeast quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 3

The West half of the Northeast quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 4

The Northeast quarter of the Southwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 5

The Southeast quarter of the Southwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 6

The Southwest quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 7

The West half of the Southwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 8

The Northwest quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 9

The Southwest quarter of the Southeast quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 10

The West half of the Northwest quarter of the Southeast quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 11

The Northwest quarter of the Southeast quarter and the Southwest quarter of the Northeast quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona. (Note: the Northern half of this parcel, consisting of about 40 acres, will be sold to the owners of the Palo Verde Satellite Switchyard).

Parcel No. 12

The Southwest quarter of the Southeast quarter of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona.

Parcel No. 13

Beginning at the Northeast corner of the West half of Section 15, Township 1 South, Range 6 West, Salt River Base and Meridian, Maricopa County, Arizona; thence South 80 rods; thence West 40 rods; thence North 80 rods; thence East 40 rods to the place of the beginning.

1.5 Proposed Transmission Line

There are no new transmission lines associated with the Mesquite Generating Station. Because the power plant site adjoins the planned Palo Verde Satellite Switchyard, the Mesquite Generating Station will be tied to the Satellite Switchyard by a direct switchyard

connection. The Palo Verde Satellite Switchyard will form part of the Palo Verde "hub"*, from which five existing 525 kV transmission lines emanate.

The Mesquite Generating Station will feed into three single-phase 230/525 kV transformer banks (along with a forth bank serving as a spare), which will be directly connected to Mesquite's termination position in the adjoining Palo Verde Satellite Switchyard. Salt River Project (SRP) is currently conducting conceptual design and planning activities for construction of the Palo Verde Satellite Switchyard. Mesquite's connection to the adjoining Palo Verde Satellite Switchyard will be analogous to a Palo Verde nuclear unit's connection to the existing Palo Verde Switchyard – one distinction being the Mesquite Generating Station will have less generating capacity than one of the Palo Verde units.

There has been much discussion regarding how the proposed generators requesting interconnection at the Palo Verde hub will reach the market. SRP is currently engaged in technical studies that will determine the present amount of Available Transmission Capacity (ATC) out of the Palo Verde hub. These studies will also determine the future ATC out of the Palo Verde hub given various system enhancements such as Remedial Action Schemes (RAS), additional transmission lines, and Static Var Compensator (SVC) devices.

Market forces will ensure that the actual generation additions delivering power into the Palo Verde hub will balance with the ATC out of the Palo Verde hub. No generation developer will invest or be successful in obtaining bank financing for the huge amount of capital required to build a generation plant, unless corresponding transmission capacity is generally available to ensure delivery of the plant's output to market. At times when there happens to be more generation connected to the Palo Verde hub than there is ATC out of the hub (e.g., during a transmission line maintenance outage), "congestion management" will determine how the limited transmission capacity is allocated. During such times, generators will compete, on a price basis, for use of that limited ATC out of the hub. Such market mechanisms ensure that limited transmission capacity is allocated to the lowest cost generation, and this is how congestion management has been designed to operate throughout this country.

1.5.1 Nominal Voltage, Description of Structures and Purpose

The nominal voltage of the interconnection will be 525 kV. The direct connection will be from the Mesquite Generating Station 230/525 kV transformer, located at the eastern edge of the power plant site, to Mesquite's termination position associated with the west bus of the adjoining new Palo Verde Satellite Switchyard. This 525 kV direct connection will be one span from the dead end structure at the Mesquite substation to the corresponding dead end structure in the Palo Verde Satellite Switchyard. Mesquite's 525 kV interconnection will satisfy all NERC†, WSCC‡, ANPP§, and local utility reliability criteria and associated interconnection requirements.

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*Hub refers to both the existing Palo Verde and the new Palo Verde Satellite Switchyards. These two switchyards, given the Common Bus Arrangement between the two, will form the Palo Verde "hub."

†NERC = North American Electric Reliability Council.

‡WSCC = Western Systems Coordinating Council.

§ANPP = Arizona Nuclear Power Project.

1.5.2 Geographical Route Description

There is no route since there is no new transmission line. However, the direct switchyard connection will run in a straight path from west to east, beginning at the eastern edge of the power plant site (the location of the 230/525 kV transformer), to Mesquite's termination position on the west side of the adjoining new Palo Verde Satellite Switchyard.

1.5.3 Width of Right-of-way, Spans, and Heights

Since there is no new transmission line, there is no associated right-of-way. The conductor span between the Mesquite Generating Station 230/525 kV transformer and the adjoining new Palo Verde Satellite Switchyard will be approximately 750 feet in length. No right-of-way is required for this span, because it will extend only across the Satellite Switchyard property and a small portion of Mesquite Power's substation property. The height of substation dead end structures supporting the direct connection will be approximately 80 foot.

1.5.4 Estimated Costs

The cost of the interconnection consists almost entirely of an allocated share of the Palo Verde Satellite Switchyard cost and is estimated at $11.2 million. This estimate does not include the cost of the 230/525 kV transformer and associated substation equipment.

1.5.5 Proposed Route and Switchyard Locations

There is no proposed route since there is no new transmission line. As described herein and as shown in Figure 1.4-2, the power plant substation adjoins the new Palo Verde Satellite Switchyard.

1.5.6 Alternative Route Ownership Percentages

Not applicable, as described above.

1.6 Areas of Jurisdiction of Site and Routes

All components of the project will be located entirely within an unincorporated portion of Maricopa County. The plant and associated linear facilities (access road, water pipelines, and natural gas pipeline) will be on private lands or within public right-of-ways.

1.7 Environmental Studies

1.7.1 Summary of Studies

The applicant has engaged the services of several experienced consultants who have conducted air quality, cultural, biological, noise, geotechnical, and traffic studies and investigations of the project site and associated area. The results of these studies are summarized as follows, and the studies have been included as exhibits to this application.

Traffic Study

A traffic study was completed regarding construction and operation of the proposed Mesquite Generating Station. A worst-case scenario was developed using the peak anticipated construction traffic of 300 vehicles and compared to existing peak hour traffic. The existing peak hour traffic was based on peak hour periods associated with the nearby Palo Verde Nuclear Generating Station. The results indicate that there will be no significant impact on roads or intersections due to traffic generated by the proposed project. The traffic study is provided in Exhibit J-1.

Cultural Resources Survey

A cultural resources survey was conducted, and it was concluded that the proposed project is not expected to impact such resources. The survey is provided in Exhibit J-2.

Noise Impact Study

The potential noise emissions associated with the proposed combined cycle facility were evaluated. In addition to determining the potential noise emissions from the proposed facility, an ambient noise survey was conducted to assess the existing acoustical environment surrounding the plant site.

The major noise sources associated with the proposed facility are anticipated to include the CTGs, HRSGs, STGs, generator step-up transformers, and cooling towers. Noise modeling was conducted to predict the noise emissions from the proposed facility during normal operation.

Additionally, the occupational noise exposure levels from the proposed facility were evaluated with respect to protecting workers and providing a comfortable work environment.

Based on available information, there are no county or local noise regulations that apply to the proposed facility. As such, the facility noise emissions have been evaluated based on meeting federal guidelines and regulations. The facility sound levels anticipated at the nearest residences do not exceed USEPA guidelines. The Facility Noise Assessment for the proposed Mesquite Generating Station is included in Exhibit I.

Air Quality Analyses

Mesquite Power, LLC has prepared a Prevention of Significant Deterioration (PSD) and Title V Air Permit Application which details the analyses performed to support issuance of this permit for the proposed Mesquite Generating Station.

The proposed facility will be classified as a major stationary source and is subject to the PSD program and the need to obtain a Title V operating permit. Under the PSD rules, all PSD regulated pollutants emitted by the proposed facility must be compared to the PSD significant emission levels in order to determine the applicability of PSD review. The required PSD analyses were conducted for each of these regulated pollutants. Included as part of the PSD application are a Best Available Control Technology (BACT) analysis, an ambient air quality analysis (AAQIA), and an additional impact analysis (AIA).

The AAQIA demonstrates that emissions of nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter with a diameter of less than or equal to ten microns (PM_{10}) are emitted in significant quantities. Based on the air dispersion modeling analysis performed for the permit application, these emissions will not cause or contribute to a violation of the National Ambient Air Quality Standards, or consume the available PSD increment for NO_2 or PM_{10}.

The BACT analysis demonstrates that the proposed pollution controls meet or exceed the criteria set by BACT. The AIA shows that operation of the proposed facility will not cause a significant impairment to visibility or have a detrimental impact on surrounding soils and vegetation.

A complete copy of the Prevention of Significant Deterioration and Title V Air Permit Application for the Mesquite Generating Station is included in Exhibit B-6. The application also contains a draft copy of the Acid Rain Permit Application, as an Acid Rain Permit will also be obtained for the facility.

Biological Description and Setting

Exhibit B-1, Biological Description and Setting, contains the complete Biological Description and Setting study. This study categorizes the site property and describes the soils, vegetation communities, faunal communities, and special status species. It further describes the potential effects of the project on biological resources.

The occurring or potentially occurring species lists are provided in the Appendix to Exhibit B-1 and also in Exhibit D, Species Lists. The study concludes that there is no suitable habitat for any federally listed species found on the project site or known in the vicinity. There are no aquatic or mesoriparian habitats on the project site or in the vicinity, therefore no aquatic or mesoriparian species will be affected, nor will any forest, cave, cliff or dead standing tree dwelling species be affected. There are no ephemeral pools on the site, therefore no species dependent on ephemeral pools will be affected.

There is no designated critical habitat on the project site or in the vicinity. The project will not affect any designated, or proposed, critical habitat. Further, Exhibit B-1 contains a letter from the Arizona Game & Fish Department dated November 10, 1999. This letter indicates that the Department's Heritage Data Management System was accessed and that current records do not indicate the presence of any Endangered, Threatened, or other special status species in the project vicinity. No federal agency reports have been prepared or are known to be required.

Pygmy Owl Survey

A pygmy owl survey was conducted on the project site and was negative for pygmy owls. The survey is contained in Exhibit B-2.

Geotechnical Investigations

Geotechnical investigations will be conducted to support engineering design, project construction, and environmental permitting. All requisite studies to support the Aquifer Protection Permit will be conducted and provided as required. See Exhibit B-3.

Phase I Environmental Site Assessment

A Phase I Environmental Site Assessment (ESA) was conducted on the plant site. The Phase I ESA consisted of site reconnaissance; interviews; review of environmental, historical, and physical records pertaining to activities on and adjacent to the site; and interpretation and reporting of the findings. A natural and cultural resource screening was also performed. A review of regulatory agency listings did not identify the site or adjoining properties as a source of recognized environmental concern, nor did the site reconnaissance reveal any significant environmental concerns. A complete copy of the Phase I ESA and associated recommendations is included in Appendix B-4.

1.7.2 Mitigation Measures

Existing conditions at the plant site and associated area were evaluated with regard to land use, cultural resources, visual resources, wilderness areas, biological resources including any threatened or endangered species or species of special concern, socioeconomics, geological resources, air quality, groundwater and surface water quality, noise, and local traffic. Potential environmental effects pertaining to implementation of the project were assessed. Such potential effects were determined by comparing the existing environmental conditions with proposed changes associated with the project. Where appropriate, mitigation measures were identified to minimize or eliminate potential impacts.

The applicant will implement a number of mitigation measures as integral elements of the project. Mitigation measures include the following: dust control measures, state-of-the-art emissions control technology, the use of neutral color tones and effective lighting design, the use of native and natural vegetation and re-vegetation where possible, and water use minimization techniques.

1.7.3 Conclusion and Recommendation

The studies performed conclude that the proposed project will not cause any significant direct, indirect, or cumulative adverse effects on land use, cultural resources, visual resources, wilderness areas, biological resources including threatened or endangered species or species of special concern, socioeconomics, geological resources, air quality, groundwater or surface water quality, noise levels, or local traffic. No low income or minority groups will be disproportionately affected.

The applicant therefore submits, upon thorough expert scientific environmental investigation and analysis, that the project and its site are environmentally compatible, and respectfully requests the Committee to issue its Certificate of Environmental Compatibility for the Project at the propose site.

MESQUITE ENERGY, LLC

By: Joseph H Rowley

Authorized Officer

ORIGINAL and 25 copies of the foregoing hand delivered and filed with the Director of Utilities, Arizona Corporation Commission this 14th day of April, 2000.

Exhibit A
Location Map and Land Use Information

As stated in Arizona Corporation Commission Rules of Practice and Procedure R14-3-219:

"Where commercially available, a topographic map, 1:250,000 scale, showing, the proposed plant site and the adjacent area within 20 miles thereof. If application is made for alternative plant sites, all plant sites may be shown on the same map, if practicable, designated by applicant's order of preference."

Exhibit A-1: Proposed plant site on a 1:250,000 scale map. Note that while there is an interconnect with the new Palo Verde satellite switchyard, there is no transmission line being constructed as a result of this project.

"Where commercially available, a topographic map, 1:62,500 scale, of each proposed plant site, showing the area within two miles thereof. The general land use plan within this area shall be shown on the map, which shall also show the areas of jurisdiction affected and any boundaries between such areas of jurisdiction. If the general land use plan is uniform throughout the area depicted, it may be described in the legend in lieu of an overlay."

Exhibit A-2: Proposed plant site on a 1:62,500 scale map.

Exhibit A-1
Topographic Map

1:250,000 Scale

Showing proposed plant site, adjacent area within 20 miles

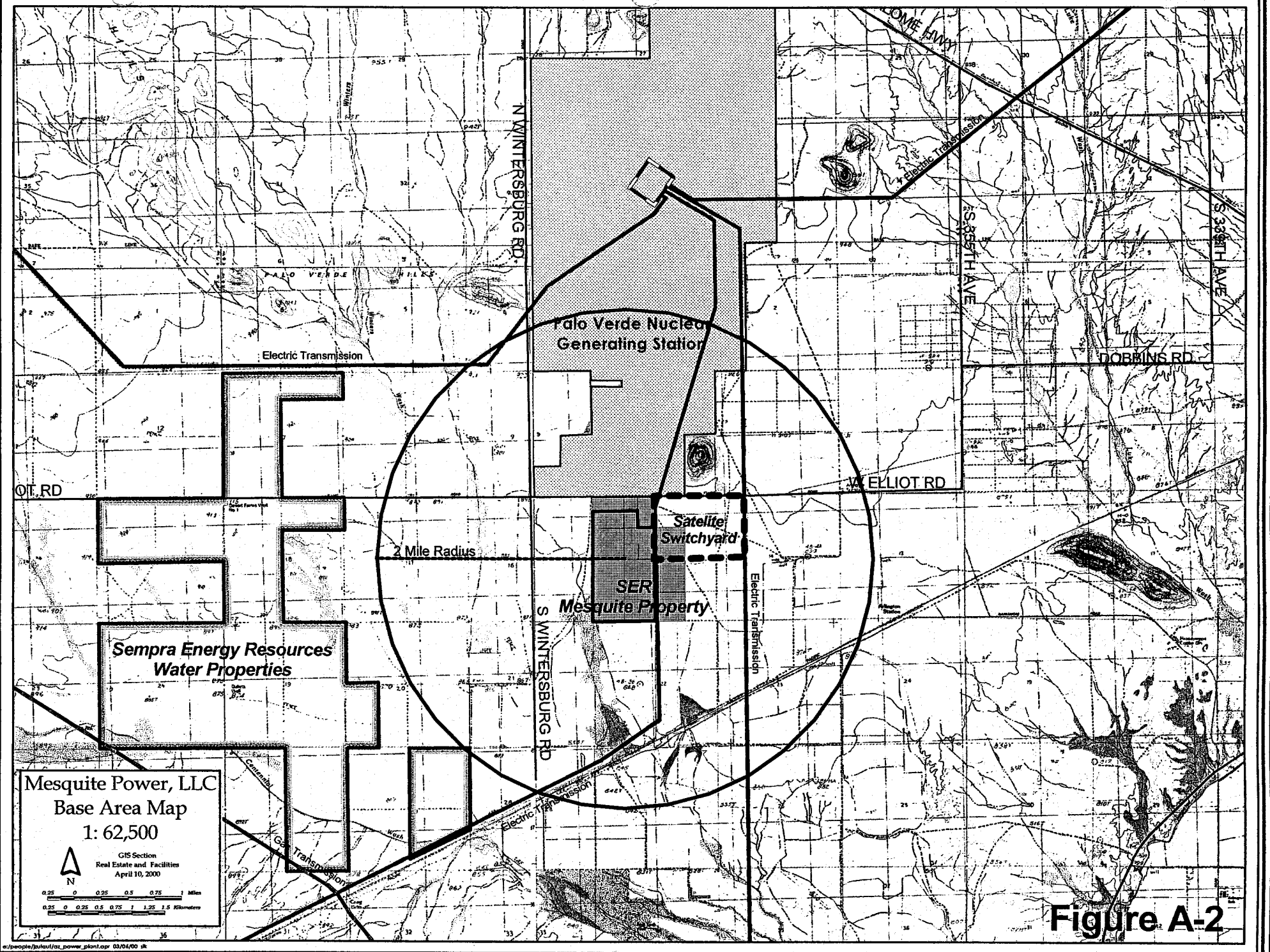
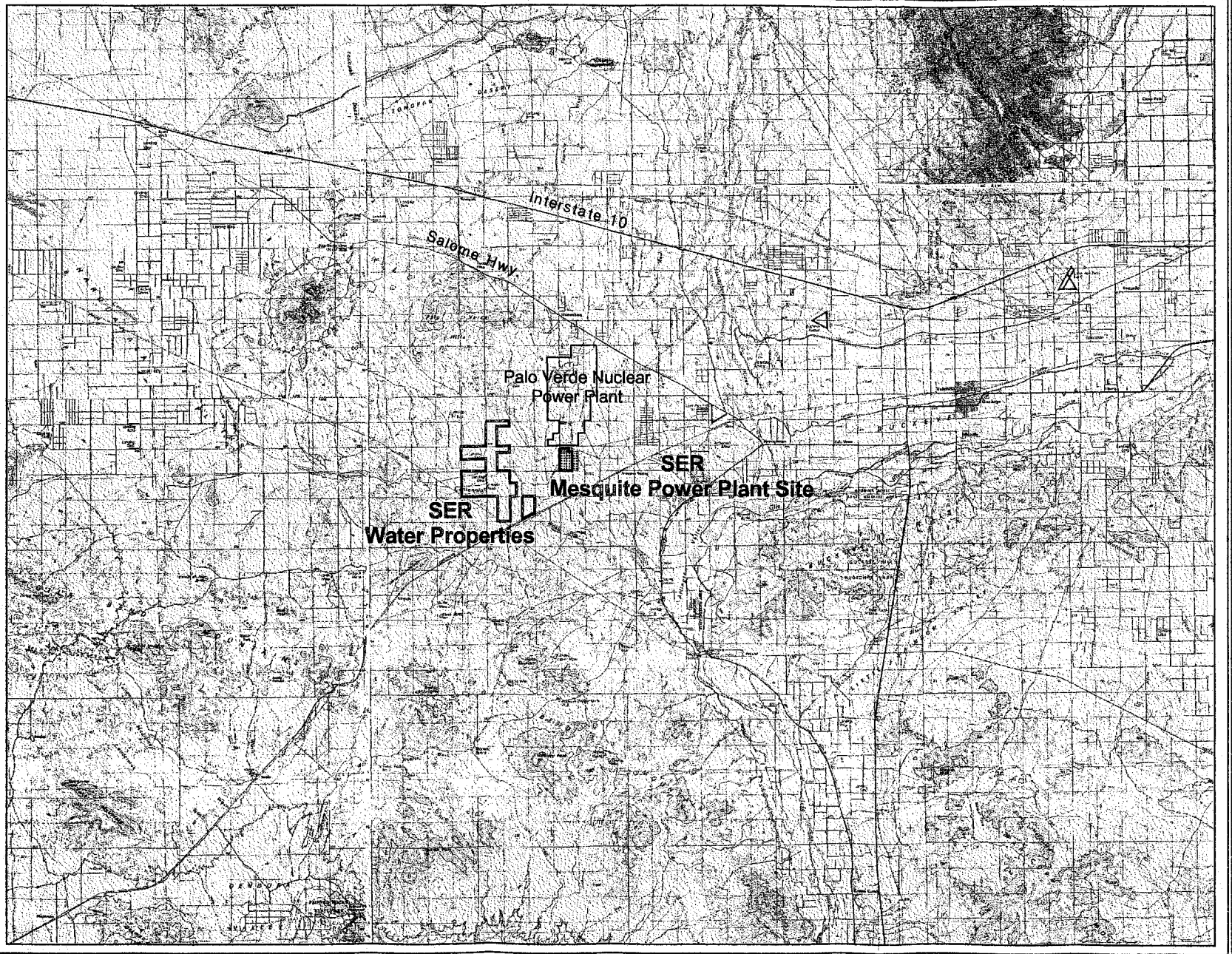

Mesquite Power, LLC
Base Area Map
1: 62,500
GIS Section
Real Estate and Facilities
April 10, 2000
N
Palo Verde Nuclear Generating Station
Electric Transmission
N WINTERSBURG RD
S WINTERSBURG RD
S 355TH AVE
S 339TH AVE
DOBBINS RD
W ELLIOT RD
OT RD
Satelite Switchyard
2 Mile Radius
SER Mesquite Property
Sempra Energy Resources Water Properties
Electric Transmission
Electric Transmission
Electric Transmission
Gas Transmission
Centennial
PALO VERDE HILLS

Figure A-2

Exhibit A-2
Topographic Map

1:62,500 Scale
Showing plant site and area within 2 miles

Maricopa Study Area 1:250,000



GIS Section
Real Estate and Facilities
April 4, 2000

N

Sempra Energy

2.5 0 2.5 5 Miles

2.5 0 2.5 5 7.5 10 Kilometers

Exhibit B
Environmental Studies

As stated in Arizona Corporation Commission Rules of Practice and Procedure R14-3-219:

"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 statement pursuant to Section 102 of the Nation Environmental Policy Act, a copy shall be included as part of this exhibit."

The environmental studies are included as attached in Exhibits B-1 through B-7. No federal agency reports have been prepared or are known to be required.

Exhibit B-1
Biological Description and Setting

MESQUITE GENERATING STATION

BIOLOGICAL DESCRIPTION AND SETTING

Prepared for:

SA&B Environmental & Chemical Consultants
3001 West Indian School Rd. Suite 312
Phoenix, AZ 85017
(602) 263-0045

Prepared by:

ENTRANCO
7740 N. 16th Street, Suite 200
Phoenix, AZ 85020-4462
602-889-7000

APRIL 2000

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Project Location

The project site is located in Maricopa County in Section 15 T1S R6W (**Figure 1**). The project area consists of gently sloping alluvial soils at an elevation of approximately 850-900 feet above sea level. Soils are well drained and are composed of silty, sandy and stony soils, with some basalt outcrops. The site is gently rolling, with limited topographic diversity. Nearby areas are farmed (irrigated agriculture), but the project site has not been plowed or farmed. There has been historic homesteading on the site and there are a few dirt roads that cross the area. The local land-use is rural and agricultural.

Methods

Mr. Rex Wahl, senior biologist with ENTRANCO, performed a biological survey to determine presence and likely abundance of flora and fauna on the project site. Before this survey, Mr. Wahl reviewed existing literature to develop a list of plant and animal species that may occur within the project area. Following the compilation of existing data a pedestrian survey of the proposed project area was conducted by Mr. Wahl during a site visit on January 18, 2000.

Field methodology used for determining likelihood of occurrence and abundance are as follows. In order to verify the specific biological characteristics of the site, parallel transects were walked to record and evaluate existing plant species and communities. Transects were spaced such that 100% visual coverage was achieved. A map of these communities was drawn during the survey (Figure 2). Habitat types on the subject property were compared with published habitat requirements and range distributions typical of the Lower Colorado Subdivision of the Sonoran desertscrub vegetative community.

A list was generated of the species likely to occur on the site (Table 1, 2). Potential of occurrence of these species was then rated on a scale from none to high, based on visual and audible observation, observed physical evidence of occurrence (tracks, burrows, nests, etc.), and extrapolation based on Mr. Wahl's experience as a field biologist in Maricopa County, Arizona. Habitat requirements and species range information was obtained from agency lists and the published sources identified in the bibliography of this document (see page 9). Principles among these were; *Biotic Communities of the American Southwest*, *Flora of Arizona*, and *Mammals of Arizona*.

Vegetation Communities

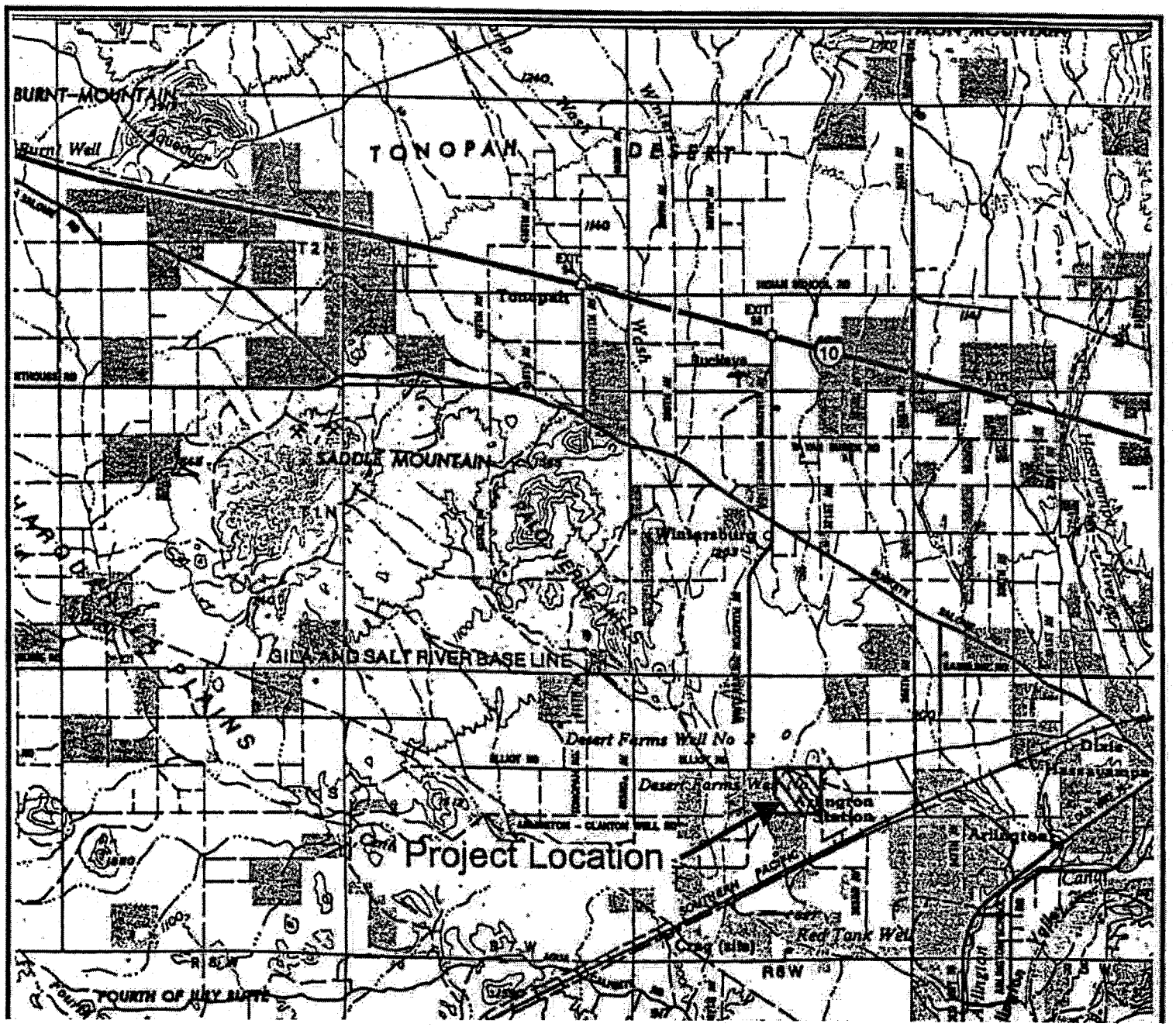
Vegetation of the site is predominantly Sonoran desertscrub on uplands (Brown 1982). The community is typical for this elevation and region, and is dominated by creosotebush (*Larrea tridentata*) in nearly monotypic stands. There are minor amounts of saltbush (*Atriplex* sp.), hedgehog cactus (*Echinocereus* sp.), fish-hook barrel cactus (*Ferrocactus wislizenii*), cane cholla (*Opuntia* sp.) and bunch-grass (*Sporobolus* sp.). Creosotebush communities are relatively widely spaced shrublands with low structural diversity. Canopy cover is varied, but ranges from 20-30%.

A minor ephemeral wash is found on the site, draining from north to south. The wash flows only in response to rainstorms, and rapidly dries following storms. Associated with the wash is xeroriparian vegetation, primarily mesquite (*Prosopis velutina*) with minor amounts of catclaw (*Acacia greggii*), foothill palo verde (*Cercidium microphyllum*) and the exotic tamarisk (*Tamarix* sp.). The xeroriparian vegetation is more structurally diverse than the creosotebush desertscrub, with several layers. The mesquite trees are up to 25 ft. tall. Canopy cover in the xeroriparian community ranges from 60 to 75%.

These communities, Sonoran desertscrub and xeroriparian mesquite, are typical of a large area within the project vicinity, where the land-use has not been converted to irrigated agriculture. Figure 2 provides a graphic representation of distribution of the vegetation communities within the project area. Locally, landscape diversity is relatively low, composed of these two natural communities and agricultural land.

There are no naturally occurring perennial or intermittent surface waters in the project vicinity. The nearest surface waters are the Gila River, located approximately 7 miles to the southeast. Likewise, there are no mesoriparian or wetland habitats in the project vicinity. Man-made surface waters include impoundments for agricultural use (stock ponds) and the Palo Verde Nuclear Plant evaporation ponds about one mile north.

Appendix A, Table A1 provides a summary of plant species occurring or potentially occurring within the project area .


BURNT MOUNTAIN
Burnt Well
TONOPAH DESERT
T2N
Tonopah
Wolfe
Welch
Buckeye
10
SADDLE MOUNTAIN
T1N
Winterburg
GILA AND SALT RIVER BASE LINE
Desert Farms Well No 2
Desert Farms Well
Dixie
Arlington Station
Arlington
Project Location
Red Tank Well
R8W
FOURTH OF JULY BUTTE

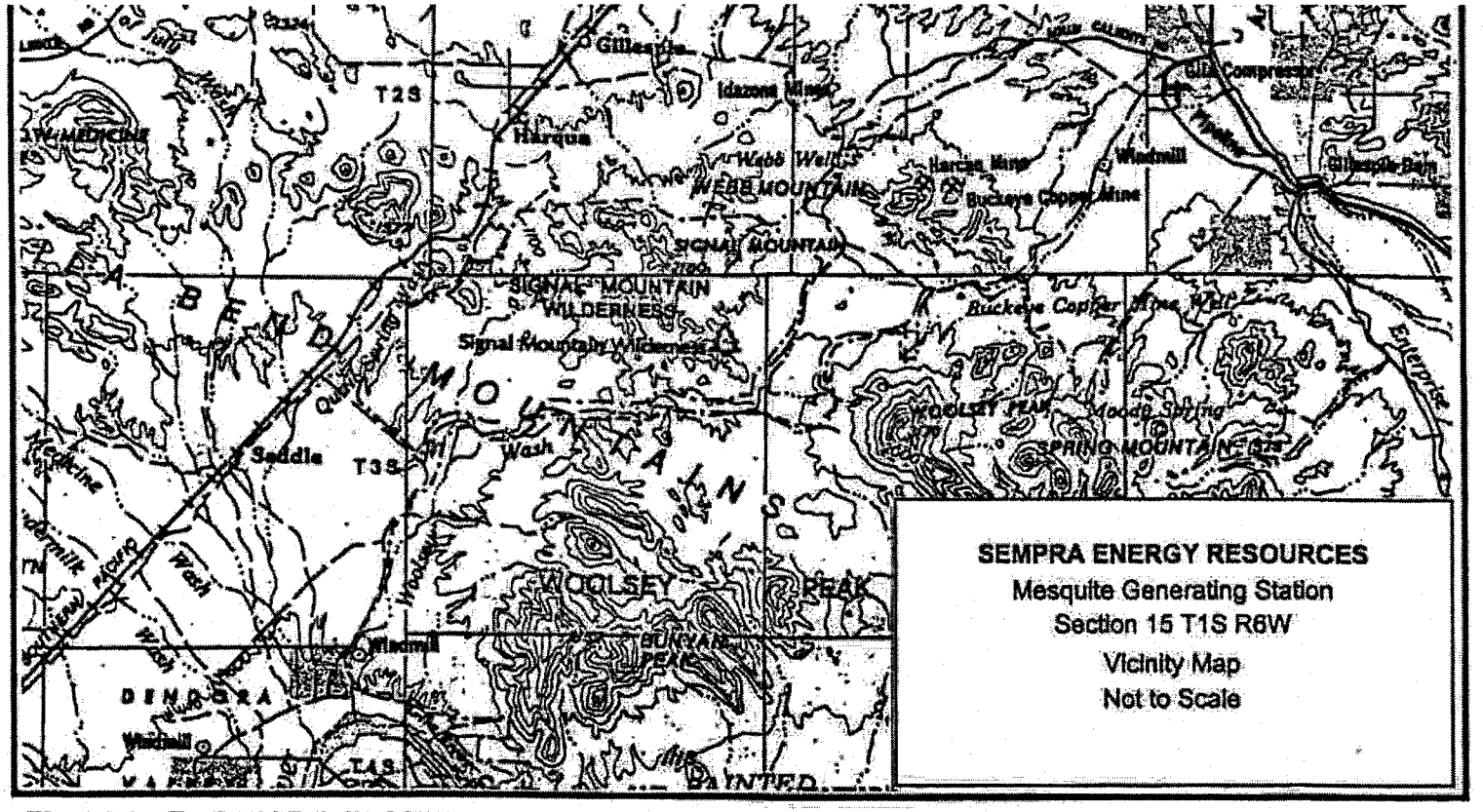


Figure 1. Project Vicinity Map

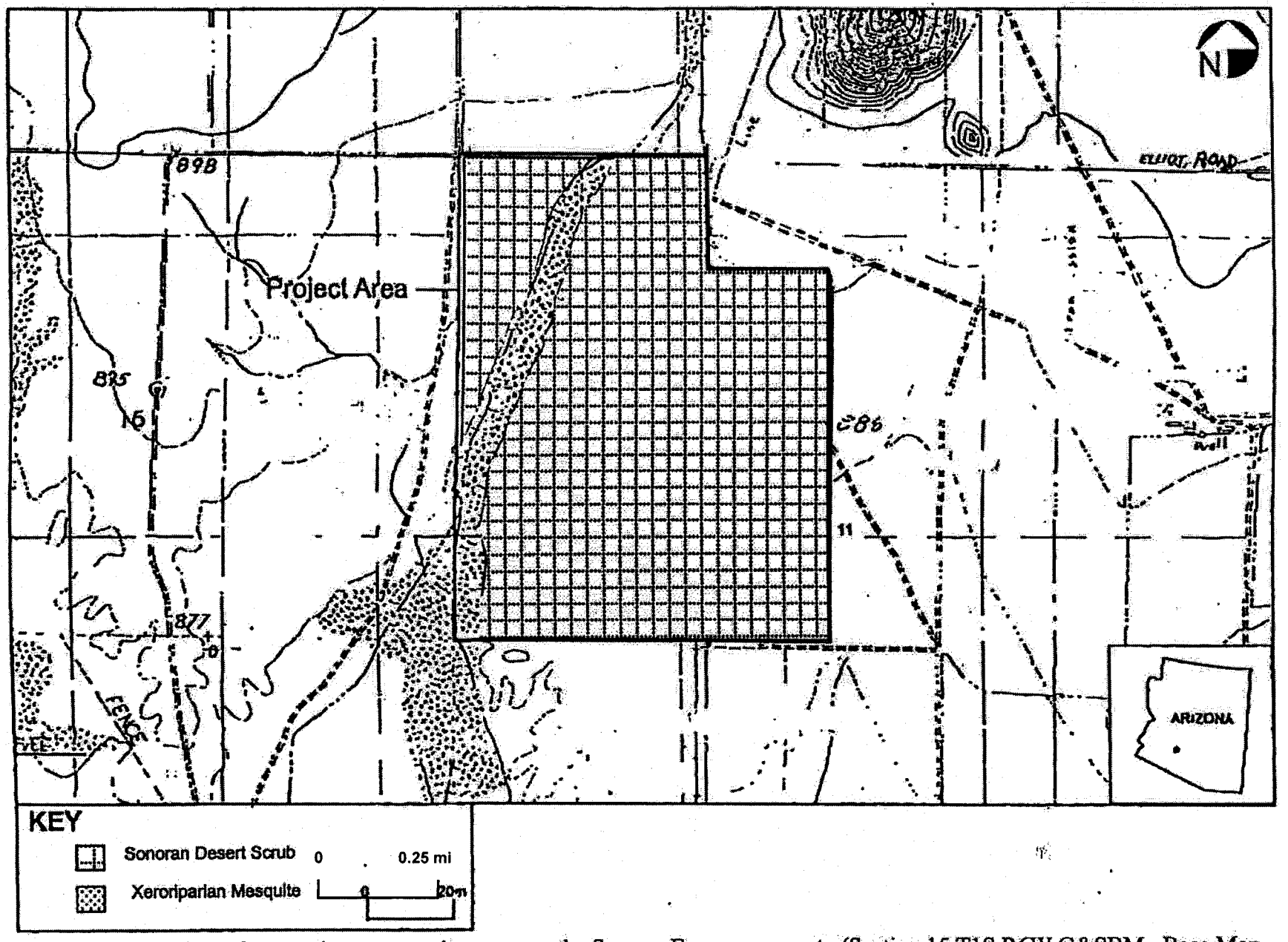


Figure 2. Distribution of vegetation community types on the Sempra Engergy property (Section 15 T1S R6W G&SBM, Base Map USGS 7.5' Arlington Quad, 1996 provisional

Faunal Communities

Faunal elements of the biotic community occurring on the site consist of common species that are consistent with the local desert ecology. The resident community is dominated by several species of small rodents and reptiles. These species provide a small prey base for infrequent transitory carnivorous species that move throughout the area exploiting the sparse resources that characterize the low deserts typical of this part of the State. Large mammals such as the desert mule deer are predominately absent with only occasional individuals passing through the area. The avian community is somewhat more diverse than other elements of the faunal association however it consists of species common to the area and lacking any distinct special or unique species. Appendix A, Tables A2 through A4 provide a summary of animal species occurring or potentially occurring within the project area.

Special Status Species

Federally Listed Threatened and Endangered Species

The database of federally listed threatened and endangered species for Maricopa County, maintained by U.S. Fish and Wildlife Service (USFWS), was used to determine if there was a potential for any federally listed species to occur in the project vicinity. Species habitat requirements, geographic range, and historic occurrence were considered in determining the potential to occur on the project site or in the vicinity (Table 1). No suitable habitat for any federally listed species is found on the project site or known in the vicinity.

There are no aquatic or mesoriparian habitats on the project site or in the vicinity, therefore no aquatic or mesoriparian species will be affected. There are no forests in the project vicinity, therefore no forest-dwelling species will be affected. There are no caves, cliffs, or standing dead trees in the project vicinity, therefore species depending on these features will not be affected. There are no ephemeral ponds or water catchments in the project vicinity, thus, no species dependent on ephemeral pools will be affected.

USFWS guidelines on the endangered Cactus Ferruginous Pygmy-owl describe potential pygmy-owl habitat as sites with woody vegetation composed of mesquite or other similar vegetation with a diameter of over six inches at breast-height (4.5 ft.). Vegetation of the ephemeral wash includes larger mesquite which fits this description. The wash vegetation on site lacks other aspects of pygmy-owl habitat including: "[xeroriparian vegetation] which is dense and well structured (USFWS 2000)."

In Maricopa County, USFWS recommend surveys for pygmy-owl in areas with vegetation fitting the habitat description for projects with a federal nexus (USFWS Zone 3 - see guidance). Given the presence of large mesquite on the project site, Sempra Energy Resources commissioned pygmy-owl surveys in the xeroriparian habitat to confirm the species absence. Surveys conducted to date have been negative for pygmy-owls. Pygmy-owl surveys will continue until the survey recommendations for project clearance are satisfied.

There is no designated critical habitat on the project site or in the vicinity. The project will not affect any designated, or proposed, critical habitat.

Table 1. Federally listed threatened (T) and endangered (E) species for Maricopa County, AZ (USFWS) and their potential to occur on, or near, the project site.

Species	Legal Status	Habitat and Range	Potential Presence in Project Area
Arizona agave *Agave arizonica*	E	Steep rocky slopes, igneous geology, in oak-juniper woodland and chaparral.	None: wrong habitat type.
Arizona cliffrose *Purshia subintegra*	E	Limestone (tertiary lakebed) deposits.	None: no suitable substrate (soil).
Arizona hedgehog cactus *Echinocereus triglochidiatus arizonicus*	E	Ecotone between chaparral and evergreen woodland.	None: wrong habitat type.
Lesser long-nosed bat *Leptonycteris curasoae yerbabuenae*	E	Roosts in caves and mines, nectar-feeding on Saguaro and agave.	None: no roost sites, insufficient forage plant diversity.
Sonoran pronghorn *Antilocapra americana sonoriensis*	E	Desert and desert grasslands, south of the Gila River.	None: project area is outside of known range of species (Hoffmeister, 1986).
Desert pupfish *Cyprinodon macularius*	E	Desert springs, aquatic.	None: no aquatic habitats present.
Gila topminnow *Poeciliopsis occidentalis*	E	Streams and springs, including desert areas.	None: no aquatic habitats present.
Razorback sucker *Xyrauchen texanus*	E	Larger streams and lakes of the Colorado River drainage.	None: no aquatic habitats present.
American peregrine falcon *Falco peregrinus anatum*	E	Cliffs and mountains, usually near water.	None: no roost sites or forage areas (water) in area.
Bald eagle *Haliaeetus leucocephalus*	T	Cliffs and mountains, usually near water.	None: no roost sites or forage areas (water) in area.
Mexican spotted owl *Strix occidentalis lucida*	T	Pine and mixed conifer forests.	None: no suitable habitat present.
Cactus ferruginous Pygmy-owl *Glaucidium brasilianum cactorum*	E	Lowland riparian woodlands and sonoran desertscrub.	No suitable habitat present due to fragmentation and low structural diversity; disturbance.
Southwestern willow flycatcher *Empidonax traillii extimus*	E	Obligate riparian habitat dweller. Dense, closed canopy riparian forests near water.	None: no suitable riparian habitat present.
Yuma clapper rail *Rallus longirostris yumanensis*	E	Freshwater and brackish marsh, on streams and lakes	None: no suitable habitat present.

Wildlife of Special Concern in Arizona

The Arizona Game and Fish Department list of *Wildlife of Special Concern in Arizona* was reviewed to determine the potential for any of these animals to occur in the project vicinity. Two species, discussed below, may potentially occur in the project vicinity based on known range:

Desert Tortoise (*Gopherus agassizii*): the tortoise occurs in rocky foothills and on alluvial bajadas in the Sonoran Desert. The tortoise is unlikely to occur in the project area due to the lack of suitable habitat (rocky foothills).

Swainson Hawk (*Buteo swainsoni*): only the Arizona breeding population is considered of concern. The project site is not within the Arizona breeding range of this species, though individuals may be found in the project area during migration.

Neither species is likely to occur in the project vicinity, thus there will be no effects on Wildlife of Special Concern in Arizona.

Arizona Native Plant Law

Species protected by the Arizona native plant law occur on the project site (Table 2). The native plant law requires that notice be given to the Arizona Department of Agriculture at least 60 days prior to clearing protected native plants. Sempra Energy Resources will give the required notice and provide for salvage of protected native plants on the project site.

Table 2. Protected native plants at the Mesquite Generating Station Project Site.

Plant Species	**Relative Abundance**
Mesquite (*Prosopis velutina*)	Common
Catclaw (*Acacia greggii*)	Occasional
Foothill palo verde (*Cercidium microphylum*)	Occasional
Hedgehog cactus (*Echinocereus* sp.)	Occasional to common
Fish-hook barrel cactus (*Ferrocactus wislizenii*)	Occasional to common
Night blooming cereus (*Peniocereus greggii)*	Occasional
Eagelmann hedgehog cactus (*Echinocereus engelmannii)*	Occasional
Pincushion cactus (*Mammillaria microcarpa)*	Occasional
Cholla (*Opuntia* sp.)	Occasional to common

Potential Effects of the Project on Biological Resources

Power-plant construction will remove approximately 340 acres of Sonoran Desertscrub community, primarily creosotebush. Most animals and plants associated with this community will no longer be supported on the project site. Approximately 50 acres of mesquite scrub associated with the desert wash will be removed. Plants and animals associated with this community will no longer be supported on the project site. While the habitat area lost relative to the total area of these plant communities is relatively small, there will be an increase in fragmentation of the desertscrub and xeroriparian communities in the project area. Some plants and animals may be limited in dispersal or occurrence by fragmentation effects. Other animals benefit from fragmentation, an increase in habitat frequency in an area. Because the project vicinity is a mosaic of irrigated agricultural lands, desertscrub, and xeroriparian wash, fragmentation effects will be limited.

Indirect effects of the power-plant may include a loss of Sonoran desertscrub to business development and infrastructure construction associated with the power-plant. There are expected to be no effects on any aquatic or riparian resources in the project vicinity, due primarily to the distance to the nearest examples of these communities. Water used for the project; pumped groundwater, does not alter any surface water resource. Wastewater disposal does not include releases to any surface waters, therefore there will be no effects on surface waters.

Populations of common animals and plants associated with these communities will be affected through the loss of individuals, however there should be no long-term population effects on any common plant or animal population. Locally, these populations are relatively large and able to absorb these localized losses.

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APPENDIX A

LISTS OF WILDLIFE AND PLANT SPECIES OCCURRING OR POTENTALLY OCCURRING WITHIN THE PROJECT AREA

Table A1
Plant Species Occurring or Potentially Occurring within the Project Area

Plants			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Cat-claw acacia	*Acacia greggii*	Sonoran desertscrub	High
White bursage	*Ambrosia dumosa*	Sonoran desertscrub	High
Triangle-leaf bursage	*Ambrosia deltoidea*	Sonoran desertscrub	High
Six-weeks three-awn	*Aristida adscensionis*	Sonoran desertscrub	High
Fourwing saltbush	*Atriplex canescens*	Sonoran desertscrub	High
Shadescale	*Atriplex confertifolia*	Sonoran desertscrub	High
All-scale	*Atriplex polycarpa*	Sonoran desertscrub	High
Desert senna	*Cassia armata*	Sonoran desertscrub	High
Desert saltgrass	*Distichlis spicata*	Sonoran desertscrub	High
Brittlebush	*Encelia farinosa*	Sonoran desertscrub	High
Filaree	*Erodium cicutarium*	Sonoran desertscrub	High
Spurges	*Euphorbia* spp.	Sonoran desertscrub	High
Cheesebush	*Hymenoclea salsola*	Sonoran desertscrub	High
Big galleta	*Hilaria rigida*	Sonoran desertscrub	High
Creosote bush	*Larrea tridentata*	Sonoran desertscrub	High
Anderson thornbush	*Lycium andersonii*	Sonoran desertscrub	High
Desert broom	*Baccharis sarothroides*	Sonoran desertscrub	High
Red brome	*Bromus rubens*	Sonoran desertscrub	High
Desert hackberry	*Celtis pallida*	Sonoran desertscrub	High
Blue palo verde	*Cercidium floridum*	Sonoran desertscrub	High
Foothill palo verde	*Cerciuium microphyllum*	Sonoran desertscrub	High
Jimmy weed	*Isocoma heterophylla*	Sonoran desertscrub	High
Burro weed	*Isocoma tenuisecta*	Sonoran desertscrub	High
Night blooming cereus	*Peniocereus greggii*	Sonoran desertscrub	High
Woolly plaintain	*Plantago insularis*	Sonoran desertscrub	High
Mesquite	*Prosopis glandulosa*	Sonoran desertscrub	High
Russian thistle	*Salsola kali*	Sonoran desertscrub	High
Arabian grass	*Schismus arabicus*	Sonoran desertscrub	High
Mediterranean grass	*Schismus barbatus*	Sonoran desertscrub	High
Yellow rocket	*Sisyjmbrium irio*	Sonoran desertscrub	High
Globemallow	*Sphaeralcea* spp.	Sonoran desertscrub	High
Greythorn	*Zizyphus obtusifolia*	Sonoran desertscrub	High
Fish-hook Barrel Cactus	*Ferrocactus wislizenii*	Sonoran desertscrub	High
Pincushion cactus	*Mammillaria microcarpa*	Sonoran desertscrub	High
Eagelmann hedgehog cactus	*Echinocereus engelmannii*	Sonoran desertscrub	High
Cholla	*Opuntia* spp.	Sonoran desertscrub	High

Habitat Requirements and range from: Kearney, T. H., R.H. Peebles and collaborators. 1960. Arizona Flora. Second edition with supplement. University of Califorina Press, Berkely. 1085 pp.
Potential for occurrence based on field observation of species or presence of suitable habitat .

Table A2
Reptiles and Amphibians Occurring or Potentially Occurring within the Project Area

Reptiles and Amphibians			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Couch's spadefoot toad	*Scaphiopus couchi*	Shortgrass plains, mesquite savannah, creostoe bush desert, and other areas of low rainfall	High
Western spadefoot toad	*Scaphiopus hammondi*	Lowlands, washes, floodplains of rivers, alluvial fans, playas, and alkali flats.	High
Great plains toad	*Bufo cognatus*	Primarily a grassland species but frequents creosote bush desert	High
Red-spotted toad	*Bufo punctatus*	Desert oases and rocky canyons	None
Mohave rattlesnake	*Crotalus scutularus*	Barren desert, gassland, and brushland: most common in areas of scattered scrubby growth such as creosote bush and mesquite	High
Coachwhip	*Masticophis flagellus*	Desert, prairie, brushland, woodland, and farmland. Usually avoids area of dense vegetation	High
Sonora whipsnake	*Masticophis bilineatus*	Sonaran desert and mountain foothills. Often associated with rock stream courses	Low
Saddled leaf-nosed snake	*Phyllorhynchus browni*	Upland desert	High
Spotted leaf-nosed snake	*Phyllorhynchus decurtatus*	Creosote desert	High
Glossy snake	*Arizona elegans*	Creosote desert	High
Long-nosed snake	*Rhinocheilus lecontei*	Creosote desert	High
Banded sand snake	*Chilomeniscus cinctus*	Creosote desert	High
Night snake	*Hypsiglena torquata*	Creosote desert	High
Western patched-nosed snake	*Salvadora hexalepis*	Creosote desert	High

Table A2 (Continued)
Reptiles and Amphibians Occurring or Potentially Occurring within the Project Area

Reptiles and Amphibians			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Western blind snake	*Leptotyphlops hyumilis*	Favors rocky hillsides with patches of loose soil	Low
Gopher snake	*Pituophis melanoleucus*	Grassland and open brushland	Moderate
Yuma kingsnake	*Lampropeltis getulus*	Creosote desert	High
Western ground snake	*Sonora semiannulate*	Deserts and mountain foothills	High
Sidewinder	*Crotalus cerastes*	Desert species usually found in areas of fine windblown sand	Low to none
Western diamondback rattlesnake	*Crotalus atrox*	Frequents a variety of habitats from deserts into the mountains	High
Mohave rattlesnake	*Crotalus scutularus*	Barren desert, gassland, and brushland: most common in areas of scattered scrubby growth such as creosote bush and mesquite	High
Banded gecko	*Coleonyx variegatus*	Creosote bush flats	High
Zebra-tailed lizard	*Callisaurus draconoides*	Desert areas with sparse vegetation	High
Leopard lizard	*Crotaphytus wislizenii*	Desert plains with creosote bush	High
Desert spiny lizard	*Sceloporus m. magister*	Creosote bush, mesquite woodlands	High
Long –tailed brush lizard	*Urosaurus graciosus*	Creosote bush desert	High
Side-blotched lizard	*Uta stansburiana*	Wide range of habitats, one of the most abundant lizards in the arid and semiarid west	High
Western whiptail	*Cnemidophorus tigris*	Arid and semiarid habitats with sparse vegetation	High
Desert iguana	*Dipsosaurus dorsalis*	Desert areas dominated by creosote bush	High
Chuckwalla	*Sauromalus*	Lava flows, rocky hillsides and rock outcrops in desert areas	None

Habitat Requirements and range from: Stebbins, Robert C. 1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Company, Boston, Massachusetts. 279 pp.
Potential for occurrence based on field observation of species or presence of suitable habitat .

Table A3
Avian Species Occurring or Potentially Occurring within the Project Area

Birds			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Turkey vulture	*Cathartes aura*	Dry open country	Occasionally
Red-tailed hawk	*Buteo jamaicensis*	A variety of habitats from tundra to desert	Occasionally
Harris hawk	*Parabureo unicinctus*	Mesquite Scrub and Desert areas	High
Prairie falcon	*Falco mexicanus*	Open mountains, dry plains, and prairies	Occasionally
Roadrunner	*Geococcyx californianus*	Chaparral, desert scrub, and arid brush	High
Gambel quail	*Lophortyx gambelii*	Desert thickets; arid country	High
Mourning dove	*Zenoida macroura*	Dry uplands and desert	High
White-winged dove	*Zenoida asuaruca*	Dry uplands and desert	High
Curve-billed thrasher	*Toxostoma curvirostre*	Upland Desert scrub	Moderate
Bendire's thrasher	*Toxostoma bendirei*	Desert scrub	High
Le Conte's thrasher	*Toxostoma lecontei*	Desert with scant vegetation	High
Abert's towhee	*Pipilo aberti*	Along arroys and desert thickets	Moderate
Verdin	*Auriparus flaviceps*	Low desert	High
Black-throated sparrow	*Amphispiza bilineata*	Desert	High
Phainopepla	*Phainopepla nitens*	Desert	High
Pyrrhuloxia	*Cardinalis sinuatus*	Mesquite scrub	High
Say's phoebe	*Sayornis saya*	Plains, sparsely vegetated country	High
Western kingbird	*Tyrannus verticalis*	Arid savanna, farmlands	High
Black-tailed gnatcatcher	*Polioptila melanura*	Deserts and arid country	High
Cactus wren	*Campylorhynchus brunneicapillus*	Deserts and arid hillsides	High
Costa's hummingbird	*Calypte costae*	Low Desert	Moderate
Ladder-backed woodpecker	*Picoides scalaris*	Deserts	Low
Gila woodpecker	*Melanerpews uropygialis*	Low desert scrub with saguaro and mesquite trees	Moderate
Logger-head shrike	*Lanius ludovicianus*	Open country	High
Lark bunting	*Chondestes grammacus*	Dry fields, savanna	Moderate
Horned lark	*Eremophila alpestris*	Open patches of bare ground alternating with low vegetation	High

Habitat Requirements and range from: Udvardy, Miklos D. F. 1977. The Audubon Society Field Guide to North American Birds – Western Region. Alfred A. Knopf, Inc., New York, New York. 855 pp.
Potential for occurrence based on field observation of species or presence of suitable habitat.

Table A4
Mammal Species Occurring or Potentially Occurring within the Project Area

Mammals			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Desert cottontail	Sylvilagus audubonii	Deserts and semiarid grasslands	High
Black-tailed jack rabbit	Lipus californicus	Deserts and semiarid grasslands	High
Coyote	Canis latrans	Variety of habitats from mountains to deserts	High
Gray fox	Urocyon cineriaorgenteus	Variety of habitats from mountains to deserts	High
Kit fox	Vulpes macrotis	Deserts with alluvial soils	High
Little pocket mouse	Perognathus lonimembris	Deserts with sandy or gravelly soils	Moderate
Arizona pocket mouse	Perognathus amplus	Desertscrub	High
Pocket mouse	Perognathus baileyi	Desertscrub	High
Desert pocket mouse	Perognathus penicillatus	Desert	High
Merriam's kangaroo rat	Dipodomys merriami	Desert	High
Desert kangaroo rat	Dipodomys deserti	Desert	High
Western harvest mouse	Reithrodontomys megalotis	Throughout Arizona	High
Cactus mouse	Peromyscus eremicus	Desertscrub	High
Deer mouse	Peromyscus maniculatus	Various	Moderate
Southern grasshopper mouse	Onychomys torridus	Various	High
Arizona cotton rat	Sigmodon arizonae	Deserts, Mesquite thickets	Moderate
White-throated wood rat	Neotoma albigula	Throughout Arizona	High
Desert wood rat	Neotoma lepida	Deserts	High
Mule deer	Odocoileus hemionus	Deserts, mountains	Occasional

Habitat Requirements and range from: Hoffmeister, Donald F. 1986. Mammals of Arizona. University of Arizona Press, Tucson, Arizona. 602 pp.
Potential for occurrence based on field observation of species or presence of suitable habitat.

THE STATE OF ARIZONA

GAME & FISH DEPARTMENT

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November 10, 1999

Ms. Nancy Shelton
SWCA Inc. Environmental Consultants
100 West Coolidge Street
Phoenix AZ 85013

Re: Special Status Species; Natural Resources Overview for 400 Acre Project - Township 1 South, Range 6 West, Section 15

Dear Ms. Shelton:

The Arizona Game and Fish Department (Department) has received your letter, dated October 14, 1999, regarding special status species in the above-referenced area, and the following information is provided.

The Department's Heritage Data Management System has been accessed and current records do not indicate the presence of any Endangered, Threatened or other special status species in the project vicinity.

At this time, the Department's comments are limited to the special status species information provided above. This correspondence does not represent the Department's evaluation of impacts to wildlife or wildlife habitat associated with activities occurring in the subject area. If you have any questions regarding this letter, please contact me at (602) 789-3606.

Sincerely,

Nancy Olson

Nancy Olson
Project Evaluation Specialist
Habitat Branch

NLO:no

cc: Russ Haughey, Habitat Program Manager, Region VI, Mesa

AGFD# 10-14-99(11)

Exhibit B-2
Pygmy Owl Survey

Survey of Sempra Energy For The Endangered Cactus Ferruginous Pygmy-owl

By Ryan Gordon
ENTRANCO

Introduction

The cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum)* was listed as endangered in Arizona on March 10, 1997, by the United States Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA). Critical Habitat (specific mapped areas of habitat) was designated for the pygmy-owl on July 12, 1999 (Federal Register 64: 37419-37440). Sempra Energy Resources plans to clear a 400-acre parcel for their proposed Mesquite Generating Station, located in Maricopa County, Section 15 of Township 1 South, Range 6 West. The purpose of this report is to examine the potential for the cactus ferruginous pygmy-owl to occur within the proposed project vicinity and report on the results of surveys conducted according to USFWS recommendations. Constituent elements of critical habitat include riparian vegetation associations of cottonwood (*Populus* sp.) with willow (*Salix* sp.), mesquite (*Prosopis velutina*), hackberry (*Celtis* sp.) and Mexican elderberry (*Sambucus mexicana*). A diverse and layered canopy, such as that found in riparian areas is another element of critical habitat. These elements support pygmy-owl as nesting and foraging habitat and provide cover from predators. No critical habitat has been designated in the project area but the site is within historic range of the pygmy-owl.

In most of Central and South America the owl is a common owl of woodlands, fencerows, roadsides and other wooded areas. When considered range-wide, the pygmy-owl's breeding habitat includes a diversity of woodlands and desert scrub of diverse species composition. In Arizona, the pygmy-owl seems to be associated with desert wash vegetation including saguaro (*Carnegia gigantea*), ironwood (*Olneya tesota*), paloverde (*Cercidium* sp.) and mesquite; and also with lowland riparian woodlands (e.g. mesquite, cottonwood-willow).

Historic records show Arizona pygmy-owls occupying riparian habitats, including cottonwood-willow, mesquite, and upper Sonoron desertscrub (Millsap and Johnson 1988). Since 1993, Arizona pygmy-owls have been seen in Sonoran desertscrub habitats with ironwood in association with mesquite, paloverde, and saguaro (Abbate et al 1996). The role of ironwood in recent pygmy-owl habitat-use is poorly understood. Fledglings shelter in ironwood for up to ten days after leaving the nest (Abbate et al 1996). Other habitat types, historically used in Arizona, have been surveyed recently for owl presence by USFWS, Arizona Game and Fish Department (AGFD), and others but contained no owls (Abbate et al 1996 and Lesh and Corman 1995). To date, no quantitative habitat descriptions are available. Narrative descriptions of habitat frequently include only

species composition, but contain little information on structure, density and canopy cover.

Pygmy-owls nest in cavities in trees, saguaro and other cactus. Cavities typically occur in older trees (e.g. mesquite, ironwood, etc.). Loss of older, more cavity-prone mesquite and ironwood in Arizona has been cited as a potential reason for the species' decline (USWFS 1994). In Texas pygmy-owls used artificial nest boxes placed in suitable habitat (Beasom and Trant 1994). The pygmy-owl does not excavate the cavity, but uses existing ones. Cavities in saguaro are typically excavated by the Gila Woodpecker (*Centurus uropygialis*), but used by a variety of species once they are abandoned by the woodpecker.

The pygmy-owl is resident in Arizona year-round. Nesting takes place in the late winter and/or early spring. Young fledge about 28 days after hatching. Male pygmy owls call throughout the nesting season. Calling is most common in the morning but may occur throughout the day or night. Owls respond to tape-recorded pygmy-owl calls by calling and approaching the simulated calls. Responses to tape recorded calls will occur throughout the year, but are most vigorous, or likely, from late January to early June (Abbate, et al 1996). Several researchers have noted that owls may fail to respond to taped calls, though they are in the vicinity and have responded in the past (Abbate et al 1996, Lesh and Corman 1995). Lesh and Corman (1995) recommend three or more call response surveys during the peak calling season (February through April) to ensure detection. A single calling survey during the peak activity season (September through May) is the minimum required by USFWS to determine presence or absence.

The USFWS and AGFD (2000) have recommended a survey methodology for determining the presence of owls that includes a ten minute period of playing taped calls (about 30 seconds) alternated with 60 to 90 seconds of listening for owls (Corman 1995). To constitute a "single calling survey", the area must be surveyed a minimum of 3 times and no less than 15 days between surveys. One of these surveys must be completed before April 15. The recommended spacing between calling stations is 150 meters, but may vary depending on local conditions. Call surveys must take place within the periods:

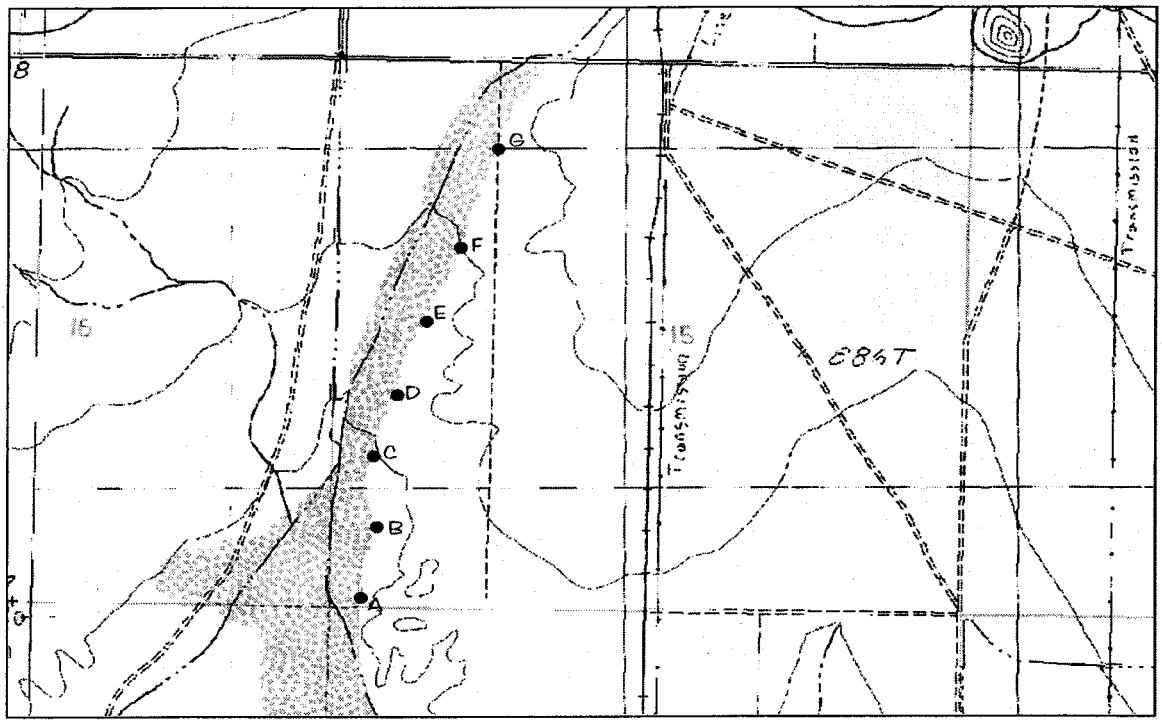
- one hour before sunrise to two hours after, or
- one hour before sunset to one hour after.

To confirm the survey results, USFWS recommends at least 2 years of consecutive surveys to be completed during the above protocol period. In 1997, USFWS issued broad guidelines intended to guide landowners in determining if they need to survey for pygmy-owls. This only applies to landowners that have actions on private lands that do not involve Federal funds, actions or permits (AGFD and USFWS 2000 revised survey protocol).

Methods

Vegetation areas fitting the broad description of potential habitat (USFWS 1997) were identified as survey areas. The presence of large (over 6 inch diameter at the base) mesquite, paloverde, and saguaro in a linear contiguous stand was the criterion for pygmy-owl survey sites. Generally, washes contained vegetation of this type. Survey locations or "stations" were identified in the field (Figure 1).

Figure 1, Survey Stations



Survey methods follow the methodology as outlined above, Corman (1995). The Surveyor played taped calls of cactus ferruginous pygmy-owls for about 30 seconds using a cassette tape recorder. Calls were played at a volume that did not distort the sound. The player was held aloft to increase its effectiveness. After a series of calls, a 60 to 90 second period of listening for owl response followed. The sequence was repeated for at least ten minutes at each station. Notes were kept on common bird observed and heard. Any birds observed were viewed with 8x binoculars for identification, light permitting. Behaviors of birds nearby were noted. Once the calling sequence was completed, the observer moved to the next location. Ryan Gordon, an experienced biologist, conducted all surveys under Entranco's endangered species survey permit from USFWS.

Results

Following protocol currently accepted by the USFWS, one calling survey (as described above) was performed at the site in 2000. Results of the survey at each station are shown in Table 1. The survey was negative for cactus ferruginous pygmy-owls. Mobbing behavior from songbirds, in response to the calls, was negative. There is no critical habitat designated in this part of Maricopa County.

Table 1. Survey Results Sempra 2000

Station	Date	Start Time	End Time	No.Tape Calls	Results	Comments
A	2/11/00	6:35am	6:50am	5	Negative	No mobbing
B	2/11/00	6:55am	7:10am	5	Negative	No mobbing
C	2/11/00	7:16am	7:31am	5	Negative	No mobbing
D	2/11/00	7:35am	7:50am	5	Negative	No mobbing
E	2/11/00	7:56am	8:11am	5	Negative	No mobbing
F	2/11/00	8:17am	8:32am	5	Negative	No mobbing
G	2/11/00	8:40am	8:55am	5	Negative	No mobbing
A	3/3/00	7:04pm	7:19pm	5	Negative	No mobbing
B	3/3/00	6:45pm	7:00pm	5	Negative	No mobbing
C	3/3/00	6:27pm	6:42pm	5	Negative	No mobbing
D	3/3/00	6:09pm	6:24pm	5	Negative	No mobbing
E	3/3/00	5:51pm	6:06pm	5	Negative	No mobbing
F	3/3/00	5:33pm	5:48pm	5	Negative	No mobbing
G	3/3/00	5:15pm	5:30pm	5	Negative	No mobbing
A	3/28/00	7:27pm	7:42pm	5	Negative	No mobbing
B	3/28/00	7:10pm	7:25pm	5	Negative	No mobbing
C	3/28/00	6:53pm	7:08pm	5	Negative	No mobbing
D	3/28/00	6:36pm	6:51pm	5	Negative	No mobbing
E	3/28/00	6:17pm	6:32pm	5	Negative	No mobbing
F	3/28/00	5:58pm	6:13pm	5	Negative	No mobbing
G	3/28/00	5:37pm	5:52pm	5	Negative	No mobbing

Conclusions

Based on these surveys, it was concluded that no cactus ferruginous pygmy-owls are present in the vicinity of the site. No designated critical habitat is present. Therefore the project will not affect pygmy-owls or its critical habitat. According to the pygmy-owl survey protocol one more survey is required next year.

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Exhibit B-3
Geotechnical Investigations

Geotechnical investigations will be conducted to support engineering design, project construction, and environmental permitting. All requisite studies to support the Aquifer Protection Permit will be conducted and provided as required.

Exhibit B-4
Phase I Environmental Survey

Environmental Consultants

SCS ENGINEERS

PHASE I
ENVIRONMENTAL SITE ASSESSMENT
400-ACRE PARCEL NEAR
PALO VERDE POWER PLANT
ARLINGTON, ARIZONA

PHASE I
ENVIRONMENTAL SITE ASSESSMENT
400-ACRE PARCEL NEAR
PALO VERDE POWER PLANT
ARLINGTON, ARIZONA

Prepared For:

Sempra Energy Resources
101 Ash Street
San Diego, California 92101

Prepared By:

SCS ENGINEERS
2702 North 44th Street
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Phoenix, Arizona 85008

REGISTERED GEOLOGIST
CERTIFICATE NO.
24057
BRADLEY F.
JOHNSTON
Date Signed 10.18.99
ARIZONA, U.S.A.

October 18, 1999
File No. 10.99029

Environmental Consultants

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Phoenix, AZ 85008-1583

602.840.2596
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SCS ENGINEERS

October 18, 1999
File No. 10.99029.00

Mr. Cecil Sterling
Sempra Energy Resources
101 Ash Street
San Diego, California 92101

Subject: Phase I Environmental Site Assessment
400-Acre Parcel Near Palo Verde Power Plant
Arlington, Arizona

Dear Mr. Sterling:

SCS Engineers (SCS) is pleased to submit this Phase I Environmental Site Assessment for the above-referenced property near Arlington, Arizona. SCS appreciates the opportunity you with this project. If you have any questions regarding this report, please feel free to contact either of the undersigned at (602) 840-2596.

Sincerely,

Connie F. Jiron
Project Scientist

Brad S. Anderer

Brad S. Anderer
Project Manager
SCS ENGINEERS

CFJ/BSA:cfj
F:\DATA\PROJECTS\9902900\PHASE 1REPORT.DOC

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EXECUTIVE SUMMARY

Sempra Energy Resources retained SCS Engineers (SCS) to perform a Phase I Environmental Site Assessment (Phase I ESA) of a 400-acre parcel of vacant property located near the Palo Verde Power Plant in Arlington, Arizona (site). The Phase I ESA consisted of a site reconnaissance; interviews; review of environmental, historical, and physical records pertaining to activities on and adjacent to the site; and interpretation and reporting of findings. A natural and cultural resource screening was performed by SWCA, Inc. Environmental Consultants and is provided in Appendix E.

At the time of the site reconnaissance, the property appeared vacant and naturally vegetated, desert land. A septic tank system was located south of Elliott Road on the site. A well and two concrete slabs were located in the center of the site near a transformer pole.

Solid waste observed on the site included broken glass, piping, and a couch and loveseat.

Based on review of historical information, the site appeared to be mostly vacant and desert land from 1978 to 1986. In 1986, a trailer (possible mobile home) was placed on the site.

Adjoining properties reviewed in the historical aerial photographs showed vacant undeveloped desert land. The Palo Verde Plant was observed in the 1978 aerial located approximately one mile north of Elliott Road. Evidence was not found to indicate that uses of adjoining properties have had an adverse environmental impact on the site.

A review of regulatory agency listings did not identify the site or adjoining properties to be a source of recognized environmental concern.

Based on the findings of this Phase I Environmental Site Assessment, SCS recommends the following:

- The domestic well be properly abandoned prior to construction activities if the future site use does not include utilizing the well; and

- Any planned construction on the site take into account the presence of the septic system on the northern portion of the site. The septic system may be a geotechnical concern if the septic system has not been properly excavated prior to construction activities. Proper procedure should be followed for its removal at time of development.

SECTION 1
INTRODUCTION

BACKGROUND

Sempra Energy Resources retained SCS Engineers (SCS) to perform a Phase I Environmental Site Assessment (Phase I ESA) of a 400-acre parcel of vacant property near the Palo Verde Power Plant in Arlington, Arizona (site).

The site is located south of Elliott Road, approximately one mile east of Wintersburg Road and approximately 37 miles west of the Phoenix metropolitan area border. The location of the site is shown on Figure 1 in Appendix A.

PURPOSE

The purpose of this investigation was to conduct an environmental assessment of the site and the immediate area to identify potential environmental conditions.

SCOPE OF WORK

The investigation consisted of a Phase I ESA. The Phase I ESA included a site reconnaissance; interviews; review of environmental, historical, and physical records pertaining to activities on and adjacent to the site; and interpretation and reporting of findings.

This work was performed in accordance with our proposal No. 10.07799, dated September 21, 1999, using the ASTM Standard for Environmental Site Assessments (E-1527-97), which is the current industry standard for Phase I ESAs. The assessment was performed in accordance with good commercial and customary practice for similar Phase I ESAs in this area.

ADDITIONS TO STANDARD SCOPE OF WORK

Additions to the general ASTM scope of work for Phase I ESAs included the following: 1) geologic and hydrogeologic information for the site area was researched in order to assess the direction of regional groundwater flow in this area; and 2) the additional environmental record sources were included as part of the environmental database search performed by All Lands Title (ALT) because they were readily available and added environmental records information to the investigation; and 3) a screen-level study of the property to identify potential issues related to threatened and endangered species, cultural resources, or Clean Water Act (CWA) Section 404 permitting was conducted by SWCA, Inc. Environmental Consultants. A letter report summarizing SCWA's findings is located in Appendix E.

LIMITATIONS

This report has been specifically prepared for the Sempra Energy Resources with regard to the assessment of environmental conditions at the site. The report has been prepared in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants, under similar circumstances at the time the services were performed, in this or similar localities. No other representations, either expressed or implied, and no warranty or guarantee is made as to the professional advice presented herein. SCS assumes no responsibility for the accuracy of information obtained from third-party sources such as regulatory agency listings.

No sampling or laboratory analyses of potential hazardous materials, petroleum products, asbestos-containing materials or other types of potential pollutants were performed as part of this Phase I ESA; sampling of materials is normally conducted as part of Phase II investigations. Although this report may provide recommendations regarding the possibility of recognized environmental conditions specific to this site, positive identification of hazardous substances can be accomplished only through sampling and appropriate laboratory analysis.

SECTION 2
SITE RECONNAISSANCE AND DESCRIPTION

LOCATION

The 400-acre site is located at approximately one mile east of Wintersburg Road and immediately south of Elliott Road near Arlington, Arizona. The property is located in Section 15 of Township 1 South, Range 6 West of the Gila and Salt River Base Line and Meridian. The location of the site is shown on Figure 1 in Appendix A.

BACKGROUND

On October 6, 1999, Ms. Connie Jiron and Mr. Josh Bernthal of SCS performed a visual reconnaissance of the site in order to observe current site conditions and uses. Mr. Mike Sullivan of Range West, Land Purchases Consultant for Sempra Energy Resources, accompanied SCS during the site visit. The boundaries of the site were not marked in the field but were estimated by Mr. Sullivan with a map provided by Range West. A subsequent site visit was performed by Ms. Jiron and Mr. Bradley F. Johnston, P.G. on October 15, 1999 to confirm identity of the underground structures.

The site consisted of vacant desert land. A site and vicinity map is provided in Figure 2, Appendix A. Site photographs are provided in Appendix B.

METHODOLOG

The site reconnaissance was performed by walking and driving through the site and along the site perimeter. Adjoining properties were also observed during the site reconnaissance.

PHYSICAL SETTING ANALYSIS

The topography of the site was generally level.

GENERAL SITE CHARACTERISTICS

Current Site Uses

At the time of the site reconnaissance, the site was generally undeveloped and consisted of naturally vegetated, desert land. A trailer (possible mobile home) occupied the property in the late 1980's.

The estimated site boundaries are shown on Figures 1 and 2, Appendix A.

Site Improvements

Structures---

No structures were located on the site at the time of the site reconnaissance.

Roads---

Elliott Road borders the property to the north. Several dirt roads were observed bisecting the site. The dirt roads were generally overgrown and appeared unused. A dirt road led south from Elliott Road to an area observed to be the location of a former residence harboring a septic tank system, two concrete foundations, a water well, and a transformer pole.

Potable Water Supply--

ADWR indicated that the site is included in the Phoenix Active Management Area (AMA) area. However, ADWR could not identify the name of the water company that provides potable water to the site. Water Utility of the Greater Tonapah provides water in the vicinity of the site.

Sewage Disposal System--

There was no evidence of a sewage disposal system observed on the site.

Septic System--

There was visual evidence of a septic system observed on the site located south of Elliott Road near the center of the property.

Heating/Cooling System--

No heating or cooling systems were observed on the site during the site reconnaissance.

HAZARDOUS SUBSTANCES

Hazardous Substances Connected with Identified Uses

No hazardous substances were observed in association with current uses of the site.

Containers with Hazardous and Unidentified Substances

No containers with hazardous and unidentified substances were identified on the site.

Storage Tanks

No evidence of USTs (such as fill ports, vent pipes, and dispensers) were observed on the site.

Indications of PCBs

An electrical transformer was on a utility pole located south of Elliott Road, near the center of the site. The transformers are owned and operated by Arizona Public Service (APS). APS would be responsible for any leaks or spills from transformers owned by APS.

Indications of Solid Waste Disposal

Broken glass, plastic pipes, and a couch and loveseat were observed on the site.

OTHER CONDITIONS OF POTENTIAL CONCERN

Odors

No strong, pungent, or noxious odors were observed on the site.

Pools of Liquid

Pools of standing liquid were not observed on the site.

Stains or Corrosion Inside Buildings

No buildings were located on the site at the time of the site reconnaissance.

Drains and Sumps

No evidence of drains or sumps (such as floor drains, grates, or vault covers) was observed on the site during the site reconnaissance.

Pits, Ponds, or Lagoons

No pits, ponds, or lagoons were observed on the site during the site reconnaissance.

Stained Soil or Pavement

Stained soil or pavement was not observed on the site during the site reconnaissance.

Stressed Vegetation

Vegetation on the site consisted of trees, weeds, and sparse grasses. Unnaturally stressed vegetation was not observed on the site.

Wastewater and Other Liquid Discharges

No indications of wastewater or other liquid discharges (including wet areas, stained areas, or pipes apparently intended to discharge liquids to the ground surface) were observed on the site.

Wells

A well was observed in the center of the site. According to ADWR's records, the well was registered to Mr. Michael Sichi in 1986 (Registration Well #55-514110). The well reportedly was constructed to 595 feet below ground surface for domestic purposes. The groundwater depth below ground surface was reported as 223 feet.

GENERAL DESCRIPTION OF ADJOINING PROPERTIES

Vacant land and the Palo Verde Nuclear Plant were observed in the area surrounding the site. Properties adjoining the site at the time of the site reconnaissance are shown on Figure 2, Appendix A.

North

Vacant land and the Palo Verde Nuclear Plant is located immediately north of the site.

East

Vacant and naturally vegetated land was located east of the site.

South

Vacant and naturally vegetated land was located south of the site.

West

Vacant and naturally vegetated land was located west of the site.

SECTION 3

RECORDS REVIEW — ENVIRONMENTAL RECORD SOURCES

INTRODUCTION

ALT was retained by SCS to perform a database search of the standard and additional federal and state environmental record sources for the site, as identified in the table below. The database search was conducted by ALT on October 7, 1999. A copy of the ALT environmental records report is included in Appendix C.

The following table lists the reviewed environmental databases, their dates, and the distances searched by ALT from the site boundary. The search distances meet or exceed the minimum search distances listed in the ASTM standard for conducting Phase I investigations.

Database	Date of Database	Approximate Minimum Search Distance (miles)
Standard Federal ASTM Environmental Record Sources		
NPL (National Priorities List)	6/99	1.0
CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System)	9/99	0.5
RCRA (Resource Conservation and Recovery Act) Large and Small Quantity Generators	9/99	Site and adjoining
RCRA - CORRACTS TSDFs (Corrective Action Treatment, Storage, and Disposal Facilities)	9/99	1.0
RCRA - Non-CORRACTS TSDFs	9/99	0.5
ERNS (Emergency Response Notification System)	1983-9/99	Site
Standard State ASTM Environmental Record Sources		
WQARF (Water Quality Assurance Revolving Fund) Areas	6/99	1.0
ACIDS (Arizona CERCLA Information and Database System) List	9/99	0.5
Solid Waste Facilities/Landfill Sites — Operating and Closed	5/98	0.5
Registered USTs (Underground Storage Tanks)	1/99	Site and adjoining
LUSTs (Leaking Underground Storage Tanks) Incident Reports	7/99	0.5

Database	Date of Database	Approximate Minimum Search Distance (miles)
Additional Environmental Record Sources		
RCRA Compliance Facilities	9/99	1.0
Hazardous Materials Incidents Emergency Response Logbook	1984-9/99	Site
Drywell Registration Database	9/99	Site
Arizona Indoor Radon Survey Information	6/16/93	Site area zip code
Superfund Amendments and Reauthorization Act (SARA) Title III	9/99	1.0
Arizona Department of Water Resources Well Registration Database	1/97	Site and adjoining

The following sections describe the various reviewed databases. Based on the location or groundwater flow direction in relation to the subject site and the status of the environmental database listing, the database listing deemed to be potential recognized environmental conditions are discussed below.

STANDARD FEDERAL ASTM ENVIRONMENTAL RECORD SOURCES

Federal National Priorities List (NPL)

Explanation--

The National Priorities List (NPL) is a listing authorized under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) and compiled by the Environmental Protection Agency (EPA). The NPL is a listing of uncontrolled or abandoned hazardous substances sites where there has been a release or threat of a release of the hazardous substances to the environment. The sites are placed on the NPL by the EPA using the Hazard Ranking System (HRS), which prioritizes each site based on site characteristics, hazardous substances at the site, and observable releases.

Search Results--

No NPL areas were identified within one mile of the site.

Federal CERCLIS List

Explanation--

The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) is a comprehensive database and management system, compiled and maintained by the EPA, which inventories and tracks suspected or actual hazardous substances sites under the Superfund program. These sites were reported to the EPA by states, municipalities, private companies, and private persons. Actions that may be taken under CERCLA include a preliminary assessment, remedial investigation, feasibility study, and remedial cleanup. Inclusion of a specific site or area in the CERCLIS database does not represent a determination of any party's liability, nor does it represent a finding that any response action is necessary.

Search Results--

No CERCLIS facilities were identified within one-half mile of the subject site.

Federal RCRA Database — Generators

Explanation--

The Resource Conservation and Recovery Act (RCRA) database is a list of facilities which have obtained an EPA identification number due to their involvement in the generation, transportation, treatment, storage, or disposal of hazardous waste. The database is compiled and maintained by the EPA. RCRA generators are separated into three categories:

- Large Quantity Generators (LQG) — produce at least 1,000 kilograms (kg) of hazardous waste per month;

- Small Quantity Generators (SQG) — produce more than 100 but less than 1,000 kg of hazardous waste per month; and

- Conditionally Exempt Small Quantity Generators (CESQG) — produce less than 100 kg of hazardous waste per month. These generator categories are further defined in the regulations regarding the types of hazardous wastes generated, and also the lengths of time the hazardous wastes are allowed to be stored at the facility.

Search Results--

No large or small quantity RCRA generator facilities were identified on the site

Federal RCRA Database – CORRACTS and Non-CORRACTS TSDFs

Explanation--

The RCRA database also identifies facilities, which treat, store, and dispose of hazardous waste. RCRA Treatment, Storage, and Disposal Facilities (TSDF) treat or dispose of hazardous wastes, or store hazardous wastes in applicable amounts for time periods stated in RCRA.

These facilities must be permitted or must have obtained interim status. Facilities which have interim status were already operating at the time the regulations went into effect in 1980, and were allowed to continue operating until EPA reviews their application, and either issues or denies a permit.

RCRA CORRACTS TSDFs are those facilities subject to Corrective Action under RCRA. The database was searched for RCRA CORRACTS TSDFs (facilities with corrective action records) within one mile of the site and RCRA non-CORRACTS TSDFs (facilities without corrective action records) within one-half mile of the site.

Search Results--

No RCRA CORRACTS TSDFs were identified within one mile of the site:

Search Results--

No RCRA CORRACTS TSDFs were identified within one mile of the site:

Federal ERNS List

Explanation--

The Emergency Response Notification System (ERNS) is a national computer database and retrieval system compiled by the National Response Center containing information on release notifications of oil and hazardous substances which have occurred throughout the United States and have been reported to the National Response Center, the ten EPA Regions, or the Coast Guard. Information may include discharger information, date of release, material released, incident location, and environmental medium into which the release occurred.

Search Results--

No incidents were identified for the site on the ERNS list.

STANDARD STATE ASTM ENVIRONMENTAL RECORD SOURCES

Arizona WQARF Areas

Explanation--

The Arizona WQARF program is the State version of the Federal Superfund program. The WQARF program was established to remedy sites for which there is an actual or potential threat of impact to waters of the State by hazardous substances.

Search Results--

No WQARF study areas or sites were identified within one mile of the subject site.

Arizona ACIDS LIST

Explanation--

The Arizona CERCLIS Information and Data System (ACIDS) list is maintained by ADEQ, and consists of locations subject to investigation under the State WQARF and Federal CERCLA programs.

Search Results--

No ACIDS facilities were identified within one-half mile of the subject site.

Arizona Solid Waste Facilities — Operating and Closed

Explanation--

ADEQ maintains a directory of active and known inactive municipal solid waste landfills, rubbish landfills, and private solid waste landfills in Arizona. The directories list the name of the facility, owner and operator, location, and types of wastes accepted at the landfills.

Search Results--

No landfills were identified within one-half mile of the subject site.

Arizona Registered USTs

Explanation--

ADEQ maintains a list of registered underground storage tanks (USTs) in Arizona which contain or have contained regulated substances, primarily petroleum products. The list includes information, where available, regarding the location, owner, number of registered tanks, contents, capacity, age, tank and piping construction material, and type of piping system.

Search Results--

No registered USTs were identified on the site.

Arizona LUSTs

Explanation--

ADEQ maintains a list of leaking underground storage tanks (LUSTs) in Arizona which have had a reported release of regulated substances, primarily petroleum products. The list identifies the owner, location, date of release, and date of closure, if applicable.

Search Results--

No LUST facilities were identified on the site or adjoining properties.

ADDITIONAL ENVIRONMENTAL RECORD SOURCES

Arizona RCRA Compliance Log

Explanation--

ADEQ maintains a list of facilities that are or have been under investigation for noncompliance with RCRA regulations. The list includes the facility's EPA identification number, name, address, and whether the case is active or inactive. Cases closed by ADEQ are purged from the list by ADEQ at the end of each fiscal year.

Search Results--

No RCRA compliance facilities were identified within one mile of the site.

Arizona Hazardous Materials Incidents Emergency Response Log

Explanation--

The ADEQ Emergency Response Unit documents chemical spills and incidents that have been reported to the unit. This is generally the Arizona equivalent to the Federal ERNS list. Reported incidents have been compiled into yearly lists, beginning with the year 1984. All lists except for 1987 provide the addresses of the recorded incidents.

Search Results—

No registered hazardous materials incidents were identified within a 0.125-mile search radius of the subject site.

Arizona Drywell Registration Database

Explanation--

ADEQ maintains a list of registered drywells located throughout Arizona. Drywells are intended to be used solely for the disposal of stormwater. Beginning in 1986, drywells were required to be registered; however, many drywells in the state have not yet been registered.

Search Results--

No registered drywells were identified for the site.

Arizona Aquifer Protection Permits (APPs) Program Existing Facility List

Explanation--

Facilities which directly or indirectly discharge any pollutant to the waters of the State may be required to obtain a permit as required by the Aquifer Protection Permit (APP) Rules. ADEQ maintains lists of facilities that have obtained an APP.

Search Results--

The lists did not identify facilities with an APP permit on the site.

Arizona Home Indoor Radon Survey

Explanation--

Through funds provided by EPA, the Arizona Radiation Regulatory Agency conducted a statewide radon survey, testing more than 2,000 homes in Arizona for the presence of radon gas in 1987 and 1988. A second phase of the survey, conducted by county health departments in 1988 and 1989, tested more than 500 homes in counties on the Colorado Plateau (Coconino, Navajo, Apache), the area nearby the cities of Payson and Prescott, and the Camp Verde area. EPA has established 4 picocuries per liter (pCi/l) as a general guideline for the maximum acceptable, long term, indoor-radon concentration.

Search Results—

The site zipcode was not available. This indicates that test were not performed in this zipcode area.

Superfund Amendments and Reauthorization Act (SARA) Title III

Explanation--

Under the Community Right-to-Know portion of the Superfund Amendments and Reauthorization Act (SARA), facilities which must prepare or have available Material Safety Data Sheets (MSDSs) pursuant to the Occupational Safety and Health Administration (OSHA) hazard communication regulations are required to submit either copies of the MSDSs or a list of the chemicals to the local emergency planning committee, the State Emergency Response Commission, and the local fire department.

Search Results--

No SARA Title III facilities were identified within a one-mile search radius of the subject property.

Arizona Department of Water Resources Well Registration Database

Explanation--

The Arizona Department of Water Resources (ADWR) Well Registration Database contains information provided to the ADWR Operations Division by well drillers and/or owners of wells.

Search Results--

One domestic well, registered with ADWR in 1986 by Mr. Michael Sichi, was identified on the subject site. The well reportedly was constructed to 595 feet below ground surface for domestic purposes. The groundwater depth below ground surface was reported as 223 feet.

SECTION 4

RECORDS REVIEW - PHYSICAL SETTING SOURCES

STANDARD PHYSICAL SETTING SOURCE - USGS 7.5-MINUTE TOPOGRAPHIC MAP

The United States Department of the Interior Geological Survey (USGS) 7.5-minute topographic map containing the site, Arlington, Arizona, was obtained and reviewed to evaluate the topographic characteristics of the site area. The map was dated 1984. The map showed the elevation on the site as approximately 890 feet above mean sea level.

OTHER PHYSICAL SETTING SOURCES

Hydrogeology

Hydrogeologic information for the site was obtained from the Arizona Department of Water Resources (ADWR) Hydrologic Map Series Report No. 12, Sheet 1 of 3, *Depth to Water and Altitude of the Water Level, 1983 – Maps Showing Groundwater Conditions in the West Salt river, East Salt River, Lake Pleasant, Carefree and Fountain Hills Sub-Basins of the Phoenix Active Management Area, Maricopa, Pinal, and Yavapai Counties, Arizona* – 1983 by R.W. Reeter and W.H. Remick. The site is located within the Basin and Range Physiographic Province, characterized by broad alluvial-filled basins bounded by steep, fault-block mountains. The site is located within the West Salt River Valley (WSRV) sub-basin of the Phoenix Active Management Area.

The Salt River Valley basin-fill deposits are characterized by three hydrogeologic units: the Lower Alluvial Unit (LAU), the Middle Alluvial Unit (MAU), and the Upper Alluvial Unit (UAU). The UAU is highly productive in the central portion of the basin, and along the Salt River. The primary source of groundwater in the Salt River Valley was formerly the UAU, which consists primarily of gravel, sand, and silt. However, only an estimated 25 percent of total pumpage is currently derived from the UAU as a result of dewatering due to groundwater withdrawal. Currently, the primary source of groundwater in most

areas of the Salt River Valley is the MAU, which consists primarily of clay, silt, mudstone, and gypsiferous mudstone with some interbedded sand and gravel; near basin margins, the unit consists primarily of sand and gravel.

Based on maps, depth to groundwater in wells located within the vicinity of the site is approximately 35 feet bgs. The direction of regional groundwater flow in this area was shown as generally the southwest. Groundwater flow direction and gradient may vary due to seasonal and areal variations in withdrawal and recharge, such as that caused by well pumpage or infiltration from unlined channels or washes.

SECTION 5

RECORDS REVIEW — HISTORICAL USE INFORMATION

STANDARD HISTORICAL USE SOURCES

Aerial Photographs

Historical aerial photographs of the site were reviewed to evaluate past uses of the site and adjoining area. Historical aerial photographs for the site area were not available at Rupp Aerial or Landiscor of Arizona. Available historical aerial photographs were reviewed at the Arizona Department of Transportation (ADOT) Highways Division. Available aerial photograph included dated April 14, 1975, January 5, 1978, March 25, 1985, and November 12, 1992.

Site--

The site appeared as vacant, undeveloped, and naturally vegetated, desert land.

Adjoining Properties--

Adjoining properties appeared as vacant, undeveloped, and naturally vegetated desert land. The Palo Verde Nuclear Plant, located north of the site, was initially observed in the 1978 aerial photograph. Evidence was not found to indicate that uses of adjoining properties have or have had a direct environmental impact to the site.

USGS 7.5-Minute Topographic Maps

The USGS 7.5-minute topographic map, Arlington, Arizona, was reviewed. The map was published in 1984. No structures were shown on the site or adjoining properties.

Fire Insurance Maps

There was no Sanborn Map coverage for the site.

Local Street Directories

City directories identify occupants of listed addresses. SCS performed a search of city directories at the COP Main Library for the site and adjoining property addresses. City directories were not found that included the site and adjoining property addresses.

INTERVIEWS

SCS obtained site information from Mr. Mike Sullivan of Range West. Mr. Sullivan indicated that the site is being considered for development of a 1,000 megawatt steam generated electric or power plant. Mr. Sullivan also reported that the property was once occupied by a residential trailer, a domestic well, and septic tank, but the site has been vacant since its removal. Mr. Sullivan indicated that 320 acres of the site is owned by Mr. Michael Sichi and 80 acres of the property is owned by Ms. Esther Hoffman.

Mr. Sullivan provided SCS with copies of a map outlining the boundaries of the site and Chain of Title information for both parcels. Chain of Title is provided in Appendix E.

ENVIRONMENTAL LIENS/CLIENT'S SPECIAL KNOWLEDGE

No environmental liens for the site were identified by Mr. Sullivan.

SECTION 6

FINDINGS AND CONCLUSIONS

SCOPE OF WORK

Sempra Energy Resources retained SCS Engineers (SCS) to perform a Phase I ESA of approximately a 400-acre parcel of vacant property located near the Palo Verde Power Plant in Arlington, Arizona. The Phase I ESA consisted of a site reconnaissance; interviews; review of environmental, historical, and physical records pertaining to activities on and adjacent to the site; and interpretation and reporting of findings.

In addition to the Phase I ESA, SCS was requested to provide a screen-level study of the site to identify potential issues related to threathened and endangered species, cultural resources, or Clean Water Act (CWA) Section 404 permitting issues. This portion of the project was performed by SWCA, Inc. Environmental Consultants. The results of the Natural and Cultural Resources Overview are provided in Appendix E of this report.

FINDINGS AND CONCLUSIONS

Current Conditions

At the time of the site reconnaissance, the property generally consisted of vacant and naturally vegetated desert land. The boundaries of the site were not marked in the field but were estimated by Mr. Sullivan of Range West. A septic tank system, a water well, two concrete slabs, and a transformer pole were located in the center of the site. Solid waste disposal observed on the site included broken glass, piping, and a couch and loveseat.

Historical Review

Based on review of historical information, the site appeared to be mostly vacant and consisted of naturally vegetated desert land.

Adjoining Properties

Adjoining properties reviewed in the historical aerial photographs showed vacant and naturally desert land. The Palo Verde Plant was observed in the 1978 aerial. Evidence was not found to indicate that uses of adjoining properties have had an adverse environmental impact on the site.

Regulatory Agency Listings

A review of regulatory agency listings did not identify the site or adjoining properties as a source of recognized environmental concern.

RECOMMENDATIONS

Based on the findings of this Phase I ESA, SCS recommends the following:

- The domestic well be properly abandoned prior to construction activities if the future site use does not include utilizing the well; and

- Any planned construction on the site take into account the presence of the septic system on the northern portion of the site. The septic system may be a geotechnical concern if the septic system has not been properly excavated prior to construction activities. Proper procedure should be followed for its removal at time of development.

APPENDIX A

FIGURES

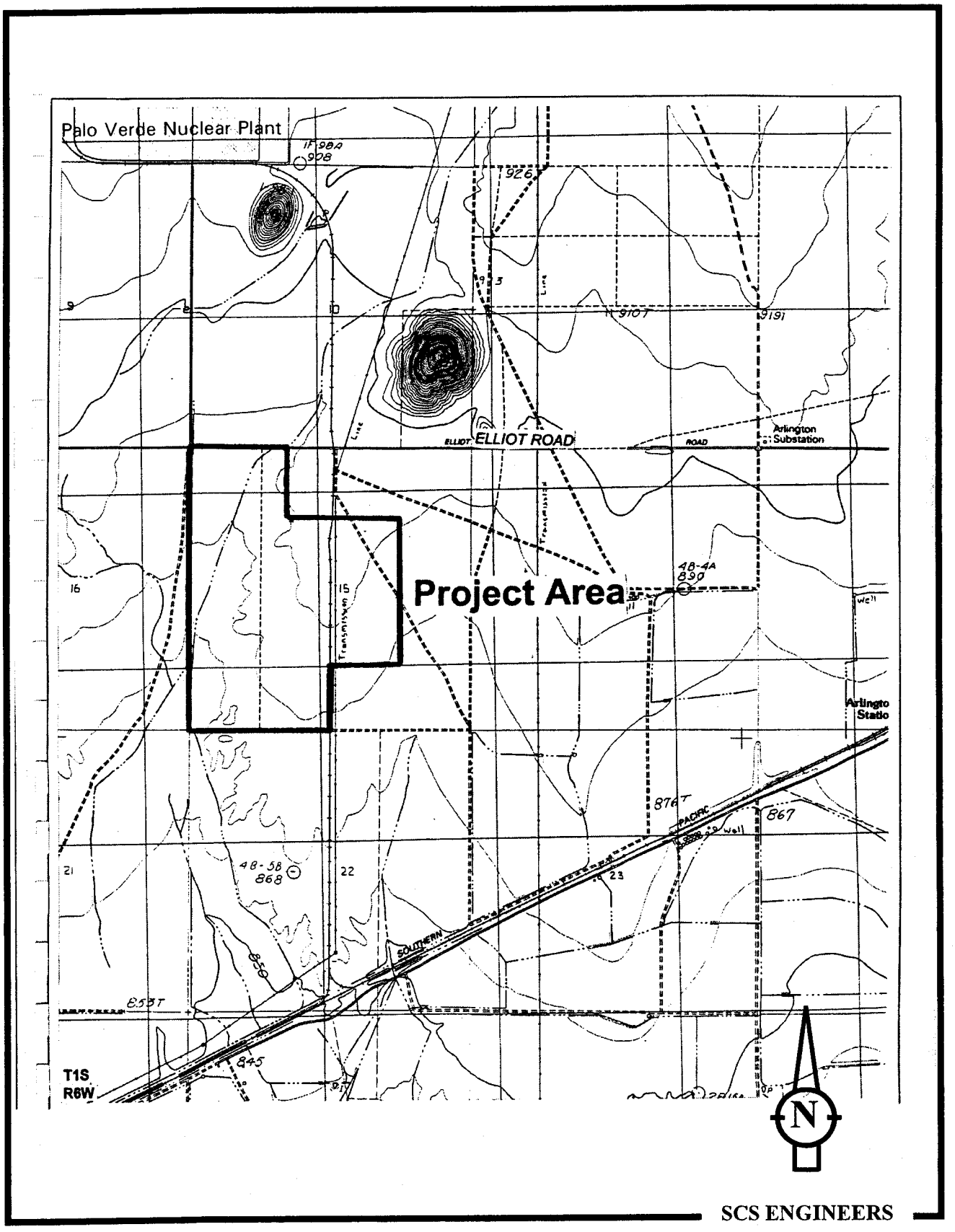


FIGURE 1. SITE LOCATION MAP

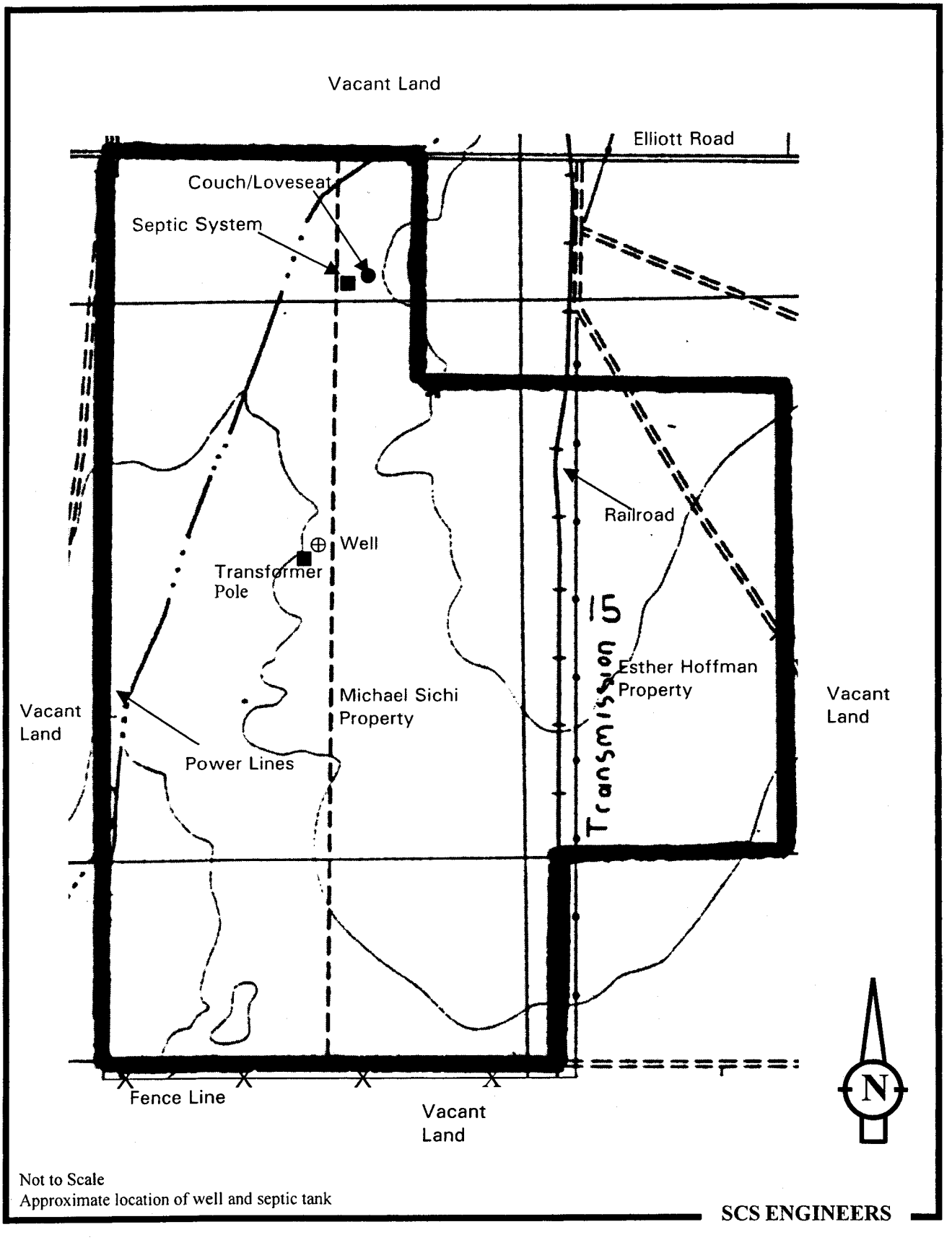


FIGURE 2. SITE AND VICINITY MAP

APPENDIX B

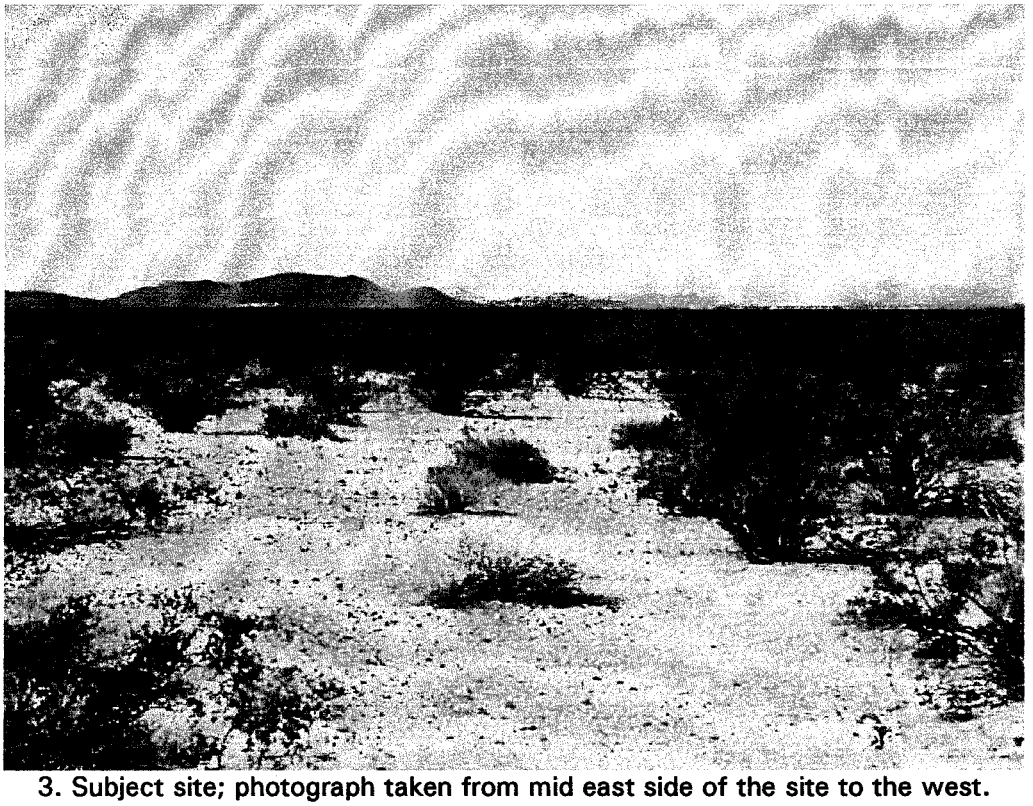
SITE PHOTOGRAPHS

THE QUALITY
OF THE FOLLOWING IMAGES IS
DIRECTLY RELATED TO THE
COLOR AND QUALITY OF THE
ORIGINAL DOCUMENT.

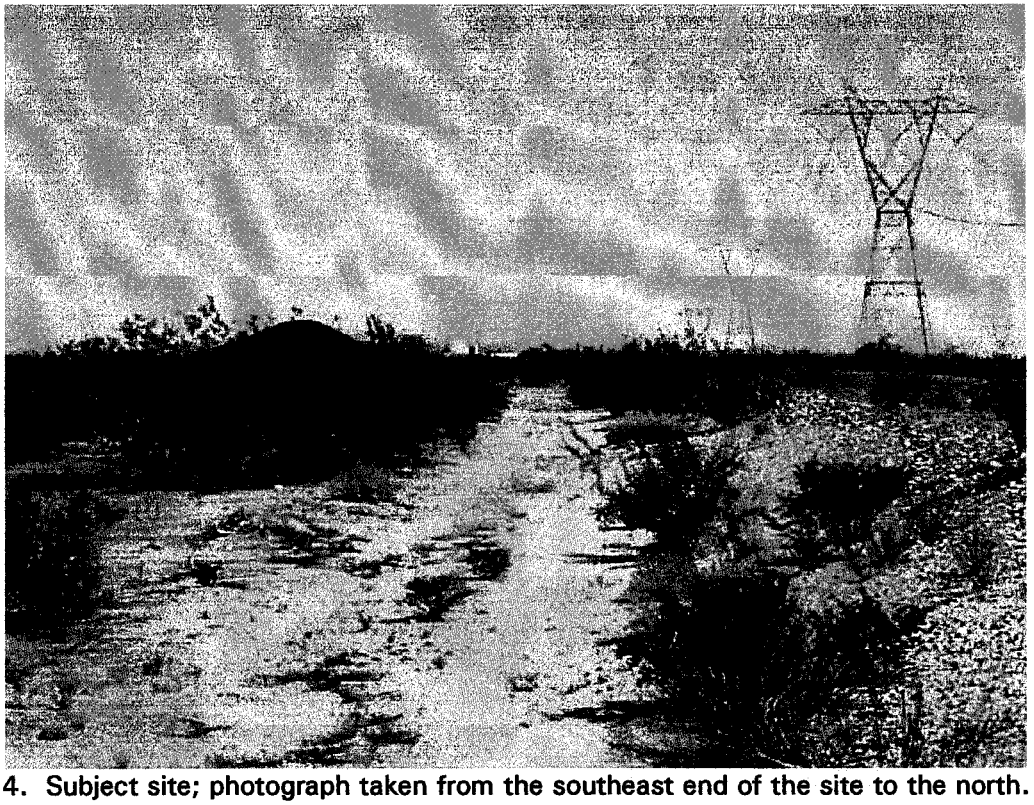
EVERY EFFORT HAS BEEN
MADE TO MAXIMIZE QUALITY
SCANNING REPRODUCTION OF
ALL DOCUMENTS.

1. The subject site; photograph taken at the southeast end of the site looking north.

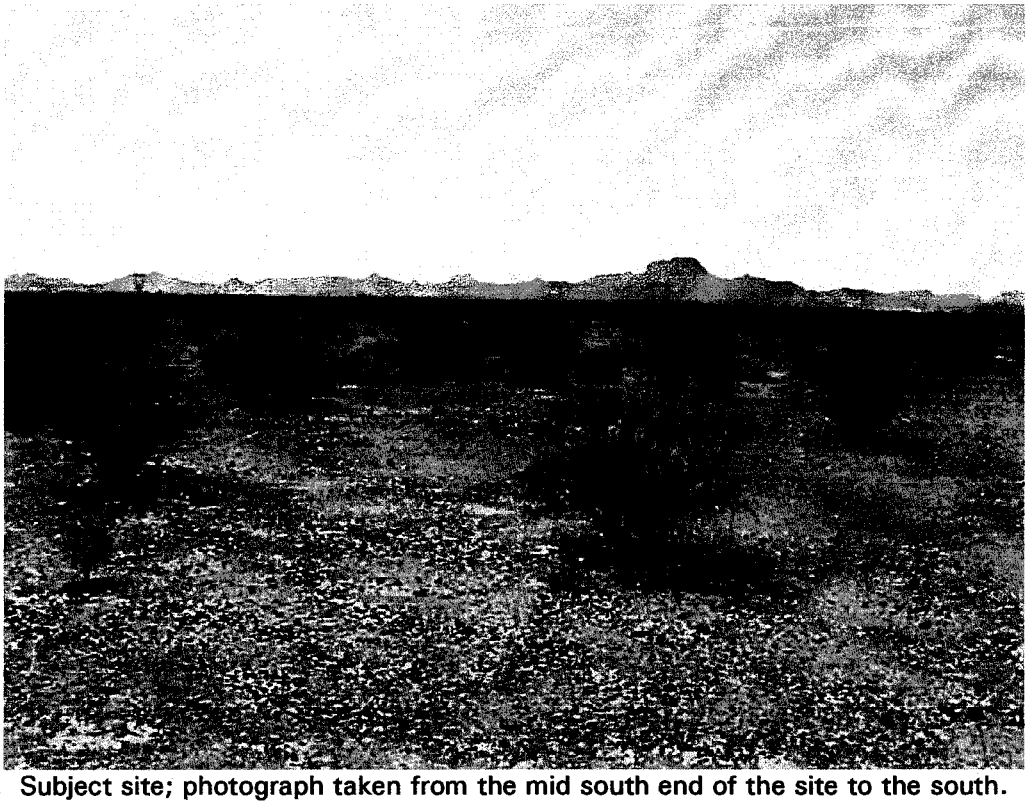
2. The subject site; photograph taken from the mid east side of the site looking south.



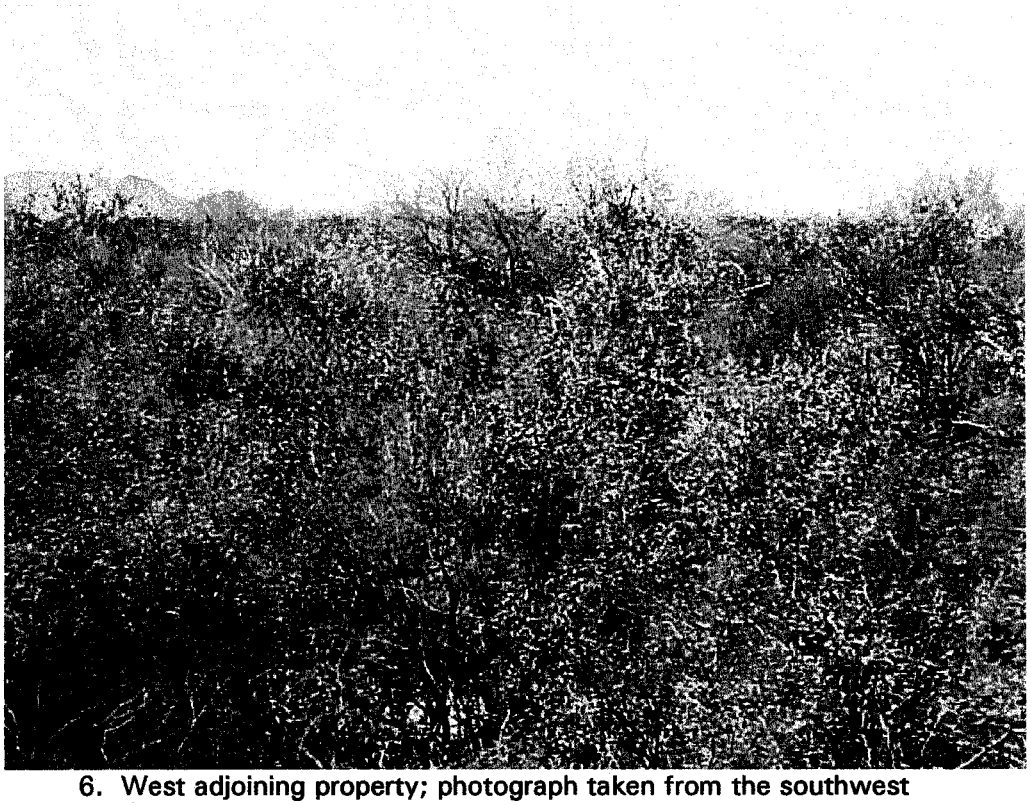
3. Subject site; photograph taken from mid east side of the site to the west.



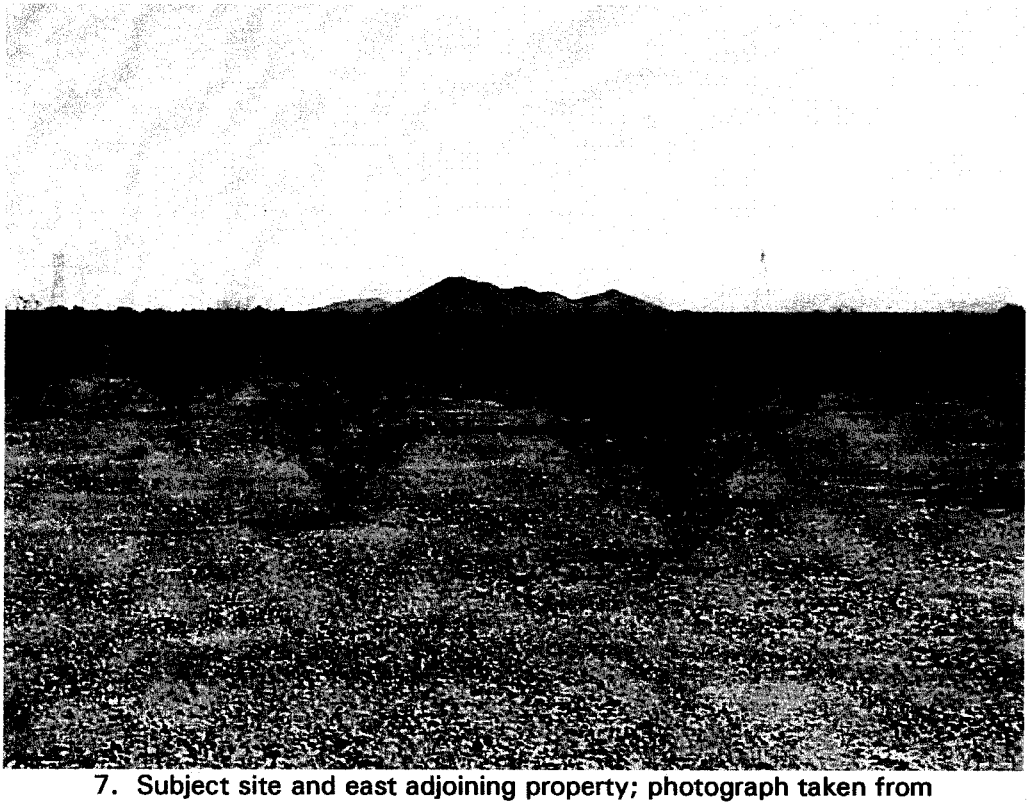
4. Subject site; photograph taken from the southeast end of the site to the north.



5. Subject site; photograph taken from the mid south end of the site to the south.



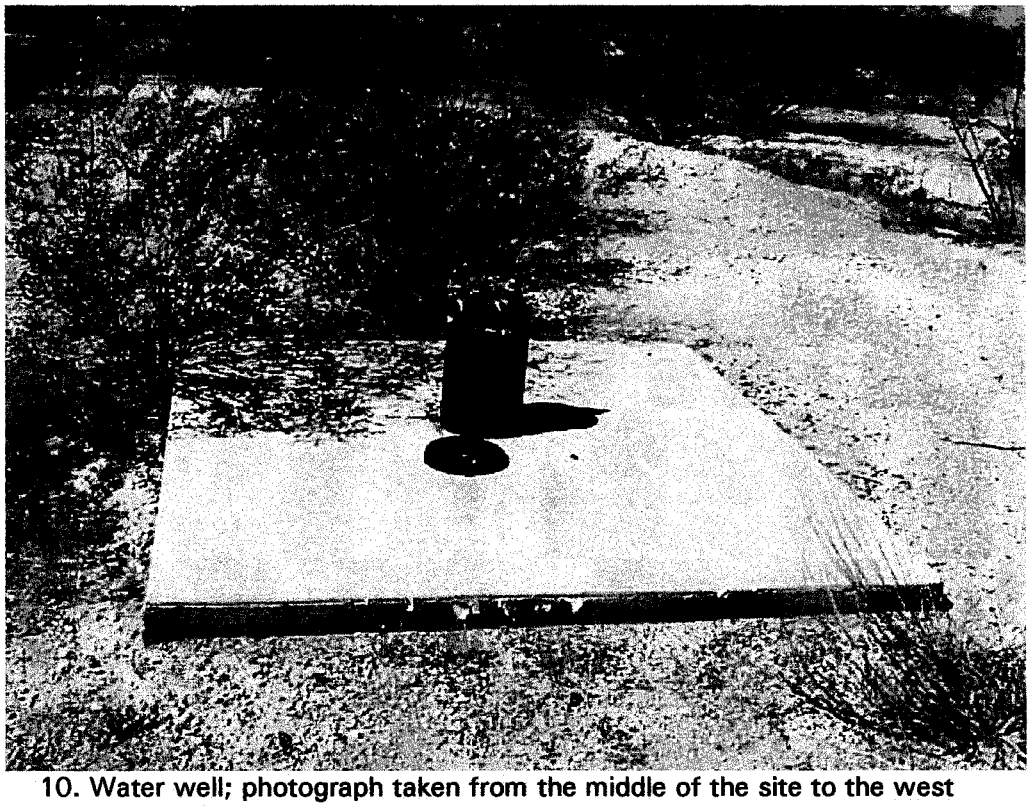
6. West adjoining property; photograph taken from the southwest end of the site looking west.



7. Subject site and east adjoining property; photograph taken from the west side of the railroad tracks to the east.

8. Septic tank located south of Elliot Road.

9. Concrete slabs located near the transformer pole and water well; photograph taken from the east to west.



10. Water well; photograph taken from the middle of the site to the west

APPENDIX C

ALL LANDS TITLE ENVIRONMENTAL RECORDS REVIEW

ALL LANDS TITLE

P.O. Box 56398, Phoenix, AZ 85079
(602) 242-7921 Fax (602) 242-4493

REGULATORY DATABASE (ASTM) SEARCH

YOUR FILE NO: 10.99029

ALT FILE NO: 99-1693D

DATE: October 7, 1999

ALL LANDS TITLE hereby reports the search results of Federal and State Databases according to ASTM standards for Phase I Environmental Site Assessments E 1527-97. This is a confidential, privileged and protected document for the use of SCS Engineers. All Lands Title is not responsible for errors in the available records. The total liability is limited to the fee paid for this report.

1. The land referred to in this report is located in Maricopa County, Arizona, described as follows:

Property being the West half of Section 15, Township 1 South, Range 6 West, Gila and Salt River Base and Meridian.

SUMMARY

FEDERAL & STATE ENVIRONMENTAL RECORDS

RECORDS (miles)	<=0.125	0.125 - 0.25	0.25 - 0.5	0.5 - 1.0
NPL	0	0	0	0
WQARF	0	0	0	0
RCRA COMPLIANCE	0	0	0	0
RCRA CORRACTS TSD	0	0	0	0
RCRA TSD FACILITIES	0	0	0	-
LANDFILLS	0	0	0	-
CERCLIS	0	0	0	-
ACIDS	0	0	0	-
LUST	0	0	0	-
RCRA GENERATORS	0	-	-	-
UST	0	-	-	-
ERNS	0	-	-	-
HAZ. MAT. INCIDENTS	0	-	-	-

OTHER ENVIRONMENTAL RECORDS

RECORDS (miles)	<=0.125	0.125 - 0.25	0.25 - 0.5	0.5 - 1.0
SARA	0	0	0	0
Dry well	0	-	-	-
Environmental Permits	0	-	-	-
ADWR Well Report	see attached report			
RADON	see text			

DEFINITIONS:

ACIDS	Arizona CERCLA information & Data System
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Federal CERCLA List
CORRACTS	TSD Facilities subject to Corrective Action under RCRA
EPA	US Environmental Protection Agency, Region IX
ERNS	Emergency Response Notification System
LUST	Leaking Underground Storage Tank
NFRAP	CERCLA Sites which have no further remediation actions planned
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List (Superfund)
RADIUS	by definition includes subject property measured from exterior boundaries
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendment and Reauthorization Act
TSD	Treatment, Storage, Disposal Facility
UST	Underground Storage Tank
WQARF	Water Quality Assurance Revolving Fund

SUPERFUND NATIONAL PRIORITIES LIST (NPL)

Under Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act the Environmental Protection Agency established a National Priorities List (NPL) of Superfund sites. Inclusion on the NPL reflects a significant risk to public health and the environment and indicates a Federal Priority to remediate the site. This database is provided by the Arizona Department of Environmental Quality, dated June, 1999, and searched to identify all NPL sites within a 1.0 mile search radius of subject property.

No National Priorities List (NPL) Sites were found located within a 1.0 mile search radius of subject property.

WATER QUALITY ASSURANCE REVOLVING FUND (WQARF)

The state of Arizona established a remedial program under A.R.S. 49-282 to facilitate the conservation and clean-up of Arizona drinking water and water sources. Under the authority of the WQARF program, the state actively identifies any actual or potential impact upon state waters, evaluates the extent of contamination, identifies parties responsible, and provides money grants to assist in clean-up activities. This database is provided by the Arizona Department of Environmental Quality dated June, 1999, and searched to identify all WQARF sites within a 1.0 mile search radius of subject property.

No WQARF Registry List sites were found located within a 1.0 mile search radius of subject property.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) COMPLIANCE FACILITIES

The RCRA Compliance Log lists facilities that have been or presently are under investigation for non-compliance with RCRA regulations. Each facility listed manages hazardous materials through generation, transportation, storage, treatment, or disposal. Inclusion of any facility on this list indicates a history of compliance problems and RCRA regulatory violation. This database is from the Arizona Department of Environmental Quality RCRA Compliance Log, dated January, 1999, and searched for compliance facilities within a 1.0 mile search radius of subject property.

No compliance facilities were found located within a 1.0 mile search radius of subject property.

CORRACTS TSD FACILITIES

Under RCRA the Environmental Protection Agency compiles a database of facilities that are involved in the generation, transportation, treatment, storage, or disposal of hazardous materials. This database is from the Arizona Department of Environmental Quality RCRA Log dated September, 1999, and checked for Federal RCRA CORRACTS TSD Facilities which occurred within a 1.0 mile search radius of subject property.

No Federal RCRA CORRACTS TSD Facilities were found which occurred within a 1.0 mile search radius of subject property.

TSD FACILITIES

Under RCRA the Environmental Protection Agency compiles a database of facilities that are involved in the generation, transportation, treatment, storage, or disposal of hazardous materials. Inclusion on the TSD Facilities list does not exclude being on the CORRACTS Facility List. This database is from the Arizona Department of Environmental Quality RCRA TSD Facilities, dated September, 1999, and checked for Federal TSD Facilities which occurred within a 0.5 mile search radius of subject property.

No Federal RCRA TSD Facilities were found which occurred within a 0.5 mile search radius of subject property.

TSD TYPE(S):
L = LAND DISPOSAL
I = INCINERATION
B = BOILERS AND INDUSTRIAL FURNACES
S = STORAGE AND TREATMENT

LANDFILLS

The state of Arizona maintains listings of closed and permitted, operating landfills and solid waste dump sites. Lists of closed facilities are not necessarily complete - older dumping areas may not be documented. This database is from the Arizona Department of Environmental Quality Waste Programs Division; Solid Waste Section Directory of Arizona Active and Inactive Landfills dated May, 1998, and checked for active and inactive landfills located within a 0.5 mile search radius of subject property.

No active nor inactive landfills were found located within a 0.5 mile search radius of subject site.

FEDERAL CERCLIS LIST

The CERCLIS list contains sites which are either proposed to or on the NPL and sites which are in the screening and assessment phase for possible inclusion on the NPL. Those sites on the NFRAP list have no further remediation action planned. This database is provided by EPA through the Right of Know Net by OMB Watch and Unison Institute dated September, 1999, and searched for facilities within a 0.5 mile search radius of subject property.

No CERCLIS facilities were found located within a 0.5 mile search radius of subject property.

ARIZONA CERCLA INFORMATION AND DATA SYSTEM (ACIDS)

The ACIDS list consists of locations and facilities subject to investigation under the Federal CERCLA and state WQARF programs. Inclusion of any facility on this list does not indicate contamination, threat of contamination or violation of state or federal statutes. This database is provided by the Arizona Department of Environmental Quality, dated September, 1999, and searched to identify all ACIDS sites within a 0.5 mile search radius of subject property.

No ACIDS facilities were found located within a 0.5 mile search radius of subject property.

REGISTERED LEAKING UNDERGROUND STORAGE TANKS (LUST)

Owners of USTs are required to report to the Arizona Department of Environmental Quality any and all releases of tank contents for which ADEQ maintains an ongoing file documenting the nature of contamination and the status of each such incident. This database is from the ADEQ LUST Log dated July, 1999, and searched for LUST sites located within a 0.5 mile search radius of subject property.

No registered leaking underground storage tanks were found located within a 0.5 mile search radius of subject property.

RESOURCE CONSERVATION AND RECOVERY ACT FACILITIES (RCRA)

Under RCRA the Environmental Protection Agency compiles a database of facilities that are involved in the generation of hazardous materials. This database is from the Arizona Department of Environmental Quality RCRA Log dated September, 1999, and checked for Federal RCRA Small (less than 1000 kg/month of non-acutely hazardous waste) & Large Generators (at least 1000 kg/month of non-acutely hazardous waste or 1 kg/month of acutely hazardous waste) located within a <=0.125 mile search radius of subject property.

No Federal RCRA Large or Small Generators were found located within a <=0.125 mile search radius of subject property.

CODES:

LQG: Large quantity generator
SQG: Small quantity generator
CEG: Conditionally Exempt generator
*** : facility notified but is not now engaged in that activity

REGISTERED UNDERGROUND STORAGE TANKS (UST)

State (A.R.S. 49-1001 to 1014) and Federal (RCRA Subtitle I) laws require that persons who own or have owned underground storage tanks containing "regulated substances" complete a notification form and register the tank with the state. This database is from the Arizona Department of Environmental Quality UST Log dated April, 1999, and searched for UST sites located within a <=0.125 mile search radius of subject property.

No registered underground storage tanks were found located within a <=0.125 mile search radius of subject property.

FEDERAL EMERGENCY RESPONSE NOTIFICATION SYSTEM (ERNS) LIST

The ERNS list is a national database used to collect information on reported releases of oil and hazardous substances. This database is provided by EPA through the Right of Know Net by OMB Watch and Unison Institute from 1983 to September, 1999, and checked for incidents located within a <=0.125 mile search radius of subject property.

No incidents were found located within a <=0.125 mile search radius of subject property.

HAZARDOUS MATERIAL INCIDENTS

The Arizona Department of Environmental Quality (ADEQ) Response Team documents spills and incidents involving hazardous materials that are reported to the unit. This database is from the Arizona Department of Environmental Quality Emergency Response Log from 1984 through June, 1999, and checked for hazardous material incidents located within a <=0.125 mile search radius of subject property.

No hazardous material incidents were found located within a <=0.125 mile search radius of subject property.

OTHER ENVIRONMENTAL RECORDS

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) TITLE III EXTREMELY HAZARDOUS SUBSTANCES SITES

Under the Community Right-To-Know portion of SARA, facilities which must prepare, or have available, material safety data sheets (MSDS) and must submit either copies of the MSDS or a list of the chemicals to the State Emergency Response Commission. This Database is from the SARA Title III List dated September, 1999, and searched to identify all SARA sites within a 1.0 mile search radius of subject property.

No SARA facilities were found located within a 1.0 mile search radius of subject property.

ADEQ DRY WELL REGISTRATION DATA BASE

Dry wells are constructed for the purpose of collecting storm waters. Dry wells are required to be registered with ADEQ. This database is from the ADEQ dry well registration database dated June, 1999, and searched for dry wells located within a <=0.125 mile search radius of subject property.

No registered dry wells were found located within a <=0.125 mile search radius of subject property.

ARIZONA RADIATION REGULATORY AGENCY
HOME RADON SURVEY

The Arizona Radiation Regulatory Agency, in cooperation with the EPA, initiated a program to measure radon concentrations with the primary goal of determining the statewide distribution of radon and identify areas of potentially high concentrations. This database is from the ARRA Home Radon Survey revised June 16, 1993, for the subject property zipcode.

ZIPCODE	HIGH VALUE in picoCuries/liter	NO. OF TESTS	TESTS <4.0 pCi/L	TESTS at 4.0+ pCi/L
Not available				

ENVIRONMENTAL PERMITS

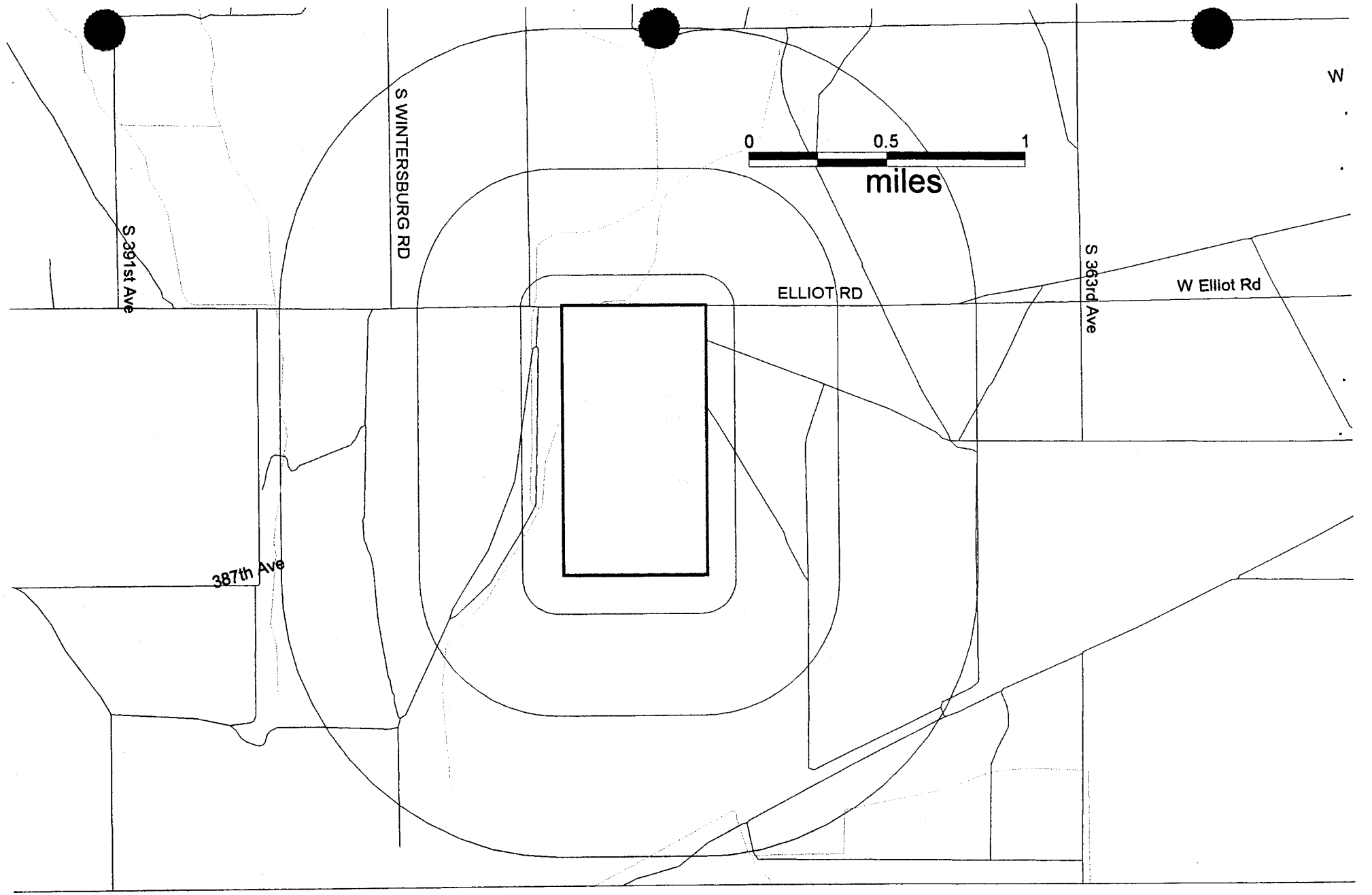
These lists include Groundwater Permits, Reuse Permits; NPDES Permitted Facilities and Aquifer Protection Permits. Any facility which discharges a material that directly or indirectly adds any pollutant to the waters of the state may be required to obtain a permit as required by the Aquifer Protection Permit Rules. These databases are from the Arizona Department of Environmental Quality Aquifer Protection Permit Program Existing Facility list dated January, 1997, and checked for inclusion of subject property.

Subject property was not found on these lists.

ARIZONA DEPARTMENT OF WATER RESOURCES
WELL REPORT

This database is from the Arizona Department of Water Resources Well Report Operations Division Report, dated March, 1999. This report identifies existing wells sequenced by legal description and checked for inclusion of subject site and adjacent properties within 10 Acres.

SEE ATTACHED REPORT



N
E
S

LEGEND

- ◆ USTs
- ● ACIDS & CERCLA
- ● SARA
- ⊙ LANDFILL
- ☆ SITE
- ■ RCRA (Generators, TSD & CORRACTS TSD)
- ▼ LUSTs
- ▲ RCRA COMPLIANCE

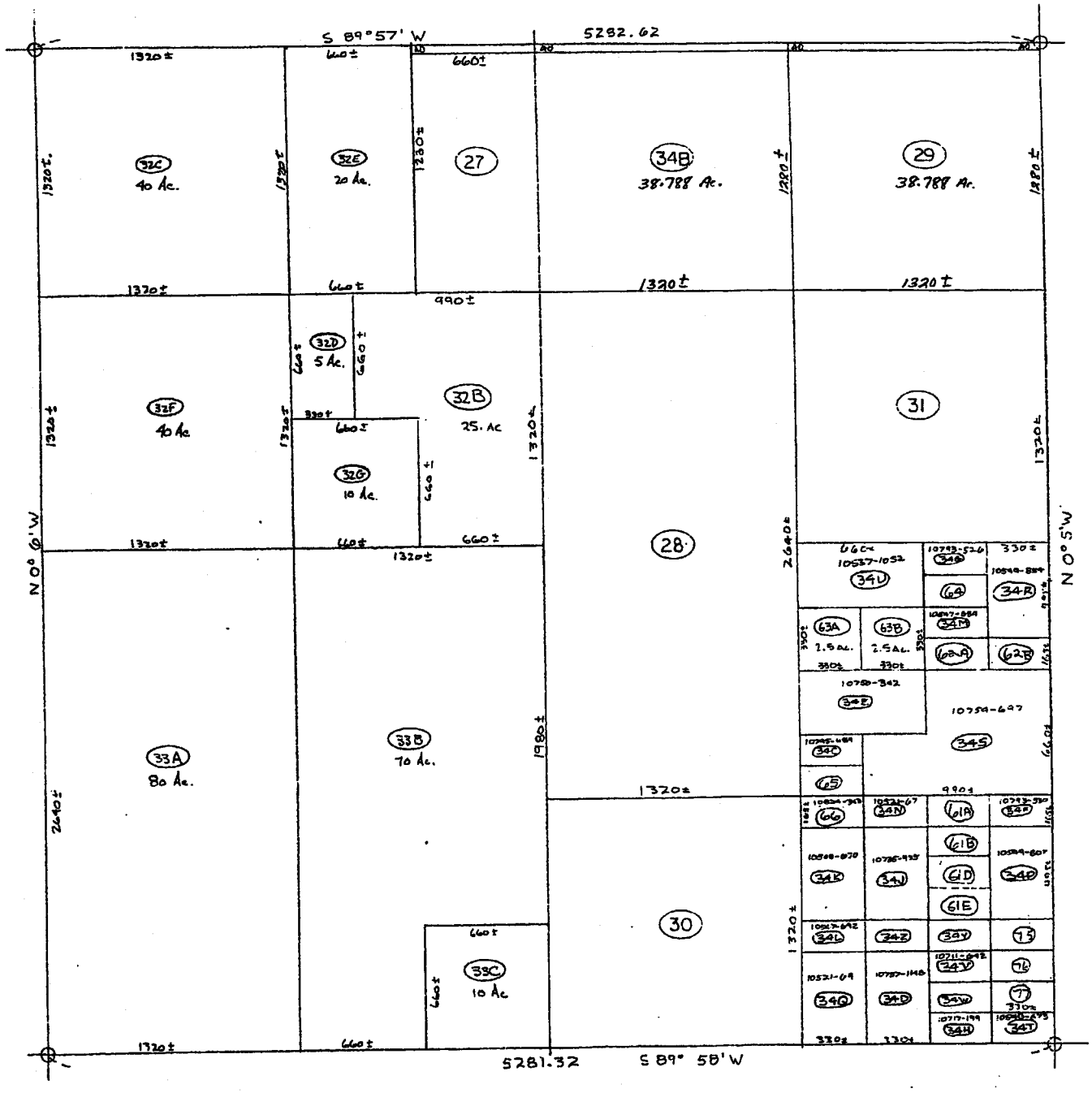
* MULTIPLE FACILITIES

SEC 15 T1[illegible]R 6W

BOOK 4[illegible]

MAP 43

SHEET 4 OF 4



N

MARICOPA COUNTY ASSESSOR'S OFFICE				
SCALE 1" = 500'				
REVISIONS				
Date	Was	Is	Draftsman	Checker
11-10-79	1	4001	2076	
3-3-75	34X	75-36-77	2071	CP 2082
3-3-75	61	ABC	2071	CP 2082
3-3-75	62	AB	2071	CP 2082
6-26-75	61C	DE	2197	2071
1-78	32	A,B	P2082	M.D. 2072
1-20-78	29	COMB SPLIT	80-AD 2072 12476-506	P2082
1-26-78	34B	COMB SPLIT	80-AD 2072 12497-1446	P2082
7-78	27	SPLIT	12592-932	2077 / 2082
1/18/82	32A	32B-32G	85-518291 85-518292	Lwc. M.D. 2072
1/18/82	33	33A,B,C	85-518291 85-518292	Lwc. M.D. 2072
1/12/87	63	63A,B	87-138124	MP 2068 M.D. 2072

13414-866

PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR
WILLIAMS RAYMOND R/OLIVIA G /TR 98-0196290 03/13/98 $5,120 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) SW4 SE4 40.00 AC $5,120 00 04 $482.04 98 $22,500

401-43-031 1917 E BAY TREE CIR GILBERT AZ 85234-4937 40.000 AC $22,500
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $22,500
PATTERSON DOROTHY & REX $5,120 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) SE4 NE4 40 AC $5,120 00 04 $482.04 98 $22,500

401-43-032B PO BOX 2081 PAGE AZ 86040-2081 $18,750 08/12/88 WD 25.000 AC $18,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $18,000
SICHI MICHAEL J 88-0400043 08/12/88 $3,200 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) E2 SE4 NW4 & E2 NW4 SE4 NW4 SEC 15 $3,200 00 04 $301.24 98 $18,000

401-43-032C PO BOX 2081 PAGE AZ 86040-2081 40.000 AC $24,500
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $24,500
SICHI MICHAEL I $5,120 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) NW4 NW4 $5,120 00 04 $482.04 98 $24,500

401-43-032D PO BOX 2081 PAGE AZ 86040-2081 217,800 $5,072
37645 W ELLIOTT RD 10.0% $4,000
SICHI MICHAEL I $509 MOBILE HOME SUB LOT 470000 $1,072
15 1S 6W (15 1S 6W) W2 NW4 S2 N2 E2 W2 $509 08 20 $39.36 98 $5,072

TYPE OF IMPROVEMENT	YEAR	HGT	STY	GR-FL-AREA	TL-FL-AREA	GR-PMTR	CONSTRUCT CD	COND	CMPL	OBSO	MODN	IMPROVE FCV
MOBILE HOME YARD IMPROVEMENTS	1986	1.0					D	100%			100%	$1,072

401-43-032E PO BOX 2081 PAGE AZ 86040-2081 $80,000 10/06/86 WD 03 20.000 AC $17,500
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $17,500
SICHI MICHAEL I $2,560 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) W2 NE4 NW4 $2,560 00 04 $241.04 98 $17,500

401-43-032F PO BOX 2081 PAGE AZ 86040-2081 40.000 AC $22,500
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $22,500
SICHI MICHAEL I $5,120 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) SW4 NW4 $5,120 00 04 $482.04 98 $22,500

401-43-032G PO BOX 2081 PAGE AZ 86040-2081 10.000 AC $11,500
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $11,500
SICHI MICHAEL I $1,280 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) SW4 SE4 NW4 $1,280 00 04 $120.52 98 $8,875

MARICOPA, AZ. J11

Real Estate Solutions Nationwide 1-800-345 7334 Copyright 1999 All Rights Reserved

TAX PARCEL OWNER MAILING ADDRESS SALE PRICE / DATE TI VC PCL SIZE TOTAL FCV
PROPERTY ADDRESS PHONE PRIOR SALE / DATE TI VC ASMTX LAND FCV
TITLEHOLDER DKT-PG REC-DATE PRIM ASSESS LCIC DESCRIPTION TAX AREA IMPR FCV
CONTRACT PURCHASER DKT-PG REC-DATE SEC ASSESS LC IC PROP TAX YR TOTAL LIM
SEC TWN RNG GRID CENSUS ZONE LEGAL DESCRIPTION

401-43-033A PO BOX 2081 PAGE AZ 86040-2081 80.000 AC $48,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $48,000
SICHI MICHAEL I $10,240 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) W2 SW4 $10,240 00 04 $964.08 98 $48,000

401-43-033B PO BOX 2081 PAGE AZ 86040-2081 $80,000 10/06/86 WD 03 70.000 AC $42,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $42,000
SICHI MICHAEL I $8,960 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) E2 SW4 EX SE4 SE4 SW4 $8,960 00 04 $843.58 98 $42,000

401-43-033C PO BOX 2081 PAGE AZ 86040-2081 10.000 AC $8,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $8,000
SICHI MICHAEL I $1,280 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) SE4 SE4 SW4 $1,280 00 04 $120.52 98 $8,000

401-43-034B 10 BEACH MANOR CT WEST ISLIP NY 11795-4935 38.788 AC $22,500
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $22,500
FABRIZIO RUDOLPH MD /TR $4,965 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) NW4 NE4 EX N 40F RD $4,965 00 04 $467.50 98 $22,500

401-43-034C 1326 N MARION WASHINGTON NY 62353 1.250 AC $4,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $4,000
BAKER LELAND S & MARY M $160 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) N2 SW4 SW4 NE4 SE4 $160 00 04 $15.04 98 $1,750

401-43-034D 108 N MAIN CROSS ST LEIPSIC OH 45856-1442 3.750 AC $7,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $7,000
BUNN JAMES C & ELOISE J $480 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) SE4 SW4 SE4 SE4 & S2 NE4 SW4 SE4 SE4 $480 00 04 $45.18 98 $4,000

401-43-034E 509 EVERGREEN DR LONG BEACH MS 39560-3232 $10,000 04/11/75 WD 02 5.000 AC $8,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $8,000
BEEDE NANCY A H $640 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) N2 SW4 NE4 SE4 $640 00 04 $60.24 98 $5,000

401-43-034F 3422 W TUCKEY LN PHOENIX AZ 85017-1449 1.250 AC $4,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $4,000
LINDER HENRY G/RUTH V /TR $160 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) N2 NE4 NE4 SE4 SE4 $160 00 04 $15.04 98 $1,750

401-43-034G 2645 E SOUTHERN AVE C#262 TEMPE AZ 85282-7649 1.250 AC $4,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $4,000
KOBLAS FRANKLIN L & FRANCES M /TR $160 VACANT-UNDETERMINED 470000
15 1S 6W (15 1S 6W) N2 NW4 NE4 NE4 SE4 $160 00 04 $15.04 98 $1,750

MARICOPA, AZ. K11

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TAX PARCEL OWNER MAILING ADDRESS SALE PRICE / DATE TI VC PCL SIZE TOTAL FCV
PROPERTY ADDRESS PHONE PRIOR SALE / DATE TI VC ASMTX LAND FCV
TITLEHOLDER DKT-PG REC-DATE PRIM ASSESS LCIC DESCRIPTION TAX AREA IMPR FCV
CONTRACT PURCHASER DKT-PG REC-DATE SEC ASSESS LC IC PROP TAX YR TOTAL LIM
SEC TWN RNG GRID CENSUS ZONE LEGAL DESCRIPTION

401-43-034H 27630 RIGGS RD FOSTER OR 97345 1.250 AC $4,000
PROPERTY ADDRESS NOT AVAILABLE FROM ASSESSOR 16.0% $4,000
TRUMM DEAN A & NORMA M $160 VACANT-UNDETERMINED 470000

ALL LANDS TITLE

P.O. Box 56398, Phoenix, AZ 85079
(602) 242-7921 Fax (602) 242-4493

ARIZONA DEPARTMENT OF WATER RESOURCES
WELL REPORT

ALT FILE NO: 99-1693 ADWR

DATE: October 7, 1999

ALL LANDS TITLE hereby reports the search results of the Arizona Department of Water Resources. This is a confidential, privileged and protected document for the use of SCS Engineers. All Lands Title is not responsible for errors in the available records. The total liability is limited to the fee paid for this report. This database is from the Arizona Department of Water Resources Well Report Operations Division Report, dated March, 1999. This report identifies existing wells sequenced by legal description and checked for wells within a 10 Acre radius of subject property.

CODES AND DEFINITIONS

Water Uses

A	Irrigation
B	Utility (Water Co.)
C	Commercial
D	Domestic
E	Municipal
F	Industrial
G	Recreational
H	Subdivision
I	Mining
J	Stock
K	Other - Exploration
L	Drainage
M	Monitoring
N	None
O	Other - Non-Production
R	Recharge
T	Test

Legal Description

A	Northeast
B	Northwest
C	Southwest
D	Southeast
Q	Quadrant
T	Township
R	Range
S	Section
160	Quarter of Section (160 Acres)
40	Quarter Quarter of Section (40 Acres)
10	Quarter Quarter Quarter of Section (10 acres)

DTW Depth to Water
REG No. Well Registration Number

Q	T	R	S	Q_16	Q_4	Q_1	LAST_NAME	COMPLETED	WATER_US	WELL_DEPT	DTW	REG_NO
C	01	06	09	D	D	D	AZ PUBLIC SERVICE,	2/1/1989	M	270	212	523299
C	01	06	15	B	A	B	SICHI, MIKE,	8/19/1986	D	595	223	514110

APPENDIX D

CHAIN OF TITLE INFORMATION

First American Title Insurance Company
4801 East Washington, Suite 110 • Phoenix, Arizona 85034
(602) 685-7560 • Fax: (602) 685-7580

September 23, 1999

SEP II
c/o Sempra Energy
101 Ash Street
San Diego, Ca. 92101
Attn: Joseph Rowley

Re: Escrow #201-800-1255409
Sichi/Sep II

Attn: Joseph Rowley

Enclosed please find the following:

1. Commitment For Title Insurance
2. Schedule B documents

If you have any questions or require any further documentation please call and we will be happy to assist you.

Sincerely,

Jackie Ulerick for
CAROL PETERSON, ESCROW OFFICER

CP/ju
Enclosure(s)

CC: Michael Sichi (w/o Schedule B)

Range West (w/o Schedule B)
Mike Sullivan

JACKIE-LTR.WPD/

SCHEDULE A

Commitment No. 201-800-1255409

Commitment Date: September 14, 1999 at 7:30 a.m.

Proposed Coverage: A.L.T.A. Extended Owner's (10-17-92)/
A.L.T.A. Extended Lender's (10-17-92)

1. Policy (or Policies) to be issued:
   (a) Owner Policy Amount: $_____
   Proposed Insured:

   SEP II, a California corporation

   (b) Lender Policy Amount: $_____
   Proposed Insured:

   MICHAEL I. SICHI, an unmarried man

2. The estate or interest in the land upon issuance of the policy shall be fee.

3. Title to the estate or interest in the land upon issuance of the policy shall be vested in:

   SEP II, a California corporation

4. The proposed mortgage and assignments thereof, if any, are described as follows:

   A Deed of Trust given to secure an indebtedness in the original principal amount of $_____, dated _____, recorded _____, in _____ of Official Records.

   TRUSTOR: SEP II, a California corporation

   TRUSTEE: _____

   BENEFICIARY: MICHAEL I. SICHI, an unmarried man

5. The land referred to in this Commitment is located in Maricopa County, Arizona, and is described as:

   SEE EXHIBIT "A" ATTACHED HEREIN

FIRST AMERICAN TITLE INSURANCE COMPANY

ESCROW OFFICER:
Carol Peterson
(602) 685-7560

By: Edward H. Kramer:glc/db 685-7737

EXHIBIT "A"

NO. 201-800-1255409

PARCEL NO. 1:

The East half of the Southeast quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 2:

The East half of the Northwest quarter of the Southeast quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 3:

The West half of the Northeast quarter of the Northwest of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 4:

The Northeast quarter of the Southwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 5:

The Southeast quarter of the Southwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 6:

The Southwest quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 7:

The West half of the Southwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 8:

The Northwest quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

Continued . . . .

EXHIBIT "A"

NO. 201-800-1255409

PARCEL NO. 9:

The Southwest quarter of the Southeast quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 10:

The West half of the Northwest quarter of the Southeast quarter of the Northwest quarter of Section 15, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

SCHEDULE B

Commitment No. 201-800-1255409

PART TWO:

1. Taxes for the full year of 1999. (The first half is due October 1, 1999 and is delinquent November 1, 1999. The second half is due March 1, 2000 and is delinquent May 1, 2000.)

2. Reservations contained in the Patent from the United States of America, reading as follows:

   Subject to any vested and accrued water rights for mining, agricultural, manufacturing, or other purposes, and rights to ditches and reservoirs used in connection with such water rights as may be recognized and acknowledged by the local customs, laws and decisions of courts; and there is reserved from the lands hereby granted, a right of way thereon for ditches or canals constructed by the authority of the United States of America.

3. Water rights, claims or title to water, whether or not the matters excepted are shown by the public records.

4. An easement for electric line and rights incident thereto as set forth in instrument recorded in Book 84 of Miscellaneous, Page 303.

   (Affects Parcel Nos. 6, 7 and 8)

5. A Resolution by the Board of Supervisors of Maricopa County, Arizona, recorded in Docket 3124, Page 573, and recorded in Book 13, Page 48, of Road Maps, purporting to establish a county roadway.

   (Affects Parcel Nos. 3 and 8)

6. An easement for railroad spur line and transmission line for distribution of electricity and telephone, signal and communication purposes and rights incident thereto as set forth in instrument recorded in Docket 11174, Page 1327 and thereafter Assignment of Easements recorded in 90-085360, of Official Records.

   (Affects Parcel Nos. 1, 4 and 5)

7. An easement for road, railroad and utility purposes and rights incident thereto as set forth in instrument recorded in Docket 12118, Page 1206 and re-recorded in Docket 12414, Page 865.

   (Affects Parcel Nos. 1 and 2)

8. An easement for highway purposes and rights incident thereto as set forth in instrument recorded in Docket 12529, Page 448.

   (Affects Parcel Nos. 3 and 8)

Continued. . . .

SCHEDULE B

Commitment No. 201-800-1255409

9. A Resolution by the Board of Supervisors of Maricopa County, Arizona, recorded in Docket 13257, Page 1539 and in Docket 13257, Page 1542, and recorded in Book 25, Page 47, of Road Maps, purporting to establish a county roadway.

(Affects Parcel Nos. 3 and 8)

10. An easement for utilities and roadway purposes and rights incident thereto as set forth in instrument recorded in 85-528851 of Official Records.

(Affects Parcel Nos. 3, 4 and 5)

11. An easement for utilities and roadway purposes and rights incident thereto as set forth in instrument recorded in 85-528852 of Official Records.

(Affects Parcel Nos. 5, 6, 7 and 10)

12. An easement for electric lines and rights incident thereto as set forth in instrument recorded in 86-431559 of Official Records.

(Affects Parcel No. 8)

13. An easement for electric lines and rights incident thereto as set forth in instrument recorded in 86-582912 of Official Records.

(Affects Parcel No. 3)

14. An easement for electric lines and rights incident thereto as set forth in instrument recorded in 86-709527 of Official Records.

(Affects Parcel Nos. 3 and 8)

15. An easement for railroad spur line and transmission line for distribution of electricity and telephone, signal and communication purposes and rights incident thereto as condemned in instrument recorded in 91-547385 of Official Records and Assignment of Easement obtained by Condemnation recorded in 92-0473987, of Official Records.

(Affects Parcel No. 1)

16. The rights of parties in possession by reason of any unrecorded lease or leases or month to month tenancies affecting any portion of the within described property.

NOTE: This matter will be more fully set forth or deleted upon compliance with Requirement No. 5 set forth herein.

End of Schedule B

FIRST AMERICAN TITLE INSURANCE COMPANY

Commitment No. 201-800-1255409

ESCROW OFFICER:
Carol Peterson
Home Office

4801 E. Washington St., #110
Phoenix, AZ 85034
(602) 685-7560 - Fax 685-7580

REQUIREMENTS:

1. All of 1998 taxes are paid in full.

   See attached tax sheets for the following 9 Parcel Numbers:

   401-43-032B7; 401-43-032C6; 401-43-032D5; 401-43-032E4; 401-43-032F3; 401-43-032G2; 401-43-033A5; 401-43-033B4; 401-43-033C3

2. Approval by all parties to this transaction of the description used herein.

3. Furnish Plat of Survey of the subject property by a Registered Land Surveyor in accordance with the "Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys" as established in 1997. Said Plat of survey shall include the recommended certification and at the minimum, also have shown thereon Items 1, 6, 8, 10, 11, 14, 15 and 16 from Table A thereof.

   NOTE: If an ALTA 3.1 Zoning Endorsement is requested, Items 7a, 7b and 7c of Table A will also be required. If "parking" is to added to the endorsement, the number and type of parking spaces must be shown on the survey. Property use information must also be provided to First American Title Insurance Company.

4. Completion of inspection now in progress by an employee of First American Title Insurance Company. If said inspection discloses the necessity for additional exceptions and/or requirements, you will be notified.

   (SIMO ONLY)

5. Furnish copies of any existing leases affecting the within described property and insertion of said leases in Schedule B of the Policy of Title Insurance.

6. Disclosure of the nature of the interest of KATHERINE AGNES DEARING, as evidenced by Deed of Distribution, recorded August 27, 1981 in Docket 15477, Page 291, and proper divesting of said interest.

Continued . . . .

7. Record Quit Claim Deed from GARY F. CRISP AND BARBARA A. CRISP, husband and wife to MICHAEL I. SICHI, a single man.

(Affects Parcel Nos. 5 and 10)

(To correct certain discrepancies in the legal description in Deed recorded November 6, 1985 and 85-528852, of Official Records)

8. Proper showing that SEP II, a California corporation has been duly incorporated under the laws of the State of California and is now in good standing and authorized to transact business in said State.

9. Furnish a certified copy of a resolution by the Board of Directors of SEP II, a California corporation, attested to by its secretary, authorizing this transaction and naming the officers authorized to execute the instruments necessary to complete this transaction.

10. Record Warranty Deed from MICHAEL I. SICHI, an unmarried man to SEP II, a California corporation.

11. Record Deed of Trust shown as Item 4, Schedule A.

NOTE: If FIRST AMERICAN TITLE is named as Trustee under the Deed of Trust, the correct name and address is:

FIRST AMERICAN TITLE INSURANCE COMPANY, a California corporation
P.O. Box 2922
Phoenix, AZ 85062

NOTE: In connection with Arizona Revised Statutes 11-480, as of January 1, 1991, the County Recorder may not accept documents for recording that do not comply with the following:

(a) Print must be ten-point type or larger

(b) Margins of at least one-half inch along the left and right sides, one-half inch across the bottom and at least two inches on top for recording and return address information.

(c) Each instrument shall be no larger than 8-1/2 inches in width and 14 inches in length.

Continued . . . .

12. Return to title department for final recheck before recording.

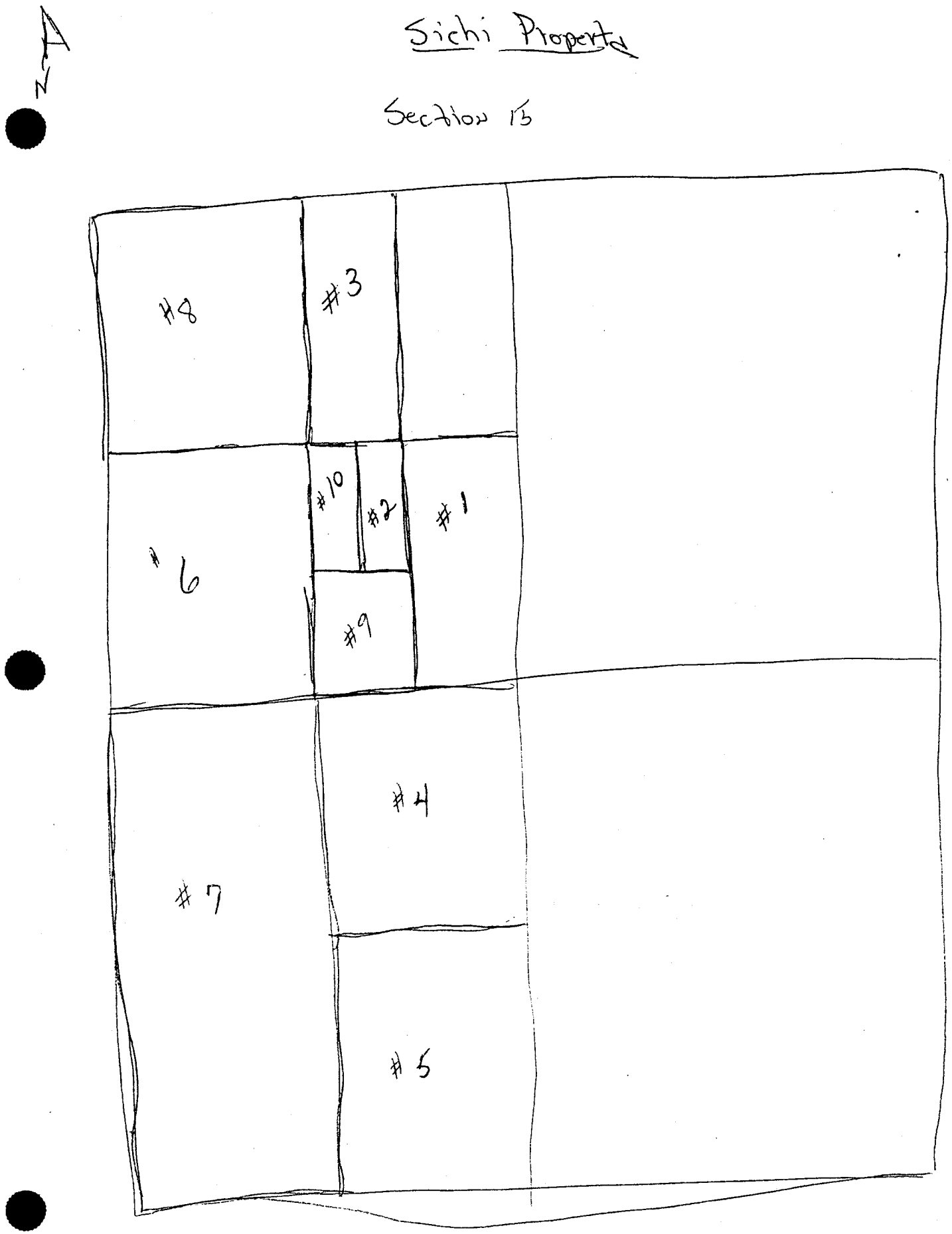
End of Requirements

NOTE:

"The Company expressly disclaims any liability resulting from date field related computer processing errors, including without limitation, "Year 2000" errors, of third parties upon whom the Company depends in processing information necessary to act as the settlement agent and/or insure the transaction. This Note is for information purposes only; it will not be carried over into any title policy and will not be construed in any way to modify or limit any policy which is issued pursuant to this Commitment."

Sichi Property

Section 13



Misc. 84 Pg 303

4

EASEMENT FOR ELECTRIC LINE

In consideration of One Dollar ($1.00), the receipt of which is hereby acknowledged, I grant Central Arizona Light and Power Company, (hereinafter called "Company"), its successors and assigns, an easement to construct, operate and maintain electric lines and poles upon, across, over and under the surface of the following described premises situate in Maricopa County, Arizona:

The West Half of Section 15, Township 1 South, Range 4 West of the Gila and Salt River Base and Meridian, EXCEPT the East 20 acres of the Northwest Quarter of the Northwest Quarter.

along the following described line on the said premises:

Beginning at a point on the north boundary line approximately 25 feet east of the west boundary line; thence southerly on a line parallel to and approximately 25 feet east of the said west boundary line to a point on the south boundary line.

STATE OF ARIZONA
County of Maricopa

I hereby certify that the within instrument was recorded in Book ____ Page ____ Records of Maricopa County, Phoenix, Arizona.

Witness my hand and official seal the day and year first above written.

Clerk of the Board, County Recorder,

By ____ Deputy.

together with the rights to repair, replace, maintain and remove said lines and poles from said premises, to trim or remove any trees or shrubs that, in the judgment of the Company, may interfere with the construction or endanger the operation of said lines and to permit the attachment of the wires of any other Company to such poles. By accepting this easement the Company agrees to exercise reasonable care to avoid damage to said premises and all property that may at any time be thereon.

Stacy B. Mecke

Dated April 12, 1967

WITNESS

STATE OF ARIZONA
County of Maricopa

This instrument was acknowledged before me this 12 day of April, 19__

WITNESS my hand and official seal the day and year in this certificate above written.

My commission expires July 3, 1968

Notary Public

08320

County of Maricopa

State of Arizona

Office of the Clerk

#5

(1)

State of Arizona
County of Maricopa } ss.

I, Myra Averill, *Clerk of the Board of Supervisors do hereby Certify That* the following is a true and correct extract from the minutes of the Board of Supervisors' meeting held January 11, 1960:

ROAD DECLARED (ROAD FILE NO. 1386)

(Attached)

In Witness Whereof, *I have hereunto set my hand and affixed the Official Seal of the Board of Supervisors. Done at Phoenix, the County Seal this* 12th *day of* January, *A.D.* 1960

Myra Averill
Clerk of the Board of Supervisors.

County Recorder
County Engineer
County Assessor
County Planning & Zoning
County R/W Agent
File

#5

(2)

ROAD DECLARED (ROAD FILE NO. 1386)

Upon motion and by unanimous vote the following resolution was passed and adopted:

WHEREAS, on the 19th day of November, 1959, the County Highway Engineer filed with the Board of Supervisors of Maricopa County, Arizona, a petition praying the Board to establish, open and declare as a County Highway the following described lines, to-wit:

> A roadway 130 feet in width being 65 feet on either side of the following described centerlines: Beginning at the Northeast corner of Section 18, T1S, R5W; thence Westerly along the North line of said Section 18 and along the North lines of Sections 13, 14, 15, 16, 17 and 18, T1S, R6W, Sections 13, 14, 15, 16, 17, and 18, T1S, R7W, to the NW corner of said Section 18, T1S, R7W; thence Northerly along the East lines of Sections 12 and 1, T1S, R8W to the NE corner of said Section 1; thence Westerly along the North lines of Sections 1, 2, 3, 4, 5 and 6, T1S, R8W; and Sections 1, 2, 3, 4, 5 and 6, T1S, R9W, to the NW corner of said Section 6, T1S, R9W.
> Also beginning at the SE corner of Section 34, T1N, R9W; thence Northerly along the East lines of Sections 34, 27, 22, 15, 10 and 3, T1N, R9W, and Sections 34, 27, 22, 15, 10 and 3, T2N, R9W, to the intersection of the Hassayampa-Salome Highway.
> Also beginning at the Southeast corner of Section 35, T2N, R8W; thence Westerly along the South line of T2N, R8W and T2N, R9W, to the SW corner of Section 31, T2N, R9W.
> Also beginning at the NE corner of Section 26, T2N, R7W; thence Southerly along the East lines of Section 26 and 35, T2N, R7W and Section 2, T1N, R7W to the intersection of the Hassayampa-Salome Highway as shown in Book 12 of Road Maps, Page 82.
> Also beginning at the NE corner of Section 30, T2N, R7W; thence Easterly along the North lines of Sections 29, 28, 27, 26 and 25, T2N, R7W, and Sections 30, 29, 28, 27, 26 and 25, T2N, R6W, to the NE corner of said Section 25, T2N, R6W.
> Also, for roadway purposes, the West 65 feet of Section 19, T3N, R2W of the Gila and Salt River Base and Meridian,

and

WHEREAS, the day and hour set by the Board for a public hearing on said petition has arrived, and notice of said hearing has been given to the public by advertising once a week for two consecutive weeks in the Arizona Weekly Gazette; and

WHEREAS, no objections to the establishment, opening and declaration of said highway have been filed; and

WHEREAS, the Board believes that the granting of said petition and the establishment, opening and declaration of the highway, as prayed for in said petition, are for the best interests of Maricopa County, and said highway is a public necessity; NOW, THEREFORE,

#6

(3)

BE IT RESOLVED that there is hereby established, opened and declared a County highway, more fully set forth hereinabove, and the County Engineer is hereby directed to make a plat of the survey of said highway and cause the same to be recorded in the office of the County Recorder of Maricopa County as provided by law.

BE IT FURTHER RESOLVED that the Board accept any right-of-way or property donated to the State or County for said highway.

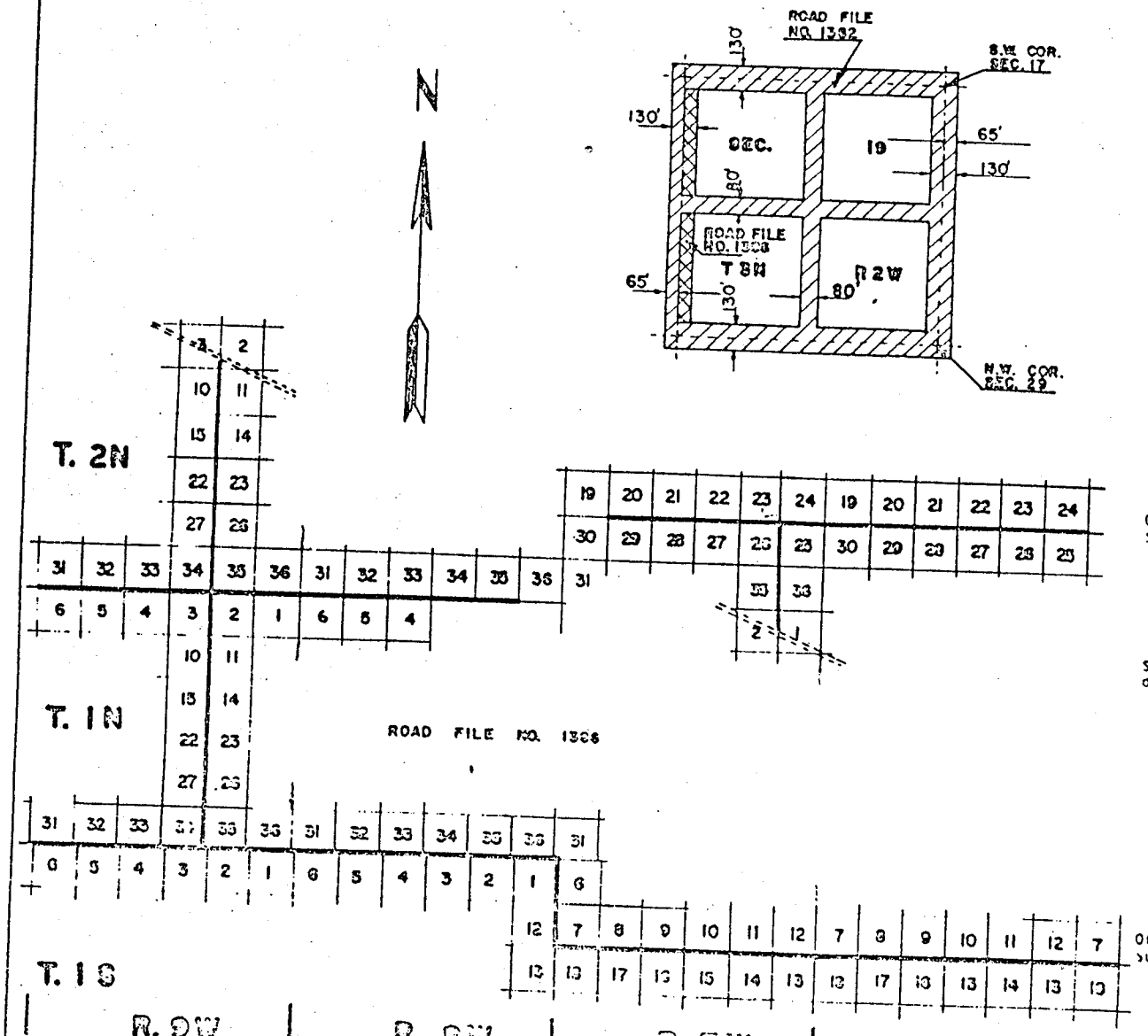
BE IT FURTHER RESOLVED that the County Engineer be directed and authorized and he is hereby so directed and authorized, to negotiate with owners of all parcels of private property required for the right-of-way of said public highway with the view of obtaining for Maricopa County said private property, subject to the ratification and approval of this Board.

BE IT FURTHER RESOLVED that the County Attorney be directed and authorized, and he is hereby directed and authorized, to initiate and prosecute actions and proceedings in the manner required by law to condemn all property required for right-of-way which cannot be obtained by donation or purchase.

DATED this 11th day of January, 1960.

DESIGNATED COUNTY ROAD A PLAT

13-48



(Road File # 1386)

Showing Designation as a County Highway the following described lines, To-wit:

A roadway 130 feet in width being 65 feet on either si the following described center lines: beginning at the Northeast corner of Section 18, T1S, R5W; thence Weste along the North line of said Section 18 and along the N lines of Sections 13, 14, 15, 16, 17 and 18, T1S, R6W, Sections 13, 14, 15, 16, 17, and 18, T1S, R7W, to the corner of said Section 18, T1S, R7W; thence Northerly the East lines of Sections 12 and 1, T1S, R8W to the NE corner of said Section 1; thence Westerly along the N lines of Sections, 1, 2, 3, 4, 5, and 6, T1S, R3W; and 1, 2, 3, 4, 5 and 6, T1S, R9W, to the NW corner of said Section 6, T1S, R9W.

Also beginning at the SE corner of Section 34, T1N, R thence Northerly along the East lines of sections 34, 2 22, 15, 10 and 3, T1N, R9W, and Sections 34, 27, 22, 1 10 and 3, T2N, R9W, to the intersection of the Hassaya Salome Highway.

Also beginning at the Southeast corner of Section 35, R6W; thence Westerly along the South line of T2N, R3W a T2N, R9W, to the SW corner of Section 31, T2N, R9W.

Also beginning at the NE corner of Section, 26, T2N, R7 thence Southerly along the East lines of Section 26 and 35, T2N, R7W and Section 2, T1N, R7W to the intersecti of the Hassayampa-Salome Highway as shown in Book 12 of Road Maps, Page 82.

Also beginning at the NE corner of Section 30, T2N, R7 thence Easterly along the North lines of Sections 29, 2 27, 26 and 25, T2N, R7W, and Sections 30, 29, 28, 27, 2 and 25, T2N, R6W, to the NE corner of said Section 25, T2N, R6W.

Also for roadway purposes, the West 65 feet of Sect 19, T3N, R2W of the Gila and Salt River Base and Meri

Officially designated January 11, 1960, by the Board of Supervisors, Maricopa County, Arizona.

Fred Glascening
County Engineer

(Road File # 1362)

Showing Designation as a County Highway the following described lines, to-wit:

A roadway 130 feet in width being 65 feet on either sid of the North, East and South lines of Section 19, T3N, R2W, of the GSSR&M. Also the South 65 feet of the Wes 65 feet of Section 17, T3N, R2W and the North 65 feet o the West 65 feet of Section 29, T3N, R2W. Also a strip of Land 65 feet in width in T3N, R2W (Unsurveyed) lying West of and adjacent to the South 65 feet of Section 19, T3N, R2W, the West line of Section 19, T3N, R2W and the North 65 feet of Section 30, T3N, R2W. Also a roadway 80 feet in width lying 40 feet on either side of the North-South mid-section line of said Section 19, and a roadway 80 feet in width lying 40 feet on either side of the East-West mid-section line of said Section 19.

Officially designated October 5, 1959, by the Board of Supervisors, Maricopa County, Arizona.

25319

Fred Glascening
County Engineer

FEB 11 1960

#5

(H)

#6

(1)

GRANT OF RIGHT OF WAY

117280

GARY F. and BARBARA A. CRISP, MICHAEL and SHARON SICHI, BILL E. and MARY REESE, (hereinafter referred to as "Grantors") for and in consideration of the sum of Ten Dollars and other good and valuable considerations paid by ARIZONA PUBLIC SERVICE COMPANY, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, to-wit: Salt River Project Agricultural Improvement and Power District, an agricultural improvement district organized and existing under and by virtue of the laws of the State of Arizona, Tucson Gas & Electric Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, Public Service Company of New Mexico, a corporation organized and existing under and by virtue of the laws of the State of New Mexico, and El Paso Electric Company, a corporation organized and existing under and by virtue of the laws of the State of Texas (all such Participants, including Arizona Public Service Company, hereinafter collectively referred to as "Grantees") which the receipt of said considerations is hereby acknowledged, do hereby grant and convey unto the Grantees, their successors and assigns, a right of way easement fifty (50) feet in width, in, upon, over and across the lands hereinafter described, to erect, construct, reconstruct, replace, repair, maintain and operate a railroad spur line for any and all uses for which such a facility may be used and all the necessary appliances, fixtures and appurtenances for use in connection therewith, and to erect, construct, reconstruct, replace, repair, maintain and use a line or lines of poles or steel towers and wires or cables, suspended thereon and supported thereby, and underground conduits, cables, vaults and manholes, for the transmission and distribution of electricity, and for all other purposes connected therewith, and for telephone, signal and communication purposes, including guys, anchorage, crossarms, braces and all other appliances and fixtures for use in connection therewith, and also for pipelines for any and all purposes, together with their necessary fixtures and appurtenances, at such locations and elevations, upon, along, over and under the hereinafter described right of way as Grantees may now or hereafter deem convenient or necessary from time to time, together with the right of ingress thereto and egress therefrom, to and along said right of way. Grantees are hereby authorized to permit the attachment of wires, cables and facilities of others to the poles, towers or structures maintained by it pursuant to this easement.

The lands through and across which this right of way easement is granted are situated in the County of MARICOPA, State of Arizona, and are particularly described as:

The West Half (W½) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila & Salt River Base & Meridian, EXCEPT the East Half (E½) of the Northeast Quarter (NE¼) of the Northwest Quarter (NW¼).

Said right of way easement in the aforesaid lands is more particularly described as follows:

The West fifty (50) feet of the East fifty-one (51) feet of the above described property EXCEPT the East Half (E½) of the Northeast Quarter (NE¼) of the Northwest Quarter (NW¼).

The Grantors reserve the right to construct, operate, maintain and attach to the Grantees' spur line, their own spur lines not to exceed seven (7) in number, and at no cost to the Grantees, with the understanding that all such attachments or use shall not in any way hinder, obstruct, curtail or limit the use of Grantees' spur line.

Grantors shall not erect or construct or permit to be erected or constructed any fences, buildings or other structures, plant any trees or drill any well, within the limits of said right of way.

Grantees shall have the right to trim, cut and clear away trees or brush whenever in their judgment the same shall be necessary for the convenient and safe exercise of the rights hereby granted.

Grantees are permitted to occupy such additional width, not to exceed fifty (50) feet, as may be necessary for the construction of the railroad spur line.

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In the event the Grantees permanently abandon said right of way, all Grantees' rights hereunder shall cease, except for the right to remove any and all property placed upon said right of way within a reasonable time subsequent to such abandonment.

The provisions hereof shall be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF, the Grantors have Executed this instrument the 1ST day of MAY, 1975.

STATE OF ARIZONA)
County of Maricopa) ss

I hereby certify that the within instrument was filed and recorded at request of
Arizona Public Service Co

MAY 27 1975 -1 05
in Docket 11174
on page 1327-1328
Witness my hand and official seal the day and year aforesaid.
Tom Freestone
County Recorder
By R. Lance
Deputy Recorder
2.00

Gary F. Crisp
Gary F. Crisp

Barbara A. Crisp
Barbara A. Crisp

Michael Sichi
Michael Sichi

Sharon Sichi
Sharon Sichi

Bill E. Reese
Bill E. Reese

Mary Reese
Mary Reese

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

This instrument was acknowledged before me this 1ST day of MAY, 1975, by GARY F. AND BARBARA A. CRISP AND BILL E AND MARY REESE

WITNESS my hand and official seal the day and year in this certificate above written.

Charles E. Laughlin
Notary Public

My Commission Expires:
AUGUST 9, 1976

INDIVIDUAL FORM OF ACKNOWLEDGMENT

STATE OF ARIZONA)
County of Coconino) ss.

On this the 15 day of May, 19 75 before me, Anita Landreth, the undersigned officer, personally appeared Michael Sichi and Sharon Sichi, known to me to be the person s whose name s subscribed to the within instrument, and acknowledged that they executed the same for the purpose therein contained.

IN WITNESS WHEREOF I hereunto set my hand and official seal.

My commission expires:
My Commission Expires June 4, 1978
(Seal)

Anita Landreth
Notary Public

N — 118 9—65

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ASSIGNMENT (AS)

RECORDED IN OFFICIAL RECORDS OF MARICOPA COUNTY, ARIZONA
FEB 26 '90 -4 00
HELEN PURCELL, County Recorder
FEE 13 POS 9 BJ

When recorded, return to:

HOLD FOR PICK UP
United Title Agency of Arizona, Inc.
Trust Department

90 085360

ASSIGNMENT OF EASEMENTS

The undersigned, ARIZONA PUBLIC SERVICE COMPANY, a corporation organized and existing under and by virtue of the laws of the State of Arizona ("Assignor"), individually and as agent for Salt River Project Agricultural Improvement and Power District, Southern California Edison Company, Public Service Company of New Mexico, and El Paso Electric Company, as participants in the Arizona Nuclear Power Project, for valuable consideration, the receipt of which is hereby acknowledged, does hereby unconditionally sell, assign, set-over, convey and transfer unto TITLE USA COMPANY OF ARIZONA (formerly known as USLife Title Company of Arizona), an Arizona corporation, as Trustee under its Trust No. 530 ("Assignee"), its successors and assigns, all of Assignor's right, title and interest in, to and under those certain easements, rights of way and grants described on EXHIBIT "A" attached hereto and made a part hereof; but excluding from such assignment any improvements, fixtures or personal property located in, on or under the real property subject to such easements, rights of way and grants, including, without limitation, the pipeline constructed thereon for the transport of waste water effluent.

This assignment is made and accepted without covenant of warranty, express or implied.

Pursuant to A.R.S. § 33-404, the names and addresses of the beneficiaries of Assignee are disclosed on EXHIBIT "B" attached hereto and made a part hereof.

DATED this 27th day of April, 1988.

ARIZONA PUBLIC SERVICE COMPANY, a corporation organized and existing under and by virtue of the laws of the State of Arizona

By David B. Kenner
Its Vice President, Engineering

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(4)

90 085360

STATE OF ARIZONA }
County of Maricopa } ss.

On this 27th day of April, 1989, before me, the undersigned Notary Public, personally appeared Donald B. Kenner, who acknowledged himself to be the Vice President of Arizona Public Service Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, and that he as such officer being authorized so to do, executed the foregoing instrument for the purpose therein contained, by signing the name of the corporation by himself as such officer.

In witness whereof, I have hereunto set my hand and official seal.

Wayne M. Darby
Notary Public

My Commission Expires:
March 14, 1989

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EXHIBIT "A" 90 085360

1. Right of Way Easement, dated March 20, 1979, executed by Josephine Blanche Coolidge, as grantor, in favor of Arizona Public Service Company, an Arizona corporation, as grantee, recorded on April 26, 1979, in Docket 13594, pages 109-110, records of Maricopa County, Arizona.

2. Easement Deed, dated January 2, 1979, executed by the Buckeye Irrigation Company, an Arizona corporation, and the Buckeye Water Conservation and Drainage District, a municipal corporation, as grantors, in favor of Arizona Public Service Company, an Arizona corporation, acting for itself and as Agent for all other participants in Palo Verde Nuclear Generating Station, and its agents and representatives, as grantee, recorded on January 15, 1979, in Docket 13382, page 816, records of Maricopa County, Arizona.

3. Pipeline Easement, dated October 30, 1980, executed by and between Maricopa County, a political subdivision of the County of Maricopa, State of Arizona, as grantor, and Arizona Public Service Company, an Arizona corporation, as grantee, recorded on January 29, 1981, in Docket 14992, pages 4-7, records of Maricopa County, Arizona.

4. Grant of Right of Way, dated May 18, 1976, executed by Clarence A. DeMerse, as grantor, in favor of Arizona Public Service, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf and as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, recorded on May 26, 1976, in Docket 11692, pages 262-263, records of Maricopa County, Arizona.

5. Grant of Right of Way, dated May 19, 1976, executed by Jesse M. Dearing and Katherine A. Dearing, as grantor, in favor of Arizona Public Service Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf and as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, recorded on May 26, 1976, in Docket 11692, pages 264-265, records of Maricopa County, Arizona.

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90 085360

6. Grant of Right of Way, executed by Gary F. Crisp, Barbara A. Crisp, Michael Sichi, Sharon Sichi, Bill E. Reese, and Mary Reese, as grantors, in favor of Arizona Public Service Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf and as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, recorded on May 27, 1975, in Docket 11174, pages 1327-1328, records of Maricopa County, Arizona.

7. Deed, dated October 26, 1977, executed by Southern Pacific Transportation Company, a Delaware corporation, as grantor, and Arizona Public Service Company, a corporation, as grantee, recorded on April 17, 1978, in Docket 12843, pages 1284-1291, records of Maricopa County, Arizona.

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6. Grant of Right of Way, executed by Gary F. Crisp, Barbara A. Crisp, Michael Sichi, Sharon Sichi, Bill E. Reese, and Mary Reese, as grantors, in favor of Arizona Public Service Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf and as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, recorded on May 27, 1975, in Docket 11174, pages 1327-1328, records of Maricopa County, Arizona.

7. Deed, dated October 26, 1977, executed by Southern Pacific Transportation Company, a Delaware corporation, as grantor, and Arizona Public Service Company, a corporation, as grantee, recorded on April 17, 1978, in Docket 12843, pages 1284-1291, records of Maricopa County, Arizona.

0378R

EXHIBIT "B"

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(3)

	Undivided Interest
Arizona Public Service Company P. O. Box 21666 Phoenix, Arizona 85036	27.97471%
	90 085360
El Paso Electric Company P. O. Box 982 El Paso, Texas 79960	10.533334%
Public Service Company of New Mexico Alvarado Square Albuquerque, New Mexico 87158	3.4%
Southern California Edison Company P. O. Box 800 Rosemead, California 91770	15.8%
Salt River Project Agricultural Improvement and Power District P. O. Box 1980 Phoenix, Arizona 85001	17.49%
Department of Water and Power of The City of Los Angeles, a department organized and existing under the charter of the City of Los Angeles, a municipal corporation of the State of California, 111 North Hope Street, Los Angeles, California 90012 Attention: Asst. General Mgr - Power	5.7%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of July 31, 1986 (the "Chase (I) Trust Agreement [PNM Unit 1]") with Palo Verde 1-PNM August 50 Corporation, a Delaware corporation, as successor beneficiary to Chase Manhattan Realty Leasing Corporation, One Chase Manhattan Plaza, New York, New York 10081, Attention: Leasing Administrator, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.377777%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 16, 1985 (the "Burnham (I) Trust Agreement [PNM Unit 1]") with Burnham Leasing Corporation, a New York corporation, Two Broadway, 6th Flr, New York, New York 10004, Attention: Mr. Phil Ozaroff, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.755556%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 16, 1985 (the "MFS (I) Trust Agreement [PNM Unit 1]") with MFS Leasing Corp., a Delaware corporation, One Mellon Bank Center, Suite 3030, Pittsburgh, Pennsylvania 15258, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.453333%

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(9)

	Undivided Interest
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 16, 1985 (the "Chrysler (I) Trust Agreement [PNM Unit 1]") with Chrysler Financial Corporation, a Michigan corporation, Greenwich Office Park I, Greenwich, Connecticut 06836, Attention: Leveraged Leasing, as beneficiary 100 Federal Street Boston, Massachusetts 02110	1.246667%
Southern California Public Power Authority d/b/a Southern California Public Power Authority Association c/o Executive Director Room 1149 Los Angeles Department of Water and Power 111 North Hope Street Los Angeles, California 90012	5.91%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Chrysler (II) Trust Agreement [El Paso Unit 2]") with Chrysler Financial Corporation, a Michigan corporation, Greenwich Office Park I, Greenwich, Connecticut 06836, Attention: Leasing and Investment Services, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.849482%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Burnham (II) Trust Agreement [El Paso Unit 2]") with Burnham Leasing Corporation, a New York corporation, 60 Broad Street, New York, New York 10004, Attention: Chief Financial Officer, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.965296%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "Burnham (III) Trust Agreement [PNM Unit 2]") with Burnham Leasing Corporation, a New York corporation, Two Broadway, 6th Flr, New York, New York 10004, Attention: Mr. Phil Ozaroff, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.7555556%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "Beneficial Trust Agreement [PNM Unit 2]") with MFS Leasing Corp., a Delaware corporation, as successor beneficiary to Beneficial Leasing Group, Inc., One Mellon Bank Center, Suite 3030, Pittsburgh, Pennsylvania, 15258, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.3777778%

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	Undivided Interest
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "MFS (II) Trust Agreement [PNM Unit 2]") with MFS Leasing Corp., a Delaware corporation, One Mellon Bank Center, Suite 3030, Pittsburgh, Pennsylvania 15258, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.4533333%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "CGI Trust Agreement [PNM Unit 2]") with CGI Capital, Inc., a Delaware corporation, One Penn's Way, Operations 1 Building, New Castle, Delaware 19720, Attention: Operations 1 Building 100 Federal Street Boston, Massachusetts 02110	.7933333%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Commercial (I) Trust Agreement [El Paso Unit 2]") with Commercial Federal Investment Corporation, a Nebraska corporation, 1300 Commercial Federal Tower, 2120 South 72nd Street, Omaha, Nebraska 68124, Attention: Mr. Jeff Bainbridge, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.513556%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 15, 1986 (the "Chase (II) Trust Agreement [PNM Unit 1]") with Palo Verde 1-PNM December 75 Corporation, a Delaware corporation, as successor beneficiary to Chase Manhattan Realty Leasing Corporation, One Chase Manhattan Plaza, New York, New York 10081, Attention: Leasing Administrator, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.566667%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 15, 1986 (the "Chase (III) Trust Agreement [PNM Unit 2]") with PV2-PNM December 35 Corporation, a Delaware corporation, as successor beneficiary to Chase Manhattan Realty Leasing Corporation, One Chase Manhattan Plaza, New York, New York, 10081 Attention: Leasing Administrator, as beneficiary 100 Federal Street, Boston, Massachusetts 02110	.2644444
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 1, 1986 (the "Commercial (II) Trust Agreement [El Paso Unit 2]") with Commercial Federal Investment Corporation, a Nebraska corporation, 1300 Commercial Federal Tower, 2120 South 72nd Street, Omaha, Nebraska 68124, Attention: Mr. Jeff Bainbridge, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.666007%

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	Undivided Interest
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Alexander Trust Agreement [El Paso Unit 2]") with Alexander Hamilton Life Insurance Company of America, a Michigan corporation, 33045 Hamilton Boulevard, Farmington Hills, Michigan 48018, Attention: Mr. Richard Egan, General Counsel, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.386111%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Palatine Trust Agreement [El Paso Unit 2]") with Palatine Hills Leasing, Inc., a Delaware corporation, 1415 South Roselle Road, Palatine, Illinois 60067, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.772222%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Energy Trust Agreement [El Paso Unit 2]") with Energy Investments Inc., a Missouri corporation, P.O. Box 13287, Kansas City, Missouri 64199-3287, Attention: Mr. Richard C. Green, Jr., as beneficiary 100 Federal Street Boston, Massachusetts 02110	.386111%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "First Chicago Trust Agreement [PNM Unit 2]") with Palo Verde Leasing Corporation, a Delaware corporation, as successor beneficiary to First Chicago Lease Holdings, Inc., Suite 0502, One First National Plaza, Chicago, Illinois 60670, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.7555556%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 1, 1986 (the "Chrysler (III) Trust Agreement" [El Paso Unit 2]) with Chrysler Financial Corporation, a Michigan corporation, Greenwich Office Park I, Greenwich, Connecticut 06836, Attention: Leasing and Investment Services, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.727881%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 15, 1986 (the "Chase (IV) Trust Agreement [APS Unit 2]") with PV2-APS 150 Corporation, a Delaware corporation, as successor beneficiary to Chase Manhattan Realty Leasing Corporation, One Chase Manhattan Plaza, New York, New York, 10081 Attention: Leasing Administrator, as beneficiary 100 Federal Street Boston, Massachusetts 02110	1.1252900%

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Copies of the Chase (I) Trust Agreement [PNM Unit 1], the Burnham (I) Trust Agreement [PNM Unit 1], the MFS (I) Trust Agreement [PNM Unit 1], the Chrysler (I) Trust Agreement [PNM Unit 1], the Chrysler (II) Trust Agreement [El Paso Unit 2], the Burnham (II) Trust Agreement [El Paso Unit 2], the Alexander Trust Agreement [El Paso Unit 2], the Palatine Trust Agreement [El Paso Unit 2], the Energy Trust Agreement [El Paso Unit 2], the First Chicago Trust Agreement [PNM Unit 2], the Burnham (III) Trust Agreement [PNM Unit 2], the Beneficial Trust Agreement [PNM Unit 2], the MFS (II) Trust Agreement [PNM Unit 2], the CGI Trust Agreement [PNM Unit 2], the Commercial (I) Trust Agreement [El Paso Unit 2], the Chase (II) Trust Agreement [PNM Unit 1], the Chase (III) Trust Agreement [PNM Unit 2], the Commercial (II) Trust Agreement [El Paso Unit 2], the Chrysler (III) Trust Agreement [El Paso Unit 2], and the Chase (IV) Trust Agreement [APS Unit 2] are available for inspection at the offices of Title USA Company of Arizona, 3030 North Central, Phoenix, Arizona.

A

#7

DKT 12118 PG 1206

DEED (D)

RECORDING REQUESTED BY

AND WHEN RECORDED MAIL TO

NAME Mr. and Mrs. Bill E. Reese
ADDRESS 6135 North 5th Place
CITY & STATE Phoenix, Arizona 85012

Order No. _____

STATE OF ARIZONA
COUNTY OF MARICOPA } ss. I hereby certify that the within instrument was filed and recorded
MAR 15 1977 - 12 45
in DOCKET 12118 Pages 1206-1208
at the request of Bill E. Reese

Witness my hand and official seal.
TOM FREESTONE, County Recorder
By R. Brooks, Deputy Recorder

Fee No. 65718

Compared

Photostated

Fee: 7.00

SPACE ABOVE THIS LINE FOR RECORDER'S USE

MAIL TAX STATEMENTS TO

NAME
ADDRESS
STREET
CITY & STATE

AFFIX I.R.S. $ ..... IN THIS SPACE

SPECIAL WARRANTY DEED

For the consideration of Ten Dollars, and other valuable considerations, the undersigned ST. PAUL TITLE and TRUST of ARIZONA, INC., an Arizona corporation, as Trustee, the Grantor herein, does hereby convey to

BILL E. REESE and MARY A. REESE, his wife, as joint tenants with right of survivorship,

the Grantee, the following real property situated in Maricopa County, Arizona:

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF

Pursuant to ARS 33-401 E.

"The Beneficiaries of the Trust and their addresses are as shown on Schedule "B" attached hereto"

SUBJECT TO: Current taxes and other assessments, reservations in patents and all easements, rights of way, encumbrances, liens, covenants, conditions, restrictions, obligations and liabilities as may appear of record.

And the Grantor hereby binds itself and its successors to warrant and defend the title as against all acts of the Grantor herein and no other, subject to the matters above set forth.

IN WITNESS WHEREOF, said Corporation has caused these presents to be signed by its duly authorized officer.

Dated March 15, 1977

ST. PAUL TITLE and TRUST of ARIZONA, INC., as Trustee
Trust No. 126
By _____
Trust Officer N. L. Dumont, Jr.

STATE OF ARIZONA
County of Maricopa } ss.

On March 15, 1977, before me, the undersigned, a Notary Public, in and for said County and State, personally appeared N. L. DUMONT, JR. known to me to be the Trust Officer of the corporation that he executed the within instrument, and also known to me to be the person who executed it on behalf of such corporation and acknowledged to me that such corporation executed the same.

My Commission Expires ..... Notary Public

Form J - A

#7 DKT 12118PG1207

EXHIBIT "A"

DESCRIPTION (2)

The East half (1/2) of the Southeast quarter (1/4) of the Northwest quarter (1/4); and the East half (1/2) of the Northwest quarter (1/4) of the Southeast quarter (1/4) of the Northeast quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, of Maricopa County, Arizona;

EXCEPTING and Reserving therefrom a non-exclusive easement and right-of-way for road, railroad and utility purposes, over, upon, and along the following described parcels of land;

(a) The North 30 feet of the East half (1/2) of the Northwest quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(b) The South 30 feet of the East half (1/2) of the Northwest quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(c) The North 30 feet of the Northwest quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(d) The South 30 feet of the Southeast quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(e) The South 30 feet of the Northwest quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(f) The North 30 feet of the Southeast quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(g) The West 50 feet of the East 51 feet of the East half (1/2) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

DKT 12118 PG 1208

#7

SCHEDULE "B"

TRUST No. 126

(3)

Beneficiaries

Name	Address
AGNES FRANCES CANNEY	4352 East 6th St. Maywood, CA 90270
GARY F. CRISP and BARBARA A. CRISP	9236 North 52nd Place Scottsdale, AZ 85251
MICHAEL I. SICHI and SHARON SICHI	Page, Arizona

DKT 12414 PG 865

RECORDING REQUESTED BY

AND WHEN RECORDED MAIL TO

NAME St. Paul Title
ADDRESS Attn: Trust Department
CITY & STATE

Order No. Trust No. 126

STATE OF ARIZONA
COUNTY OF MARICOPA } ss. I hereby certify that the within instrument was filed and recorded
SEP 2 - 1977 - 2 45
in DOCKET 12414 Pages 865-868
at the request of ST. PAUL TITLE

Witness my hand and official seal.
TOM FREESTONE, County Recorder
By R B R..., Deputy Recorder

Fee No.
Compared
Photostated
Fee: 3.00

SPACE ABOVE THIS LINE FOR RECORDER'S USE

MAIL TAX STATEMENTS TO

NAME
ADDRESS
STREET
CITY & STATE

AFFIX I.R.S. $ ..... IN THIS SPACE

NO FEE NECESSARY
EXEMPT ARS 42-1614
B-2

#17

(4)

SPECIAL WARRANTY DEED

For the consideration of Ten Dollars, and other valuable considerations, the undersigned ST. PAUL TITLE and TRUST of ARIZONA, INC., an Arizona corporation, as Trustee, the Grantor herein does hereby convey to

BILL E. REESE and MARY A. REESE, his wife,

the Grantee, the following real property situated in Maricopa County, Arizona:

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF.

THIS DEED IS EXECUTED AND RECORDED TO CORRECT CERTAIN PORTIONS OF THE LEGAL DESCRIPTIONS CONTAINED IN DEED RECORDED MARCH 15, 1977, IN DOCKET 12118, PAGE 1206, RECORDS OF MARICOPA COUNTY, ARIZONA.

Pursuant to ARS 33-401E, the Beneficiaries of the Trust and their addresses are as shown on Instrument recorded in Docket 12118, page 1208.

SUBJECT TO: Current taxes and other assessments, reservations in patents and all easements, rights of way, encumbrances, liens, covenants, conditions, restrictions, obligations and liabilities as may appear of record.

And the Grantor hereby binds itself and its successors to warrant and defend the title as against all acts of the Grantor herein and no other, subject to the matters above set forth.

IN WITNESS WHEREOF, said Corporation has caused these presents to be signed by its duly authorized officer.

Dated September 2, 1977.

ST. PAUL TITLE and TRUST of ARIZONA, INC., as Trustee
Trust No. 126
By J. D. Keller
Trust Officer

STATE OF ARIZONA
County of Maricopa } ss.

On September 2, 1977, before me, the undersigned, a Notary Public, in and for said County and State, personally appeared J. D. KELLER known to me to be the Trust Officer of the corporation that he executed the within instrument, and also known to me to be the person who executed it on behalf of such corporation and acknowledged to me that such corporation executed the same.

My Commission Expires 5-31-81

Judith Bennett
JUDITH BENNETT Notary Public

FORM 10

EXHIBIT "A"

DESCRIPTION

#7

(5)

The East half (1/2) of the Southeast quarter (1/4) of the Northwest quarter (1/4); and the East half (1/2) of the Northwest quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, of Maricopa County, Arizona;

EXCEPTING and Reserving therefrom a non-exclusive easement and right-of-way for road, railroad and utility purposes, over, upon, and along the following described parcels of land;

(a) The North 30 feet of the East half (1/2) of the Northwest quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(b) The South 30 feet of the East half (1/2) of the Northwest quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(c) The North 30 feet of the Northeast quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(d) The South 30 feet of the Southeast quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(e) The South 30 feet of the Northeast quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(f) The North 30 feet of the Southeast quarter (1/4) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(g) The West 50 feet of the East 51 feet of the East half (1/2) of the Southeast quarter (1/4) of the Northwest quarter (1/4) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

NOV 4 - 1977 4 55 DK 12529 PG 448

I do hereby certify that the within named instrument was recorded at request of MARICOPA COUNTY HIGHWAY Fee No.: 328996

County Highway Docket 12529 Page 448-449 EASEMENT (ES)

Records of Maricopa County, Arizona. 1977 OCT -7 AM 10:23

WITNESS my hand and official seal the day and year aforesaid. Fee: N/C

TOM FREESTONE By S. Lewis

County Recorder Deputy Recorder

When recorded return to: MARICOPA COUNTY BOARD OF SUPERVISORS

#8 (1)

EASEMENT AND AGREEMENT FOR HIGHWAY PURPOSES 401-43-32

Project No. 63500, Ward Road Cutoff

Item No. S-2627

ST. PAUL TITLE AND TRUST OF ARIZONA, INC., an Arizona corporation, as Trustee under Trust No. 126, GRANTORS,

for and in consideration of the sum of One Dollar and other valuable consideration, receipt of which is hereby acknowledged, do hereby grant to MARICOPA COUNTY, a political subdivision of the State of Arizona, its successors, and assigns, a permanent easement and right-of-way, for the following purposes, namely: The right to enter upon the hereinafter described land and grade, level, fill, drain, pave, build, maintain, repair and rebuild a road or highway, including incidental purposes consistent therewith, together with such bridges, culverts, ramps and cuts as may be necessary, on, over, under, and across the ground embraced within the right-of-way situated in the County of Maricopa, State of Arizona, and described as follows:

M.C.H.D. Proofed 9-13-77 Checked 9-23-77 Approved 10/12/77

The North Forty(40) feet of the Northwest one-quarter(NW¼) of Section Fifteen(15), Township One(1) South, Range Six(6) West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.
EXCEPT the East Twenty(20) acres of the NE¼ of NW¼.

To have and to hold the said easement and right-of-way unto Maricopa County, a political subdivision of the State of Arizona and unto its successors and assigns forever, together with the right of ingress and egress to permit the economical operation and maintenance of said public highway and all incidents thereto, and together with the right to authorize, permit, and license the use thereof for utilities or other public purposes not inconsistent with its primary use as a highway.

And the Grantors hereby covenant that they are lawfully seized and possessed on this aforementioned tract or parcel of land; that they have a good and lawful right to sell and convey it; and that they will warrant the title and quiet possession thereto against the lawful claim of all persons, subject to easements of record.

The said easement to include the right to cut back and trim such portion of the branches and tops of the trees now growing or that may hereafter grow upon the above described premises, as may extend over said right-of-way, so as to prevent the same from interfering with the efficient maintenance and operation of said public highway.

In the event the right, privilege and easement herein granted shall be abandoned and permanently cease to be used for the purposes herein granted all rights herein granted shall cease and revert to the grantors, their heirs or assigns.

Wherever in the foregoing instrument the plural is used, it will be read as singular when necessary, and wherever words indicating gender are employed they will apply to either masculine, feminine or neuter as the context requires.

(See Reverse Side For Agreement and Signatures)

#5

(2)

NOW THEREFORE, in consideration of the same and further consideration hereinafter set forth, it is agreed, that this instrument contains the entire agreement between the parties hereto there being no further consideration paid than herein specified.

THE COUNTY OF MARICOPA AGREES:

A. To use the above described land for the general welfare and benefit of the public.

THE GRANTOR AGREES:

1. To grant an easement for the above described land to the County of Maricopa for the general welfare and benefit of the public.

IN WITNESS WHEREOF, said Corporation has caused these presents to be signed by its duly authorized officer.

Dated October 5, 1977

ST PAUL TITLE and TRUST of ARIZONA, INC., as Trustee

Trust No. 126

By J. D. Keller
Trust Officer

STATE OF ARIZONA
County of Maricopa } ss.

On October 5, 1977, before me, the undersigned, a Notary Public, in and for said County and State, personally appeared J. D. KELLER known to me to be the Trust Officer of the corporation that be executed the within instrument, and also known to me to be the person who executed it on behalf of such corporation and acknowledged to me that such corporation executed the same.

My Commission Expires 5-21-81

Judith Bennett
JUDITH BENNETT Notary Public

FORM 10

Recommended for approval: Right of Way Agent

County Engineer

ACCEPTED:
MARICOPA COUNTY BOARD OF SUPERVISORS

by Chairman of the Board

ATTEST:

Clerk of Board of Supervisors

Date October 31, 1977

PHOTOSTATIC COPYS REQUESTED
MARICOPA COUNTY ENG. WAY DEPT.
MARICOPA COUNTY P. WORKS DEPT.
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Schedule D, Item # 5B

1 of 2

When recorded, return to:

Land Department
ARIZONA PUBLIC SERVICE COMPANY
P. O. Box 53999, Station 9370
Phoenix, Arizona 85072-3999

RECORDED IN OFFICIAL RECORDS OF MARICOPA COUNTY, ARIZONA
OCT 31 89 - 8 00
HELEN PURCELL, County Recorder
FEE 900 PGS 3

ASSIGNMNT (AS)

ASSIGNMENT OF INTEREST IN RIGHT-OF-WAY EASEMENTS

89 503790

ARIZONA PUBLIC SERVICE COMPANY, an Arizona corporation (Assignor), for good and valuable consideration, receipt of which is hereby acknowledged, hereby assigns, grants and conveys an undivided 76.22% interest to SAN DIEGO GAS & ELECTRIC COMPANY, a California corporation, and an undivided 12.78% interest to IMPERIAL IRRIGATION DISTRICT, an irrigation district organized and operating under the laws of the State of California, in certain right-of-way easements currently in Arizona Public Service Company's name, together with the covenants, rights and obligations contained therein as described in said right-of-way easements which are delineated in Exhibit "A," attached hereto and made a part hereof.

76 22
12 78

IN WITNESS WHEREOF, Assignor has executed this instrument on the 30th day of April, 1989.

ARIZONA PUBLIC SERVICE COMPANY,
an Arizona corporation

By [signature]

Its Manager, Land Department

STATE OF ARIZONA)
) ss.
County of Maricopa)

The foregoing instrument was acknowledged before me this 30th day of April, 1989, by John B. Lawson, as Manager, Land Department of ARIZONA PUBLIC SERVICE COMPANY, an Arizona corporation, on behalf of the Corporation.

[signature]
Notary Public

My Commission Expires:
My Commission Expires Nov. 12, 1992

89 503790

EXHIBIT "A"

All documents referred to below have been recorded in Maricopa County, Arizona.

APS Parcel Number	Document/Page Numbers
M-1	15037/992-995 15776/602-603
M-2	15192/300-303 * 15896/1372-1374
M-3	15004/1399-1401
M-5	15079/95-98 15438/1063-1064 15807/726-727
M-5A	15709/161-163 15709/169-171
M-6	84-532533
M-7	84-532533
M-8	14992/27-30 15428/1253-1354 15776/604-605
M-9	16342/976-977 16342/978-980
M-10	16370/814-817
M-11	16370/818-821
M-12	15137/1190-1192 15137/1193-1195
M-13	83-263432
M-14	83-263431
M-15	83-263433
M-16	83-263433
M-17	83-263433

89 503790

M-18	83-263433
M-19	83-242188 1333/608-610 Yuma County

Schedule B, #5C

9

ASSIGNMENT (AS)

RECORDED IN OFFICIAL RECORDS OF MARICOPA COUNTY, ARIZONA
FEB 26 '90 -4 00
HELEN PURCELL, County Recorder
FEE 13 — POS 9 BJ

When recorded, return to:

HOLD FOR PICK UP
United Title Agency of Arizona, Inc.
Trust Department

90 085360

ASSIGNMENT OF EASEMENTS

The undersigned, ARIZONA PUBLIC SERVICE COMPANY, a corporation organized and existing under and by virtue of the laws of the State of Arizona ("Assignor"), individually and as agent for Salt River Project Agricultural Improvement and Power District, Southern California Edison Company, Public Service Company of New Mexico, and El Paso Electric Company, as participants in the Arizona Nuclear Power Project, for valuable consideration, the receipt of which is hereby acknowledged, does hereby unconditionally sell, assign, set-over, convey and transfer unto TITLE USA COMPANY OF ARIZONA (formerly known as USLife Title Company of Arizona), an Arizona corporation, as Trustee under its Trust No. 530 ("Assignee"), its successors and assigns, all of Assignor's right, title and interest in, to and under those certain easements, rights of way and grants described on EXHIBIT "A" attached hereto and made a part hereof; but excluding from such assignment any improvements, fixtures or personal property located in, on or under the real property subject to such easements, rights of way and grants, including, without limitation, the pipeline constructed thereon for the transport of waste water effluent.

This assignment is made and accepted without covenant of warranty, express or implied.

Pursuant to A.R.S. § 33-404, the names and addresses of the beneficiaries of Assignee are disclosed on EXHIBIT "B" attached hereto and made a part hereof.

DATED this 27th day of April, 1988.

ARIZONA PUBLIC SERVICE COMPANY, a corporation organized and existing under and by virtue of the laws of the State of Arizona

By David B. Kenner
Its Vice President, Engineering

90 085360

STATE OF ARIZONA)
) ss.
County of Maricopa)

On this 27th day of April, 1988, before me, the undersigned Notary Public, personally appeared Donald B. Kenner, who acknowledged himself to be the Vice President of Arizona Public Service Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, and that he as such officer being authorized so to do, executed the foregoing instrument for the purpose therein contained, by signing the name of the corporation by himself as such officer.

In witness whereof, I have hereunto set my hand and official seal.

Wayne M. Darby
Notary Public

My Commission Expires:
March 14, 1989

EXHIBIT "A" 90 085360

1. Right of Way Easement, dated March 20, 1979, executed by Josephine Blanche Coolidge, as grantor, in favor of Arizona Public Service Company, an Arizona corporation, as grantee, recorded on April 26, 1979, in Docket 13594, pages 109-110, records of Maricopa County, Arizona.

2. Easement Deed, dated January 2, 1979, executed by the Buckeye Irrigation Company, an Arizona corporation, and the Buckeye Water Conservation and Drainage District, a municipal corporation, as grantors, in favor of Arizona Public Service Company, an Arizona corporation, acting for itself and as Agent for all other participants in Palo Verde Nuclear Generating Station, and its agents and representatives, as grantee, recorded on January 15, 1979, in Docket 13382, page 816, records of Maricopa County, Arizona.

3. Pipeline Easement, dated October 30, 1980, executed by and between Maricopa County, a political subdivision of the County of Maricopa, State of Arizona, as grantor, and Arizona Public Service Company, an Arizona corporation, as grantee, recorded on January 29, 1981, in Docket 14992, pages 4-7, records of Maricopa County, Arizona.

4. Grant of Right of Way, dated May 18, 1976, executed by Clarence A. DeMerse, as grantor, in favor of Arizona Public Service, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf and as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, recorded on May 26, 1976, in Docket 11692, pages 262-263, records of Maricopa County, Arizona.

Railroad 5. Grant of Right of Way, dated May 19, 1976, executed by Jesse M. Dearing and Katherine A. Dearing, as grantor, in favor of Arizona Public Service Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf and as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, recorded on May 26, 1976, in Docket 11692, pages 264-265, records of Maricopa County, Arizona.

6. Grant of Right of Way, executed by Gary F. Crisp, Barbara A. Crisp, Michael Sichi, Sharon Sichi, Bill E. Reese, and Mary Reese, as grantors, in favor of Arizona Public Service Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf and as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, recorded on May 27, 1975, in Docket 11174, pages 1327-1328, records of Maricopa County, Arizona.

7. Deed, dated October 26, 1977, executed by Southern Pacific Transportation Company, a Delaware corporation, as grantor, and Arizona Public Service Company, a corporation, as grantee, recorded on April 17, 1978, in Docket 12843, pages 1284-1291, records of Maricopa County, Arizona.

6. Grant of Right of Way, executed by Gary F. Crisp, Barbara A. Crisp, Michael Sichi, Sharon Sichi, Bill E. Reese, and Mary Reese, as grantors, in favor of Arizona Public Service Company, a corporation organized and existing under and by virtue of the laws of the State of Arizona, acting in its own behalf and as a Participant in Arizona Nuclear Power Project and as agent for all other Participants in Arizona Nuclear Power Project, recorded on May 27, 1975, in Docket 11174, pages 1327-1328, records of Maricopa County, Arizona.

7. Deed, dated October 26, 1977, executed by Southern Pacific Transportation Company, a Delaware corporation, as grantor, and Arizona Public Service Company, a corporation, as grantee, recorded on April 17, 1978, in Docket 12843, pages 1284-1291, records of Maricopa County, Arizona.

0378R

EXHIBIT "B"

	Undivided Interest
Arizona Public Service Company P. O. Box 21666 Phoenix, Arizona 85036	27.97471%
	90 085360
El Paso Electric Company P. O. Box 982 El Paso, Texas 79960	10.533334%
Public Service Company of New Mexico Alvarado Square Albuquerque, New Mexico 87158	3.4%
Southern California Edison Company P. O. Box 800 Rosemead, California 91770	15.8%
Salt River Project Agricultural Improvement and Power District P. O. Box 1980 Phoenix, Arizona 85001	17.49%
Department of Water and Power of The City of Los Angeles, a department organized and existing under the charter of the City of Los Angeles, a municipal corporation of the State of California, 111 North Hope Street, Los Angeles, California 90012 Attention: Asst. General Mgr - Power	5.7%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of July 31, 1986 (the "Chase (I) Trust Agreement [PNM Unit 1]") with Palo Verde 1-PNM August 50 Corporation, a Delaware corporation, as successor beneficiary to Chase Manhattan Realty Leasing Corporation, One Chase Manhattan Plaza, New York, New York 10081, Attention: Leasing Administrator, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.377777%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 16, 1985 (the "Burnham (I) Trust Agreement [PNM Unit 1]") with Burnham Leasing Corporation, a New York corporation, Two Broadway, 6th Flr, New York, New York 10004, Attention: Mr. Phil Ozaroff, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.755556%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 16, 1985 (the "MFS (I) Trust Agreement [PNM Unit 1]") with MFS Leasing Corp., a Delaware corporation, One Mellon Bank Center, Suite 3030, Pittsburgh, Pennsylvania 15258, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.453333%

	Undivided Interest
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 16, 1985 (the "Chrysler (I) Trust Agreement [PNM Unit 1]") with Chrysler Financial Corporation, a Michigan corporation, Greenwich Office Park I, Greenwich, Connecticut 06836, Attention: Leveraged Leasing, as beneficiary 100 Federal Street Boston, Massachusetts 02110	1.246667%
Southern California Public Power Authority d/b/a Southern California Public Power Authority Association c/o Executive Director Room 1149 Los Angeles Department of Water and Power 111 North Hope Street Los Angeles, California 90012	5.91%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Chrysler (II) Trust Agreement [El Paso Unit 2]") with Chrysler Financial Corporation, a Michigan corporation, Greenwich Office Park I, Greenwich, Connecticut 06836, Attention: Leasing and Investment Services, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.849482%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Burnham (II) Trust Agreement [El Paso Unit 2]") with Burnham Leasing Corporation, a New York corporation, 60 Broad Street, New York, New York 10004, Attention: Chief Financial Officer, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.965296%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "Burnham (III) Trust Agreement [PNM Unit 2]") with Burnham Leasing Corporation, a New York corporation, Two Broadway, 6th Flr, New York, New York 10004, Attention: Mr. Phil Ozaroff, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.7555556%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "Beneficial Trust Agreement [PNM Unit 2]") with MFS Leasing Corp., a Delaware corporation, as successor beneficiary to Beneficial Leasing Group, Inc., One Mellon Bank Center, Suite 3030, Pittsburgh, Pennsylvania, 15258, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.3777778%

90 085360

	Undivided Interest
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "MFS (II) Trust Agreement [PNM Unit 2]") with MFS Leasing Corp., a Delaware corporation, One Mellon Bank Center, Suite 3030, Pittsburgh, Pennsylvania 15258, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.4533333%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "CGI Trust Agreement [PNM Unit 2]") with CGI Capital, Inc., a Delaware corporation, One Penn's Way, Operations 1 Building, New Castle, Delaware 19720, Attention: Operations 1 Building 100 Federal Street Boston, Massachusetts 02110	.7933333%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Commercial (I) Trust Agreement [El Paso Unit 2]") with Commercial Federal Investment Corporation, a Nebraska corporation, 1300 Commercial Federal Tower, 2120 South 72nd Street, Omaha, Nebraska 68124, Attention: Mr. Jeff Bainbridge, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.513556%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 15, 1986 (the "Chase (II) Trust Agreement [PNM Unit 1]") with Palo Verde 1-PNM December 75 Corporation, a Delaware corporation, as successor beneficiary to Chase Manhattan Realty Leasing Corporation, One Chase Manhattan Plaza, New York, New York 10081, Attention: Leasing Administrator, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.566667%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 15, 1986 (the "Chase (III) Trust Agreement [PNM Unit 2]") with PV2-PNM December 35 Corporation, a Delaware corporation, as successor beneficiary to Chase Manhattan Realty Leasing Corporation, One Chase Manhattan Plaza, New York, New York, 10081 Attention: Leasing Administrator, as beneficiary 100 Federal Street, Boston, Massachusetts 02110	.2644444
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 1, 1986 (the "Commercial (II) Trust Agreement [El Paso Unit 2]") with Commercial Federal Investment Corporation, a Nebraska corporation, 1300 Commercial Federal Tower, 2120 South 72nd Street, Omaha, Nebraska 68124, Attention: Mr. Jeff Bainbridge, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.666007%

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	Undivided Interest
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Alexander Trust Agreement [El Paso Unit 2]") with Alexander Hamilton Life Insurance Company of America, a Michigan corporation, 33045 Hamilton Boulevard, Farmington Hills, Michigan 48018, Attention: Mr. Richard Egan, General Counsel, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.386111%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Palatine Trust Agreement [El Paso Unit 2]") with Palatine Hills Leasing, Inc., a Delaware corporation, 1415 South Roselle Road, Palatine, Illinois 60067, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.772222%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 1, 1986 (the "Energy Trust Agreement [El Paso Unit 2]") with Energy Investments Inc., a Missouri corporation, P.O. Box 13287, Kansas City, Missouri 64199-3287, Attention: Mr. Richard C. Green, Jr., as beneficiary 100 Federal Street Boston, Massachusetts 02110	.386111%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of August 12, 1986 (the "First Chicago Trust Agreement [PNM Unit 2]") with Palo Verde Leasing Corporation, a Delaware corporation, as successor beneficiary to First Chicago Lease Holdings, Inc., Suite 0502, One First National Plaza, Chicago, Illinois 60670, Attention: President, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.7555556%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 1, 1986 (the "Chrysler (III) Trust Agreement" [El Paso Unit 2]) with Chrysler Financial Corporation, a Michigan corporation, Greenwich Office Park I, Greenwich, Connecticut 06836, Attention: Leasing and Investment Services, as beneficiary 100 Federal Street Boston, Massachusetts 02110	.727881%
The First National Bank of Boston, as Owner Trustee under the Trust Agreement, dated as of December 15, 1986 (the "Chase (IV) Trust Agreement [APS Unit 2]") with PV2-APS 150 Corporation, a Delaware corporation, as successor beneficiary to Chase Manhattan Realty Leasing Corporation, One Chase Manhattan Plaza, New York, New York, 10081 Attention: Leasing Administrator, as beneficiary 100 Federal Street Boston, Massachusetts 02110	1.1252900%

90 085360

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Copies of the Chase (I) Trust Agreement [PNM Unit 1], the Burnham (I) Trust Agreement [PNM Unit 1], the MFS (I) Trust Agreement [PNM Unit 1], the Chrysler (I) Trust Agreement [PNM Unit 1], the Chrysler (II) Trust Agreement [El Paso Unit 2], the Burnham (II) Trust Agreement [El Paso Unit 2], the Alexander Trust Agreement [El Paso Unit 2], the Palatine Trust Agreement [El Paso Unit 2], the Energy Trust Agreement [El Paso Unit 2], the First Chicago Trust Agreement [PNM Unit 2], the Burnham (III) Trust Agreement [PNM Unit 2], the Beneficial Trust Agreement [PNM Unit 2], the MFS (II) Trust Agreement [PNM Unit 2], the CGI Trust Agreement [PNM Unit 2], the Commercial (I) Trust Agreement [El Paso Unit 2], the Chase (II) Trust Agreement [PNM Unit 1], the Chase (III) Trust Agreement [PNM Unit 2], the Commercial (II) Trust Agreement [El Paso Unit 2], the Chrysler (III) Trust Agreement [El Paso Unit 2], and the Chase (IV) Trust Agreement [APS Unit 2] are available for inspection at the offices of Title USA Company of Arizona, 3030 North Central, Phoenix, Arizona.

When recorded, return to:

United Title Agency of Arizona, Inc.
Trust Department
3030 N. Central Ave.
Phoenix, AZ 85012 Att'n: Patricia Bauer

RECORDED IN OFFICIAL RECORDS
OF MARICOPA COUNTY, ARIZONA
AUG 15 '90 -4 00
HELEN PURCELL, County Recorder
FEE 10 PGS 10 BJ

90 369527

GRANT OF RIGHT OF WAY

ESTHER M. HOFFMAN, a married woman dealing with her sole and separate property as to an undivided one-third (1/3) interest; KAY FRANCES McGREW, a married woman dealing with her sole and separate property, as to an undivided one-third (1/3) interest; and RICHARD VAN DERIPE, a single man, as to an undivided one third (1/3) interest (hereinafter collectively referred to as "Grantors") for and in consideration of the sum of Ten Dollars and other good and valuable consideration paid by UNITED TITLE AGENCY OF ARIZONA (formerly known as Title USA Company of Arizona formerly known as USLife Title Company of Arizona), an Arizona corporation, as Trustee under Trust No. 530 (hereinafter referred to as "Grantee"), the receipt of which is hereby acknowledged, do hereby grant and convey unto Grantee, its successors and assigns, and Grantee's beneficiaries, their successors and assigns, a right of way easement one (1) foot in width, in, upon, over and across the lands hereinafter described, to erect, construct, reconstruct, replace, repair, maintain and operate a railroad spur line for any and all uses for which such a facility may be used and all the necessary appliances, fixtures and appurtenances for use in connection therewith, and to erect, construct, reconstruct, replace, repair, maintain and use a line or lines of poles or steel towers and wires or cables, suspended thereon and supported thereby, and underground conduits, cables, vaults and manholes, for the transmission and distribution of electricity, and for all other purposes connected therewith, and for telephone, signal and communication purposes, including guys, anchorage, crossarms, braces and all other appliances and fixtures for use in connection therewith, and also for pipelines for any and all purposes, together with their necessarY fixtures and appurtenances, at such locations and elevations, upon, along, over and under the hereinafter described right of way as Grantee, its successors and assigns, and Grantee's beneficiaries, their successors or assigns may now or hereafter deem convenient or necessary from time to time, together with the right of ingress thereto and egress therefrom, to and along said right of way. Grantee, its successors and assigns, and Grantee's beneficiaries, their successors and assigns are

hereby authorized to permit the attachment of wires, cables and facilities of others to the poles, towers or structures maintained pursuant to this easement.

The lands through and across which this right of way easement is granted are situated in the County of Maricopa, State of Arizona, and are more particularly described on Exhibit A attached hereto and incorporated herein by this reference.

Grantors shall not erect or construct or permit to be erected or constructed any fences, buildings or other structures, plant any trees nor drill any well, within the limits of said right of way.

Grantee, its successors and assigns, and Grantee's beneficiaries, their successors and assigns shall have the right to trim, cut and clear away trees or brush whenever in their judgment the same shall be necessary for the convenient and safe exercise of the rights hereby granted.

Grantee, its successors and assigns, and Grantee's beneficiaries, their successors and assigns are permitted to occupy such additional width, not to exceed fifty (50) feet, as may be necessary for the construction of the railroad spur line.

In the event Grantee permanently abandons said right of way, all Grantee's rights hereunder shall cease, except Grantee shall have the right to remove any and all property placed upon said right of way within a reasonable time subsequent to such abandonment.

Pursuant to A.R.S. § 33-404, the names and addresses of the beneficiaries of Grantee are disclosed on Exhibit B attached hereto and incorporated herein by this reference.

The provisions hereof shall be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF, Grantors have executed this Grant of Right of Way as the 4th day of August, 1990.

90 369527

Esther M. Hoffman
ESTHER M. HOFFMAN

STATE OF ~~ARIZONA~~ CALIFORNIA)
SAN DIEGO) ss.
County of ~~Maricopa~~)

This instrument was acknowledged before me this 4th day of August, 1990, by ESTHER M. HOFFMAN.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

OFFICIAL SEAL
COLETTE DEE LIPSEY
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
My Comm. Expires June 4, 1994

Colette Dee Lipsey
Notary Public

My Commission Expires:
June 4, 1994

GRANT OF RIGHT OF WAY

90 369527

Kay Frances McGrew
KAY FRANCES McGREW

STATE OF CALIFORNIA)
) ss.
County of SAN DIEGO)

This instrument was acknowledged before me this 14th day of JULY, 1988, by KAY FRANCES McGREW.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Barbara J. Frazier
Notary Public

My Commission Expires:
SEPTEMBER 14, 1990

OFFICIAL SEAL
BARBARA J. FRAZIER
NOTARY PUBLIC CALIFORNIA
PRINCIPAL OFFICE IN
SAN DIEGO COUNTY
My Commission Exp Sept 14 1990

Richard D Van Deripe

RICHARD VAN DERIPE

90 369527

STATE OF CALIFORNIA)
) ss.
County of San Diego)

This instrument was acknowledged before me this 12th day of July, 1988, by RICHARD VAN DERIPE.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Notary Public

My Commission Expires:

February 10, 1989

OFFICIAL SEAL
ROBERT J WECKMAN
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
My comm. expires FEB 10, 1989

(Parcel 80)
0468R

90 369527

EXHIBIT "A"

The Southwest quarter of the Northeast quarter (SW¼NE¼) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian.

Said Right of Way Easement in the aforesaid lands is more particularly described as follows:

The West One (1) foot of the North Three Hundred Thirty (330) feet of the above-described property.

Schedule D, F & UD

GMD

United Title Agency of Arizona, Inc.

48

When recorded, return to:

United Title Agency of Arizona, Inc.
Trust Department
3030 N. Central Ave.
Phoenix, AZ 85012 Att'n: Patricia Bauer

RECORDED IN OFFICIAL RECORDS
OF MARICOPA COUNTY, ARIZONA
AUG 15 '90 - 4 10
HELEN PURCELL, County Recorder
FEE 10 PGS 10 BJ

90 369527
90 435154

GRANT OF RIGHT OF WAY

ESTHER M. HOFFMAN, a married woman dealing with her sole and separate property as to an undivided one-third (1/3) interest; KAY FRANCES McGREW, a married woman dealing with her sole and separate property, as to an undivided one-third (1/3) interest; and RICHARD VAN DERIPE, a single man, as to an undivided one third (1/3) interest (hereinafter collectively referred to as "Grantors") for and in consideration of the sum of Ten Dollars and other good and valuable consideration paid by UNITED TITLE AGENCY OF ARIZONA* (formerly known as Title USA Company of Arizona formerly known as USLife Title Company of Arizona), an Arizona corporation, as Trustee under Trust No. 530 (hereinafter referred to as "Grantee"), the receipt of which is hereby acknowledged, do hereby grant and convey unto Grantee, its successors and assigns, and Grantee's beneficiaries, their successors and assigns, a right of way easement one (1) foot in width, in, upon, over and across the lands hereinafter described, to erect, construct, reconstruct, replace, repair, maintain and operate a railroad spur line for any and all uses for which such a facility may be used and all the necessary appliances, fixtures and appurtenances for use in connection therewith, and to erect, construct, reconstruct, replace, repair, maintain and use a line or lines of poles or steel towers and wires or cables, suspended thereon and supported thereby, and underground conduits, cables, vaults and manholes, for the transmission and distribution of electricity, and for all other purposes connected therewith, and for telephone, signal and communication purposes, including guys, anchorage, crossarms, braces and all other appliances and fixtures for use in connection therewith, and also for pipelines for any and all purposes, together with their necessary fixtures and appurtenances, at such locations and elevations, upon, along, over and under the hereinafter described right of way as Grantee, its successors and assigns, and Grantee's beneficiaries, their successors or assigns may now or hereafter deem convenient or necessary from time to time, together with the right of ingress thereto and egress therefrom, to and along said right of way. Grantee, its successors and assigns, and Grantee's beneficiaries, their successors and assigns are

* INC..

This document is being re-recorded for the sole purpose of correcting the name of the Grantee and adding the referenced Exhibit B and correct the referenced A.R.S. Number.

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hereby authorized to permit the attachment of wires, cables and facilities of others to the poles, towers or structures maintained pursuant to this easement.

The lands through and across which this right of way easement is granted are situated in the County of Maricopa, State of Arizona, and are more particularly described on Exhibit A attached hereto and incorporated herein by this reference.

Grantors shall not erect or construct or permit to be erected or constructed any fences, buildings or other structures, plant any trees nor drill any well, within the limits of said right of way.

Grantee, its successors and assigns, and Grantee's beneficiaries, their successors and assigns shall have the right to trim, cut and clear away trees or brush whenever in their judgment the same shall be necessary for the convenient and safe exercise of the rights hereby granted.

Grantee, its successors and assigns, and Grantee's beneficiaries, their successors and assigns are permitted to occupy such additional width, not to exceed fifty (50) feet, as may be necessary for the construction of the railroad spur line.

In the event Grantee permanently abandons said right of way, all Grantee's rights hereunder shall cease, except Grantee shall have the right to remove any and all property placed upon said right of way within a reasonable time subsequent to such abandonment.

Pursuant to A.R.S. § 33-404* the names and addresses of the beneficiaries of Grantee are disclosed on Exhibit B attached hereto and incorporated herein by this reference.

The provisions hereof shall be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF, Grantors have executed this Grant of Right of Way as the 4th day of August, 1990.

*the correct A.R.S. reference is 33-401E

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~~90 369527~~

ESTHER M. HOFFMAN

STATE OF ~~ARIZONA~~ CALIFORNIA)
SAN DIEGO) ss.
County of ~~Maricopa~~)

This instrument was acknowledged before me this 4th day of August, 1990, by ESTHER M. HOFFMAN.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

OFFICIAL SEAL
COLETTE DEE LIPSEY
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
My Comm. Expires June 4, 1994

Notary Public

My Commission Expires:

June 4, 1994

GRANT OF RIGHT OF WAY

90 435154

~~90 369527~~

Kay Frances McGrew
KAY FRANCES McGREW

STATE OF CALIFORNIA)
) ss.
County of SAN DIEGO)

This instrument was acknowledged before me this 14th day of JULY, 1988, by KAY FRANCES McGREW.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Barbara J. Frazier
Notary Public

My Commission Expires:
SEPTEMBER 14, 1990

OFFICIAL SEAL
BARBARA J. FRAZIER
NOTARY PUBLIC CALIFORNIA
PRINCIPAL OFFICE IN
SAN DIEGO COUNTY
My Commission Exp Sept 14 1990

90 435154

Richard Van Deripe
RICHARD VAN DERIPE

~~90 369527~~

STATE OF CALIFORNIA)
) ss.
County of San Diego)

This instrument was acknowledged before me this 12th day of July, 1988, by RICHARD VAN DERIPE.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Notary Public

My Commission Expires:
February 10, 1989

OFFICIAL SEAL
ROBERT J WECKMANN
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
My comm. expires FEB 10, 1989

(Parcel 80)
0468R

90 435154

~~90 369527~~

EXHIBIT "A"

The Southwest quarter of the Northeast quarter (SW¼NE¼) of Section Fifteen (15), Township One (1) South, Range Six (6) West of the Gila and Salt River Base and Meridian.

Said Right of Way Easement in the aforesaid lands is more particularly described as follows:

The West One (1) foot of the North Three Hundred Thirty (330) feet of the above-described property.

EXHIBIT "B"

90 435154

The names and addresses of the Beneficiaries are as disclosed in instrument recorded in Document 87-127969, records of Maricopa County, Arizona.

RECORDED IN OFFICIAL RECORDS
OF MARICOPA COUNTY, ARIZONA
SEP 27 '90 -8 00
HELEN PURCELL, County Recorder
FEE 1 — PGS 2 HC

APPENDIX E

SWCA, INC. ENVIRONMENTAL CONSULTANTS

NATURAL AND CULTURAL RESOURCES LETTER REPORT

SWCA INC. ENVIRONMENTAL CONSULTANTS

October 18, 1999

Mr. Brad Johnson
SCS Engineers
2702 North 44th Street, Suite 105B
Phoenix, Arizona 85008-1583

RE: Natural and Cultural Resources Overview - 400 acre property near Palo Verde Nuclear Power Plant, Maricopa County, Arizona

Dear Mr. Johnson:

SWCA has been contracted by SCS Engineers to complete a natural resources and cultural resources overview on a 400-acre project area. This letter report addresses (1) the presence or potential presence of federally-listed or species of special concern (attached), (2) Clean Water Act Section 404 compliance requirements, and (3) the results of a cultural resource site file search. The project area is proposed for construction of an alternative-energy power generating facility. It is located on privately owned land within the Upper Sonoran desert, and ranges in elevation from 850-900 feet. The project area is south of Elliot Road, west of 383rd Avenue, and north of the Southern Pacific Railroad line (Figure 1). The legal location of the project area is Section 15 of Township 1 South, Range 6 West, outside of Buckeye, Maricopa County, Arizona.

Attached is a Natural Resources Overview (NRO). This NRO was prepared to assess the resources within the project area and to evaluate the presence of individuals or habitat for species federally-listed as threatened or endangered as well as other special status species within the project area. In addition, Arizona Game and Fish Department (AGFD) has been contacted regarding other special status species that may have been recorded within or near the project area. A response from AGFD has not yet been received, and typically takes 4-6 weeks to receive. The NRO will be updated, if necessary upon receipt. Thirteen federally-listed species are reported by the U.S. Fish and Wildlife Service (USFWS) as having the potential to occur in Maricopa County. Habitat evaluations for each of these species were completed in the field. The result of the field survey indicate that none of the species listed by USFWS are expected to occur regularly in the project area based on the known elevational and geographic ranges of these species, and on the habitat characteristics of the project area (see attached NRO).

SWCA biologists also surveyed the property on October 7, 1999 for the presence of areas that may be considered jurisdictional waters of the U.S., wetlands, or special aquatic sites under Section 404 of the Clean Water Act. The project area contains no wetland or special aquatic sites, but does contain ephemeral washes considered to be jurisdictional. Criteria used to determine the status of washes was channel width, indicator(s) of ordinary high water mark, and presence of riparian vegetation. At least two jurisdictional washes occur, but aerial photos are required for a more accurate delineation. One of the washes crosses the property diagonally in the southeast corner, and is mapped on the 7.5 minute Arlington quad. Another jurisdictional wash occurs to the west of the mesquite bosque on the west side of the project area. SWCA can advise on the best permitting strategy once proposed impacts on jurisdictional waters are determined. If impacts are determined to be between zero and 1/3 of an acre, no permit will be required. If a 404 permit is required, to obtain such a permit a general range of cost would be $5,000.00-$15,000.00 which includes

SWCA INC. ENVIRONMENTAL CONSULTANTS
100 West Coolidge Street • Phoenix, Arizona 85013
(602) 274-3831 • FAX (602) 274-3958

generating the necessary supporting documents such as: 401 certification, alternatives analysis, Environmental Assessment coordination, habitat mitigation and monitoring plan, cultural resource field survey, and a Biological Evaluation.

SWCA also examined the site files at the Arizona State Museum (ASM) and the Arizona State Historic Preservation Office (SHPO) to determine if any previous surveys had been conducted in the area or if any cultural resources have previously been recorded. The SHPO had no records of any sites or previous surveys in or near the project area. At the ASM, two projects are reported for the project area. A transmission line survey was conducted in 1981 and no sites were found. The surveyed alignment was oriented north-south, passing through the eastern part of the project area (Richard E. Effland, Jr. and Margerie Green, 1982, *A Survey of Four Yuma 500 Kv Transmission Line Locations*, Archaeological Consulting Services, Ltd., Tempe). A later survey was conducted for a pipeline, passing through the center of the project area, in an east-west orientation. No cultural resources were found during this survey (A.E. Rogge, 1994, *Pacific Corp Turbine Pipeline Project - Wintersburg Alternative: A Cultural Resource Survey*, Dames and Moore, Inc., Phoenix.).

If you have any questions or require any additional information, please contact me or Mr. Ken Houser at (602) 274-3831.

Sincerely,

Fiona Goodson

Fiona Goodson

P:\Natural Resources\Projects and Reports\Palo Verde\sumlet.wpd

NATURAL RESOURCE OVERVIEW

PALO VERDE POWER PLANT, MARICOPA COUNTY ARIZONA

Prepared for:

SCS ENGINEERING

Prepared by:

SWCA, INC.
ENVIRONMENTAL CONSULTANTS

SWCA INC.

October 1999

NATURAL RESOURCES OVERVIEW
PALO VERDE POWER PLANT
MARICOPA COUNTY, ARIZONA

Prepared for

SCS Engineers
2702 North 44th Street
Suite 105B
Phoenix, Arizona 85008

Prepared by

SWCA, Inc.
Environmental Consultants
100 West Coolidge Street
Phoenix, Arizona 85013

October 18, 1999

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Appendix B. ADA Notice of Intent to Clear Land

EXECUTIVE SUMMARY

SWCA, Inc. Environmental Consultants was contracted by the SCS Engineers to complete a Natural Resources Overview (NRO) in support of the development of an alternative-energy electrical generating facility located outside Palo Verde, Maricopa County, Arizona. The project area encompasses approximately 400 acres and is located in Section 15 of Township 1 South, Range 6 West. This NRO was prepared to assess the resources within the project area and to evaluate the presence of individuals or habitat for species federally-listed as threatened or endangered and other special status species within the project area.

Thirteen federally-listed species are reported by the U.S. Fish and Wildlife Service (USFWS) as having the potential to occur in Maricopa County. Habitat evaluations for each of these species were completed in the field. Arizona Game and Fish Department (AGFD) was consulted regarding other special status species that may have been recorded within or near the project area. This NRO will be updated if necessary once correspondence is received.

None of the species listed by USFWS are expected to occur regularly in the project area based on the known elevational and geographic ranges of these species, and on the habitat characteristics of the project area.

1.0 INTRODUCTION

This report serves as a Natural Resources Overview (NRO) for the proposed alternative-energy electrical generating facility located within Maricopa County, Section 15 of Township 1 South, Range 6 West. The project area is south of Elliot Road, west of 383rd Avenue, and north of the Southern Pacific Railroad line (Figure 1).

This NRO evaluates the presence of individuals or habitat for species listed as threatened or endangered by the USFWS under the Endangered Species Act (ESA) and other special status species as defined below. This NRO is based on the USFWS listings of threatened and endangered species in Maricopa County. A field evaluation was conducted to determine the suitability of the project area and vicinity for federally-listed and other special status species.

Species status designations and their implications are summarized below. In general, projects on private land are only required to consider effects on federally-listed (threatened or endangered) species. However, it is recommended that other special status species are also considered in project planning and development.

- **Listed Species.** These are plants and animals listed by the USFWS as threatened or endangered under the ESA. The ESA specifically prohibits the "take" of a listed species. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct."[1] The USFWS has interpreted the definition of take to also include modification of habitat that supports listed species. Projects that may affect listed species or their habitat require either consultation with the USFWS under either Section 7 or an Incidental Take Permit under Section 10(a) of the ESA. The USFWS maintains a listing of threatened and endangered species known to occur or have occurred in each Arizona county.

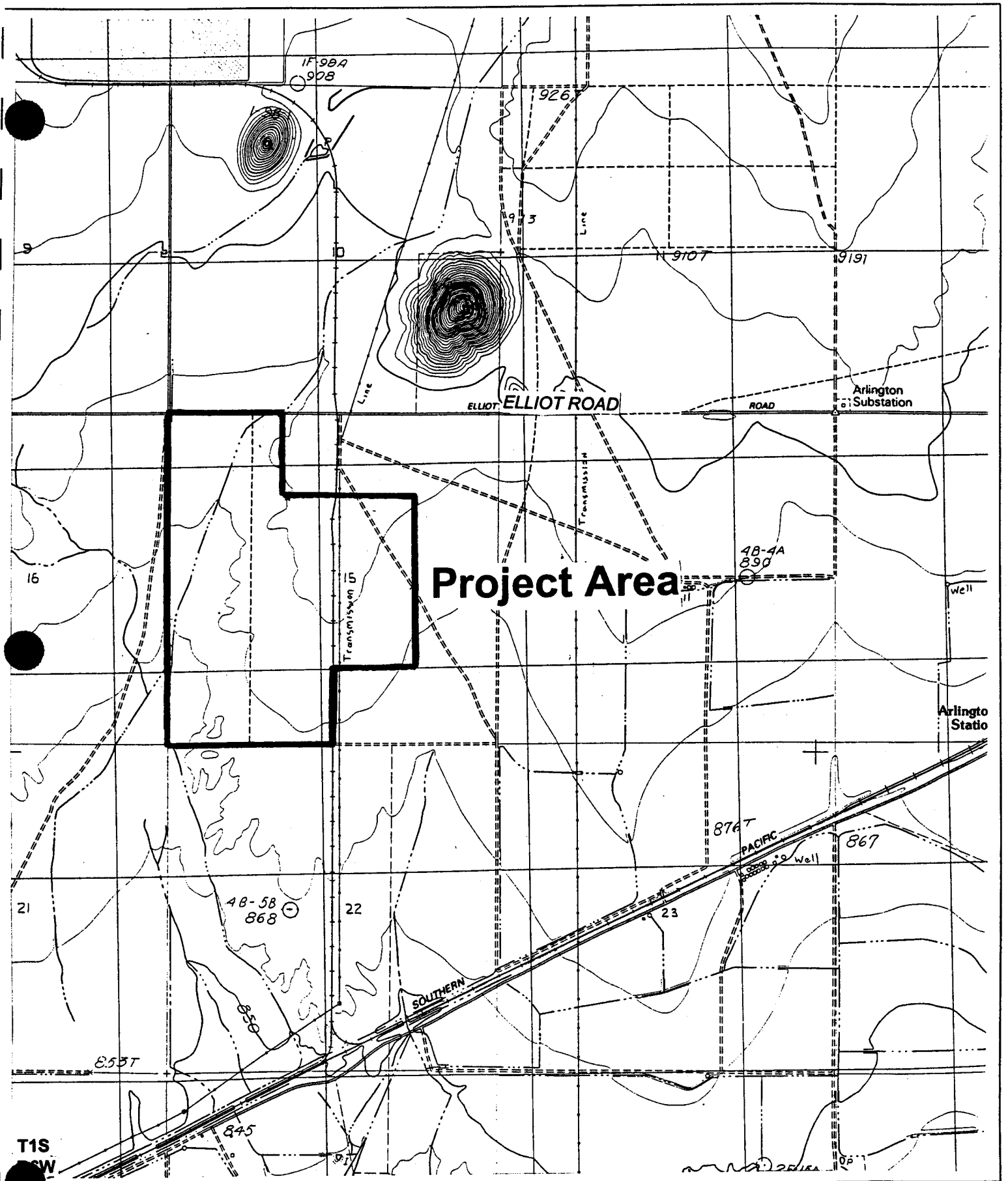
- **Proposed Species.** These are species that have been proposed by the USFWS for listing under the ESA. They are not legally protected by the ESA, but because these species may be listed in the near future, they typically receive the same consideration. USFWS threatened and endangered species listings by county also include proposed and candidate (see below) species.

- **Candidate Species.** These are species that are being considered for listing as threatened or endangered under the ESA, but have not yet been proposed. Like proposed species, they are not legally protected under the ESA.

- **Wildlife of Special Concern in Arizona.** The Arizona Game and Fish Department (AGFD) formerly listed 116 species as extinct, endangered, threatened, and candidate species in Arizona (AGFD 1988). While the terminology used by AGFD was identical to that of USFWS, the AGFD categories were advisory and provided no legal protection for take of such species or modification of their habitat under the ESA.

---

[1] Endangered Species Act, Section 3, paragraph 19. Further, 50 CFR § 17.3 defines "harm" as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering."



SWCA Environmental Consultants Inc.
100 West Coolidge, Phoenix, Arizona 85013

Map Source: 7.5' USGS Quadrangle, Arlington, AZ (1984)

1 Mile 1/2 1

1000 Feet 0 1000 2000 3000

1 Kilometer 0.5 1

Palo Verde Power Plant

Figure 1. Project Location.

The latter point contrasts the USFWS list. To avoid confusion, AGFD is currently revising and reissuing their list as "Wildlife of Special Concern in Arizona" without using the terms endangered or threatened. The revised list has not yet been officially adopted, but has been published in draft form (AGFD 1996).

- **Sensitive.** These are species considered sensitive when occurring on lands managed by the U.S. Forest Service. They are not legally protected under the ESA, but should be considered in project planning and development. Projects requiring easements or authorizations on Forest Service lands may have to consider these species.

- **Protected Plants.** The Arizona Department of Agriculture (ADA) administers the Arizona Native Plant Law. The law categorizes protected plants as Highly Safeguarded and Salvage Restricted, among others. Many common native forbs, shrubs, trees, and succulents are protected. It is unlawful to collect, transport, transplant, or kill protected native plants without a permit or without following specific regulatory procedures. Such regulation also applies to protected plants on private lands. The law does not prevent the destruction of protected plants on private lands as long as (1) the plants are not transported from the land or offered for sale and (2) the landowner notifies the ADA of the intended destruction[2]. Destruction of Highly Safeguarded plants is subject to review by the ADA.

2.0 METHODS

The AGFD was contacted in writing on October 14, 1999 to obtain information about the known occurrence of any federally-listed threatened and endangered species in or near the project site. The AGFD maintains a statewide database which tracks records for federally-listed species and other species of concern. Species listings provided by the AGFD are indicative of those for which current or historic records exist within a 5-mile radius of the project area. The USFWS Internet database was also accessed to obtain information on federally-listed species that may potentially occur in Maricopa County.

A field investigation was conducted on October 7, 1999 to determine the habitat types present in the project area and its immediate vicinity. The surveyed area includes open-spaces crossed by transmission lines, and a railroad spur, which runs through the project area in a north-south direction. Two parallel man-made channels run north-south on the western side of the property and fences or fence posts are present along the perimeter of the project area. Dominant vegetation types and species were recorded during the evaluation. Based on documented habitat requirements, a determination was made of the suitability of the project area and its immediate vicinity for threatened and endangered species listed by the USFWS as having the potential to occur in Maricopa County.

---

[2]Landowners must notify the ADA regarding intended destruction of native plants at least 20 days before plants are destroyed over an area less than one acre, 30 days before plants are destroyed over an area less than 40 acres, and 60 days before plants are destroyed over an area 40 acres or more. The required ADA notification form is attached as Appendix B to this report.

3.0 RESULTS

3.1 Description of the Project Area

3.1.1 Topography and Elevation

The project area occurs at an elevation of 850-900 feet above mean sea level, on a gently sloping alluvial plain. The project area is characterized by soils that are sandy to gravelly and granitic in nature and is occasionally crossed by small ephemeral washes running in a north-south direction. While there are two unnamed buttes to the north of the project area, no significant geologic structures occur within the site. The larger of the two buttes to the north has a maximum elevation of approximately 1,240 feet.

3.1.2 Physical Characteristics and Land Use

The project area is currently undeveloped. However, this area has been used for grazing and some related man-made features are present, including fence lines and a pair of man-made canals that run north-south through the property. The only adjacent development is the Palo Verde Nuclear Generating Facility to the north. A single railroad line and several transmission lines traverse the property. The project area is crossed by several ephemeral washes which run in a north-south direction, towards the Gila River. No sources of permanent standing water were found within the site.

3.1.2 Vegetation

The predominant vegetation type within and around the project area is classified as Arizona Upland Division Sonoran Desertscrub, palo verde-mixed scrub-mixed cacti series (Brown 1994). Vegetation differs depending on elevation and topography and degree of disturbance. Vegetation within the project area is primarily characterized by monotypic stands of creosotebush (*Larrea tridentata*), and a large mesquite (*Prosopis* sp.) bosque. Other types of vegetation present include: graythorn (*Ziziphus obtusifolia*), catclaw acacia (*Acacia greggii*), crucifixion thorn (*Holacantha emoryi*), triangle-leaf bursage (*Ambrosia deltoidea*), tamarisk (*Tamarix* sp.), and various grasses. Cacti found within the project area and include hedgehog (*Echinocereus engelmannii*), barrel (*Ferocactus wislizenii*), and cholla (*Opuntia* sp.). No saguaros (*Carnegiea gigantea*) were observed within the project area.

The distribution of plant species is relatively uniform over the majority of the open spaces within the project area, with trees and larger shrubs occurring both along ephemeral washes and canals. The only exception is the large mesquite bosque on the western half of the project area.

3.2 Agency Correspondence

The USFWS Internet Database was accessed and thirteen species that are endangered or threatened are listed for Maricopa County. Listed species identified by the USFWS and their possible occurrence in the project area are summarized in Table 1. Presently, correspondence has not been received from the AGFD regarding federally-listed species or species of special concern that may have been recorded in and/or near the project area. When correspondence is received, this NRO will be updated, if necessary.

Table 1. Threatened and endangered species listed by the USFWS for Maricopa County and their potential to occur within the project area. E=federally-listed endangered, T=federally-listed threatened

Species Common Name *Scientific Name*	**Status**	**Possible Occurrence in Project Area**
Arizona agave *Agave arizonica*	E	Species not expected to occur in project area: Project site below known elevation range for this species, lack of plant communities with which species is typically associated, no agaves of any species found on site.
Arizona cliffrose *Purshia subintegra*	E	Species not expected to occur in project area: No limestone deposits or outcrops in the project area.
Arizona hedgehog cactus *Echinocereus triglochidiatus arizonicus*	E	Species not expected to occur in project area: Project site below known elevation range, lack of plant communities with which species is typically associated.
Lesser long-nosed bat *Leptonycteris curasoae yerbabuenae*	E	Species not expected to occur in project area: Project site outside of known geographic range, no possible roost sites; limited foraging resources.
Sonoran pronghorn *Antilocapra americana sonoriensis*	E	Species not expected to occur in project area: Project site outside of known geographic range.
Desert pupfish *Cyprinodon macularius macularius*	E	Species not expected to occur in project area: Project site outside of known geographic range, no permanent aquatic habitat, and no records in project vicinity.
Gila topminnow *Poeciliopsis occidentalis occidentalis*	E	Species not expected to occur in project area: Project site outside of known geographic range, no permanent aquatic habitat in project area, and no records in project vicinity.
Razorback sucker *Xyrauchen texanus*	E	Species not expected to occur in project area: No permanent aquatic habitat in project area, no known records in project vicinity.
*American peregrine falcon *Falco peregrinus anatum*	E	Species not expected to occur regularly in project area: No high cliffs for nesting and perching in project area.
Cactus ferruginous pygmy-owl *Glaucidium brasilianum cactorum*	E	Species not expected to occur regularly in project area: No recent records in Maricopa County, vegetation characteristics not similar to known pygmy-owl habitat.
Southwestern willow flycatcher *Empidonax traillii extimus*	E	Species not expected to occur regularly in project area: No suitable riparian habitat in project area.
Yuma clapper rail *Rallus longirostrus yumanensis*	E	Species not expected to occur in project area: No marsh, aquatic, or possible riparian habitat.
Bald eagle *Haliaeetus leucocephalus*	T	Species not expected to occur in project area: No reservoirs, rivers, perennial streams in project area.
Mexican spotted owl *Strix occidentalis lucida*	T	Species not expected to occur in project area: Project area unsuitable for nesting, unlikely to be used by wintering or transient birds.

Source: USFWS 1998; http://ifw2es.fws.gov/EndangeredSpecies/Lists/ListSpecies.cfm
*Recently removed from the Federal list of Endangered and Threatened Wildlife. See section 3.3.9.

3.3 Possible Occurrence of Federally-Listed Species

No federally-listed species are expected to occur regularly in the project area. More detailed descriptions of each species, including habitat requirements, known geographic and elevational range, and recorded occurrences, are provided in this section.

3.3.1 Arizona agave

The Arizona agave is found in the transition zone between oak-juniper woodland and mountain mahogany-oak scrub at 3,000 to 6,000 feet above sea level. Its known habitats are characterized by steep rocky slopes, however, it can occur on drainage bottoms or on relatively gentle slopes or saddles (USFWS 1998). The plant is believed to have originated through a hybridization between two other agave species, *A. chrysantha* and *A. toumeyana* var. *bella*. The nearest known populations of this plant occur in the New River Mountains, north and west of the project area.

The site is below the known elevation range at which Arizona agave typically occurs. Furthermore, no oak-juniper woodland or mahogany-oak scrub vegetation associations occur within or near the project area. No agaves of any species were observed during field investigations. This species is not expected to occur in the project area.

3.3.2 Arizona cliffrose

Arizona cliffrose is restricted to Tertiary limestone lake bed deposits and occurs in small populations within relatively few locations in southeastern, central, and north-central Arizona (USFWS 1998). The only known population of Arizona cliffrose in Maricopa County is located in the Horseshoe Lake area.

Soils in the project area are sandy and gravelly, derived primarily from granitic rock. No limestone deposits or outcrops were found in or near the project area. Arizona cliffrose is not expected to occur in the project area.

3.3.3 Arizona hedgehog cactus

The Arizona hedgehog cactus is found on open slopes in narrow cracks between boulders and in the understory of shrubs in the zone between Madrean Evergreen Woodlands and Interior Chaparral at an elevation range from about 3,700 to 5,200 feet above sea level (USFWS 1998).

The elevation of the project area is below the known elevational range for this species. No Madrean Evergreen Woodlands or Interior Chaparral vegetation types occur. Arizona hedgehog cactus is not expected to occur in the project area.

3.3.4 Lesser long-nosed bat

The lesser long-nosed bat is a migratory species that occurs as a summer resident in desertscrub habitats in southeastern and central Arizona. Pregnant females of this species generally arrive in late April and early May and form maternity roosts in abandoned mine adits and natural caves. In late summer, lesser long-nosed bats migrate to higher elevations and feed primarily on the nectar and pollen of agaves and roost locally in caves. There are currently only three known maternity roosts in the State, all of which occur in southern Arizona (Petryszyn 1998). There are relatively few records for this species in Maricopa

County; prior to 1986, records were limited to one from Phoenix and one from Glendale (Hoffmeister 1986). A single sight record (1992) also exists from a mine site in the Scottsdale area, although the species was not positively identified as a lesser long-nosed bat (Tim Snow, AGFD, per. comm. to SWCA 1998). Except for these records, the project area is outside the known geographic range for this species.

The occurrence of this species in the project area is considered highly unlikely. Potential roost sites such as mine adits and natural caves were not found within the project area. The United States Geological Survey (USGS) Arlington 7.5' quadrangle was examined and no such features were found within or near the project area. The project area is outside the known geographic range for this species, and there are no agaves and sparse saguaros on the project area, and therefore few possible foraging resources for this species.

3.3.5 Sonoran pronghorn

The Sonoran pronghorn occurs only as a small remnant population in arid flatlands of southwestern Arizona and adjacent Sonora, Mexico, although historically this subspecies ranged more widely than at present (AGFD 1996). Its habitat consists of wide alluvial basins with desert grasslands in the Sonoran Desert climatic zone (USFWS 1998).

The project site falls well outside the known geographic range of this subspecies in southwestern Arizona; Sonoran pronghorn are not expected to occur in the project area.

3.3.6 Desert pupfish

The desert pupfish occurred historically throughout the lower Gila River Basin. Although formerly extirpated in the State, the subspecies *C. m. macularius* has been reintroduced in four locations. The other subspecies, *C.m. eremus*, occurs only in Organ Pipe National Monument in southwestern Arizona (AGFD 1996).

The project area is outside the known geographical range of the species and does not support aquatic habitat.

3.3.7 Gila topminnow

Gila topminnows occurred historically in low to mid-elevation streams in drainages associated with the Gila River. A fairly extensive reintroduction of this species into its historic range occurred in the 1970s, with some success (AGFD 1996). Gila topminnows have been reintroduced at 11 natural sites in southern Arizona (AGFD 1996) and 200 sites throughout the Southwest (USFWS 1998).

The project area does not support a permanent aquatic habitat.

3.3.8 Razorback sucker

Formerly widespread in the Gila and Colorado River systems, this species has been extirpated from much of its former range including the Gila River and its tributaries (USFWS 1994). Reintroduction of millions of fingerlings and a few large razorback suckers were made into the Gila, Salt, and Verde rivers and some tributaries between 1981 and 1990. No populations of razorbacks appear to have become established in any of the areas where they were reintroduced and little evidence has been found of individuals persisting

for more than a few months (Hendrickson 1993).

There is no aquatic habitat in the project area for the razorback sucker.

3.3.9 American peregrine falcon

The American peregrine falcon was officially removed from the Federal list of Endangered and Threatened Wildlife on August 25, 1999 (Federal Register 1999). However, the bird is still protected under the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as amended. The Act provides for regulations to control the taking, selling, transporting, and importing of migratory birds, their nests, eggs, and parts or products, when such items are included in the terms of any treaty, and provides enforcement authority and penalties for violations.

In Arizona, peregrine falcons typically occur throughout the State at elevations up to 9,000 feet, sometimes at considerable distances from standing water. Peregrine falcons prefer high cliffs for nesting and perching, although they have also been found to nest in trees and on high rise buildings (Johnsgard 1990). Transient and wintering peregrine falcons have been reported in downtown Phoenix and Mesa and nest on suitable cliff sites in areas outside the greater Phoenix area (Witzeman et al. 1997).

No peregrine falcons were seen in or around the project area during the field evaluation. The topography of the area is relatively flat and does not include high cliffs that the peregrine falcon typically uses for perching and nesting. The falcons may fly over the general project area on occasion in search of prey, but the area is not likely to be an important foraging area. The project area is not considered to have nesting habitat for this species.

3.3.10 Cactus ferruginous pygmy-owl

Habitat for the cactus ferruginous pygmy-owl in Arizona includes Sonoran riparian deciduous woodlands and Sonoran desertscrub. Currently, this species is known only from southern Arizona, primarily Pima County and southern Pinal County. There are no recent records of this species in Maricopa County. Historic records from around the turn of the century exist for New River, Cave Creek, Phoenix, Salt River, and Agua Caliente in western Maricopa County (Johnson et al. 1998). A cactus ferruginous pygmy-owl was collected at the confluence of the Salt and Verde Rivers in 1951. A ferruginous pygmy-owl was heard at this location in 1971, but was not visually confirmed or heard after that (Witzeman et al. 1997). There are no historic or recent records of the cactus ferruginous pygmy-owl in the project vicinity.

The occurrence of the species appears unlikely based on the lack of recent records of the species in Maricopa County and the habitat characteristics of the site.

3.3.11 Southwestern willow flycatcher

The southwestern willow flycatcher is a riparian-obligate species that nests in densely vegetated flood plain areas where cottonwood, willow, box elder, buttonbush, and arrow weed are present (USFWS 1998). Generally, this species is found in Sonoran life zones, although it has also been recorded from higher elevation in the White Mountains. The factors that are important to Southwestern willow flycatcher habitat include distribution and isolation of vegetation patches, hydrology, prey types and abundance, parasites, predators, interspecific competition, and environmental factors (NPS 1997). The project area falls outside the designated critical habitat for this species (Federal Register 1997).

No riparian habitat occurs in the project area. Southwestern willow flycatcher is not expected to nest or occur in the project area.

3.3.12 Yuma clapper rail

The Yuma clapper rail is a summer resident in cattail and bulrush marshes in the central and southwestern portions of the State. It has been reported from the Salt River near the Verde River confluence. A least 29 individuals were recorded in 1995 along the Gila River west of Phoenix (Witzeman et al. 1997).

No marsh or other aquatic riparian habitats occur in the project area. Yuma clapper rail is not expected to nest or occur in the project area.

3.3.13 Bald eagle

In Arizona, bald eagles nest primarily along the Gila, Salt, Verde, and Bill Williams Rivers (USFWS 1998). Over 200 bald eagles may winter in the State, primarily near lakes and reservoirs.

Bald eagles are not expected to nest or forage near the project area due to the lack of permanent surface water sources such as streams, rivers, or lakes. Bald eagles may occasionally fly over the project area but are not expected to occur regularly in the project area.

3.3.14 Mexican spotted owl

Suitable habitat for the Mexican spotted owl is generally described as a relatively closed canopy ponderosa pine/mixed conifer forest associated with steep canyons or north-facing slopes in the northern and eastern portions of the State and with deciduous vegetation in steep canyons in the southern and southeastern portions of the State (Ganey and Balda 1994). Populations are scattered and occur in all but the arid southwestern portion of the state and most of the lowland riparian zones (USFWS 1998). Outside the breeding season, Mexican spotted owls may be found in canyons at lower elevations and have occasionally been reported in urbanized park settings in the Phoenix and Tucson metropolitan areas (R.B. Duncan, R.B. Duncan and Associates, pers. comm. to SWCA, 1999).

Mexican spotted owls are not expected to nest in the project area. Their occasional occurrence in winter is possible, but highly improbable.

4.0 FINDINGS/RECOMMENDATIONS

No federally-listed species are expected to occur regularly in the project area. No additional field work is required. However, we recommend species-specific field surveys be conducted for the cactus ferruginous pygmy-owl if a federal permit is required. Survey requirements require two consecutive years of three surveys per year between January-June.. Sonoran desert tortoise-like scat was observed during the field investigation. The desert tortoise is not protected by the ESA, but is considered a species of special concern in Arizona. A copy of the desert tortoise handling guidelines are included as Appendix A.

All native shrubs, trees, and cacti are protected under the Native Plant Law. The Arizona Department of Agriculture (ADA) must be notified at least 60 days prior to destruction of protected native plants. A copy of the notification form to ADA is included as Appendix B.

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APPENDIX A
Sonoran Desert Tortoise Handling Guidelines

APPENDIX B

Arizona Department of Agriculture Notice of Intent to Clear Land

Exhibit B-5
Water Study

EVALUATION OF GROUNDWATER RESPONSES TO PUMPING FOR PROPOSED POWER PLANTS IN THE CENTENNIAL WASH AREA, MARICOPA COUNTY, ARIZONA

INTERIM REPORT

Prepared for
Sempra Energy Resources

Prepared by
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Phoenix, Arizona

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April 4, 2000

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EXECUTIVE SUMMARY

This interim report presents a current summary of information regarding the groundwater system and a preliminary evaluation of the potential response of groundwater to pumping for three proposed power plants in the Centennial Wash Area. Development and calibration of a groundwater flow model to project responses to pumping for the three proposed power plants will be based on the findings of this report.

The region consisting of the Hassayampa Sub-Basin of the Phoenix Active Management Area was considered in compiling and reviewing relevant reports and data regarding groundwater. Review of that information indicated that focusing efforts on a local study area is appropriate within the Hassayampa Sub-Basin. The local study area is called the Centennial Wash Area.

The geologic framework of the Centennial Wash Area was developed starting from the extensive work conducted for siting of the Palo Verde Nuclear Generating Station and review of drillers', geologists' and geophysical logs collected from the files of the Arizona Department of Water Resources. In order of oldest to youngest, the geologic units identified in the area are:

- Basement Complex – Precambrian granitic and metamorphic rocks
- Bedrock – Tertiary (Miocene) Volcanic-Sedimentary sequence
- Lithologic Zone 1 – Tertiary (Miocene-Pliocene) Indurated Fanglomerate (also called the Red Unit)
- Lithologic Zone 2 – Tertiary-Quaternary Lower Silt, Sand and Gravel Deposits (also called the Lower Alluvial Unit)
- Lithologic Zone 3 – Tertiary-Quaternary (Upper Pliocene) Palo Verde Clay (part of the Middle Alluvial Unit)
- Lithologic Zone 4 – Tertiary-Quaternary Upper Silt Deposits (part of the Middle Alluvial Unit)
- Lithologic Zone 5 – Quaternary Upper Sand and Gravel Deposits (part of the Upper Alluvial Unit)

- Lithologic Zone 6 – Quaternary Younger Fan Deposits (part of the Upper Alluvial Unit)

The principal aquifer system and perched water-table aquifers are hydrostratigraphic units selected from this geologic framework and consideration of available water-level elevation contour maps and hydrographs. The regional, principal aquifer system comprises aquifers in the Volcanic-Sedimentary Bedrock Sequence, the Red Unit, and the Lower Alluvial Unit. Where the Palo Verde Clay of the Middle Alluvial Unit is present, it is a leaky aquitard confining the principal aquifer system. Where the Palo Verde Clay is absent and the Upper Silt Deposits of the Middle Alluvial Unit are present, the Upper Silt Deposits are also included with the principal aquifer system. Where the Palo Verde Clay is present, perched water-table aquifers may develop in the overlying Upper Silt Deposits or Upper Alluvial Unit with water-level elevations tens of feet higher than those of the underlying principal aquifer.

The Basement Complex and the Palo Verde Clay were identified as boundaries to groundwater flow in the Centennial Wash Area. The Basement Complex serves as a substantial boundary to groundwater flow both horizontally at the sides of the area and vertically as a basement to the area. The Basement Complex rises up along the northeast side of the Centennial Wash Area and restricts groundwater flow there. The Palo Verde Clay is not as substantial a boundary to flow as the Basement Complex, but it is expected to substantially slow the flow of groundwater downward from the surface and upward from the principal aquifer system where the Basement Complex rises up in the northwestern part of the Centennial Wash Area.

The available data and interpretations for hydraulic parameters such as transmissivity and hydraulic conductivity for the Centennial Wash Area were compiled and reviewed. The available information for estimating hydraulic parameters is sparse. Efforts are ongoing to collect data and estimate hydraulic parameters in the vicinity of the proposed power plants.

Recharge and discharge components of the groundwater system in the Centennial Wash Area were identified and preliminary estimates were made as data allowed. The recharge components were summarized as:

- Groundwater flow in from adjacent areas,
- Infiltration of precipitation and runoff, and
- Infiltration from agricultural operations;

and included:

- West-bound groundwater flow in from the West Salt River Valley beneath the Gila River channel near Hassayampa,

- East-bound groundwater flow in from the Harquahala Basin beneath the Centennial Wash channel at Mullen's Cut,
- Direct infiltration of precipitation,
- Infiltration of runoff at mountain fronts,
- Gila River infiltration,
- Hassayampa River infiltration,
- Centennial Wash infiltration,
- Minor tributary infiltration,
- Industrial detention basin infiltration,
- Agricultural leaching requirement, and
- Arlington Canal transmission losses.

The discharge components were summarized as:

- Groundwater flow out to adjacent areas,
- Groundwater flow into the Gila River,
- Evapotranspiration, and
- Wells;

and included:

- Southeast-bound groundwater flow out to the Gila Bend Basin beneath the Gillespie Basalt flow near Gillespie Dam,
- Direct evaporation from the water table,
- Transpiration from phreatophytes,
- Groundwater flow into the Gila River,
- Agricultural pumping,
- Industrial pumping,
- Domestic pumping, and
- Pumping for livestock watering.

The recharge and discharge estimates were assembled into a preliminary groundwater budget and the resulting summary was reviewed. Inspection of the preliminary groundwater budget indicates that the estimated boundary flows and flows to and from the Gila River will require refinement. This conclusion is based on expected overall depletions in storage indicated by water-level data and the assumption that the agricultural water use estimates are relatively accurate, an assumption that should be confirmed

Based on the information available to date, it is concluded that approximately 40,000 acre-feet per year (ac.-ft./yr.) of pumping for agriculture in the Centennial Wash Area from approximately 1950 to 1980 resulted in water-level declines near pumping centers of over 100 feet. During the times of largest drawdowns in the pumping centers, water-level elevations in areas a few miles from the pumping centers fluctuated up and down by only a few feet. Proposed pumping for the power plants is estimated here at 16,000 to

18,000 ac.-ft./yr. Therefore, the response of the groundwater system to pumping for the power plants - water-level declines - may be expected to be a fraction (perhaps one third to half) of that observed in the past in response to agricultural pumping.

The conclusions of this interim report should be tested by refining the water budget components through model calibration and conducting simulations of 30 years of power plant pumping. A model provides for consistent comparison of simulated water level elevations with measured water-level elevations (calibration targets) and therefore is a more severe test of water budget components than a simple, lumped water balance. The available water-level data will provide suitable targets for model calibration.

In developing the model, agricultural water use characteristics of the area during the past 50 years should be further investigated and the relevant water budget component estimates should be refined. Estimates of flow to and from the Gila River should be refined as part of model calibration.

To further support and guide the calibration of the model, additional estimates of hydraulic parameters should be developed through the conduct of aquifer tests in the principal aquifer system at several locations using observation wells, as they are available and access can be obtained. The hydraulic parameter estimates resulting from the aquifer tests can be incorporated into the model during calibration and can serve as additional calibration targets.

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1.0 INTRODUCTION

1.1 Purpose

The goal of the work discussed in this interim report is to qualitatively evaluate the potential response of groundwater to pumping for three proposed electrical power generation facilities (power plants) south of the Palo Verde Nuclear Generating Station (PVNGS) west of Phoenix, Arizona. In support of addressing this goal, the following objectives were selected:

1. Review relevant reports on groundwater for the region surrounding the proposed power plants,
2. Select a local model study area,
3. Review in detail the available reports and data for the local model study area,
4. Characterize the groundwater resources of the local model study area,
5. Qualitatively evaluate the response of the groundwater in the local model study area to pumping for the proposed power plants, and
6. Develop the technical foundation for development of quantitative calculations of groundwater response to the proposed power plant pumping.

This interim report addresses the first five objectives stated above. The development of a computer simulation model of the groundwater in the local model area to address the sixth objective has begun with technical input from the Arizona Department of Water Resources, Maricopa County, and representatives and technical consultants to the proposed power plant companies. The development and results of that model will be presented in a separate document.

1.2 Background on Arizona Groundwater Regulation

The following discussion of potential groundwater use by the three proposed power plants requires some background on terms derived from groundwater regulations in Arizona. This subsection is a preliminary effort at providing definitions of these terms, but does not purport to be a legal analysis. Instead, this subsection is a generalized collection of definitions found in publicly available sources and commonly used in discussions of water use by the proposed power plants. Legal counsel should be consulted for interpretation of Arizona's statutes for a specific situation.

Groundwater rights within Active Management Areas (AMAs) are subject to the Arizona Groundwater Management Act of 1980 (GMA) and are quantified and enforced by the Arizona Department of Water Resources (ADWR). All of the proposed power plants are within the Phoenix Active Management Area (PhxAMA). All of the power plants have acquired rights to pump groundwater through purchase of farmlands with associated groundwater rights.

Irrigation grandfathered rights (IGRs) within the AMAs are calculated by ADWR based on the GMA as follows: "multiply the water duty acres for each farm within the farm unit by the irrigation water duty for the farm unit and divide that amount by the number of irrigation acres in the farm..." (ADWR, 1998 - page 76). Irrigation water duty or water duty is "the amount of water in acre-feet per acre that is reasonable to apply to irrigated land in a farm unit during the accounting period as determined by the [ADWR] director..." [underlining added] (ADWR, 1998 – page 54). An acre-foot (ac.-ft.) is a volume unit commonly used in Arizona that amounts to 325,851 gallons of water. Water duty acres are "...the highest number of acres in the farm, taking rotation into account, which were legally irrigated in any one year in the five years preceding January 1, 1980 ..."[underlining added] (ADWR, 1998 - page 76). The irrigation acres are "...the acres in the farm which were legally irrigated at any time during the five years preceding January 1, 1980..." [underlining added] (ADWR, 1998 – page 76). Note that the water duty changes with the accounting period while the other quantities are fixed based on the data from 1975-1980. ADWR institutes plans to reduce agricultural water use by adjusting the amount reasonable to apply to irrigated land in each 10-year management plan period (1980-1990, 1990-200, etc.).

An IGR can be conveyed for non-irrigation use, specifically an "...industry engaged in the generation of electrical energy for the purpose of electrical energy generation..." (ADWR, 1998, page 86). The right after conveyance is called a Type I non-irrigation grandfathered right (or, informally, a Type I right) and amounts to the lesser of the IGR or ..."three acre-feet per year multiplied by the number of water duty acres in the farm in which the acre to which the right is appurtenant is located divided by the number of irrigation acres in the farm" (ADWR, 1998 – Page 87). Although the applicability of protocols for determining the Type I rights are to be evaluated by legal counsel, the general process is to allow three ac.ft. per acre per year (ac.-ft./ac.-yr.) of farmland purchased by the power companies.

By foreseeing the purchases of agricultural lands for other uses with urban growth, and instructing ADWR to reduce water rights from a typical range of four to six ac.ft./ac.-yr. down to three ac.ft./ac.-yr. upon conveyance, the GMA instituted a long-term plan to reduce groundwater use by agriculture. The GMA, through ADWR, limits the maximum permissible pumping by the proposed power plants to their conveyed Type I rights. With this background in mind, the potential groundwater use by the proposed power plants is summarized below.

1.3 Three Proposed Power Plants

The three proposed power plants would connect to a new switchyard south of PVNGS called the Palo Verde South Switchyard. The three proposed power plants are:

- The Mesquite Power Project proposed by Sempra Energy Resources,

- The Arlington Valley Energy Project proposed by Duke Energy North America, and

- The Combined Cycle Power Plant Project (informally known as the Redhawk Plant) proposed by Pinnacle West Energy Corporation.

All three power plants will be new combined cycle facilities that generate electrical power primarily from combustion of natural gas, but also use residual heat to create steam and generate electrical power from the steam as well. All of the proposed facilities will be built in 500-megawatt (MW) units.

The Mesquite Power Project proposed by Sempra Energy Resources comprises two 500-MW units completed by 2003, depending on the completion of the Palo Verde South Switchyard (Sempra Energy Resources, 2000). The project owns options to purchase approximately 2,990 acres of farmland with approximately 15,000 ac.-ft./yr. of IGR. The conveyance at a rate of 2.67 ac.-ft./ac.-yr. (less than three ac.-ft./ac.-yr. due to the number of acres irrigated during the historical period) would result in a Type I right of 7,990 ac.-ft./yr. Based on operational plans, the proposed project is expected to have a water demand of approximately 7,500 ac.-ft./yr. Pumping on the acquired land for irrigation since 1983 ranged from zero to 3,400 ac.-ft./yr. and averaged 700 ac.-ft./yr. (ADWR, 1999b), an amount that is well below the IGR or conveyed Type I rights.

The Arlington Valley Energy Project proposed by Duke Energy North America comprises two 500-MW units. Maximum estimated water demand at build out is estimated to equal the conveyed Type I rights (ARCADIS Geraghty & Miller, 1999). Duke Energy North America acquired 2,400 acres of farmland with six IGRs. The total of the IGRs for 1999 was 11,200 ac.-ft./yr., which was obtained by applying varying water duties to lands totaling 2,272 acres. Conveyance to a Type I right at three ac.-ft./ac.-yr. would amount to 6,817 ac.-ft./yr. Pumping on the acquired land for irrigation since 1983 ranged from 1,700 ac.-ft./yr. to 7,400 ac.-ft./yr. and averaged 4,000 ac.-ft./yr. (ADWR, 1999b), an amount that is well below the IGR or conveyed Type I rights.

The Combined Cycle Power (Redhawk) Plant proposed by Pinnacle West Energy Corporation comprises four 500-MW units built one at a time and completed between late 2000 and 2007 (Hargis+Associates, Inc., 1999 - page 1). Maximum estimated water demand at build-out is 13,300 ac.-ft./yr. The projected water supply will be 90 to 95 percent effluent purchased from PVNGS (11,970 to 12,640 ac.-ft./yr.). Negotiations for the effluent delivery between PVNGS and Pinnacle West Energy Corporation continue at this writing (April 2000). Pinnacle West Energy Corporation purchased 1,119 acres of farmland with IGRs that will convey to Type I rights amounting to approximately 3,356 ac.-ft./yr. Groundwater demand for the Redhawk Plant is expected to be 660 to 1,330 ac.-ft./yr., given expected effluent deliveries, but permissible maximum under state law will be the Type I right (approximately 3,360 ac.-ft./yr.). Pumping on the acquired land for irrigation since 1983 has ranged from 1 ac.-ft./yr. to 2,500 ac.-ft./yr. and averaged 600 ac.-ft./yr. (ADWR, 1999b), an amount that is well below the IGR or conveyed Type I rights.

Together, the three power plants have acquired 6,509 acres of farmlands with 31,200 ac.-ft./yr. of IGRs. Conversion of these IGRs to Type I rights would result in a maximum permissible groundwater withdrawal by all three plants of 18,167 ac.-ft./yr. Projected actual groundwater demand for the three plants is 15,600 ac.-ft./yr.

In summary, the groundwater use by the three power plants is projected to range between approximately 16,000 ac.-ft./yr. (estimated demand) and 18,000 ac.-ft./yr (maximum permissible under Arizona state law). Pumping on the lands acquired by the power plants since 1983 has ranged from 1,700 ac.-ft./yr. to 11,500 ac.-ft./yr. and averaged 5,100 ac.-ft./yr. (ADWR, 1999b). If irrigated agriculture were to resume at historical levels (1950s, 1960s and 1970s) on the farmlands acquired by the power plants, the groundwater pumping would range between approximately 20,000 and 40,000 ac.-ft./yr.

1.4 Scope

This interim report is based on the data and reports available to Peter Mock Groundwater Consulting, Inc. (PMGC) as of this writing (April 2000). Additional data are expected in the next few months from aquifer testing, water-quality sampling and analysis, water-level measurement and drilling programs initiated by Sempra Energy. Aquifer testing and drilling programs initiated by Pinnacle West Energy Corporation are expected to provide additional data in the next few months as well.

As mentioned above, the Hassayampa Sub-Basin of the PhxAMA is considered a useful area for the regional evaluation of groundwater flow and logical, considered selection of a local model study area. Specifically, the local model study area only needs to enclose an area surrounding the proposed power plant properties out to obvious boundaries to groundwater flow or distances containing distinctive groundwater occurrence and flow conditions. From evaluation of reports and interpretations presented in existing reports for the regional area, a local model study area was selected here and detailed interpretations were limited to that area. For completeness, data within a small margin around the local model study area (one to two miles) were also considered.

Water quality is not considered in this report at this time. However, data were noted in the references reviewed here upon which interpretations could be made at a later time concerning the distribution of inorganic chemical constituents in groundwater.

1.5 Plan of Development

This Section 1 has been an introduction to the work described in this interim report. Section 2 is a discussion of relevant geologic and hydrologic reports from a regional perspective (for the Hassayampa Sub-Basin of the PhxAMA) and selection of a local model study area (the Centennial Wash Area). Section 3 is a geologic framework for the

Centennial Wash Area, which serves as the foundation for the identification of hydrostratigraphic (groundwater flow) units presented in Section 4. Section 5 is a description of the hydrologic boundaries to the Centennial Wash Area while Section 6 provides estimates of hydraulic properties of the hydrostratigraphic units in the Centennial Wash Area. Section 7 provides estimates of inflow and outflow components of the groundwater budget in the Centennial Wash Area, which are used in Section to construct a preliminary, overall groundwater flow budget for the Centennial Wash Area. Section 9 is a discussion of the report as a whole – summary of findings, conclusions drawn, and recommendations for future work, while Section 10 presents citations for documents referred to in Sections 1 – 9.

2.0 REGIONAL SETTING

2.1 Introduction

For this interim report, the extent of regional consideration is defined by the Hassayampa Sub-Basin of the PhxAMA defined by ADWR (Figure 1). To the extent that previous geologic or hydrologic studies investigated and reported on areas including, adjacent to, or overlapping with the Hassayampa Sub-Basin, they were considered relevant to this study. This section on regional setting is divided into subsections on review of relevant studies, geography, geology, climate, surface hydrology, subsurface hydrology, and selection of a local study area.

2.2 Review of Relevant Regional Studies

This subsection presents a review of the primary geology and hydrology studies of the region. There have been numerous studies of areas including or overlapping with portions of the Hassayampa Sub-Basin. However, none focused on the area acquired for the proposed power plants, a situation which requires extraction of relevant information from each study and synthesis for the Hassayampa Sub-Basin. In the subsection, the scope of each relevant study is briefly described, followed by an assessment of the particular relevance of the study to this effort. The review is presented in chronological order based on publication date.

The U.S. Geological Survey (USGS) of the U.S. Department of the Interior conducted the first regional study of groundwater conditions in the Lower Hassayampa Area (Stulik, 1974). The study area for that report is approximately the lower half of the Hassayampa Sub-Basin of the PhxAMA. See Figure 1 for the locations of the Lower Hassayampa Area in relation to the Hassayampa Sub-Basin. As reported in Stulik (1974), the USGS compiled a field inventory of wells in 1968, collected drillers logs, measured water-levels and well discharges during the period 1968 to 1973, and collected water-quality samples for analysis of inorganic constituents. Of particular interest to this study is that the report includes a map of surficial geology and subsurface geologic interpretations by M.E. Cooley, a map of irrigated areas interpreted from a 1968 aerial photograph, a water-level elevation contour map for 1970, and estimates of groundwater pumping separated between what Stulik (1974 – Plate 1) defined as the Centennial and Tonopah-Hassayampa areas. See Figure 1 for the dividing line between these two areas.

Two closely related studies characterized groundwater conditions in a corridor along the Salt and Gila Rivers from 23rd Avenue to Gillespie Dam. Both Water Development Corporation (Halpenny and Greene, 1975) and Water Resources Associates, Inc. (1975) prepared reports for NUS Corporation concerning the potential impacts of water use by the then proposed Palo Verde Nuclear Generating Station (PVNGS) on the regional water resources. Both reports provided water balances for the study corridor for 1974 and

projections of water balances in 5-year intervals forward to the year 2000. Relevant to this study are estimates of surface water flows, effluent discharges from the City of Avondale, City of Tolleson and City of Phoenix 23rd and 91st Avenue Wastewater Treatment Plants, channel seepage losses/gains, consumptive use of crops in Arlington Canal Company lands and discharge to phreatophytes.

The USGS published an update to Stulik's (1974) report (Stulik and Laney, 1976) that is in the typical format of USGS and ADWR "Ground-Water Conditions" map reports. The report covers the USGS Lower Hassayampa Area of Stulik (1974) and presents water-level measurements for 1975, water-level change maps for 1970 – 1975, and specific conductance (related to total dissolved solids) and fluoride measurements for 1975. The report also presents irrigated acreages for 1974 based on Arizona Crop and Livestock Reporting Service data checked in the field by the USGS. A supplement was published for this report containing the basic data used for the report (USGS, 1976).

The Soil Conservation Service (SCS) of the U.S. Department of Agriculture mapped soils over the central part of Maricopa County in the 1960s and 1970s (SCS, 1977). Of relevance to this study are descriptions of surficial geologic materials and aerial photography used as bases for presenting the detailed maps of the soil units. The lands prepared for irrigation in 1973 are visible in the aerial photographs.

Between 1978 and 1980, Fugro (1978, 1980) investigated the geology and groundwater conditions in the vicinity of the then-proposed PVNGS for the Arizona Nuclear Power Project. The scope of their studies extended for tens of miles around the PVNGS. Surficial geology was mapped for the entire Lower Hassayampa Area of Stulik (1974) and beyond. Over 70 borings were drilled to depths of 200 to 600 feet, borehole geophysical logs were run in the boreholes, and gravity and seismic surveys were conducted. The report further summarized interpretations of two pumping tests (of a deep irrigation well and of a shallow test well), interpretations of numerous slug/bail tests of the borings and laboratory tests of permeability for core samples from the borings.

The USGS published a report for the "Hassayampa Area" in 1980 (Sanger and Appel, 1980), but it addressed only the area north and east of the Belmont Mountains. See Figure 1 for the location of the Hassayampa Area as defined by Sanger and Appel (1980). The focus of the study was primarily far to the north of the Hassayampa Plain in the vicinity of the Town of Wickenburg. Six water-level measurements (and observations of three dry holes) for 1976-1977 in the Hassayampa Plain were presented, but were considered insufficient to contour. One water-quality sample in the Hassayampa Plain was analyzed for inorganic constituents.

The ADWR Basic Data Unit assumed the work of preparing groundwater conditions map reports from the USGS in 1980. ADWR began with a study of the Harquahala Basin by Graf (1980). Water-level measurements and results of inorganic water-quality analyses are presented for 1979-1980. That report has significance to this study in that the Harquahala Basin is adjacent to the Hassayampa Sub-Basin on the west and boundary

conditions between the two basins for 1979-80 can be inferred from water-level elevation contour maps.

ADWR's Basic Data unit developed a groundwater conditions map report in 1981 for the Gila Bend Area (Sebenik, 1981). Water-level measurements and results of inorganic water-quality analyses are presented for 1979. Another groundwater conditions map report for the Gila Bend Basin was completed and published by ADWR Basic Data Unit in 1996 (Rascona, 1996). Water-level measurements and results of inorganic water-quality analyses were presented for 1993 along with hydrographs and water-level change maps. These reports have significance to this study in that the Gila Bend Basin is adjacent to the Hassayampa Sub-Basin on the south and boundary conditions between the two basins for 1979 and 1993 can be inferred from the water-level elevation contour maps.

In 1984, Water Development Corporation (Halpenny, 1984) published the first study dedicated solely to the "waterlogging" problem in the vicinity of the Town of Buckeye. The waterlogging problem comprises depths to water of 4 to 10 feet and increasing salinity within Buckeye Water Conservation and Drainage District. The increasing base flow of the Gila River was identified as the major cause of the waterlogging. This report extracted and expanded on previous reports for the Buckeye area by this same author (Halpenny and Greene, 1975, 1977; Halpenny, 1982a,b; Halpenny, 1983) with a focus on the waterlogging problem. Of relevance to this study is the summary of the Buckeye area reports up to 1984 and a December 1983 water-level elevation contour map.

Long (1983) prepared a groundwater conditions map report for ADWR's Basic Data Unit that expanded on the works of Stulik (1974) and Stulik and Laney (1976). This report addressed the entire Hassayampa Sub-Basin of the then newly created PhxAMA. The area also included much of what Sanger and Appel (1980) had called the Hassayampa Area, but excluded the Wickenburg area. See Figure 1 for the locations of these areas relative to the Hassayampa Sub-Basin. Long (1983) presented maps of water-level elevation contours and inorganic water-quality analyses results for 1982, along with hydrographs (1950 to 1982) and a water-level change map for the period 1970 to 1982. The water-level elevation contour map included data points and separately addressed the principal regional aquifer and a regional of shallower groundwater ("perched water") beneath PVNGS. Long (1983) also presented pumping estimates for the Lower Hassayampa area for the period 1973 to 1981. Unlike the previous USGS studies (Stulik, 1974; Stulik and Laney, 1976), irrigated area estimates were not presented. A supplement was published for this report containing the basic data used for the report (ADWR, 1983).

A groundwater conditions map report for the adjacent PhxAMA, minus the Hassayampa Sub-Basin, was published by the ADWR Basic Data Unit using data collected in 1982 (Reeter and Remick, 1986). Of relevance to this study are the plotted individual water-level elevation data points and interpreted contours, which assist in evaluating the flow of groundwater into the Hassayampa Sub-Basin from the east beneath the Gila River channel.

Errol L. Montgomery & Associates, Inc. (1986, 1988) performed a study of waterlogging in the Buckeye area for the PhxAMA of ADWR in the 1980s. The first report (Montgomery, 1986) compiled and evaluated historical data and the second report (Montgomery, 1988) used water budget models to evaluate conditions as of 1985 and project conditions into the future under various scenarios for the area along the Salt and Gila Rivers from 23rd Avenue to Gillespie Dam. The scope of this study was reminiscent of that of the work reported on by Halpenny and Greene (1975) and Water Resources Associates, Inc (1975) in the early 1970s, but the emphasis of the work in the 1980s was on depths to water of 4 to 10 feet in the Buckeye area that were impacting agricultural production and the applicability of a tax on pumping imposed by the Groundwater Management Act of 1980. The study by Montgomery (1986, 1988) was comprehensive and relevant to this study in that water budgets were computed (with detailed groundwater and surface water flow components) for the Arlington area for 1985 conditions. In addition, several dozen shallow piezometers were installed and water-level elevation data were collected in March 1987.

Halpenny and Halpenny (1988) reported on the first comprehensive assessment of groundwater resources in the Hassayampa Plain. See Figure 1 for the location of the alluvium of the Hassayampa Plain investigated by Halpenny and Halpenny (1988). Based on inspection of water-level and stream-gaging data from the USGS and ADWR, and from the findings of nine new test holes (approximately 1200 feet deep) and aquifer tests of three new test wells and an existing well, Halpenny and Halpenny (1988) estimated the flux of that portion of the groundwater flow leaving the Hassayampa Plain east of the Belmont Mountains and south to the Buckeye area. Halpenny and Halpenny (1988) defined the subsurface geology of the Hassayampa Plain for the first time and developed a water-level elevation map for 1987 that they compared to that of Long (1983) and a map developed by the U.S. Bureau of Reclamation in 1945.

Investigations of the Hassayampa Landfill Federal Superfund Site began in the 1980s and remedial action (four wells pumping a total of 7 gallons per minute (gpm) followed by air stripping treatment, followed by deep injection) for volatile organic compounds in shallow groundwater began March 1994. Hydrogeologic data for the Hassayampa Landfill Site are presented in reports by Errol L. Montgomery & Associates, Inc. (1994, 1998). They defined the local geology, ran pumping tests and monitored water levels. This work is relevant to this study in that detailed data are available to assist in interpreting the shallow (less than 300 feet below land surface [bls]) geology and groundwater flow in this area.

The most recent product of the ADWR Basic Data Unit in terms of groundwater conditions maps for the region is that of Hammett and Herther (1995). These maps cover the complete PhxAMA, including the Hassayampa Sub-Basin and present water-level measurements and inorganic water-quality data collected in 1992. A draft set of similar groundwater conditions maps using data from 1997 is being prepared by ADWR at this writing (April 2000).

In summary, there have been substantial studies completed since the 1970s of portions of the Hassayampa Sub-Basin. Each had a specific focus and none focused on the pumping along the north side of Centennial Wash. However, the assembled reports for these studies comprise a foundation for interpreting groundwater flow conditions in this area and selecting a local study area. The remaining subsections of this section extract relevant information from the previous regional studies as necessary to assist in selecting a local study area.

2.2 Geography

A brief overview of geography is provided here to assist the reader in developing a familiarity with the general features of the region. Topography, landmarks, and locations of the proposed power plant properties and named areas are discussed in this subsection. Figure 1 summarizes many of the features discussed in this subsection.

The Hassayampa Sub-Basin is the focus of this study. The Harquahala Basin bounds it on the west, the West Salt River Valley Sub-basin bounds it on the east, and the Gila Bend Basin bounds it on the south. The McMullen Valley Basin and the northern portion of the Hassayampa Basin bound it on the north. The Sub-Basin boundaries are dominated by mountain ranges. The Gila Bend and Buckeye Mountains are on the south, The White Tank Mountains are on the East. The Vulture Mountains form the northern boundary of the Sub-Basin. The Belmont Mountains and Palo Verde Hills traverse the Sub-Basin from the northwest to southeast.

Interstate Highway 10 (I-10) traverses the Sub-Basin from west to east, as does the Buckeye-Salome Road and a major natural gas pipeline. The Gila River, Hassayampa River, Centennial Wash, and Jackrabbit Wash are the primary drainages of the Sub-Basin. Dickey and Winters Washes are a few of the many small tributaries to Centennial Wash.

PVNGS and the three proposed power plants are located in the south central portion of the Hassayampa Sub-basin. The towns of Palo Verde, Hassayampa, and Arlington are also located in the south central area. The towns of Wintersburg and Tonopah are located in the north and west areas of the Sub-basin. The Hassayampa Landfill is located just to the northwest of the Town of Hassayampa. The town of Buckeye is outside of the Sub-Basin on the eastern edge of the map shown in Figure 1.

Study areas of the various investigators described in the previous subsection include the Hassayampa and Lower Hassayampa Areas of the USGS, the Centennial and Tonopah-Hassayampa Areas of the USGS, and the Hassayampa Plain of Halpenny and Halpenny (1988).

2.3 Geology

The geology of the region can be interpreted from surficial mapping and analysis of subsurface data such as drill cuttings within the framework of structural geology principles. The region has experienced dramatic geologic forces moving rocks thousands of feet relative to their starting positions. The time-sequence and typical processes involved in the geologic events is important for gaining an understanding the current distribution of geologic materials at the surface and in the subsurface. Reports by the Arizona Geological Survey (AGS), USGS, Fugro, Water Development Corporation (Leonard Halpenny), and hydroGEOPHYSICS are the basis for the discussion in this section.

The primary subsurface geologic descriptions of the area were presented by M.E. Cooley (Stulik, 1974) and Fugro (1978, 1980). Typical current nomenclature for alluvial sediments developed by the USGS and ADWR from earlier U.S. Bureau of Reclamation definitions for the adjacent East and West Salt River Valley Sub-Basins (see Corkhill and others [1993 – page 16] for a recent synthesis) are also considered relevant and are used for comparison although they are not discussed separately here.

AGS (Reynolds, 1988) developed a current map of surficial geology for Arizona that includes the region of interest here. The Hassayampa Sub-Basin is located in the Basin and Range tectonic province (Kamilli and Richards, 1998) where steep vertical breaks in the earth's crust produce elongated mountain ranges and intervening sediment-filled basins. Figure 2 is a map of surficial geology modified from Reynolds (1988) with updates found in Kamilli and Richard (1998). The White Tank Mountains are aligned north to south while the remaining mountain ranges and groups of isolated rock exposures are typically aligned N40°W. Precambrian rocks (look for ***YXg*** in Figure 2) - primarily granite-gneiss and minor metamorphosed sedimentary types - are exposed in the White Tank Mountains, Belmont Mountains, Buckeye Hills, and portions of the Gila Bend Mountains and Palo Verde Hills. Tertiary rocks (***Tsv***) – primarily igneous extrusive (volcanics: rhyolite to andesite to basalt flows and tuffs) and minor sedimentary rocks (gray arkosic, white tuffaceous and red-brown mixed sediment conglomerates) - dominate the Palo Verde Hills and portions of the White Tank Mountains, Belmont Mountains and Gila Bend Mountains. Quaternary igneous extrusive rocks (***QTb***) – two basalt cones – rise above and are interbedded with fluvial sediments along the Gila River near Hassayampa (the Arlington Basalt Flow) and at Gillespie Dam (the Gillespie Basalt Flow). Exposures of granite and gneiss are key points to note, as they are substantial barriers to groundwater flow in this area. Examples of granite or gneiss exposures are the White Tank Mountains, the southeast extension of the Belmont Mountains at the junction of the Hassayampa Plain and Lower Hassayampa Areas, the south boundary of the Centennial Wash area in the Gila Bend Mountains and the northwest end of the Palo Verde Hills.

M.E. Cooley of the USGS developed the geologic map and organization of geologic units for the Lower Hassayampa Area presented in Stulik (1974 – Page 7 and Plate 1).

Drillers' logs are presented as an appendix with interpreted divisions of the units encountered in each well. At the time of that writing (Stulik, 1974 – page 7), M.E. Cooley divided the geologic materials of the area into:

- Crystalline and consolidated sedimentary rocks
- Volcanic rocks
- Valley-fill deposits
- Stream and flood-plain alluvium

The crystalline and consolidated sedimentary rocks were reported by Stulik (1974) to be dominated by gneiss and granite. The volcanic rocks were reported to be dominated by rhyolitic to andesitic tuffs overlain by andesitic to basaltic flows. The valley-fill deposits were reported to be weakly cemented sand, silt and clay with minor gravel and basalt flows. Consideration of current USGS and ADWR nomenclature would likely result in assignment of Cooley's valley-fill deposits to the Red Unit, Lower Alluvial Unit and Middle Alluvial Unit (see Corkhill and others, 1993). The stream and flood-plain alluvium were reported to be primarily unconsolidated gravel, sand and silt. Consideration of current USGS and ADWR nomenclature would likely result in assignment of the Cooley's stream and flood-plain alluvium to the Upper Alluvial Unit (see Corkhill and others, 1993).

Fugro (1978, 1980) presented surficial geology maps, geophysical surveys and numerous geologic cross-sections for the area in and surrounding the PVNGS property. Figure 3 presents the central portions of the two regional geologic cross sections presented by Fugro (1978). They defined a framework for the geology that is more detailed than the general framework used by the USGS and ADWR for groundwater studies in adjacent alluvial basins: Basement Complex, Red Unit, Lower Alluvial Unit (LAU), Middle Alluvial Unit (MAU), and Upper Alluvial Unit (UAU). See Corkhill and others (1993) for a review of the current USGS and ADWR nomenclature. Fugro's (1980) definitions were based on observations and measurements for over 70 boreholes ranging from 200 to over 600 feet. The measurements included geotechnical parameters, particle size, natural gamma radiation and magnetic orientation reversals. Fugro (1978 – Figure 2.5-19) defined a geologic framework for the vicinity of the PVNGS, as follows in order of decreasing age:

- Basement Complex – Precambrian granitic and metamorphic rocks.

- Bedrock – Tertiary (Miocene) Volcanic-Sedimentary Sequence

- Lithologic Zone 1 – Tertiary (Miocene-Pliocene) Indurated Fanglomerate (Red Unit)

- Lithologic Zone 2 – Tertiary-Quaternary Lower Silt, Sand and Gravel Deposits (LAU)

- Lithologic Zone 3 – Tertiary-Quaternary (Upper Pliocene) Palo Verde Clay (MAU)
- Lithologic Zone 4 – Tertiary-Quaternary Upper Silt Deposits (MAU)
- Lithologic Zone 5 – Quaternary Upper Sand and Gravel Deposits (UAU)
- Lithologic Zone 6 – Quaternary Younger Fan Deposits (UAU)

Halpenny (1984 – page 4-2) notes that depth to bedrock (probably Basement Complex) increases beneath the Buckeye Area from exposures in the Buckeye Hills on the south side of the Gila River to the north and that there is a clay layer between 200-250 and 500-700 feet. This clay is likely the MAU. Water-bearing sands and gravels occur above and below this clay layer. These sands and gravels are likely the UAU and LAU, respectively. Halpenny (1984 – page 4-3) hypothesized a long shallow lake on an east-west axis through the Buckeye Valley and a more northward (2 miles) alignment of the Gila River in the past (page 4-1).

Long (1983) adopted the USGS convention of UAU, MAU, LAU and described their extents based on the Fugro (1978, 1980) work for PVNGS and drillers' logs. Of particular interest is Long's (1983 – Sheet 1) note that the Palo Verde Clay may be present south of PVNGS along Centennial Wash.

Montgomery (1986) applied the division of UAU, MAU and LAU to the Arlington Valley. Their cross-section A- A' interprets the UAU as approximately 100 feet thick, the MAU as approximately 250 feet thick and the LAU as greater than 550 feet thick along the Arlington Canal on the west edge of the Arlington Valley

Halpenny and Halpenny (1988) defined the geology of the Hassayampa Plain with a two-part division: Older Alluvium (***QTs*** – Quaternary-Tertiary Sand, Gravel and conglomerate) and Younger Alluvium (***Qs*** – Quaternary Silt, Sand and Gravel). They note (page 4-9) that in the Hassayampa Plain, both the Younger and Older Alluvium were deposited as "mountain-front outwash" (proximal alluvial fan depositional systems) and that there is not an incised channel in the Older Alluvium aligned with the Hassayampa River and filled with Younger Alluvium. Halpenny and Halpenny (1988) further conclude that this is an indication that the Hassayampa was never a through-flowing stream south of the Vulture Mountains front and that its flow has always sunk into the ground throughout the period during which the Older and Younger Alluvium were deposited. Halpenny and Halpenny (1988 – page 4-10) reported on a distinctive unit above bedrock, but below the Older Alluvium, which he terms "bedrock rubble". This material was characterized by Halpenny and Halpenny (1988 – page 4-10) as fractured mountain-front outwash - highly angular fragments of granite, gneiss, andesite, rhyolite and basalt with very little to no sand and little rounded gravel.

The base of the Older Alluvium is greater than 1,200 feet below land surface at six of the nine test holes reported by Halpenny and Halpenny (1988 – page 4-11), an observation which he reports confirms depth to bedrock model estimates of 1,600 to 3,200 feet bls made by the University of Arizona. Although the Older Alluvium is more consolidated than the Younger Alluvium, it nonetheless produces thousands of gpm of water to wells. The Older Alluvium is a friable gray to light buff conglomerate of rounded gravel and cobbles with some coarse sand and no silt or clay where it is exposed in washes that cross Palo Verde Road in Township 3 North. This is consistent with the geologists' logs of the test holes presented in Halpenny and Halpenny (1988 – Appendix 2). The Younger Alluvium is primarily sand and silt at the surface and in places this material turns into dust so deep that automobiles become stuck in it (Halpenny, 1988-page 4-12). Below 20 to 40 feet, the Younger Alluvium is indistinguishable from the Older Alluvium in drill cuttings (slightly silty/clayey sandy gravel rotary drilling returns). The Older Alluvium is likely LAU and the Younger Alluvium is likely UAU.

Errol L. Montgomery and Associates, Inc. (1994, 1998) defined the shallow geology of the Hassayampa Landfill near the north end of the Arlington Basalt Flow. The Arlington Basalt was encountered between 60 and 80 feet bls, which coincides with the highest water levels at the site. The Palo Verde Clay was encountered at a depth of approximately 260 feet below the site. Between the Arlington Basalt and the Palo Verde Clay, the UAU was divided into an upper Unit A (75-105 feet bls - dominated by clayey silt and silt clay layers) and a lower Unit B (105-260 feet bls – comprising interbedded silt-clay and sandy gravel layers).

The available gravity data for the Centennial Wash area were compiled and evaluated recently by hydroGEOPHYSICS (2000). Figure 4 is a specialized plot of gravity variations across the area called the Complete Bouguer Anomaly (CBA). In general, CBA plots can be used to locate areas where the top of the basement complex (granite-gneiss) is submerged to greater depths beneath less dense materials (sediments and volcanics) relative to other areas. The CBA plot can be thought of as an imprecise, but nevertheless useful, analogy for depth to basement rock. The work of hydroGEOPHYSICS (2000) has been modified with information from Fugro (1978 – Figure 2.5-54) for the Gillespie Dam area that indicates a southward extension of the Centennial Wash basin connecting with the Gila Bend Basin. In general, deep sediment-filled basins are present where the contours of equal gravity variation are more negative (less than –60 milligals) and are termed "lows". The Tonopah Basin Low is the deepest, followed by the West Buckeye Valley Low, the East Hassayampa River Low, and the Centennial Wash Low. The higher points of granite-gneiss occurrence (> -60 milligals) called "highs" are coincidental with the foundations of the White Tank Mountains, the Buckeye Hills, the Gila Bend Mountains, and the northwest end of the Palo Verde Hills. The names of the highs were developed by replacing the term "Mountain" or "Hills" with the term "High" for each mountain or hill exposure. An exception is the Jackrabbit Wash high which appears to be a buried ridge connecting the Belmont High with ridges extending from the Palo Verde High and from the White Tank High. Note that the individual exposed volcanic rock hills (***Tsv***) have little apparent representation in gravity variations. The CBA for this area correlates well with the outcrops of granite-gneiss

(*YXg*) mapped by the AGS (see Figure 2) and reasonable structural arrangements in the subsurface brought about by the mid-Tertiary Orogeny and the Basin and Range Disturbance normal faulting episode.

In summary, the Hassayampa Sub-basin geology is typical of the Basin and Range tectonic province. The Sub-Basin actually contains several geologic structural basins or lows. In the southern part of the Sub-Basin (south of the Buckeye-Salome Road), these basins are relatively shallow compared to the adjacent West Salt River Valley. The shallower nature of these basins within the southern part of the Sub-Basin carries the implication that older rock units, particularly volcanic and conglomerate sequences play an important role in the flow of groundwater to wells. In contrast, groundwater flow to wells in much of the West Salt River Valley occurs in relatively young, unconsolidated sediments that have not been strongly faulted or tilted.

2.4 Climate

Investigators of groundwater resources in the region have briefly discussed climate. A few excerpts are summarized in this subsection.

Stulik (1974 - page 6) characterized the climate of the Lower Hassayampa Area as semiarid based on climatic data from Buckeye for the period 1905 to 1962. Annual precipitation ranged from less than 2 inches to more than 21 inches with an average of 7.5 inches per year.

Halpenny and Greene (1975 – page 2-1) reported average annual rainfall at Buckeye was 7.92 inches/year as of 1964, and divided the year into a dry season (October), a season of winter storms (December to February), a season of spring snow melt (March to April) and a summer rainy season (July to September).

Halpenny and Halpenny (1988 – page 4-1) characterized the climate of the Hassayampa Plain by reporting the range of precipitation reported for Aguila (just northwest of the Hassayampa Plain), 8.8 inch/yr, and for Buckeye (just southeast of the Hassayampa Plain), 7.4 in/yr. Average daily minimum and maximum temperatures are 3 to 4 degrees cooler at Aguila compared to Buckeye.

In summary, the climate of the area is semi-arid with annual precipitation averaging approximately 8 inches per year depending on location with an increase with elevation (to the north and northwest). Precipitation falls primarily as low-intensity, widespread frontal storm fronts in the winter (January to March) and more high intensity, sporadic thunderstorms in the late summer and early fall (July to September).

2.5 Surface Hydrology

This subsection is very general and is divided into discussions of topography, soils, surface flow characteristics, vegetation and land use. The intent of this subsection is to give the reader a brief overview of surficial features. Detailed analyses of surface flows and flooding are not presented here but can be obtained from the Maricopa County Flood Control District.

2.5.1 Topography

Stulik (1974 – page 6) described the Lower Hassayampa area as a gently sloping alluvial plain (elevations 800 to 1400 feet above mean sea level [amsl] surrounded by low, steep-sided mountains (elevations 1,000 to 3,000 feet amsl).

2.5.2 Soils

The Soil Conservation Service (SCS) of the U.S. Department of Agriculture, now the Natural Resource Conservation Service (NRCS), mapped the soils of Maricopa County (SCS, 1977). They defined three primary soils associations: "Soils Formed on Recent Alluvium", "Soils Formed on Old Alluvium", and "Soils of Mountains and Buttes". The SCS Soils Formed on Recent Alluvium correlate to the exposed Upper Sand and Gravel Unit (Lithologic Zone 5 or UAU). The SCS Soils Formed on Recent Alluvium were mapped by the SCS along the Gila River, Hassayampa River, Centennial Wash and the many minor tributaries to these streams. The soils are mapped as sandy loams and gravelly-sandy loams (Carrizo-Brios association) in the streambeds and along the eastern half of the Arlington Valley. Surrounding these associations are loams (Gilman-Estrella-Avondale association) interpreted as floodplains for these surface water features. The SCS Soils Formed on Old Alluvium correlate to the exposed Upper Silt Deposits (Lithologic Zone 4 or MAU) and Lower Silt, Sand and Gravel Deposits (lithologic Zone 2 or LAU). Fugro (1978) inferred a dominance of LAU in the western Centennial Wash area and MAU in the eastern Centennial Wash area. The Soils Formed on Older Alluvium dominate the area and are mapped as loams and gravelly loams (Rillito-Gunsight-Perryville association).

Halpenny (1984 – page 4-3) noted a strong contrast between coarse soils north of the RID canal (spreading detritus from the White Tank Mountains) and silty-clayey soils south of the RID canal.

In general, the soils of the region are dominated by surficial exposures of the Upper Silt Deposits and the Lower Silt, sand and Gravel Deposits with local exposures of the Upper Sand and Gravel Deposits. The Lower Silt, Sand and Gravel Deposits are much

older than the Upper Silt Deposits, which in turn are older than the Upper Sand and Gravel Deposits. Age and development of cement (caliche) horizons in the near surface are closely related.

2.5.3 Surface Flow Characteristics

The characterization of surface flows is relevant here only in terms of the potential for recharge from sustained river flows and short-term flood events as well as the capacity for the channels to collect groundwater under high water table conditions. Relatively steady releases of treated municipal wastewater treatment plant effluent created artificial flow conditions in the Gila River beginning in approximately 1962.

Stulik (1974 – page 6) reported that the Hassayampa River and Centennial Wash were primarily ephemeral (flow only during sustained precipitation events) while the Gila River flowed during part of the year from excess irrigation water (return flows).

Water Resources Associates (1975 – page 6) estimated that the Hassayampa River has a drainage area of 417 square miles and contributed 400 acre feet of flood flows to the Gila River in 1974; Centennial Wash has a drainage area of 1,810 square miles and contributed 800 acre feet of flood flows to the Gila River in 1974; average discharge of the Gila River at Gillespie Dam (Water Resources Associates, 1975 – Table 1) was estimated at 28,340 ac.-ft./yr.

Halpenny and Greene (1975 – Table 2) combined records for the flow below Gillespie Dam, with flows in the Gila Bend and Enterprise Canals to characterize the flows reaching Gillespie Dam for the years 1936 to 1974. The years of 1941, 1965-66 and 1973 included major flood events on the Salt and Verde River system which joined the Gila River just to the east of the Sub-Basin.

Halpenny and Greene (1975 – Table 6) combined the records for the Gila and Santa Cruz Rivers near Laveen to estimate the discharge of the Gila River near the confluence with the Salt Rive for the years 1941 to 1974. 1941, 1955, and 1965-66 were years with large flood flows.

Long (1983 – Sheet 1) noted Jackrabbit Wash as an additional, important ephemeral stream in the area. It drains the Hassayampa Plain and joins the Hassayampa River east of the Belmont Mountains.

Montgomery (1988) compiled and plotted surface water records for the area. They state that the combined flow of the Gila and Santa Cruz Rivers at the Laveen gaging stations represents the surface water inflow to their study area at 23rd Avenue because few losses were believed to occur in the intervening distance. The flows of the Hassayampa at the Box Dam site were summarized for 1947 to 1981 – average was 17,610 ac.-ft./yr. and maximum was 123,400 ac.-ft. in 1980. The Arlington gage for the

Hassayampa is located 1.8 miles upstream from the confluence with the Gila and recorded only maximum flows and for broken periods of time. The Centennial Wash gage was moved in September of 1979 from 4.4 miles west of Arlington to 9.0 miles upstream of Arlington (at the Southern Pacific Railroad bridge). Average annual flow 2,770 ac-.ft./yr. (1961 to 1978 and 1981 to 1983), maximum was 9,230 ac.-ft. in 1978. The plot of the combined flows of the Gila River at Gillespie Dam and the Enterprise and Gila Bend Canals is especially instructive (page 36). The average for 1936 to 1986 was 294,900 ac.-ft./yr., but a steady drop from 1936 to 1962 (attributed to increased reservoir storage upstream) is apparent in the plotted data followed by the steady rise from 1962 to 1986 (attributed to increasing volumes of the effluent releases). Floods in 1941, 1966, 1973, 1978, 1979, 1980, 1983, 1984, and 1985 punctuated the general trends discussed in the previous sentence.

Montgomery (1988 – page 34) compiled, plotted and discussed effluent releases by the City of Phoenix for the 23rd Avenue WWTP and the 91st Avenue WWTP. Effluent releases from 23rd Avenue ranged between 15,000 and 40,000 ac.-ft./yr between 1955 and 1985. Releases were 30,800 ac.ft. in 1986; higher releases were in the mid-1970s and early 1980s. Effluent releases from 91st Avenue increased steadily from zero in 1957 5,000 ac.-ft./yr. in 1955 to148,600 ac.-ft./yr. in 1986. They also reported that the City of Tolleson released 8,200 ac.-ft./yr of effluent in 1986 (page 34). The cities of Goodyear, Avondale and Tolleson were not releasing significant quantities of effluent by 1986 (page 35).

Halpenny and Halpenny (1988 – page 4-1) characterize the Hassayampa River as running over exposed mountain rock until it reaches the "narrows" seven miles downstream from Wickenburg. At the narrows (near the Morristown gage), the River crosses a steep fault at the southern foot of the Vulture Mountains and "virtually all the runoff … sinks into the bed of the river". Halpenny and Halpenny (1988 – page 4-6) summarized studies of the Hassayampa River from the first half of the 20th century. Flow of the Hassayampa rarely reaches the Gila River near Arlington. Annual discharge of the Hassayampa River at Box Canyon averaged approximately 50,000 ac.ft./yr. for the 27-year period 1916 to 1942 (Halpenny and Halpenny, 1988 – page 4-5) Annual discharges for the 44-year period 1939 to 1982 at the Vulture Mountain fault (assembled by Halpenny and Halpenny from gaging data for Morristown and Box Canyon) ranged from approximately 600 (in 1940) to 123,000 (in 1980) ac.-ft./yr. and averaged approximately 17,000 ac.-ft./yr. Halpenny and Halpenny (1988, page 4-7) note that the drainage area of the Hassayampa Plain can be calculated a the difference between the drainage areas of the Hassayampa River at the gage near Arlington (1470 mi^2) and of the Hassayampa River near Morristown (774 mi^2) or 66 mi^2.

In summary, the Gila River is the largest surface water feature in the Sub-Basin. The flow of the Gila River in the Sub-Basin has been perennial in recorded history, but declined from 1936 to 1962 due to increasing upstream diversion, groundwater pumping and resulting losses from the river. From 1962 to the present, flows steadily increased due to increasing effluent releases. Large flood events have occurred on the Gila River since 1962 that have largely not recharged the aquifer due to high water table conditions.

In contrast, the flows on the Hassayampa River are rare and are essentially lost from the channel before they reach the Gila River. Likewise, flows on Centennial Wash, Jackrabbit Wash, and their tributaries are rare and sink into the ground before reaching the Gila River. Therefore, flood events on the Hassayampa River and the various washes are almost entirely converted to groundwater recharge.

2.5.4 Vegetation

The vegetation of the area outside of the Salt-Gila River corridor or irrigated farmland can be characterized as Lower Colorado River Sonoran Desertscrub. Typical species are palo verde, catclaw acacia, mesquite, desert broom, creosote, ocotillo and brittle bush with sparse to moderately abundant saguaro and cholla cactus (Kamilli and Richard, 1998). The river corridor was originally populated with typical riverine species, but tamarisk (salt cedar) invaded in the early 1900s.

Water Resources Associates (1975 – page 12) reported that a solid stand of phreatophytes (tamarisk) was present in the 1930s from Tempe to Gillespie Dam. Dropping water tables started to kill the tamarisk and reduce the phreatophyte stands starting in the 1940s. By 1958, the stand reached only from Jackrabbit Trail to Gillespie Dam. Effluent flows (starting in 1962) and the flood of 1973 immediately increased water levels near the river and increased phreatophyte water use. Phreatophyte water use for 1974 for the area below Powers Butte was estimated (Water Resources Associates, 1975 – Table 4), based on plant type and acreage for specific areas listed in Table 1. The estimates given in Table 1 indicate the assumption of a consumptive use of 3.7 ac.-ft./ac.-yr.

Table 1 Phreatophyte Water Use Estimates for 1974

Cadastral Location	Phreatophyte Area (acres)	Water Use (ac.-ft./yr.)
C-01-04 19 & 30	927	3508
C-01-05 24, 25 & 36	673	3019
C-01-05 26 & 35	361	1846
C-01-05 27 & 28	460	1600
C-01-05 33 & 34	548	1944
C-02-05 3 & 4	535	1973
C-02-05 9 & 10	497	1413
C-02-05 16	622	1871
C-02-05 21 & 28	289	995
Totals	**4,912**	**18,169**

Halpenny and Greene (1975 – page 6-1) report that tamarisk first appeared in 1929 at Gillespie Dam and spread upstream to Tempe by the late 1940's. Heavy pumping cleared phreatophytes upstream up to approximately 1965. In early 1960s, the phreatophytes were dense from Buckeye Canal heading downstream to Gillespie Dam. They report that the water table was effectively at land surface from the Highway 80

Bridge to Gillespie Dam in the 1960s and this allowed re-establishment of the phreatophytes as tamarisk cannot effectively use groundwater at depths greater than 15 feet bls.

Montgomery (1986) reports that the MCFCD cleared a 1000-foot channel of the Gila River from 91st Avenue to Gillespie Dam of phreatophytes in the early 1980s. The stand of tamarisk continues in places on other side of this 1000-foot channel.

In summary, desert vegetation is sparse and its water use can be neglected. However, phreatophytes along the Gila River, primarily tamarisk, use significant quantities of groundwater. The amount of water used by phreatophytes in the Sub-Basin in 1974 was estimated to be approximately 18,000 ac.-ft./yr., based on a consumptive use rate of 3.7 ac.-ft./ac.-yr. Reports indicate that phreatophytes died back significantly between the 1940s and the late 1960s with declining water tables. Effluent releases starting in 1962 and flood events starting in 1965 brought the water table back up and allowed re-establishment of the phreatophyte stands.

2.5.5 Land Use

Land uses in the region comprise primarily either undeveloped desert or farmland. Farmland in the region has been irrigated by flood irrigation methods since the early 1900s with groundwater and surface water including Gila River water, effluent and irrigation return flows from Buckeye Water Conservation and Drainage District (BWCDD). Because water use is dominated by agricultural use, the character of cropping and farm water applications is the focus of this subsection. Information was only fund on the organized irrigation districts of Buckeye (BWCDD) and Arlington Canal Company (ACC) in published reports. Cropping patterns on the farms of the Palo Verde Hills and along Centennial Wash are assumed to be similar.

Water Resources Associates (1975 – Table 3) estimated that BWCDD cropping in 1974 was dominated by alfalfa (46%), followed by barley (18%), cotton (13%), sorghum (10%) and sugar beets (5%). Subtracting 67,070 ac.-ft./yr. of consumptive use (3.65 ac.-ft./yr. as a weighted average of crop types and acreages) from 134,943 ac.-ft./yr of applied water (53,602 ac.-ft./yr was pumped groundwater in BWCDD) lead Water Resources Associates (1975 – Table 2) to estimate 67,873 ac.-ft./yr of excess irrigation by BIC in 1974. BIC pumped and discharged 15,500 ac.ft of groundwater for drainage in 1974 (Water Resources Associates, 1975 - page 9). The remainder, or 49,400 ac.-ft./yr. would have become recharge to groundwater beneath the BWCDD lands.

Water Resources Associates, Inc (1975 - page 22) estimated the consumptive use for ACC lands in 1974 at 12,800 ac.-ft./yr., based on 3.2 ac.-ft./ac.-yr. on 4,000 acres. The lower consumptive use factor was selected by Water Resources Associates (1975) for ACC because of a lower percentage of alfalfa than BWCDD, whose total consumptive use was estimated at 3.65 ac.-ft./ac.-yr. in 1974.

Halpenny and Greene (1975 – page 5-5) state that ACC never irrigated more than 4,000 acres with diversions of surface water and that the quantity was less than 4,000 acres in 1974. Much of the diverted water is tail water and drainage water from BWCDD. Halpenny and Greene's (1975 – page 5-12) estimates for diversions by ACC "in early days" were 24,000 ac.-ft./yr based on 6 ac.-ft./ac.-yr. on 4,000 acres although no records are available. More recent estimates (Halpenny and Greene, 1975 - page 5-14) of diversions are 1,500 ac.-ft./yr. in recent years.

Long (1983 – sheet 1) reported that surface water deliveries to ACC were less than 5,400 ac.-ft./year although delivery records do not exist.

Montgomery (1986) reported that ACC pumped 2,402 ac.-ft./yr. from 10 wells in 1984. Most of ACC water supply was from surface water diversions from the Gila River, which comprise primarily effluent from the City of Phoenix and drainage water from BWCDD.

Montgomery (1988) developed water balance models for areas, one of which was the ACC area. The 1985 (base case) water balance models for the ACC area (Montgomery, 1988 - page 69) compiled the following estimates: 9,088 total acres; 3,501 irrigated acres; 4,000 phreatophyte acres; 485 river surface acres; no acres with groundwater less than 5 feet bls; and 14,495 ac.-ft./yr. applied irrigation. Groundwater flow into the ACC area at Hassayampa was estimated at 15,900 ac.-ft./yr (Appendix B, page B-2), groundwater flow out of the ACC area to the west was estimated at 18,000 ac.-ft./yr and groundwater flow out of the ACC area to the south was estimated at 1,000 ac.-ft./yr. Seepage tests (Montgomery, 1988 - page 88) indicate 11,880 ac.-ft./yr of ACC canal losses to groundwater in 1985. Excess deep percolation in test plots ranged from 0 to 17 percent of applied water and averaged 8 percent (Montgomery, 1988 - page 89), total deep percolation recharge for 1985 was estimated at 3,600 ac.-ft./yr (Montgomery, 1988 - Appendix B, page B-2). The Gila River carried more than 1,000,000 ac.-ft./yr. of flood flows in 1985, but was estimated to receive 10,000 ac.-ft./yr of groundwater in the ACC area in 1985. Phreatophyte water use for 1985 was estimated at 24,000 ac.-ft./yr. in the ACC area, drains collected or lost less than 500 ac.-ft./yr.

In summary, there are a substantial number of reports of agricultural cropping and water use for the BWCCD and ACC, although detailed records were never kept by either irrigation district. Some of the reports are contradictory.

However, it seems reasonable to say that there have typically been approximately 4,000 acres of land irrigated in the ACC area with a consumptive use of approximately 13,000 ac.-ft./yr. Cropping has been dominated by alfalfa, barley, cotton, sorghum, and sugar beets. Assuming an efficiency of 65%, the total applied water for the ACC area is approximately 20,000 ac.-ft./yr. ACC pumps approximately 2,000 ac.-ft./yr from 10 wells. This leaves a residual of approximately 18,000 ac.-ft./yr. that is supplied from surface water diversions. With approximately 12,000 ac.-ft./yr. of canal seepage losses, total surface water deliveries to the ACC prior to transport in the canal would be 30,000 ac.-ft./yr. Total recharge to groundwater beneath ACC lands can be estimated as the sum

of the difference between applied water and consumptive use (7,000 ac.-ft./yr.) and canal seepage losses (12,000 ac.-ft./yr.). The total estimate is 19,000 ac.-ft./yr. for recharge to groundwater beneath ACC lands. The operations of the ACC since the 1930s are assumed to have remained relatively constant, but the variation in cropping types over time has not been investigated. It appears that cropped acres dropped from approximately 4,000 acres to approximately 3,500 acres between the 1970s and 1980s. The reason for this decrease is not known.

Conditions for the irrigated lands along Centennial Wash and between the Palo Verde Hills are not available, but it is reasonable to assume that cropping types were similar to those of ACC and BWCDD lands. Water application rates and seepage losses in canal transport would be less for farms outside of the ACC because the water supply delivery points (wells) are numerous and scattered throughout the irrigated areas.

2.5.6 Summary

In summary, the region is dominated by open, undeveloped desert with sparse vegetation. The soils are typically loams, except in stream channels, and are therefore generally suitable for farming. Through recorded history, the Gila River in the Sub-Basin has been perennial with declining natural flows being replaced by increasing releases of municipal wastewater treatment effluent since the early 1960s. The tributary rivers and washes to the Gila River are typically dry, but during rare flood events, the water quickly sinks into the channels and recharges the groundwater. Agricultural areas have been planted since the early 1900s in cotton, alfalfa, barley, sorghum and sugar beets and irrigated with groundwater and surface water. Recharge from excess irrigation at a rate of one to two ac.-ft./ac.-yr. (and canal seepages losses in the ACC) contribute significant recharge to groundwater.

2.6 Subsurface Hydrology

This subsection is divided into discussion of available water-level elevation contour maps, discussion of available hydrographs, and interpretations presented by the primary investigators of the region. This subsection is fundamental to selecting a local model study area, since it reviews information from actual measurements of the groundwater system in the region.

2.6.1 Available Water-Level Elevation Contour Maps

The available water-level elevation contour maps for the Sub-Basin typically assume that there is one, regional principal aquifer. As discussed previously, several geologic

units, each comprising an aquifer, may be viewed as a single aquifer system. The exceptions are maps of a limited occurrence of groundwater at elevations tens of feet above the principal aquifer system between the Palo Verde Hills (the "perched zone"). The USGS, ADWR, and Water Development Corporation prepared the maps discussed in this subsection.

The water-level elevation contour map presented by Stulik (1974 – Plate 2) for 1970 indicates southbound groundwater flow from the Hassayampa Plain was splitting, with part turning west and moving to an area of depressed water-level elevations near Tonopah, part turning southeast and moving through and beneath the Palo Verde Hills, and part continuing due south to the Gila River near Buckeye (Figure 5). The portion passing through and beneath the Palo Verde Hills moved towards two areas of depressed water-level elevations: 1) the area between the Palo Verde Hills with a center three miles south of Wintersburg and 2) the area along both the north and south sides of Centennial Wash.

The water-level elevation contour map presented by Stulik and Laney (1974 – Sheet 2) for 1975 indicates the same flow pattern as in 1970 (see previous paragraph) with one difference. The area of depressed water levels in the vicinity of Centennial Wash appeared to be limited to north of Centennial Wash rather than extending south of it as in 1970 (Figure 6). However, because elevation data are not plotted on either the 1970 or 1975 maps, the basis for the differences could not be determined without recreating the maps from the original data. Inspection of both the elevation maps and the water-level change map presented in Stulik and Laney (1976 – Sheet 1) indicates that the water levels just north of, and along the Buckeye-Salome Road (at approximately the 850 feet amsl equipotential contour) remained relatively constant (± 2 feet) between 1970 and 1975 while significant changes were observed to the southeast (10 feet decline) and northwest (20 to 30 feet decline).

The water-level elevation contour map presented by Long (1983 – Sheet 1) for 1982 indicates the same flow pattern as 1975 (see previous paragraph) with one exception. The area of depressed water- level elevations in the vicinity of Centennial Wash had then expanded to a much larger, almost circular area (Figure 7). However, because elevation data are not plotted on either the 1970 or 1975 maps, the basis for the differences could not be determined without recreating the maps from the original data. Inspection of both the elevation maps and the water-level change map presented in Long (1983 – Sheet 2) indicates that the water levels just north of and along the Buckeye-Salome Road (approximately the 850 feet amsl equipotential contour) remained relatively constant (-8 to +3 feet) between 1975 and 1982 while significant changes were observed to the southeast (20 to 45 feet decline) and northwest (50 to 75 feet decline).

Errol L. Montgomery & Associates, Inc. (1988) presented a depth to water map for the corridor along the Salt and Gila Rivers from 23rd Avenue to Gillespie Dam for 1986-1987. Numerous piezometers less than 30 feet deep were installed along the Gila River for this study and water-level measurements from the piezometers were used to construct this map. Depth to water was less than 10 feet near and along the Gila River channel

from east of the confluence with the Hassayampa River to Gillespie Dam. Depths to water in wells decreased to 44 – 62 feet bls in wells along the Arlington Canal. The distance between the two lines of measurements (less than 10 feet and 44 to 62 feet) is approximately 1 mile. Given that the land surface rises 10 to 15 feet between the two lines of measurements, the hydraulic gradient would be 40 to 50 feet per mile or 0.008 to 0.009 between the Gila River and areas of depressed water-level elevations along Centennial Wash.

The water-level elevation contour map presented by Halpenny and Halpenny (1988 – plate 3) covers the area of the Hassayampa Plain and the area east of the Hassayampa River from the east end of the Belmont Mountains to I-10 (Figure 8). Given that there is little to no pumping in the Hassayampa Plain, the sharp bends in the equipotential contours extending northwest along Jackrabbit Wash and North along Hassayampa River may indicate elongated arrangements of distinctively coarse-grained sediments with accompanying larger hydraulic conductivity. The apparent cone of depression near I-10 may be due to pumping along the west end of the RID canal.

The water-level elevation contour map presented by Hammett and Herther (1995 – Sheet 1) for 1992 indicates the same flow pattern as 1983 (see discussion of Long, 1983 above) and 1987 (see discussion of Halpenny and Halpenny, 1988 above) with the exception that the equipotential contours in the Hassayampa Plain are much straighter (less curved) than those presented for 1987 by Halpenny and Halpenny (1988) (Figure 9). The reason for this is not known. Inspection of both the elevation maps and the water-level change map (1982 to 1992) presented in Hammett and Herther (1995 – Sheet 2) indicates that the water levels just north of and along the Buckeye-Salome Road (approximately the 850 feet amsl equipotential contour) remained relatively constant (-2 to +8 feet) between 1982 and 1992 while significant changes were observed to the southeast (1 to 22 feet of increase) and northwest (25 feet of decline to 57 feet of increase).

The water-level elevation contour maps for the immediate vicinity of the Hassayampa Landfill presented by Errol L. Montgomery & Associates, Inc. (1994) indicate flow is due south in both Units A and B of the UAU with horizontal gradients of 0.004 in Unit A and 0.006 in Unit B in October 1993.

The available water-level elevation contour maps typically assume that there is one, regional, principal. In general, the maps resulting from the assumption of a single principal aquifer system appear reasonable in that groundwater flow paths appear to proceed smoothly from recharge to discharge areas. Despite the fact that different study areas and different time periods were considered, a consistent flow pattern is indicated by all of the available water level maps. Of particular interest to this study is the permanence of the 850 feet amsl equipotential contour (along the Buckeye-Salome Road) on the various maps while water level elevations dropped in the central Centennial Wash and Tonopah Desert areas.

2.6.2 Available Hydrograph Data

Building upon the observations from the available water-level elevation contour maps, review of available hydrographs assists in identifying areas where groundwater has distinctive responses over time. Areas with consistent decline and/or buildup patterns are considered to have common geologic and hydrologic constraints and are candidates for separate analysis, while giving consideration to their interactions through their boundaries. In this subsection, the hydrographs presented in various reports are discussed first, followed by review of hydrographs recently created from available historical water-level data.

Hydrographs for the period 1951 to 1973 presented and discussed in Stulik (1974 – pages 9 and 10, Figure 3) indicate periods of continuous declines of two to three feet per year in the Centennial Wash area (see [C-01-07] 15 bbb), and five feet per year in the western part of the Tonopah area (see [B-02-06] 06cbb, [B-02-07] 27aab, and [B-02-07] 29aaa). During these times of continuous declines in the Centennial Wash and Tonopah areas, the water levels in areas to the east and north remained relatively unchanged (see [B-01-05] 8dab, [B-01-06] 03bbc, and [B-02-05] 29dac). Stulik (1974 – page 9) related the magnitude of water-level declines to the magnitude of nearby pumping.

Hydrographs presented in Fugro (1980) indicate that cessation of the irrigation pumping for PVNGS construction in the late 1970s lead to rises in water levels in the principal aquifer and declines in the perched zone.

Water-level elevation hydrographs for wells along the Gila River between Hassayampa and Gillespie Dam presented by Montgomery (1986) indicate rises starting in 1962 and continuing to the time of report preparation (1985). This is coincidental with the rapid increase in effluent releases from the 91st Avenue WWTP. Hydrographs for wells six to eight miles to the northwest of Hassayampa showed slight declines (10 to 15 feet) between the mid 1950s and 1985. Collectively, these data indicate that the increasing quantities of effluent in the Gila River were the source of the water-level elevation rises and the waterlogging.

Figure 10 shows the locations of wells grouped for hydrographs in succeeding figures. The groups by area for hydrographs presented in Figures 11 through 18 are:

- Western Centennial Wash
- Eastern Centennial Wash
- Palo Verde Hills
- Shallow Wells in Palo Verde Hills
- Southern Tonopah Desert
- Arlington Valley
- Hassayampa
- I-10 – Buckeye-Salome Road Corridor

The first five groups are for areas with major pumping centers for agricultural production since the late 1940s. The last three areas surround these areas and indicate the extent to which pumping responses spread outward from the pumping centers in the past.

Each of the hydrographs has the same time axis (January 1, 1940 to December 31, 2000). The limits of the elevation axis scales may differ, but they all have the same vertical scale (20 feet per inch) to allow easy comparison between them.

Figure 11 presents the group of hydrographs for wells selected from the western Centennial Wash area. Steady declines of 100 to 110 feet were measured in wells in this area between approximately 1948 and 1981-1982 (3.2 feet per year), followed by rises of 30 to 50 feet between 1982 and 2000. A slight reduction in the rate of rise may be noted since 1995. Two wells shown on Figure 11 ([C-01-06] 19cbb [168 feet] and [C-01-06] 20aba [280 feet]) are much shallower than the other wells. They experienced approximately 30 feet less drawdown between 1948 and 1982 than the other wells.

Figure 12 presents the group of hydrographs for wells selected from the eastern Centennial Wash area. Steady declines of 30 to 50 feet were measured in wells in this area between approximately 1954 (earliest record) and 1969 (2.7 feet per year), followed by declines of an additional 10 feet between 1969 and 1981-1982 (a reduced rate of 0.8 feet per year). The eastern Centennial Wash area experienced rises of 25 to 35 feet between 1982 and 2000. A slight reduction in the rate of rise is apparent in the data after 1995.

Figure 13 presents the group of hydrographs for three production wells and one deep (490 feet total depth) monitoring well selected from the Palo Verde Hills area. A sporadic, but persistent decline of 105 feet was measured in (B-01-06) 27cbc between approximately 1954 (earliest record) and 1962 (13.1 feet per year), followed by stabilization or partial recovery between 1962 and 1968. Water levels in another well declined 40 feet from1956 to1962 (6.7 feet per year). In 1968, declines of an additional 35 to 50 feet between1968 and 1975 were measured in wells in the area (a reduced rate of 6.0 feet per year). The Palo Verde Hills area experienced rises of 15 to 65 feet between 1975 and 1984. Water level declines resumed from 1984 to 1987-1988 when recovery of 5 to 15 feet was measured. Monitoring well PV-7 showed a different pattern, declining 20 feet between 1973 and 1992 without the fluctuations noted in the production wells.

Figure 14 presents the group of hydrographs of two shallow (20 to 50 feet bls) monitoring wells selected from the Palo Verde Hills area. Measurements of water levels in thee wells commenced with the cessation of irrigation September 1975 on the farmland acquired for the PVNGS. A smooth, decreasing rate of decline is apparent in the hydrographs for these three wells. The water levels in one well (PV-31H) began a seasonal cyclic fluctuation in late 1977 that has been attributed to periodic recharge in a large detention basin constructed at the PVNGS facility.

Figure 15 presents the group of hydrographs for wells selected from the southern Tonopah Desert area. Steady declines of 110 to 125 feet were measured in wells in this

area between approximately 1956 (earliest record) and 1985-1986 (4.1 feet per year), followed by rises of 10 to 20 feet between 1985 and 2000. Two of the wells ([B-01-06] 07 bda1 [340 feet] and [B-02-07] 23bca1 [390 feet]) are relatively shallow, yet water levels declined at a rate similar to that of wells more than twice as deep. One well ([B-01-06] 07abd1 [85 feet]) is much shallower than the other wells. Water levels in this well declined much less (30 feet as opposed to over 100 feet in the other wells) and the water level declines did not begin in this well until after 1970 (as opposed to declines starting before 1956 in the other wells).

Figure 16 presents the group of hydrographs for wells selected from the Arlington Valley area. Steady declines of 20 to 40 feet were measured in wells in this area between approximately 1949 and 1964 (2.0 feet per year), followed by rises of 20 to 30 feet between 1964 and 1968. Water levels dropped as much as 50 feet between 1968 adn1970 before rising abruptly again by 30 to 60 feet between 1970 and 1973. With the exception of another sudden downturn in water levels in 1975-1976, water levels rose to high points that have typically been sustained since 1979. One well in this group ([C-01-05] 17abb1 [110 feet]) is shallower than the other wells, and located farther north. The water level in this well is typically 50 feet higher then the others and its fluctuations are similar to the other wells, but with less magnitude (± 5 feet from 1955 to1998) in fluctuation.

Figure 17 presents the group of hydrographs for wells selected from the Hassayampa area. Steady declines of 15 to 30 feet were measured in wells in this area between approximately 1949 and 1964 (1.5 feet per year), followed by rises of 15 to 20 feet between 1964 and 1975. Water levels in wells in this area have remained relatively steady between 1975 and 2000. Although the wells in this group vary significantly in depth, the responses in terms of water levels have been similar over the period studied here. However, water levels from two wells (Hassayampa Landfill monitoring wells MW-1UA, B) drilled specifically to monitor different depth intervals show that a vertical head difference of 30 feet exists between shallow silt clays and deeper interbedded sands, gravels and silty/sandy clays. The sudden decline in water levels in MW-1UA in March of 1993 is due to commencement of the pumping of 7 gpm from four extraction wells for the remedial action. The water levels in MW-1UB fluctuate up in the winter and down in the summer (± 4 feet), a pattern that is not seen in MW-1UA.

Figure 18 presents the group of hydrographs selected for wells in the area south of Interstate 10 and north of the Buckeye-Salome Road and between the south Tonopah Desert and Hassayampa areas discussed in previous paragraphs. These wells are typically 150 to 400 feet deep. Two are located farther south (closer to the Buckeye Salome Road) and have relatively lower water level elevations. The striking feature of all of the hydrographs in Figure 18 is that the water levels remained relatively steady (fluctuations are ± 5 to10 feet from 1945 to 2000) while large declines (greater than 100 feet) and rises (greater than 50 feet) were occurring in the Centennial Wash, Palo Verde Hills and Tonopah Desert areas. The differences are noteworthy given that the Centennial Wash, Palo Verde Hills and Tonopah Desert areas are only six, three and six miles, respectively, from the center of this well group.

In summary, water-level elevation measurements for wells in the different areas grouped in the hydrographs indicate that pumping in the Centennial Wash, Palo Verde Hills and Tonopah Desert areas resulted in localized drawdowns that did not expand to the Arlington Valley or Hassayampa area or to the corridor between I-10 and the Buckeye-Salome Road, despite their proximity. Within the pumping centers, water level data from some relatively shallow wells indicate much higher water-level elevations and distinct water-level patterns compared to water-level elevations in the deep production wells.

2.6.3 Selected Interpretations

In this subsection, the authors of previous investigations interpret the meaning of the water-level elevation contour maps and hydrographs in their respective reports. These interpretations are presented in order of publication and are summarized at the conclusion of this subsection.

Stulik (1974 – pages 8) interpreted the measured water levels in the area to represent a single water-table aquifer and considered the valley-fill deposits to be the principle aquifer in the area (Stulik, 1974 – page 7). Exceptions noted by Stulik (1974 – pages 8-9) included water levels in shallow wells near Winters Wash. Wells in (B-01-06) 07 appear to be an example of the shallow wells noted by Stulik (1974).

Water Resources Associates (1975) report that water could leave the Gila River channel and recharge groundwater in 1974 from 23rd to 115th avenue (2.5 miles below 91st avenue) and from El Mirage Road to the Buckeye heading (an additional distance of approximately 2.5 miles).

Water Resources Associates (1975 – page 16) report that Gillespie Dam had the effect of raising the water table in the Arlington area. Halpenny and Greene (1975 – page 5-5) report that Gillespie Dam was completed in 1921 and had filled with sediment to the crest by 1924.

Halpenny and Greene (1975 – page 5-14) report that water levels in the Liberty-Buckeye-Hassayampa area declined 37 feet from the 1945 to 1965 and then rose one to 37 feet during the period 1965 to 1973 when flood events locally filled groundwater reservoir.

Halpenny and Greene (1975 – Table 11) report that BWCDD had to start drainage pumping in 1969 at approximately 3,000 ac.-ft./yr. and increased that drainage pumping to approximately 10,000 ac.-ft./yr. in 1970. They further reported that water levels were at land surface in the largest area (well east of Salt-Gila confluence) during 1910-1920. Pumping by Roosevelt Irrigation District (RID – to the east of the Sub-Basin) reduced levels by 1930 to the point that river flows were insufficient for diversion and BWCDD started using wells to supplement surface water deliveries (Halpenny and Greene, 1975 - page 5-14).

Fugro (1980) interpreted the Tertiary Volcanic-Sedimentary Bedrock Sequence as the principal regional aquifer. Water in the Upper Silt Deposits above the Palo Verde Clay was interpreted as perched water of limited extent. Maps of the principal aquifer water-level elevations are similar to those prepared by Stulik (1974) and Stulik and Laney (1976). Fugro (1980 interpreted the principal aquifer to be artesian (confined) beneath the PVNGS site, but that water table (unconfined) conditions existed westward from the west boundary of the site. Maps of the perched water developed by Fugro (1980) indicate an elliptical mound with upper surface ranging from 880 to 920 feet amsl that dissipates in all lateral directions. They measured variable amounts of saturation beneath the Palo Verde Clay that holds up the perched water. Fugro (1980) interpreted the Palo Verde Clay to be a leaky aquitard.

Long (1983 – Sheet 1) reported that groundwater was typically unconfined in the Tonopah Desert, Hassayampa and Arlington areas (and possibly the Centennial Wash area) and confined (for the regional aquifer) and perched above the Palo Verde Clay beneath the PVNGS area. The upper surface of the perched water ranged from 865 to 916 feet amsl in 1982 while the regional aquifer water levels below the perched water ranged from 700 to 800 feet amsl in 1982.

Halpenny (1984 – page 7-1) reported that drainage of high groundwater levels at Buckeye started in 1922 and consisted of open drains. Wells came into use for drainage at Buckeye in the 1930s. Base flow at the Buckeye heading ceased in 1957. Effluent reached the Buckeye heading in 1962.

Halpenny (1984 – page 4-2) characterized Buckeye as being close to the "cork in the bottle" in that groundwater from the Salt River Valley flows toward this area, but the mountains form a constriction or narrows that are made worse, according to Halpenny (1984), by the construction of Gillespie Dam in the early 1920s. Halpenny (1984 – Plate 1) presented a water-level contour map for the Buckeye area for 1983 that showed southward flow to the Gila River near the Hassayampa River and flow around the south end of the White Tank Mountains into the West Salt River sub-basin. Numerous hydrographs for BWCDD wells presented by Halpenny (1984 – Appendix B) show rises of 20 to 70 feet over the period from the early 1960s to the date of the report. The largest rises occurred in early 1966 in response to the 1965-1966 flood event.

Halpenny (1984 – page 7-3) reported that seepage from the Buckeye Canal is not significant downstream from well 3A (far to the west of our study area) based on trenching for PVNGS pipeline which was dry at levels below the nearby invert of the BIC canal.

Halpenny and Halpenny (1988 – page 4-7) pointed out that the key to understanding the groundwater system of the Hassayampa Plain was noting that once the Hassayampa River crosses the fault at the south end of the Vulture Mountains, it encounters deep alluvial fill and essentially all flow sinks in and becomes recharge. Flows reach Arlington three to four days in some years and no days in most years. They presented a

water-level contour map (Halpenny and Halpenny, 1988 – Plate 3) that indicates that flow is primarily south along the course of the Hassayampa River at least as far south as the south end of the White Tank Mountains. An area of depressed water-level elevations is indicated near the west end of the RID canal approximately 4 miles west of Buckeye.

Based on a comparison of a north-south section of the Hassayampa Plain through water-level elevation contour maps for 1945 (by the USBR), 1982 (Long, 1983) and 1987, Halpenny and Halpenny (1988) concluded that groundwater flow has been steady in the Hassayampa plain for at least 40 years and that this is persists despite large recharge events on Jackrabbit Wash and the Hassayampa River.

Errol L. Montgomery and Associates, Inc. (1994, 1998) installed monitoring wells in two vertical intervals of the UAU: an upper Unit A (75-105 feet bls - dominated by clayey silt and silt clay layers) and a lower Unit B (105-260 feet bls – comprising interbedded silt-clay and sandy gravel layers). The water levels in Unit B were approximately 30 feet lower than the water levels in Unit A, indicating downward flow. Water levels in Unit B fluctuated up and down with seasonal pumping while Unit A water levels do not fluctuate with seasonal pumping.

The available interpretations for the Sub-Basin consistently portray most water-level data to represent a single regional principal aquifer. The exception is an isolated perched zone in the vicinity of PVNGS in the Palo Verde Hills area. The principal aquifer is unconfined expect for where it passes through the Palo Verde Hills area and is confined above by the Palo Verde Clay. Water-level elevations were close to land surface early in the 1900s and required localized drains and drainage pumping by BIC and RID to address waterlogging, but large-scale regional pumping drew the water levels down between the 1930s and the 1960s. Large flood events and the increasing release of effluent in the early 1960s locally refilled the groundwater system around the Gila River.

2.6.4 Summary

The available water-level elevation contour maps, hydrographs and reported interpretations provide a consistent basis for interpreting the regional subsurface hydrology of the Hassayampa Sub-Basin. Large declines followed by rises in water-level elevations have been observed in several areas, such as Arlington and Hassayampa, or Centennial Wash, Palo Verde Hills and Tonopah Desert, while water-level elevations along the Buckeye-Salome Road remained essentially constant. Each of the areas of decline and rise have distinct forms in terms of timing and magnitude which reflect the primary causes of the declines and rises: localized pumping of groundwater or flows in the Gila River. Together, the data may be interpreted to indicate that there are restrictions to groundwater flow between the areas of distinctive groundwater responses noted in the past.

2.7 Selection of Local Study Area

Based on the observations condensed in this section, the area shown on Figure 19, bounded by the Salome-Buckeye Road on the northwest is a useful study area for further work in estimating impacts from pumping groundwater for the proposed power plants. This will be called the Centennial Wash Area in this report. The remainder of this report is a detailed analysis of data for the information available within and immediately adjacent to the Centennial Wash Area.

3.0 GEOLOGIC FRAMEWORK

3.1 Introduction

The geologic structure of the Centennial Wash Area serves as the framework for consideration of groundwater flow. The subsurface architecture is evaluated and interpreted here in detail sufficient to define the primary controls on groundwater flow. Specifically, the extents of the following are considered important in controlling groundwater flow at the scale of the Centennial Wash Area:

- Precambrian basement complex (granite-gneiss),
- Tertiary bedrock (conglomerates, sandstones and volcanics) and
- Tertiary to Quaternary unconsolidated to weakly consolidated sediments (Red LAU, MAU and UAU).

In this section, the geology of the Centennial Wash Area is discussed in subsections on sources of data, approach to interpretation, geologic conceptual model, and discussion.

3.2 Sources of Data

The primary sources of data for interpreting the geology of the Centennial Wash area include:

- surficial mapping by the AGS, USGS and Fugro,
- Gravity data in the public record and from PVNGS,
- Drillers' logs on file at the ADWR,
- Geologists' logs by Fugro,
- Borehole geophysical logs for selected Youngker Farms and RID wells on file at ADWR, and
- Borehole geophysical logs for PVNGS boreholes presented by Fugro.

3.3 Approach for Interpretation

The approach taken here to defining the geologic structure of the Centennial Wash Area is to adopt the surficial mapping of the AGS as the most recent interpretation of exposed rocks. Next, the framework and identification of units in boreholes presented by Fugro (1978, 1980) is adopted due to its detail and substantial supporting database. Then, drillers', geologists', and borehole geophysical logs are interpreted working from Fugro's (1978, 1980) definitions outward away from areas where Fugro drilled and inspected core. Finally, the upper surface of basement complex materials in the subsurface is approximated, based on the gravity interpretations of hydroGEOPHYSICS (2000) and elevations of selected outcrops taken from 7.5 minute topographic quadrangle maps of the USGS. Outcrop locations for granite-gneiss and volcanics were transferred

from the AGS maps and outcrops of the LAU were transferred from Fugro (1978) maps to the topographic quadrangle maps to compile additional elevation point data.

3.4 Geologic Conceptual Model

The conceptual model of the geology of the Centennial Wash Area is described in this subsection as a history of the area. Plots of the surfaces for these units are presented and discussed in ascending order as well.

The area is underlain to unknown, but probably very large depths by Precambrian granites, gneisses and schists. These materials comprise the uppermost part of the North American Continent. These materials will collectively be called the Basement Complex in the Centennial Wash Area. The geologic symbol ***YXg*** is given to this material. Figure 20 is a plot of the estimated elevations of the upper surface of the Basement Complex as interpreted from drillers' and geologists' logs, surface outcrops and gravity surveys for the area.

All younger geologic materials were deposited and eroded from the platform of the Basement Complex. If geologic materials of Paleozoic, Mesozoic, or early Cenozoic age were deposited in the Centennial Wash Area, as they were on the Colorado Plateau, they were removed prior to the Tertiary period.

During the early Tertiary period, conglomerates were deposited from erosion of the primarily granitic Precambrian Basement complex. Soon thereafter, a wide variety of ashfall rhyolite tuffs, andesitic flows, breccia and tuffs and basalt flows inundated this area. There was a shift in composition from acidic to basic igneous material as time progressed. A distinctive white sandstone was formed from the earliest ash falls. These extrusive and sedimentary materials of the early to mid Tertiary period will collectively be called the Tertiary Volcanic-Sedimentary Sequence in the Centennial Wash Area and will be given the geologic symbol ***Tsv***. Figure 21 is a plot of the estimated elevations of the top of the Tertiary Volcanic-Sedimentary Sequence interpreted from drillers' and geologists' logs and outcrop exposures in the area.

During the middle to late Tertiary period, conglomerates were formed from erosion of the Precambrian and Tertiary rocks. These conglomerates range from siltstones to strongly-consolidated debris flows, are now red to brown in color, and are correlative with the Red Unit exposed on the head of Camelback Mountain in central Phoenix and Red Mountain east of Mesa. Fugro (1978-1980) named these materials the Tertiary Volcanic Fanglomerate as an indication of the depositional system type they formed in. This material in the Centennial Wash will be called the Tertiary Red Unit in order to conform to the USGS names given in the adjacent West Salt River Valley and will be given the geologic symbol ***Tvfn*** to maintain consistency with the primary work of Fugro (1978-1980). Fugro (1978-1980) also gave this material the designation lithologic zone (LZ)-1, which will also be used here. Figure 22 is a plot of the estimated elevations of

the upper surface of the Red Unit as interpreted from drillers' and geologists' logs for the area.

At the end of the Tertiary period, sand and gravel deposits were widespread throughout central Arizona. These deposits are distinctive from the underlying Red Unit in their relative lack of consolidation and light brown or gray color. A common designation for these weakly to unconsolidated deposits is the Lower Alluvial Unit (LAU). Fugro (1978, 1980) also gave these deposits the designation LZ-2, which will also be used here. Some time during the deposition of the LAU, the Basin and Range Disturbance began and created the basins present to this day. The LAU appears to be dominated by proximal alluvial fan depositional systems. Fugro (1980) noted that the LAU is at land surface in the western Centennial Wash area. Figure 23 is a plot of the estimated elevations of the upper surface of the LAU as interpreted from drillers' and geologists' logs and surface exposures in the area.

A sharp break is present between the LAU and overlying, predominantly fine-grained deposits commonly designated as the Middle Alluvial Unit (MAU). Previous studies have also called this unit the Middle Fined-Grained Unit, but this term has been replaced by MAU to allow a more complete characterization. In the Centennial Wash Area, the MAU is divided into the lower Palo Verde Clay and the Upper Silt Deposits. Fugro (1978, 1980) gave these deposits the designations LZ-3 for the Palo Verde Clay and LZ-4 for the Upper Silt Deposits. The Palo Verde Clay contains substantial clay sediments and a notable lack of coarse-grained interbeds. The Upper Silt Deposits is a stack of clayey silts, sandy silts, sandy clays, sands, and gravels. The Upper Silt Deposits are at land surface over much of the central and eastern portions of the Centennial Wash Area. The MAU was deposited in a closed basin (no through-flowing streams) and comprised distal alluvial fan (Upper Silt Deposits) and lacustrine/playa (lake or salt flat) (Palo Verde Clay) depositional systems. Sometime during the deposition of the MAU, the Basin and Range Disturbance normal faulting slowed, and near the end of the time in which the MAU was deposited, through-flowing stream drainage developed. Figure 24 is a plot of the estimated elevations of the upper surface of the Palo Verde Clay as interpreted from drillers' and geologists' logs for the area.

Deposits above the MAU are commonly ascribed to the Upper Alluvial Unit (UAU). Over much of the Centennial Wash Area, the UAU occurs as isolated deposits incised into the MAU. Along the coarse of the Gila and Hassayampa Rivers and along the course of the Centennial, Jackrabbit, Winters, Dickey and other Washes, sands and gravels are common and distinguish the UAU from the underlying MAU. The UAU comprises distal alluvial fan and fluvial depositional systems. Fugro (1978. 1980) called these the Upper Sand and Gravel Deposits and gave these deposits the designation LZ-5.

Together, the UAU, MAU and LAU are given the geologic symbol ***QTbf*** to maintain consistency with Fugro (1978, 1980) and emphasize that they are fill for the basins created by the Basin and Range Disturbance normal faulting.

Two additional geologic materials that are of less interest since they occur above the water table are the Quaternary basalt flows (remnant lava cones) in the UAU near Hassayampa (the Arlington basalt flow) and at Gillespie Dam (the Gillespie basalt flow). These materials are given the designation ***Qb***. Fugro (1978, 1980) designated as LZ-6 proximal alluvial fan deposits forming aprons in limited areas around exposed rock knobs. These materials are given the geologic symbol ***Qsu***.

3.5 Discussion

Geologic units have been defined for the Centennial Wash Area from existing reports and detailed review of drillers' and geologists' logs, surface exposure maps, and geophysical surveys. The Basement Complex has a variable depth of occurrence with a notable rise to mountain outcrops and shallow occurrence beneath the northwestern end of the Palo Verde Hills. The Tertiary Volcanic-Sedimentary Sequence is draped over the basement complex over most of the area, except where the basement complex is exposed in mountains or along the Gila River. The Red Unit apparently is restricted to the area in and surrounding the Palo Verde Hills. The LAU appears to be present over much of the Centennial Wash area and is present at land surface in the western Centennial Wash area. The MAU is present primarily in the eastern Centennial Wash Area where it is present at land surface. The UAU is present in isolated locations in the Centennial Wash area. The UAU is thickest along the Gila River.

4.0 HYDROSTRATIGRAPHIC UNITS

4.1 Introduction

The geologic units require evaluation with respect to how groundwater flows within them. In this section, hydrostratigraphic units are selected from the framework of geologic units described in the previous section. Hydrostratigraphic units are volumes of distinctive groundwater flow regimes and have distinctive hydraulic conductivity distributions derived from their internal architecture.

4.2 Sources of Data

Data considered in this section are the water-level contour maps and hydrographs discussed in Section 2, the geological conceptual model of Section 3 and the geologic unit upper surface maps discussed in Section 3.

4.3 Selection of Hydrostratigraphic Units

The Basement Complex is considered a substantial barrier to groundwater flow and its relatively shallow occurrence beneath the Palo Verde Hills has an important effect on groundwater flow by restricting the area open for flow and propagation of changes in water-level elevations. The Volcanic-Sedimentary Bedrock Sequence would be expected to be less of a barrier to flow than the underlying Basement Complex, but more so than the overlying moderately to weakly consolidated sediments. The sedimentary and volcanic components of the Volcanic-Sedimentary Bedrock Sequence would be expected to have similar groundwater flow characteristics due to the strong consolidation of the sedimentary components. The LAU would be expected to have the highest potential hydraulic conductivity of the basin fill sediments; certainly more than the Red Unit due to the relatively weak consolidation of the LAU compared to the Red Unit. The Palo Verde Clay and Upper Silt Deposits would be expected to confine groundwater flowing beneath and restrict recharge moving down from above.

In this section, groundwater flow is inferred from the water-level elevations and their position relative to the surface separating geologic units. The LAU, Red Unit, and the Volcanic-Sedimentary Bedrock Sequence are interpreted to comprise the principal regional aquifer system in the Centennial Wash area. Multiple aquifers may be present within the principal aquifer system which together account for most of the groundwater flow through the area. In the Arlington Valley, the UAU is also a part of the principal aquifer system.

The principal aquifer is unconfined, expect where the Palo Verde Clay is present below the piezometric surface of the principal aquifer. Where the Palo Verde Clay is

present in such a position, the principal aquifer system is considered a leaky confined aquifer and the Palo Verde Clay is considered a leaky aquitard. Groundwater above the Palo Verde Clay in the Upper Silt Deposits or UAU has been investigated, particularly by Fugro (1978, 1980), and appears to be a localized unconfined aquifer.

4.4 Discussion

Based on the water level maps and hydrographs presented in Section 2, groundwater in the principal aquifer system since the 1960s has had a water table or piezometric surface ranging from approximately 850 feet amsl along the Buckeye-Salome Road to less than 700 feet near Centennial Wash. Prior to the 1950s, water levels near Centennial Wash were between 760 and 770 feet amsl and the lowest point was approximately 720 feet amsl near Gillespie Dam. The water table in the unconfined aquifers above the Palo Verde Clay has had a range of approximately 800 to over 900 feet amsl since the 1970s.

The piezometric surface of the principal aquifer system, as represented by water-level elevations in wells, is above the top of the LAU throughout the area where the Palo Verde Clay has been identified. Therefore, the principal aquifer system is considered confined wherever the Palo Verde Clay is present. Based on inspection of the currently available drillers' and geologists' logs, and consideration of geologic structures, the Palo Verde Clay is not present beneath the two lines of volcanic rock outcrops of the Palo Verde Hills or in the western Centennial Wash area where the LAU outcrops.

The interpretations of groundwater flow presented in Section 2.0 are considered representative of the principal aquifer system. There may be variations in flow among the aquifers within the principal aquifer system, but data are not available to isolate and characterize such differences. Characterization of flow between aquifers within the principal aquifer system is probably not be necessary to predict groundwater responses to pumping for the proposed power plants.

In general, flow in the principal aquifer system moves southwestward into the Centennial Wash Area from a line roughly paralleling the Buckeye-Salome Road. Prior to the late 1940s, the flow continued southward and entered the Gila River or passed through the area near Gillespie Dam into the Gila Bend Basin. Since the 1940s, pumping for farms in the Palo Verde Hills and along Centennial Wash collected a substantial portion of the flow and also caused water to reverse its path and flow from the Gila River towards the wells along Centennial Wash.

In general, flow in the Upper Silt Deposits spreads laterally in several directions until sufficient area is developed to allow flow downward into the Palo Verde Clay. Flow in the UAU along the Gila River generally follows the alignment of the Gila River, but also provides for flow to or from the Gila River.

5.0 BOUNDARIES TO GROUNDWATER FLOW

5.1 Introduction

The arrangement of distinctive geologic materials in the Centennial Wash Area, particularly the Basement Complex, exerts a strong control on the flow of groundwater. Stulik (1974 – Plate 1) considered all rock outcrops to be boundaries to the valley-fill sediments, which he considered the principal aquifer in the area. Stulik (1974 – Plate 1) presented contours of equal thickness of valley-fill deposits. Depths to the base of the valley fill deposits interpreted by Stulik (1974) range from less than 300 feet around exposed rock to more than 1200 feet in a large area including Centennial Wash and the Arlington Valley. Reassessment of the water-level contour maps indicates that occurrences of the Volcanic-Sedimentary Bedrock Sequence may not represent barriers to groundwater flow in the Centennial Wash Area. For this work, the Volcanic-Sedimentary Bedrock Sequence is included in the principal aquifer system.

In this section, the controls of the Basement Complex on groundwater flow in the Centennial Wash Area are briefly reviewed from the available data. Specifically, information on the horizontal and vertical extents of the Basement Complex is compared with the water level elevation maps. A similar comparison is made with respect to vertical flow in the case of the Palo Verde Clay.

5.2 Vertical Boundaries

The upper surface of the basement complex (see Figure 20) is considered a bounding surface for groundwater flow. Of particular interest is the rise of this surface from sea level to over 500 feet beneath the Palo Verde Hills. This ridge of high basement complex is coincidental with closely-spaced contours of equal water-level elevations on the water-level contour maps for 1970, 1975, 1982, and 1992. As groundwater is forced through a thinner cross section, the hydraulic gradients would be expected to increase as seem in the Centennial Wash Area.

The Palo Verde Clay also represents a substantial barrier to groundwater flow, but not as substantial as the basement complex. The large vertical differences between water-level elevations above and below the Palo Verde Clay indicate the restriction imposed by the Palo Verde Clay on vertical groundwater flow. The occurrence of the Palo Verde Clay is coincidental with the rise in the basement complex. The Palo Verde Clay further narrows the cross section for flow passing south and west beneath the Palo Verde Hills.

5.3 Horizontal Boundaries

The west and south edges of the Centennial Wash Area form a corner for the PhxAMA as a whole. As Halpenny (1984) noted, this area can be thought of as the cork (actually more like the neck) of the bottle comprising the groundwater system of the western PhxAMA viewed as a whole. Groundwater flow is laterally restricted from locations where the top of the Basement Complex rises above the water level elevations in the principal aquifer system. Such restriction occurs around the edges of the Centennial Wash Area selected here with the exceptions of:

- the alignment of the Buckeye-Salome Road and the northeast end of the Arlington Valley and
- a two to three-mile long gap directly south-southwest of Gillespie Dam.

5.4 Discussion

The primary boundaries to groundwater flow in the Centennial Wash area are the Basement Complex and the Palo Verde Clay. Contrary to some earlier studies, the Volcanic-Sedimentary Bedrock Sequence in general is currently not considered to present a barrier to groundwater flow in the Centennial Wash Area.

6.0 HYDRAULIC PROPERTIES ESTIMATES

6.1 Introduction

The extents to which water can move through or be stored in a hydrostratigraphic unit are quantified with the parameters hydraulic conductivity and specific storage/specific yield, respectively. These parameters are typically estimated from field and laboratory tests, but they also can be estimated from literature summaries and model simulations.

6.2 Sources of Data

Data for estimating hydraulic parameters are limited at this time for the Centennial Wash Area. Stulik (1974), Fugro (1980) and Halpenny (1984) compiled and summarized specific capacity data for wells in the principal aquifer system. Fugro (1980), ARCADIS Geraghty & Miller (1999) and Hargis+Associates, Inc. (2000) reported on aquifer tests in the principal aquifer system. Fugro (1980) also reported on the results of slug/bail and laboratory permeameter tests. Sempra Energy Resources and Pinnacle West Energy Corporation are conducting additional aquifer testing at this writing (April 2000) to develop additional hydraulic parameter estimates for the Centennial Wash Area.

6.3 Approach for Interpretation

Horizontal hydraulic conductivity (K_H) can be estimated by dividing the transmissivity by the saturated thickness of the well at the time of the test. Transmissivity can be estimated from analysis of an aquifer test, slug test, or bail test, or from a rough, approximate relationship between specific capacity and transmissivity (transmissivity in gallons per day per foot ([gpd/ft] equals specific capacity in gallons per minute per foot of drawdown [gpm/ft] multiplied by 2000 – [Driscoll, 1986 – page 1021]). Vertical hydraulic conductivity (K_V) and K_H can be estimated from laboratory permeameter tests on oriented core samples. Aquifer test estimates are significantly better than estimates based on slug tests, bail tests, or the relationship between specific capacity and transmissivity. In the absence of any field data, K_H can be estimated from literature-reported ranges for similar geologic materials. However, the reported ranges for K_H are very large (several orders of magnitude for a given material)

Specific storage (S_S) can be estimated by dividing the storage coefficient (S_C) by the saturated thickness of the well at the time of the test. Storage coefficient can be estimated from analysis of an aquifer test. Specific yield (S_Y) can be estimated from analysis of an aquifer test. In the absence of field data, S_S and S_Y can be estimated from literature-reported ranges for similar geologic materials. Compared to K, the storage parameters have much smaller reported ranges for a given material.

To the extent that data are presented in the available reports, the interpretations of the authors are reviewed here. Otherwise, the reported values are summarized.

6.4 Hydraulic Conductivity

Stulik (1974 – page 8 and Table 1) presented specific capacity data for the area that range from one to 86 gpm/ft. Transmissivity estimated for this specific capacity range using the approximation (Driscoll, 1986 – page 1021) ranges from 2,000 to 190,000 gpd/ft. These values probably represent the principal aquifer system or parts of the principal aquifer system over a broad area.

Fugro (1980) summarized data for existing wells in the vicinity of the PVNGS site as having pumping capacities of 400 to 2,800 gpm and specific capacities averaging 35 gpm/ft. Average transmissivity estimated from specific capacity is approximately 70,000 gpd/ft. These values probably represent the principal aquifer system within a few miles of the PVNGS site.

A 24-hour aquifer test (Fugro, 1980 – page 20) was conducted in irrigation well (B-01-06) 34abb and the reported results included an estimated specific capacity of 55 gpm/ft at 2,360 gpm and a transmissivity of 100,000 gpd/ft. Assuming a saturated thickness of 1000 feet (the well is perforated from 250 to 1235 feet bls) and converting units leads to a K_H estimate of 13 ft/d. These values probably represent the principal aquifer system at the PVNGS site. Fugro (1978 – Appendix 2I) also reported on a multi-well aquifer test run in sands of the UAU at the PVNGS site between 20 and 40 feet bls. Fugro (1978) interpreted the test results to estimate transmissivity at 4,000 gpd/ft. Assuming a saturated thickness of 18 feet, Fugro (1978) estimated K_H at 30 ft/d. These values probably represent the coarser parts of the UAU at the PVNGS site.

Fugro (1980 – pages 21 to 22,) further summarized the results of slug and bail tests or laboratory permeability tests for the vicinity of the PVNGS site as follows:

Upper Sands, Gravels and Silt Deposits (UAU, LZ-5): K_H of 1.3 ft/d.
Upper Silt Deposit (MAU, LZ-4): $K_H = 0.0013$ ft/d, $K_V = 0.00013$ ft/d
Palo Verde Clay (MAU, LZ-3) $K_H = 0.0013$ ft/d, $K_V = 0.0007$ ft/d

Halpenny (1982a – Table 5) reviewed well data for the Buckeye Irrigation Company (BIC), calculated specific capacities, and evaluated the specific capacity data. He cautioned (Halpenny, 1982a - page 3-16) that specific capacities decrease with time due to well encrustation although aquifer properties remain constant. He also noted that the relationship between the perforated interval and the water table. The use in this case of January water levels for static and pumping water levels during July or August lead to excessive drawdown estimates, and that therefore specific capacities may be higher. Nevertheless, specific capacities for many wells are in the 100 to 300 gpm/ft range, which is exceptionally high. Transmissivity estimated for this specific capacity range

using the approximation (Driscoll, 1986 – page 1021) ranges from 200,000 to 300,000 gpd/ft. Assuming a saturated thickness of 200 feet for the BIC wells and converting units, K_H estimates would range from 130 to 200 ft/d. These estimates probably represent the UAU north of the Gila River near Buckeye. Specific capacities are lower (Halpenny, 1982a – Table 5), 20 to 60 gpm/ft, along the BIC canal for 4 miles east of the Hassayampa River. Transmissivity estimated for this specific capacity range using the approximation (Driscoll, 1986 – page 1021) ranges from 40,000 to 120,000 gpd/ft. These estimates probably represent an unknown combination of the UAU and MAU west of Buckeye.

ARCADIS Geraghty & Miller (1999 – Appendix A) reported on pumping tests conducted November 29 and 30, 1999. The tests were 24 hours in duration and were conducted on Duke wells 4-1 (C-01-06 21CBB2) and 4-2 (C-01-06 21BCB). Their results are as follows:

Well 4-1: At 1,530 gpm, drawdown was 41.5 feet, which yields a specific capacity of 37 gpm/ft. Application of the Cooper-Jacob (1946) semi-log straight-line method to the drawdown data from 1 to 450 minutes resulted in a transmissivity estimate of 109,000 gpd/ft. Application of Theis (1935) Recovery Method to the recovery data from one to 490 minutes resulted in a transmissivity estimate of 86,000 gpd/ft. Until combined drawdown and recovery analysis of this test is conducted, the recovery-based estimate of 86,000 gpd/ft is preferred. The well is open from 229 to 1012 feet bls and the static water level at the time of the test was approximately 170 feet (above the top of the perforations), so the saturated thickness can be assumed to be 783 feet. Dividing transmissivity by saturated thickness yields a K_H estimate of 14.7 ft/d. However, water production is likely limited to intervals beneath the Palo Verde Clay. Estimated depth to the top of the LAU at this well (see Figure in Section 3) is 270 feet bls. The saturated thickness beneath the Palo Verde Clay in this well is then estimated at 740 feet. The estimate for K_H beneath the Palo Verde Clay is 15.4 ft/d. Therefore, the K_H estimate of 15 ft/d developed by ARCADIS Geraghty & Miller Inc (1999 - Table A1) is reasonable.

Well 4-2: At 1,530 gpm, drawdown was 74.1 feet, which yields a specific capacity of 21 gpm/ft. Application of the Cooper-Jacob (1946) semi-log straight-line method to the drawdown data from 7 to 250 minutes resulted in a transmissivity estimate of 62,000 gpd/ft. Application of Theis (1935) Recovery Method to the recovery data from 5 to 340 minutes resulted in a transmissivity estimate of 78,000 gpd/ft. Until combined drawdown and recovery analysis of this test is conducted, the recovery-based estimate of 78,000 gpd/ft is preferred. This well is open from 350 to 980 feet bls and the static water level at the time of the test was approximately 170 feet (above the top of the perforations) so the saturated thickness can be assumed to be 630 feet. Dividing transmissivity by saturated thickness yields a K_H estimate of 16.6 ft/d. The top of the perforations is below the estimated bottom of the Palo Verde Clay. Therefore, the K_H estimate of 16.4 ft/d developed by ARCADIS Geraghty & Miller Inc (1999 Table A3) is reasonable

The results of the two tests by ARCADIS Geraghty & Miller (1999) probably represent the principal aquifer system beneath the Duke Energy property.

Hargis+Associates, Inc (2000) reported on the March 8, 2000 6-hour pumping test of well (C-01 –06) 23adb on the Redhawk property. At 1,875 gpm, drawdown was 97 feet, which yields a specific capacity of 19 gpm/ft. Application of the Cooper-Jacob (1946) semi-log straight-line method to the drawdown data from 8 to 80 minutes resulted in a T estimate of 55,000 gpd/ft. Application of Theis (1935) Recovery Method to the recovery data from 20 to 180 minutes resulted in a transmissivity estimate of 48,000 gpd/ft. Until combined drawdown and recovery analysis of this test is conducted, the recovery-based estimate of 50,000 gpd/ft is preferred. The well is perforated from 140 to 930 feet bls and the 1986 depth to water of 180 feet bls is assumed as an estimate of the static water level, so the saturated thickness can be assumed to be 750 feet. Dividing transmissivity by saturated thickness yields a K_H estimate of 9 ft/d. However, water production is likely from materials beneath the Palo Verde Clay. Estimated depth to the top of the LAU at this well (see Figure in Section 3) is 270 feet bls. The saturated thickness beneath the Palo Verde Clay in this well is then estimated at 660 feet. The estimate for K_H beneath the Palo Verde Clay is 10.1 ft/d. Therefore, the range of K_H estimates given by Hargis+Associates, Inc. (2000) – 6 to 12 ft/d - is reasonable. These results probably represent the principal aquifer system beneath the Redhawk property, but longer testing would be useful for confirming the results of this short test.

6.5 Storage

A 24-hour aquifer test (Fugro, 1980 – page 20) was conducted in irrigation well (B-01-06) 34abb and the resulting estimate for S_C was 0.005. Assuming a saturated thickness of 1000 feet and converting units leads to a S_S estimate of 10^{-6} cubic feet water per cubic foot sediments per foot drawdown (ft^{-1}).

Fugro (1978 – Appendix 2I) also reported on a multi-well aquifer test run in the UAU (Upper Silts, Sands and Gravel Deposits) between 20 and 40 feet bls. Fugro (1978) interpreted the test results with the Theis (1935) method to find a S_C (or S_Y) ranging from 0.008 to 0.013, average 0.01. Reinterpretation of this test with modern water-table aquifer test analysis methods would likely clarify the confusion and find a lower S_C and a higher S_Y.

6.6 Discussion

Transmissivity of the principal aquifer system in the Centennial Wash Area may range between 2,000 and 190,000 gpd/ft and average 70,000 gpd/ft. This summary is based on a rough approximation from specific capacity data, but has been confirmed in a preliminary manner by the results of four single-well aquifer tests: 100,000 gpd/ft, 86,000 gpd/ft, 78,000 gpd/ft and 50,000 gpd/ft). Horizontal hydraulic conductivity of the principal aquifer system estimated from the four available aquifer tests ranges from 10 to 17 ft/d. Specific storage of the principal aquifer system was estimated from one aquifer test at 10^{-6} ft^{-1}. Additional, longer-term (one to seven days) aquifer tests with observation wells are needed to improve the support for estimating transmissivity and hydraulic

conductivity in the area of the proposed power plants. Such tests are planned for the spring of 2000.

The K_H of the Palo Verde Clay appears to be very low, but as expected for these geologic materials: 10^{-3} ft/d, and the K_V of the Palo Verde Clay appears to be one half the K_H. These values were based on core tests that sample a small volume. Therefore, there may be substantial variability to the Palo Verde Clay above or below the values found to date.

The reported values of hydraulic conductivity for the Upper Silt Deposits are surprisingly similar to those for the Palo Verde Clay: 10^{-3} ft/d for K_H and 10^{-4} ft/d for K_V. The Upper Silt Deposits were tested with slug/bail tests for K_H and core tests for K_V. As with the Palo Verde Clay, the Upper Silt Deposits may have substantial variability at volumes larger than those sampled at PVNGS.

A group of slug/bail tests of the UAU at PVNGS resulted in an average K_H of 1.3 ft/d. There is one aquifer test based value for the K_H of the UAU at PVNGS: 30 ft/d. These results indicate significant variability in the UAU at PVNGS. The specific yield reported for the one available aquifer test is unrealistically low, as was stated by the report authors (Fugro, 1978).

7.0 RECHARGE AND DISCHARGE ESTIMATES

7.1 Introduction

This section compiles the available information for the flow of water to and from the groundwater system in the Centennial Wash Area. The groundwater system includes all groundwater in the Centennial Wash Area including the principal aquifer system and perched zones. No distinction is made between locations within the Centennial Wash Area.

All of the estimates made here are preliminary and subject to revision, based on review of this report and the water budget, as well as during model calibration to match historical water-level elevation distributions and changes. This section is intended as a first approximation of groundwater flow in the Centennial Wash Area.

In this section, the term recharge includes the following components or categories of inflows to groundwater:

- West-bound groundwater flow in from the West Salt River Valley, beneath the Gila River channel near Hassayampa
- Southwest-bound groundwater flow in from the Hassayampa Plain beneath the Buckeye-Salome Road
- East-bound groundwater flow in from the Harquahala Basin beneath the Centennial Wash channel at Mullen's Cut
- Direct infiltration of precipitation
- Mountain front infiltration of runoff
- Gila River infiltration
- Hassayampa River infiltration
- Centennial Wash infiltration
- Minor tributary infiltration
- Industrial detention basin infiltration
- Agricultural leaching requirement
- Canal transmission losses

The magnitude of the individual recharge components has changed in the Centennial Wash Area over time. Currently, the largest recharge components in the Centennial Wash Area are the groundwater inflow from the Hassayampa Plain, agricultural leaching requirement, canal transmission losses and Gila River infiltration.

In this section, the term discharge includes the following components or categories of outflows from groundwater:

- Southeast-bound groundwater flow out to the Gila Bend Basin beneath the Gillespie Basalt flow near Gillespie Dam

- Direct evaporation from the water table
- Transpiration from phreatophytes
- Groundwater flow into the Gila River
- Agriculture pumping
- Industrial pumping
- Domestic pumping
- Pumping for livestock watering

The magnitude of the individual discharge components has changed in the Centennial Wash Area over time. Currently, the largest discharge components in the Centennial Wash Area are agricultural pumping and transpiration by phreatophytes.

7.2 Sources of Data

Data to estimate recharge and discharge components in the Centennial Wash Area come from a variety of sources. The studies by the USGS, ADWR and consulting firms reviewed in Section 2 are the primary sources of recharge and discharge estimates and supporting data.

7.3 Approach for Interpretation

Where available, estimates of recharge and discharge components are extracted from the sources discussed above. Other estimates are made based on methods described with the estimates in the following subsections. In all cases, simple methods for estimating recharge or discharge components are employed here which have been used in similar studies of adjacent basins in Central Arizona.

The recharge and discharge estimates are combined in the next section – Section 8.0 Water Budget. Within the framework of a water budget, the estimates of each recharge or discharge component can be compared with each other and their changes can be reviewed over time.

7.4 Recharge Estimates

The recharge components listed at the beginning of this section are described in detail in this subsection. The recharge components have been grouped for further discussion as follows:

- Groundwater flow in from adjacent areas,

- Infiltration of precipitation and runoff, and

- Infiltration from agricultural operations.

7.4.1 Groundwater Flow in from Adjacent Areas

Groundwater flow into the Centennial Wash Area includes:

- West-bound groundwater inflow from the West Salt River Valley, beneath the Gila River channel near Hassayampa
- Southwest-bound groundwater inflow from the Hassayampa Plain beneath the Buckeye-Salome Road
- East-bound groundwater inflow from the Harquahala Basin beneath the Centennial Wash channel at Mullen's Cut

In general, groundwater flow is estimated by applying Darcy's Law to estimates for transmissivity, horizontal hydraulic gradient and cross-sectional width. Where gradients have changed with time, those changes are investigated from water-level elevation maps in the following discussions.

Westbound groundwater inflow from the West Salt River Valley, beneath the Gila River channel near Hassayampa can be estimated from water-level elevation contour maps prepared by ADWR. Reeter and Remick (1986 – sheet 1) present water-level elevation data for 1982 useful for estimating the flow of groundwater. The line of flow between the West Salt River and Hassayampa Sub-Basins appears in 1982 to be only one mile wide and extends up from the exposed rock of the Buckeye Hills at Powers Butte. The flow direction appears to be due south in the area north of this line, which indicates no flow between the Sub-Basins north of this line. The data points indicate a west-southwest gradient of 35 feet per mile (0.007) beneath the Gila River channel across a line extending one mile north from Powers Butte. Water levels for the same walls measured in 1992 (Hammett and Herther, 1996 – Sheet 1) indicate a gradient in the same direction of 56 feet per mile (0.011).

Using the gradient estimated from Reeter and Remick (1986 – Sheet 1) and assuming a section width of one mile and transmissivity of 300,000 gpd/ft for sediments beneath the Gila River channel (see Section 6) results in an estimate of 12,400 ac.-ft./yr. of flow across this line in 1982. Using the 1992 gradient estimated from Hammett and Herther (1996 - Sheet 1) results in an estimate of 19,500 ac.-ft./yr. Errol L. Montgomery & Associates, Inc. (1988 - Appendix B, page B-2) estimated groundwater flow into the ACC area near Hassayampa to be 15,900 ac.-ft./yr. in 1985. ADWR (Correll and Corkhill, 1994 – Figure 16) estimated flow out of the West Salt River Valley Sub-Basin at Arlington to be 3,000 ac.-ft./yr., but did not provide the basis for their estimates. Based on the use of data described above, an estimate of 16,000 ac.-ft./yr. groundwater flow into the Centennial Wash Area at Hassayampa is considered more accurate at this time.

Halpenny and Halpenny (1988 – page 4-45) present a calculation for the portion of groundwater flow moving from the Hassayampa Plain directly south towards the Buckeye area. The cross section is in Township 2 North, Ranges 4 and 5 West, is seven miles long (east to west) and is approximately 3 miles north of I-10 at Palo Verde Road. The estimate is 32,000 ac.-ft./yr and Halpenny and Halpenny (1988, page 4-45) note that this estimate is similar to that made by Montgomery & Associates (1988 page 75, line 50) of 26,500 ac.-ft./yr without the benefit of the testing data collected by Halpenny and Halpenny (1988). Inspection of the maps used by Halpenny and Halpenny (1988 – plate 3) in comparison to water –level contour maps of broader coverage indicate that this estimate does not account for groundwater leaving the Hassayampa Plain for the Tonopah Desert or to pass through the Palo Verde Hills. Therefore, although it initially appears to account for all groundwater flow out of the Hassayampa Plain, this estimate does not apply to the Centennial Wash Area.

Southwest-bound groundwater inflow from the Hassayampa Plain beneath the Buckeye-Salome Road can be estimated from gradients indicated on the maps shown in Figures 5 to 9. The water-level contour maps indicate horizontal gradients along the Buckeye-Salome Road as follows: 1970 – 40 to 120 feet per mile (0.008 to 0.022), 1975 – 70 feet per mile (0.013), 1982 -30 to 70 feet per mile (0.006 to 0.013), 1992 – 50 feet per mile (0.009). The variability in these estimates arises primarily from the assumptions made by the authors in contouring. A value of 50 feet per mile (0.009) appears reasonable to estimate the gradient along this line. The line is 10 miles long and the closest transmissivity estimate for the principal aquifer system is 100,000 gpd/ft for a well at the PVNGS site. The resulting flow estimate is 53,300 ac.-ft./yr.

East-bound groundwater inflow from the Harquahala Basin beneath the Centennial Wash channel at Mullen's Cut can be estimated from water-level elevation contour maps prepared by ADWR. The water level elevation contour map for 1979-1980 presented by Graf (1980 – sheet 1) indicates that water in the Harquahala Basin in 1980 was flowing westward from Mullen's Cut. Therefore, as of 1980, regional groundwater flow was not moving from the Harquahala Basin to the Lower Hassayampa Basin. Prior to development of areas of depressed water level-elevations in both the Harquahala and Centennial Wash Areas, groundwater flowed from the Harquahala Basin into the Centennial Wash Area at a rate of approximately 200 ac.-ft./yr. (Mason, 2000). This amount probably slowly decreased to zero between the 1940 and the 1960s.

7.4.2 Infiltration of Precipitation and Runoff

Direct infiltration of precipitation is estimated from the average annual precipitation, the surface area above the groundwater system, and an estimate of the fraction of precipitation that becomes groundwater recharge for the local climate and soils conditions. The average annual precipitation is 8 inches per year; the surface area of soils above the groundwater system is approximately four townships (144 square miles). The fraction of precipitation that becomes groundwater recharge is estimated at 0.001 based on the work in the Ajo, Arizona area by Liu and others (1995) and a 50:50 mix of old and

young soil surfaces. The resulting estimate is less than 100 ac.-ft./yr. (61 ac.-ft./yr.), which can be neglected at this time.

Mountain front recharge is the sum of the precipitation that falls on exposed rock, escapes evaporation, and runs off into the contact with the unconsolidated sediments at the mountain fronts. Although mountain front recharge is probably concentrated at the mouths of canyons, it is typically estimated as a basin-wide total or an average rate per mile of mountain front. The USGS (Frethey, 1985 – Table 1) has estimated that mountain front recharge in the West and Central ("Storage-Depletion") Basins of Arizona ranges from 50 to 5,000 ac.-ft./yr per basin. In other reports from that same USGS work, a statistical relation between total mountain front recharge flux and total precipitation flux was developed, but only for basins with average rainfall greater than eight inches per year (Anderson and Others, 1992 – page B33). Basins with less than eight inches of recharge per year were arbitrarily assumed to have negligible mountain front recharge in that all precipitation was consumed in soil moisture deficits and evapotranspiration (Anderson and Others, 1992 – page B33).

Since the Centennial Wash Area has average annual precipitation very near the USGS threshold, a relatively small amount of mountain front recharge may be present. Given that the Centennial Wash Area has characteristics similar to other West and Central Basins, a total value of 300 ac.-ft./yr. (in the lower end of the range of the USGS estimates) for the entire area seems reasonable. Given that the Centennial Wash Area has approximately 30 miles of mountain front, the average mountain front recharge estimate is 10 ac.-ft./yr. per mile of mountain front. This compares to 20 ac.-ft./yr. per mile of mountain front estimated by the USGS (Hanson and Benedict, 1994) for the Tucson Mountains, which are relatively low in elevation and precipitation is larger (12 inches per year). No closer studies for mountain front recharge are known at this time

Infiltration from the Gila River has changed over time in the Centennial Wash Area. As noted previously, flows in the Gila River declined from the late 1930s to 1962 when effluent releases increased flow dramatically up to the present. Prior to groundwater pumping for irrigation in the Centennial Wash Area, the Gila River was a gaining stream and infiltration is assumed negligible. This situation changed by the late 1960s. Based on review of the available water-level contour maps, the Gila River started losing water from a point approximately eight miles north of Gillespie Dam southward some time before 1970 and this situation persists to this day. The rate of infiltration from the Gila River in the Centennial Wash Area has not been rigorously estimated at this time, because sporadic gaging records indicate larger flows at Gillespie Dam than at the Confluence with the Salt, even in years with no releases on the Salt. Because both stage in the river and surrounding groundwater elevations play a role in determining infiltration, model calibration is a promising method for estimating this value. As an initial set of estimates, the infiltration of the Gila River within the Centennial Wash Area may have ranged from zero in 1940 to some rate less than the pumping in the Centennial Wash Area (10,000 to 40,000 ac.-ft./yr.).

Infiltration from the Hassayampa and River and Centennial Wash cannot be directly estimated at this time from the available gaging data. Upstream and downstream gaging stations are not located to allow calculation of losses in the Centennial Wash Area on an event-by-event basis. As noted in Section 2, flood flows are rare on these streams and they have significant distances on alluvial fill to cover before entering the Centennial Wash Area. As an initial set of estimates, the infiltration of either the Hassayampa River or Centennial Wash within the Centennial Wash Area may have ranged from zero in most years to 500 ac.-ft./yr. in years with flood events.

There are many minor tributaries to the Hassayampa River and Centennial Wash in the Centennial Wash Area. Because their drainage areas are so much smaller, the sum of infiltration from these minor tributaries is probably much less than the infiltration on the Hassayampa River or Centennial Wash, and will be neglected at this time.

Detention basins were constructed at the PVNGS to protect the facilities from flooding. These basins fill during recharge events and infiltration is sufficient to cause water-level rises in shallow piezometers (see Section 2). The total volume infiltrated from these basins is probably small, however and will be neglected at this time

7.4.3 Infiltration from Agricultural Operations

Infiltration associated with agricultural operations in the Centennial Wash Area can be divided into agricultural leaching requirement and transmission losses in delivering agricultural water.

Stulik (1974 – Plate 1) presented the areas of irrigated agriculture transferred from a 1968 aerial photograph. No mention is made of crop types or patterns. However, Stulik (1974 – page 9) estimated irrigation pumping quantities at 95,000 ac.-ft./yr. for 1969 on more than 24,000 acres and apportioned 50,000 ac.-ft./yr. to the Tonopah-Hassayampa area and 45,000 ac.-ft./yr. to the Centennial Wash area. Stulik (1974 – page 9) further noted that extensive agricultural development began in the early 1950s and irrigated lands reached 24,000 acres by 1960.

As a first approximation, the groundwater pumping volumes can be used to estimate the volume of water applied for irrigation in the Lower Hassayampa Area. Total application of four ac.-ft./ac.-yr. (total pumping divided by acres from Stulik, 1974) at an estimated efficiency (consumptive use of crop per unit ground surface area divided by total applied water per unit ground surface area) of 75% leaves 25% or 23,750 ac.-ft./yr. for agricultural leaching requirement. Applying the apportionment by area (47% to the Centennial area) to the agricultural leaching requirement yields an estimate of 11,200 ac.-ft./yr of recharge from agricultural leaching requirement in the Centennial Wash and Palo Verde Hills areas in 1969. The agricultural leaching fraction from 4,000 acres at ACC adds another 7,000 ac.-ft./yr. for a total of 18,200 ac.-ft./yr. in 1969.

Fugro (1980) estimated infiltration of the agricultural leaching requirement for the PVNGS property in 1972 (prior to construction) from the following data and assumptions: 2,150 acres were cultivated, 7,550 ac.-ft./yr. was applied, the consumptive use of cotton is 41 inches per year, precipitation is 6.2 inches per year. The resulting estimate for agricultural leaching requirement was 200 ac.-ft./yr. for 1972, but this rate amounts to 3% recharge or 97% efficiency. Such a high efficiency would result in salt build up and could not be maintained, so it is questionable. Different estimates for agricultural leaching requirement were presented in Fugro (1978): The average application rate for the period 1966 to 1972 was 6,000 ac.-ft./yr., which was applied to an average of 1,500 acres. At 25% leaching requirement, the total infiltration would be 1,500 ac.-ft./yr., and represents a more sustainable farming practice. This later estimate is considered more acceptable than the first estimate presented in this paragraph.

Long (1983 – Sheet 1) estimated that 22,500 acres were irrigated in 1982 in the Lower Hassayampa area, which is down slightly from 24,000 acres reported to be in production by 1960.

Although excess deep percolation in test plots ranged from 0 to 17 percent of applied water and averaged 8 percent (Montgomery, 1988 - page 89), total deep percolation recharge for 1985 was estimated at 3,600 ac.-ft./yr (Montgomery, 1988 - Appendix B, page B-2), a quantity which is closer to 25% and more in line with most other estimates. The infiltration from agricultural leaching requirements probably averages approximately one ac.-ft./ac.-yr. and irrigated acreages can be used to estimate the total agricultural leaching requirement.

Water transmission losses are related to the size and character of the transmission system and the distance over which the water is transmitted. The Arlington Canal is considered the only significant source of transmission losses for the agricultural fields in the Centennial Wash Area. Seepage tests conducted on the Arlington canal by Montgomery (1988 - page 88) indicate 11,880 ac.-ft./yr of ACC canal losses to groundwater in 1985. For approximately seven miles of Arlington Canal with an average wetted width of ten feet, this estimate converts to an instantaneous infiltration rate of 3.8 ft/d, which is a high rate – approximately ten times the average rate for unlined canals in the Salt River Project (Corkhill and others 1993 – Page 62, table 8). Since this estimate is based on actual seepage tests, it is considered accurate.

7.5 Discharge Estimates

The discharge components listed at the beginning of this section are described in detail in this subsection. The discharge components have been grouped for further discussion as follows:

- Groundwater flow out to adjacent areas,
- Groundwater flow into the Gila River,

- Evapotranspiration, and
- Wells.

7.5.1 Groundwater Flow out to Adjacent Areas

Southeast-bound groundwater flow out to the Gila Bend Basin beneath the Gillespie Basalt flow near Gillespie Dam can be estimated from water-level elevation contour maps prepared by ADWR. Water level maps for the Gila Bend Basin in 1979 and 1993 presented in Sebenik (1981) and Rascona (1996), respectively, indicate regional groundwater flow passes beneath the Gillespie Basalt flow and Gillespie Dam and moves eastward to pumping wells arranged on a north-south line for two townships at the northern boundary of the Gila Bend Basin. The gradients on the east side of the inflow area southeast of Gillespie Dam were 0.006 in 1979 (Sebenik, 1981 – sheet 1) and 0.012 in 1993 (Rascona, 1993 – sheet 1).

Using the gradient estimated from Sebenik (1981 – sheet 1) and assuming a section width of three miles and transmissivity of 10,000 gpd/ft for sediments beneath the Gila River channel (drillers logs indicate much less coarse sediments than at Hassayampa) results in an estimate of 1,000 ac.-ft./yr. of flow across this line in 1979. Using the gradient estimated from Rascona (1993 – sheet 1) results in an estimate of 2,400 ac.-ft./yr. Groundwater flow out of the ACC area to the south was estimated at 1,000 ac.-ft./yr. by Errol L. Montgomery & Associates, Inc. (1988 - Appendix B, page B-2), which is one order of magnitude smaller than the above estimates. Aquifer tests of the full aquifer system thickness to the southeast of Gillespie Dam would be needed to support or refine the estimates developed in this paragraph.

The water-level change map shown in Sebenik (1979 – sheet 2) indicates the inflow area of the Gila Bend Basin near Gillespie Dam experienced water-level rises of 30 feet between 1973 and 1979. The hydrographs for irrigation wells near the inflow area shown in Rascona (1996 – sheet 2) – (C-03-05 02CBB) dropped through the late 1950s and early 1960s, then rose steadily 90 feet from 1965 to 1974 at which point the water level was 20 feet bls. Water levels in another well near the inflow area to the Gila Bend Basin (C-02-04 26 CBA) rose steadily from 1965 to 1981 at which point the water level was 80 feet bls. Water levels in both these wells have since fluctuated about the points they rose to. In summary, the saturated thickness and gradients increased at the boundary between the Hassayampa Sub-basin and the Gila Bend Basin decreased during the 1950s and early 1960s and then increased between 1965 and the late 1970s. Therefore, groundwater flow out of the Hassayampa Sub-Basin probably followed a similar pattern.

7.5.2 Evapotranspiration

Evapotranspiration estimates for the Centennial Wash Area can be divided into direct evaporation from the water table and transpiration from phreatophytes. Direct evaporation from the water table is neglected for the Centennial Wash Area since the water table is typically deeper than ten feet bls. Evapotranspiration associated with agriculture is substantial, but it occurs well above the water table and is already accounted for in the consumptive use estimates discussed elsewhere.

Estimates of transpiration by phreatophytes for 1974 in the Centennial Wash Area was extracted from Water Resources Associates (1975 – Table 4). The estimate of 18,200 ac.-ft./yr. from 4,900 acres of phreatophytes was based on the assumption of a consumptive use of 3.7 ac.-ft./ac.-yr. Water use by 4,000 acres of phreatophytes in the ACC area for 1985 was estimated by Montgomery (1988 - Appendix B, page B-2) at 24,000 ac.-ft./yr. This estimate assumed a consumptive use of six ac.-ft./ac.-yr. If the 1974 estimate is refined with consumptive use of six ac.-ft./ac.-yr, the 1974 phreatophyte water use is 29,400 ac.-ft./yr. The lower consumptive use estimate is preferred as it likely is more accurate is representing the density of phreatophytes in the area.

7.5.3 Groundwater Flow into the Gila River

As noted in the previous section, water-level elevation contours since the 1970s have indicated flow into the Gila River (commonly called base flow) from a point approximately eight miles north of Gillespie Dam. Before commencement of pumping for irrigation on the Centennial Wash Area in the 1940s, groundwater primarily flowed to the Gila River from the west and northwest.

The rate of groundwater flows into the Gila River in the Centennial Wash Area has not been rigorously estimated at this time, because the sporadic gaging records do not allow unambiguous separation of base flow. Because both the stages in the river and the surrounding groundwater elevations play a role in determining the base flow, model calibration is a promising method for estimating this value. As an initial set of estimates, the flow of groundwater into the Gila River within the Centennial Wash Area may have ranged from tens of thousands of ac.-ft./yr. in 1940 to some rate of perhaps one-third to one-half that value since the 1940s.

7.5.4 Wells

There are four general categories of pumping from wells in the Centennial Wash Area: agricultural, industrial, domestic and stock watering. Since 1983, well owners have been required to report pumping volumes by well for all wells in AMAs pumping more than 35 gpm. Therefore, detailed records are available on a well-by-well basis since 1983. This threshold excludes most domestic wells. Agricultural pumping prior to 1983

is typically estimated based on irrigated acres, crop type and estimated consumptive use and farm efficiency values. Industrial pumping is assumed to include only PVNGS. Domestic pumping can be estimated based on the number of residences or population and estimated consumptive use values.

Stulik (1974 – page 9) estimated agricultural pumping quantities for the entire Lower Hassayampa Area during 1969 at 95,000 ac.-ft./yr. on more than 24,000 acres. Stulik (1974 – page 9) further apportioned 50,000 ac.-ft./yr. – 53% - to the Tonopah-Hassayampa area and 45,000 ac.ft./yr. – 47% - to the Centennial area. Stulik's (1974) Centennial area is essentially the same as the Centennial Wash Area considered here. Stulik (1974 – page 9) estimated pumping quantities for domestic and stock watering to be less than 100 ac.ft/yr. Stulik (1974 – page 9) further noted that extensive agricultural development began in the early 1950s and irrigated lands reached 24,000 acres by 1960.

Industrial pumping for PVNGS was estimated as an increase from zero in the 1960s to a current use estimate of approximately half of the average on-site agricultural use in the seven years ending in 1972 reported by Fugro (1980): 6,000 ac.-ft./yr.

The USGS frequently publishes pumping estimates by area in Arizona. Anning and Duet (1994) is the most recent such summary. It contains pumping estimates for the Lower Hassayampa Area as provided in the first two columns of Table 2.

Table 2 Estimated Pumping in the Lower Hassayampa Area (USGS)

Year	Pumping Total (ac.ft./yr.)	Only Centennial Wash Area
<Prior to 1973>	<Included with Salt River Valley>	<Included with Salt River Valley>
1973	91,000	41,600
1974	89,000	40,700
1975	94,000	43,000
1976	98,000	44,900
1977	84,000	38,400
1978	63,000	28,500
1979	64,000	29,000
1980	74,000	33,700
1981	87,000	39,800
1982	70,000	31,800
1983	48,000	21,400
1984	72,000	32,700
1985	60,000	27,100
1986	31,000	13,400
1987	40,000	17,700
1988	41,000	18,100
1989	47,000	21,000
1990	42,000	18,600

Apportionment of these total pumping estimates to only the Centennial Wash Area can be made by subtracting the pumping by ACC (2,400 ac.-ft./yr.) and then multiplying by the proportion reported by Stulik (1974) of 47%. The results of applying the proportion of 47% to the USGS estimates are also shown in Table 2.

ADWR (1999b) provides files containing the reported pumping to the public over the Internet. These data were reviewed and totals for the Centennial Wash Area and for the three power plants were extracted and summarized in Table 3. In general, pumping has declined since 1983. The wells acquired with the power plant properties accounted for approximately 1/3 of the reported pumping in the Centennial Wash Area since 1983. Comparison for the time periods of overlap between Table 2 (USGS estimates and constant 47% split for the Centennial Wash Area) and Table 3 (ADWR reports for wells in Centennial Wash Area) indicates the differences range between 10 and 40 percent. Therefore, the earlier USGS estimates and constant split appear reasonable.

Table 3 Reported Pumping in the Centennial Wash Area (ADWR)

Year	Pumping Total (ac.ft./yr.)	Only Power Plant-Acquired Wells (ac.-ft./yr.)
1984	25,246	10,413
1985	24,574	11,462
1986	18,702	8,218
1987	18,485	8,058
1988	20,069	7,325
1989	13,837	6,172
1990	15,264	5,424
1991	11,235	3,573
1992	8,504	1,706
1993	7,634	2,228
1994	8,850	2,431
1995	9,468	3,311
1996	9,421	3,885
1997	9,733	3,199
1998	9,372	2,906
15-year Average	14,026	5,354

7.6 Discussion

Estimates by previous investigators or data to make estimates are available for most of the recharge and discharge categories in the Centennial Wash Area. The groundwater inflow and outflow estimates appear to be relatively large, but have less supporting data than other large components such as pumping estimates. The usefulness of the estimates can be tested by comparing them in a simple groundwater budget (Section 8) and in a groundwater flow model that can be calibrated to available water-level data and aquifer test estimates of transmissivity.

8.0 WATER BUDGET

8.1 Introduction

The recharge and discharge component estimates of the previous section are summarized, totaled and compared in this section. As with its components, this water budget is a preliminary effort subject to refinement with additional analysis.

The water budget lumps the entire groundwater system of the Centennial Wash Area together and neglects any restrictions in groundwater flow between sinks and sources within the area. That is, the water budget does not consider the time it takes for inflows to flow towards and interact with outflows. A groundwater model would take these restrictions into account.

8.2 Water Budget

The water budget consists of a summation of inflows and outflows and their difference, which is defined to be the change in storage. The change in storage calculated in this way cannot be compared to individual field measurements such as water-level changes because individual water-level changes do not reflect the averaging across the entire volume of groundwater in the Centennial Wash Area assumed in the water budget. Nevertheless, a water budget is a useful first step in assembling and reviewing individual hydrologic estimates for an area. General patterns of declines or rises in water-level elevations noted in hydrographs would be expected to be represented in the water balance as negative or positive changes in storage, respectively.

Table 4 presents the preliminary groundwater budget for the Centennial Wash Area. The inflows, outflows, and changes in storage are briefly discussed in the following subsections. Reductions were made to the groundwater inflow estimates at Hassayampa (down from 16,000 to 4,000 ac.-ft./yr.) and along Buckeye-Salome Road (down from 50,000 to 10,000 ac.-ft./yr.) in order arrive at negative changes in storage as would be expected from the review of the hydrographs discussed in Section 2.

8.2.1 Inflows

Estimated total groundwater inflows for the Centennial Wash Area ranged from 34,000 ac.-ft./yr. in the 1940s to 56,000 ac.-ft./yr. in the 1970s and currently are approximately 44,000 ac.-ft./yr. The largest components have consistently been the agricultural leaching requirement, infiltration from the Arlington Canal, and groundwater inflow along the Buckeye-Salome Road.

Table 4 Centennial Wash Area Preliminary Groundwater Budget

(all inflows, outflows and change in storage values are in acre-feet per year)

	1940s	1950s	1960s	1970s	1980s	1990s
Arlington Valley Irrigation (ac.)	4,000	4,000	4,000	4,000	3,500	3,000
Centennial Wash Irrig. (ac.)	0	5,200	5,200	5,200	5,200	1,500
Palo Verde Hills Irrig (ac.)	0	1,500	1,500	1,500	0	0
Mullen's Cut Irrigation (ac.)	0	600	600	600	600	300
Total Irrigated Area (ac.)	4,000	11,300	11,300	11,300	9,300	4,800
Avg. Crop Consumptive Use	3.30	3.30	3.30	3.30	3.30	3.30
Avg. Farm Efficiency	0.60	0.60	0.60	0.60	0.70	0.75
Phreatophyte Area (ac.)	6,000	4,000	2,000	5,000	4,000	4,000
Phreatophyte Consump. Use	3.7	3.7	3.7	3.7	3.7	3.7
Population	200	200	200	200	200	200
Mountain Front (miles)	30	30	30	30	30	30
Annual Precipitation (in.yr)	8	8	8	8	8	8
Inflows						
Groundwater at Hassayampa	4,000	4,000	4,000	4,000	4,000	4,000
Groundwater at Buckeye-Salome Rd.	10,000	10,000	10,000	10,000	10,000	10,000
Groundwater at Mullen's Cut	200	150	100	0	0	0
Mountain Front Infiltration	281	281	281	281	281	281
Gila River Infiltration	0	0	4,000	6,000	8,000	8,000
Hassayampa River Infiltration	100	0	0	100	100	100
Centennial Wash Infiltration	200	0	0	200	200	200
Agricultural Leaching Requirement	7,000	23,060	23,060	23,060	14,328	7,230
Arlington Canal Infiltration	12,000	12,000	12,000	12,000	12,000	12,000
TOTAL	33,781	49,491	53,441	55,641	48,909	41,811
Outflows						
Groundwater at Gillespie Dam	2,000	1,500	1,000	1,500	2,000	2,000
Phreatophytes	22,200	14,800	7,400	18,500	14,800	14,800
Flow to Gila River	10,000	10,000	10,000	10,000	10,000	10,000
Agricultural Pumping	2,400	39,250	39,250	39,250	26,914	9,000
Industrial Pumping	0	0	0	1,000	2,000	3,000
Domestic Pumping	243	243	243	243	243	243
Pumping for Livestock Watering	122	122	122	122	122	122
TOTAL	36,965	65,915	58,015	70,615	56,079	39,165
Change in Storage (Inflows-Outflows)	-3,183	-16,423	-4,573	-14,973	-7,170	2,647
relative % difference	-9.00%	-28.46%	-8.21%	-23.72%	-13.66%	6.54%

8.2.2 Outflows

Estimated total groundwater outflows for the Centennial Wash Area ranged from 35,000 ac.-ft./yr. in the 1940s to 72,000 ac.-ft./yr. in the 1970s and currently are approximately 47,000 ac.-ft./yr. The largest components have consistently been agricultural pumping, phreatophyte transpiration and flow to the Gila River.

8.2.3 Changes in Storage

Estimated total changes in groundwater storage for the Centennial Wash Area (using this preliminary water balance) ranged from essentially zero in the 1940s to 17,000 ac.-ft./yr. in the 1950s and currently are approximately 3,000 ac.-ft./yr. The calculated changes in storage are not consistent in value during the 1950s, 1960s and 1970s as would be expected for the relatively consistent declines noted in the hydrographs in Section 2.

8.3 Discussion

Review of the preliminary water budget for the Centennial Wash Area indicates that some of the recharge and discharge components developed in Section 7 should be refined. Water budget components associated with irrigated agriculture should be verified, such as irrigated acres, consumptive use, and farm efficiencies. With these numbers set, the groundwater inflows at boundaries and to and from the Gila River should be adjusted to achieve consistent negative changes in groundwater storage (deficits) for the 1950s, 1960s, and 1970s as indicated by the hydrograph responses in the Centennial Wash Area. An example is the reduction in the boundary flows suggested by the water balance and discussed at the beginning of this section.

The results of testing preliminary recharge and discharge estimates by comparing them in the water balance points out the need to build a groundwater model that can be used to not only check the water balance, but check the simulated water-level elevations associated with estimated water budget components. The revisions suggested here can be incorporated into the model as it is built and calibrated.

9.0 DISCUSSION

9.1 Conclusions

Based on the information available to date, it appears that approximately 40,000 ac.-ft./yr. of pumping for agriculture in the Centennial Wash Area from approximately 1950 to 1980 resulted in water-level declines near pumping centers of over 100 feet. During the times of largest drawdowns in the pumping centers, water-level elevations in areas a few miles from the pumping centers fluctuated up and down by only a few feet.

Proposed pumping for the power plants is estimated here at 16,000 to 18,000 ac.-ft./yr. Therefore, the response of the groundwater system to pumping for the power plants - water-level declines - may be expected to be a fraction (perhaps one third to half) of that observed in the past in response to agricultural pumping.

9.2 Recommendations

The conclusions of this interim report should be tested by refining the water budget components through model calibration and conducting simulations of 30 years of power plant pumping. A model provides for consistent comparison of simulated water level elevations with measured water-level elevations (calibration targets) and therefore is a more severe test of water budget components than a simple, lumped water balance. The available water-level data will provide suitable targets for model calibration.

In developing the model, agricultural water use characteristics of the area during the past 50 years should be further investigated and the relevant water budget component estimates should be refined. Estimates of flow to and from the Gila River should be refined as part of model calibration.

To further support and guide the calibration of the model, additional estimates of hydraulic parameters should be developed through the conduct of aquifer tests in the principal aquifer system at several locations using observation wells, as they are available and access can be obtained. The hydraulic parameter estimates resulting from the aquifer tests can be incorporated into the model during calibration and can serve as additional calibration targets.

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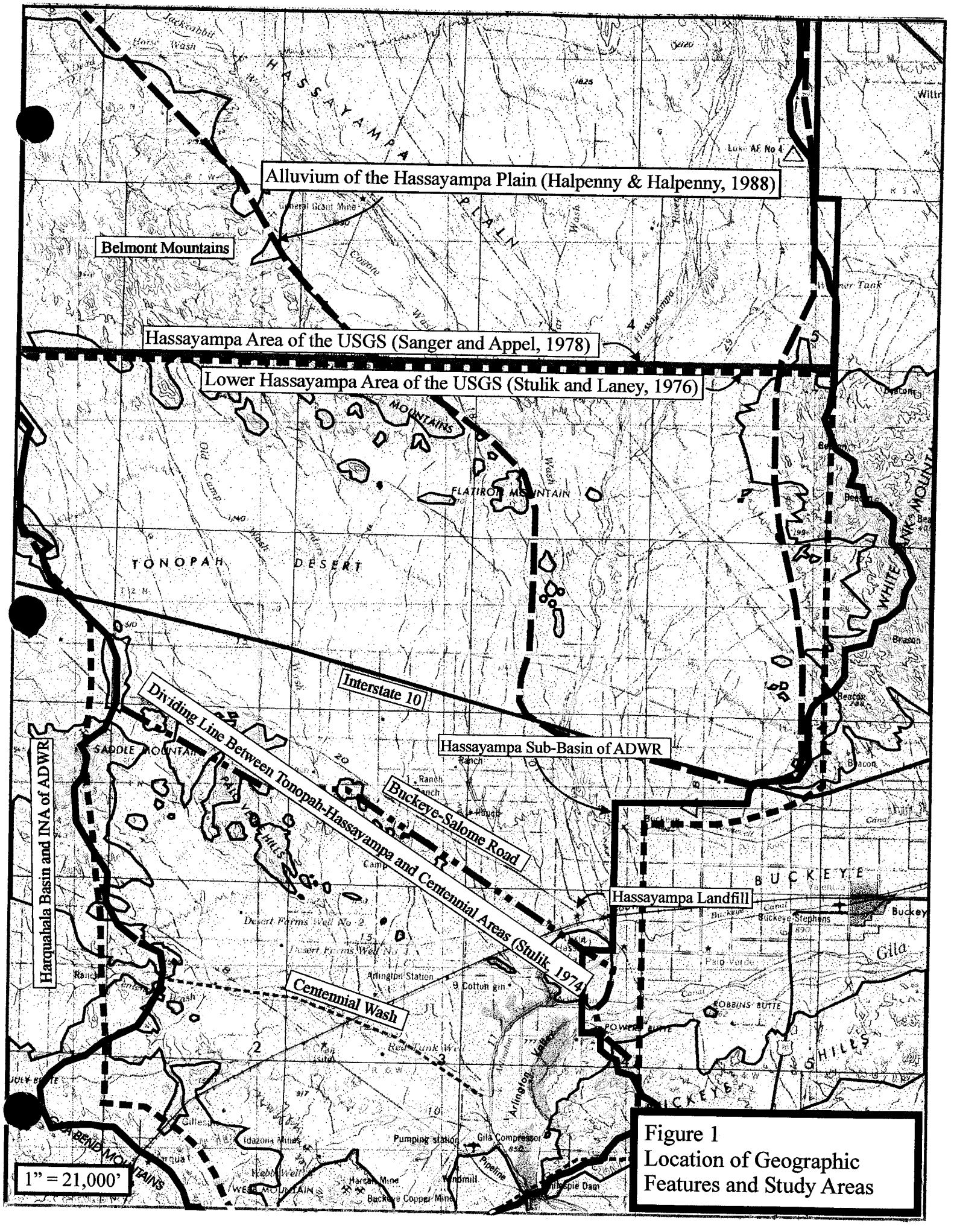
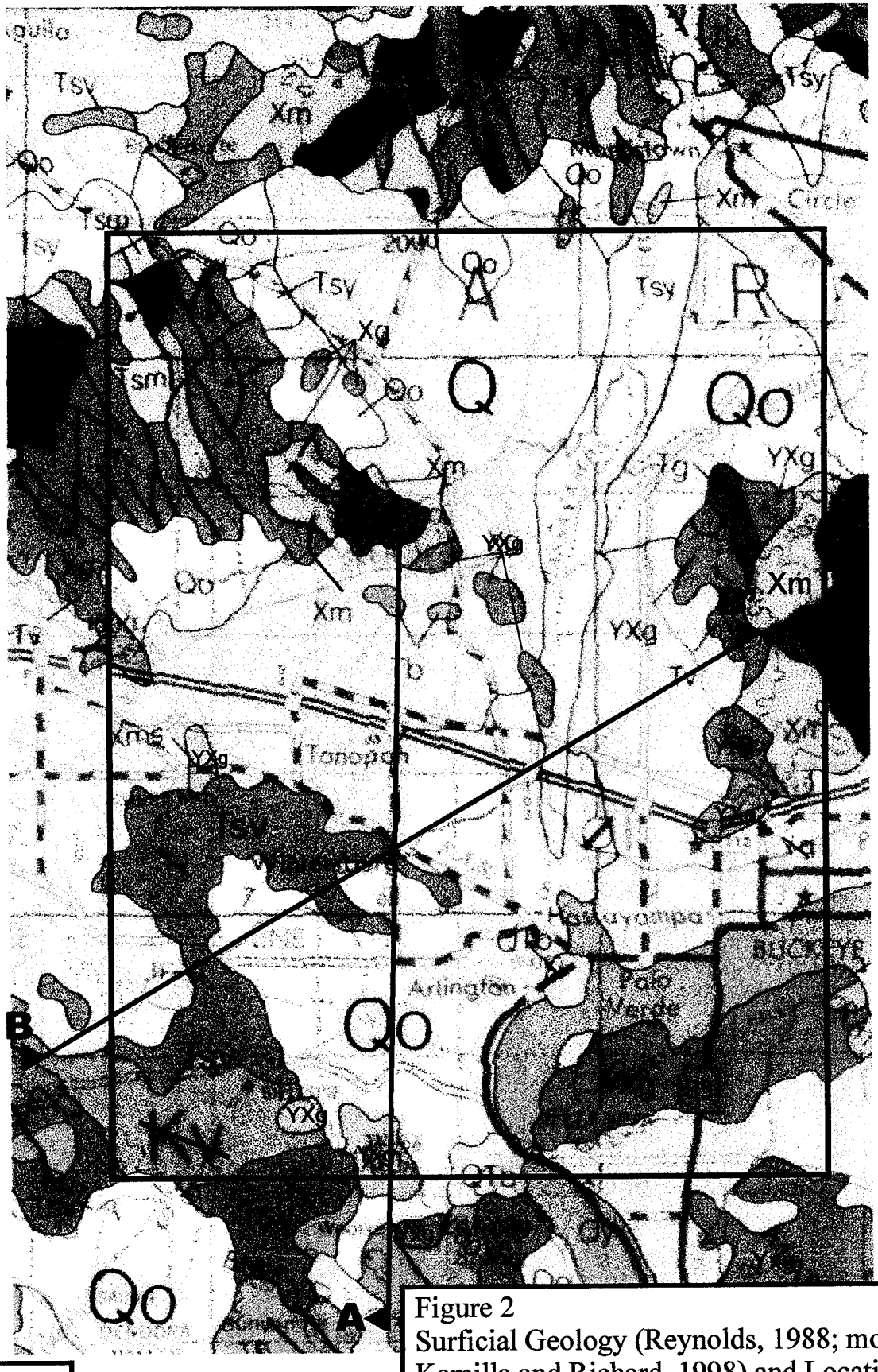
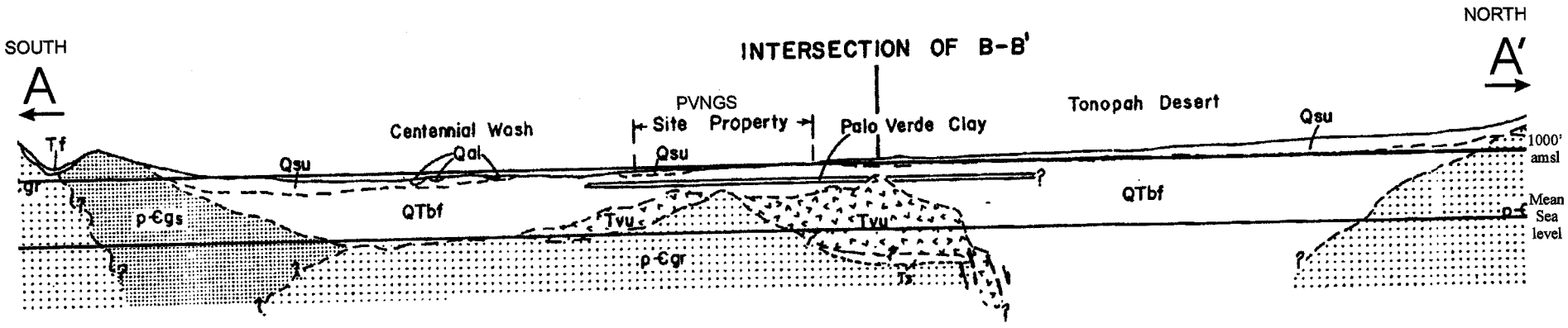


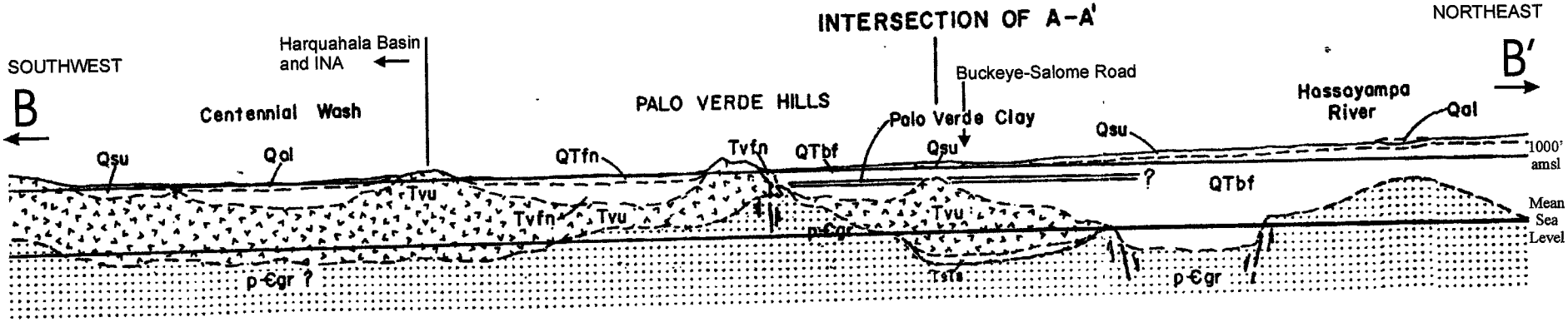
Figure 1
Location of Geographic Features and Study Areas



1" = 35,200'

Figure 2
Surficial Geology (Reynolds, 1988; modified from Kamilla and Richard, 1998) and Locations of Geologic Cross-Sections (Fugro, 1978)





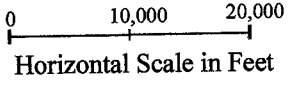


Figure 3
Regional Geologic Cross-Sections
(Modified from Fugro, 1980 - Figure 2.5-8)

Correlations:

pCgr: Precambrian granite and gneiss
Ts: Tertiary tuffaceous sandstones and arkosic conglomerates
Tvu: Tertiary Volcanics
Tvfn: Red Unit
QTfn: LAU
QTbf: MAU
Qsu, Qal: UAU

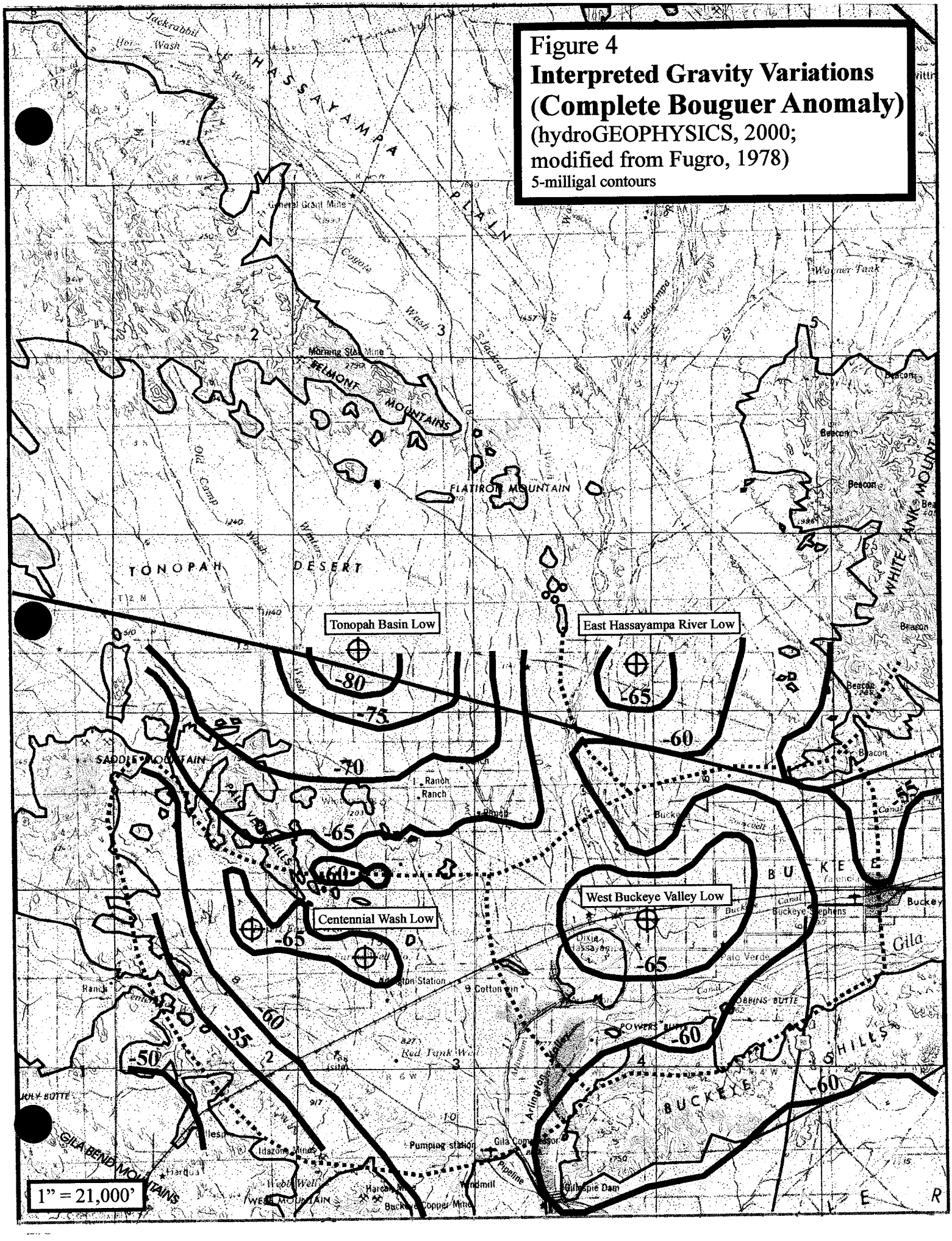


Figure 4
Interpreted Gravity Variations
(Complete Bouguer Anomaly)
(hydroGEOPHYSICS, 2000;
modified from Fugro, 1978)
5-milligal contours
HASSAYAMPA PLAIN
BELMONT MOUNTAINS
FLATIRON MOUNTAIN
TONOPAH DESERT
WHITE TANK MOUNTAINS
SADDLE MOUNTAIN
BUCKEYE HILLS
GILA BEND MOUNTAINS
Tonopah Basin Low
East Hassayampa River Low
West Buckeye Valley Low
Centennial Wash Low
-80
-75
-70
-65
-60
-55
-50
1" = 21,000'

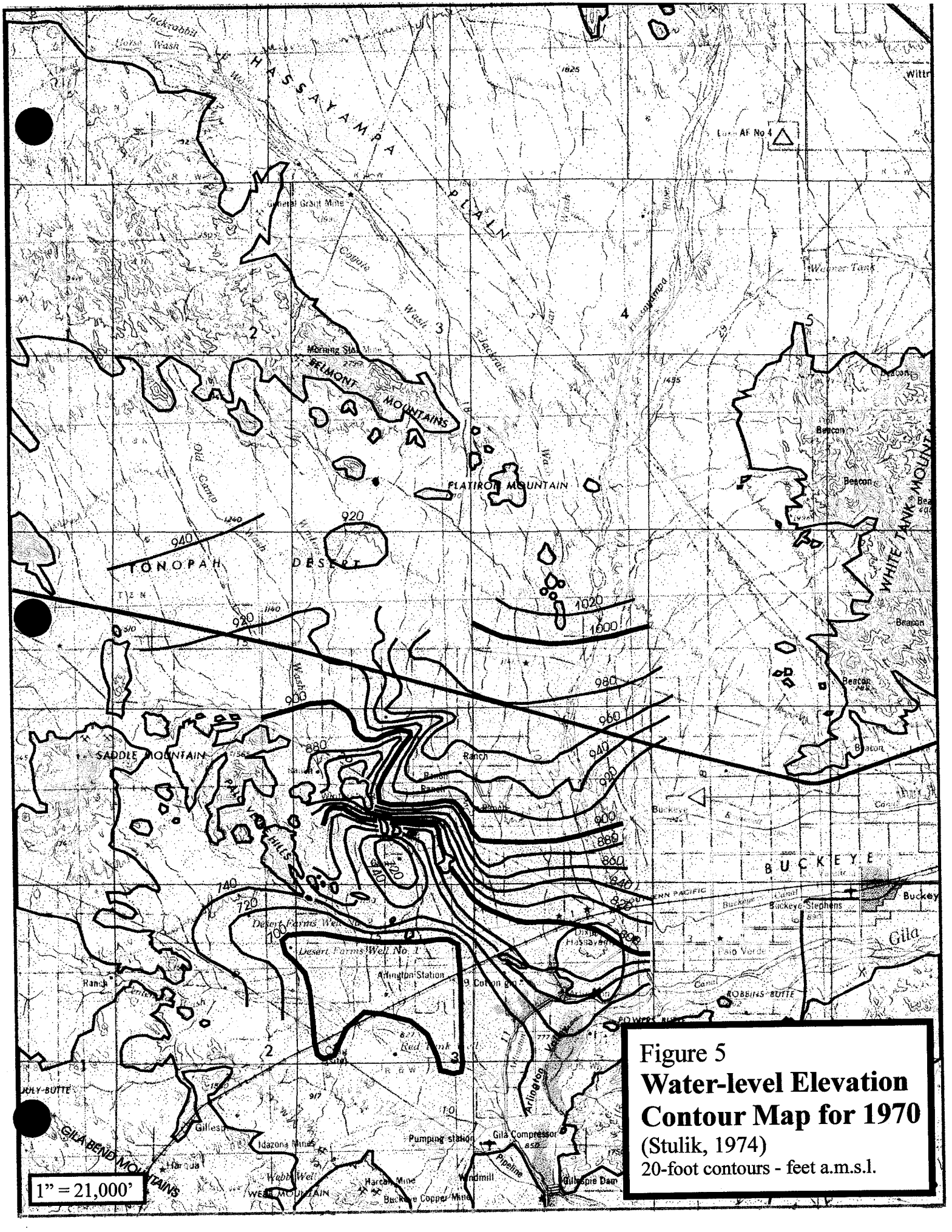


Figure 5
Water-level Elevation Contour Map for 1970
(Stulik, 1974)
20-foot contours - feet a.m.s.l.

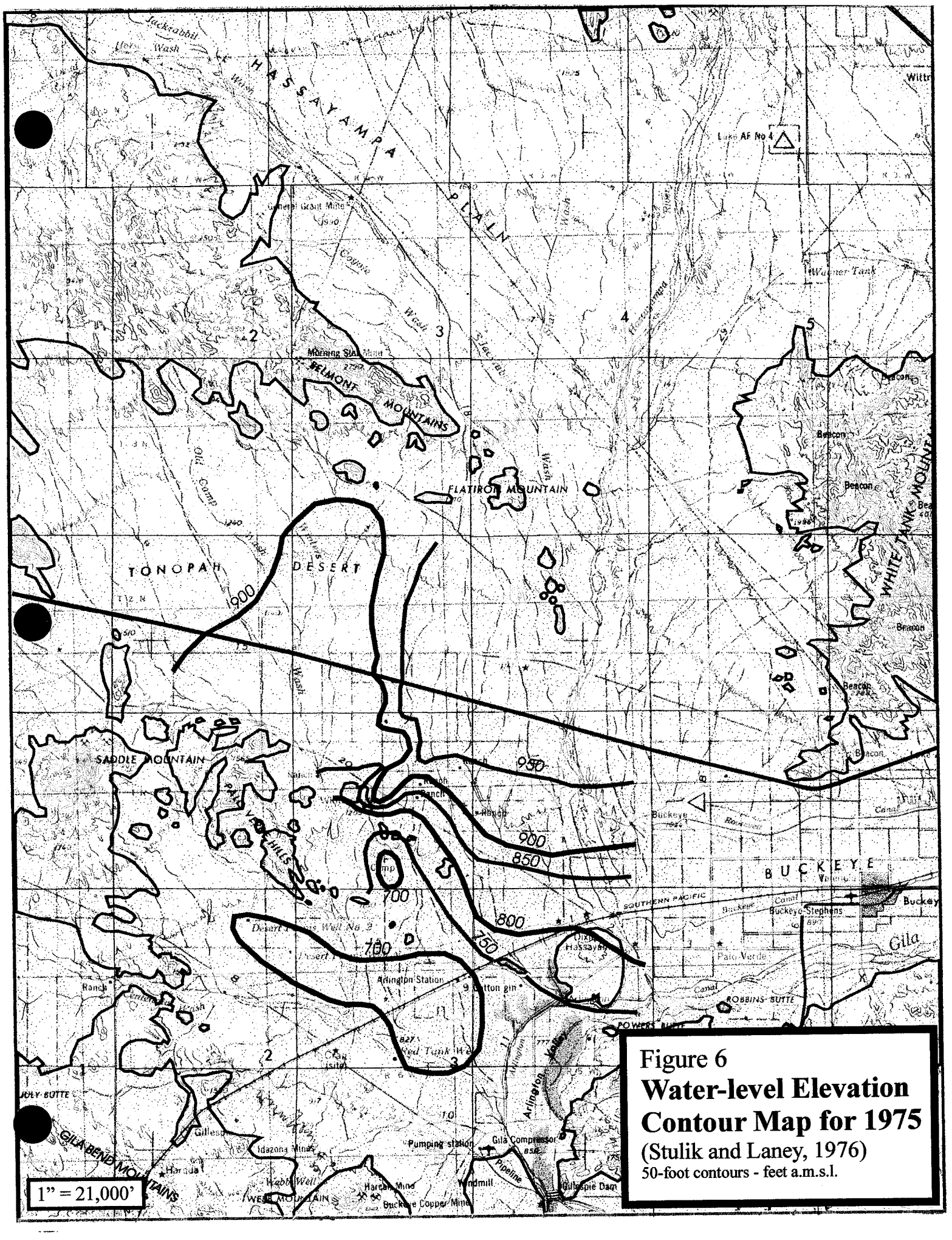


Figure 6
Water-level Elevation Contour Map for 1975
(Stulik and Laney, 1976)
50-foot contours - feet a.m.s.l.

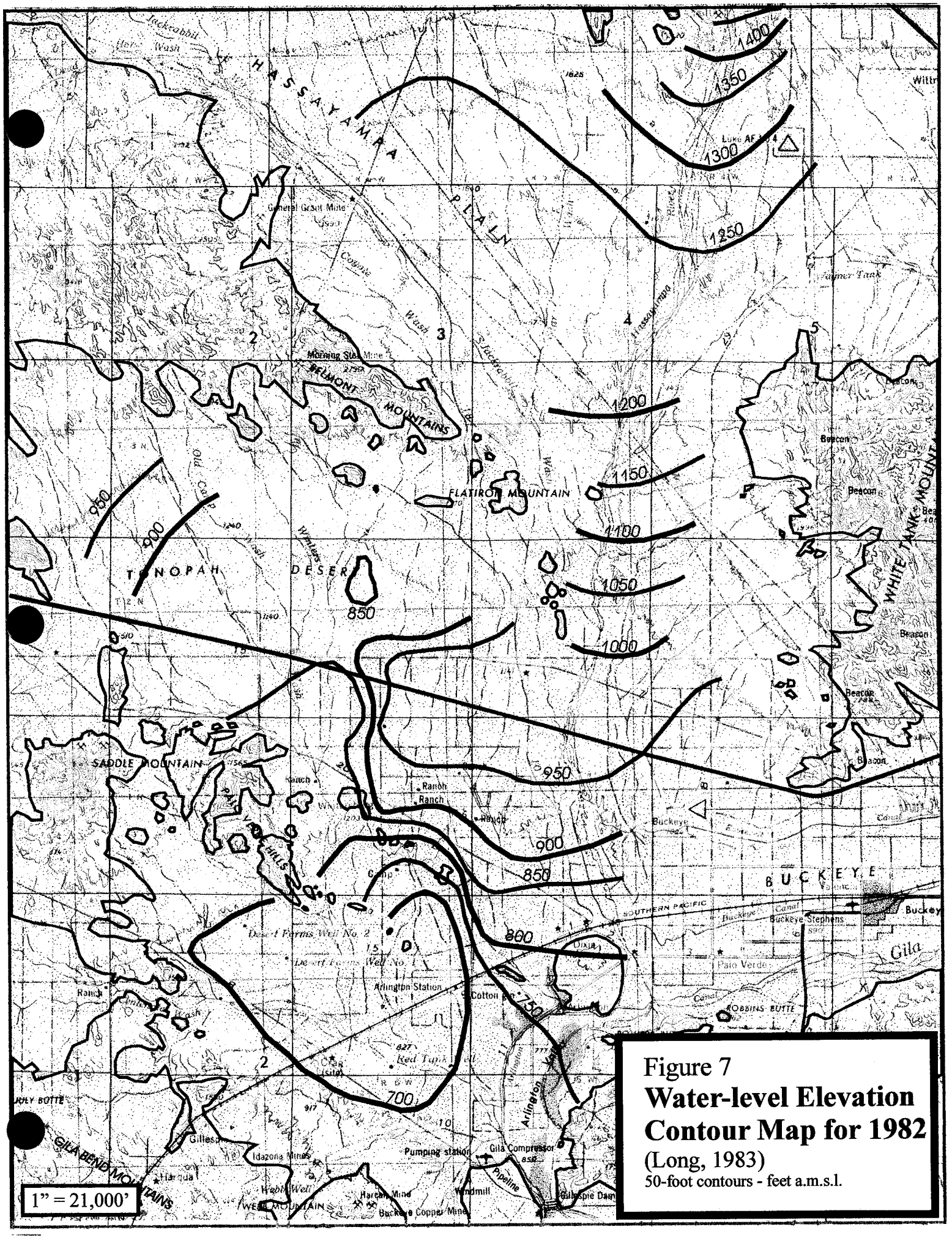


Figure 7
Water-level Elevation Contour Map for 1982
(Long, 1983)
50-foot contours - feet a.m.s.l.

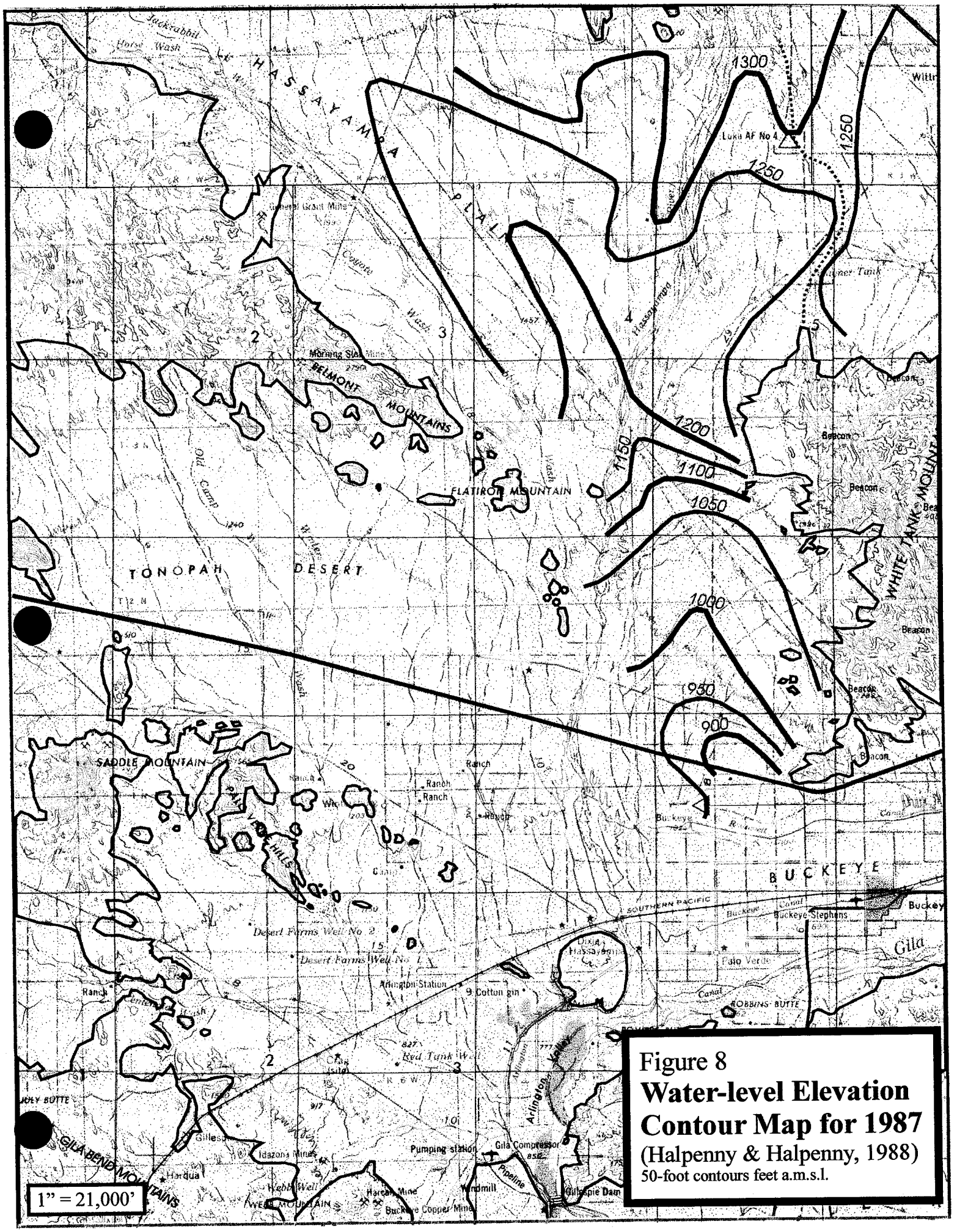


Figure 8
Water-level Elevation Contour Map for 1987
(Halpenny & Halpenny, 1988)
50-foot contours feet a.m.s.l.

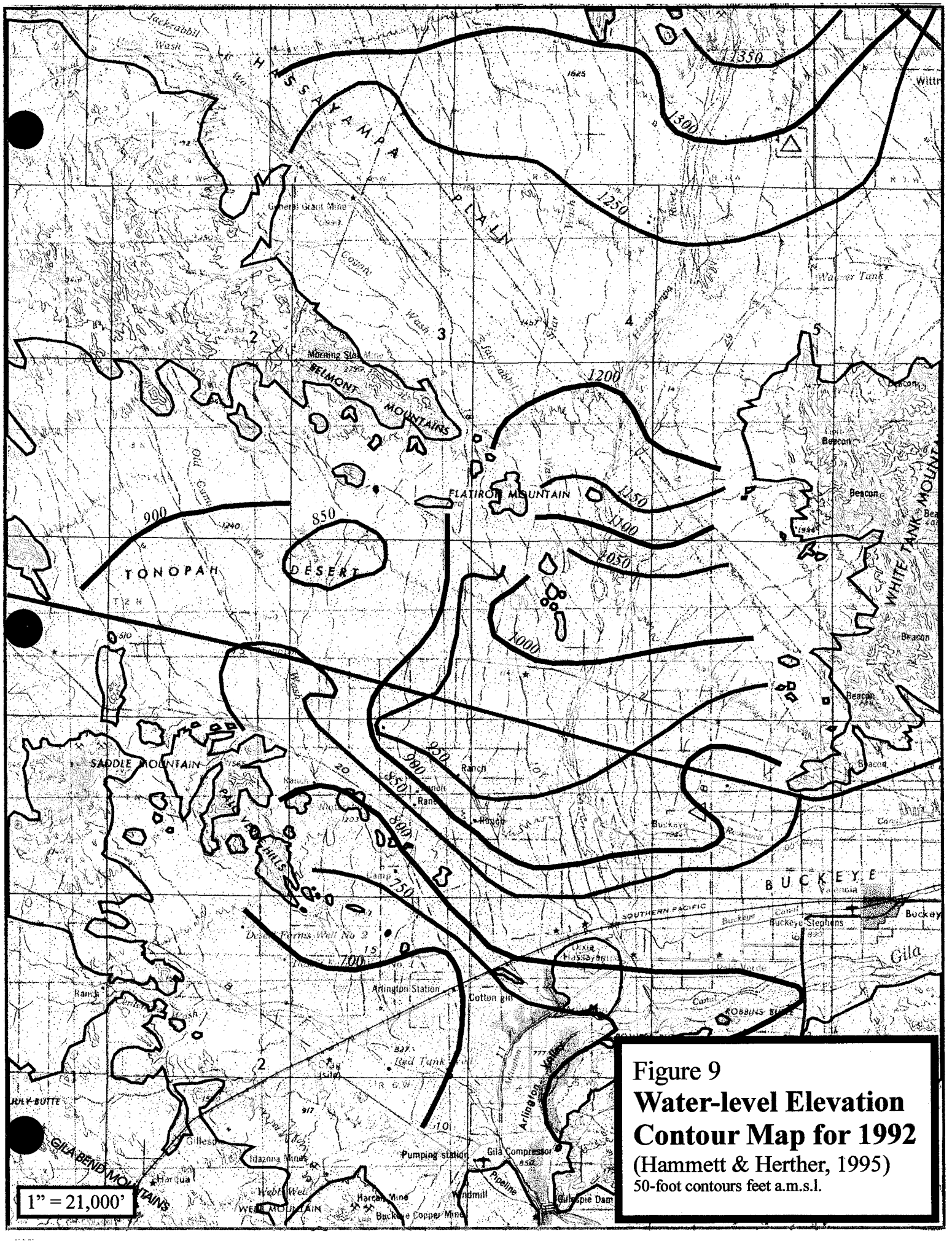


Figure 9
Water-level Elevation Contour Map for 1992
(Hammett & Herther, 1995)
50-foot contours feet a.m.s.l.

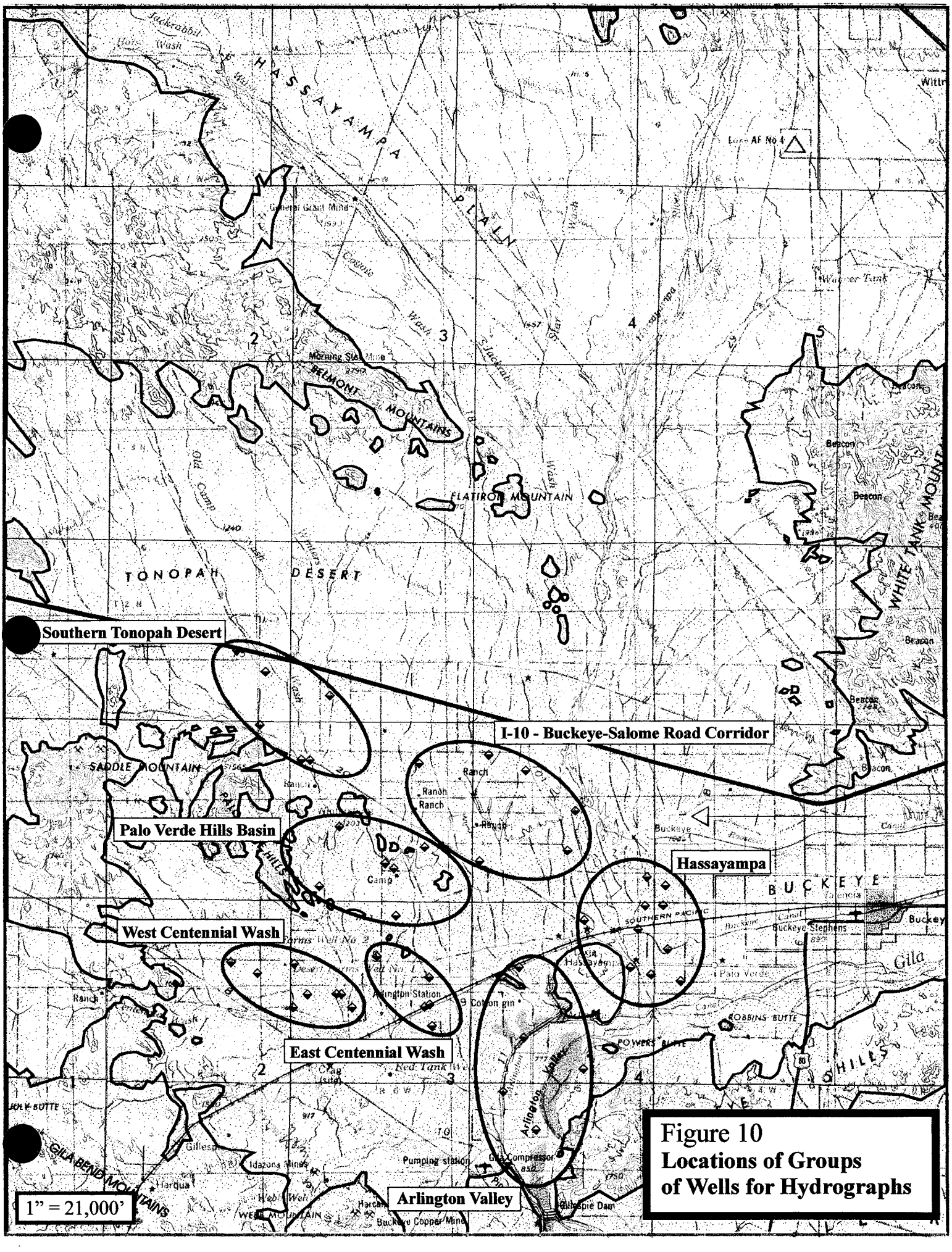


Figure 10
Locations of Groups of Wells for Hydrographs

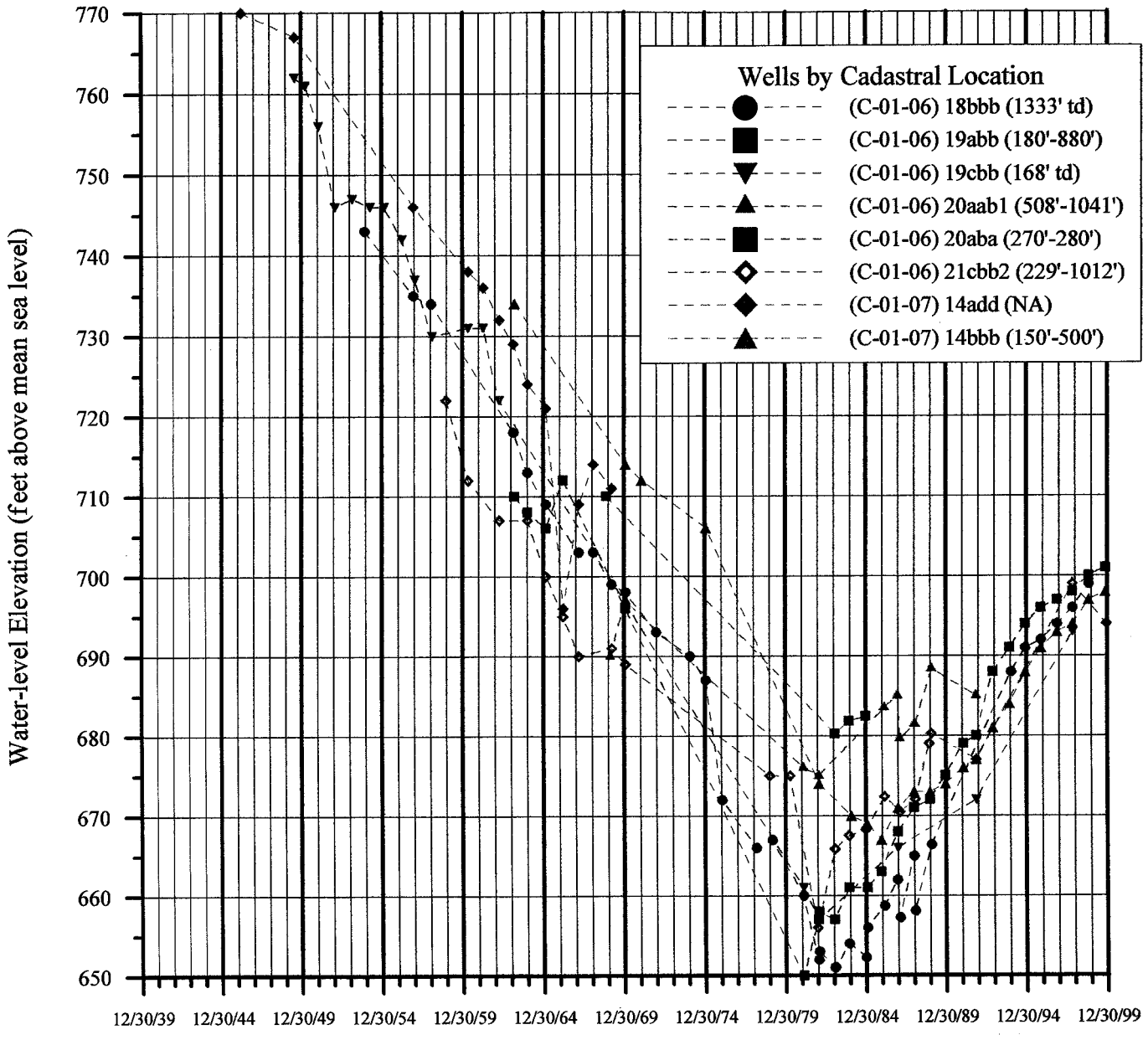


Figure 11 Hydrographs for Wells in the Western Centennial Wash Area

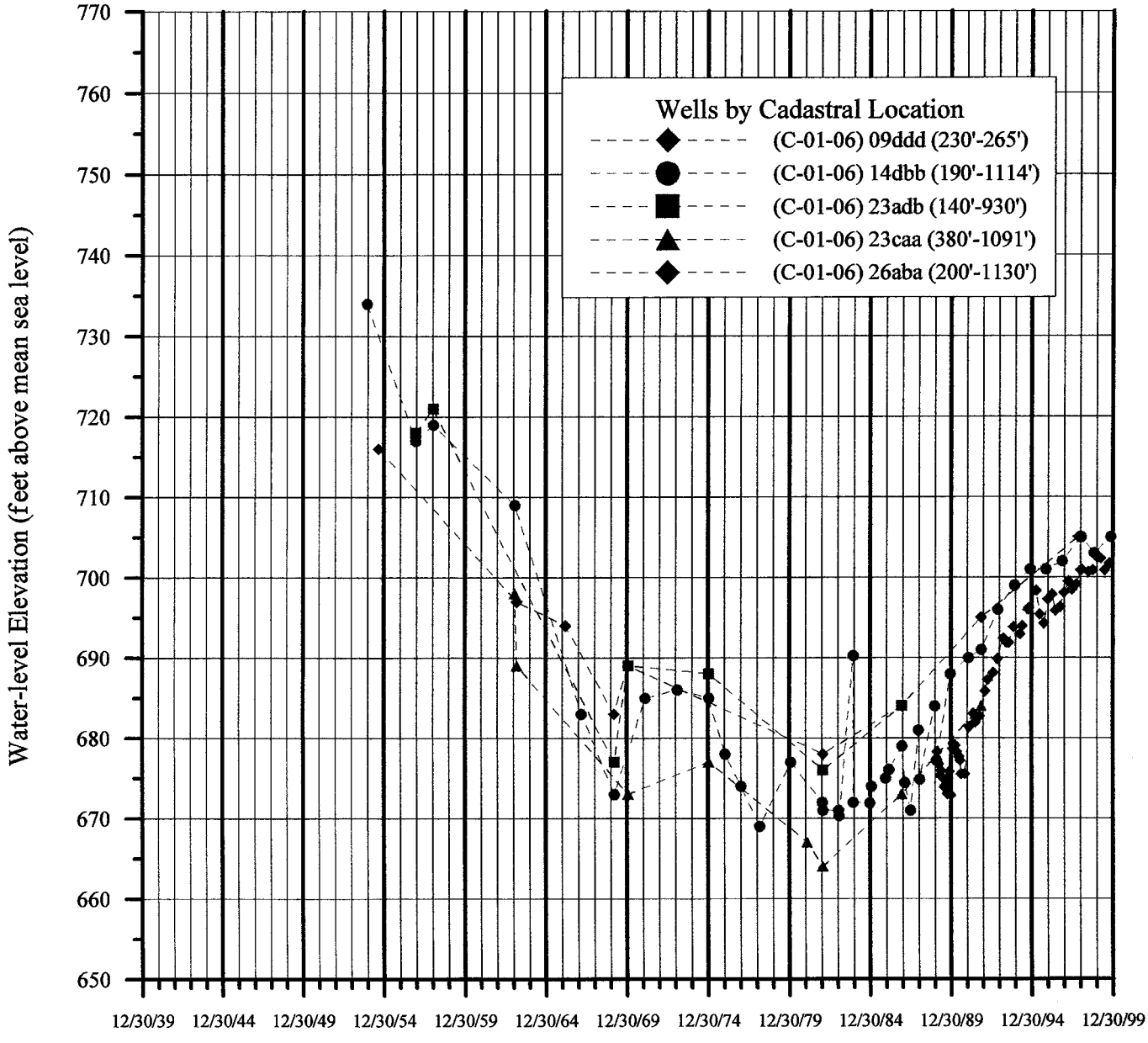


Figure 12 Hydrographs for Wells in the Eastern Centennial Wash Area

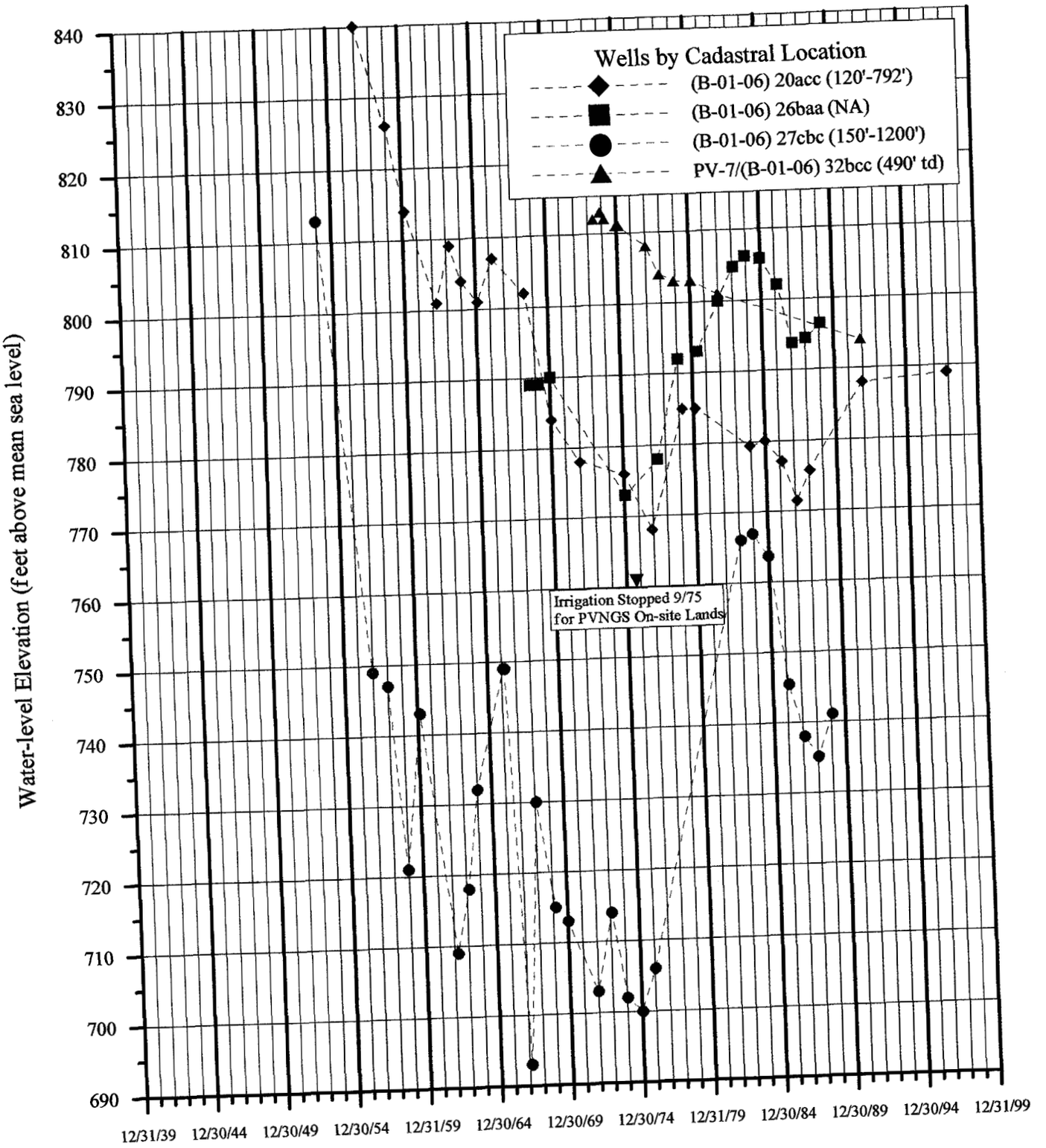


Figure 13 Hydrographs for Deep Wells in the Palo Verde Hills Area

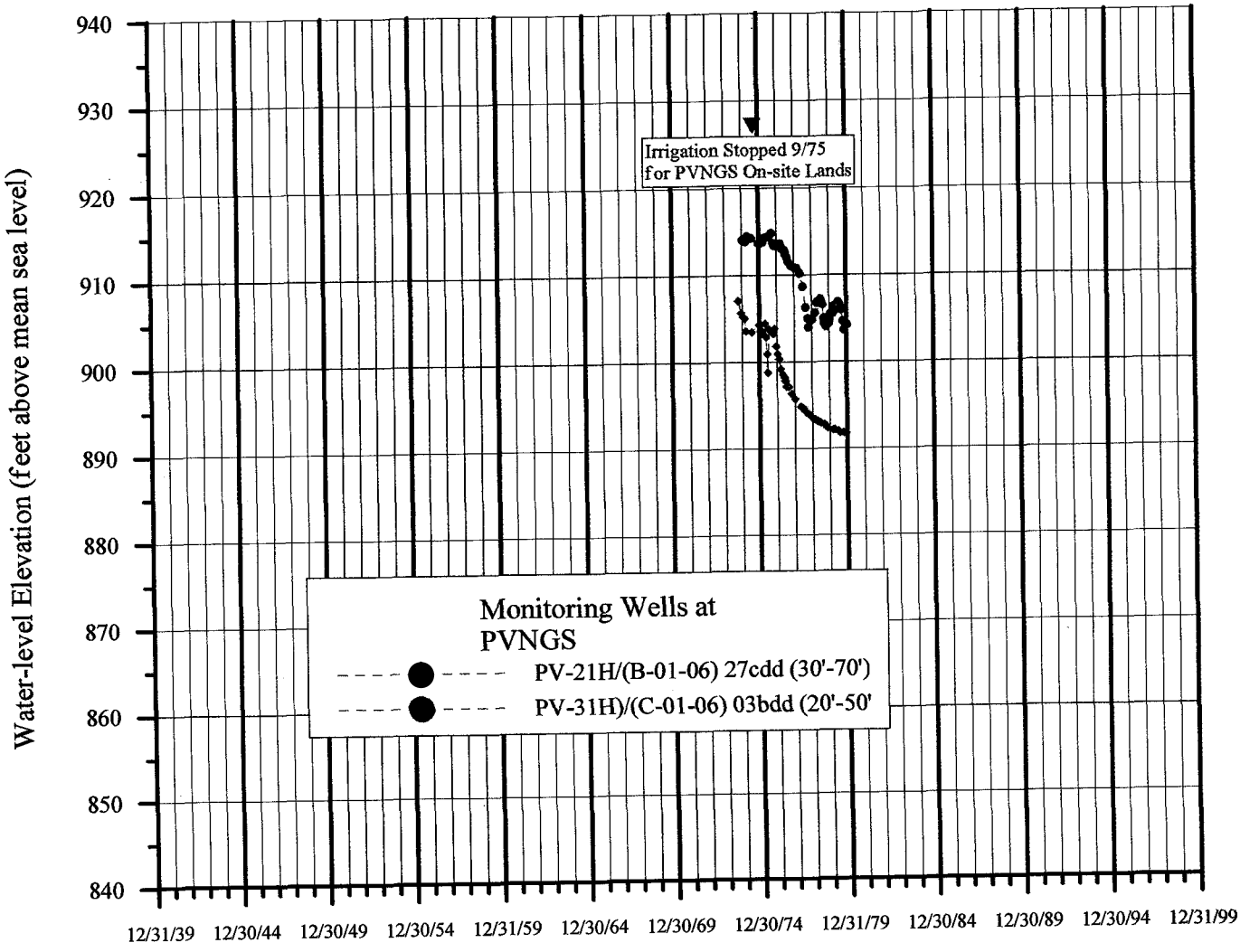


Figure 14 Hydrographs for Shallow Wells in the Palo Verde Hills Area

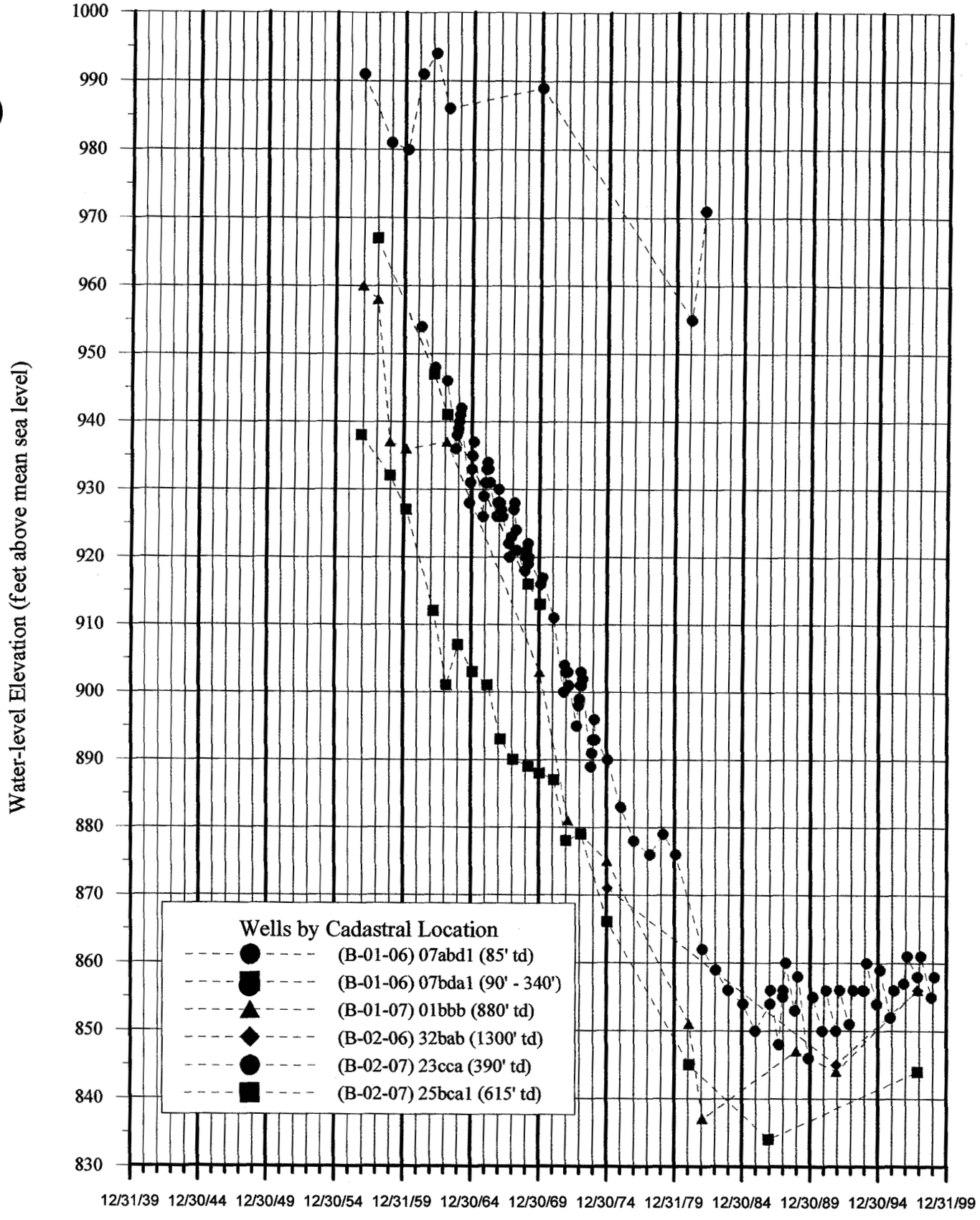


Figure 15 Hydrographs for Wells in the Southern Tonopah Desert Area

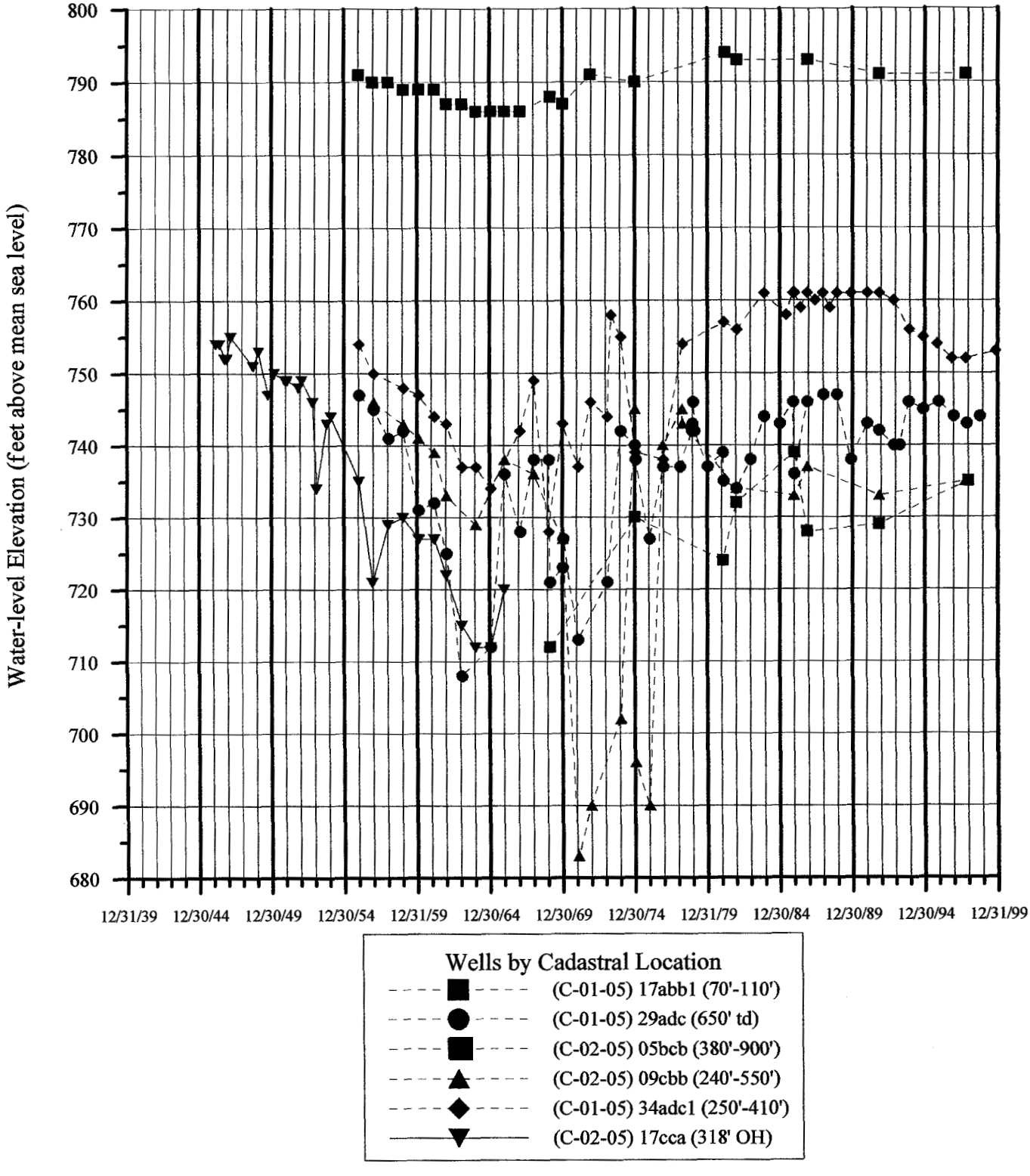


Figure 16 Hydrographs for Wells in the Arlington Valley Area

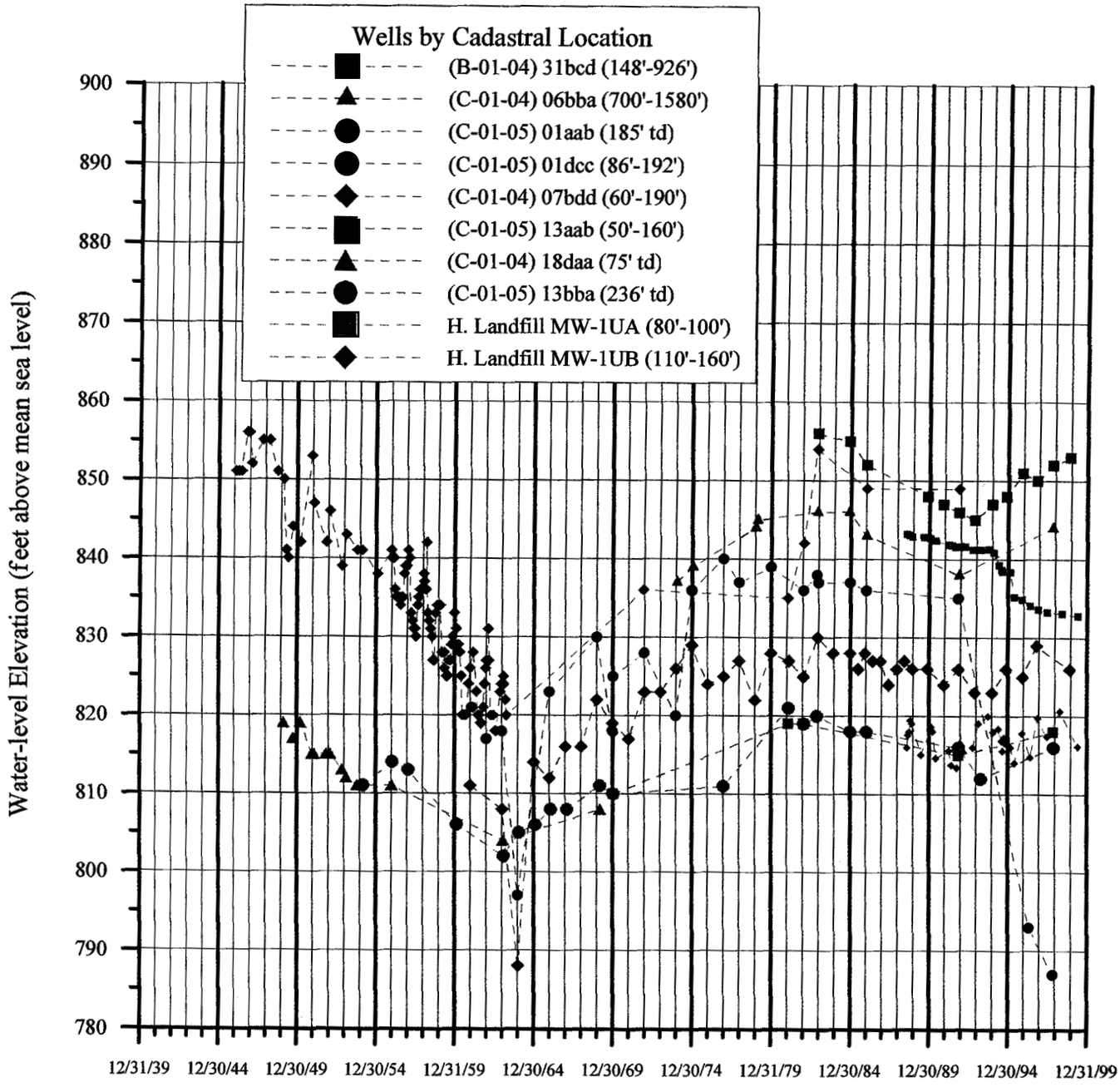


Figure 17 Hydrographs for Wells in the Hassayampa Area

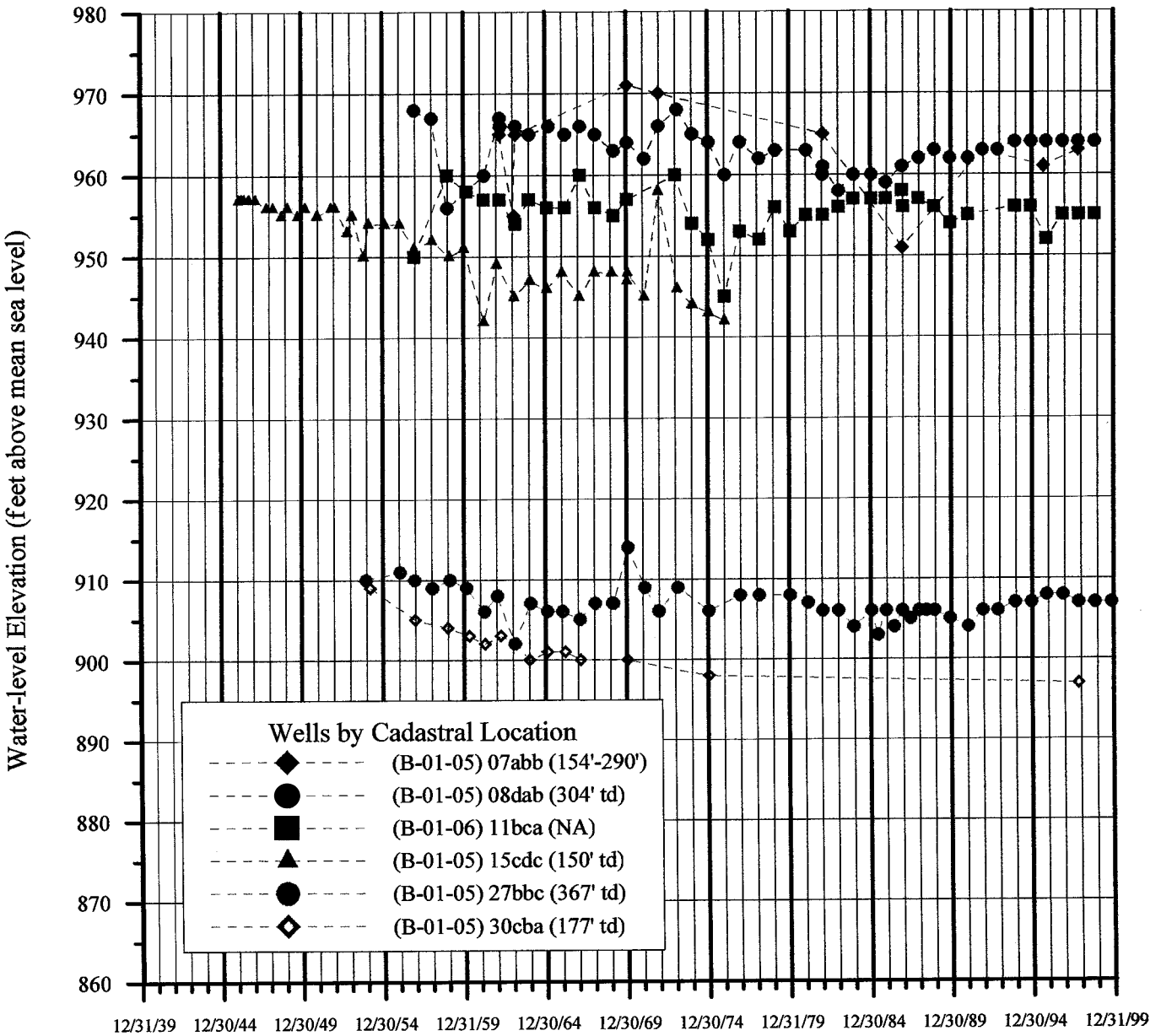


Figure 18 Hydrographs for wells in the I-10 - Buckeye-Salome Road Corridor

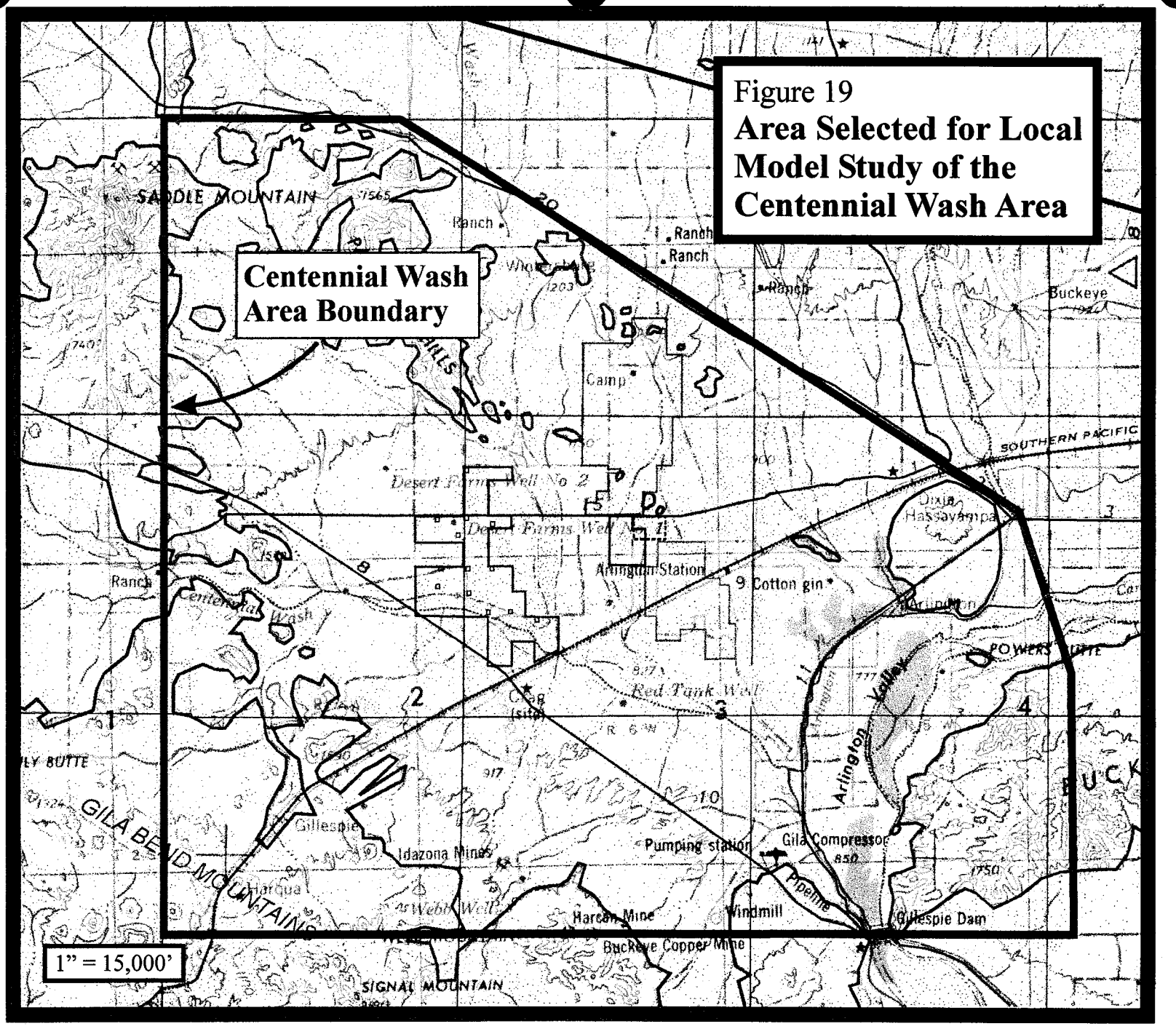


Figure 19
Area Selected for Local Model Study of the Centennial Wash Area

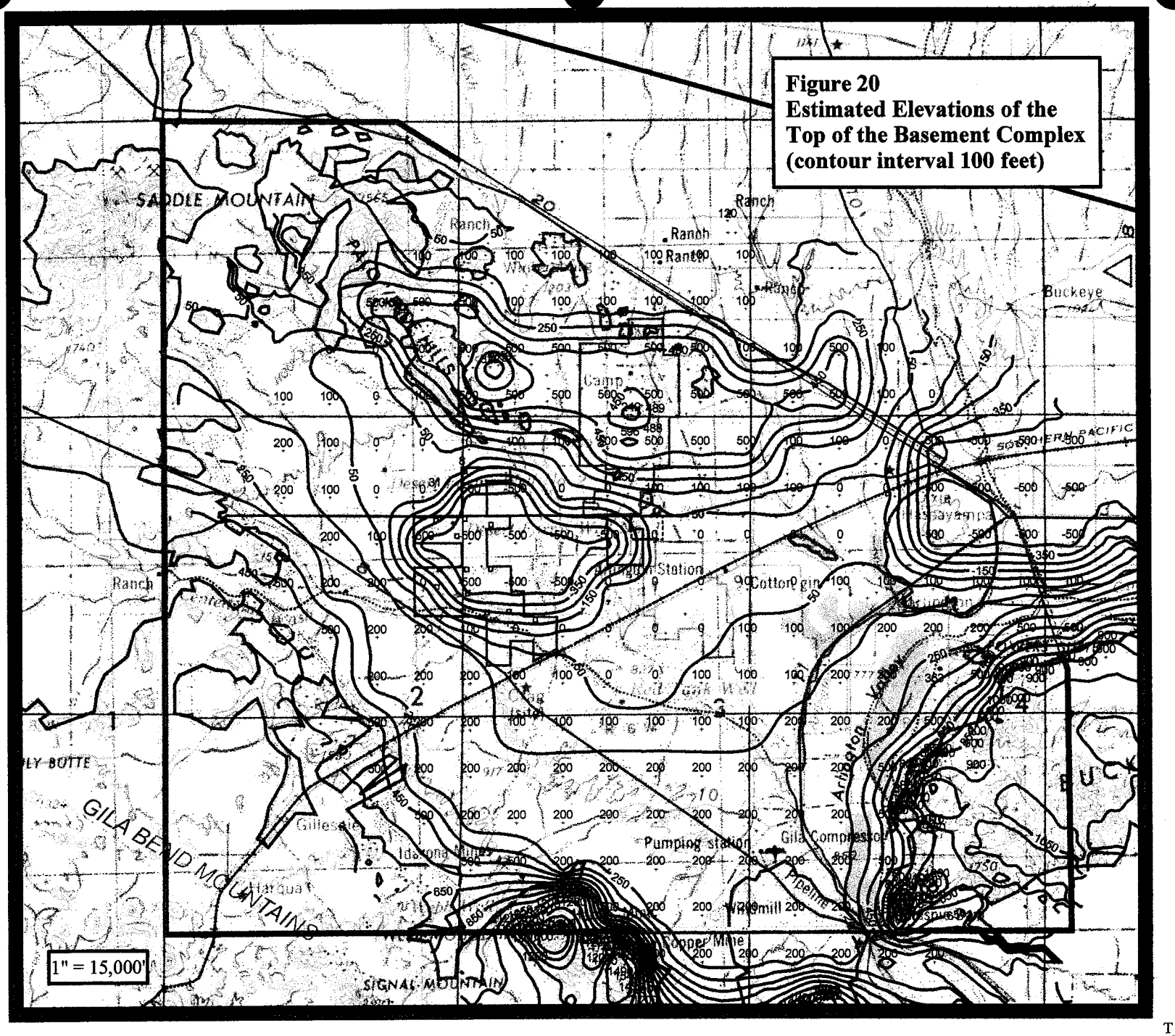


Figure 20
Estimated Elevations of the Top of the Basement Complex (contour interval 100 feet)

T_pCGr.srf

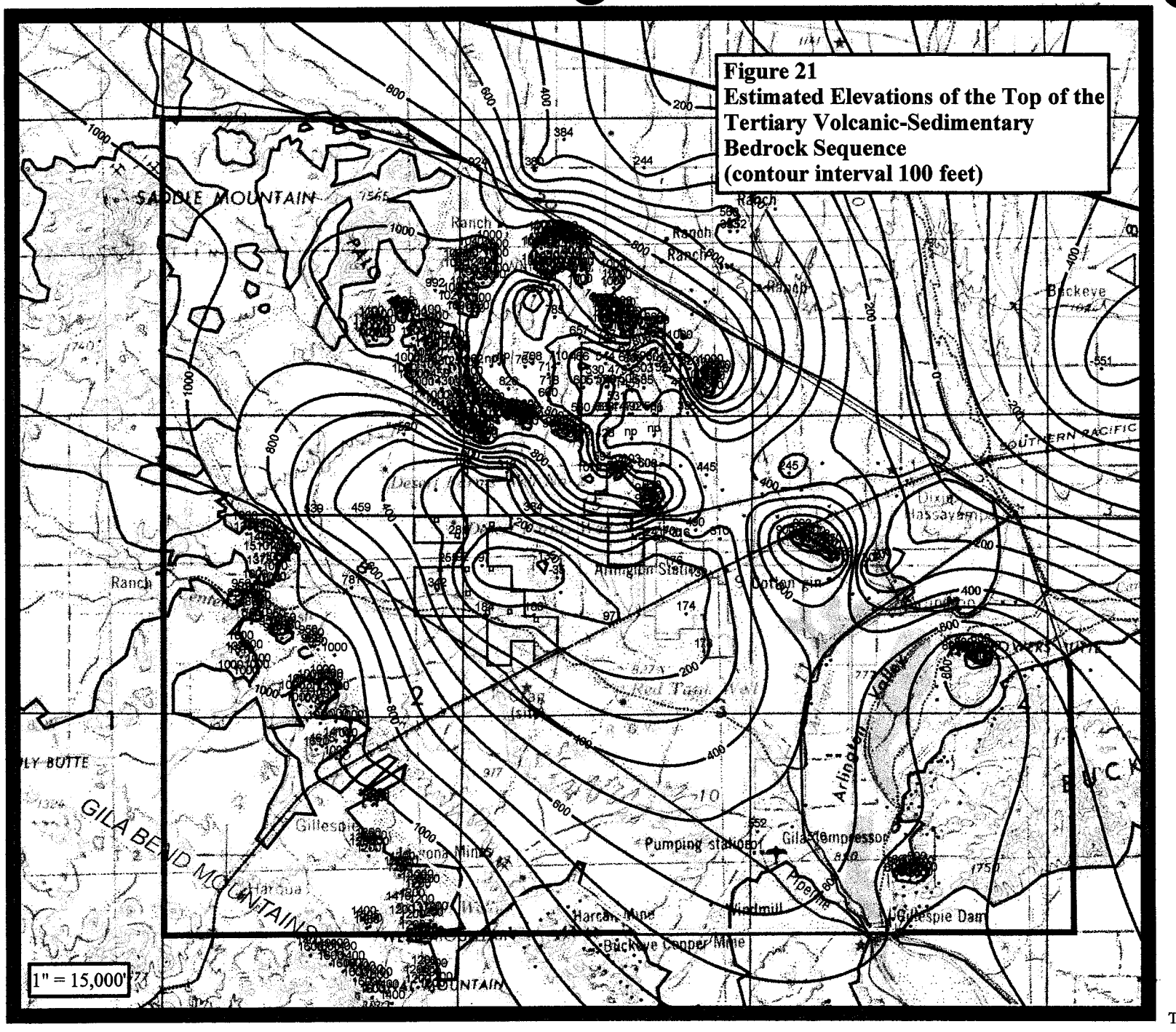


Figure 21
Estimated Elevations of the Top of the Tertiary Volcanic-Sedimentary Bedrock Sequence
(contour interval 100 feet)

T_Tv.srf

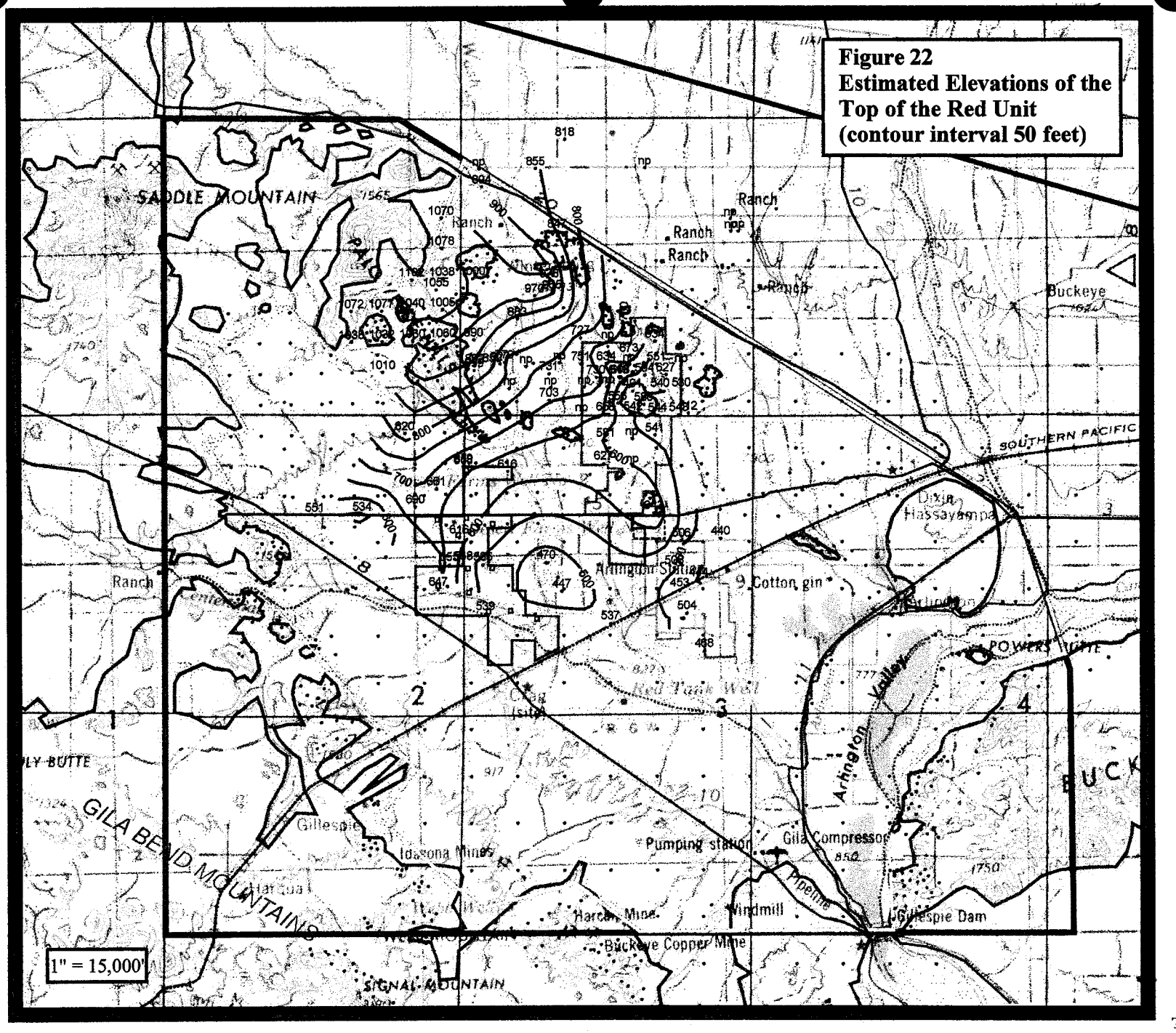


Figure 22
Estimated Elevations of the Top of the Red Unit (contour interval 50 feet)

T_Tvfn.srf

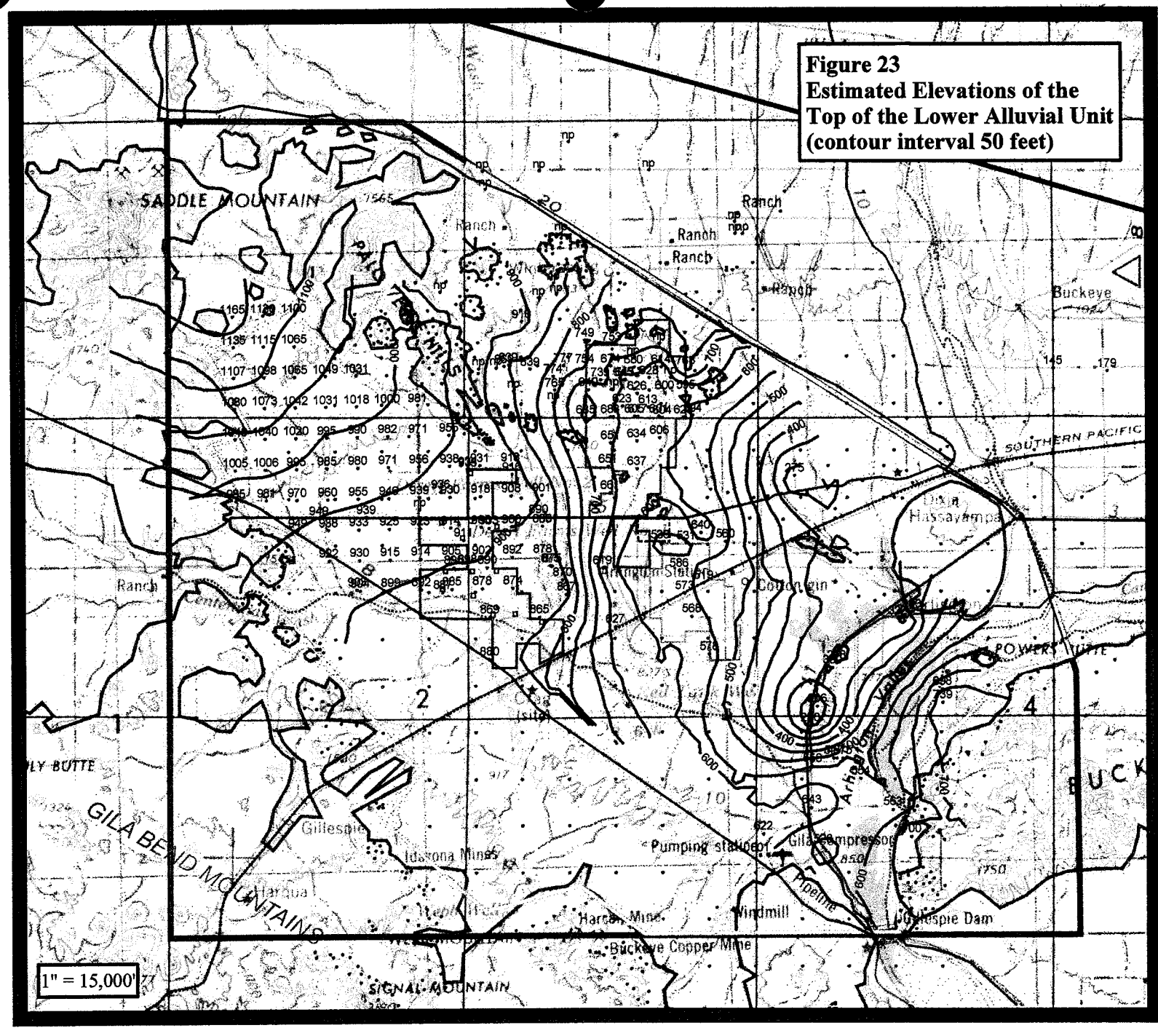


Figure 23
Estimated Elevations of the Top of the Lower Alluvial Unit (contour interval 50 feet)

T_LAU.srf

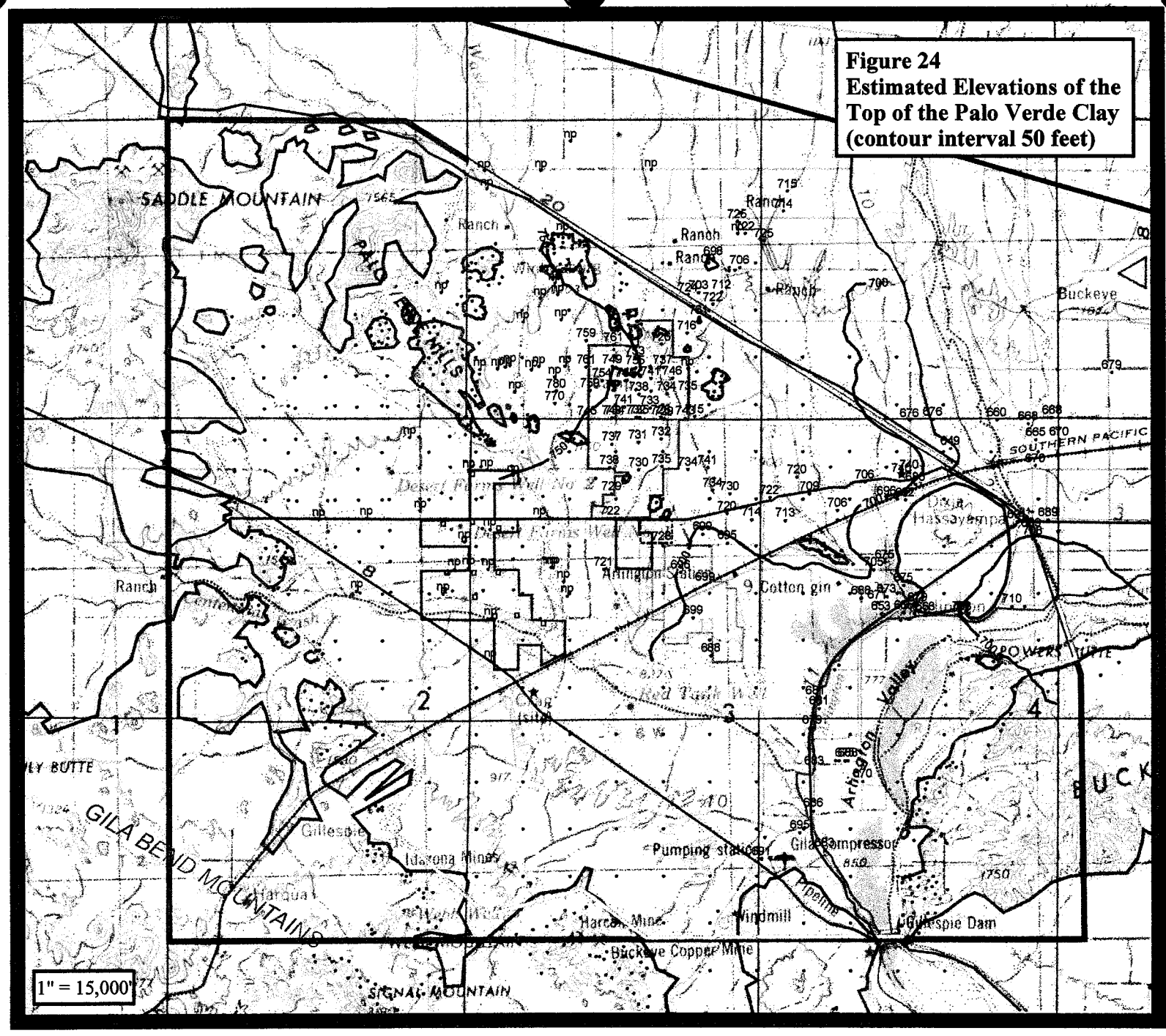


Figure 24
Estimated Elevations of the Top of the Palo Verde Clay (contour interval 50 feet)

T_PVClay.srf

Exhibit B-7
Land Use

Land Use Study
Mesquite Generating Station

Introduction

This land use study will identify existing land ownership and uses, plans for future land uses, and zoning requirements within a 2 mile radius of the plant site (study area). This baseline data will be developed using existing maps, aerial photographs, Maricopa County planning documents and visual surveys and inspections. The data will be evaluated to determine any potential land use impacts from the construction and operation of the proposed power plant. In addition to the plant site, this land use study will determine any potential impacts for the land on which the existing agricultural water rights are being converted to Type I rights (water property). This ground water will be the source for the plant water supply. Mitigation measures will be proposed if any potential land use impacts are identified.

Plant Site Location

The plant site is located in the unincorporated community of Arlington, Arizona, in the county of Maricopa. The site is located approximately 40 miles west of Phoenix and approximately 8 miles south of interstate 10. The site is situated south of the existing Palo Verde Nuclear Generating Station (PVNGS) on a 400 acre parcel. Access to the site is via Elliot Road, which borders the site to the north. The approximate coordinates for the plant site are latitude 33° 20' north, longitude 112° 51' east. The water property is 2,990 acres located approximately 2 miles west of the plant site. Refer to the area map provided in Exhibit A-2.

Land Ownership

The ownership in the study area consists of State land administered by the Arizona State Land Department, and private land. The land ownership in the study area is shown on the map provided in Figure A3-1. The plant site and the water property are located on private land.

Existing Land Uses

The land in the study area is general rural in nature and the primary uses are agricultural, residential, industrial, vacant, transportation or utilities. The map in Figure A3-2 indicates the existing land uses with transportation and utility corridors highlighted for clarification. The following is a brief description of the various existing land uses.

Agricultural

The agricultural land use within the study area is primarily irrigated farmland. The active agricultural land is generally located south and southeast of the plant site and is located outside of the study area. The agricultural land in the study area (including the water property) were previously used for agriculture but are currently out of production and are returning to vacant desert.

Residential

The residential land use in the study area is primarily single family dwellings. The location of the single family dwellings within the study area are shown on the map provided in Figure A3-2

Industrial

The industrial land use in the study area consists of the PVNGS located directly north of the plant site.

Transportation

The transportation corridors within the study area consist of roads and railroads.

The roads within the study area are generally unpaved, two-track roads used by local property owners. The major arterial paved roads in the study area are Elliot Road and Wintersburg Road (383rd Avenue).

The Southern Pacific Railroad operates one main railroad line that runs southwest to northeast with the closest point approximately 1 mile from the plant site. One rail spurs runs north from this line to the PVNGS and bisects the plant site property.

Utilities

Several transmission lines exist within the study area and an El Paso interstate gas line, though not within the study area, crosses a portion of the water properties.

There are three 500kV transmission lines within the study area (excluding transmission lines within the PVNGS property) and are described below:

- The North Gila transmission line runs north to south through the western edge of plant site property.
- The Kyrene line runs north to south at a location approximately ½ mile west of the plant site property.
- The Devers line runs east to west approximately 1 mile northeast of the plant site and crosses the most northern portion of the water properties.

A 69 kV Arlington substation is located just north of Elliot Road approximately 1-1/2 miles east of the plant site. There are several 69 kV subtransmission lines emanating from this substation that are in the study area.

There are low voltage distribution running along the northern and western portion of the plant site property boundaries.

There are several agricultural irrigation wells and canals/ditches throughout the study area. Most of these appear not to be in operation.

Vacant Land

A large portion of the study area consists of undeveloped or vacant land. This vacant land has no visible building or structures.

Future Land Use

The purpose of the future land use inventory was to document all planned and proposed land uses. Sources of future land use information include projected uses embodied in officially adopted general and wide-area plans. Planned uses within the vicinity of the study area are described in the Maricopa County Tonopah Area Land Use Plan, adopted by the Maricopa County board of Supervisors in 1992 ("Tonopah Plan"). The Tonopah Plan amended the original plan to reflect changing growth patterns, population projections and annexations and other changes within the planning area.

Changes in existing, developed land uses within the study area are unlikely to occur. It is more likely the development of vacant and agricultural lands will occur as rural-type development (e.g., residential) continues throughout the study area

The majority of lands within the study area are currently planned for Rural Residential, High Density use. According to the Tonopah Plan, the Rural Residential, High Density category denotes areas where single-family residential development is desirable but urban services (e.g., water, sewer, schools, parks, law enforcement, fire protection, etc.) are limited. Uses in this category include agricultural and single-family residential. However, Maricopa County is currently drafting a major revision to the Tonopah Plan. County planners are considering a change that would replace a portion of the land designated as Rural Residential land use, which includes the plant site, with an Industrial use classification.

Several locations within the study area are designated by the Tonopah Plan as Open Space; although no such designation occurs at the plant site. The majority of land designated as open space is located south and west of the plant site along the Centennial Wash. According to the Tonopah Plan, the "open space" designation is prescribed for areas that would be best precluded from development except for recreational purposes.

The existing PVNGS property is designated as a Heavy Industrial Center. Lands designated for this use denote areas for the location of major employment centers. Uses permitted in this category include warehousing, storage, distribution activities and general manufacturing and assembly of small parts.

The proposed Palo Verde South Switchyard would be located east of the plant site, south of Elliot Road between the existing Kyrene and North Gila 500kV transmission lines. Preliminary plans indicate that the Palo Verde South Switchyard would serve as a satellite facility for new and existing power lines and an alternative to connecting directly into the existing PVNGS switchyard.

Zoning

Zoning is a method of land use control that specifies the types of land uses allowed, the intensity or density of the use, and standards for development. Zoning classifications for the study area were obtained from Maricopa County's Planning and Development Department and are shown in Figure A3-3.

According to Maricopa County's Zoning Ordinance (1998) and Maricopa County's Planning and Development Department, the plant site is zoned Rural-190. The principal purpose of this Rural-190 zoning designation is to conserve and protect farms and other open land uses, foster orderly growth in rural areas and prevent urban and agricultural land use conflicts. Uses permitted in these zoning districts typically include both farm and non-farm residential uses, farms, and recreational and institutional uses.

All lands within the study area are zoned Rural-190 with the exception of that portion of the PVNGS property that occurs within the study area, which area includes both Rural-190 and Rural-43 designations. The PVNGS operation is currently permitted under a Special Use Permit granted by Maricopa County. Rural-190 zoning requires a minimum lot size of 190,000 square feet per dwelling unit and Rural-43 zoning requires a minimum lot size of one acre per dwelling unit.

As the plant site is located within the current Rural-190 zoning designation, according to the Maricopa County's Zoning Ordinance (Article IV, Section 402), a Special Use Permit would be required to construct and operate the proposed Project. The Applicant is in the process of applying for a Special Use Permit, which would be issued by the Maricopa County Board of Supervisors upon recommendation of Maricopa County's Planning and Zoning Commission.

Impact Assessment

The proposed project site is located on land under private ownership. Lands adjacent to the project are primarily undeveloped. There are no plans for any new transmission lines or rail spurs and new access roads will be confined to the project site except for the entrance way at Elliot Road. The project will not have any direct adverse impacts to existing residential or other uses.

The project site and surrounding lands are designated for rural residential high-density use according to the Maricopa County *Tonopah Area Land Use Plan.* Based on a records search at the County's Planning and Development Department, no residential developments have been proposed or approved for the area immediately surrounding the project site. Recent proposals (i.e., proposed Palo Verde South Switchyard) indicates that other land use plans within the vicinity of the project will be consistent with the proposed project. In addition, County planners are considering a change that would replace a portion of the land designated as Rural Residential land use, which includes

the plant site, with an Industrial use classification. Therefore, the project would have no adverse impacts to future land use plans.

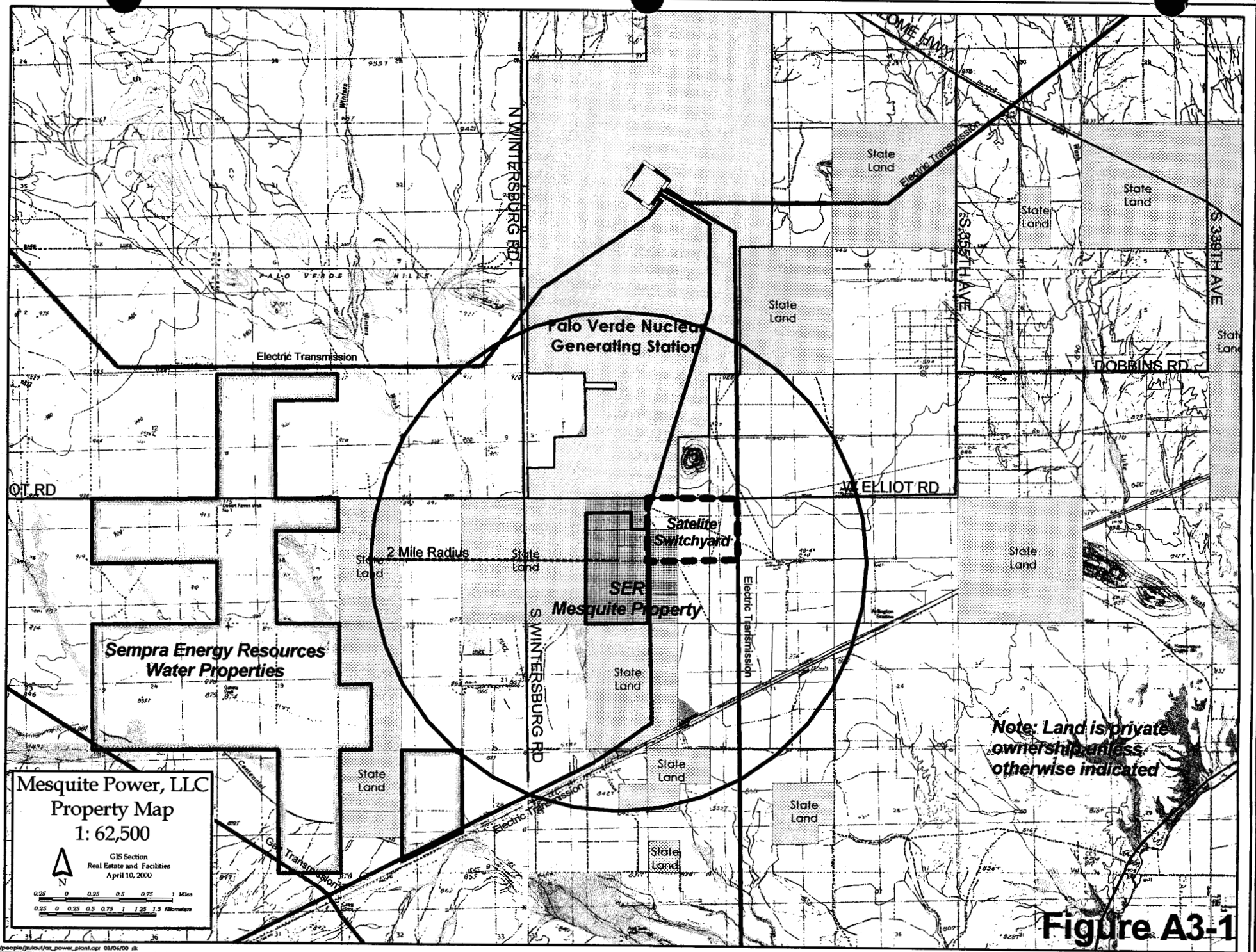
Mitigation Measures

No site-specific mitigation measures have been identified at this time because no substantial impacts to existing or future land use are expected as a result of constructing and operating the proposed project. The water property, though not part of the plant site, will be taken out of agricultural production and subject to the provision of ARS S 45-546 "Weed and Dust Control". A plan is being developed for the water property to establish compliance with the above provision. This plan will be provided upon its completion.

References

Maricopa County. 11/99. *Zoning Ordinance*. Phoenix, Arizona

Maricopa County. *Tonopah Area Land Use Plan*. Phoenix, Arizona.


Mesquite Power, LLC
Property Map
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GIS Section
Real Estate and Facilities
April 10, 2000
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0.25 0 0.25 0.5 0.75 1 1.25 1.5 Kilometers
Palo Verde Nuclear Generating Station
Electric Transmission
N WINTERSBURG RD
S WINTERSBURG RD
S 355TH AVE
S 339TH AVE
DOBBINS RD
W ELLIOT RD
OT RD
2 Mile Radius
Satelite Switchyard
SER Mesquite Property
Sempra Energy Resources Water Properties
State Land
Electric Transmission
Gas Transmission
Note: Land is private ownership unless otherwise indicated
Figure A3-1

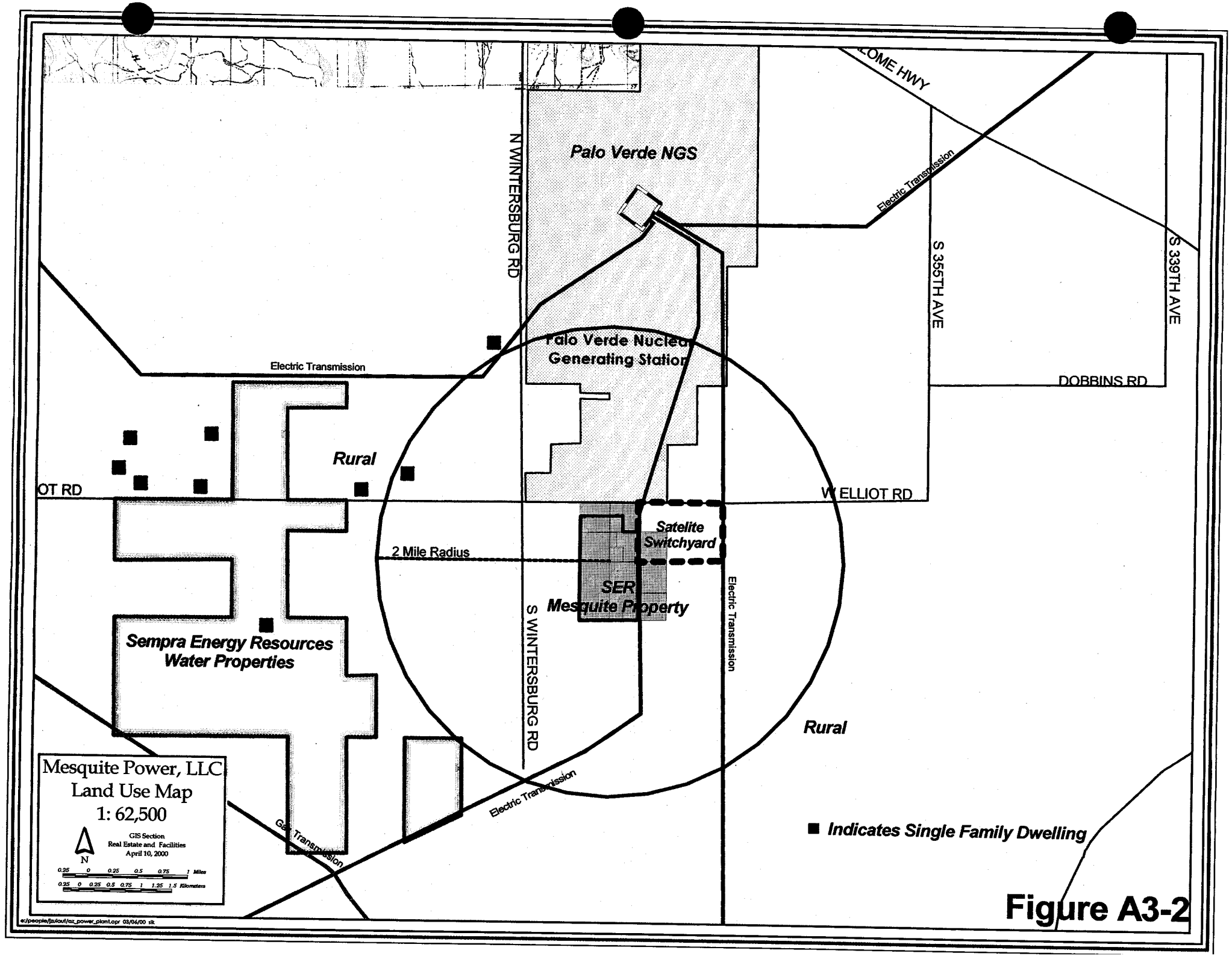
Palo Verde NGS
Palo Verde Nuclear Generating Station
N WINTERSBURG RD
S WINTERSBURG RD
S 355TH AVE
S 339TH AVE
DOBBINS RD
W ELLIOT RD
OT RD
Electric Transmission
Electric Transmission
Electric Transmission
Electric Transmission
Gas Transmission
Rural
Rural
Satelite Switchyard
SER Mesquite Property
2 Mile Radius
Sempra Energy Resources Water Properties
Indicates Single Family Dwelling
Mesquite Power, LLC
Land Use Map
1: 62,500
GIS Section
Real Estate and Facilities
April 10, 2000
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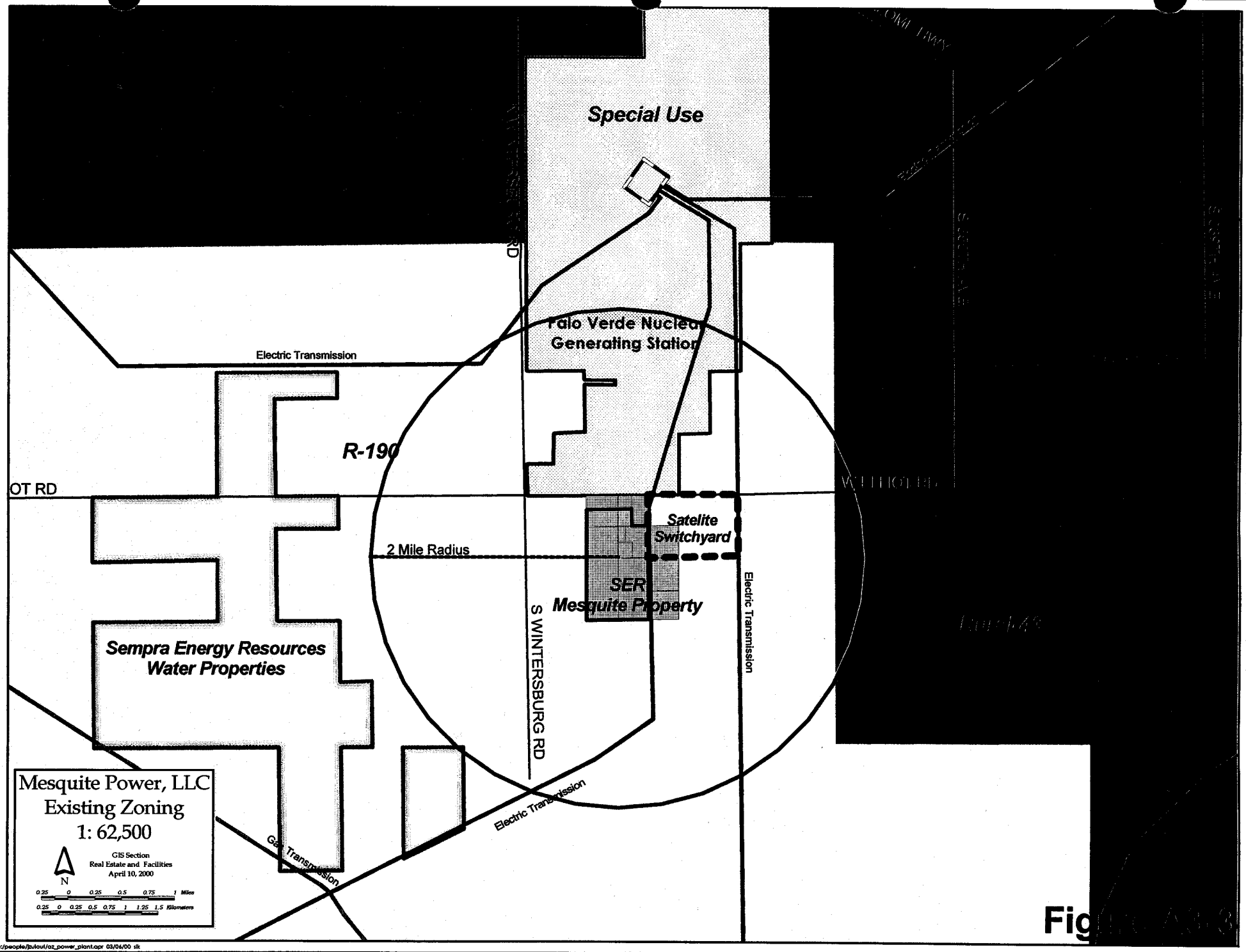
Figure A3-2


Special Use
Palo Verde Nuclear
Generating Station
Electric Transmission
R-190
OT RD
2 Mile Radius
Satelite
Switchyard
SER
Mesquite Property
S WINTERSBURG RD
Electric Transmission
Sempra Energy Resources
Water Properties
Electric Transmission
Gas Transmission
Mesquite Power, LLC
Existing Zoning
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GIS Section
Real Estate and Facilities
April 10, 2000
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Fig

Exhibit C
Unique Biological Wealth or Rare and Endangered Species

The Arizona Corporation Commission Rule of Practice and Procedure R14-3-219 provides that the applicant: "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 the effects, if any, the proposed facility will have thereon."

Biological Wealth and Potential Impacts

No areas in the vicinity of the proposed site are unique because of biological wealth or because they are habitats for rare and endangered species. Exhibit B-1, Biological Description and Setting, contains the complete Biological Description and Setting study and a copy of the Game & Fish Department letter dated November 10, 1999.

The project site consists of gently sloping alluvial soils at an elevation of approximately 850 – 900 feet above sea level. The soils are well drained and composed of silty, sandy and stony soils with some basalt outcrops. The site is gently rolling, with limited topographic diversity. Nearby areas are farmed (irrigated agriculture), but the project site has not been plowed or farmed. The local land-use is rural and agricultural.

The occurring or potentially occurring species lists are provided in Appendix A to the Biological Description and Setting study and again in Exhibit D, Species Lists. No suitable habitat for any federally listed species is found on the project site or known in the vicinity. There are no aquatic or mesoriparian habitats on the site, nor are there any forests, caves, cliffs, dead standing trees or ephemeral pools.

Since there are no aquatic or mesoriparian habitats on the project site or in the vicinity, no aquatic or mesoriparian species will be affected. Likewise, given the lack of such habitat, no forest, cave, cliff or dead standing tree dwelling species are anticipated to be affected. There are no ephemeral pools on site, therefore no species of dependent on ephemeral pools will be affected.

A pygmy owl survey was conducted on the project site and is contained in Exhibit B-2. All pygmy owl surveys have been negative for pygmy owls, therefore, no impact on pygmy owls is expected.

There is no designated critical habitat on the project site or in the vicinity. The project will not affect any designated, or proposed, critical habitat. No suitable habitat for any federally listed species is found on the project site or known in the vicinity, therefore, no impact to any federally listed species is expected. Further, the Game & Fish Department's Heritage Data Management System was accessed and current records did not indicate the presence of any endangered, threatened, or special status species in the project vicinity.

The power plant construction will remove approximately 340 acres of Sonoran Desertscrub community, primarily creosotebush. Most of the animals and plants associated with this community will no longer be supported on the project site. Approximately 50 acres of mesquite scrub associated with the desert wash will be removed. Plants and animals associated with this community will no longer be supported on the project site. While the habitat area lost relative to the total area of the plant communities is small, there will be some increase in fragmentation of the desertscrub and xeroriparian communities in the project area. Some plants and animals may be limited in dispersal or occurrence by fragmentation effects.

Other animals benefit from fragmentation, an increase in habitat frequency in an area. Because the project vicinity is a mosaic of irrigated agricultural lands, desertscrub, and xeroriparian wash, fragmentation effects will be limited.

Indirect effects of the power-plant may include a loss of Sonoran desertscrub to business development and infrastructure construction associated with the power-plant. Water used for the project will be pumped groundwater and is not expected to alter surface water resources. There will be no wastewater disposal to surface waters, therefore there will be no disposal related effects to such waters.

Populations of common animals and plants associated with these communities will be affected through the loss of individuals, however there should be no long-term population effects on any common plant or animal population. Locally, these populations are relatively large and able to absorb these localized losses.

It is concluded that based on this information that this project will not significantly impact native vegetation or wildlife.

Exhibit D
Species Lists

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 associated with the vicinity of the proposed sites or route and describe the effects, if any, other proposed facilities will have thereon."

Tables A1 through A4 outline the plant and animal species occurring, or potentially occurring, within the project area. The potential impact on these species is described below:

Plants and animals associated with the Sonoran Desertscrub area to be disturbed will no longer be supported on the project site. Those species associated with the mesquite in the wash area will also be displaced. The habitat area lost relative to the total area of the plant communities is small, but there will be some increase in fragmentation of the desertscrub and xeroriparian communities in the project area. Some plants and animals may be limited in dispersal or occurrence by fragmentation effects.

Populations of common animals and plants associated with these communities will be affected through the loss of individuals, however there should be no long-term population effects on any common plant or animal population. Locally, these populations are relatively large and able to absorb these localized losses.

There is no designated critical habitat on the project site or in the vicinity. The project will not affect any designated, or proposed, critical habitat. No suitable habitat for any federally listed species is found on the project site or known in the vicinity, therefore, no impact to any federally listed species is expected. Further, there are no anticipated to effects to any Wildlife of Special Concern in Arizona. It is concluded that the project should not have any significant adverse impacts to native vegetation or wildlife.

Table A1
Plant Species Occurring or Potentially Occurring within the Project Area

Plants			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Cat-claw acacia	*Acacia greggii*	Sonoran desertscrub	High
White bursage	*Ambrosia dumosa*	Sonoran desertscrub	High
Triangle-leaf bursage	*Ambrosia deltoidea*	Sonoran desertscrub	High
Six-weeks three-awn	*Aristida adscensionis*	Sonoran desertscrub	High
Fourwing saltbush	*Atriplex canescens*	Sonoran desertscrub	High
Shadescale	*Atriplex confertifolia*	Sonoran desertscrub	High
All-scale	*Atriplex polycarpa*	Sonoran desertscrub	High
Desert senna	*Cassia armata*	Sonoran desertscrub	High
Desert saltgrass	*Distichlis spicata*	Sonoran desertscrub	High
Brittlebush	*Encelia farinosa*	Sonoran desertscrub	High
Filaree	*Erodium cicutarium*	Sonoran desertscrub	High
Spurges	*Euphorbia* spp.	Sonoran desertscrub	High
Cheesebush	*Hymenoclea salsola*	Sonoran desertscrub	High
Big galleta	*Hilaria rigida*	Sonoran desertscrub	High
Creosote bush	*Larrea tridentata*	Sonoran desertscrub	High
Anderson thornbush	*Lycium andersonii*	Sonoran desertscrub	High
Desert broom	*Baccharis sarothroides*	Sonoran desertscrub	High
Red brome	*Bromus rubens*	Sonoran desertscrub	High
Desert hackberry	*Celtis pallida*	Sonoran desertscrub	High
Blue palo verde	*Cercidium floridum*	Sonoran desertscrub	High
Foothill palo verde	*Cerciuium microphyllum*	Sonoran desertscrub	High
Jimmy weed	*Isocoma heterophylla*	Sonoran desertscrub	High
Burro weed	*Isocoma tenuisecta*	Sonoran desertscrub	High
Night blooming cereus	*Peniocereus greggii*	Sonoran desertscrub	High
Woolly plaintain	*Plantago insularis*	Sonoran desertscrub	High
Mesquite	*Prosopis glandulosa*	Sonoran desertscrub	High
Russian thistle	*Salsola kali*	Sonoran desertscrub	High
Arabian grass	*Schismus arabicus*	Sonoran desertscrub	High
Mediterranean grass	*Schismus barbatus*	Sonoran desertscrub	High
Yellow rocket	*Sisyjmbrium irio*	Sonoran desertscrub	High
Globemallow	*Sphaeralcea* spp.	Sonoran desertscrub	High
Greythorn	*Zizyphus obtusifolia*	Sonoran desertscrub	High
Fish-hook Barrel Cactus	*Ferrocactus wislizenii*	Sonoran desertscrub	High
Pincushion cactus	*Mammillaria microcarpa*	Sonoran desertscrub	High
Eagelmann hedgehog cactus	*Echinocereus engelmannii*	Sonoran desertscrub	High
Cholla	*Opuntia* spp.	Sonoran desertscrub	High

Table A2
Reptiles and Amphibians Occurring or Potentially Occurring within the Project Area

Reptiles and Amphibians			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Couch's spadefoot toad	*Scaphiopus couchi*	Shortgrass plains, mesquite savannah, creostoe bush desert, and other areas of low rainfall	High
Western spadefoot toad	*Scaphiopus hammondi*	Lowlands, washes, floodplains of rivers, alluvial fans, playas, and alkali flats.	High
Great plains toad	*Bufo cognatus*	Primarily a grassland species but frequents creosote bush desert	High
Red-spotted toad	*Bufo punctatus*	Desert oases and rocky canyons	None
Mohave rattlesnake	*Crotalus scutularus*	Barren desert, gassland, and brushland: most common in areas of scattered scrubby growth such as creosote bush and mesquite	High
Coachwhip	*Masticophis flagellus*	Desert, prairie, brushland, woodland, and farmland. Usually avoids area of dense vegetation	High
Sonora whipsnake	*Masticophis bilineatus*	Sonaran desert and mountain foothills. Often associated with rock stream courses	Low
Saddled leaf-nosed snake	*Phyllorhynchus browni*	Upland desert	High
Spotted leaf-nosed snake	*Phyllorhynchus decurtatus*	Creosote desert	High
Glossy snake	*Arizona elegans*	Creosote desert	High
Long-nosed snake	*Rhinocheilus lecontei*	Creosote desert	High
Banded sand snake	*Chilomeniscus cinctus*	Creosote desert	High
Night snake	*Hypsiglena torquata*	Creosote desert	High
Western patched-nosed snake	*Salvadora hexalepis*	Creosote desert	High

Table A2 (Continued)
Reptiles and Amphibians Occurring or Potentially Occurring within the Project Area

Reptiles and Amphibians			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Western blind snake	*Leptotyphlops hyumilis*	Favors rocky hillsides with patches of loose soil	Low
Gopher snake	*Pituophis melanoleucus*	Grassland and open brushland	Moderate
Yuma kingsnake	*Lampropeltis getulus*	Creosote desert	High
Western ground snake	*Sonora semiannulate*	Deserts and mountain foothills	High
Sidewinder	*Crotalus cerastes*	Desert species usually found in areas of fine windblown sand	Low to none
Western diamondback rattlesnake	*Crotalus atrox*	Frequents a variety of habitats from deserts into the mountains	High
Mohave rattlesnake	*Crotalus scutularus*	Barren desert, gassland, and brushland: most common in areas of scattered scrubby growth such as creosote bush and mesquite	High
Banded gecko	*Coleonyx variegatus*	Creosote bush flats	High
Zebra-tailed lizard	*Callisaurus draconoides*	Desert areas with sparse vegetation	High
Leopard lizard	*Crotaphytus wislizenii*	Desert plains with creosote bush	High
Desert spiny lizard	*Sceloporus m. magister*	Creosote bush, mesquite woodlands	High
Long –tailed brush lizard	*Urosaurus graciosus*	Creosote bush desert	High
Side-blotched lizard	*Uta stansburiana*	Wide range of habitats, one of the most abundant lizards in the arid and semiarid west	High
Western whiptail	*Cnemidophorus tigris*	Arid and semiarid habitats with sparse vegetation	High
Desert iguana	*Dipsosaurus dorsalis*	Desert areas dominated by creosote bush	High
Chuckwalla	*Sauromalus*	Lava flows, rocky hillsides and rock outcrops in desert areas	None

Table A3
Avian Species Occurring or Potentially Occurring within the Project Area

Birds			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Turkey vulture	*Cathartes aura*	Dry open country	Occasionally
Red-tailed hawk	*Buteo jamaicensis*	A variety of habitats from tundra to desert	Occasionally
Harris hawk	*Parabureo unicinctus*	Mesquite Scrub and Desert areas	High
Prairie falcon	*Falco mexicanus*	Open mountains, dry plains, and prairies	Occasionally
Roadrunner	*Geococcyx californianus*	Chaparral, desert scrub, and arid brush	High
Gambel quail	*Lophortyx gambelii*	Desert thickets; arid country	High
Mourning dove	*Zenoida macroura*	Dry uplands and desert	High
White-winged dove	*Zenoida asuaruca*	Dry uplands and desert	High
Curve-billed thrasher	*Toxostoma curvirostre*	Upland Desert scrub	Moderate
Bendire's thrasher	*Toxostoma bendirei*	Desert scrub	High
Le Conte's thrasher	*Toxostoma lecontei*	Desert with scant vegetation	High
Abert's towhee	*Pipilo aberti*	Along arroys and desert thickets	Moderate
Verdin	*Auriparus flaviceps*	Low desert	High
Black-throated sparrow	*Amphispiza bilineata*	Desert	High
Phainopepla	*Phainopepla nitens*	Desert	High
Pyrrhuloxia	*Cardinalis sinuatus*	Mesquite scrub	High
Say's phoebe	*Sayornis saya*	Plains, sparsely vegetated country	High
Western kingbird	*Tyrannus verticalis*	Arid savanna, farmlands	High
Black-tailed gnatcatcher	*Polioptila melanura*	Deserts and arid country	High
Cactus wren	*Campylorhynchus brunneicapillus*	Deserts and arid hillsides	High
Costa's hummingbird	*Calypte costae*	Low Desert	Moderate
Ladder-backed woodpecker	*Picoides scalaris*	Deserts	Low
Gila woodpecker	*Melanerpews uropygialis*	Low desert scrub with saguaro and mesquite trees	Moderate
Logger-head shrike	*Lanius ludovicianus*	Open country	High
Lark bunting	*Chondestes grammacus*	Dry fields, savanna	Moderate
Horned lark	*Eremophila alpestris*	Open patches of bare ground alternating with low vegetation	High

Table A4
Mammal Species Occurring or Potentially Occurring within the Project Area

Mammals			
Common Name	Scientific Name	Habitat Type	Potential for Occurrence on Proposed Project Site
Desert cottontail	Sylvilagus audubonii	Deserts and semiarid grasslands	High
Black-tailed jack rabbit	Lipus californicus	Deserts and semiarid grasslands	High
Coyote	Canis latrans	Variety of habitats from mountains to deserts	High
Gray fox	Urocyon cineriaorgenteus	Variety of habitats from mountains to deserts	High
Kit fox	Vulpes macrotis	Deserts with alluvial soils	High
Little pocket mouse	Perognathus lonimembris	Deserts with sandy or gravelly soils	Moderate
Arizona pocket mouse	Perognathus amplus	Desertscrub	High
Pocket mouse	Perognathus baileyi	Desertscrub	High
Desert pocket mouse	Perognathus penicillatus	Desert	High
Merriam's kangaroo rat	Dipodomys merriami	Desert	High
Desert kangaroo rat	Dipodomys deserti	Desert	High
Western harvest mouse	Reithrodontomys megalotis	Throughout Arizona	High
Cactus mouse	Peromyscus eremicus	Desertscrub	High
Deer mouse	Peromyscus maniculatus	Various	Moderate
Southern grasshopper mouse	Onychomys torridus	Various	High
Arizona cotton rat	Sigmodon arizonae	Deserts, Mesquite thickets	Moderate
White-throated wood rat	Neotoma albigula	Throughout Arizona	High
Desert wood rat	Neotoma lepida	Deserts	High
Mule deer	Odocoileus hemionus	Deserts, mountains	Occasional

Exhibit E

Existing Scenic Areas, Historic Sites and Structures or Archeological Sites in Vicinity

As stated in Arizona Corporation Commission Rules of Practice and Procedure R14-3-219:

"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 document entitled "Scenic and Visual Resources" was prepared for Mesquite Power, LLC by SA&B Environmental & Chemical Consultants and outlines the existing and potential impact on visual resources.

Historic and archeological sites are described in Exhibit J-2, "Cultural Resources."

Scenic Areas and Visual Resources

Project Location and Setting

The 440 acre project area is located on the south side of Elliott Road approximately 1 mile south of the Palo Verde Nuclear Generating Station (PVNGS) in Maricopa County. The Hassayampa River is located about seven miles to the east of the project area.

The project area is located within the Basin and Range physiographic province in southwest Arizona. More specifically, the project area lies at an elevation of between 868 and 895 ft. above mean sea level in the Lower Colorado subdivision of the Sonoran Desertscrub community (Brown 1984). The parcel is undeveloped and contains sparse scrub vegetation, including palo verde and mesquite, creosotebush, and various cacti, grasses and forbs (weeds). The topographic character of the area is flat, and several unnamed, small and ephemeral drainages traverse the project area. A large, unnamed drainage located in the west half of the study area is more densely vegetated with mesquite, palo verde, and grasses.

Visual Characteristics

The foreground views within the project boundaries vary from the flat, sparsely vegetated desert in the eastern and central portions of the property, to the more densely vegetated areas associated with the drainage in the western portion of the site. Midrange views are relatively nondescript as they lie on the flat land and do not contain notable visual elements except for several unnamed hills located within a quarter mile northeast of the project area. Distant views are comprised of low hills and mountain ranges including the Palo Verde Hills located approximately 10 miles northwest of the project area, the Buckeye Hills approximately six miles southeast of the site, and hills and mountains associated with the Woolsey Peak Wilderness located approximately eight miles south of the property.

Permanent cultural modifications are visible in and around the project area including the PVNGS one mile to the north and a 500kV transmission line that runs north-south near the mid-section line in the eastern portion of the project area. A Southern-Pacific railroad (RR) track parallels the transmission line, a utility (telephone) line delineates the western boundary of the project area, and a drainage ditch and wire fence mark the southern edge of the project area.

Existing Scenic Quality

The aesthetic value and/or scenic quality of a setting is a function of the natural and man-made visual elements which add to and/or distract from the value of an areas visual resources. For the on-site observer, the general project area lacks in distinctive natural visual amenities and is considered relatively common and nondescript. Mid-range and

distant views of the hills and mountains referenced above provide some relief in the visual landscape, however these are relatively unspectacular additions to the visual panorama. Other obvious existing visual elements include the power and telephone lines on the site and the PVNGS to the north. A common visual element related to the PVNGS is steam rising from the cooling towers, especially noticeable in the winter months.

Scenic Viewpoints

The perception of visual quality is directly related to the public's concerns regarding modifications to the viewshed from any given location. Factors used to evaluate the level of visual impacts caused by development and/or other alterations of the existing landscape include: the accessibility and amount of visual observance by the public, the duration of viewing, the subjective opinion of viewers, and the impact of changes occurring on adjacent properties. The project site does not contain any notable changes in elevation that provide viewers with viewpoints that would improve the opportunities for enhanced views. In addition, the site is located in an area that does not contain recreational opportunities and does not generate an abundance of public attention or opportunity to view the project site or its surroundings.

There are no residences within the project area or within a half-mile radius of the project area. Residential development and supporting infrastructure such as parks, schools, commercial developments, and facilities are not anticipated in the near future within or close to the project area. Upon development of the area, it is anticipated that the land uses adjacent to the site will be occupied by similar facilities. The viewshed will be impacted by these proposed developments, however, the opportunities and reasons for public access to the area for purposes other than those related to the new facilities will not increase.

Mitigation

It is recommended that the relatively minor visual impacts related to developing the proposed project can be minimized by consideration of aesthetic treatments of structural elements (e.g., colors consistent with the surrounding natural setting).

Exhibit F
Public Recreational Purposes

As stated in the Arizona Corporation Commission Rules of Practice and Procedure R14-3-219:

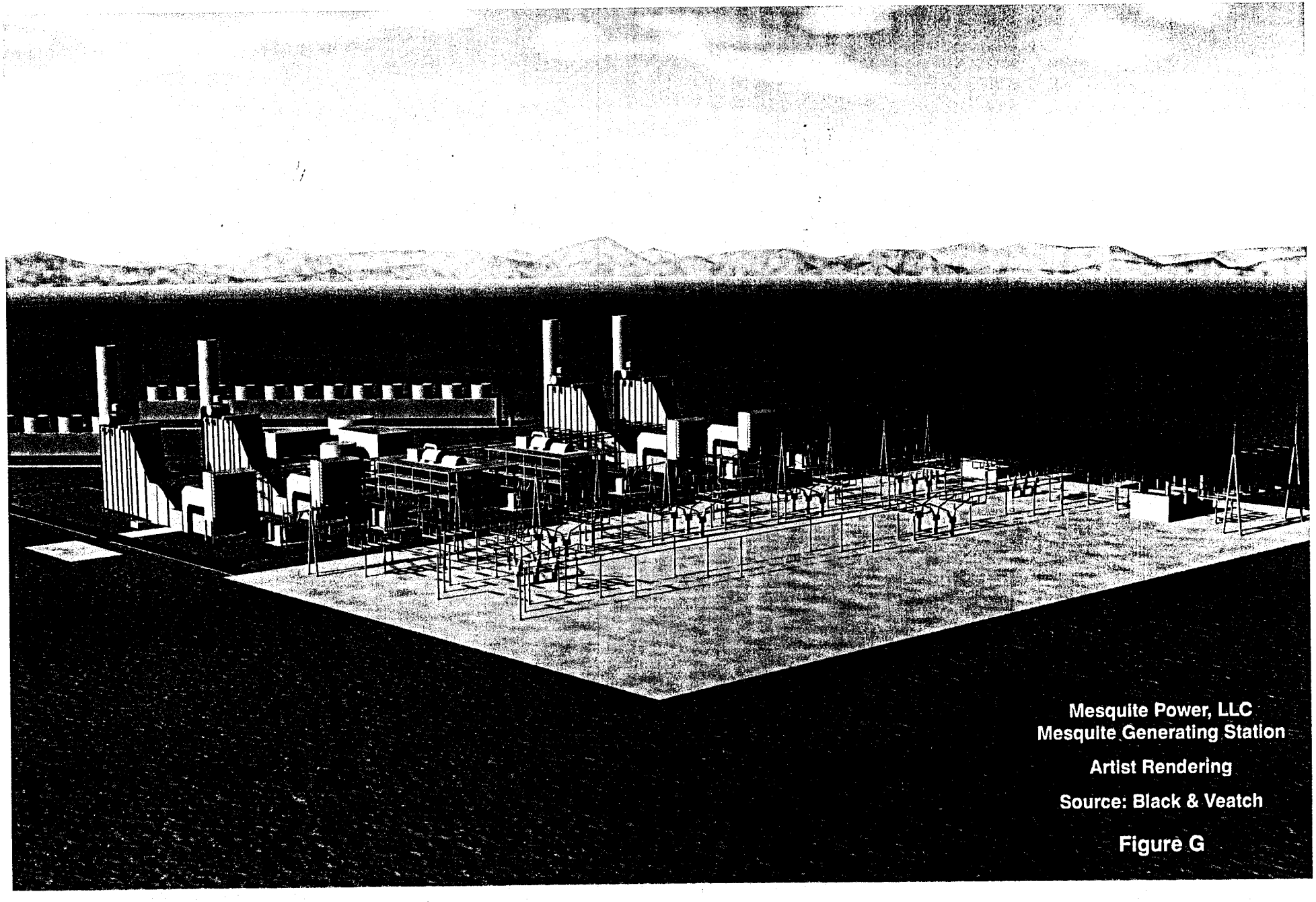
"State the extent, if any, the proposed site or route will be available to the public for recreational purposes, consistent with safety considerations and regulations, and attach any plans the applicant may have concerning the development of the recreational aspects of the proposed site or route."

Recreational Purposes

The construction, operation and maintenance of the Mesquite Generating Station will be consistent with all required safety considerations and as such will not be open to public access. The use of any lands crossed by pipelines or transmission lines would continue to be controlled by any individual or agency currently managing recreation areas or recreation opportunities.

There is currently no developed recreation within the project area and no significant recreation occurs on or around the proposed Plant site location. Occasional hunting or off-road vehicle uses may occur in the general area. Consistent with safety and operational requirements, there are no plans to develop the proposed Plant site for recreational purposes.

Exhibit G
Artists or Architect's Conception



Mesquite Power, LLC
Mesquite Generating Station

Artist Rendering

Source: Black & Veatch

Figure G

Mesquite Power, LLC
Mesquite Generating Station

Photo Simulation
View Looking Southwest
Approximately 742 ft. from Plant

Source: Black & Veatch

Figure G-1

Mesquite Power, LLC
Mesquite Generating Station

Photo Simulation
10.5 Miles West on Elliot Road

Source: Black & Veatch

Figure G-2

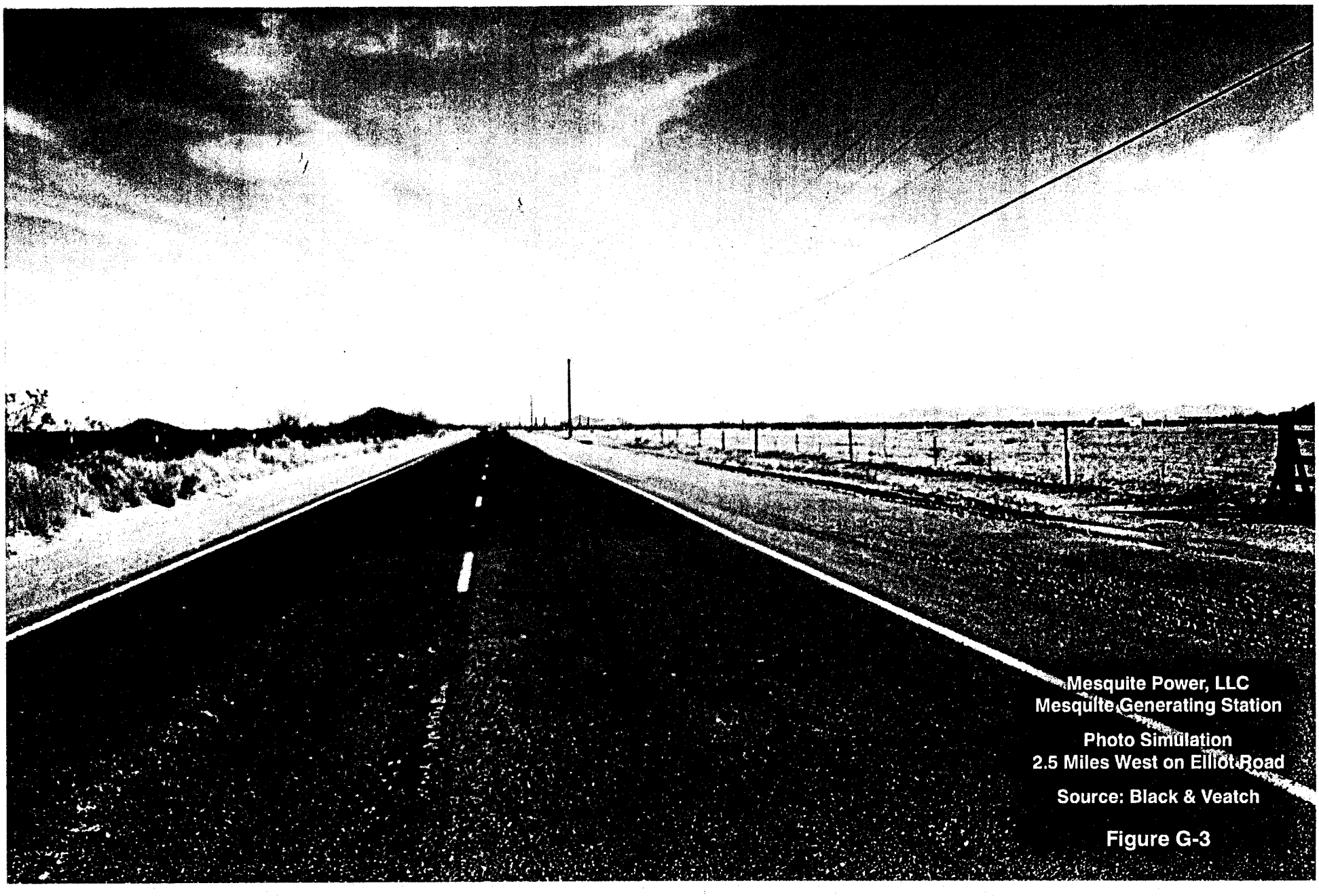

Mesquite Power, LLC
Mesquite Generating Station
Photo Simulation
2.5 Miles West on Elliot Road
Source: Black & Veatch

Figure G-3

Exhibit H
Existing Development Plans

As stated in Arizona Corporation Commission Rules of Practice R14-3-219:

"To the extent applicant is able to determine, state the existing plans of the State, local government and private entities for other developments at or in the vicinity of the proposed site or route."

Existing and future land uses are described throughout Exhibits A through J, references are specifically included in Exhibits B-1, "Biological Description and Setting"; B-4, "Phase I Environmental Survey"; B-7, "Land Use"; I, "Facility Noise Assessment"; and J-1, "Traffic Study."

Known future land uses include a proposed satellite switchyard (Palo Verde South) which will be located nearly adjacent to the project site. In addition to the Mesquite Generating Station, other merchant power plants are being proposed in the general area of the project site by other companies.

Additionally, Exhibit H describes the existing and proposed land use development plans known to exist in the area. Included is the "Proposed Development Plan, Arizona Department of Water Resources, Mesquite Generating Station." This plan describes Mesquite Power, LLC plans for developing the water rights on the water properties associated with the proposed Mesquite Generating Station.

Proposed Development Plan
Arizona Department of Water Resources
Mesquite Generating Station

Introduction

Mesquite Power, LLC, a wholly owned subsidiary of Sempra Energy Resources (SER), is currently developing a power plant project (Mesquite Generating Station) in an area directly south of the Palo Verde Nuclear Generating Station. A 440-acre plant site has been purchased directly south of Elliot Road as shown on the map provided in Appendix 1. The proposed natural gas fired combustion turbine combined cycle power plant will require a water supply for plant operations. As such, Mesquite Power has an option to purchase 2990 acres of land with grandfathered agricultural ground water rights (hereafter referred to as "water property"). A copy of the Memorandum of Option Agreement is provided in Appendix 2. These water rights are to be converted to Type 1 water rights and pumped to the site for plant operations. The water property is located approximately 2 miles west of the plant site.

The properties to be purchased along with the associated grandfathered water rights certificate numbers, the total acres, and the numbers of irrigated acres will be identified. The development plan will specify the conversion rate used to convert the water rights to Type 1 rights, specified the general location of wells and provide a brief description of the water withdrawal plan.

Identification of Properties

The map in Appendix 1 provides the location of the proposed water rights properties, with each property identified by its grandfathered water rights certificate number. The certificate number along with the total acreage and irrigated acres for each property are provided in Table 1 below.

Table 1 – Certificate Numbers and Acres

Grandfathered Water Rights Certificate Numbers	Total Acres	Irrigated Acres
107805	400	379
108354	320	320
109909	320	301
117240	80	77.6
112193	600	600
111348	1030	855.9
103054	160	153.9
106981	80	77.6

Type 1 Water Rights

The existing grandfathered agricultural ground water rights will not be converted to Type 1 rights until ownership of the land has been transfer to Mesquite Power, LLC. In order to ensure that the purchased properties have sufficient water rights to support the plant operations, the existing grandfathered agricultural ground water rights were converted to Type 1 water rights using the lesser of 3 acre-feet per irrigated acre or 3 acre-feet per water duty acre. The results are summarized in Table 2 below.

Table 2 – Type 1 Water Rights

Grandfathered Water Rights Certificate Numbers	Total Acres	Irrigated Acres	Acre-feet of Type I Water
107805	400	379	1104
108354	320	320	878
109909	320	301	895
117240	80	77.6	225.7
112193	600	600	1716
111348	1030	855.9	2492
103054	160	153.9	447.8
106981	80	77.6	232.8

This development plan is based on maximum annual withdrawal of 7991.3 acre-feet of ground water for power plant operations.

Description of Water Withdrawal Plan

Wells and Water Transportation

The properties to be purchased are considered to be contiguous properties and the total allotment of type 1 water may be pumped at any location within the contiguous property. The type 1 water can be transported from the contiguous properties and used on the plant site located approximately 2 miles to the east. The plant site is not contiguous with the properties that have associated water rights.

There are fourteen (14) existing wells on the properties (excluding domestic wells). The approximate locations of these existing wells are identified on the map provided in Appendix C. Mesquite Power intends to use a portion of these existing wells to pump the water from the properties to the plant site. Based on review of ADWR records, all these wells were all established prior to 1980. Therefore, these existing wells may be modified or new wells drilled within a 650 feet radius of the existing well as required to obtain the necessary pumping capacity.

Well Testing and Groundwater Flow Model

Mesquite Power, LLC will conduct an evaluation of the existing wells, perform the necessary pump tests, evaluate the available ground-water resources, and evaluate the impact of pumping those resources on the water properties and surrounding lands.

A detailed data search from both the public and private sectors of available hydrologic and geologic data in and around the proposed water property will be conducted. These data, together with an extensive evaluation of the on-site wells and aquifer testing of at least 4 on-site wells, will be used to establish current hydrogeologic conditions. This information will also be used to develop the hydrogeologic framework for a ground-water flow model of the region (MODFLOW: 3 layers, 9 mile radius). This model will be used to simulate the long-term pumping impacts from the water property on surrounding wells, and the local and regional aquifer system.

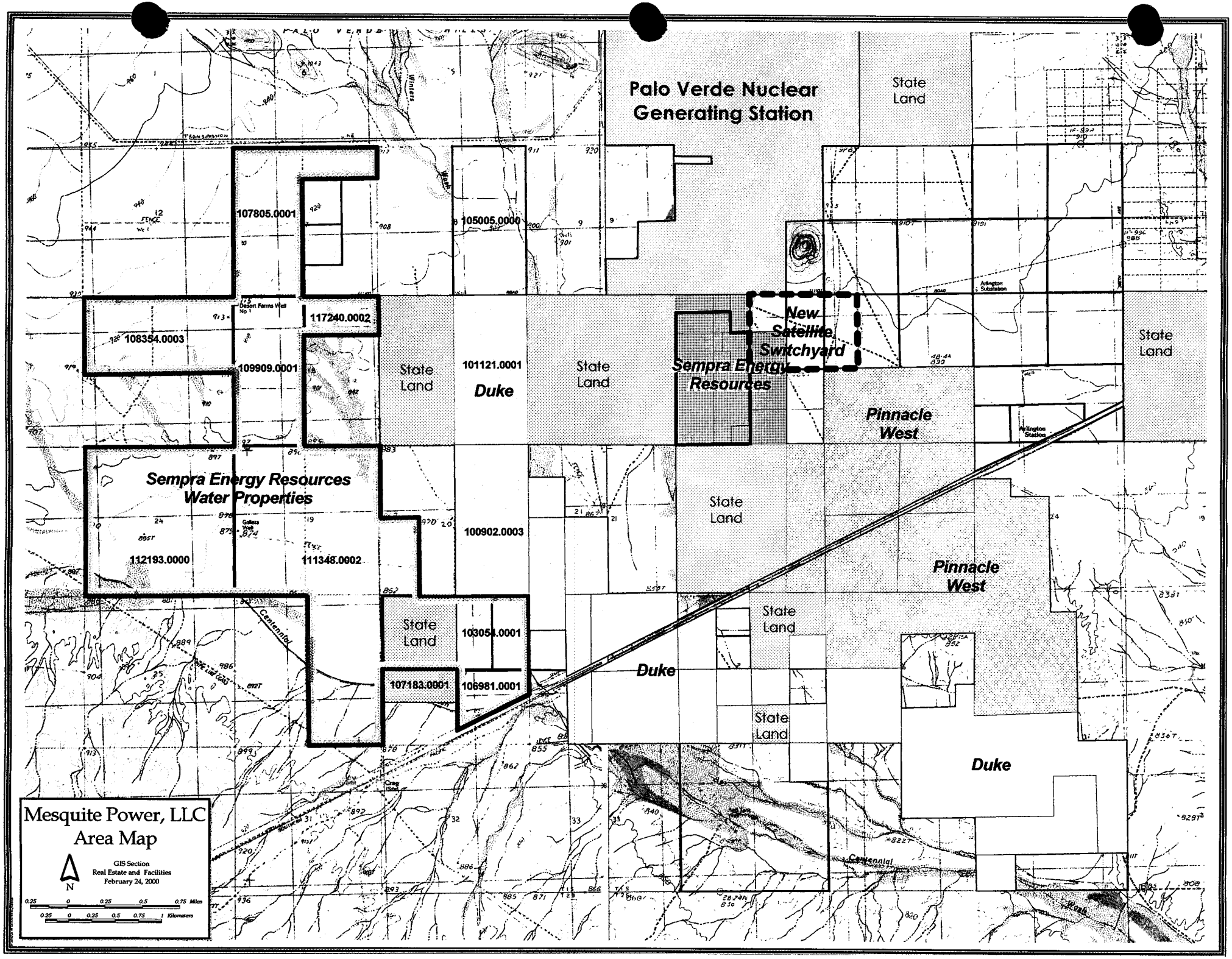
Based on preliminary evaluations, ten (10) of the existing wells will be evaluated further to determine the four (4) wells to be used for the pump tests. These ten (10) wells are identified as wells #1, #2, #3, #4, #6, #9, #10, #12, #13, and #14 are the map provided in Appendix 3. Wells #5, #7, #8, and #11 will not be evaluated at this time.

Plant Site Water System

The water delivered to the plant site will be used for the cooling towers, fire protection, boiler water make-up, air coolers, and other miscellaneous plant equipment. Various types of water treatment systems will be used at the plant site to treat the well water depending on the well water quality and the equipment water quality specifications. On site storage tanks will be provided to ensure that there is sufficient water available for emergency use (i.e. fire protection) and on loss of pumping capacity from the water property wells.

Based on preliminary analysis of water samples taken from an existing well and preliminary engineering design, the plant will require between 3,500 and 4,000 gpm at full load operation. This water usage is based on a worst case water analysis with a Total dissolved solids content of 3000 mg/l and treating the cooling tower water such that ten (10) cycles of concentration can be achieved prior to discharge. These values are preliminary and will be revised based on actual ground water quality, final treatment system design and final equipment specifications.

APPENDIX 1


Palo Verde Nuclear Generating Station
State Land
107805.0001
105005.0000
108354.0003
117240.0002
109909.0001
101121.0001
Duke
State Land
State Land
Sempra Energy Resources
New Satellite Switchyard
Pinnacle West
State Land
Sempra Energy Resources Water Properties
112193.0000
111348.0002
100902.0003
State Land
Pinnacle West
State Land
103054.0001
107183.0001
106981.0001
Duke
State Land
Duke
Centennial
Mesquite Power, LLC
Area Map
GIS Section
Real Estate and Facilities
February 24, 2000
N
0.25 0 0.25 0.5 0.75 Miles
0.25 0 0.25 0.5 0.75 1 Kilometers

APPENDIX 2

WHEN RECORDED, RETURN TO:

Margaret E. Koppen, Esq.
Bryan Cave LLP
Two N. Central Ave., Suite 2200
Phoenix, AZ 85004

MEMORANDUM OF OPTION AGREEMENT

BY THIS MEMORANDUM OF OPTION AGREEMENT ("Memorandum"), dated November 15, 1999, is entered into by and between MCMURTRY FAMILY PROPERTIES LIMITED LIABILITY COMPANY, an Arizona limited liability company ("Owner"), and SEP II, a California corporation ("Purchaser"), declare and agree as follows:

A. Owner owns that certain real property located in Maricopa County, Arizona and described on the attached Exhibit "A" (the "Property").

B. Owner has granted to Purchaser, pursuant to that certain Option Agreement between Purchaser and Owner, dated November 15, 1999 ("Option Agreement"), an option to purchase the Property in accordance with the terms of the Option Agreement.

C. The term of the Option commenced upon November 15, 1999, the Option must be exercised on or before January 31, 2001 and closing of the purchase of the Property under the Option must occur on or before January 2, 2002.

D. All of the other terms, conditions and agreement contained within the Option Agreement are fully incorporated herein by reference as if fully set forth herein. This Memorandum is not intended to change any of the terms of the Option Agreement.

[SIGNATURES BEGIN ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the parties have executed this Memorandum of Option Agreement as of the date first set forth above.

OWNER:

MCMURTRY FAMILY PROPERTIES LIMITED LIABILITY COMPANY, an Arizona limited liability company

By: McMurtry
Its: Manager

STATE OF ARIZONA)
) ss.
County of Maricopa)

The foregoing instrument was acknowledged before me on November 5, 1995 by William McMurtry the Manager of MCMURTRY FAMILY PROPERTIES LIMITED LIABILITY COMPANY, an Arizona limited liability company, on behalf of such company.

Lisa E. Holder
Notary Public

OFFICIAL SEAL
LISA E. HOLDER
NOTARY PUBLIC-ARIZONA
MARICOPA COUNTY
My Comm. Expires May 9, 2002

My Commission Expires:

5-9-02

[SIGNATURES CONTINUED ON FOLLOWING PAGE]

PURCHASER:

SEP II, a California corporation

By: Joseph H Rowley
Joseph H. Rowley
Its: Vice-President-Project Development

State of California }
}
County of San Diego }

On November 15, 1999, before me, Donna R. Corona, a Notary Public, personally appeared JOSEPH H. ROWLEY personally known to me to be the persons whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person or the entities upon behalf of which the persons acted, executed the instrument.

WITNESS my hand and official seal.

DONNA R. CORONA
Commission # 1132091
Notary Public — California
San Diego County
My Comm. Expires Apr 21, 2001

Donna R Corona
DONNA R. CORONA

My Commission Expires:
4/21/01

EXHIBIT "A"

PARCEL NO. 1:

That part of the Southeast quarter of Section 29, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, lying North of the Southern Pacific Transportation Company right-of-way as described in Patent recorded in Book 196 of Deeds, Page 235, Maricopa County Records.

EXCEPT 1/16th of all gas, oil, metals and mineral rights, as set forth in ARS 37-231, Subsection C, as reserved in the Patent from the State of Arizona recorded July 19, 1957 in Docket 2232, Page 283.

(Harper Farm)

EXHIBIT "A"

The Northeast quarter of Section 29, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona;

EXCEPT an undivided 1/16th interest in all minerals in the West half of the Northeast quarter of said Section 29, as reserved by LOREN JONES in Deed recorded in Docket 6611, Page 271, records of Maricopa County, Arizona, and

EXCEPT an undivided 1/16th interest in all minerals in the East half of the Northeast quarter of said Section 29, as reserved by LOREN JONES in Deed recorded in Docket 7676, Page 115, records of Maricopa County, Arizona.

(Foreclosure Rescue)

EXHIBIT "A"

PARCEL NO.-1:

The West half and the South half of the Southeast quarter of Section 19, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 2:

The Northeast quarter and the North half of the Southeast quarter of Section 19, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 3:

The West half of the Southwest quarter of Section 20, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

PARCEL NO. 4:

The East half of Section 30, Township 1 South, Range 6 West of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

(Campio)

APPENDIX 3

OVERSIZED DOCUMENT

MAP

SEE SUPERVISOR
(EXHIBIT CABINET)

ARIZONA DEPARTMENT OF WATER RESOURCES
500 North Third Street, Phoenix, Arizona 85004

APPLICATION FOR DEVELOPMENT PLAN APPROVAL TO RETIRE AN IRRIGATION GRANDFATHERED RIGHT FOR A NON-IRRIGATION (TYPE I)-USE

Filing fee: No Charge

CERTIFICATE No. 58- 107805.0001

CERTIFIED ACRES 379.23

1. Mesquite Power, LLC a Delaware Limited Liability Company
   Last Name First Middle Initial

   Swartz Marty C
   Last Name First Middle Initial

   101 Ash Street San Diego CA 92101
   Mailing Address City State Zip

2. Active Management Area Phoenix

3. Attach a copy of the proposed development plan.

4. Legal description of land covered by certificate:
   W ½; N ½ NE ¼ Section 7, T1S Range 6W GSRB&M, excluding all dedicated rights of way
   See attached Exhibit "A"

5. Legal description of land to be retired (attach map).
   See Attached Exhibit "B"

6. Total number of acres to be retired 379.23

7. Describe the location of each well, which was used to irrigate the land.
   NW 1/4 NW 1/4 NW 1/4 Section 7 Township 1S Range 6W Reg.No. 55 610921
   ____ 1/4 ____ 1/4 ____ 1/4 Section ____ Township ____ Range ____ Reg.No. 55 ____

8. When was the land last irrigated? Approximately four years ago

9. Has the land been held under the same ownership since it was last irrigated? ___Yes _X__No

   If no, did the applicant purchase the land from the last irrigator? ___Yes _X__No

   Enclose evidence to show date of purchase. *(See Appendix 2 of the proposed development plan)*

10. Has the land been sold or taken out of production primarily because it would have been uneconomical to continue to withdraw for irrigation? _X__Yes ___No

    If 'No" explain why the land was retired. _____

11. The intended use of the water is. ____Expanded animal industry _____Domestic
    _____ Industrial X Electrical Energy Generation _____ Mining _____ Other

12. Is the land to be retired within the exterior boundaries of a service area of a city, town or private water company? ___Yes _X__No

    If "Yes" indicate name of city town or private water company N/A

Signature: _____ Date: March 10, 2000
Marty C. Swartz – Manager, Project Development

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of Title 45, Chapter 2, Arizona Revised Statutes

BIRMINGHAM INVESTMENTS, LTD.,
A CALIFORNIA LIMITED PARTNERSHIP

1801-1 PARKCOURT PLACE #101
SANTA ANA, CA 92701

is granted
IRRIGATION GRANDFATHERED RIGHTS
in the

PHOENIX ACTIVE MANAGEMENT AREA

for 379.23 *irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:*

W½; N½ NE¼ Sec. 7 T1S R6W GSRB&M excluding all dedicated rights of way.

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

CERTIFICATE NO. 58-107805.0001

is granted this 11th day of January, 1988

ARIZONA DEPARTMENT OF WATER RESOURCES

Allen P. Klein

Director

The Department of Water Resources must be notified if the above named person(s) changes his address, conveys ownership of the land to another person(s), or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

STATE OF ARIZONA

DEPARTMENT OF WATER RESOURCES
PHOENIX ACTIVE MANAGEMENT AREA

NOTICE OF IRRIGATION WATER DUTY AND MAXIMUM ANNUAL GROUNDWATER ALLOTMENT

Pursuant to A.R.S. §45-564.B, the Director of Water Resources hereby gives notice of the irrigation water duty and the maximum annual groundwater allotment for Irrigation Grandfathered Right Certificate No. 58-107805.0001 The maximum annual groundwater allotment is the maximum amount of groundwater that may be used per year to irrigate the lands described in the above-referenced Certificate of Irrigation Grandfathered Right, except as provided in A.R.S. §45-467, the operating flexibility account provision.

IRRIGATION WATER DUTY 4.22 ACRE-FEET PER ACRE.

MAXIMUM ANNUAL GROUNDWATER ALLOTMENT 1552.3 ACRE-FEET PER YEAR.

Attachment A to this notice sets forth the official language of the above requirements for holders of grandfathered rights as adopted in the first management plan for the Phoenix Active Management Area. Attachment A is incorporated into this notice by reference. Compliance with the irrigation water duty and maximum annual groundwater allotment must be achieved beginning January 1, 1987 and must be maintained until the effective date of any new irrigation water duty established in the second management plan for the Phoenix Active Management Area.

NOTICE ISSUED BY

Alan P. Kleinman

Alan P. Kleinman, Ph.D
Director

1. **Conservation Requirements for Holders of Irrigation Grandfathered Rights**

a. Each person who is entitled to use groundwater pursuant to a certificate of irrigation grandfathered right shall comply with the applicable irrigation water duty no later than the compliance date and shall remain in compliance with that irrigation water duty until the effective date of any applicable irrigation water duty prescribed in the second management plan.

b. During the first accounting period after the compliance date and during each succeeding accounting period until the effective date of any applicable irrigation water duty prescribed in the second management plan, a person who is entitled to use groundwater pursuant to a certificate of irrigation grandfathered right shall not use groundwater in excess of the applicable maximum annual groundwater allotment to irrigate the certified irrigation acres in the farm, except as provided in A.R.S. 45-467.

2. **Definitions**

a. In this attachment, unless the context otherwise requires:

(1) "Certified irrigation acres" means the acres of land described on each certificate of irrigation grandfathered right.

(2) "Compliance date" means the date that falls two years after the date of the original notice (December 30, 1984) of the applicable irrigation water duty pursuant to A.R.S. 45-564. The compliance date is December 31, 1986.

(3) "Maximum annual groundwater allotment" means the quantity of water in acre-feet obtained by multiplying the water duty acres for a farm by the irrigation water duty for the farm unit.

b. The applicable definitions in A.R.S. 45-101, 45-402 and 45-461 are hereby incorporated reference into this attachment.

Affidavit of Mailing IGR

The original of the foregoing cover letter dated 1/11/88 and Certificate of Irrigation Grandfathered Right and Notice of Irrigation Water Duty and Maximum Annual Groundwater Allotment for Certificate No. 58-107805.0001 was mailed this 25th day of February, 1988.

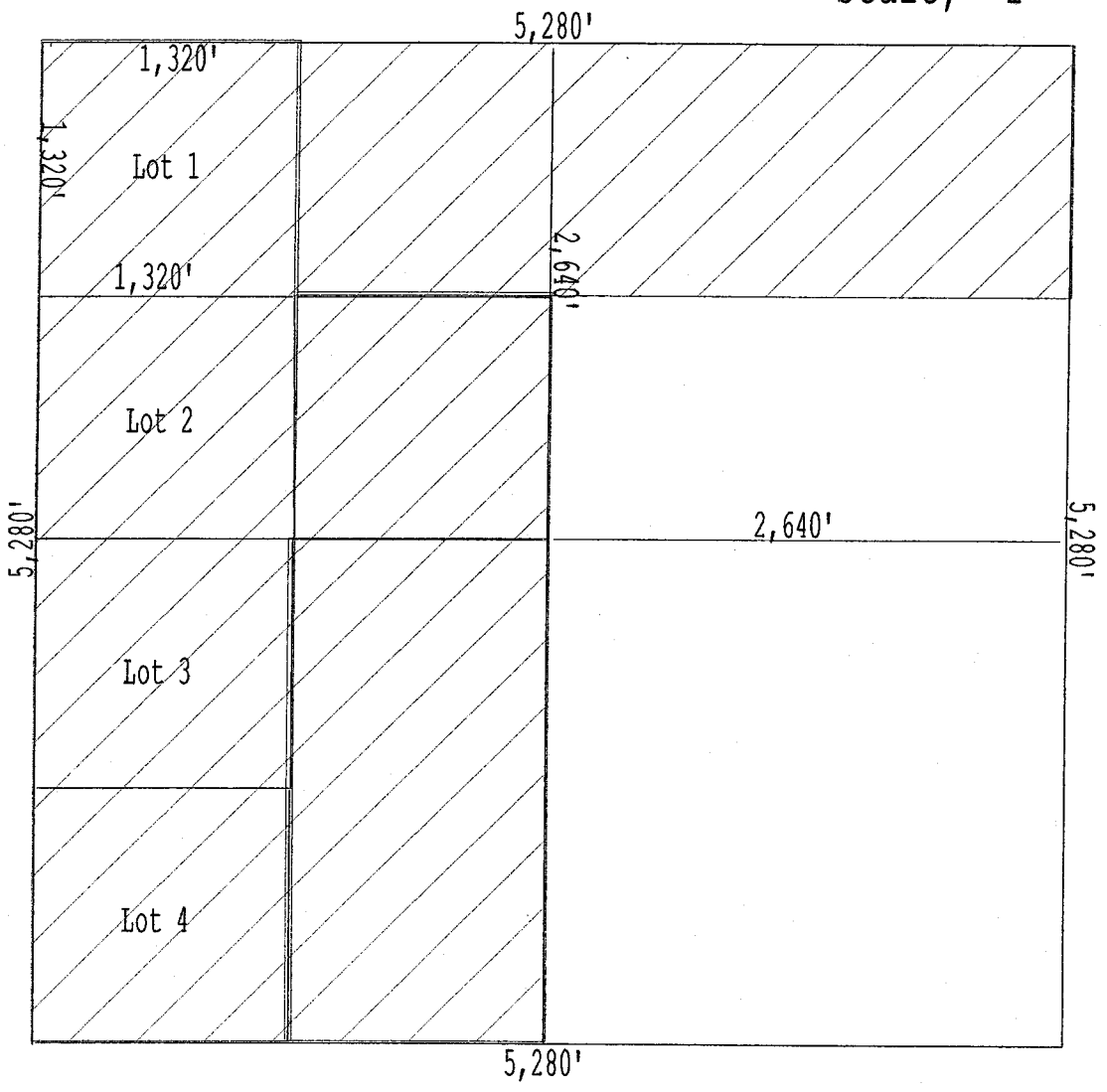
Certified
No. P-541-808-906

M L Russo
Mailed by

2/affimail3

Exhibit "B"

Cetificate NO.58-107805.00
Section,7. w1/2; n1/2 ne1/4
Certified acres 379.23



ARIZONA DEPARTMENT OF WATER RESOURCES
500 North Third Street, Phoenix, Arizona 85004

APPLICATION FOR DEVELOPMENT PLAN APPROVAL TO RETIRE AN IRRIGATION GRANDFATHERED RIGHT FOR A NON-IRRIGATION (TYPE I)-USE

Filing fee: No Charge

CERTIFICATE No. 58- 108354.0003

CERTIFIED ACRES 351.00

1. Mesquite Power, LLC a Delaware Limited Liability Company
   Last Name First Middle Initial

   Swartz Marty C
   Last Name First Middle Initial

   101 Ash Street San Diego CA 92101
   Mailing Address City State Zip

2. Active Management Area Phoenix

3. Attach a copy of the proposed development plan.

4. Legal description of land covered by certificate:
   Assessor Parcel Number 401-48 - 7, 8A, 8B, 9, 10, 11B, 11C, 11D as of 12/95 in Section 13. T1S, R7W GSRB&M excluding all non-irrigated areas as more fully described in the map attached hereto as Exhibit "A" and made part hereof by reference.

5. Legal description of land to be retired (attach map).
   See Attached Exhibit "B"

6. Total number of acres to be retired 351.00

7. Describe the location of each well, which was used to irrigate the land.

NW	1/4	NW	1/4	NE	1/4	Section	13	Township	1S	Range	7W	Reg.No. 55	086710
	1/4		1/4		1/4	Section		Township		Range		Reg.No. 55	

8. When was the land last irrigated? Approximately one year ago

9. Has the land been held under the same ownership since it was last irrigated? ___Yes _X__No

   If no, did the applicant purchase the land from the last irrigator? ___Yes _X__No

   Enclose evidence to show date of purchase. *(See Appendix 2 of the proposed development plan)*

10. Has the land been sold or taken out of production primarily because it would have been uneconomical to continue to withdraw for irrigation? _X__Yes ___No

    If 'No" explain why the land was retired. _____

11. The intended use of the water is. ____Expanded animal industry _____Domestic
    _____ Industrial X Electrical Energy Generation _____ Mining _____ Other

12. Is the land to be retired within the exterior boundaries of a service area of a city, town or private water company? ___Yes _X__No

    If "Yes" indicate name of city town or private water company N/A

Signature: _____ Date: March 10, 2000
Marty C. Swartz – Manager, Project Development

EXHIBIT "A"

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of Title 45, Chapter 2, Arizona Revised Statutes

Joseph H. Jobe and Shirley A. Jobe, as Trustees of
The Jobe Revocable Trust, dated June 3, 1988
13835 North Crown Point
Sun City, Arizona 85351

is granted

IRRIGATION GRANDFATHERED RIGHTS

in the

PHOENIX ACTIVE MANAGEMENT AREA

for **351.00** *irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:*

Assessor Parcel Number 401-48-7, 8A, 8B, 9, 10, 11B, 11C, 11D as of 12/95 in Section 13 T1S R7W GSRB&M, excluding all non-irrigated areas as more fully described in the map attached hereto as Exhibit A and made a part hereof by reference.

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

GREAT SEAL OF THE STATE OF ARIZONA
DITAT DEUS
1912

CERTIFICATE NO. 58-108354.0003

is granted this 17th day of April, 1997

ARIZONA DEPARTMENT OF WATER RESOURCES

Mark Frank

Director, Phoenix Active Management Area

The Department of Water Resources must be notified if the above named person(s) makes an address change, conveys ownership of the right to another person(s) or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

ARIZONA DEPARTMENT OF WATER RESOURCES

Certificate Map

OWNER: Jobe Revocable Trust

IRRIGATION ACRES CERTIFIED: 351.00

TOWNSHIP	RANGE	SECTION
1.0 S	7.0 W	13

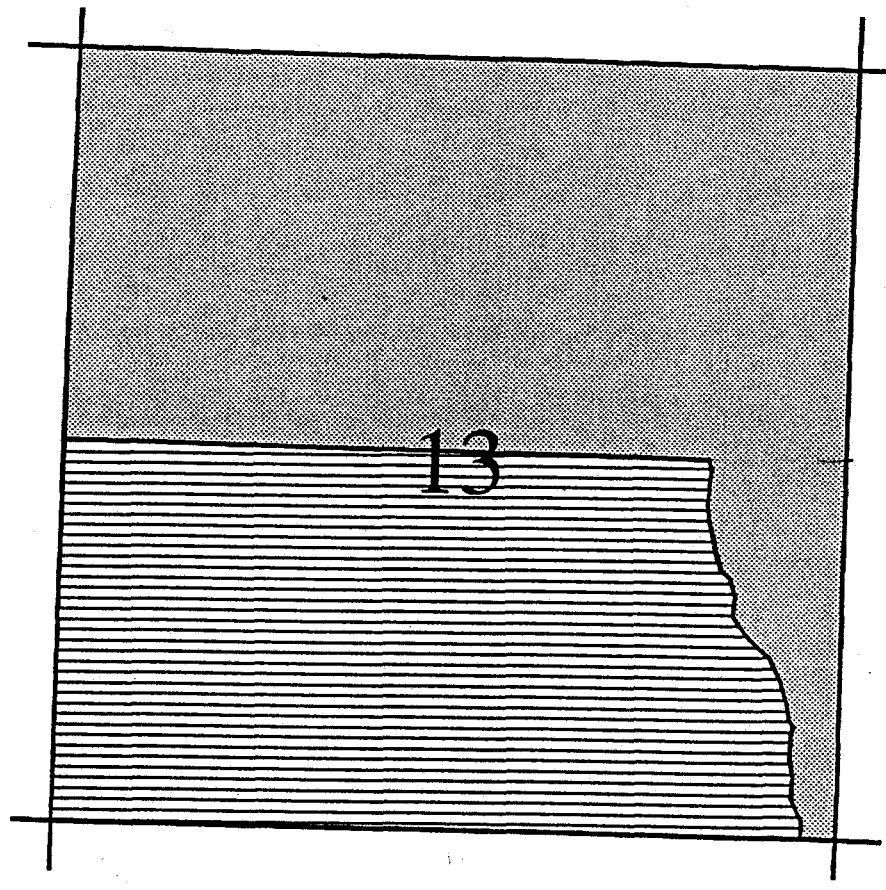
CERTIFICATE NO: 58-108354.0003

EXHIBIT: A

PAGE: 1 of 1

DATE: 4/17/97

EXHIBIT "B"



FEET

0 660 1320 2640 5280

0 1/8 1/4 1/2 1

MILE

IRRIGATION ACRES

NON-IRRIGATED ACRES

ARIZONA DEPARTMENT OF WATER RESOURCES
500 North Third Street, Phoenix, Arizona 85004

APPLICATION FOR DEVELOPMENT PLAN APPROVAL TO RETIRE AN IRRIGATION GRANDFATHERED RIGHT FOR A NON-IRRIGATION (TYPE I)-USE

Filing fee: No Charge

CERTIFICATE No. 58- 109909.0001

CERTIFIED ACRES 300.50

1. Mesquite Power, LLC a Delaware Limited Liability Company
   Last Name First Middle Initial

   Swartz Marty C
   Last Name First Middle Initial

   101 Ash Street San Diego CA 92101
   Mailing Address City State Zip

2. Active Management Area Phoenix

3. Attach a copy of the proposed development plan.

4. Legal description of land covered by certificate:
   Assessor Parcel Number 401-47-54. (Part) as of 11/93 in W ½ Sec. Section 18, T1S, R6W GSRB&M, A copy is attached as Exhibit "A"

5. Legal description of land to be retired (attach map).
   See Attached Exhibit "B"

6. Total number of acres to be retired 300.50

7. Describe the location of each well, which was used to irrigate the land.

NW	1/4	NW	1/4	NW	1/4	Section	18	Township	1S	Range	6W	Reg.No. 55	629645
	1/4		1/4		1/4	Section		Township		Range		Reg.No. 55	

8. When was the land last irrigated? Approximately one year ago

9. Has the land been held under the same ownership since it was last irrigated? ___Yes _X__No

   If no, did the applicant purchase the land from the last irrigator? ___Yes _X__No

   Enclose evidence to show date of purchase. *(See Appendix 2 of the proposed development plan)*

10. Has the land been sold or taken out of production primarily because it would have been uneconomical to continue to withdraw for irrigation? _X__Yes ___No

    If 'No" explain why the land was retired.

11. The intended use of the water is. ____Expanded animal industry _____Domestic
    _____ Industrial _X_ Electrical Energy Generation _____ Mining _____ Other

12. Is the land to be retired within the exterior boundaries of a service area of a city, town or private water company? ___Yes _X__No

    If "Yes" indicate name of city town or private water company N/A

Signature: _____ Date: March 10, 2000
Marty C. Swartz – Manager, Project Development

EXHIBIT "A"

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of
Title 45, Chapter 2, Arizona Revised Statutes

G & G Winburne

3440 West Catalina Drive, No. 101

Phoenix, Arizona 85017

is granted

IRRIGATION GRANDFATHERED RIGHTS

in the

PHOENIX ACTIVE MANAGEMENT AREA

for *300.50* irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:

Assessor's Parcel Number 401-47-54, 55 (part) as of 11/93 in W½ Sec. 18 T1S R6W GSRB&M.
A copy of the Assessor's Parcel Map depicting your certified acreage is on file with this Department.

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

GREAT SEAL OF THE STATE OF ARIZONA
DITAT DEUS
1912

CERTIFICATE NO. 58-109909.0001

is granted this 14th day of April, 1998

ARIZONA DEPARTMENT OF WATER RESOURCES

Mark Frank

Director, Phoenix Active Management Area

The Department of Water Resources must be notified if the above named person(s) makes an address change, conveys ownership of the right to another person(s) or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of Title 45, Chapter 2, Arizona Revised Statutes

RANDY WAYNE AND SANDY LEE VANOSDELL, ET AL
STAR ROUTE BOX 131
ARLINGTON, ARIZONA 85322

is granted
IRRIGATION GRANDFATHERED RIGHTS
in the
PHOENIX ACTIVE MANAGEMENT AREA

for 300.50 *irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:*

W½ Sec 18 T1S R6W GSRB&M

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

CERTIFICATE NO. 58-109909

is granted this 6th day of September, 1983

ARIZONA DEPARTMENT OF WATER RESOURCES

Wesley E. Steiner
Director

The Department of Water Resources must be notified if the above named person(s) changes his address, conveys ownership of the land to another person(s), or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of Title 45, Chapter 2, Arizona Revised Statutes

RANDY WAYNE AND SANDY LEE VANOSDELL, ET AL

STAR ROUTE BOX 131

ARLINGTON, ARIZONA 85322

is granted
IRRIGATION GRANDFATHERED RIGHTS
in the
PHOENIX ACTIVE MANAGEMENT AREA

for 300.50 *irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:*

W½ Sec 18 T1S R6W GSRB&M

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

CERTIFICATE NO. 58-109909

is granted this 6th day of September, 1983

ARIZONA DEPARTMENT OF WATER RESOURCES

Wesley E. Steiner
Director

The Department of Water Resources must be notified if the above named person(s) changes his address, conveys ownership of the land to another person(s), or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

Sec 18 T1S R6W
G+G Winburne ~~[illegible]~~
58-109909.0001
300.50 Ac
APN 401-47-54,55 (part) 11/93

BOOK 401
MAP 47

PART OF T-1S, R-6W
SECTIONS 4-9, 16-18

NOTE
PARCELS THAT ARE PART OF PALO VERDE NUCLEAR GENERATING STATION INCLUDE: 3A, 50E

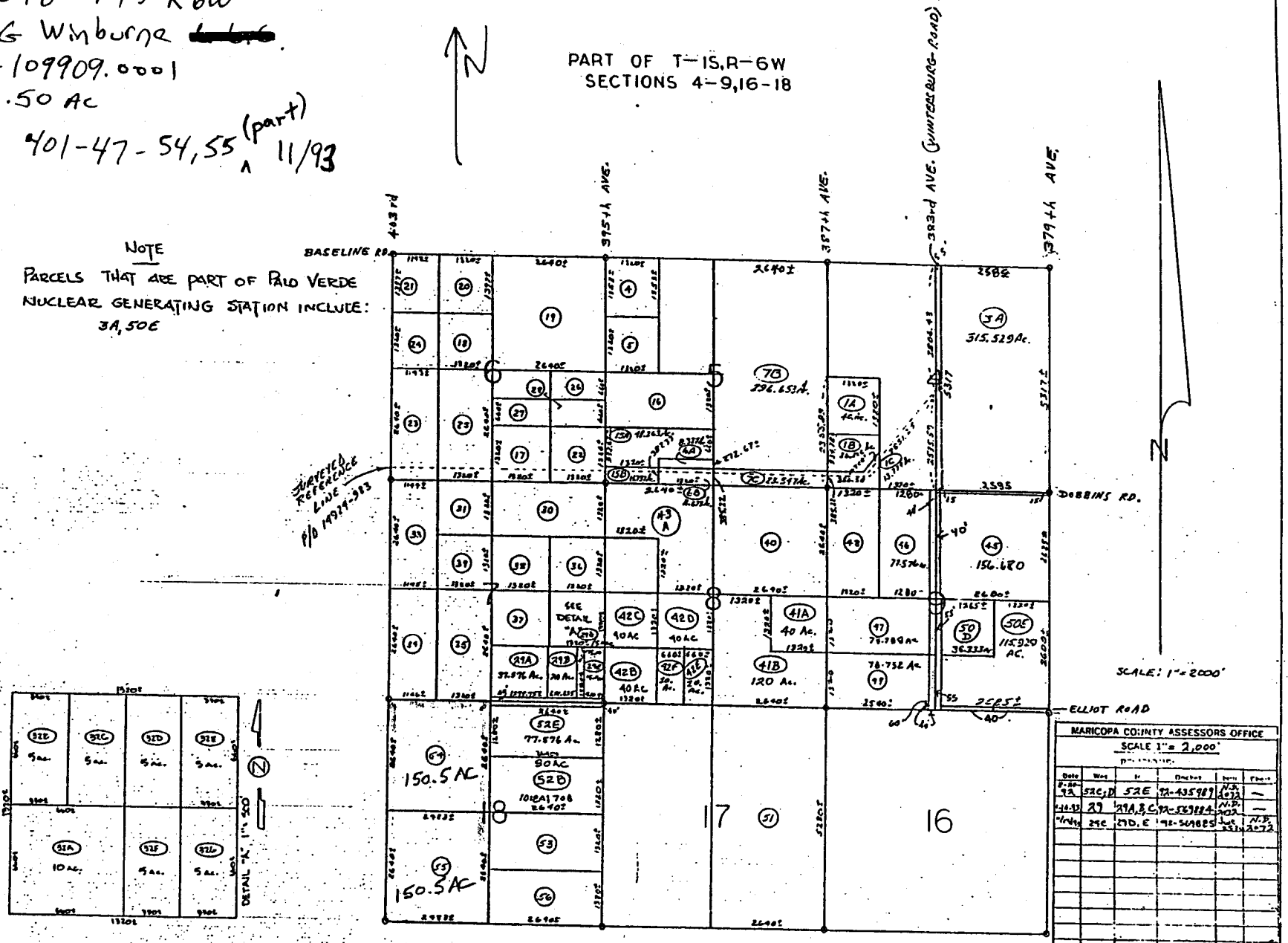
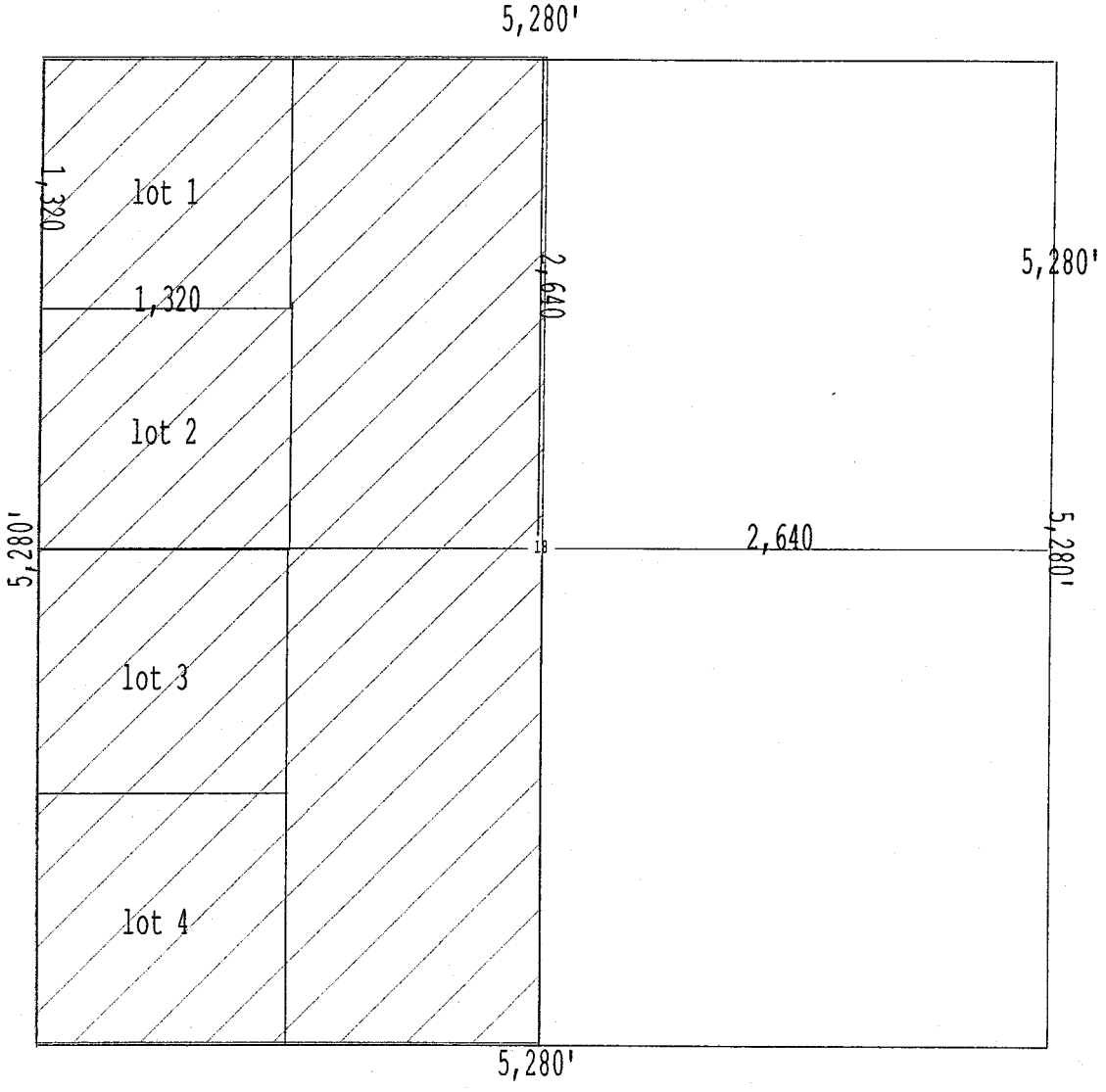


Exhibit "B"

Certificate no.58-109909.0001
Section,18. w 1/2
Total certified Acres 300.50



Scale, 1'' = 1,000'

ARIZONA DEPARTMENT OF WATER RESOURCES
500 North Third Street, Phoenix, Arizona 85004

APPLICATION FOR DEVELOPMENT PLAN APPROVAL TO RETIRE AN IRRIGATION GRANDFATHERED RIGHT FOR A NON-IRRIGATION (TYPE I)-USE

Filing fee: No Charge

CERTIFICATE No. 58- 117240.0002

CERTIFIED ACRES 77.57

1. Mesquite Power, LLC a Delaware Limited Liability Company
   Last Name First Middle Initial

   Swartz Marty C
   Last Name First Middle Initial

   101 Ash Street San Diego CA 92101
   Mailing Address City State Zip

2. Active Management Area Phoenix

3. Attach a copy of the proposed development plan.

4. Legal description of land covered by certificate:
   N ½ NE ¼ Sec 18, T1S R6W GSRB&M, See attached Exhibit "A"

5. Legal description of land to be retired (attach map).
   See Attached Exhibit "B"

6. Total number of acres to be retired 77.57

7. Describe the location of each well, which was used to irrigate the land.

___	1/4	SW	1/4	SW	1/4	Section	18	Township	1S	Range	6W	Reg.No. 55	627864
___	1/4	___	1/4	___	1/4	Section	___	Township	___	Range	___	Reg.No. 55	___

8. When was the land last irrigated? Currently Irrigated

9. Has the land been held under the same ownership since it was last irrigated? ___Yes _X__No

   If no, did the applicant purchase the land from the last irrigator? ___Yes _X__No

   Enclose evidence to show date of purchase. *(See Appendix 2 of the proposed development plan)*

10. Has the land been sold or taken out of production primarily because it would have been uneconomical to continue to withdraw for irrigation? _X__ Yes____No

    If 'No" explain why the land was retired. ___

11. The intended use of the water is. ____Expanded animal industry _____Domestic
    _____ Industrial X Electrical Energy Generation _____ Mining _____ Other

12. Is the land to be retired within the exterior boundaries of a service area of a city, town or private water company? ___Yes _X__No

    If "Yes" indicate name of city town or private water company N/A

Signature: _____ Date: March 10, 2000
Marty C. Swartz – Manager, Project Development

EXHIBIT "A"

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of Title 45, Chapter 2, Arizona Revised Statutes

Garrett S. & Barbara J. Cacciaguidi

31927 Palos Verdes Dr., Rt2.
Escondido, Ca. 92025

is granted
IRRIGATION GRANDFATHERED RIGHTS
in the

PHOENIX ACTIVE MANAGEMENT AREA

for 77.57 *irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:*

N 1/2 NE 1/4 Sec. 18 T1S R6W GSRB&M;, excluding
all dedicated Rights of Way.

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

CERTIFICATE NO. 58-117240.0002

is granted this 24th day of January, 1989

ARIZONA DEPARTMENT OF WATER RESOURCES

Director

The Department of Water Resources must be notified if the above named person(s) changes his address or conveys ownership of the right to another person(s) or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

STATE OF ARIZONA

DEPARTMENT OF WATER RESOURCES
PHOENIX ACTIVE MANAGEMENT AREA

NOTICE OF IRRIGATION WATER DUTY AND MAXIMUM ANNUAL GROUNDWATER ALLOTMENT

Pursuant to A.R.S. §45-564.B, the Director of Water Resources hereby gives notice of the irrigation water duty and the maximum annual groundwater allotment for Irrigation Grandfathered Right Certificate No. 58-117240.0002 . The maximum annual groundwater allotment is the maximum amount of groundwater that may be used per year to irrigate the lands described in the above-referenced Certificate of Irrigation Grandfathered Right, except as provided in A.R.S. §45-467, the operating flexibility account provision.

IRRIGATION WATER DUTY 4.66 ACRE-FEET PER ACRE.

MAXIMUM ANNUAL GROUNDWATER ALLOTMENT 350.4 ACRE-FEET PER YEAR.

Attachment A to this notice sets forth the official language of the above requirements for holders of grandfathered rights as adopted in the first management plan for the Phoenix Active Management Area. Attachment A is incorporated into this notice by reference. Compliance with the irrigation water duty and maximum annual groundwater allotment must be achieved beginning January 1, 1987 and must be maintained until the effective date of any new irrigation water duty established in the second management plan for the Phoenix Active Management Area.

NOTICE ISSUED BY

ATTACHMENT A

1. Conservation Requirements for Holders of Irrigation Grandfathered Rights

a. Each person who is entitled to use groundwater pursuant to a certificate of irrigation grandfathered right shall comply with the applicable irrigation water duty no later than the compliance date and shall remain in compliance with that irrigation water duty until the effective date of any applicable irrigation water duty prescribed in the second management plan.

b. During the first accounting period after the compliance date and during each succeeding accounting period until the effective date of any applicable irrigation water duty prescribed in the second management plan, a person who is entitled to use groundwater pursuant to a certificate of irrigation grandfathered right shall not use groundwater in excess of the applicable maximum annual groundwater allotment to irrigate the certified irrigation acres in the farm, except as provided in A.R.S. 45-467.

2. Definitions

a. In this attachment, unless the context otherwise requires:

(1) "Certified irrigation acres" means the acres of land described on each certificate of irrigation grandfathered right.

(2) "Compliance date" means the date that falls two years after the date of the original notice (December 30, 1984) of the applicable irrigation water duty pursuant to A.R.S. 45-564. The compliance date is December 31, 1986.

(3) "Maximum annual groundwater allotment" means the quantity of water in acre-feet obtained by multiplying the water duty acres for a farm by the irrigation water duty for the farm unit.

b. The applicable definitions in A.R.S. 45-101, 45-402 and 45-461 are hereby incorporated by reference into this attachment.

Garrett S. & Barbara J. Cacciaguidi

31927 Palos Verdes Dr., Rt2.
Escondido, Ca. 92025 58-117240.0002

Affidavit of Mailing IGR

The original of the foregoing cover letter dated 1-24-89 and Certificate of Irrigation Grandfathered Right and Notice of Irrigation Water Duty and Maximum Annual Groundwater Allotment for Certificate No. 58-117240.0002 was mailed this 6th day of February, 1989.

Certified
No. P 578 763 935

[illegible]
Mailed by

FR-AFFIDAV

ARIZONA DEPARTMENT OF WATER RESOURCES
REGISTRY OF GROUNDWATER RIGHTS
DATA ENTRY WORKSHEET #1

☒ AMA ☐ PRESCOTT ☒ PHOENIX ☐ PINAL ☐ TUCSON
☐ INA ☐ JOSEPH CITY ☐ HARQUAHALA ☐ DOUGLAS

☒ CONVEYANCE ☐ CHANGE OF EXISTING FILE DATE 1-24-89
INITIALS SG

WR 0300 OWNERSHIP

A

RIGHT 58 - 117240.0002 CERTIFICATE TYPE IGR

NAME Cacciaguidi, Garrett S. & Cacciaguidi, Barbara J. PHONE (619) 728-2457

ADDRESS 31927 Palos Verdes, Rt2 Escondido, CA. 92025 MA C SUB-BASIN 03

BOOK 401 MAP 47 PARCEL 52 A LAND OWNERSHIP P

WR 0105 PLACE OF USE

A

Quarters				Sec	Township		Range	
		N2	NE	18	L	S	6	W

SEE ADDITIONAL LIST ☐

WR 0115 WATER ALLOTMENTS

A

Allotment 350.40 AFA
Water Duty Acres 75.24
Irrigation Acres 77.57

CAP Allotment — AFA Retired
Water Duty 4.66 AFA Acres
MAWA/Acre 4.52 AFAA
Target Efficiency 70.%

WR 0120 WATER DELIVERED TO OTHER RIGHTS

☐ 58-
☐ 58-
☐ 58-
☐ 58-

WR 0125 OTHER WELLS SERVING RIGHT

☐ 0 - 55-
☐ 0 - 55-
☐ 0 - 55-
☐ 0 - 55-

SEE ADDITIONAL LIST ☐

WR 0130 OWNED WELLS SERVING RIGHT

A

	DWR NUMBER	POWER CO.	ACCOUNT #	METER #	DEVICE	ENERGY
☒ 55-	627864	APS	02382200075	564252	1	E
☐ 55-						
☐ 55-						
☐ 55-						

SEE ADDITIONAL LIST ☐

WR 0700 FILE STATUS

A

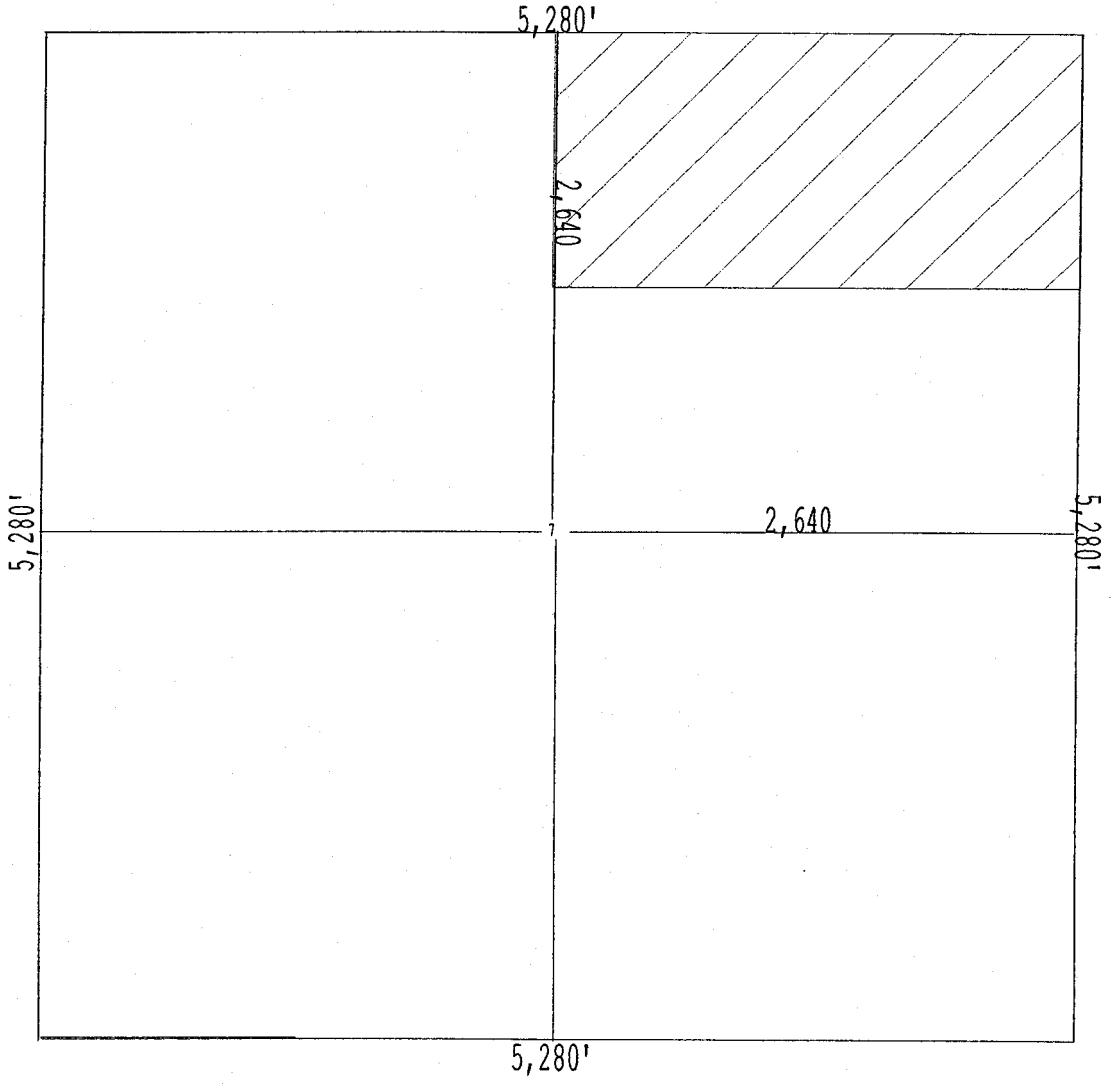
ACTIVE: C

ASSOCIATED INACTIVE FILES: 58-117240.0001

JAN 31 1989

Exhibit "B"

Certificate No. 58-117240
Section,18. N1/2 NE1/4
Certified Acres:77.57



Scale, 1'' = 1,000'

ARIZONA DEPARTMENT OF WATER RESOURCES
500 North Third Street, Phoenix, Arizona 85004

APPLICATION FOR DEVELOPMENT PLAN APPROVAL TO RETIRE AN IRRIGATION GRANDFATHERED RIGHT FOR A NON-IRRIGATION (TYPE I)-USE

Filing fee: No Charge

CERTIFICATE No. 58- 112193

CERTIFIED ACRES 640.00

1. Mesquite Power, LLC a Delaware Limited Liability Company
   Last Name First Middle Initial

   Swartz Marty C
   Last Name First Middle Initial

   101 Ash Street San Diego CA 92101
   Mailing Address City State Zip

2. Active Management Area Phoenix

3. Attach a copy of the proposed development plan.

4. Legal description of land covered by certificate:
   Section 24, T1S, R7W GSRB&M See attached Exhibit "A"

5. Legal description of land to be retired (attach map).
   See Attached Exhibit "B"

6. Total number of acres to be retired 640.00

7. Describe the location of each well, which was used to irrigate the land.

NE	1/4	NE	1/4	NE	1/4	Section	24	Township	1S	Range	7W	Reg.No. 55	628646
	1/4		1/4		1/4	Section		Township		Range		Reg.No. 55	

8. When was the land last irrigated? Approximately three years ago

9. Has the land been held under the same ownership since it was last irrigated? ___Yes _X__No

   If no, did the applicant purchase the land from the last irrigator? ___Yes _X__No

   Enclose evidence to show date of purchase. *(See Appendix 2 of the proposed development plan)*

10. Has the land been sold or taken out of production primarily because it would have been uneconomical to continue to withdraw for irrigation? _X__Yes ____No

    If 'No" explain why the land was retired.

11. The intended use of the water is. ____Expanded animal industry _____Domestic
    _____ Industrial _X_ Electrical Energy Generation _____ Mining _____ Other

12. Is the land to be retired within the exterior boundaries of a service area of a city, town or private water company? ___Yes _X__No

    If "Yes" indicate name of city town or private water company N/A

Signature: _____ Date: March 10, 2000
Marty C. Swartz – Manager Project Development

EXHIBIT "A"

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of Title 45, Chapter 2, Arizona Revised Statutes

ROYAL FARMS
P. O. Box 1778
GOODYEAR, ARIZONA 85338

is granted
IRRIGATION GRANDFATHERED RIGHTS
in the
PHOENIX ACTIVE MANAGEMENT AREA

for 640 *irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:*

Sec 24 T1S R7W GSRB&M

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

CERTIFICATE NO. 58-112193

is granted this 20th day of September, 1983

ARIZONA DEPARTMENT OF WATER RESOURCES

Wesley E. Steiner
Director

The Department of Water Resources must be notified if the above named person(s) changes his address, conveys ownership of the land to another person(s), or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

STATE OF ARIZONA

DEPARTMENT OF WATER RESOURCES
PHOENIX ACTIVE MANAGEMENT AREA

NOTICE OF IRRIGATION WATER DUTY AND MAXIMUM ANNUAL GROUNDWATER ALLOTMENT

Pursuant to A.R.S. §45-564.B, the Director of Water Resources hereby gives notice of the irrigation water duty and the maximum annual groundwater allotment for Irrigation Grandfathered Right Certificate No. 58- 112193.0000 . The maximum annual groundwater allotment is the maximum amount of groundwater that may be used per year to irrigate the lands described in the above-referenced Certificate of Irrigation Grandfathered Right, except as provided in A.R.S. § 45-467, the operating flexibility account provision.

IRRIGATION WATER DUTY 5.54 ACRE-FEET PER ACRE.

MAXIMUM ANNUAL GROUNDWATER ALLOTMENT 3381.1 ACRE-FEET PER YEAR.

Attachment A to this notice sets forth the official language of the above requirements for holders of grandfathered rights as adopted in the first management plan for the Phoenix Active Management Area. Attachment A is incorporated into this notice by reference.

The date of this notice is December 30, 1984. Compliance with the irrigation water duty and maximum annual groundwater allotment must be achieved beginning January 1, 1987 and must be maintained until the effective date of any new irrigation water duty established in the second management plan for the Phoenix Active Management Area.

NOTICE ISSUED BY

Wesley E. Steiner
Director

1. **Conservation Requirements for Holders of Irrigation Grandfathered Rights**

a. Each person who is entitled to use groundwater pursuant to a certificate of irrigation grandfathered right shall comply with the applicable irrigation water duty no later than the compliance date and shall remain in compliance with that irrigation water duty until the effective date of any applicable irrigation water duty prescribed in the second management plan.

b. During the first accounting period after the compliance date and during each succeeding accounting period until the effective date of any applicable irrigation water duty prescribed in the second management plan, a person who is entitled to use groundwater pursuant to a certificate of irrigation grandfathered right shall not use groundwater in excess of the applicable maximum annual groundwater allotment to irrigate the certified irrigation acres in the farm, except as provided in A.R.S. § 45-467.

2. **Definitions**

a. In this attachment, unless the context otherwise requires:

(1) "Certified irrigation acres" means the acres of land described on each certificate of irrigation grandfathered right.

(2) "Compliance date" means the date that falls two years after the date of the notice of the applicable irrigation water duty pursuant to A.R.S. § 45-564.

(3) "Maximum annual groundwater allotment" means the quantity of water in acre-feet obtained by multiplying the water duty acres for a farm by the irrigation water duty for the farm unit.

b. The applicable definitions in A.R.S. §§ 45-101, 45-402 and 45-461 are hereby incorporated by reference into this attachment.

AFFIDAVIT OF MAILING

The foregoing are a duplicate original computer print-out of the Notice of Irrigation Water Duty and Maximum Annual Groundwater Allotment for the Certificate No. listed below and a duplicate original of Attachment A to that Notice which were sent by certified mail this 31st day of December 1984 to:

Certificate No.		58-112193.0000
Name	ROYAL FARMS	
Address	PO BOX 1778 GOODYEAR	AZ 85338

E. Heineman

E. Heineman
Phoenix AMA

PS Form 3811, July 1983

SENDER: Complete items 1, 2, 3 and 4.

Put your address in the "RETURN TO" space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for service(s) requested.

1. ☒ Show to whom, date and address of delivery.
2. ☐ Restricted Delivery.

ROYAL FARMS 58-112193.0000
PO BOX 1778
GOODYEAR AZ 85338
CERTIFIED MAIL NO. PHX15741

4. Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail

Article Number
SEE ABOVE

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature – Addressee
X

6. Signature – Agent
X Cindy Hayden

7. Date of Delivery
1-2-85

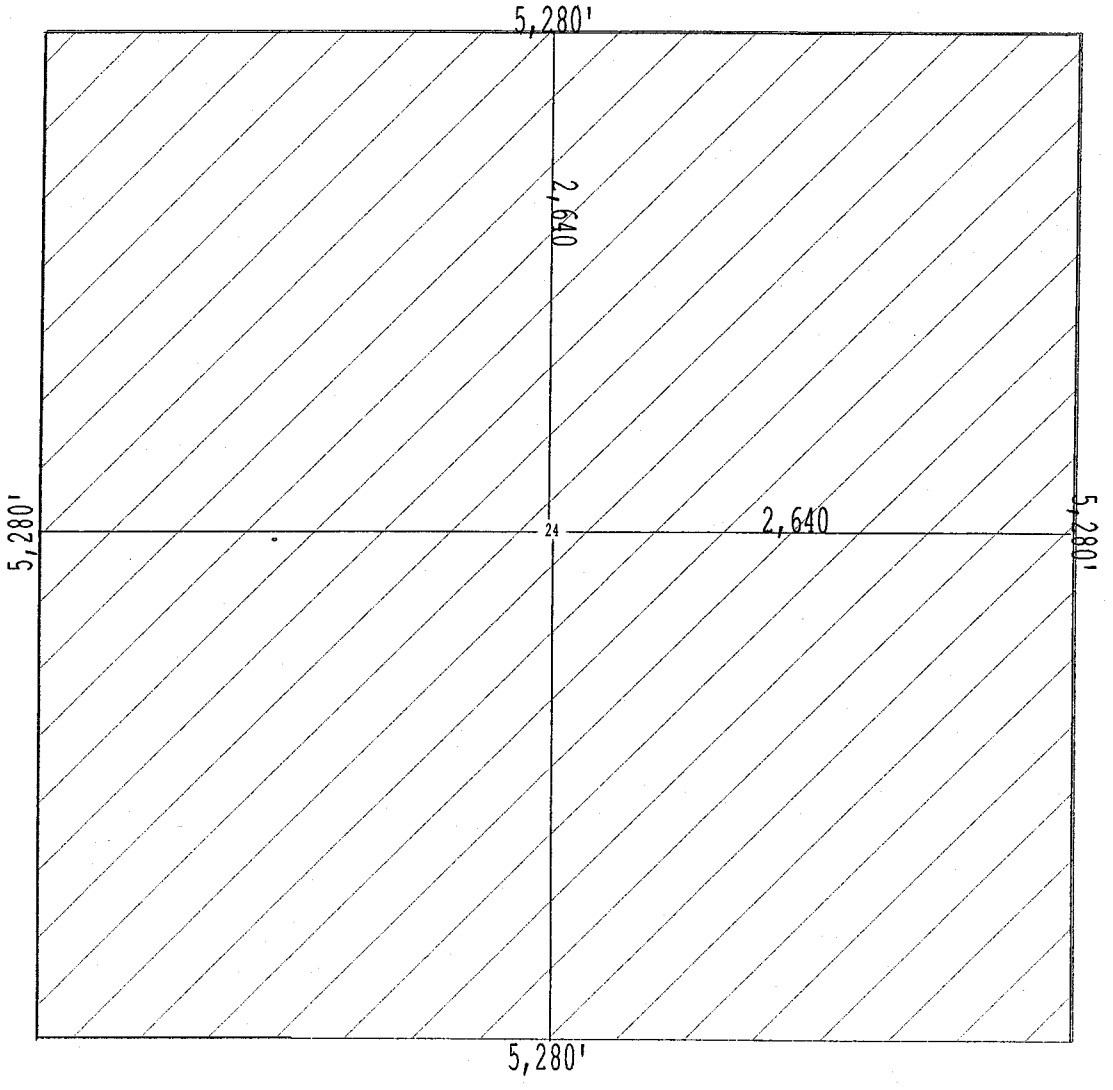
Addressee's Address (ONLY if requested and fee paid)
Box 1778
Goodyear AZ 85338

DOMESTIC RETURN RECEIPT

Exhibit "B"

Certificate No. 58-1121931

Section 24, T15, R7W, GSRB and M
Certified acres, 640



Scale, 1'' = 1,000'

ARIZONA DEPARTMENT OF WATER RESOURCES
500 North Third Street, Phoenix, Arizona 85004

APPLICATION FOR DEVELOPMENT PLAN APPROVAL TO RETIRE AN IRRIGATION GRANDFATHERED RIGHT FOR A NON-IRRIGATION (TYPE I)-USE

Filing fee: No Charge

CERTIFICATE No. 58- 111348

CERTIFIED ACRES 855.90

1. Mesquite Power, LLC a Delaware Limited Liability Company
   Last Name First Middle Initial

   Swartz Marty C
   Last Name First Middle Initial

   101 Ash Street San Diego CA 92101
   Mailing Address City State Zip

2. Active Management Area Phoenix

3. Attach a copy of the proposed development plan.

4. Legal description of land covered by certificate:
   See attached Exhibit "A" NOTE: Certificate also covers portions of Section 20 & 30 as illustrated on Exhibit "B"

5. Legal description of land to be retired (attach map).
   See Attached Exhibit "B"

6. Total number of acres to be retired 855.90

7. Describe the location of each well, which was used to irrigate the land.

SW	1/4	NW	1/4	NW	1/4	Section	19	Township	1S	Range	6W	Reg.No. 55	628645
	1/4		1/4		1/4	Section		Township		Range		Reg.No. 55	

8. When was the land last irrigated? Approximately four years ago

9. Has the land been held under the same ownership since it was last irrigated? ___Yes _X__No

   If no, did the applicant purchase the land from the last irrigator? ___Yes _X__No

   Enclose evidence to show date of purchase. *(See Appendix 2 of the proposed development plan)*

10. Has the land been sold or taken out of production primarily because it would have been uneconomical to continue to withdraw for irrigation? _X_ Yes ____ No

    If 'No" explain why the land was retired. _____

11. The intended use of the water is. ____Expanded animal industry _____Domestic
    _____ Industrial X Electrical Energy Generation _____ Mining _____ Other

12. Is the land to be retired within the exterior boundaries of a service area of a city, town or private water company? ___Yes _X__No

    If "Yes" indicate name of city town or private water company N/A

Signature: _____ Date: March 10, 2000
Marty C. Swartz ~~Manager,~~ Project Development

Arizona Department of Water Resources
Groundwater Right/Facility Report

EXHIBIT "A"

RIGHT #: 58-111348.0002 **STATUS DATE:** 11/08/1994

AMA: PHOENIX AMA **RIGHT/PERMIT/FACILITY TYPE:** IRRIGATION USE

LAND OWNERSHIP : PRIVATE OR COMPANY **FILE STATUS:** ACTIVE - FULL CONV FEE REQUESTED

1999 ALLOTMENT: 3.347,31 **IRRIGATION ACRES** 855,90 **RETIRED ACRES:** 0,00

WATER DUTY ACRES: 830,60 **WATER DUTY** 4,03

IRRIGATION DISTRICT NAME: **MAWA:** 3,91

NAME & ADDRESS

CAMPILLO, CELEDONIO R & MARIA **TYPE:** OWNER
P O BOX 234

ARLINGTON AZ 85322

PLACE OF USE

19 T1.0S R6.0W

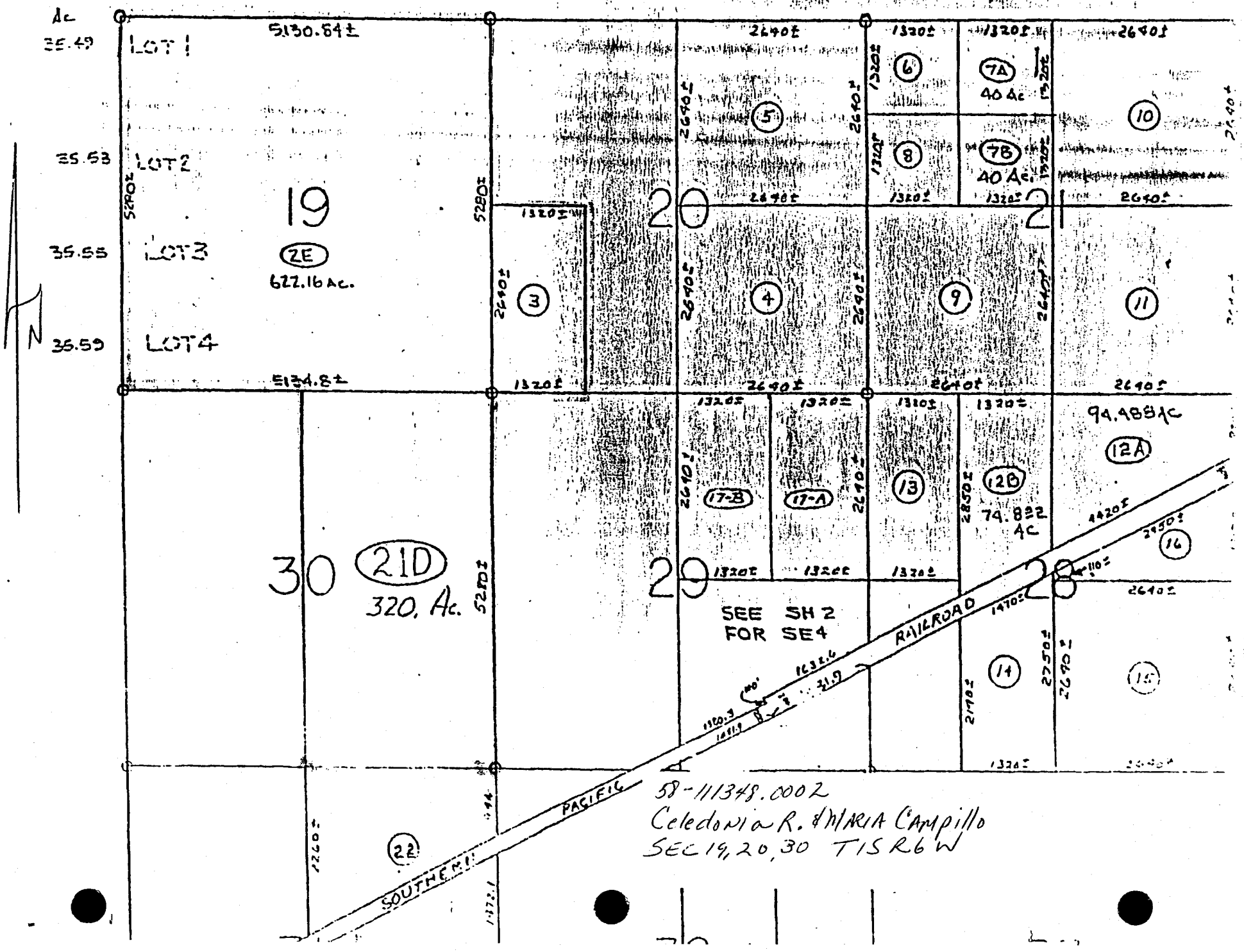
BOOK/MAP/PARCEL

Book: 401 **Map:** 46 **Parcel:** ** **Part:**

WELL SERVING

Well# 55 - 628645 **Location** SW NW NW 19 T1.0S R6.0W **Year** 1999

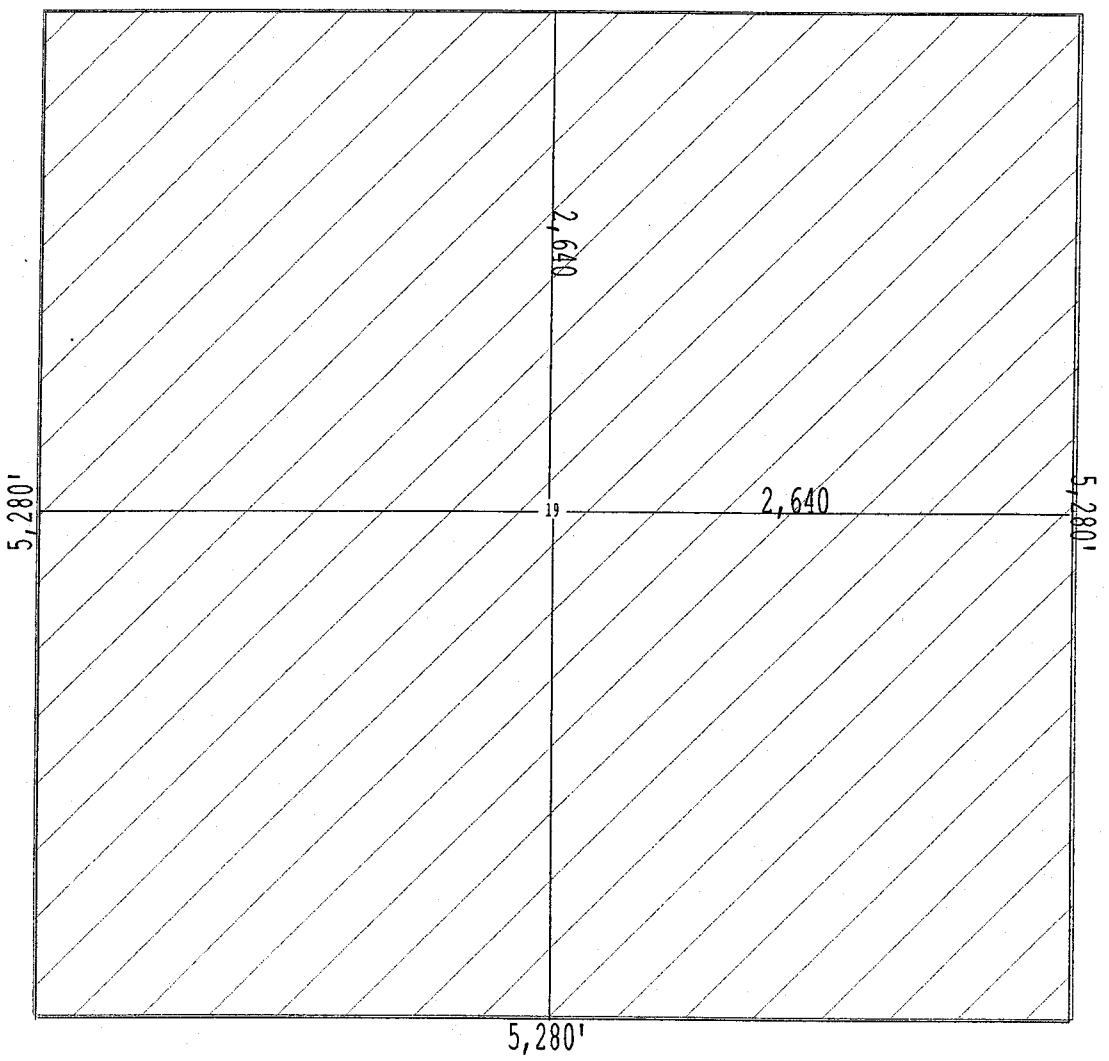
401-46



58-111348.0002
Celedonia R. & Maria Campillo
SEC 19, 20, 30 T1S R6W

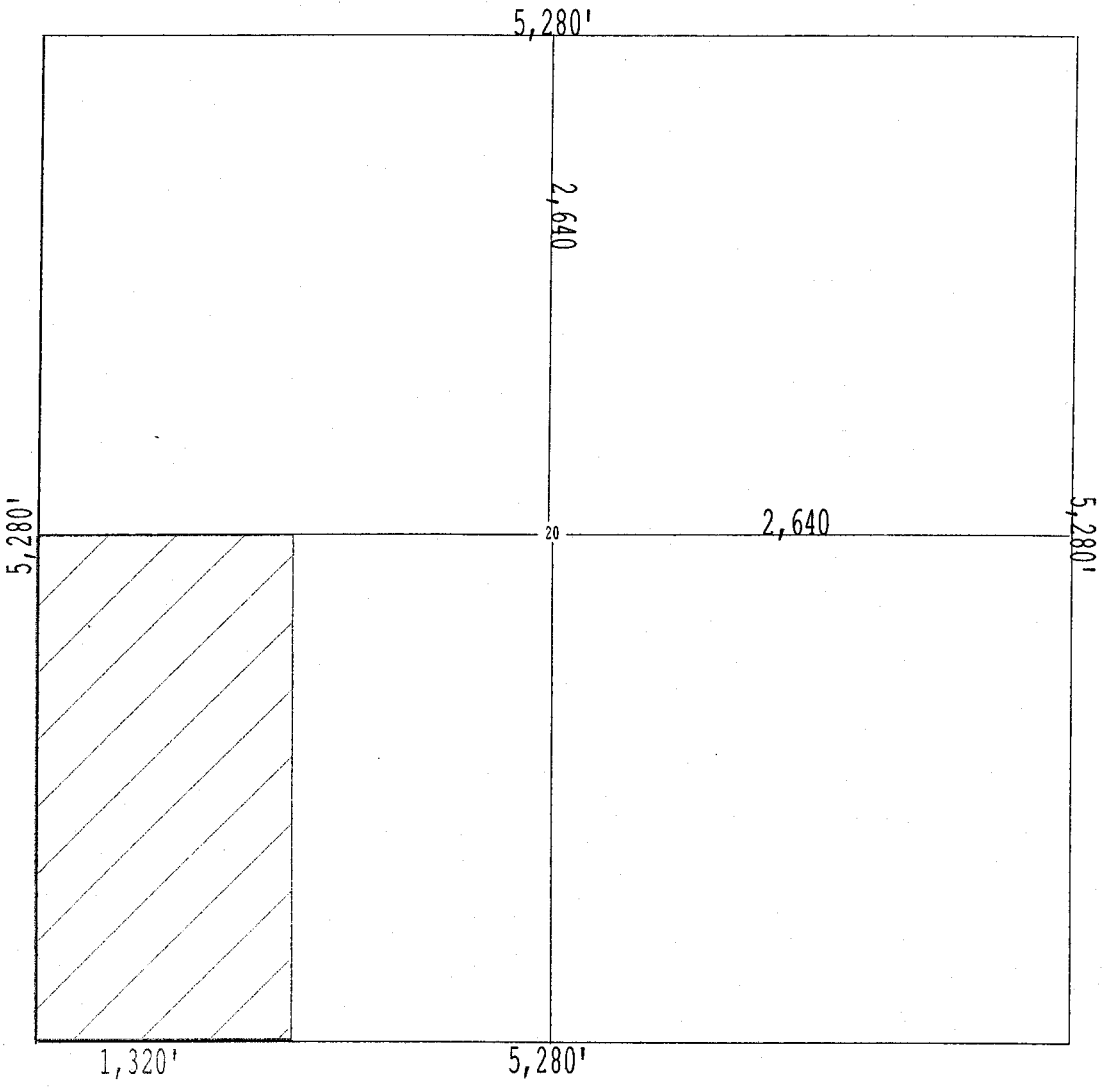
Exhibit "B"

Certificate NO. 58-111348
All of Section,19; W1/2 S1/4 of sec 20; E1/2 of section 30. T15, R6W GSRB and M
Certified acres 855.90



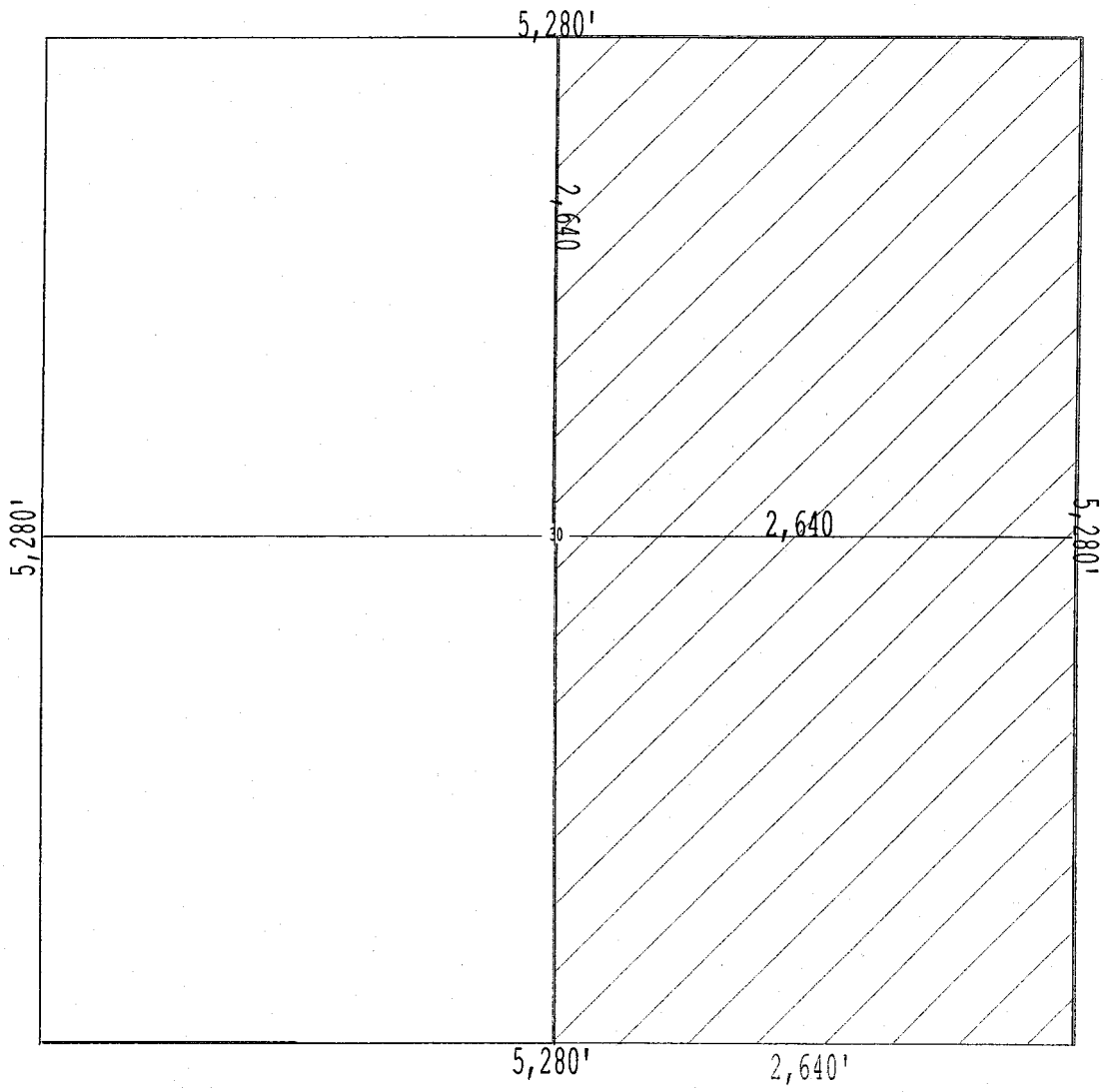
Scale, 1'' = 1,000'

Certificate No. 58-111348
Section,20.



Scale, 1'' = 1,000'

Certificate No. 58-111348
Section, 30.



Scale, 1'' = 1,000'

ARIZONA DEPARTMENT OF WATER RESOURCES
500 North Third Street, Phoenix, Arizona 85004

APPLICATION FOR DEVELOPMENT PLAN APPROVAL TO RETIRE AN IRRIGATION GRANDFATHERED RIGHT FOR A NON-IRRIGATION (TYPE I)-USE

Filing fee: No Charge

CERTIFICATE No. 58- 106981.0001

CERTIFIED ACRES 77.6

1. Mesquite Power, LLC a Delaware Limited Liability Company
   Last Name First Middle Initial

   Swartz Marty C
   Last Name First Middle Initial

   101 Ash Street San Diego CA 92101
   Mailing Address City State Zip

2. Active Management Area Phoenix

3. Attach a copy of the proposed development plan.

4. Legal description of land covered by certificate:
   SE ¼ Section 29, lying N of Southern Pacific Railroad. TS1, R6W, GSRB&M
   See attached Exhibit "A"

5. Legal description of land to be retired (attach map).
   See Attached Exhibit "B"

6. Total number of acres to be retired 77.6

7. Describe the location of each well, which was used to irrigate the land.
   SE 1/4 SE 1/4 SE 1/4 Section 29 Township 1S Range 6W Reg.No. 55 628645
   ___ 1/4 ___ 1/4 ___ 1/4 Section ___ Township ___ Range ___ Reg.No. 55 ___

8. When was the land last irrigated? Approximately four years ago

9. Has the land been held under the same ownership since it was last irrigated? ___Yes _X__No

   If no, did the applicant purchase the land from the last irrigator? ___Yes _X__No

   Enclose evidence to show date of purchase. *(See Appendix 2 of the proposed development plan)*

10. Has the land been sold or taken out of production primarily because it would have been uneconomical to continue to withdraw for irrigation? _X__Yes ___No

    If 'No" explain why the land was retired. ___

11. The intended use of the water is. ____Expanded animal industry _____Domestic
    _____ Industrial X Electrical Energy Generation _____ Mining _____ Other

12. Is the land to be retired within the exterior boundaries of a service area of a city, town or private water company? ___Yes _X__No

    If "Yes" indicate name of city town or private water company N/A

Signature: _____ Date: March 10, 2000
Marty C. Swartz – Manager, Project Development

EXHIBIT "A"

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of Title 45, Chapter 2, Arizona Revised Statutes

PAUL EMERY AND SHIRLEY Y. HARPER
P.O. Box 1778
GOODYEAR, ARIZONA 85338

is granted
IRRIGATION GRANDFATHERED RIGHTS
in the
PHOENIX ACTIVE MANAGEMENT AREA

for 77.60 *irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:*

SE¼ lying N of the Southern Pacific Railroad
in Sec 29 T1S R6W GSRB&M
excluding non-irrigated areas as more fully described in the map attached hereto as Exhibit A and made a part hereof by reference.

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

CERTIFICATE NO. 58-106981.0001

is granted this 30th day of July, 1985

ARIZONA DEPARTMENT OF WATER RESOURCES

Wesley E. Steiner
Director

The Department of Water Resources must be notified if the above named person(s) changes his address, conveys ownership of the land to another person(s), or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

REGISTRY OF GROUNDWATER RIGHTS
DATA ENTRY WORKSHEET #1

AMA ☐ Prescott ☒ Phoenix ☐ Pinal ☐ Tucson

INA ☐ Joseph City ☐ Harquahala ☐ Douglas

☒ CONVEYANCE ☐ CHANGE OF EXISTING FILE

DATE 7-19-85

INITIALS M.S.

ACTION
A-C-D

WR 0300 OWNERSHIP

A

Right # 58-106981.0001 Certificate Type IGR

Name HARPER, PAUL EMERY & SHIRLEY Y.

Address P.O. BOX 1778 AMA C

GOODYEAR, ARIZ. Sub-basin 3

Book 401 Map 46 Parcel 018 Land Ownership P

WR 0105 PLACE OF USE

A

Quarters	Sec	Township	Range
SE	29	1 S	6 W

See Additional List ☐

WR 0150 REPORTING PARTIES

A

Contact Person

Meter Report Party

Comments 7-19-85 M.S.

WR 0115 WATER ALLOTMENTS

A

Allotment 462.2 AFA

Water Duty Acres 77.60

Irrigation Acres 77.60

CAP Allotment AFA

Water Duty 5.96 AFA

MAWA/Acre 5.96 AFAA

Retired Acres

WR 0125 OTHER WELLS SERVING RIGHT

A

☐ # 55-629644.

☐ # 55-629646.

☐ # 55-629647.

☐ # -.

55-

55-

55-

55-

See Additional List ☐

8-20-85

WR 0130 OWNED WELLS SERVING RIGHT

A

	DWR NUMBER	POWER CO	ACCOUNT #	METER #	DEVICE
☐	55-628645				
☐	55-628646				
☐	55-				
☐	55-				

See Additional List ☐

WR 0700 FILE STATUS

A

New File

☒ F Full Conveyance ☐ P Partial Conveyance

☐ R Full Retirement ☐ S Partial Retirement

Current File

Status A (A-Active/I-Inactive) Specific Status

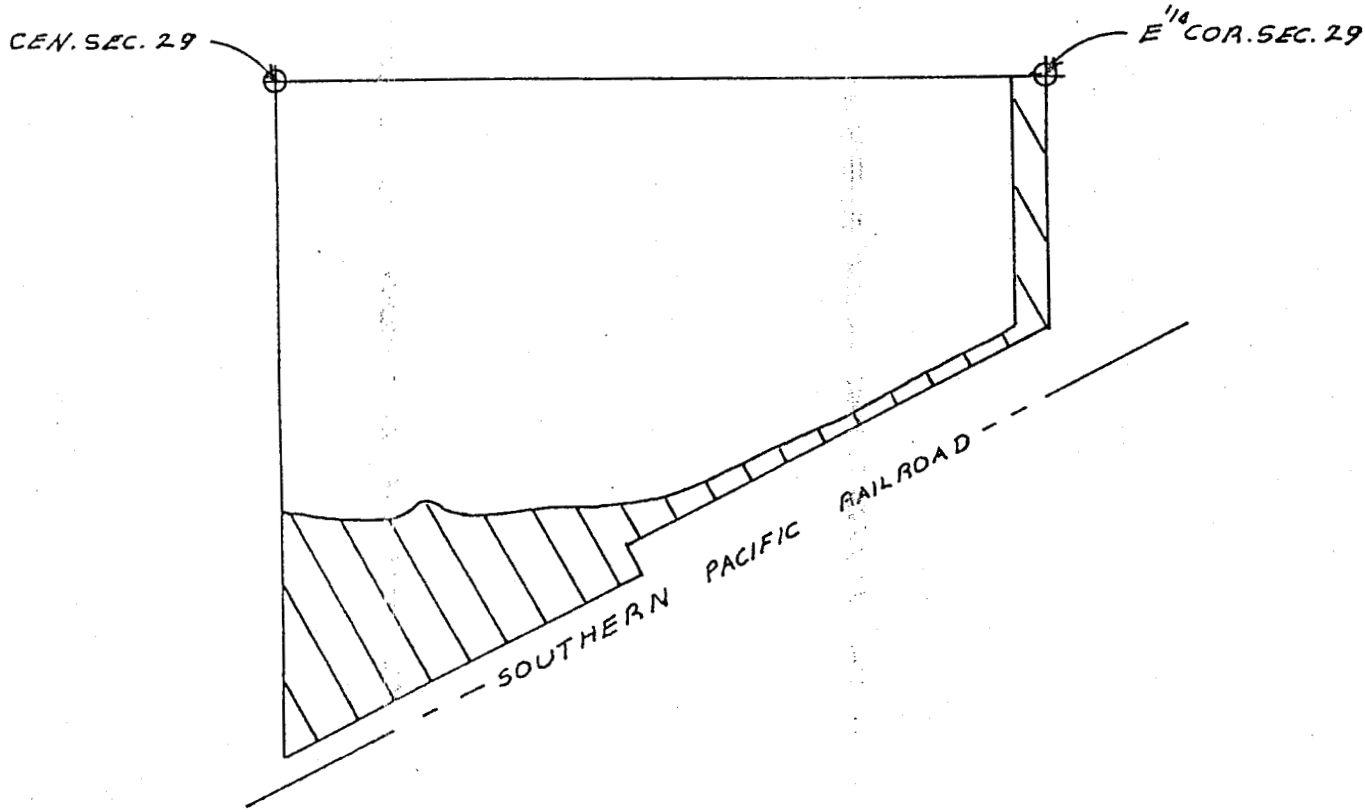
EXHIBIT A PAGE 1 OF 1

CERTIFICATE NO. 58-106981.0001

NAME PAUL EMERY AND SHIRLEY Y. HARPER Irrigation Acres Certified 77.60

Sec 29 T 1 S R 6 W Map Source A.S.C.S. Map Date 3-79 Map Scale 1" = 660'

EXHIBIT "B"



0 330 660 1320 1980 FT

Irrigation Acres

Non Irrigated Areas

STATE OF ARIZONA
DEPARTMENT OF WATER RESOURCES

PHOENIX ACTIVE MANAGEMENT AREA

NOTICE OF IRRIGATION WATER DUTY
AND MAXIMUM ANNUAL GROUNDWATER ALLOTMENT

Pursuant to A.R.S. § 45-565., the Director of the Department of Water Resources hereby gives notice of irrigation water duties and the maximum annual groundwater allotments for the Second Management Period, 1990 to 2000 for:

IRRIGATION GRANDFATHERED RIGHT CERTIFICATE NO. 58-106981.0001

The irrigation water duty is the amount of water in acre-feet per acre that is reasonable to apply to irrigated land in a farm unit during the accounting period. The maximum annual groundwater allotment is the maximum amount of water that may be used to irrigate the above-referenced Grandfathered Right, except as provided in A.R.S. § 45-467, the flexibility account provision.

In accordance with A.R.S. § 45-565.A.1., the Department has established two (2) intermediate water duties, two (2) intermediate maximum annual water allotments, one (1) final water duty and (1) final maximum annual water allotment as follows:

Beginning calendar year 1992 and for each calendar year through calendar year 1994:

IRRIGATION WATER DUTY: 6.31 ACRE-FEET PER ACRE.

MAXIMUM ANNUAL GROUNDWATER ALLOTMENT: 489.65 ACRE-FEET PER YEAR.

Beginning calendar year 1995 and for each calendar year through calendar year 1999:

IRRIGATION WATER DUTY: 4.96 ACRE-FEET PER ACRE.

MAXIMUM ANNUAL GROUNDWATER ALLOTMENT: 384.89 ACRE-FEET PER YEAR.

Beginning calendar year 2000 and for each calendar year until the first compliance date of any Third Management Plan requirements:

IRRIGATION WATER DUTY: 4.08 ACRE-FEET PER ACRE.

MAXIMUM ANNUAL GROUNDWATER ALLOTMENT: 316.60 ACRE-FEET PER YEAR.

ARIZONA DEPARTMENT OF WATER RESOURCES

December 28, 1992

HARPER PAUL EMERY
HARPER SHIRLEY Y
PO BOX 1778
GOODYEAR AZ 85338

Dear Irrigation Grandfathered Right Holder;

Enclosed is an OFFICIAL NOTICE of your agricultural conservation requirements for the second management period (1990 to 2000). It is important that you review and understand the enclosed requirements.

Effective December 1989, the Arizona Department of Water Resources adopted the Second Management Plan (SMP) for the PHOENIX Active Management Area (AMA). The plan establishes conservation requirements for the second management period (1990 to 2000). Requirements include two intermediate water duties and intermediate maximum annual groundwater allotments and a final water duty and final maximum annual groundwater allotment.

The first intermediate requirements became effective in calendar year 1992. Second intermediate requirements must be achieved beginning with calendar year 1995. The final requirements will become effective beginning with calendar year 2000 and will continue until the compliance date of the Third Management Plan requirements. You were previously given written notice of all of your conservation requirements for the second management period following adoption of the SMP. The purpose of this Notice is to again inform you of the second intermediate requirements that will become effective January 1, 1995.

VARIANCES

The SMP was written in accordance with Arizona's Groundwater Code which mandates establishment of maximum conservation requirements consistent with prudent long term farm management practices. The Department considers these requirements to be achievable by most water users. However, if you believe you will be unable to comply with the second intermediate conservation requirements, you may request a VARIANCE.

A VARIANCE may be granted for up to five years if there are "compelling economic circumstances" preventing the timely compliance with the conservation requirements assigned to your irrigation right. Applications for a Variance must be filed within 95 days after the date of this notice.

Application forms and information on the VARIANCE procedure will be available at the PHOENIX AMA office after January 1, 1993.

VARIANCE applications for the final conservation requirements of the SMP will not be accepted at this time. You will be given an opportunity to apply for a VARIANCE from the final conservation requirements after you have been given additional notice of those requirements at the end of 1997.

ADMINISTRATIVE REVIEWS

You (or a previous owner) were provided an opportunity to file for an ADMINISTRATIVE REVIEW of all of your conservation requirements for the second management period within 90 days after receipt of the original notice of the requirements following adoption of the SMP. The ADMINISTRATIVE REVIEW process was designed to correct any technical, factual or legal errors made in establishing the SMP conservation requirements.

If you (or a previous owner) filed a request for an ADMINISTRATIVE REVIEW during that time, and the application included documentation in support for a leaching allowance, please be aware that the analysis is only valid for the first intermediate conservation requirements of the SMP. To qualify for a leaching allowance for the second intermediate requirements (1995 through 1999), a new water analysis must be submitted within 90 days after January 1, 1994.

No new applications for ADMINISTRATIVE REVIEW will be accepted at this time, except as allowed under A.R.S § 45-575.B.
The language of A.R.S. § 45-575.B allows for the filing of an application for ADMINISTRATIVE REVIEW at any time during the second management period if extraordinary circumstances, which were not in existence as of the date of the original SMP conservation notice, make it unreasonable to require compliance with the conservation requirements.

If you have any questions regarding your conservation requirements or if you need an application form and information on the VARIANCE procedure, please contact Monika Goy at the Phoenix AMA, 542-1512.

Sincerely,

Elizabeth Ann Rieke

Elizabeth Ann Rieke
Director
Arizona Department of Water Resources

ARIZONA DEPARTMENT OF WATER RESOURCES
500 North Third Street, Phoenix, Arizona 85004

APPLICATION FOR DEVELOPMENT PLAN APPROVAL TO RETIRE AN IRRIGATION GRANDFATHERED RIGHT FOR A NON-IRRIGATION (TYPE I)-USE

Filing fee: No Charge

CERTIFICATE No. 58- 103054.001

CERTIFIED ACRES 153.9

1. Mesquite Power, LLC a Delaware Limited Liability Company
   Last Name First Middle Initial

   Swartz Marty C
   Last Name First Middle Initial

   101 Ash Street San Diego CA 92101
   Mailing Address City State Zip

2. Active Management Area Phoenix

3. Attach a copy of the proposed development plan.

4. Legal description of land covered by certificate:
   NE ¼ Section 29, TS1, R6W, GSRB&M
   See attached Exhibit "A"

5. Legal description of land to be retired (attach map).
   See Attached Exhibit "B"

6. Total number of acres to be retired 153.9

7. Describe the location of each well, which was used to irrigate the land.
   NW 1/4 NW 1/4 NE 1/4 Section 29 Township 1S Range 6W Reg.No. 55 620365
   ____ 1/4 ____ 1/4 ____ 1/4 Section ____ Township ____ Range ____ Reg.No. 55 ____

8. When was the land last irrigated? Approximately four years ago

9. Has the land been held under the same ownership since it was last irrigated? ___Yes _X__No

   If no, did the applicant purchase the land from the last irrigator? ___Yes _X__No

   Enclose evidence to show date of purchase. *(See Appendix 2 of the proposed development plan)*

10. Has the land been sold or taken out of production primarily because it would have been uneconomical to continue to withdraw for irrigation? _X__Yes ___No

    If 'No" explain why the land was retired. ____

11. The intended use of the water is. ____Expanded animal industry _____Domestic
    _____ Industrial X Electrical Energy Generation _____ Mining _____ Other

12. Is the land to be retired within the exterior boundaries of a service area of a city, town or private water company? ___Yes _X__No

    If "Yes" indicate name of city town or private water company N/A

Signature: _____ Date: March 10, 2000
Marty C. Swartz – Manager, Project Development

EXHIBIT "A"

Certificate Of Grandfathered Groundwater Right

COUNTY OF MARICOPA

STATE OF ARIZONA DEPARTMENT OF WATER RESOURCES

This is to certify that pursuant to the provisions of Title 45, Chapter 2, Arizona Revised Statutes

GARY LEO AND SUZANNE D. ACCOMAZZO

ROUTE 2, BOX 337
BUCKEYE, AZ 85326
is granted
IRRIGATION GRANDFATHERED RIGHTS
in the

PHOENIX ACTIVE MANAGEMENT AREA
for 153.9 *irrigation acres of land. The rights are appurtenant to and groundwater may be used only on the irrigation acres of land described as follows:*

NE¼ Sec. 29 T1S R6W GSRB&M excluding non-irrigated areas as more fully described in the map attached hereto as Exhibit A and made a part hereof by reference.

The use of groundwater on the above described land shall be for irrigation purposes in accordance with the laws of the State of Arizona and restrictions placed on use by the Director of the Department of Water Resources pursuant to Title 45, Chapter 2, Arizona Revised Statutes.

CERTIFICATE NO. 58-103054.0001

is granted this 5th day of August, 1988

ARIZONA DEPARTMENT OF WATER RESOURCES

Director

The Department of Water Resources must be notified if the above named person(s) changes his address or conveys ownership of the right to another person(s) or wishes to convert the right to a non-irrigation grandfathered right associated with retired irrigated land.

Affidavit of Mailing IGR

The original of the foregoing cover letter dated 8/5/88 and Certificate of Irrigation Grandfathered Right and Notice of Irrigation Water Duty and Maximum Annual Groundwater Allotment for Certificate No. 58-103054.0001 was mailed this 24th day of Aug., 1988.

Certified
No. P 541-808-854

M L Russo
Mailed by

2/affimail3

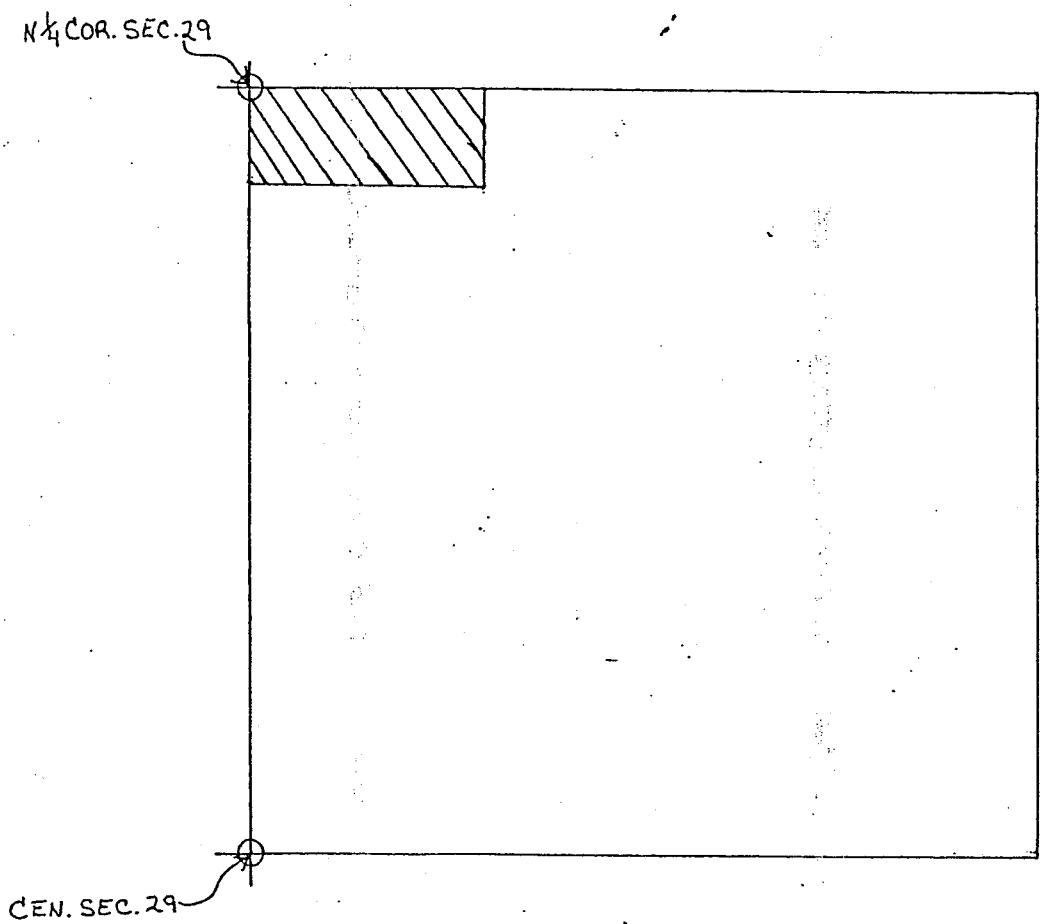
EXHIBIT A PAGE 1 OF 1

CERTIFICATE NO. 58-103054.0001

NAME GARY LEO AND SUZANNE D. ACCOMAZZO IRRIGATION ACRES CERTIFIED

Sec 29 T 1 S R 6 W Map Source A.S.C.S. Map Date 3-79 Scale 1":660'

EXHIBIT "B"



0 330 660

IRRIGABLE Acres

NON-IRRIGABLE ACRES

STATE OF ARIZONA

DEPARTMENT OF WATER RESOURCES
PHOENIX ACTIVE MANAGEMENT AREA

NOTICE OF IRRIGATION WATER DUTY AND MAXIMUM ANNUAL GROUNDWATER ALLOTMENT

Pursuant to A.R.S. §45-564.B, the Director of Water Resources hereby gives notice of the irrigation water duty and the maximum annual groundwater allotment for Irrigation Grandfathered Right Certificate No. 58-103054.0001 The maximum annual groundwater allotment is the maximum amount of groundwater that may be used per year to irrigate the lands described in the above-referenced Certificate of Irrigation Grandfathered Right, except as provided in A.R.S. §45-467, the operating flexibility account provision.

IRRIGATION WATER DUTY 4.27 ACRE-FEET PER ACRE.

MAXIMUM ANNUAL GROUNDWATER ALLOTMENT 637.8 ACRE-FEET PER YEAR.

Attachment A to this notice sets forth the official language of the above requirements for holders of grandfathered rights as adopted in the first management plan for the Phoenix Active Management Area. Attachment A is incorporated into this notice by reference. Compliance with the irrigation water duty and maximum annual groundwater allotment must be achieved beginning January 1, 1987 and must be maintained until the effective date of any new irrigation water duty established in the second management plan for the Phoenix Active Management Area.

NOTICE ISSUED BY

Director

ATTACHMENT A

1. Conservation Requirements for Holders of Irrigation Grandfathered Rights

a. Each person who is entitled to use groundwater pursuant to a certificate of irrigation grandfathered right shall comply with the applicable irrigation water duty no later than the compliance date and shall remain in compliance with that irrigation water duty until the effective date of any applicable irrigation water duty prescribed in the second management plan.

b. During the first accounting period after the compliance date and during each succeeding accounting period until the effective date of any applicable irrigation water duty prescribed in the second management plan, a person who is entitled to use groundwater pursuant to a certificate of irrigation grandfathered right shall not use groundwater in excess of the applicable maximum annual groundwater allotment to irrigate the certified irrigation acres in the farm, except as provided in A.R.S. 45-467.

2. Definitions

a. In this attachment, unless the context otherwise requires:

(1) "Certified irrigation acres" means the acres of land described on each certificate of irrigation grandfathered right.

(2) "Compliance date" means the date that falls two years after the date of the original notice (December 30, 1984) of the applicable irrigation water duty pursuant to A.R.S. 45-564. The compliance date is December 31, 1986.

(3) "Maximum annual groundwater allotment" means the quantity of water in acre-feet obtained by multiplying the water duty acres for a farm by the irrigation water duty for the farm unit.

b. The applicable definitions in A.R.S. 45-101, 45-402 and 45-461 are hereby incorporated by reference into this attachment.

REGISTRY OF GROUNDWATER RIGHTS
DATA ENTRY WORKSHEET #1

☒ AMA ☐ PRESCOTT ☒ PHOENIX ☐ PINAL ☐ TUCSON
☐ INA ☐ JOSEPH CITY ☐ HARQUAHALA ☐ DOUGLAS

☐ CONVEYANCE ☒ CHANGE OF EXISTING FILE DATE 8/5/88
INITIALS [illegible]

WR 0300 OWNERSHIP

A

RIGHT 58 - 103054.0001 CERTIFICATE TYPE IGR

NAME Accomazzo, Gary Leo and Suzanne D. PHONE

ADDRESS Route 2 Box 337 AMA C
Buckeye, Az. 85326 SUB-BASIN 03

BOOK ____ MAP ____ PARCEL ____ LAND OWNERSHIP P

WR 0105 PLACE OF USE

A

Quarters			Sec	Township		Range	
		NE	29	01	S	06	W

SEE ADDITIONAL LIST ☐

WR 0115 WATER ALLOTMENTS

A

Allotment 637.83 AFA
Water Duty Acres 149.28
Irrigation Acres 153.90

CAP Allotment — AFA Retired
Water Duty 4.27 AFA Acres
MAWA/Acre 4.14 AFAA
Target Efficiency .55

WR 0120 WATER DELIVERED TO OTHER RIGHTS

☐ 58-
☐ 58-
☐ 58-
☐ 58-

WR 0125 OTHER WELLS SERVING RIGHT

☐ 0 - 55-
☐ 0 - 55-
☐ 0 - 55-
☐ 0 - 55-

SEE ADDITIONAL LIST ☐

WR 0130 OWNED WELLS SERVING RIGHT

A

	DWR NUMBER	POWER CO.	ACCOUNT #	METER #	DEVICE	ENERGY
☒	55-620365	APS	10-07-110500-36	234716	4	E
☒	55-620366	APS			4	E
☐	55-					
☐	55-					

SEE ADDITIONAL LIST ☐

WR 0700 FILE STATUS

A

ACTIVE
C

ASSOCIATED INACTIVE FILES
58-103054.0001

AUG 11 1988

Exhibit I
Facility Noise Assessment

As stated in Arizona Corporation Commission Rules of Practice and Procedure R14-3-219:

"Describe the anticipated noise emission levels and any interference with communication signals which will emanate from the proposed facilities."

The proposed facility will generate noise, however, no interference with communication signals is anticipated. The anticipated sound levels at the nearest residences will be below the USEPA outdoor guideline. The complete Environmental Noise Assessment for the Proposed Mesquite Generating Station is attached and describes in full the anticipated noise emission levels from the project, the modeling performed, and other pertinent information.

ENVIRONMENTAL NOISE ASSESSMENT

Proposed Mesquite Generating Station

Maricopa County, Arizona

Prepared for:

Mesquite Energy, LLC

April 3, 2000

BLACK & VEATCH
Corporation

Table of Contents

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5.0 Environmental Noise Emissions 15

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5.2 Facility Noise Emissions 15

6.0 Occupational Noise Exposure 17

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6.2 Worker Noise Exposure 18

Appendix A 19

Appendix B 20

Executive Summary

The proposed site for the Mesquite Generating Station is located approximately 40 miles west of Phoenix, Arizona within an unincorporated portion of Maricopa County. The facility will consist of a natural gas-fired power plant comprised of two 2-on-1 combined cycle configurations utilizing F-class technology. During normal facility operation, noise emissions associated with the proposed combined cycle facility will include both environmental noise emissions and occupational noise exposure. Based on the available information, there are no county or local noise regulations that apply to the proposed facility. As such, the facility noise emissions have been evaluated based on meeting federal guidelines and regulations.

A noise survey was conducted on March 13 and 14, 2000, to characterize the existing acoustical environment within the vicinity of the proposed site. The existing background sound levels in the vicinity of the proposed site range from 24 dBA to 29 dBA, which is typical of very quiet rural areas. The nearest residence is located approximately 1.5 miles (8000 feet) southwest of the proposed power block location. The next nearest residences (Popoff & Sons Ranch and Fading Fantasy Ranch) are located approximately 1.7 miles (9000 feet) northwest of the proposed power block location.

Noise modeling was conducted to predict the environmental noise emissions during normal facility operation. The facility sound levels anticipated at the nearest residences will be below the USEPA outdoor guideline of 48 dBA (L_{eq}). It should be noted, however, that due to the very low existing outdoor background sound levels, the facility would increase the existing outdoor background sound levels. Additionally, the facility sound levels anticipated within the indoor spaces of the nearest residences will be below the USEPA indoor guideline of 38 dBA (L_{eq}).

The sound pressure levels within the combined cycle power plant will vary throughout the plant. Sound pressure levels within close proximity to major noise sources may exceed 85 dBA. However, workers will not typically occupy these areas for prolonged periods of time. All areas throughout the facility that experience sound levels in excess of 85 dBA will be identified with warning signs prescribing hearing protection.

1.0 Introduction

The proposed site for the Mesquite Generating Station is located approximately 40 miles west of Phoenix, Arizona within an unincorporated portion of Maricopa County. The facility will consist of a natural gas-fired combined cycle power plant with a nominal electrical output of 1,000 MW. Specifically, the facility will consist of two 2-on-1 combined cycle configurations utilizing F-class technology (170 MW each).

The expected noise emissions associated with the proposed combined cycle facility have been evaluated. The facility noise emissions include both environmental noise emissions and occupational noise exposure during normal facility operation.

Prior to determining the potential noise emissions from the proposed combined cycle facility, an environmental noise survey was conducted to assess the existing acoustical environment surrounding the proposed site. The existing acoustical environment surrounding the proposed site is typical of quiet rural areas.

The major noise sources associated with the proposed combined cycle facility are anticipated to include the combustion turbine generator packages, the heat recovery steam generators, the steam turbine generator packages, the generator step-up transformers, and the cooling towers. Noise modeling was conducted to predict the environmental noise emissions from the proposed combined cycle facility during normal operation.

Additionally, the occupational noise exposure levels from the proposed facility have been evaluated with respect to protecting worker's hearing and providing a comfortable work environment.

2.0 Acoustical Terminology

Sound energy is generated by the propagation of pressure waves. As a wave phenomenon, sound is characterized by amplitude (sound level) and frequency (pitch). Sound amplitude is measured in decibels, dB. The decibel is the logarithmic ratio of a sound pressure to a reference sound pressure. Typically, 0 dB corresponds to the threshold of human hearing. Generally, a 3 dB change is just barely perceptible, a 6 dB change is clearly noticeable, and a 10 dB change is a doubling (or halving) of the apparent loudness. The standard unit of measure for frequency is hertz, Hz (cycles per second). The typical human ear can hear frequencies ranging from 20 Hz to 20,000 Hz.

Typically, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the low and high frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels, dBA. For reference, the A-weighted sound pressure levels associated with common noise sources are shown in Figure 2-1.

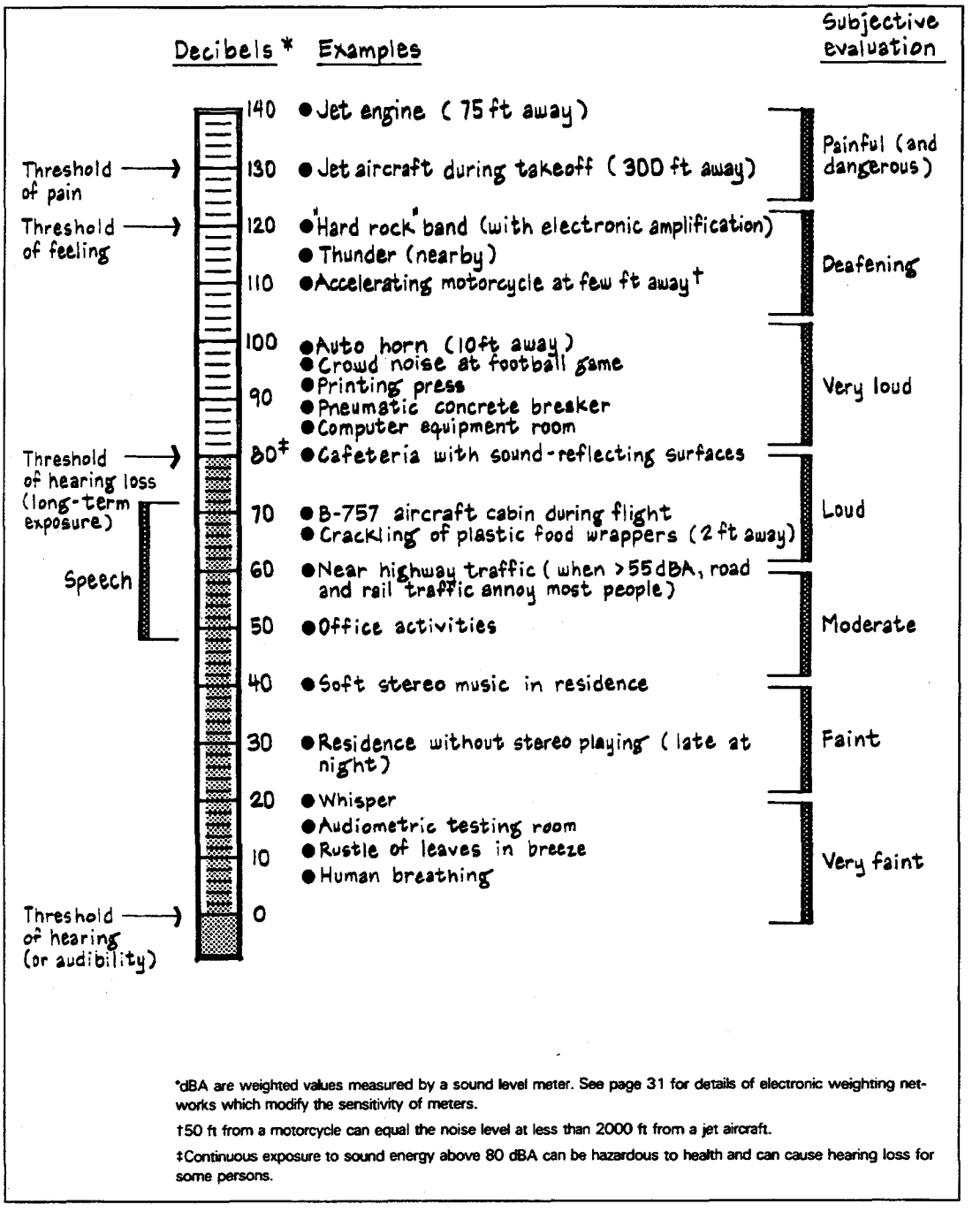
Noise in the environment is constantly fluctuating. Sound levels vary when, for example, a car drives by, a dog barks, or a plane passes overhead. Several noise metrics have been developed to quantify fluctuating noise levels. These metrics include the equivalent-continuous sound level and the exceedance sound level.

The equivalent-continuous sound level, L_{eq}, is the level of a hypothetical steady sound that has the equivalent sound energy as the actual fluctuating sound over a given time duration. For example, $L_{eq(1h)}$ is the equivalent-continuous sound level measured over a one-hour period and provides an indication of the average sound level over the one-hour period.

The exceedance sound level, L_x, is the sound level exceeded "x" percent of the sampling period and is referred to as a statistical sound level. The most common L_x values are L_{90}, L_{50}, and L_{10}. L_{90} is the sound level exceeded 90 percent of the sampling period. L_{90} is often referred to as the residual sound level because it measures the background sound level without the influence of loud, transient noise sources. L_{50} is the sound level

exceeded 50 percent of the sampling period or the median sound level. L_{10} is the sound level exceeded 10 percent of the sampling period. L_{10} is often referred to as the intrusive sound level because it measures the occasional louder noises.

The variation between the L_{90}, L_{50}, and L_{10} sound levels can provide an indication of the variability and distribution of the noise environment. If the noise environment were perfectly steady, all values would be identical. A large variation between the values would indicate a large range of sound levels within the environment. For instance, measurements near a roadway with frequent passing vehicles would cause a large variation in the statistical sound levels.



Source: Architectural Acoustics, M. David Egan, 1988.

Figure 2-1

Typical Sound Pressure Levels Associated with Common Noise Sources.

3.0 Local Noise Ordinance

The proposed site for the facility is located approximately 40 miles west of Phoenix, Arizona in an unincorporated portion of Maricopa County. Based on the available information, there are no county or local noise regulations that apply to the proposed facility. As such, the facility noise emissions have been evaluated based on meeting federal guidelines and regulations.

In the absence of a local noise ordinance, noise level limits recommended by the U.S. Environmental Protection Agency (USEPA) can be utilized to establish a design criteria for the proposed facility. The USEPA has identified yearly day-night average sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise [*EPA Pub. No. 550/9-77, April 1977*].

According to the USEPA, outdoor yearly sound levels that do not exceed an L_{dn} of 55 dBA are sufficient to protect public health and welfare in sensitive areas such as residences, schools, and hospitals. The day-night sound level, L_{dn}, is the 24-hour average sound level, $L_{eq(24h)}$, with a 10 dB penalty applied to nighttime sound levels (10:00 p.m. to 7:00 a.m.) to account for increased sensitivity to noise during nighttime hours. A constant 24-hour sound level, $L_{eq(24h)}$, of 48 dBA would be equivalent to an L_{dn} of 55 dBA. Therefore, if the facility does not exceed an A-weighted sound pressure level of 48 dBA at the nearest sensitive areas (residences, schools, hospitals, churches, etc.), the facility would meet the USEPA outdoor guidelines.

Additionally, according to the USEPA, indoor yearly sound levels that do not exceed an L_{dn} of 45 dBA are sufficient to protect public health and welfare within indoor residential spaces. An L_{dn} of 45 dBA would be equivalent to an a constant 24-hour sound level, $L_{eq(24h)}$, of 38 dBA. Therefore, if the facility does not exceed an A-weighted sound pressure level of 38 dBA within indoor residential spaces, the facility would meet the USEPA indoor guidelines.

4.0 Existing Acoustical Environment

The proposed site is typical of the surrounding rural area and consists of undeveloped desert land. The surrounding area includes fallow (or abandoned) agricultural fields and desert brush land. Nearby buildings and structures are abandoned. However, some rural residences are located within a few miles of the site. These residences include two ranches. The Palo Verde Nuclear Generating Station is approximately 2.5 miles north of the site. Local traffic is very light with 383rd Avenue and Elliot Road being the only paved roads in the general vicinity. All other roads are unimproved and lead to remote areas.

A noise survey was conducted on March 13 and 14, 2000, to characterize the existing acoustical environment within the vicinity of the proposed site. Noise monitoring was conducted at four locations surrounding the site. These locations were selected to capture the acoustical environment representative of the site and the nearby residences. A description of each measurement location is listed below. Additionally, the locations of the nearby residences and noise monitoring locations are shown in Figure 4-1.

Noise Monitoring Location	Description
1	Along the west edge of the site just south of Elliot Road.
2	Approximately 2.5 miles west of the site just south of Elliot Road.
3	Approximately 0.75 miles northwest of the site along 383rd Avenue.
4	Approximately 2.0 miles southeast of the site near the Southern Pacific railroad line and along the access road to the H&H Desert Ranch.

Long-term noise measurements were conducted at each location for a 24-hour period to capture typical ambient daytime and nighttime sound levels. The measurements included the equivalent-continuous sound level, L_{eq}; the 90-percentile exceedance sound level, L_{90}; the 50-percentile exceedance sound level, L_{50}; and the 10-percentile exceedance sound level, L_{10}, during each one-hour period. Additionally, short-term octave band noise measurements were conducted at each location in order to evaluate the spectral content of the existing acoustical environment. Weather conditions during the measurement period were favorable for sound level measurements and generally included clear skies with temperatures ranging from 55 to 80 °F throughout the day.

The 24-hour noise monitoring results are detailed in Figure 4-2. The corresponding measurement data is included in Appendix A. Figure 4-2 depicts the L_{eq}, L_{10}, and L_{90} hourly sound levels during the 24-hour period at each location. As previously discussed, the L_{eq} sound level is the average sound level during the period. Also, as previously discussed, the L_{90} sound level is typically considered the residual or background sound level and the L_{10} sound level is generally considered the intrusive sound level. The 24-hour measurements indicate the daytime and nighttime background sound levels (L_{90}) were constant and below 35 dBA. The measured sound levels were typical of very quiet rural areas.

The short-term measurement results are detailed in Figures 4-3 through 4-6. The corresponding measurement data is included in Appendix B. The figures show the L_{eq}, L_{10}, L_{50}, and L_{90} sound levels and the octave band sound levels recorded during the short-term measurement period at each location. The measurement periods ranged from 5 to 10 minutes as necessary to capture representative sound levels. The octave band sound pressure levels at each location did not exhibit any significant tones and are typical of rural ambient sound levels. The measured L_{eq}, L_{10}, L_{50}, and L_{90} sound levels are listed in Table 4-1. As shown, the background sound levels (L_{90}) ranged from 24.0 dBA to 36.5 dBA. Locations 3 and 4 experienced the highest background sound levels due to a rattle from overhead transmission lines and noise from nearby well drilling, respectively.

In general, the existing background sound levels in the vicinity of the proposed site range from 24 dBA to 29 dBA, which is typical of very quiet rural areas. The nearest residence is located approximately 1.5 miles (8000 feet) southwest of the proposed power block location. The next nearest residences (Popoff & Sons Ranch and Fading Fantasy Ranch) are located approximately 1.7 miles (9000 feet) northwest of the proposed power block location. Refer to Figure 4-1 for the relative locations of the nearest residences. The power block is proposed to be located in the northern portion of the site.

Table 4-1
Short-term Measurement Sound Level Measurement Results.

Location	Time	Leq, dBA	L90, dBA	L50, dBA	L10, dBA
1	Day - 11:43 AM	29.1	***24.0***	26.0	32.5
	Evening - 6:42 PM	31.4	***25.5***	28.5	34.5
	Night - *None*				
2	Day - 11:25 AM	34.3	***29.5***	32.5	38.0
	Evening - 6:55 PM	32.1	***25.5***	29.0	35.0
	Night - 1:50 AM	32.1	***26.0***	27.5	36.0
3	Day - 11:15 AM	30.3	***28.5***	29.5	31.0
	Evening - 7:10 PM	31.2	***29.0***	31.0	33.5
	Night - 1:35 AM	37.9	***36.5***	37.5	39.0
4	Day - 12:25 PM	37.4	***35.5***	37.0	39.0
	Evening - 6:15 PM	35.3	***24.0***	26.5	36.5
	Night - *None*				

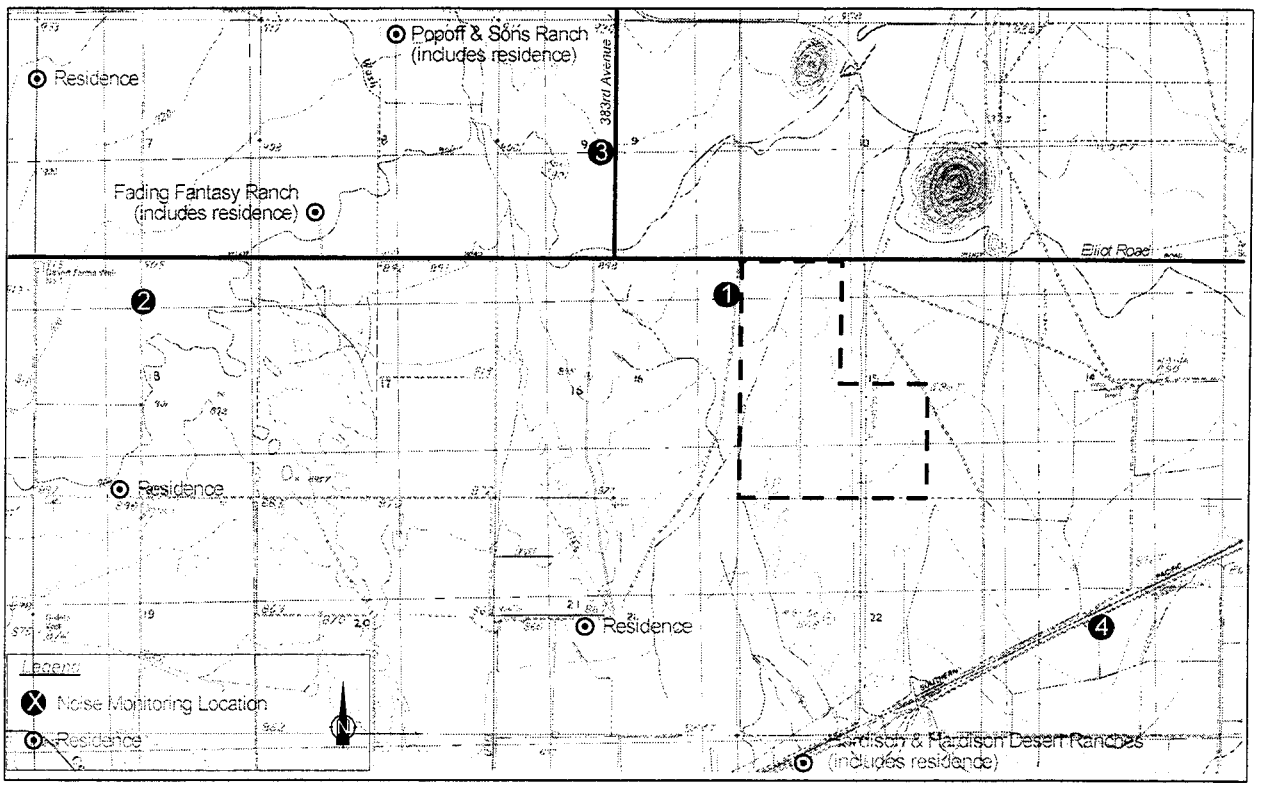


Figure 4-1

Nearby Residences and Ambient Noise Monitoring Locations.

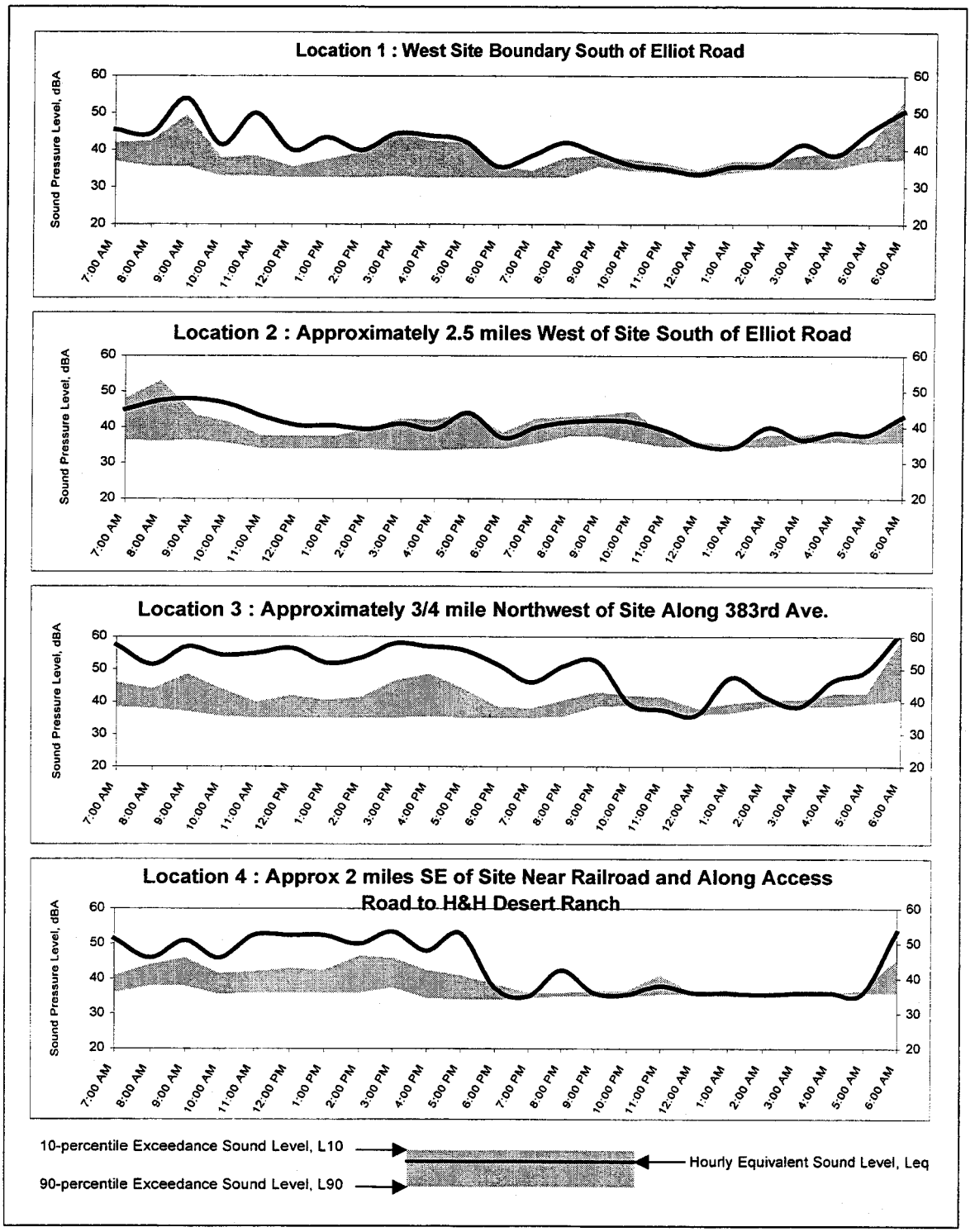


Figure 4-2

Long-Term (24-hour) Ambient Noise Level Measurements.

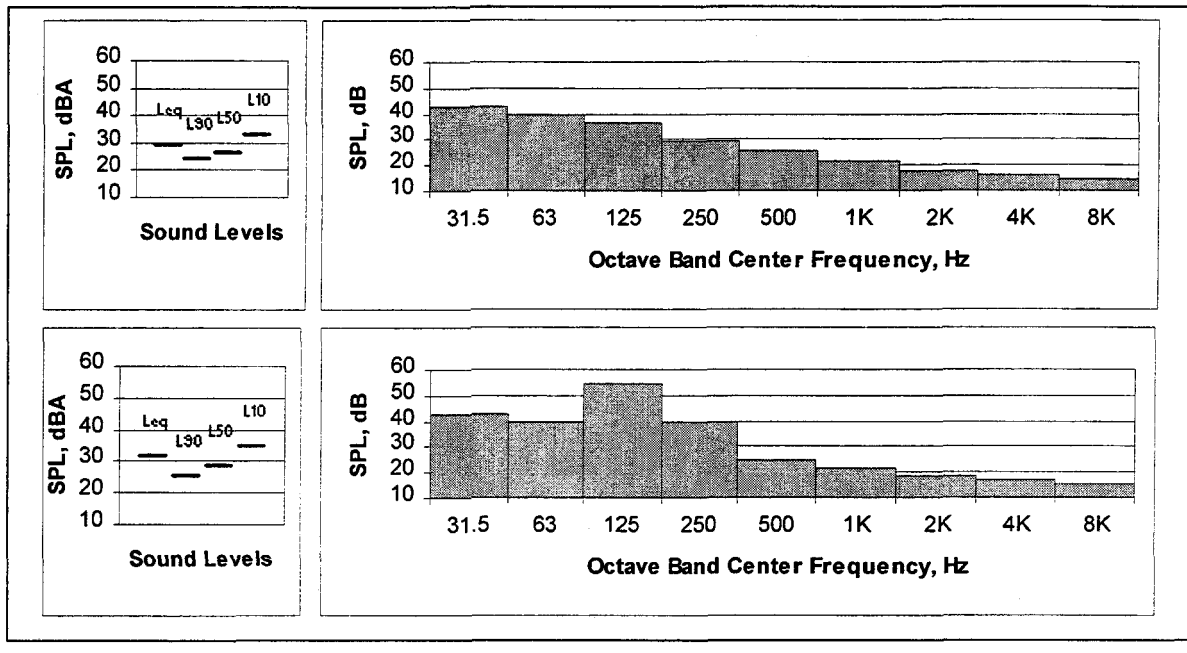


Figure 4-3

Location 1
Short-Term Ambient Noise Level Measurements.

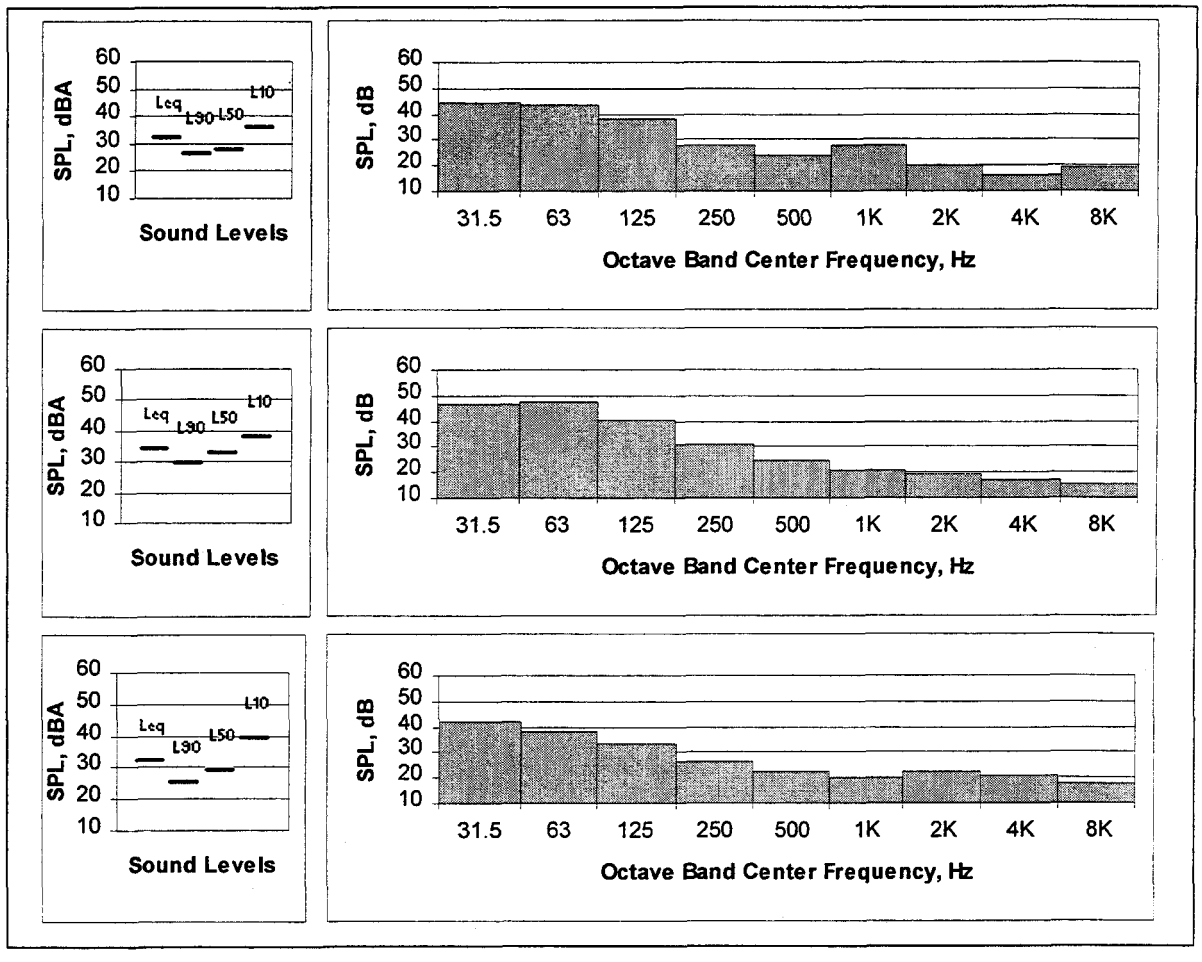


Figure 4-4

Location 2
Short-Term Ambient Noise Level Measurements.

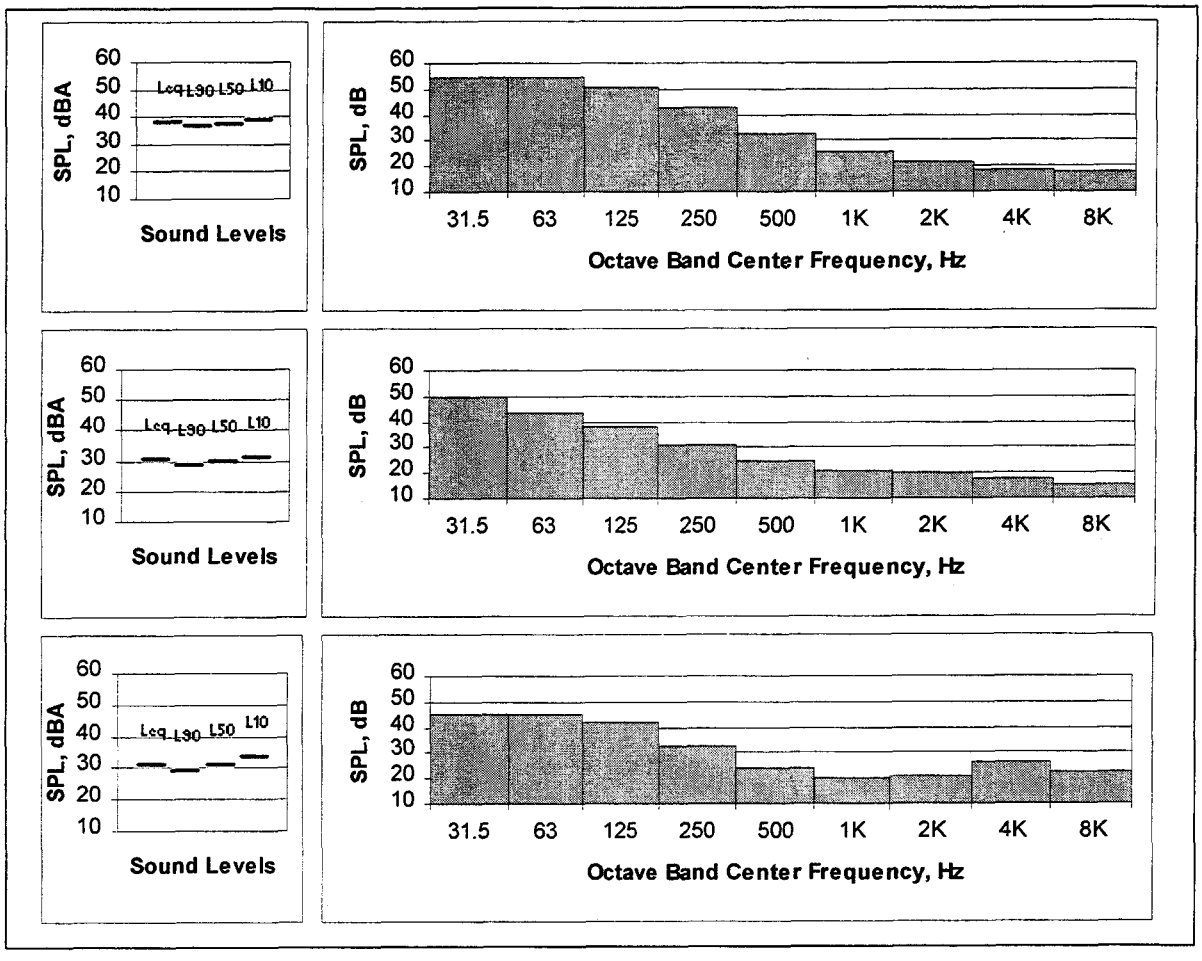


Figure 4-5

Location 3
Short-Term Ambient Noise Level Measurements.

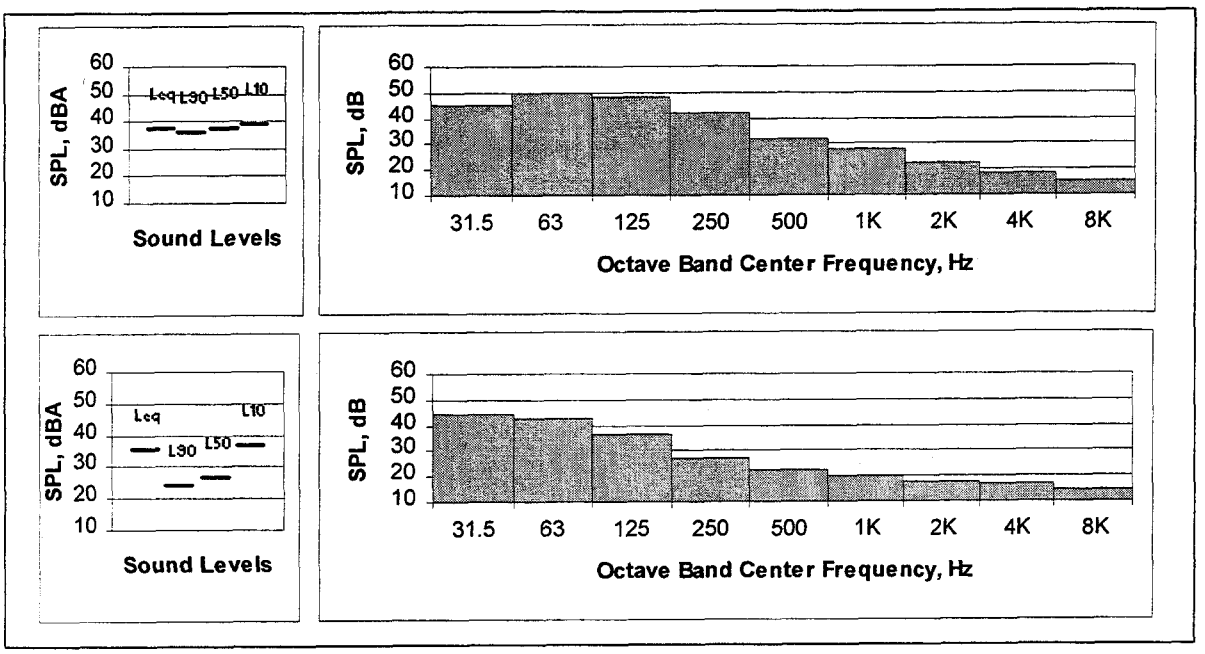


Figure 4-6

Location 4
Short-Term Ambient Noise Level Measurements.

5.0 Environmental Noise Emissions

The environmental noise emissions include the noise emitted by the proposed facility to the areas surrounding the proposed facility site.

5.1 Noise Modeling Methodology

The environmental noise emissions were modeled using noise prediction software. The model simulated the outdoor propagation of sound from each point source and accounted for sound wave divergence, atmospheric sound absorption, sound directivity, and sound attenuation due to interceding barriers. A database was developed which specified the location, octave band sound power levels, and sound directivity of each noise source. A receptor grid was specified which covered the entire area of interest. The model calculated the overall A-weighted sound pressure level at each receptor location based on the octave band sound level contribution of each noise source. Finally, a noise contour plot was produced based on the overall sound pressure level at each receptor location.

5.2 Facility Noise Emissions

The proposed facility includes two 2-on-1 combined cycle arrangements. The primary noise sources anticipated with this facility include the combustion turbine generator packages, the heat recovery steam generator packages, the steam turbine generator packages, and the cooling towers. Noise modeling was conducted to predict the environmental noise emissions during normal facility operation. Normal operation excludes intermittent activities such as start-up, shut down, steam release, bypass operation, and any other abnormal or upset operating conditions.

The predicted facility noise emissions are detailed in Figure 5-1. As shown, the sound level at the nearest residence is below approximately 46 dBA. Additionally, the sound level at the Popoff & Sons Ranch, the Fading Fantasy Ranch, and the Hardison & Hardison Desert Ranches are below approximately 44 dBA. Lastly, the sound levels at all residences beyond these locations are below 40 dBA. Therefore, the facility sound levels anticipated at the nearest residences will be below the USEPA outdoor guideline of 48 dBA (L_{eq}). It should be noted, however, that due to the very low existing outdoor background sound levels, the facility would increase the existing outdoor background sound levels.

Typical residential construction in warm climates generally provides an outdoor-to-indoor noise reduction of approximately 12 dB with windows open and 24 dB with windows closed [*EPA Pub. No. 550/9-74-004, March 1974*]. As such, the nearest residence would experience indoor sound levels of 34 dBA and 22 dBA with the windows open and closed, respectively. Therefore, the facility sound levels anticipated within the indoor spaces of the nearest residence will be below the USEPA indoor guideline of 38 dBA (L_{eq}).

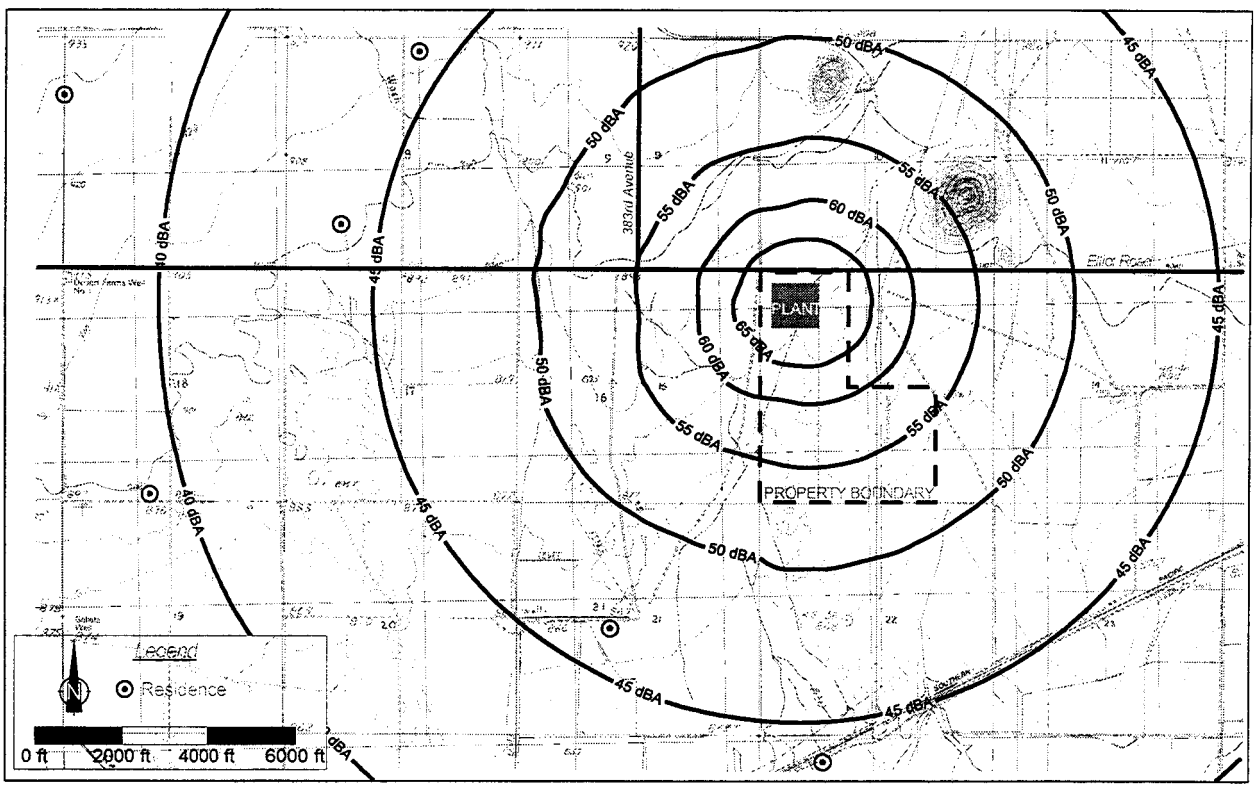


Figure 5-1

Predicted A-weighted sound pressure levels, $L_{eq(24h)}$, (re: 20e-6 Pa) at 5 feet above the facility base elevation during normal operation of the proposed combined cycle facility. Sound pressure level results do not include the barrier effect of off-site buildings, structures, and intervening terrain.

6.0 Occupational Noise Exposure

Occupational noise exposure includes the facility noise within the areas where facility personnel may be located. The occupational noise exposure levels have been evaluated with respect to protecting worker's hearing and providing a comfortable work environment.

6.1 Noise Exposure Criteria

The U. S. Occupational Safety and Health Administration (USOSHA) has established worker noise exposure limits. The OSHA worker noise exposure limits are based on a worker's noise exposure over a specific time period. Examples of these limits are outlined in Table 6-1.

Table 6-1
USOSHA Permissible Daily Noise Exposures

Duration per day in hours.	Sound Exposure Level, dBA.
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4 or less	115

Source : 29 CFR Part 1910

When worker noise exposure exceeds the permissible exposure limit, feasible engineering or administrative controls must be implemented to reduce the noise exposure. When such controls fail to reduce the noise exposure to below the criteria levels, personal protective equipment must be provided and used to reduce the noise exposure to a permissible level. Although the permissible noise exposure over an 8-hour duration is shown as 90 dBA, OSHA has established a trigger level of 85 dBA over an 8-hour duration. When the trigger level is exceeded, the employer must provide the workers with hearing protection and establish an annual audiometric testing program.

6.2 Worker Noise Exposure

Sound pressure levels within a combined cycle power plant vary throughout the plant. Sound pressure levels within close proximity to major noise sources can exceed 85 dBA. However, workers do not typically occupy these areas for prolonged periods of time. All areas throughout the facility that experience sound levels in excess of 85 dBA will be identified with warning signs prescribing hearing protection.

Appendix A

Mesquite Generating Station
Ambient Noise Survey - Noise Monitoring Data
March 13 and 14, 2000

LOCATION 1

	Date	Time	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)	L1 (dBA)
7:00 AM	3/14/00	7:25 AM	45.5	37.0	38.5	42.0	60.0
8:00 AM		8:25 AM	44.5	35.5	38.5	42.5	57.5
9:00 AM		9:25 AM	54.0	35.5	38.5	49.5	70.0
10:00 AM		10:25 AM	41.5	33.0	34.0	38.0	54.5
11:00 AM	3/13/00	11:25 AM	50.0	33.0	33.5	38.5	62.5
12:00 PM		12:25 PM	40.0	32.5	33.0	35.5	55.5
1:00 PM		1:25 PM	43.5	32.5	33.0	37.5	58.0
2:00 PM		2:25 PM	40.0	32.5	34.0	39.5	52.0
3:00 PM		3:25 PM	44.5	33.0	34.5	45.0	58.5
4:00 PM		4:25 PM	44.0	32.5	33.5	42.5	58.0
5:00 PM		5:25 PM	42.5	32.5	33.5	42.0	57.0
6:00 PM		6:25 PM	35.5	32.5	33.0	35.5	45.5
7:00 PM		7:25 PM	38.5	32.5	32.5	34.5	51.5
8:00 PM		8:25 PM	42.0	32.5	34.5	38.0	56.0
9:00 PM		9:25 PM	39.0	35.5	37.0	38.5	46.0
10:00 PM		10:25 PM	36.0	34.5	35.5	37.5	39.0
11:00 PM		11:25 PM	35.0	34.0	34.5	36.5	38.0
12:00 AM	3/14/00	12:25 AM	33.5	32.5	33.5	34.5	36.0
1:00 AM		1:25 AM	35.5	34.0	35.0	37.0	39.0
2:00 AM		2:25 AM	36.0	35.0	36.0	37.0	38.5
3:00 AM		3:25 AM	41.5	35.0	36.5	38.5	52.0
4:00 AM		4:25 AM	38.5	35.0	37.0	39.5	44.0
5:00 AM		5:25 AM	45.0	37.0	39.0	41.5	60.0
6:00 AM		6:25 AM	50.5	37.5	40.0	53.0	63.5
		ALL	45.2	32.5	35.5	40.5	58.0
		Leq(24h)	45.0				
		Ldn	50.0				
		Minimum		32.5	32.5	34.5	36.0
		Median		33.5	34.5	38.5	55.0
		Maximum		37.5	40.0	53.0	70.0

LOCATION 2

Date	Time	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)	L33 (dBA)
3/14/00	6:53 AM	45.0	36.5	40.0	48.0	42.5
	7:53 AM	47.5	36.0	37.0	53.0	39.5
	8:53 AM	48.0	36.5	38.5	43.5	39.5
	9:53 AM	46.5	35.5	38.0	41.5	39.0
	10:53 AM	43.0	34.0	34.5	37.5	35.0
3/13/00	11:53 AM	40.5	34.0	34.5	37.5	35.0
	12:53 PM	40.5	34.0	34.5	37.5	35.0
	1:53 PM	39.5	34.0	34.5	39.5	35.0
	2:53 PM	41.0	33.5	35.5	42.5	37.5
	3:53 PM	39.5	33.5	35.0	42.0	36.5
	4:53 PM	44.0	34.0	36.0	44.0	37.5
	5:53 PM	37.0	34.0	35.5	38.5	36.0
	6:53 PM	40.0	35.5	38.5	42.5	40.5
	7:53 PM	41.5	37.5	41.5	43.0	42.0
	8:53 PM	42.0	37.5	41.0	43.5	42.0
	9:53 PM	41.5	36.0	41.0	44.5	43.0
	10:53 PM	39.0	34.5	35.0	37.5	35.5
3/14/00	11:53 PM	35.0	34.5	34.5	36.0	35.0
	12:53 AM	34.5	34.5	34.5	35.0	34.5
	1:53 AM	40.0	34.5	35.0	38.0	36.0
	2:53 AM	36.5	35.5	36.5	38.0	37.0
	3:53 AM	38.5	36.0	37.5	38.5	38.0
	4:53 AM	38.0	35.5	36.0	37.5	36.0
	5:53 AM	43.0	36.0	38.5	43.0	39.0
	ALL	42.6	34.5	36.5	42.5	38.0
	Leq(24h)	42.4				
	Ldn	46.6				
	Minimum		33.5	34.5	35.0	34.5
	Median		35.0	36.0	40.5	37.3
	Maximum		37.5	41.5	53.0	43.0

LOCATION 3

	Date	Time	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)	L1 (dBA)
7:00 AM	3/14/00	7:08 AM	57.5	38.5	40.5	46.0	73.5
8:00 AM		8:08 AM	51.5	38.0	41.5	44.0	60.0
9:00 AM		9:08 AM	57.0	37.0	39.5	48.5	73.0
10:00 AM		10:08 AM	54.5	35.5	37.0	44.0	71.0
11:00 AM		11:08 AM	55.0	35.0	36.0	40.0	70.0
12:00 PM	3/13/00	12:08 PM	56.5	35.0	36.0	42.0	72.0
1:00 PM		1:08 PM	52.0	35.0	35.5	40.5	66.5
2:00 PM		2:08 PM	53.5	35.0	36.0	41.5	68.0
3:00 PM		3:08 PM	58.0	35.0	36.0	46.5	74.5
4:00 PM		4:08 PM	57.0	35.5	38.0	48.5	73.0
5:00 PM		5:08 PM	56.0	35.0	36.5	44.0	71.5
6:00 PM		6:08 PM	51.5	35.0	36.0	38.5	60.0
7:00 PM		7:08 PM	46.0	35.0	35.5	38.0	54.5
8:00 PM		8:08 PM	51.0	35.5	36.5	40.5	62.5
9:00 PM		9:08 PM	52.5	38.5	40.5	43.0	61.0
10:00 PM		10:08 PM	39.5	39.0	40.5	42.0	42.5
11:00 PM		11:08 PM	37.5	37.5	38.5	41.5	42.5
12:00 AM	3/14/00	12:08 AM	36.0	36.0	37.0	38.0	39.5
1:00 AM		1:08 AM	47.5	36.5	38.0	39.5	55.5
2:00 AM		2:08 AM	41.5	38.5	39.0	40.5	48.0
3:00 AM		3:08 AM	38.5	38.5	39.0	40.5	45.0
4:00 AM		4:08 AM	46.5	38.5	40.0	42.5	54.0
5:00 AM		5:08 AM	49.5	39.5	41.0	42.5	57.0
6:00 AM		6:08 AM	61.0	40.5	43.0	58.5	76.5
		ALL	54.3	35.5	38.5	43.0	68.5
		Leq(24h)	54.1				
		Ldn	59.1				
		Minimum		35.0	35.5	38.0	39.5
		Median		36.3	38.0	42.0	61.8

LOCATION 4

Date	Time	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)	L33 (dBA)
3/14/00	7:29 AM	51.5	36.0	36.0	41.0	36.5
	8:29 AM	46.0	38.0	41.5	44.0	42.0
	9:29 AM	51.0	38.0	42.0	46.0	42.5
	10:29 AM	46.0	35.5	38.0	41.5	39.0
	11:29 AM	52.5	36.0	38.0	42.0	39.0
3/13/00	12:29 PM	52.5	36.0	40.0	43.0	41.0
	1:29 PM	52.5	36.0	38.5	42.5	39.5
	2:29 PM	50.0	36.0	40.0	46.5	41.5
	3:29 PM	53.5	37.5	40.5	46.0	42.0
	4:29 PM	48.0	34.5	36.5	42.5	38.0
	5:29 PM	53.0	34.0	34.5	41.0	35.5
	6:29 PM	37.5	34.0	34.5	38.5	34.5
	7:29 PM	35.0	34.5	34.5	36.0	35.0
	8:29 PM	42.5	35.0	35.5	36.0	35.5
	9:29 PM	36.0	35.0	35.5	36.5	35.5
	10:29 PM	35.5	35.0	35.5	36.5	35.5
	11:29 PM	38.0	35.5	37.0	41.0	38.0
3/14/00	12:29 AM	36.0	35.5	36.0	36.0	36.0
	1:29 AM	36.0	35.0	35.5	36.5	36.0
	2:29 AM	35.5	35.5	35.5	35.5	35.5
	3:29 AM	36.0	35.5	35.5	36.0	36.0
	4:29 AM	36.0	35.5	36.0	36.0	36.0
	5:29 AM	36.0	36.0	36.0	36.5	36.5
	6:29 AM	53.5	36.0	37.0	45.5	38.0
	ALL	48.9	35.0	36.0	42.0	37.5
	Leq(24h)	48.6				
	Ldn	52.3				
	Minimum		34.0	34.5	35.5	34.5
	Median		35.5	36.0	41.0	36.5

Appendix B

BLACK & VEATCH

SOUND LEVEL MEASUREMENTS

PAGE 1

PROJECT NAME / CLIENT	B&V PROJECT NUMBER
Mesquite Generating Station / Sempra Energy Resources	096210.0030

TEST DESCRIPTION	TEST EQUIPMENT
Ambient Noise Survey	CEL-393 s/n 600028B

DATE	PRE-CAL	POST-CAL	WEATHER CONDITIONS	WIND
3/13/00	113.0	113.0	CLEAR SKIES, 65-75°F, 20%RH	0 MPH

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
1		6:42P	6 MIN	31.4	25.5	28.5	34.5

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
42.6	39.9	54.3	39.8	24.6	21.9	18.3	16.9	15.6	51.3

LOCATION DESCRIPTION: ALONG WEST EDGE OF PROPERTY JUST SOUTH OF ELLIOT ROAD

AUDIBLE SOURCES: INSECTS - FAINT (NO WIND)
DISTANT AIRCRAFT

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
2		6:55P	5 MIN	32.1	25.5	29.0	35.0

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
41.8	38.2	33.6	26.4	22.3	20.4	22.5	20.6	17.9	55.4

LOCATION DESCRIPTION: APPROX 2.5 MI. WEST OF SITE JUST SOUTH OF ELLIOT ROAD.

AUDIBLE SOURCES: INSECTS/BIRDS - FAINT
DISTANT AIRCRAFT (NO WIND)

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
3		7:10P	5 MIN	31.2	29.0	31.0	33.5

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
45.4	44.9	41.7	32.3	23.8	20.3	20.7	26.3	22.3	51.8

LOCATION DESCRIPTION: APPROX 0.75 MILES N.W. OF SITE ALONG 383RD AVE.

AUDIBLE SOURCES: T-LINE (RATTLE) INSECT - FAINT
DISTANT AIRCRAFT

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
4		6:15P	10 MIN	35.3	24.0	26.5	36.5

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
44.6	42.6	36.8	26.8	22.6	20.5	18.1	17.4	14.9	50.6

LOCATION DESCRIPTION: APPROX 2 MI. S.E. OF SITE NEAR SO. PACIFIC RAIL LINE.

AUDIBLE SOURCES: DISTANT AIRCRAFT
OCCASIONAL BIRD

SIGNATURE	COMPANY	DATE
[signature]	B&V	3/13/00

DATASHT4.VSD : 991111

BLACK & VEATCH

SOUND LEVEL MEASUREMENTS

PAGE 1

PROJECT NAME / CLIENT	B&V PROJECT NUMBER
Mesquite Generating Station / Sempra Energy Resources	096210.0030

TEST DESCRIPTION	TEST EQUIPMENT
Ambient Noise Survey	CEL-393 s/n 600028B

DATE	PRE-CAL	POST-CAL	WEATHER CONDITIONS	WIND
3/14/00	113.0	113.0	CLEAR, 55°F (approx)	0 MPH

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
1		—					

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB

LOCATION DESCRIPTION :

AUDIBLE SOURCES :

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
2		1:50A	6 MIN	32.1	26.0	27.5	36.0

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
44.6	43.8	37.9	27.9	23.9	28.2	20.3	16.4	19.7	51.0

LOCATION DESCRIPTION :

AUDIBLE SOURCES: INSECTS - DISTANT
DOG - DISTANT

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
3		1:35A	5 MIN	37.9	36.5	37.5	39.0

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
54.6	54.2	50.4	42.8	32.8	25.8	21.9	18.6	17.5	60.4

LOCATION DESCRIPTION :

AUDIBLE SOURCES : T-LINE (RATTLE)
PALO VERDE NUKE (FAINT - CLG TWRS ?)

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
4		—					

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB

LOCATION DESCRIPTION :

AUDIBLE SOURCES :

SIGNATURE	COMPANY	DATE
WBJensen	B&V	3/14/00

DATASHT4.VSD : 991111

BLACK & VEATCH

SOUND LEVEL MEASUREMENTS

PAGE 1

PROJECT NAME / CLIENT	B&V PROJECT NUMBER
Mesquite Generating Station / Sempra Energy Resources	096210.0030

TEST DESCRIPTION	TEST EQUIPMENT
Ambient Noise Survey	CEL-393 s/n 600028B

DATE	PRE-CAL	POST-CAL	WEATHER CONDITIONS	WIND
3/14/00	113.0	113.1	CLEAR SKIES, 75°F	< 3 MPH

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
1		11:43A	5 MIN	29.1	24.0	26.0	32.5

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
42.6	39.4	36.9	29.3	25.3	21.4	17.9	16.3	14.8	56.4

LOCATION DESCRIPTION:

AUDIBLE SOURCES: INSECTS - FAINT
DISTANT AIRCRAFT

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
2		11:25A	5 MIN	34.3	29.5	32.5	38.0

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
47.1	47.4	40.5	30.9	24.9	20.6	19.1	16.9	15.1	55.4

LOCATION DESCRIPTION:

AUDIBLE SOURCES: DISTANT AIRCRAFT
DISTANT BIRDS

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
3		11:15A	6 MIN	30.3	28.5	29.5	31.0

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
49.6	43.9	38.1	31.1	24.9	20.9	20.4	17.8	15.4	58.2

LOCATION DESCRIPTION:

AUDIBLE SOURCES: INSECTS - FAINT
PALO VERDE NUKE - FAINT

NML	DATE	TIME	DURATION	Leq (dBA)	L90 (dBA)	L50 (dBA)	L10 (dBA)
4		12:25P	5 MIN	37.4	35.5	37.0	39.0

31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	TOTAL, dB
45.4	49.9	48.4	42.3	32.0	27.6	22.3	18.9	15.3	57.8

LOCATION DESCRIPTION:

AUDIBLE SOURCES: DISTANT AIRCRAFT
INSECTS-FAINT
DISTANT WELL DRILLING

SIGNATURE	COMPANY	DATE
[signature]	B&V	3/14/00

DATASHT4.VSD : 991111

Exhibit J
Special Factors

As stated in Arizona Corporation Commission Rules of Practice and Procedure R14-3-219:

"Describe any special factors not previously covered herein, which applicant believes to be relevant to an informed decision on its application."

The following Special Factors exhibits are provided:

J-1 Traffic Study
J-2 Cultural Resources Survey
J-3 Public Involvement Program

Mesquite Power, LLC has caused to be prepared a comprehensive traffic study and cultural resources survey. Both, the study and the survey, indicate insignificant impacts on local traffic and local cultural resources, respectively. Attachment J-3 outlines the extensive public involvement activities undertaken by Mesquite Power, LLC.

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Mesquite Generating Station
Traffic Study
Maricopa County, Arizona

Prepared for: Mesquite Power LLC

March 27, 2000

Black & Veatch and
Engineering Design Source, Inc.

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INTRODUCTION AND SUMMARY

The purpose of this study is to review the existing conditions and evaluate the impact of traffic generated by the construction and operation of the proposed power plant, Mesquite Generating Station, on the adjacent roadway system. Existing traffic counts and new trips associated with the plant are included in this report. An evaluation of the sight distance requirements at the proposed site entrance was also performed. The traffic study was based on the morning and evening, commuter peak hour periods for a typical weekday and continuous 24-hour traffic volumes. The analysis included the following situations: Existing Traffic Condition, Peak Construction Traffic Condition (projected background traffic plus construction traffic, year 2002), and Normal Plant Operational Traffic Condition (projected background traffic plus operational traffic, year 2003). It is anticipated that there could be a maximum of 250 to 300 construction workers at the site during the peak construction period. The permanent work force at the plant once it goes on-line is expected to be 30 people.

The proposed Mesquite Generating Station will be located on the south side of Elliot Road approximately 1 mile east of the Wintersburg Road (383rd Avenue) and Elliot Road intersection in western Maricopa County, Arizona. The town of Wintersburg is located about 3 miles north of the plant, at the Wintersburg Road and Salome Highway intersection. The Palo Verde Nuclear Generating Station (PVNGS) is located just north of the proposed plant. A location map is provided on Figure 1.

The Mesquite Generating Station will have a capacity of 1000 MW and will be fueled by natural gas, transported to the site by pipeline. The plant property encompasses 400 acres and located just to the east of the plant will be a 500KV Substation.

The report analyzed the intersections of Elliot Road and the proposed plant entrance, Wintersburg Road and the PVNGS Main Entrance, Wintersburg Road and Salome Highway, 339th Avenue and Salome Highway, and the Wintersburg Road and I-10 ramps. A two-lane highway analysis was also performed for Elliot Road and Wintersburg Road.

The results for the existing traffic conditions were very good at all five intersections, with Level of Service A or B. Level of Service (LOS) is a measure of the delay, or congestion, one experiences while traveling to and from the facility. The existing two-lane highway analyses illustrated that the roads are handling the peak traffic adequately, with a LOS A on Elliot Road and LOS C on Wintersburg Road (between the PVNGS main entrance and Salome Highway). The peak construction traffic conditions yielded results similar to the existing condition at the five intersections and produced a LOS B and LOS D on Elliot Road and Wintersburg Road, respectively. Large platoons of vehicles are representative of LOS D, but it is still considered acceptable during peak hour conditions. The operational traffic conditions produced the same LOS as the existing conditions at all of the five intersections and along Elliot Road and Wintersburg Road.

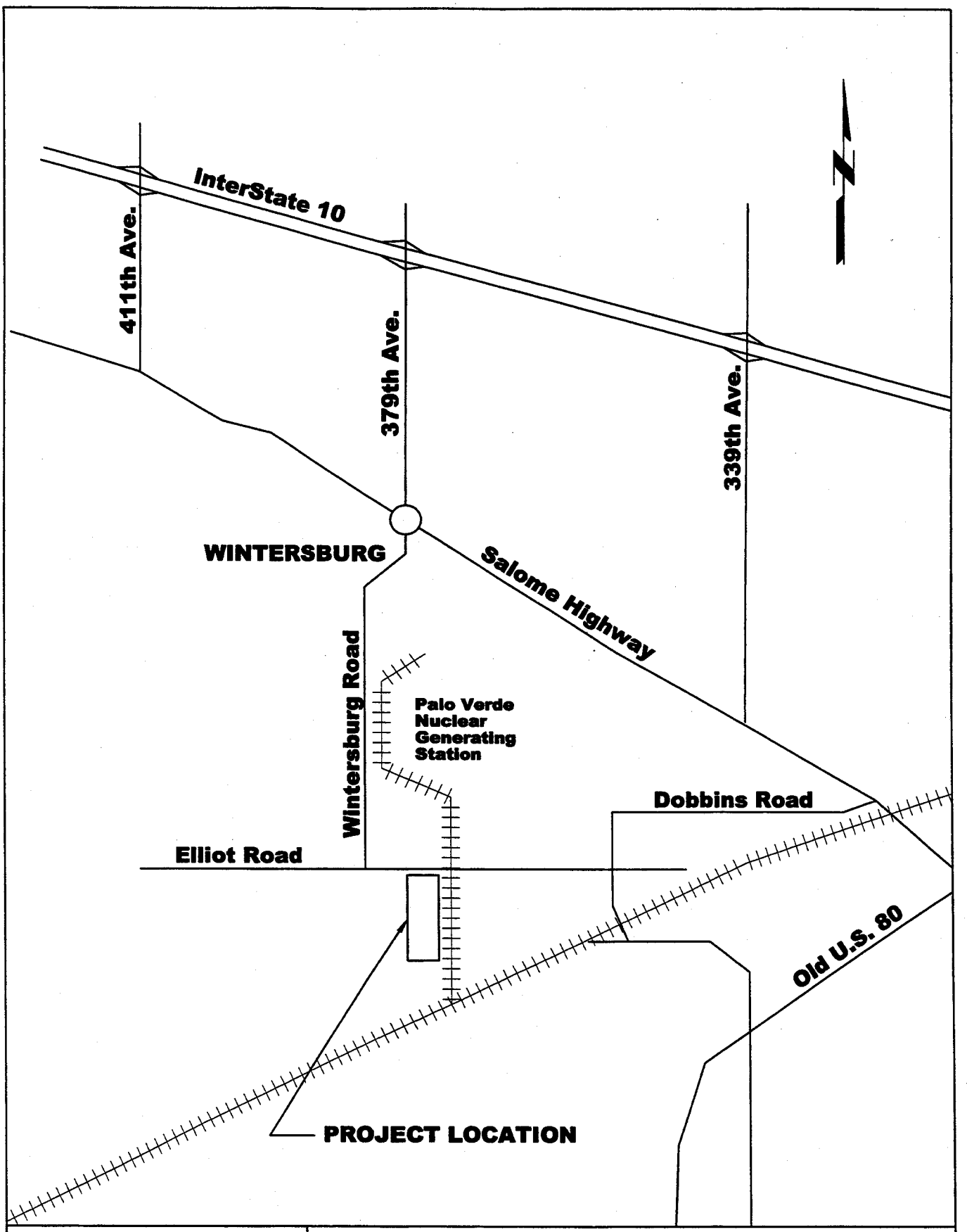

Figure 1	Mesquite Generating Station-Mesquite Power LLC
Black & Veatch	Location Map

03/23/00

View 1

traffic.dwg

A00003

Therefore, the addition of the Mesquite Generating Station site traffic will add no significant delay, and will not adversely affect the surrounding area with regard to traffic flow. Only a short-term impact during the peak construction period, approximately 4 to 6 month period, will be experienced on Wintersburg Road. There are also two other power plants going through the permitting process that would be located in the area, south of Elliot Road. One is Duke Energy, located just west of Wintersburg Road, and the other is Pinnacle West, located just southeast of the Mesquite Power property. If one or both of the other power plants are approved, there most likely would be construction activities occurring simultaneously at the three plants. Therefore, coordination would be required amongst the plant contractors, and a mitigation measure should be imposed which would alternate or stagger construction work shifts at the plants. Staggering the work shifts at half-hour increments would drastically reduce the delay and congestion on the surrounding roadways.

PROPOSED DEVELOPMENT

The proposed Mesquite Generating Station is located near the town of Wintersburg, Arizona, just south of the existing PVNGS. Specifically, it is located on the south side of Elliot Road, approximately one mile east of Wintersburg Road (383rd Avenue). The plant is situated on 400 acres of land. A site plan of the proposed plant is shown in Figure 2. The plant capacity is 1000 MW and will be fueled by natural gas. A 500KV substation, to be constructed by others, will be located just east of the plant.

The existing land use of the property acquired by Mesquite Power is zoned rural and a special use permit will be required for the power plant.

Construction is expected to begin in May of 2001, with an anticipated total construction duration of 18 months. Once commercial operation begins, a total of 30 people will be employed at the plant. There will be three, eight hour shifts per day, seven days a week.

There is only one planned entrance for the Mesquite Generating Station. The entrance road is located approximately 0.6 miles east of Wintersburg Road. It will tie into Elliot Road at a 90-degree angle and form a "T" intersection. The site entrance will be a paved roadway 24 feet in width and have a 60 feet paved turning radii at its junction with Elliot Road.

STUDY AREA CONDITIONS

Regional access to the site is good via I-10, Salome Highway, Wintersburg Road and Elliot Road. The existing nuclear power plant, located along Wintersburg Road, generates 95% of the existing traffic on these roadways in the peak morning and evening hours. Currently, there are no plans for roadway improvements in the area. Therefore, the existing roads will be used to access the site. Plant operators and the temporary construction work force will be arriving to the site from throughout the County. It is

03/23/00

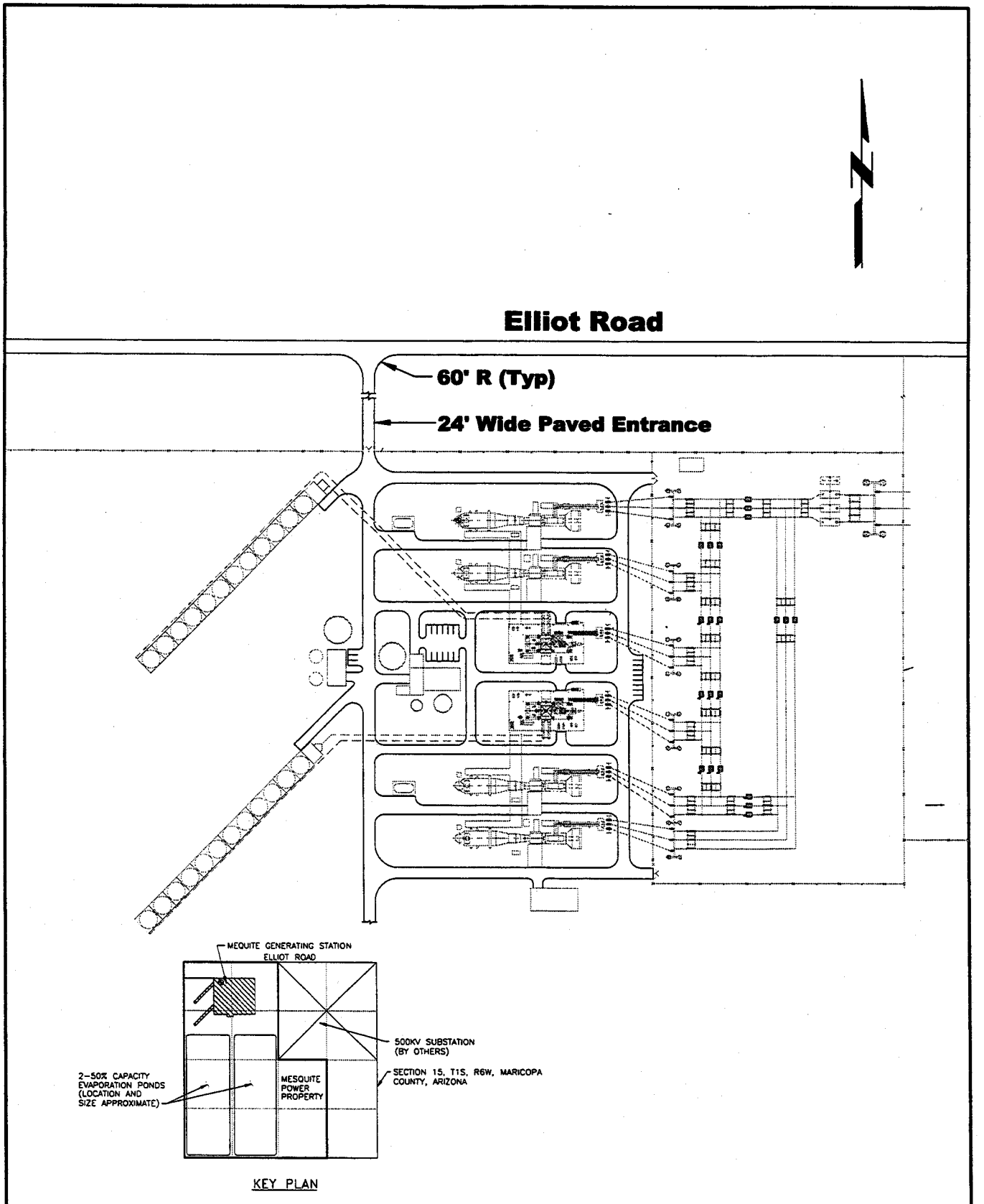

Figure 2	Mesquite Generating Station-Mesquite Power LLC
Black & Veatch	Site Plan

View 3

traffic.dwg
A00003

assumed that the existing distribution pattern, which is established mainly by the PVNGS traffic, will remain the same for this proposed site generated traffic. The main access route to the site will be I-10, then south on Wintersburg Road, and then east on Elliot Road for approximately 0.6 miles to the Mesquite Generating Station entrance. There is only one entrance for the proposed plant and on-site there is a loop road system.

The study area for this report includes the intersections of Elliot Road and the proposed plant entrance, Wintersburg Road and the PVNGS Main Entrance, Wintersburg Road and Salome Highway, 339th Avenue and Salome Highway, and the Wintersburg Road and I-10 ramps. The road segments of Elliot Road, between the proposed plant entrance road and Wintersburg Road, and Wintersburg Road between the PVNGS Main Entrance and Salome Highway, were also evaluated for possible impacts.

The existing land use within a five mile radius of the proposed site is predominately zoned rural. The PVNGS has a special use permit and there is an area zoned industrial in the southeast corner of the Wintersburg Road and Salome Highway intersection. There are two zoned areas of residential land use, totaling 120 acres, which are located along 355th Avenue at Dobbins Road and Baseline Road. The other zoned land use in this area is a one square mile section of commercial land use which is centered on the Wintersburg Road and Salome Highway intersection. There is currently a general store/gas station and an old tavern in the southwest corner of Wintersburg Road and Salome Highway.

ANALYSIS OF EXISTING CONDITIONS

The roadway characteristics and traffic control devices within the study area will be discussed in the order that they are outlined in the subsequent analyses. The roadway characteristics of the following roads are similar: Elliot Road, Wintersburg Road, Salome Highway, and 339th Avenue. All of these roads are two-lane facilities with 12 feet lanes, 2-3 feet paved shoulders and an additional 12-13 feet of graded dirt shoulders. The posted speed is 55 mph and they are on level to slightly rolling terrain. The pavement on Elliot road is in fair to good condition with several cracks needing sealing. The pavement on Wintersburg is in good condition, as is the pavement on Salome Highway and 339th Avenue. I-10 is a four-lane divided highway and has a posted speed limit of 75 mph.

The proposed intersection of the Mesquite Generating Station entrance road and Elliot Road will be a "T" intersection. The plant entrance will be a paved two-lane road that will tie into Elliot Road at a 90-degree angle with a 60 feet paved turning radii and will be stop sign controlled.

Wintersburg Road and the PVNGS Main Entrance is also a "T" intersection, with a separate free right-turn lane for traffic exiting the plant. The PVNGS entrance road is a two-lane road with 12 feet lanes and 1 foot paved shoulders and is stop sign controlled. The free right-turn is separated from the two-lane entrance by a dirt island and it is controlled with a yield sign.

Wintersburg Road and Salome Highway is a semi-actuated signalized intersection. Wintersburg has the default green with loop sensors located on Salome Highway. The Wintersburg Road northbound approach has a 100 foot exclusive left-turn lane, one through lane and a free right-turn lane (yield sign). Wintersburg Road southbound approach has one through lane and a 60 foot right-turn lane. The Salome Highway westbound approach has a 150 foot left-turn lane and one through lane. The eastbound approach on Salome Highway has a 100 foot left-turn lane, one through lane and a 80 foot right-turn lane. The exclusive turn lanes on Salome Highway are all 11 feet in width. All other lane widths at the intersection are 12 feet.

The 339th and Salome Highway is a "T" intersection with stop sign control on 339th Avenue. There is actually a small dirt road to the south which creates a 4th leg, but only one vehicle was witnessed using this during the morning and evening peak hour turning movement counts. There are no exclusive turn lanes at this intersection. 339th Avenue and Salome Highway at this intersection are the typical two-lane road sections of 12 feet lanes, 2-3 feet paved shoulders and 12-13 graded dirt shoulders.

Wintersburg Road and the I-10 westbound exit and eastbound entrance ramp intersections were evaluated during the morning and afternoon peak hours, respectively. The westbound exit ramp intersection is on the north side of the Wintersburg Road bridge over I-10 and is a fully actuated signalized intersection. Again, due to the large volumes of traffic accessing the existing PVNGS, the exit ramp has the default green during the morning peak hours. Wintersburg Road is a two-lane road with 12 feet lanes and 2-3 feet paved shoulders. The I-10 westbound exit ramp is approximately 0.5 miles in length and there is a 300 foot long left-turn lane at the intersection. The exclusive left-turn lane is 12 feet wide. The standard ramp width is approximately 15 feet and it has 6 feet wide outside and 2 feet wide inside paved shoulders. The grades on the ramps are fairly flat and there is an approximate 3.5% downgrade on the northbound Wintersburg Road approach.

On the south side of the Wintersburg Road bridge over I-10 is the eastbound exit/entrance intersection. The exit ramp is stop sign controlled. There are no exclusive turn lanes at this intersection. Wintersburg Road is a two-lane road with 12 feet lanes and 2-3 feet paved shoulders. The I-10 ramps are approximate 0.5 miles in length and they are striped as a 15 feet wide lane and 6 feet wide outside and 2-3 feet wide inside paved shoulders. Again, the grades on these ramps are fairly flat and there is an approximate 3.5% downgrade on the southbound Wintersburg Road approach (due to the bridge over I-10).

The remaining portion of this section will discuss the existing traffic volumes and the existing level of service analyses. Field traffic data was collect by Traffic Research & Analysis, Inc. (TRA) of Phoenix, Arizona, and Black & Veatch. Manual traffic counts were conducted at the study area intersections from 6:00 a.m. to 9:00 a.m. and from 3:30 p.m. to 6:00 p.m. on Tuesday, February 29 and Wednesday, March 1, 2000. The counts included through movements and turning volumes. Field observations indicated that the peak traffic conditions occurred during the hours of 6:00 to 7:00 a.m. and 5:00 to 6:00 p.m. at all of the intersections. This correlates well with the work shifts of the major

traffic generator in the area, PVNGS. They work a 4 day/10 hours a day schedule and their normal (majority of personnel) shift is 7:00 a.m. to 5:30 p.m., Tuesday through Friday. Continuous, 24-hour machine counts were also collected along Elliot Road, Wintersburg Road south of I-10 interchange and the I-10 westbound exit ramp at Wintersburg Road. A summary of the field traffic counts are included in the appendix.

Existing conditions, as well as construction traffic and operational traffic conditions, were analyzed using study procedures outlined in the Highway Capacity Manual, by the Transportation Research Board and published in 1994. This manual, which is used universally by highway and traffic engineers to measure roadway capacity, establishes six levels of service (LOS), ranging from "Most Desirable" (LOS A) to "Fully Loaded" (LOS F). Tabular results of the capacity analyses used to derive the LOS for the intersections and roadway segments were prepared using the Highway Capacity Software (HCS), University of Florida 1997, and are included in the appendix.

Levels of traffic service are measures of traffic flow, which consider such factors as speed and delay time, traffic interruptions, safety, driving comfort, and convenience. LOS C, which is normally used for highway design, represents a roadway with volumes ranging from 70% to 80% of its capacity. However, LOS D is considered acceptable for peak period conditions.

Location 1 – Elliot Road at the Proposed Plant Entrance

Since the proposed power plant entrance does not exist during the current year (2000) analysis, a section of Elliot Road to the west of the proposed entrance was analyzed as a two-lane highway section. This will provide us with an estimate of the current levels of traffic flow and congestion. The HCS Two-Lane Highways program utilizes information such as volumes, grade, no-passing zones, directional distribution, and lane width to determine the degree of ease with which traffic flows.

During the A.M. Peak Hour, a total of 23 vehicles traveled on this section of Elliot Road, with 3 moving eastbound and 20 driving westbound. The resulting Level of Service determined by HCS was Level A, which indicates free-flowing (optimal) conditions.

During the P.M. Peak Hour, 20 vehicles were counted at this location, 3 traveling westbound and 17 traveling eastbound. Again, the HCS Level of Service was found to be Level A. Specific delay times are not provided by the Two-Lane Highways program, but it may be assumed that the delay in both directions is minimal based on the excellent Levels of Service.

Location 2 – Wintersburg Road and PVNGS Main Entrance

Northwest of the proposed power plant site is the intersection of Wintersburg Road and the PVNGS entrance. This is a three-leg, unsignalized intersection. The speed limit on

Wintersburg Road is currently 55 mph and continues north to an intersection with Salome Highway, and further north to an interchange at I-10.

This intersection was analyzed using the HCS Unsignalized Intersections program during both the A.M. and P.M. Peak Hours. For the current year (2000), the following Peak Hour volumes were used: (Note: abbreviations in the following tables are represented by – NB, SB, WB and EB represent northbound, southbound, westbound and eastbound, respectively; LT, TH and RT represent left turns, through movements, and right turns, respectively.)

	WINTERSBURG RD.				PVNGS ENTR	
YEAR 2000	NB TH	NB RT	SB LT	SB TH	WB LT	WB RT
A.M.	5	38	571	4	0	23
P.M.	2	0	36	4	7	489

The westbound leg of the intersection includes a channelized right-turn lane with a "Yield" sign. This, in theory, separates the right-turn vehicles from the intersection, and these vehicles are not required to be included in the intersection analysis. To simulate a worst-case scenario, 100% of these right turns have been included in the analysis.

The following results were obtained using the A.M. Peak Hour data:

YEAR 2000	DELAY (sec / vehicle)	LEVEL OF SERVICE
WB RT	2.7	A
SB LT	3.7	A
OVERALL	3.3	

Since the northbound and southbound through movements have no stop control, there is effectively no delay to these movements, except through movements which share a lane with turning movements and they will experience some delay. For this reason, HCS does not show a delay or Level of Service for these movements, and it may be assumed that no delay exists. There is no delay shown for the eastbound left due to the fact that no cars were seen during the A.M. Peak Hour count, thus no volume was entered. Highway Capacity Software does not provide an overall Level of Service with the Unsignalized Intersections program.

The following results were obtained using the P.M. Peak Hour data:

YEAR 2000	DELAY (sec / vehicle)	LEVEL OF SERVICE
WB LT AND RT	4.5	A
SB LT	2.2	A
OVERALL	4.0	

The HCS Unsignalized Intersections program provides an overall Level of Service for the westbound movement rather than for each turning movement independently. It is apparent from this output that delays in all directions are minimal during the P.M. Peak Hour as well.

Since Wintersburg Road will be handling nearly all of the construction and operational traffic in the future, a section of this road between the PVNGS entrance and Salome Highway was analyzed using the HCS Two-Lane Highways program. The current year volumes were determined from average volumes going north from Palo Verde and traveling south from Salome Highway.

During the A.M. Peak Hour, 620 southbound vehicles and 33 northbound vehicles travel this section of road on a typical day. This resulted in a Level of Service of C. While this is lower than results of other analyses performed thus far, this is still an acceptable level of service for peak hour traffic. The majority of traffic during the A.M. Peak Hour is traveling southbound past Salome Highway toward Palo Verde, but since this is a two-lane road, these southbound vehicles must slow down when they are behind a vehicle that is turning left. This would increase the delay somewhat to the southbound vehicles.

The situation is nearly reversed during the P.M. Peak Hour, with 532 vehicles traveling northbound and 38 traveling southbound. Again, the HCS Level of Service for these conditions was Level C. The northbound vehicles may be experiencing some delay as they approach the traffic signal at Salome Highway, since they may get backed up slightly when the light is red.

Location 3 – Wintersburg Road at Salome Highway

The intersection of Wintersburg Road and Salome Highway is a four-leg, signalized intersection, with the majority of traffic traveling on Wintersburg Road. Traffic volumes are fairly light on Salome Highway.

The following Peak Hour volumes were used in conjunction with the HCS Signalized Intersections program:

	SALOME HWY						WINTERSBURG RD					
YEAR 2000	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
A.M.	1	10	28	119	4	9	1	27	9	1	519	1
P.M.	1	12	5	8	14	2	23	434	115	10	22	7

Results of the A.M. and P.M. Peak Hour analyses were as follows:

YEAR 2000	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
EB LT	12.0	B	12.0	B
EB TH	12.1	B	12.1	B
EB RT	12.1	B	12.0	B
WB LT	13.3	B	12.1	B
WB TH & RT	12.1	B	12.1	B
NB LT	2.9	A	2.9	A
NB TH & RT	2.9	A	4.4	A
SB LT & TH	4.5	A	3.0	A
SB RT	2.9	A	2.9	A
OVERALL	6.3	B	4.8	A

As shown in the above table, there is not much difference in the A.M. and P.M. Peak Hour results. The overall delays are less than two seconds apart, and no individual movement experiences a delay of more than 13.3 seconds. Some of the movements are combined by HCS (such as the westbound through and right turn) because they share traffic lanes, and the delay applies to the entire lane rather than to each individual directional movement.

Location 4 – 339th Avenue and Salome Highway

The intersection of 339th Avenue and Salome Highway is an unsignalized, four-leg intersection. Stop signs for the southbound traffic on 339th Avenue and the adjacent northbound dirt road provide access control. Salome Highway has a speed limit of 55 mph in this area, and the terrain is relatively flat.

The following A.M. and P.M. Peak Hour volumes were used in the HCS analysis:

	SALOME HWY				339th AVE		
YEAR 2000	EB LT	EB TH	WB TH	WB RT	NB LT	SB LT	SB RT
A.M.	5	24	125	4	1	7	23
P.M.	16	144	30	16	0	6	6

The HCS Unsignalized Intersections program was used in this analysis, and produced the following results for the A.M. Peak Hour:

YEAR 2000	DELAY (sec / vehicle)	LEVEL OF SERVICE
SB LT & RT	3.7	A
EB LT	2.2	A
NB LT	4.4	A
OVERALL	0.6	

As seen in the analysis of the intersection of Wintersburg Road and the PVNGS entrance, movements which do not have conflicting movements - such as the through movements on both Wintersburg Road and Salome Highway in this case, are considered to have no delay and are not listed in the HCS output. When these movements are taken into account, their effective delay of zero brings the average delay time down considerably. This explains why the overall delay is less than the individual movement delay times shown in the above table.

The HCS Unsignalized Intersections program was used in this analysis, and produced the following results for the P.M. Peak Hour:

YEAR 2000	DELAY (sec / vehicle)	LEVEL OF SERVICE
SB LT & RT	3.7	A
EB LT	2.2	A
OVERALL	0.4	

In both cases, the Peak Hour volumes are very low, resulting in minor delays. Again, movements that run unopposed are not assigned delays, as it is presumed that their movement delay is zero, resulting in a low average delay of 0.4 seconds per vehicle.

Location 5 – Wintersburg Road at I-10 ramps

Wintersburg Road at I-10 is the only interchange in this analysis, and is a standard diamond interchange. There are two intersections at the interchange ramps, the northern of which is signalized. The southern intersection is controlled by a stop sign.

The northern, signalized intersection was reviewed during the A.M. Peak Hour, as this is the time when most drivers are exiting westbound I-10 and turning left onto southbound Wintersburg Road. During the P.M. Peak Hour, the southern, unsignalized intersection was analyzed due to increased traffic volumes running from northbound Wintersburg Road to eastbound I-10.

The following volumes were used for the A.M. Peak Hour:

	WINTERSBURG RD				I-10 WB EXIT	
YEAR 2000	NB LT	NB TH	SB TH	SB RT	WB LT	WB RT
VOL	1	6	32	1	464	11

This intersection was analyzed using the HCS Signalized Intersections program. The following results were obtained:

YEAR 2000	DELAY (sec / vehicle)	LEVEL OF SERVICE
WB LT	8.4	B
WB RT	5.4	B
NB LT	8.2	B
SB TH	8.3	B
OVERALL	8.3	B

The overall delay is slightly higher than the projected delay at other intersections in this analysis, but a level B is still indicative of smooth traffic flow and is considered very good for rush-hour conditions.

The following volumes were utilized during the P.M. Peak Hour analysis:

	WINTERSBURG RD				I-10 EB EXIT	
YEAR 2000	NB TH	NB RT	SB LT	SB TH	EB LT	EB RT
VOL	26	377	12	34	0	3

Using the HCS Unsignalized Intersections program, the following results were obtained using these volumes:

YEAR 2000	DELAY (sec / vehicle)	LEVEL OF SERVICE
EB RT	2.7	A
SB LT	3.4	A
OVERALL	0.1	

The two turning movements experience minimal delays. No delay is given for the eastbound left, as there was no volume during the P.M. Peak Hour count. The overall delay is low due to averaging in zero delay for the unopposed movements.

PROJECTED TRAFFIC

This report analyzes two conditions of site generated traffic, peak construction traffic and normal operations traffic. Typically, studies are just performed for the development after construction is completed and depict the work force who will be employed at the site on a permanent basis. But, due to the size of these plants and the number of construction workers it takes to a build a power facility, an analysis for the period of peak construction is usually warranted.

Construction is expected to begin in May of 2001 and continue for 18 months. On projects of similar size and scope, a few months around the twelfth month of construction produce the peak number of construction workers at the site. Therefore, the background traffic (non-site) was projected to the year of 2002 and then the peak construction work force was added to it and analyzed for potential impacts during construction. Again, based on similar projects it is anticipated that the number of construction workers will be approximately 250 to 300. For the analysis of the peak construction condition, a total of 300 construction workers was used. To provide the most conservative estimate of impacts, it is assumed that all of the workers will arrive and depart the project site at the same time as the peak hour of the adjacent roadways, 6:00 to 7:00 a.m. and 5:00 to 6:00 p.m., respectively. Also, it was assumed that carpooling would not occur and one vehicular trip was assigned to each worker for both the morning and evening peak hours. Therefore, 300 vehicles will enter the site in the morning peak hour and 300 vehicles will exit the site in the evening peak hour.

The second condition to be analyzed is the potential impact due to the daily work force at the power plant once it goes on-line. The Mesquite Generating Station will be continually operated over three 8-hour shifts during the workweek, as well as the weekend. There will be a total of 30 employees at the plant, based on trends of current plants of similar capacity. To account for shift changes, it was assumed that there will be 10 vehicles entering and exiting the site during both the morning and evening peak hours. Construction is expected to be completed in the fall of 2002. Thus, the first full year of commercial operations is anticipated to be in the year 2003. Therefore, the background traffic (non-site) was projected to the year of 2003 and then the operations work force was added to it and analyzed for potential impacts during operations.

Regional access to the site is good via I-10, Salome Highway, Wintersburg Road and Elliot Road. The existing nuclear power plant along Wintersburg Road generates 95% of the existing traffic on these roadways in the peak morning and evening hours. Plant operators and the temporary construction work force will be arriving to the site from throughout the County. It is assumed that the existing distribution pattern, driven mainly by the PVNGS, will remain the same for this proposed site generated traffic. Figure 3 illustrates the anticipated distribution of traffic accessing the site during the morning peak hour. For the distribution of traffic leaving the plant site, just reverse the directions shown in Figure 3. The main access route to the site will be I-10, then south on Wintersburg Road, and then east on Elliot Road for approximately 0.6 miles to the Mesquite Generating Station entrance.

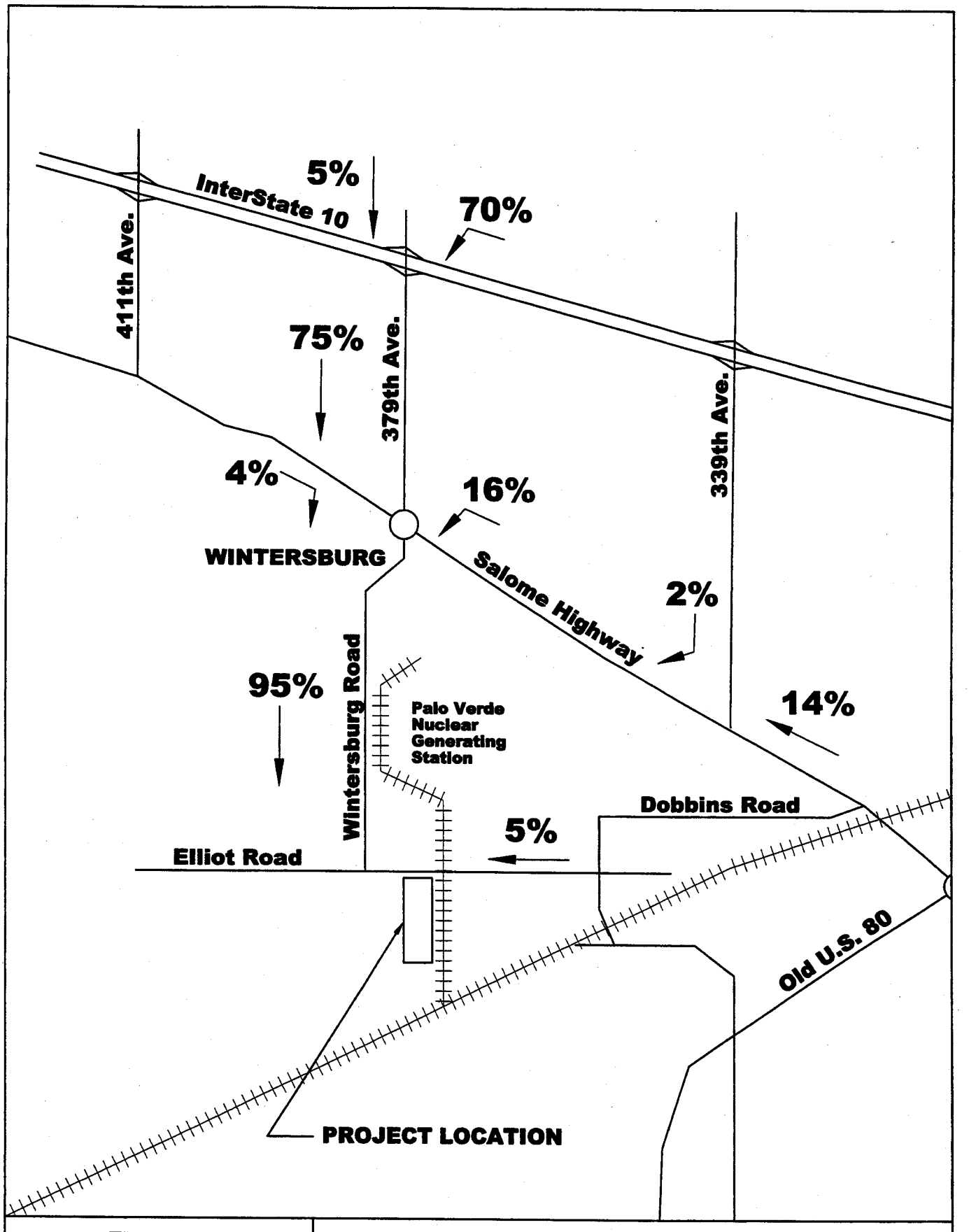

Figure 3	Mesquite Generating Station-Mesquite Power LLC
Black & Veatch	Distribution of Traffic

03/23/00

View 2

traffic.dwg
A00003

Background traffic (no-site traffic) was projected to the years of 2002 and 2003, for the analysis of the peak construction condition and normal operations condition, respectively. The Staffing Department at the PVNGS stated that there is no planned increase in the number of workers at the plant for the next five years. The Maricopa Association of Governments latest population projections in the surrounding area, Regional Analysis Zone 346, yield an eight percent increase from 2,560 in the year 2000 to 3,825 in the year 2005. Since the nuclear power plant generates 95% of the traffic in the peak hours, conservatively we used a one percent annual growth rate to project background traffic for this analysis (this more than accounts for the projected population increase in the area).

The following section describes the traffic volumes (non-site and site generated) used in the analyses. The appendix also includes a summary of existing traffic volumes and tabular results of the HCS analysis for each of the conditions evaluated in this study.

TRAFFIC AND IMPROVEMENT ANALYSIS

Since this report analyzes two conditions of site generated traffic, the following analyses will be divided into two sections, peak construction traffic and normal operations traffic. As discussed previously, the main access route to the Mesquite Generating Station will be via I-10 from the east, then south on Wintersburg Road and then east on Elliot Road for approximately 0.6 miles to the plant entrance. Reference Figure 3 for the distribution of traffic to and from the site.

Peak Construction Traffic Condition (Year 2002)

By the year 2002, construction will be well underway at the Mesquite Generating Station. It has been estimated that 300 vehicles per day will enter and exit the site during the peak construction period. The peak period will last approximately four to six months. These additional vehicles, along with an anticipated one percent per year growth rate for background traffic, have been incorporated into the existing volumes to approximate traffic during the peak construction phase in the year 2002.

Location 1 – Elliot Road at the Proposed Plant Entrance

The proposed entrance will have one lane in and one lane out of the facility. It is assumed that all 300 construction-related vehicles will arrive during the A.M. Peak Hour and depart during the P.M. Peak Hour of the adjacent roadway network. These vehicles have been distributed among the various routes leading to and from the facility in a manner coinciding with current traffic patterns. It is expected that 95% of traffic traveling to the facility will use Wintersburg Road, while the remaining 5% will come from the east on Elliot Road.

The following volumes were used with the Highway Capacity Software Unsignalized Intersections program to analyze the effect of construction traffic on the existing conditions:

	ELLIOT RD				MESQUITE ENTR	
YEAR 2002	EB TH	EB RT	WB LT	WB TH	NB LT	NB RT
A.M.	4	285	15	21	0	0
P.M.	21	2	2	4	285	15

The results from the HCS Unsignalized Intersection analysis were as follows:

YEAR 2002	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
NB LT & RT	--		5.3	B
WB LT	2.9	A	2.2	A
OVERALL	0.1		4.8	

During both the A.M. and P.M. Peak Hours, the delay per vehicle is still very low. This is due primarily to the fact that the bulk of traffic in the morning is making an unopposed right turn, and in the afternoon there is little opposing traffic to slow down these cars as they make a left turn out of the facility. There is no delay shown for the northbound movements during the A.M. Peak Hour due to the fact that no cars are anticipated to be making these movements.

This entrance should function with no difficulty during construction. To evaluate the effect of the additional traffic on Elliot Road west of the facility, the HCS Two-Lane Highways program was again run using the year 2002 volumes. Analysis was completed using an anticipated 21 westbound vehicles and 289 eastbound vehicles during the A.M. Peak Hour, for a total of 310. The P.M. Peak Hour will have approximately 289 westbound and 23 eastbound vehicles, totaling 312.

In both cases, HCS produced a Level of Service of B, which indicates good driving conditions with very little delay.

Location 2 – Wintersburg Road and PVNGS Main Entrance

The majority of the anticipated construction traffic will travel south from I-10 and Salome Highway past the PVNGS main entrance to get to Elliot Road. An additional 285 vehicles are expected to travel south on Wintersburg Road to get to the new facility. This site generated, in additional to the standard growth rate for background traffic, results in the following A.M. and P.M. Peak Hour volumes:

	WINTERSBURG RD				PVNGS ENTR	
YEAR 2002	NB TH	NB RT	SB LT	SB TH	WB LT	WB RT
A.M.	6	39	582	290	0	24
P.M.	288	1	37	5	8	499

The results from the HCS Unsignalized Intersection analysis were as follows:

YEAR 2002	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
WB LT	--		9.2	B
WB RT	2.7	A	9.2	B
SB LT	3.8	A	3.0	A
OVERALL	2.4		5.5	

The delays are up slightly from the year 2000 condition for both the A.M. and P.M. Peak Hours, but are still extremely good, particularly for rush hour conditions. The delays are still quite low due to the fact that in both the A.M. and P.M., the heaviest movements have very little traffic opposing them. This allows even heavy movements which are stop-controlled to progress quickly through the intersection.

The impact of the increased traffic volumes during the peak construction period will be the most noticeable on the section of Wintersburg Road between the PVNGS main entrance and Salome Highway. The addition of nearly 300 vehicles to an area that was previously at a Level of Service of C may temporarily create some congestion, until construction is completed.

During the A.M. Peak Hour, 919 southbound and 35 northbound vehicles utilize this section of Wintersburg Road. The resulting Level of Service using the Two-Lane Highways program was a Level D. This indicates a somewhat congested situation which results in larger platoons of vehicles, but is still considered acceptable during peak hour conditions.

The P.M. Peak Hour volumes used were 41 southbound and 829 northbound vehicles, also produced a Level of Service of D. In reviewing the output from HCS, it is apparent that the flow rate was not far from being a Level C, indicating that the level of congestion will not be very heavy. Again, this is only a temporary condition during the peak construction period and this LOS is still considered acceptable during peak hours.

Location 3 – Wintersburg Road at Salome Highway

As previously stated, 95% of construction traffic (approximately 285 vehicles) will utilize Wintersburg Road to get to the facility. It is expected that 75% of the original 300 vehicles will approach this intersection from the north, 4% from the west, and 16% from the east. This will result in the following traffic volumes:

	SALOME HWY						WINTERSBURG RD					
YEAR 2002	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
A.M.	2	11	41	169	5	10	2	28	10	1	755	1
P.M.	2	13	6	9	15	3	36	668	166	11	23	8

Using the HCS Signalized Intersections program, the following delays and Levels of Service were determined:

YEAR 2002	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
EB LT	12.0	B	12.0	B
EB TH	12.1	B	12.1	B
EB RT	12.2	B	12.0	B
WB LT	14.2	B	12.1	B
WB TH & RT	12.1	B	12.1	B
NB LT	2.9	A	3.0	A
NB TH & RT	2.9	A	7.1	B
SB LT & TH	7.0	B	3.0	A
SB RT	2.9	A	2.9	A
OVERALL	8.3	B	6.0	A

Again, there is very little difference in the delays and Levels of Service, even with the additional vehicles. Many movements will experience no discernable change. The overall Levels of Service dropped slightly, from 6.3 to 8.3 seconds per vehicle in the A.M. Peak Hour and 4.8 to 6.0 seconds per vehicle during the P.M. Peak Hour.

Location 4 – 339th Avenue and Salome Highway

Due to the assumption that 16% of construction traffic will be approaching Wintersburg Road from the east, this traffic will have some impact on the intersection of 339th and Salome Highway, particularly the westbound through movement during the A.M. Peak Hour and the eastbound through during the P.M. Peak Hour.

	SALOME HWY				339th AVE		
YEAR 2002	EB LT	EB TH	WB TH	WB RT	NB LT	SB LT	SB RT
A.M.	6	25	170	5	2	8	30
P.M.	23	189	31	17	0	7	7

Using these volumes with the HCS Unsignalized Intersections program, the following results were obtained:

YEAR 2002	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
SB LT & RT	3.6	A	3.8	A
EB LT	2.6	A	2.3	A
NB LT	4.7	A	3.8	A
OVERALL	0.7		0.4	

The overall delays are within one-tenth of a second of the year 2000 delays, and are still extremely low. The primary reason for this is the fact that most additional traffic at this intersection is traveling westbound and eastbound, which means it does not have to stop or yield to other traffic movements.

Location 5 – Wintersburg Road at I-10 ramps

Based on the assumed distribution pattern, the I-10 westbound exit ramp will handle 70% of the site generated traffic and Wintersburg Road, north of I-10, contributes 5% of the site traffic. The following volumes were used for the A.M. Peak Hour:

	WINTERSBURG RD				I-10 WB EXIT	
YEAR 2002	NB LT	NB TH	SB TH	SB RT	WB LT	WB RT
VOL	2	7	48	2	684	12

This intersection was analyzed using the HCS Signalized Intersections program. The following results were obtained:

YEAR 2002	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE
WB LT	9.3	B
WB RT	3.9	A
NB LT	10.3	B
SB TH	10.6	B
OVERALL	9.3	B

Between the years 2000 and 2002, the overall delay increased by only one second per vehicle. The vast majority of vehicles are turning left from I-10 to go south on Wintersburg Road, and the signal allows them to get through in a very timely manner.

The following volumes were utilized during the P.M. Peak Hour analysis for the I-10 eastbound exit/entrance ramp intersection and Wintersburg Road:

	WINTERSBURG RD				I-10 EB EXIT	
YEAR 2002	NB TH	NB RT	SB LT	SB TH	EB LT	EB RT
VOL	42	595	13	35	0	4

Using the HCS Unsignalized Intersections program, the following results were obtained using these volumes:

YEAR 2002	DELAY (sec / vehicle)	LEVEL OF SERVICE
EB RT	2.7	A
SB LT	4.3	A
OVERALL	0.1	

The delay to the southbound left-turn movement increased by less than one second per vehicle, and the overall delay remained the same. In contrast to the A.M. Peak Hour, the majority of vehicles are traveling north on Wintersburg Road and turning right onto I-10. This right turn movement does not experience a significant delay, as these vehicles may turn without being expected to stop or yield.

Overall, the construction traffic will have very little impact on the study area intersections as compared to the existing conditions in the year 2000 analysis. There were no Levels of Service below a Level B. This is considered very good, particularly during peak hour conditions. The only impact was a reduction from LOS C to LOS D in the two-lane highway analysis on Wintersburg Road. This is a temporary condition during the peak construction period, and is still considered acceptable during the peak hour.

Operational Traffic Condition (Year 2003)

Once construction on the Mesquite Generating Station has been completed, the amount of site generated traffic in the area will decrease considerably. Instead of including an additional 300 vehicles per day, operation of the facility will require a total of only 30 employees. These employees will be divided into three eight-hour shifts, seven days a week.

To simulate the worst-case scenario, it was assumed that the shift changes will coincide with the A.M. and P.M Peak Hours already in use in this study, 6:00 to 7:00 a.m. and 5:00 to 6:00 p.m. Additionally, the volumes due to operational traffic will not only include 10 vehicles coming into the facility during the A.M. Peak Hour, but also 10 vehicles leaving the facility at this time as well. The same will be assumed for the P.M. Peak Hour.

Background traffic volumes were again increased by one percent per year to simulate normal growth in the area.

Location 1 – Elliot Road at the Proposed Plant Entrance

This intersection experiences a significant change in vehicle volumes when the change from construction to operational traffic takes place. The following volumes were used in this part of the analysis:

	ELLIOT RD				MESQUITE ENTR	
YEAR 2003	EB TH	EB RT	WB LT	WB TH	NB LT	NB RT
A.M.	4	9	1	22	9	1
P.M.	22	12	4	5	9	1

The results from the HCS Unsignalized Intersection analysis were as follows:

YEAR 2003	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
NB LT & RT	3.5	A	3.5	A
WB LT	2.1	A	2.2	A
OVERALL	0.8		0.8	

Traffic during the operation of the facility is minimal, resulting in minimal delays in all directions.

In order to evaluate how this area compares to the existing year 2000 condition, the HCS Two-Lane Highways program was run using the 2003 A.M. and P.M. Peak Hour data. In all cases, an overall Level of Service of A was the result. This indicates that traffic is flowing at an optimum level, and that the addition of the power plant will not impair the ability of drivers to move freely through this area.

Location 2 – Wintersburg Road and PVNGS Main Entrance

Most of the operational traffic will come from the north on Wintersburg Road past the Palo Verde facility. However, since the additional volume is small, it should not have a significant impact on traffic flow in and out of the facility.

The following volumes were used for the A.M. and P.M. Peak Hours:

	WINTERSBURG RD				PVNGS ENTR	
YEAR 2003	NB TH	NB RT	SB LT	SB TH	WB LT	WB RT
A.M.	15	39	589	14	0	24
P.M.	12	1	37	14	8	504

The results from the HCS Unsignalized Intersection analysis were as follows:

YEAR 2003	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
WB LT	--		4.7	A
WB RT	2.8	A	4.7	A
SB LT	3.9	A	2.2	A
OVERALL	3.3		4.2	

Overall delays during the years 2000, 2002, and 2003 are summarized below:

YEAR	A.M. DELAY (sec / vehicle)	P.M. DELAY (sec / vehicle)
2000	**3.3**	**4.0**
2002	**2.4**	**5.5**
2003	**3.3**	**4.2**

In evaluating the 'before' and 'after' conditions of this area, it should be noted that the year 2000 and year 2003 delays are extremely similar, and very low. This indicates that overall, the new facility will not have an adverse effect on local traffic.

It should also be explained that the year 2002 A.M. delay is lower when construction volumes are included because of the increased number of vehicles at the intersection which move unopposed. By increasing the number of vehicles with essentially zero delay and no need to yield to other movements, the overall delay of the intersection is lowered. When these construction vehicles are removed in the year 2003 analysis, fewer vehicles are able to move unopposed, and the average delay increases slightly.

As a final comparison in this area, the HCS Two-Lane Highways program was again run for a section of Wintersburg Road between the PVNGS main entrance and Salome Highway. The peak hour volumes during the plant operations were very close to the year 2000 volumes, with A.M. peak hour volumes of 644 southbound and 45 northbound vehicles, and P.M. peak hour volumes of 49 southbound and 558 northbound vehicles. In both cases, a Level of Service of C was the result, which is the same result attained using the year 2000 data.

Location 3 – Wintersburg Road at Salome Highway

The majority of existing traffic at this intersection travels northbound and southbound on Wintersburg Road. This is the same route that most of the construction and operational traffic will take.

The following volumes were used for the A.M. and P.M. Peak Hours:

	SALOME HWY						WINTERSBURG RD					
YEAR 2003	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
A.M.	2	11	30	124	5	10	3	35	12	2	541	2
P.M.	2	13	7	10	15	3	25	454	120	11	30	8

Using the HCS Signalized Intersections program, the following delays and Levels of Service were found:

YEAR 2003	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
EB LT	11.6	B	11.1	B
EB TH	11.6	B	11.2	B
EB RT	11.7	B	11.1	B
WB LT	12.8	B	11.2	B
WB TH & RT	11.6	B	11.2	B
NB LT	3.2	A	3.4	A
NB TH & RT	3.2	A	5.3	B
SB LT & TH	5.1	B	3.5	A
SB RT	3.1	A	3.4	A
OVERALL	6.6	B	5.5	B

Comparing the existing, construction, and operational traffic delays, it may be seen that the impact at this intersection will be minimal:

YEAR	**A.M. DELAY (sec / vehicle)**	**P.M. DELAY (sec / vehicle)**
2000	**6.3**	**4.8**
2002	**8.3**	**6.0**
2003	**6.6**	**5.5**

Location 4 – 339th Avenue and Salome Highway

This intersection is far enough away from the proposed plant that the volumes of operational traffic will only make a slight difference of a couple of cars per peak hour. Using the directional distributions provided for this area, a total of 16% of site generated vehicles are expected to pass through this intersection. With only 10 operational vehicles coming and going each shift, this contributes about three cars per peak period. Thus, the majority of vehicles at this intersection in the year 2003 analysis are background vehicles which have been annually increased one percent per year from the existing condition.

	SALOME HWY				339th AVE		
YEAR 2003	EB LT	EB TH	WB TH	WB RT	NB LT	SB LT	SB RT
A.M.	7	26	130	5	2	8	25
P.M.	18	150	32	17	0	7	8

Using these volumes with the HCS Unsignalized Intersections program, the following results were obtained:

YEAR 2003	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE	P.M. DELAY (sec / vehicle)	P.M. LEVEL OF SERVICE
SB LT & RT	3.4	A	3.6	A
EB LT	2.4	A	2.2	A
NB LT	4.5	A	--	
OVERALL	0.7		0.4	

No delay was given for the northbound left during the P.M. Peak Hour since no vehicles are expected to make this movement during this time.

Overall, the intersection delays compare as follows:

YEAR	**A.M. DELAY (sec / vehicle)**	**P.M. DELAY (sec / vehicle)**
2000	**0.6**	**0.4**
2002	**0.7**	**0.4**
2003	**0.7**	**0.4**

Even during the peak construction period, this intersection is equipped to handle higher volumes of traffic. For this reason, the overall delays are not affected by the addition of construction or operational traffic.

Location 5 – Wintersburg Road at I-10 ramps

The majority of the construction and operational traffic going to and from the proposed facility will travel through this interchange, with an estimated 70% of these additional vehicles making a left-turn from the I-10 westbound exit ramp to go south on Wintersburg Road during the A.M. Peak Hour. These vehicles return during the P.M. Peak Hour on northbound Wintersburg Road, making a right-turn on the I-10 eastbound entrance ramp.

The following volumes were used for the A.M. Peak Hour:

	WINTERSBURG RD				I-10 WB EXIT	
YEAR 2003	NB LT	NB TH	SB TH	SB RT	WB LT	WB RT
VOL	2	8	34	2	485	12

This intersection was analyzed using the HCS Signalized Intersections program. The following results were obtained:

YEAR 2003	A.M. DELAY (sec / vehicle)	A.M. LEVEL OF SERVICE
WB LT	8.7	B
WB RT	5.4	B
NB LT	8.2	B
SB TH	8.3	B
OVERALL	8.6	B

The following volumes were utilized during the P.M. Peak Hour analysis:

	WINTERSBURG RD				I-10 EB EXIT	
YEAR 2003	NB TH	NB RT	SB LT	SB TH	EB LT	EB RT
VOL	28	396	13	36	0	4

Using the HCS Unsignalized Intersections program, the following results were obtained using these volumes:

YEAR 2003	DELAY (sec / vehicle)	LEVEL OF SERVICE
EB RT	2.7	A
SB LT	3.4	A
OVERALL	0.1	

An overall comparison of the three years analyzed may be found below:

YEAR	**A.M. DELAY (sec / vehicle)**	**P.M. DELAY (sec / vehicle)**
2000	**8.3**	**0.1**
2002	**9.3**	**0.1**
2003	**8.6**	**0.1**

As seen in every other situation in this study, the overall delay does not significantly increase during either the construction phase or the operation phase of the project. During the A.M. Peak Hour there is very little northbound and southbound through traffic to oppose the westbound left turn, which explains the ability of this movement to accommodate so many vehicles with such little delay. During the P.M. Peak Hour, nearly all of the site generated traffic is making an unopposed right turn onto I-10, which explains the delay of only 0.1 seconds per vehicle.

The operational traffic condition of the year 2003 did not significantly impact any of the intersections in the study area or the two road segments analyzed as compared to the existing traffic condition of the year 2000. In fact, there was only a slight increase in

travel time delay and all of the Level of Services were the exact same as the existing condition.

There are no planned roadway improvements in the study area in the near future. Since there are no significant impacts to the existing roadways during the peak construction period and the normal plant operations, no improvement projects are required due to the construction and operation of the Mesquite Generating Station.

The sight distance of vehicles entering Elliot Road from the proposed site entrance was investigated. The American Association of State Highways and Transportation Officials *A Policy on Geometric Design of Highways and Streets* (1990) (also known as the Green Book), was used as a reference for determining the intersection sight distance required at the entrance. Using the design speed of 55 mph and referencing Figure IX-40 in the Green Book, the required sight distance both left and right as one enters the roadway is 985 feet. The actual sight distance at the proposed entrance was measured in the field. The sight distances for motorists accessing Elliot Road is approximately 1750 feet to the right and approximately 3000 feet to the left. As can be seen by the long sight distances available at this location, the existing terrain in this area is relatively flat. Thus, there is adequate sight distance at the Mesquite Generating Station entrance.

Due to the very low traffic volumes on Elliot Road, there is no need for auxiliary turn lanes at the proposed site entrance road. The existing morning peak hour traffic on Elliot Road is 23 vehicles and the evening peak hour traffic is 20 vehicles. The operation of the plant will only add 10 vehicles entering and 10 vehicles exiting the site entrance road in both the morning and evening peak hours. During construction there will be an increase in the number of vehicles accessing the site, but this will be a temporary condition only occurring during the anticipated 18 month construction duration.

CONCLUSIONS

The existing traffic conditions (year 2000 analyses) are very good at all five intersections, and the two-lane highway analyses found the roads to be handling the peak traffic adequately. The addition of the peak construction traffic (year 2002 analyses) will bring very little change to most locations, with only minor delays for most movements. Wintersburg Road, between the PVNGS main entrance and Salome Highway, will perhaps experience some degree of congestion with larger platoons of traffic forming during this time. But, when the construction of the proposed plant is completed it will return to the pre-construction condition. Results of the operational traffic conditions (year 2003 analyses) indicate that the addition of the new power plant will add no significant delay, and will not adversely affect the surrounding area with regard to traffic flow.

RECOMMENDATIONS

The results of this study show that there will be no significant impact on the existing roadways in the study area due to the additional site generated traffic from the Mesquite Generating Station. Thus, there are no roadway improvements required to accommodate this added traffic. However, there are two other power plants going through the permitting process that would be located in the study area, both on the south side of Elliot Road. One is Duke Energy, located just west of Wintersburg Road, and the other is Pinnacle West, located just southeast of the Mesquite Power property. If one or both of the other power plants are approved, there most likely would be construction activities occurring simultaneously at the three plants. Therefore, coordination would be required amongst the plant contractors, and a mitigation measure should be imposed which would alternate or stagger construction work shifts at the plants. Staggering the work shifts at half-hour increments would drastically reduce the delay and congestion on the surrounding roadways.

APPENDIX A

EXISTING TRAFFIC COUNTS (2000)

Sempra Energy
Mesquite Station
Manual Turning Movement Counts

Date of Counts: February 29, 2000
Western Maricopa County, Arizona

Wintersburg Road and Palo Verde Main Gate Access Road

	Wintersburg Road Northbound			Wintersburg Road Southbound			Palo Verde Access Road Westbound			Total Approach	4 consec. 15 minute
Morning	L	T	R	L	T	R	L	T	R	Volume	volumes
6:00 - 6:15AM	0	1	1	61	1	0	0	0	5	69	
6:15 - 6:30AM	0	0	5	90	1	0	0	0	4	100	
6:30 - 6:45AM	0	2	25	211	2	0	0	0	11	251	
6:45 - 7:00AM	0	2	7	209	0	0	0	0	3	221	641
7:00 - 7:15AM	0	0	1	47	4	0	0	0	3	55	627
7:15 - 7:30AM	0	2	0	14	0	0	0	0	1	17	544
7:30 - 7:45AM	0	2	0	12	0	0	0	0	0	14	307
7:45 - 8:00AM	0	0	0	4	1	0	0	0	0	5	91
8:00 - 8:15AM	0	2	0	11	0	0	0	0	0	13	49
8:15 - 8:30AM	0	0	0	2	2	0	0	0	1	5	37
8:30 - 8:45AM	0	0	0	3	1	0	1	0	0	5	28
8:45 - 9:00AM	0	2	2	13	0	0	1	0	2	20	43

	Wintersburg Road Northbound			Wintersburg Road Southbound			Palo Verde Access Road Westbound			Total Approach	4 consec. 15 minute
Afternoon	L	T	R	L	T	R	L	T	R	Volume	volumes
3:30 - 3:45PM	0	0	0	0	2	0	1	0	35	38	
3:45 - 4:00PM	0	2	0	0	0	0	0	0	26	28	
4:00 - 4:15PM	0	4	0	0	1	0	0	0	15	20	
4:15 - 4:30PM	0	0	0	1	1	0	0	0	22	24	110
4:30 - 4:45PM	0	0	0	0	0	0	1	0	24	25	97
4:45 - 5:00PM	0	0	0	1	0	0	0	0	29	30	99
5:00 - 5:15PM	0	1	0	13	1	0	1	0	45	61	140
5:15 - 5:30PM	0	0	0	3	1	0	4	0	152	160	276
5:30 - 5:45PM	0	0	0	7	1	0	2	0	250	260	511
5:45 - 6:00PM	0	1	0	13	1	0	0	0	42	57	538
6:00 - 6:15PM	0	1	0	7	0	0	1	0	14	23	500

Sempra Energy
Mesquite Station
Manual Turning Movement Counts

Date of Counts: February 29, 2000
Western Maricopa County, Arizona

Wintersburg Road & Salome Highway

Morning	Wintersburg Road Northbound			Wintersburg Road Southbound			Salome Highway Eastbound			Salome Highway Westbound			Total Approach Volume	4 consec. 15 minute volumes
	L	T	R	L	T	R	L	T	R	L	T	R		
6:00 - 6:15AM	0	4	1	0	66	0	0	4	3	19	2	0	99	
6:15 - 6:30AM	0	9	1	0	104	0	0	2	8	28	0	4	156	
6:30 - 6:45AM	0	11	4	0	236	0	1	3	11	50	1	2	319	
6:45 - 7:00AM	1	3	3	0	113	0	0	1	6	22	1	3	153	727
7:00 - 7:15AM	0	6	2	0	35	0	4	1	0	4	3	2	57	685
7:15 - 7:30AM	1	4	3	1	13	0	1	3	1	4	5	1	37	566
7:30 - 7:45AM	3	7	0	1	15	0	1	8	2	4	1	2	44	291
7:45 - 8:00AM	2	0	0	1	9	0	0	6	0	1	4	1	24	162
8:00 - 8:15AM	0	4	0	1	10	0	0	2	0	1	2	2	22	127
8:15 - 8:30AM	1	2	2	1	5	0	3	1	3	1	1	1	21	111
8:30 - 8:45AM	0	3	2	0	7	1	0	2	2	1	2	1	21	88
8:45 - 9:00AM	0	2	4	0	6	1	1	4	0	4	2	1	25	89

Afternoon	Wintersburg Road Northbound			Wintersburg Road Southbound			Salome Highway Eastbound			Salome Highway Westbound			Total Approach Volume	4 consec. 15 minute volumes
	L	T	R	L	T	R	L	T	R	L	T	R		
3:30 - 3:45PM	1	33	6	0	4	0	1	5	1	2	1	0	54	
3:45 - 4:00PM	4	29	8	1	0	1	1	1	3	6	4	2	60	
4:00 - 4:15PM	1	18	2	2	2	0	1	4	4	7	3	2	46	
4:15 - 4:30PM	6	21	6	0	4	3	1	6	0	4	4	1	56	216
4:30 - 4:45PM	3	35	6	2	5	0	2	3	2	6	3	0	67	229
4:45 - 5:00PM	0	22	7	1	6	0	0	1	2	5	4	0	48	217
5:00 - 5:15PM	1	37	8	1	0	6	0	4	1	2	4	0	64	235
5:15 - 5:30PM	4	76	18	2	4	2	0	4	2	1	4	0	117	296
5:30 - 5:45PM	13	242	68	1	3	1	1	2	1	1	3	1	337	566
5:45 - 6:00PM	5	79	21	0	9	0	0	2	1	4	3	1	125	643

Sempra Energy
Mesquite Station
Manual Turning Movement Counts

Date of Counts: Mar. 1, 2000
Western Maricopa County, Arizona

339th Avenue & Salome Highway

	339th Avenue Northbound			339th Avenue Southbound			Salome Highway Eastbound			Salome Highway Westbound			Total Approach	4 consec. 15 minute
Morning	L	T	R	L	T	R	L	T	R	L	T	R	Volume	volumes
6:00 - 6:15AM	0	0	0	1	0	4	2	8	0	0	22	3	40	
6:15 - 6:30AM	1	0	0	3	0	6	1	5	0	0	43	0	59	
6:30 - 6:45AM	0	0	0	2	0	9	2	6	0	0	44	0	63	
6:45 - 7:00AM	0	0	0	1	0	4	0	5	0	0	16	1	27	189
7:00 - 7:15AM	0	0	0	2	0	2	2	6	0	0	2	0	14	163
7:15 - 7:30AM	0	0	0	5	0	1	0	6	0	0	6	0	18	122
7:30 - 7:45AM	0	0	0	2	0	1	0	8	0	0	2	1	14	73
7:45 - 8:00AM	0	0	0	3	0	0	1	5	0	0	1	1	11	57
8:00 - 8:15AM	0	0	0	3	0	0	0	8	0	0	5	0	16	59
8:15 - 8:30AM	0	0	0	2	0	0	1	2	0	0	6	0	11	52
8:30 - 8:45AM	0	0	0	5	0	0	2	7	0	0	7	0	21	59
8:45 - 9:00AM	0	0	0	2	0	0	0	4	0	0	3	1	10	58

	339th Avenue Northbound			339th Avenue Southbound			Salome Highway Eastbound			Salome Highway Westbound			Total Approach	4 consec. 15 minute
Afternoon	L	T	R	L	T	R	L	T	R	L	T	R	Volume	volumes
3:30 - 3:45PM	0	0	0	1	0	2	2	15	0	0	7	5	32	
3:45 - 4:00PM	0	0	0	1	0	1	1	10	0	0	14	3	30	
4:00 - 4:15PM	0	0	0	1	0	0	2	3	0	0	9	5	20	
4:15 - 4:30PM	0	0	0	1	0	2	1	8	0	0	11	1	24	106
4:30 - 4:45PM	0	0	0	0	0	1	1	10	0	0	8	6	26	100
4:45 - 5:00PM	0	0	0	0	0	2	0	8	0	0	8	4	22	92
5:00 - 5:15PM	0	0	0	0	0	4	0	22	0	0	6	1	33	105
5:15 - 5:30PM	0	0	0	5	0	0	2	13	0	0	8	6	34	115
5:30 - 5:45PM	0	0	0	0	0	0	8	78	0	0	3	6	95	184
5:45 - 6:00PM	0	0	0	1	0	2	6	31	0	0	13	3	56	218

Sempra Energy
Mesquite Station
Manual Turning Movement Counts

Date of Counts: February 29, 2000
Western Maricopa County, Arizona

I-10 WB Exit & EB Exit Ramps and Wintersburg Road

	Wintersburg Road Northbound			Wintersburg Road Southbound			I-10 WB Exit Ramp Westbound (N. of I-10)			Total Approach	4 consec. 15 minute
Morning	L	T	R	L	T	R	L	T	R	Volume	volumes
6:00 - 6:15AM	0	0	0	0	5	0	71	0	0	76	
6:15 - 6:30AM	0	1	0	0	9	0	131	0	3	144	
6:30 - 6:45AM	1	4	0	0	10	1	197	0	4	217	
6:45 - 7:00AM	0	1	0	0	8	0	65	0	4	78	515
7:00 - 7:15AM	0	3	0	0	6	0	23	0	2	34	473
7:15 - 7:30AM	0	9	0	0	0	0	13	1	4	27	356
7:30 - 7:45AM	0	6	0	0	4	0	10	0	9	29	168
7:45 - 8:00AM	0	2	0	0	4	0	9	0	3	18	108
8:00 - 8:15AM	1	2	0	0	4	0	5	0	2	14	88
8:15 - 8:30AM	1	0	0	0	1	0	3	0	1	6	67
8:30 - 8:45AM	0	2	0	0	2	0	6	0	1	11	49
8:45 - 9:00AM	0	1	0	0	2	0	5	0	1	9	40

	Wintersburg Road Northbound			Wintersburg Road Southbound			I-10 EB Exit Ramp Eastbound (S. of I-10)			Total Approach	4 consec. 15 minute
Afternoon	L	T	R	L	T	R	L	T	R	Volume	volumes
3:30 - 3:45PM	0	1	33	1	1	0	0	1	0	37	
3:45 - 4:00PM	0	8	22	1	2	0	0	0	0	33	
4:00 - 4:15PM	0	8	13	7	12	0	0	0	0	40	
4:15 - 4:30PM	0	1	17	3	8	0	0	0	0	29	139
4:30 - 4:45PM	0	2	17	3	4	0	0	0	0	26	128
4:45 - 5:00PM	0	3	23	6	9	0	0	1	0	42	137
5:00 - 5:15PM	0	5	34	5	4	0	0	0	0	48	145
5:15 - 5:30PM	0	6	67	2	7	0	0	0	0	82	198
5:30 - 5:45PM	0	11	203	3	9	0	0	0	1	227	399
5:45 - 6:00PM	0	4	73	2	14	0	0	0	2	95	452

Traffic Research & Analysis, Inc.

3844 EAST INDIAN SCHOOL RD
Phoenix, Arizona 85018
(602)840-1500 Fax.840-1577

Weather= CLEAR

Site Code : 00057
Start Date: 03/02/00
File I.D. : 200174X

Street name :ELLIOT RD E. OF WINTERSBURG @ RR TRACKS EB/WB

Begin	<------ EB		------>		<------ WB		------>		<------Combined		------>	
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.	
12:00 03/02	0		2		0		0		0		2	
12:15	0		0		0		0		0		0	
12:30	0		0		0		0		0		0	
12:45	0	•	2	4	0	*	0	*	0	•	2	4
01:00	1		0		0		0		1		0	
01:15	0		0		0		0		0		0	
01:30	0		0		0		1		0		1	
01:45	0	1	0	*	0	*	0	1	0	1	0	1
02:00	0		1		0		1		0		2	
02:15	0		2		0		1		0		3	
02:30	0		2		0		0		0		2	
02:45	0	•	0	5	0	•	0	2	0	*	0	7
03:00	0		0		0		0		0		0	
03:15	0		0		0		0		0		0	
03:30	0		1		0		1		0		2	
03:45	0	*	1	2	0	*	1	2	0	*	2	4
04:00	1		0		0		4		1		4	
04:15	0		1		0		1		0		2	
04:30	0		2		0		2		0		4	
04:45	0	1	3	6	0	•	3	10	0	1	6	16
05:00	1		4		1		0		2		4	
05:15	0		4		0		0		0		4	
05:30	0		7		1		0		1		7	
05:45	0	1	2	17	0	2	3	3	0	3	5	20
06:00	0		0		4		0		4		0	
06:15	1		3		7		1		8		4	
06:30	2		1		5		0		7		1	
06:45	0	3	0	4	4	20	0	1	4	23	0	5
07:00	1		2		1		2		2		4	
07:15	4		0		1		0		5		0	
07:30	0		0		0		0		0		0	
07:45	0	5	0	2	0	2	0	2	0	7	0	4
08:00	0		0		0		0		0		0	
08:15	0		0		0		0		0		0	
08:30	0		0		1		1		1		1	
08:45	2	2	0	*	0	1	1	2	2	3	1	2
09:00	1		0		0		0		1		0	
09:15	0		0		0		0		0		0	
09:30	2		0		0		0		2		0	
09:45	2	5	0	*	0	•	0	*	2	5	0	*
10:00	2		0		1		0		3		0	
10:15	0		0		1		0		1		0	
10:30	0		0		2		0		2		0	
10:45	1	3	0	*	2	6	0	*	3	9	0	*
11:00	0		0		0		0		0		0	
11:15	0		0		0		0		0		0	
11:30	1		0		0		0		1		0	
11:45	0	1	0	*	0	*	0	*	0	1	0	•
Totals	22		40		31		23		53		63	
Day Totals		62				54				116		
Split %	41.5%		63.4%		58.4%		36.5%					

Peak Hour	06:30	04:45	06:00	04:00	04:45
Volume	7	18	20	10	21
P.H.F.	.43	.64	.71	.62	.75

Traffic Research & Analysis, Inc.

3844 EAST INDIAN SCHOOL RD
Phoenix, Arizona 85018
(602)840-1500 Fax.840-1577

Site Code : 00057
Start Date: 03/02/00
File I.D. : 200172

Weather= CLEAR

Street name :WINTERSBURG RD S. OF I-10 (North & Van Buren St.) NB

Page : 1

Begin	03/02		03/03		03/04		Daily	Avg.
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	1	7	*	*	*	*	1	7
12:15	0	7	*	*	*	*	0	7
12:30	2	2	*	*	*	*	2	2
12:45	1	8	*	*	*	*	1	8
01:00	0	2	*	*	*	*	0	2
01:15	1	6	*	*	*	*	1	6
01:30	0	2	*	*	*	*	0	2
01:45	0	6	*	*	*	*	0	6
02:00	1	5	*	*	*	*	1	5
02:15	0	6	*	*	*	*	0	6
02:30	2	0	*	*	*	*	2	0
02:45	0	9	*	*	*	*	0	9
03:00	0	8	*	*	*	*	0	8
03:15	0	0	*	*	*	*	0	0
03:30	1	5	*	*	*	*	1	5
03:45	0	7	*	*	*	*	0	7
04:00	2	3	*	*	*	*	2	3
04:15	1	5	*	*	*	*	1	5
04:30	8	6	*	*	*	*	8	6
04:45	20	5	*	*	*	*	20	5
05:00	5	9	*	*	*	*	5	9
05:15	27	7	*	*	*	*	27	7
05:30	44	20	*	*	*	*	44	20
05:45	52	6	*	*	*	*	52	6
06:00	118	2	*	*	*	*	118	2
06:15	211	3	*	*	*	*	211	3
06:30	100	2	*	*	*	*	100	2
06:45	34	0	*	*	*	*	34	0
07:00	17	6	*	*	*	*	17	6
07:15	12	4	*	*	*	*	12	4
07:30	6	3	*	*	*	*	6	3
07:45	8	1	*	*	*	*	8	1
08:00	6	2	*	*	*	*	6	2
08:15	10	2	*	*	*	*	10	2
08:30	12	1	*	*	*	*	12	1
08:45	1	0	*	*	*	*	1	0
09:00	14	1	*	*	*	*	14	1
09:15	4	0	*	*	*	*	4	0
09:30	15	1	*	*	*	*	15	1
09:45	6	0	*	*	*	*	6	0
10:00	9	1	*	*	*	*	9	1
10:15	13	0	*	*	*	*	13	0
10:30	6	2	*	*	*	*	6	2
10:45	8	1	*	*	*	*	8	1
11:00	7	0	*	*	*	*	7	0
11:15	0	1	*	*	*	*	0	1
11:30	5	0	*	*	*	*	5	0
11:45	7	0	*	*	*	*	7	0
Total	797	174	0	0	0	0	797	174
Combined	971		0		0		971	
Peak Hour	05:45	05:00					05:45	
Volume	481	42					481	
P.H.F.	.56	.52					.56	

ADTs

Traffic Research & Analysis, Inc.

3844 EAST INDIAN SCHOOL RD
Phoenix, Arizona 85018
(602)840-1500 Fax.840-1577

Weather= CLEAR

Site Code : 00057
Start Date: 03/09/00
File I.D. : 200172X

Street name :WINTERSBURG RD S. OF I-10 (North of Van Buren St.) SB

Begin	03/09		03/10		03/11		Daily Avg.	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	2	14	*	*	*	*	2	14
12:15	2	4	*	*	*	*	2	4
12:30	0	11	*	*	*	*	0	11
12:45	2	11	*	*	*	*	2	11
01:00	2	12	*	*	*	*	2	12
01:15	1	18	*	*	*	*	1	18
01:30	1	11	*	*	*	*	1	11
01:45	0	17	*	*	*	*	0	17
02:00	0	10	*	*	*	*	0	10
02:15	2	12	*	*	*	*	2	12
02:30	2	7	*	*	*	*	2	7
02:45	1	6	*	*	*	*	1	6
03:00	0	13	*	*	*	*	0	13
03:15	0	14	*	*	*	*	0	14
03:30	0	21	*	*	*	*	0	21
03:45	0	14	*	*	*	*	0	14
04:00	2	19	*	*	*	*	2	19
04:15	1	19	*	*	*	*	1	19
04:30	1	22	*	*	*	*	1	22
04:45	1	18	*	*	*	*	1	18
05:00	4	29	*	*	*	*	4	29
05:15	3	10	*	*	*	*	3	10
05:30	5	13	*	*	*	*	5	13
05:45	6	18	*	*	*	*	6	18
06:00	6	22	*	*	*	*	6	22
06:15	15	21	*	*	*	*	15	21
06:30	14	16	*	*	*	*	14	16
06:45	8	14	*	*	*	*	8	14
07:00	3	20	*	*	*	*	3	20
07:15	8	13	*	*	*	*	8	13
07:30	6	10	*	*	*	*	6	10
07:45	9	16	*	*	*	*	9	16
08:00	6	5	*	*	*	*	6	5
08:15	7	7	*	*	*	*	7	7
08:30	10	14	*	*	*	*	10	14
08:45	6	10	*	*	*	*	6	10
09:00	7	5	*	*	*	*	7	5
09:15	6	9	*	*	*	*	6	9
09:30	4	10	*	*	*	*	4	10
09:45	7	6	*	*	*	*	7	6
10:00	11	8	*	*	*	*	11	8
10:15	6	7	*	*	*	*	6	7
10:30	4	3	*	*	*	*	4	3
10:45	9	6	*	*	*	*	9	6
11:00	19	4	*	*	*	*	19	4
11:15	8	2	*	*	*	*	8	2
11:30	6	4	*	*	*	*	6	4
11:45	9	7	*	*	*	*	9	7
Total	232	582	0	0	0	0	232	582
Combined	814		0		0		814	
Peak Hour	06:00	04:15					06:00	
Volume	43	88					43	
P.H.F.	.71	.75					.71	

ADTs

Traffic Research & Analysis, Inc.

3844 EAST INDIAN SCHOOL RD
Phoenix, Arizona 85018
(602)840-1500 Fax.840-1577

Weather= CLEAR

Site Code : 00057
Start Date: 03/02/00
File I.D. : 200170

Street name :I-10 & WINTERSBURG RD (WB) OFF RAMP WB Page : 1

Begin	Fri. 03/02		Sat. 03/03		Sun. 03/04		Daily Avg.	
Time	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00	1	11	*	*	*	*	1	11
12:15	0	3	*	*	*	*	0	3
12:30	2	3	*	*	*	*	2	3
12:45	1	5	*	*	*	*	1	5
01:00	0	4	*	*	*	*	0	4
01:15	2	5	*	*	*	*	2	5
01:30	0	7	*	*	*	*	0	7
01:45	1	8	*	*	*	*	1	8
02:00	1	5	*	*	*	*	1	5
02:15	0	7	*	*	*	*	0	7
02:30	3	10	*	*	*	*	3	10
02:45	0	9	*	*	*	*	0	9
03:00	0	8	*	*	*	*	0	8
03:15	0	2	*	*	*	*	0	2
03:30	1	7	*	*	*	*	1	7
03:45	0	6	*	*	*	*	0	6
04:00	3	3	*	*	*	*	3	3
04:15	1	5	*	*	*	*	1	5
04:30	12	4	*	*	*	*	12	4
04:45	20	3	*	*	*	*	20	3
05:00	7	5	*	*	*	*	7	5
05:15	25	7	*	*	*	*	25	7
05:30	44	22	*	*	*	*	44	22
05:45	47	10	*	*	*	*	47	10
06:00	115	3	*	*	*	*	115	3
06:15	205	3	*	*	*	*	205	3
06:30	87	6	*	*	*	*	87	6
06:45	35	1	*	*	*	*	35	1
07:00	18	3	*	*	*	*	18	3
07:15	22	4	*	*	*	*	22	4
07:30	10	3	*	*	*	*	10	3
07:45	11	5	*	*	*	*	11	5
08:00	9	2	*	*	*	*	9	2
08:15	9	3	*	*	*	*	9	3
08:30	16	2	*	*	*	*	16	2
08:45	2	1	*	*	*	*	2	1
09:00	11	1	*	*	*	*	11	1
09:15	8	2	*	*	*	*	8	2
09:30	14	1	*	*	*	*	14	1
09:45	9	2	*	*	*	*	9	2
10:00	10	2	*	*	*	*	10	2
10:15	10	0	*	*	*	*	10	0
10:30	5	2	*	*	*	*	5	2
10:45	13	1	*	*	*	*	13	1
11:00	6	0	*	*	*	*	6	0
11:15	7	1	*	*	*	*	7	1
11:30	5	0	*	*	*	*	5	0
11:45	8	3	*	*	*	*	8	3
Total	816	210	0	0	0	0	816	210
Combined	1026		0		0		1026	
Peak Hour	05:45	05:00					05:45	
Volume	454	44					454	
P.H.F.	.55	.5					.55	

ADTs

APPENDIX B

EXISTING TRAFFIC (2000)
HIGHWAY CAPACITY SOFTWARE OUTPUT

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Elliot Road west of Proposed Plant, 2000
ANALYST..... EJD
TIME OF ANALYSIS..... AM Peak Hour
DATE OF ANALYSIS..... 03-14-2000
OTHER INFORMATION.... Current year (2000)

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	5
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.9
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	85 / 15
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	10

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.79	.95
B	2.2	2	2.5	1	.79	.94
C	2.2	2	2.5	1	.79	.94
D	2	1.6	1.6	1	.79	.95
E	2	1.6	1.6	1	.79	.95

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 23
ACTUAL FLOW RATE: 26

LOS	SERVICE FLOW RATE	V/C
A	316	.15
B	563	.27
C	897	.43
D	1348	.64
E	2107	1

LOS FOR GIVEN CONDITIONS: A

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Elliot Road west of Proposed Plant, 2000
ANALYST..... EJD
TIME OF ANALYSIS..... PM peak 5-6
DATE OF ANALYSIS..... 03-14-2000
OTHER INFORMATION.... Current year (2000) PM peak analysis

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	5
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.9
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	80 / 20
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	10

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.83	.95
B	2.2	2	2.5	1	.83	.94
C	2.2	2	2.5	1	.83	.94
D	2	1.6	1.6	1	.83	.95
E	2	1.6	1.6	1	.83	.95

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 20
ACTUAL FLOW RATE: 22

LOS	SERVICE FLOW RATE	V/C
A	332	.15
B	592	.27
C	943	.43
D	1417	.64
E	2213	1

LOS FOR GIVEN CONDITIONS: A

Center For Microcomputers In Transportation
HCS: Unsignalized Intersection Release 2.1 Page 1
****

File Name PVAM00RT.HC0
Streets: (N-S) Palo Verde entrance (E-W) Wintersburg Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/14/0
Other Information..... AM Peak Hour - 2000 (current year) WB RT include
d

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0	0	0	0>	0<	0
Stop/Yield			N			N						
Volumes		5	38	571	4					0		23
PHF		.9	.9	.9	.9					.9		.9
Grade		0			0			0			0	
MC's (%)		0	0	0	0					0		0
SU/RV's (%)		0	0	0	0					0		0
CV's (%)		5	5	5	5					5		5
PCE's		1.05	1.05	1.05	1.05					1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	24	
Potential Capacity: (pcph)	1346	
Movement Capacity: (pcph)	1346	
Prob. of Queue-free State:	0.98	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	43	
Potential Capacity: (pcph)	1635	
Movement Capacity: (pcph)	1635	
Prob. of Queue-free State:	0.59	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.59	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	599	
Potential Capacity: (pcph)	476	
Major LT, Minor TH Impedance Factor:	0.59	
Adjusted Impedance Factor:	0.59	
Capacity Adjustment Factor due to Impeding Movements	0.59	
Movement Capacity: (pcph)	282	

****

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
WB	R	27	1346	1346	2.7	A	
SB	L	666	1635		3.7	A	3.6

Intersection Delay = 3.3

Center For Microcomputers In Transportation

HCS: Unsignalized Intersection Release 2.1 Page 1

****

File Name PVPM00RT.HC0
Streets: (N-S) Palo Verde entrance (E-W) Wintersburg Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/14/0
Other Information..... PM Peak Hour - 2000 (current year) WB RT include
d

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0	0	0	0>	0<	0
Stop/Yield			N			N						
Volumes		2	0	36	4					7		489
PHF		.9	.9	.9	.9					.9		.9
Grade		0			0			0			0	
MC's (%)		0	0	0	0					0		0
SU/RV's (%)		0	0	0	0					0		0
CV's (%)		5	5	5	5					5		5
PCE's		1.05	1.05	1.05	1.05					1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	2	
Potential Capacity: (pcph)	1381	
Movement Capacity: (pcph)	1381	
Prob. of Queue-free State:	0.59	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	2	
Potential Capacity: (pcph)	1711	
Movement Capacity: (pcph)	1711	
Prob. of Queue-free State:	0.98	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.98	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	42	
Potential Capacity: (pcph)	1001	
Major LT, Minor TH Impedance Factor:	0.98	
Adjusted Impedance Factor:	0.98	
Capacity Adjustment Factor due to Impeding Movements	0.98	
Movement Capacity: (pcph)	976	

****

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
WB	L	8	976 >	1373	4.5	A	4.5
WB	R	570	1381 >		>	>	
SB	L	42	1711		2.2	A	1.0

Intersection Delay = 4.0

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Wintersburg Road s/o Salome Highway
ANALYST..... EJD
TIME OF ANALYSIS..... AM Peak Hour
DATE OF ANALYSIS..... 03-23-2000
OTHER INFORMATION.... Existing Traffic (2000)

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	1
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.9
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	5 / 95
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	16

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.73	.99
B	2.2	2	2.5	1	.73	.99
C	2.2	2	2.5	1	.73	.99
D	2	1.6	1.6	1	.73	.99
E	2	1.6	1.6	1	.73	.99

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 653
ACTUAL FLOW RATE: 726

LOS	SERVICE FLOW RATE	V/C
A	243	.12
B	485	.24
C	788	.39
D	1255	.62
E	2024	1

LOS FOR GIVEN CONDITIONS: C

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Wintersburg Road s/o Salome Highway
ANALYST..... EJD
TIME OF ANALYSIS..... PM Peak HOur
DATE OF ANALYSIS..... 03-23-2000
OTHER INFORMATION.... Existing Traffic (2000)

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	1
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	1
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	7 / 93
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	16

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.74	.99
B	2.2	2	2.5	1	.74	.99
C	2.2	2	2.5	1	.74	.99
D	2	1.6	1.6	1	.74	.99
E	2	1.6	1.6	1	.74	.99

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 570
ACTUAL FLOW RATE: 570

LOS	SERVICE FLOW RATE	V/C
A	246	.12
B	490	.24
C	796	.39
D	1268	.62
E	2046	1

LOS FOR GIVEN CONDITIONS: C

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 04-07-2000
Center For Microcomputers In Transportation

Streets: (E-W) Salome Highway (N-S) Wintersburg Road
Analyst: EJD File Name: WSALAM00.HC9
Area Type: Other 3-14-0 6-7 AM
Comment: Current year (2000) A.M. peak hour

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	<	1	1	<		> 1	1
Volumes	1	10	28	119	4	9	1	27	9	1	519	1
PHF or PK15	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Lane Width	11.0	11.0	11.0	10.0	12.0		12.0	12.0			12.0	12.0
Grade		0			0			0			0	
% Heavy Veh	5	5	5	5	5	5	5	5	5	5	5	5
Parking	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type	3	3	3	3	3		3	3			3	3
RTOR Vols			14			4			4			0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left	*				NB	Left	*			
Thru	*					Thru	•			
Right	*					Right	*			
Peds						Peds				
WB Left	•				SB	Left	*			
Thru	*					Thru	*			
Right	*					Right	*			
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	18.0A				Green		44.0P			
Yellow/AR	4.0				Yellow/AR		4.0			

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	439	1616	0.002	0.271	12.0	B	12.1	B
	T	475	1749	0.023	0.271	12.1	B		
	R	404	1487	0.037	0.271	12.1	B		
WB	L	422	1556	0.313	0.271	13.3	B	13.2	B
	TR	447	1647	0.022	0.271	12.1	B		
NB	L	210	326	0.005	0.643	2.9	A	2.9	A
	TR	1134	1764	0.032	0.643	2.9	A		
SB	LT	1163	1809	0.497	0.643	4.5	A	4.5	A
	R	989	1538	0.001	0.643	2.9	A		

Intersection Delay = 6.3 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.442

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 03-14-2000
Center For Microcomputers In Transportation

Streets: (E-W) Salome Highway (N-S) Wintersburg Road
Analyst: EJD File Name: WSALPM00.HC9
Area Type: Other 3-14-0 5-6 pm
Comment: Current year (2000) P.M. peak hour

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	<	1	1	<		> 1	1
Volumes	1	12	5	8	14	2	23	434	115	10	22	7
PHF or PK15	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Lane Width	11.0	11.0	11.0	10.0	12.0		12.0	12.0			12.0	12.0
Grade		0			0			0			0	
% Heavy Veh	5	5	5	5	5	5	5	5	5	5	5	5
Parking	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type	3	3	3	3	3		3	3			3	3
RTOR Vols			2			1			55			3
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	*				NB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
WB	Left	*				SB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		18.0A				Green		44.0P			
Yellow/AR		4.0				Yellow/AR		4.0			

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	430	1583	0.002	0.271	12.0	B	12.1	B
	T	475	1749	0.027	0.271	12.1	B		
	R	404	1487	0.010	0.271	12.0	B		
WB	L	420	1546	0.021	0.271	12.1	B	12.1	B
	TR	487	1793	0.035	0.271	12.1	B		
NB	L	1000	1555	0.026	0.643	2.9	A	4.4	A
	TR	1142	1777	0.481	0.643	4.4	A		
SB	LT	930	1447	0.038	0.643	3.0	A	2.9	A
	R	989	1538	0.005	0.643	2.9	A		

Intersection Delay = 4.8 sec/veh Intersection LOS = A

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.348

****

File Name 339SAM00.HC0
Streets: (N-S) 339th Avenue (E-W) Salome Highway
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/14/0
Other Information..... AM Peak Hour - 2000 (current year)

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0>	1	0	0	1<	0	0>	1<	0	0>	0<	0
Stop/Yield			N			N						
Volumes	5	24			125	4	1	0	0	7		23
PHF	.9	.9			.9	.9	.9	.9	.9	.9		.9
Grade		0			0			0			0	
MC's (%)	0	0			0	0	0	0	0	0		0
SU/RV's (%)	0	0			0	0	0	0	0	0		0
CV's (%)	5	5			5	5	0	0	0	5		5
PCE's	1	1			1	1	1.1	1.1	1.1	1		1

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	24	127
Potential Capacity: (pcph)	1346	1194
Movement Capacity: (pcph)	1346	1194
Prob. of Queue-free State:	1.00	0.98

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		129
Potential Capacity: (pcph)		1488
Movement Capacity: (pcph)		1488
Prob. of Queue-free State:		1.00
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:		1.00

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	158	
Potential Capacity: (pcph)	901	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	897	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	168	156
Potential Capacity: (pcph)	846	860
Major LT, Minor TH Impedance Factor:	1.00	1.00
Adjusted Impedance Factor:	1.00	1.00
Capacity Adjustment Factor due to Impeding Movements	0.97	1.00
Movement Capacity: (pcph)	824	857

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)		SharedCap Csh(pcph)	Avg.Total Delay		LOS		Delay By App
NB	L	1	824	>	824	>	4.4	>	A	
SB	L	8	857	>		>		>		
					1093		3.4		A	3.4
SB	R	26	1194	>		>		>		
EB	L	6	1488			2.4		A		0.4

Intersection Delay = 0.6

Center For Microcomputers In Transportation

HCS: Unsignalized Intersection Release 2.1 Page 1

****

File Name 339SPM00.HC0
Streets: (N-S) 339th Avenue (E-W) Salome Highway
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/14/0
Other Information..... PM Peak Hour - 2000 (current year)

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0>	1	0	0	1<	0	0>	1<	0	0>	0<	0
Stop/Yield			N			N						
Volumes	16	144			30	16	0	0	0	6		6
PHF	.9	.9			.9	.9	.9	.9	.9	.9		.9
Grade		0			0			0			0	
MC's (%)	0	0			0	0	0	0	0	0		0
SU/RV's (%)	0	0			0	0	0	0	0	0		0
CV's (%)	0	0			0	0	0	0	0	0		0
PCE's	1.1	1.1			1.1	1.1	1.1	1.1	1.1	1.1		1.1

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	144	38
Potential Capacity: (pcph)	1170	1325
Movement Capacity: (pcph)	1170	1325
Prob. of Queue-free State:	1.00	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		46
Potential Capacity: (pcph)		1630
Movement Capacity: (pcph)		1630
Prob. of Queue-free State:		0.99
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	206	
Potential Capacity: (pcph)	851	
Capacity Adjustment Factor due to Impeding Movements	0.99	
Movement Capacity: (pcph)	839	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	201	198
Potential Capacity: (pcph)	810	813
Major LT, Minor TH Impedance Factor:	0.99	0.99
Adjusted Impedance Factor:	0.99	0.99
Capacity Adjustment Factor due to Impeding Movements	0.98	0.99
Movement Capacity: (pcph)	794	805

****

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
SB L	8	805 >	1002	> 3.7	> A	3.7
SB R	8	1325 >		>	>	
EB L	20	1630		2.2	A	0.2

Intersection Delay = 0.4

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 03-20-2000
Center For Microcomputers In Transportation

Streets: (E-W) I-10 ramps (N-S) Wintersburg Road
Analyst: EJD File Name: 10WSAM00.HC9
Area Type: Other 3-14-0 6-7 am
Comment: AM Peak Hour, Current Year (2000)

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes				1		1		> 1			1	<
Volumes				464		11	1		6		32	1
PHF or PK15				0.90		0.90	0.90	0.90			0.90	0.90
Lane Width				12.0		12.0		12.0			12.0	
Grade					0			3			0	
% Heavy Veh				5		2	5		5		5	5
Parking				(Y/N) N			(Y/N) N			(Y/N) N		
Bus Stops						0			0			0
Con. Peds			0			0			0			0
Ped Button				(Y/N) N			(Y/N) N			(Y/N) N		
Arr Type				3		3		3			3	
RTOR Vols						0			0			0
Lost Time				3.00		3.00	3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left					NB	Left	*			
Thru						Thru	*			
Right						Right				
Peds						Peds				
WB Left	*				SB	Left				
Thru	*					Thru	*			
Right	*					Right	*			
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	35.0A				Green		27.0P			
Yellow/AR	4.0				Yellow/AR		4.0			

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	L	884	1719	0.584	0.514	8.4	B	8.3	B
	R	814	1583	0.015	0.514	5.4	B		
NB	LT	709	1772	0.011	0.400	8.2	B	8.2	B
SB	TR	648	1621	0.057	0.400	8.3	B	8.3	B

Intersection Delay = 8.3 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.353

Center For Microcomputers In Transportation

HCS: Unsignalized Intersection Release 2.1 Page 1

****

File Name 10WUPM00.HC0
Streets: (N-S) Wintersburg Road (E-W) I-10 Eastbound ramps
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/14/0
Other Information..... Current year (2000) P.M. peak hour, southern ramps

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0>	1<	0	0	0	0
Stop/Yield			N			N						
Volumes		26	377	12	34		0	0	3			
PHF		.9	.9	.9	.9		.9	.9	.9			
Grade		0			0			0			0	
MC's (%)		0	0	0	0		0	0	0			
SU/RV's (%)		0	0	0	0		0	0	0			
CV's (%)		5	5	5	5		5	5	5			
PCE's		1.05	1.05	3.5	3.5		1.05	1.05	1.05			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		34
Potential Capacity: (pcph)		1331
Movement Capacity: (pcph)		1331
Prob. of Queue-free State:		1.00

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	403	
Potential Capacity: (pcph)	1102	
Movement Capacity: (pcph)	1102	
Prob. of Queue-free State:	0.96	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.95	

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		449
Potential Capacity: (pcph)		634
Capacity Adjustment Factor due to Impeding Movements		0.95
Movement Capacity: (pcph)		605
Prob. of Queue-free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		260
Potential Capacity: (pcph)		749
Major LT, Minor TH Impedance Factor:		0.95
Adjusted Impedance Factor:		0.95
Capacity Adjustment Factor due to Impeding Movements		0.95
Movement Capacity: (pcph)		715

****

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
EB R	3	1331 >	1331	> 2.7	> A	
SB L	46	1102		3.4	A	0.9

Intersection Delay = 0.1

APPENDIX C

PEAK CONSTRUCTION TRAFFIC (2002) HIGHWAY CAPACITY SOFTWARE OUTPUT

****

File Name ENTAM02.HC0
Streets: (N-S) Plant entrance (E-W) Elliot
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/20/0
Other Information..... Construction volumes, AM Peak Hour, 2002

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0>	1<	0	0	0	0
Stop/Yield			N			N						
Volumes		4	285	15	21		0	0	0			
PHF		.9	.9	.9	.9		.9	.9	.9			
Grade		0			0			0			0	
MC's (%)		0	0	0	0		0	0	0			
SU/RV's (%)		0	0	0	0		0	0	0			
CV's (%)		5	5	5	5		5	5	5			
PCE's		1.05	1.05	1.05	1.05		1.05	1.05	1.05			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	146	
Potential Capacity: (pcph)	1168	
Movement Capacity: (pcph)	1168	
Prob. of Queue-free State:	1.00	

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	289	
Potential Capacity: (pcph)	1248	
Movement Capacity: (pcph)	1248	
Prob. of Queue-free State:	0.99	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.99	

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	182	
Potential Capacity: (pcph)	876	
Capacity Adjustment Factor due to Impeding Movements	0.99	
Movement Capacity: (pcph)	863	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	182	
Potential Capacity: (pcph)	831	
Major LT, Minor TH Impedance Factor:	0.99	
Adjusted Impedance Factor:	0.99	
Capacity Adjustment Factor due to Impeding Movements	0.99	
Movement Capacity: (pcph)	819	

****

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
WB L	18	1248		2.9	A	1.2

Intersection Delay = 0.1

Center For Microcomputers In Transportation

HCS: Unsignalized Intersection Release 2.1

****

File Name ENTPM02.HC0
Streets: (N-S) Plant entrance (E-W) Elliot
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/20/0
Other Information..... Construction volumes, PM Peak Hour, 2002

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0>	1<	0	0	0	0
Stop/Yield			N			N						
Volumes		21	2	2	4		285	0	15			
PHF		.9	.9	.9	.9		.9	.9	.9			
Grade		0			0			0			0	
MC's (%)		0	0	0	0		0	0	0			
SU/RV's (%)		0	0	0	0		0	0	0			
CV's (%)		5	5	5	5		5	5	5			
PCE's		1.05	1.05	1.05	1.05		1.05	1.05	1.05			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	22	
Potential Capacity: (pcph)	1350	
Movement Capacity: (pcph)	1350	
Prob. of Queue-free State:	0.99	

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	23	
Potential Capacity: (pcph)	1672	
Movement Capacity: (pcph)	1672	
Prob. of Queue-free State:	1.00	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	1.00	

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	28	
Potential Capacity: (pcph)	1055	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	1054	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	28	
Potential Capacity: (pcph)	1020	
Major LT, Minor TH Impedance Factor:	1.00	
Adjusted Impedance Factor:	1.00	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	1019	

****

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
NB L	333	1019 >		>	>	
			1032	5.3	B	5.3
NB R	18	1350 >		>	>	
WB L	2	1672		2.2	A	0.7

Intersection Delay = 4.8

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Elliot Road west of Proposed Plant, 2002
ANALYST..... EJD
TIME OF ANALYSIS..... AM Peak
DATE OF ANALYSIS..... 03-20-2000
OTHER INFORMATION.... Includes construction traffic

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	5
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	4
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.9
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	7 / 93
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	10

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.74	.91
B	2.2	2	2.5	1	.74	.89
C	2.2	2	2.5	1	.74	.89
D	2	1.6	1.6	1	.74	.93
E	2	1.6	1.6	1	.74	.93

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 310
ACTUAL FLOW RATE: 344

LOS	SERVICE FLOW RATE	V/C
A	283	.15
B	500	.27
C	796	.43
D	1235	.64
E	1929	1

LOS FOR GIVEN CONDITIONS: B

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Elliot Road west of Proposed Plant, 2002
ANALYST..... EJD
TIME OF ANALYSIS..... PM Peak Hour
DATE OF ANALYSIS..... 03-20-2000
OTHER INFORMATION.... Includes construction traffic

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	5
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	4
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.9
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	8 / 92
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	10

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.74	.91
B	2.2	2	2.5	1	.74	.89
C	2.2	2	2.5	1	.74	.89
D	2	1.6	1.6	1	.74	.93
E	2	1.6	1.6	1	.74	.93

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 312
ACTUAL FLOW RATE: 347

LOS	SERVICE FLOW RATE	V/C
A	283	.15
B	500	.27
C	796	.43
D	1235	.64
E	1929	1

LOS FOR GIVEN CONDITIONS: B

Center For Microcomputers In Transportation
HCS: Unsignalized Intersection Release 2.1 Page 1
****

File Name PVAM02RT.HC0
Streets: (N-S) Palo Verde entrance (E-W) Wintersburg Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/20/0
Other Information..... Construction Traffic, AM Peak Hour, 2002

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0	0	0	0>	0<	0
Stop/Yield			N			N						
Volumes		6	39	582	290					0		24
PHF		.9	.9	.9	.9					.9		.9
Grade		0			0			0			0	
MC's (%)		0	0	0	0					0		0
SU/RV's (%)		0	0	0	0					0		0
CV's (%)		5	5	5	5					5		5
PCE's		1.05	1.05	1.05	1.05					1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	26	
Potential Capacity: (pcph)	1343	
Movement Capacity: (pcph)	1343	
Prob. of Queue-free State:	0.98	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	45	
Potential Capacity: (pcph)	1632	
Movement Capacity: (pcph)	1632	
Prob. of Queue-free State:	0.58	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.48	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	898	
Potential Capacity: (pcph)	320	
Major LT, Minor TH Impedance Factor:	0.48	
Adjusted Impedance Factor:	0.48	
Capacity Adjustment Factor due to Impeding Movements	0.48	
Movement Capacity: (pcph)	154	

****

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
WB	R	28	1343 >	1343	> 2.7	> A	
SB	L	679	1632		3.8	A	2.5

Intersection Delay = 2.4

Center For Microcomputers In Transportation
HCS: Unsignalized Intersection Release 2.1 Page 1
****

File Name PVPM02RT.HC0
Streets: (N-S) Palo Verde entrance (E-W) Wintersburg Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/20/0
Other Information..... Construction Traffic, PM Peak Hour, 2002

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0	0	0	0>	0<	0
Stop/Yield			N			N						
Volumes		288	1	37	5					8		499
PHF		.9	.9	.9	.9					.9		.9
Grade		0			0			0			0	
MC's (%)		0	0	0	0					0		0
SU/RV's (%)		0	0	0	0					0		0
CV's (%)		5	5	5	5					5		5
PCE's		1.05	1.05	1.05	1.05					1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	288	
Potential Capacity: (pcph)	989	
Movement Capacity: (pcph)	989	
Prob. of Queue-free State:	0.41	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	289	
Potential Capacity: (pcph)	1248	
Movement Capacity: (pcph)	1248	
Prob. of Queue-free State:	0.97	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.97	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	330	
Potential Capacity: (pcph)	682	
Major LT, Minor TH Impedance Factor:	0.97	
Adjusted Impedance Factor:	0.97	
Capacity Adjustment Factor due to Impeding Movements	0.97	
Movement Capacity: (pcph)	658	

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
WB	L	9	658 >	981	9.2	B	9.2
WB	R	582	989 >				
SB	L	43	1248		3.0	A	1.9

Intersection Delay = 5.5

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Wintersburg Road s/o Salome Highway
ANALYST..... EJD
TIME OF ANALYSIS..... AM Peak Hour
DATE OF ANALYSIS..... 03-23-2000
OTHER INFORMATION.... Construction traffic (2002)

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	1
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	1
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	4 / 96
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	16

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.73	.99
B	2.2	2	2.5	1	.73	.99
C	2.2	2	2.5	1	.73	.99
D	2	1.6	1.6	1	.73	.99
E	2	1.6	1.6	1	.73	.99

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 954
ACTUAL FLOW RATE: 954

LOS	SERVICE FLOW RATE	V/C
A	243	.12
B	485	.24
C	788	.39
D	1255	.62
E	2024	1

LOS FOR GIVEN CONDITIONS: D

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Wintersburg Road s/o Salome Highway
ANALYST..... EJD
TIME OF ANALYSIS..... PM Peak Hour
DATE OF ANALYSIS..... 03-23-2000
OTHER INFORMATION.... Construction traffic (2002)

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	1
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	1
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	5 / 95
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	16

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.73	.99
B	2.2	2	2.5	1	.73	.99
C	2.2	2	2.5	1	.73	.99
D	2	1.6	1.6	1	.73	.99
E	2	1.6	1.6	1	.73	.99

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 870
ACTUAL FLOW RATE: 870

LOS	SERVICE FLOW RATE	V/C
A	243	.12
B	485	.24
C	788	.39
D	1255	.62
E	2024	1

LOS FOR GIVEN CONDITIONS: D

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 03-20-2000
Center For Microcomputers In Transportation

Streets: (E-W) Salome Highway (N-S) Wintersburg Road
Analyst: EJD File Name: WSALAM02.HC9
Area Type: Other 3-20-0 6-7 AM
Comment: Construction traffic, AM Peak Hour, 2002

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	<	1	1	<	>	1	1
Volumes	2	11	41	169	5	10	2	28	10	1	755	1
PHF or PK15	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Lane Width	11.0	11.0	11.0	10.0	12.0		12.0	12.0			12.0	12.0
Grade		0			0			0			0	
% Heavy Veh	5	5	5	5	5	5	5	5	5	5	5	5
Parking	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type	3	3	3	3	3		3	3			3	3
RTOR Vols			20			5			5			0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	*				NB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
WB	Left	*				SB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		18.0A				Green		44.0P			
Yellow/AR		4.0				Yellow/AR		4.0			

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	437	1611	0.005	0.271	12.0	B	12.2	B
	T	475	1749	0.025	0.271	12.1	B		
	R	404	1487	0.059	0.271	12.2	B		
WB	L	421	1551	0.447	0.271	14.2	B	14.1	B
	TR	458	1687	0.024	0.271	12.1	B		
NB	L	104	161	0.019	0.643	2.9	A	2.9	A
	TR	1139	1772	0.032	0.643	2.9	A		
SB	LT	1163	1809	0.722	0.643	7.0	B	6.9	B
	R	989	1538	0.001	0.643	2.9	A		

Intersection Delay = 8.3 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.640

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 03-20-2000
Center For Microcomputers In Transportation

Streets: (E-W) Salome Highway (N-S) Wintersburg Road
Analyst: EJD File Name: WSALPM02.HC9
Area Type: Other 3-20-0 ~~6-7 AM~~ 5-6 PM
Comment: Construction traffic, PM Peak Hour, 2002

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	<	1	1	<	>	1	1
Volumes	2	13	6	9	15	3	36	668	166	11	23	8
PHF or PK15	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Lane Width	11.0	11.0	11.0	10.0	12.0		12.0	12.0			12.0	12.0
Grade		0			0			0			0	
% Heavy Veh	5	5	5	5	5	5	5	5	5	5	5	5
Parking	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type	3	3	3	3	3		3	3			3	3
RTOR Vols			3			1			83			4
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	*				NB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
WB	Left	*				SB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		18.0A				Green		44.0P			
Yellow/AR		4.0				Yellow/AR		4.0			

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	427	1573	0.005	0.271	12.0	B	12.1	B
	T	475	1749	0.029	0.271	12.1	B		
	R	404	1487	0.010	0.271	12.0	B		
WB	L	419	1542	0.024	0.271	12.1	B	12.1	B
	TR	483	1780	0.039	0.271	12.1	B		
NB	L	991	1542	0.040	0.643	3.0	A	6.9	B
	TR	1144	1780	0.729	0.643	7.1	B		
SB	LT	827	1287	0.046	0.643	3.0	A	3.0	A
	R	989	1538	0.005	0.643	2.9	A		

Intersection Delay = 7.0 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.524

Center For Microcomputers In Transportation

HCS: Unsignalized Intersection Release 2.1

****

File Name 339SAM02.HC0
Streets: (N-S) 339th Avenue (E-W) Salome Highway
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/20/0
Other Information..... Construction traffic, AM Peak Hour, 2002

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0>	1	0	0	1<	0	0>	1<	0	0>	0<	0
Stop/Yield			N			N						
Volumes	6	25			170	5	2	0	0	8		30
PHF	.9	.9			.9	.9	.9	.9	.9	.9		.9
Grade		0			0			0			0	
MC's (%)	0	0			0	0	0	0	0	0		0
SU/RV's (%)	0	0			0	0	0	0	0	0		0
CV's (%)	5	5			5	5	5	5	5	5		5
PCE's	1.05	1.05			1.05	1.05	1.05	1.05	1.05	1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	25	172
Potential Capacity: (pcph)	1345	1133
Movement Capacity: (pcph)	1345	1133
Prob. of Queue-free State:	1.00	0.97

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		175
Potential Capacity: (pcph)		1415
Movement Capacity: (pcph)		1415
Prob. of Queue-free State:		1.00
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	206	
Potential Capacity: (pcph)	851	
Capacity Adjustment Factor due to Impeding Movements	0.99	
Movement Capacity: (pcph)	847	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	218	204
Potential Capacity: (pcph)	792	807
Major LT, Minor TH Impedance Factor:	0.99	0.99
Adjusted Impedance Factor:	0.99	1.00
Capacity Adjustment Factor due to Impeding Movements	0.96	1.00
Movement Capacity: (pcph)	764	804

****

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
NB L	2	764 >	764	> 4.7	> A	
SB L	9	804 >		>	>	
			1045	3.6	A	3.6
SB R	35	1133 >		>	>	
EB L	7	1415		2.6	A	0.5

Intersection Delay = 0.7

****

File Name 339SPM02.HC0
Streets: (N-S) 339th Avenue (E-W) Salome Highway
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/20/0
Other Information..... Construction traffic, PM Peak Hour, 2002

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0>	1	0	0	1<	0	0>	1<	0	0>	0<	0
Stop/Yield			N			N						
Volumes	23	189			31	17	0	0	0	7		7
PHF	.9	.9			.9	.9	.9	.9	.9	.9		.9
Grade		0			0			0			0	
MC's (%)	0	0			0	0	0	0	0	0		0
SU/RV's (%)	0	0			0	0	0	0	0	0		0
CV's (%)	5	5			5	5	5	5	5	5		5
PCE's	1.05	1.05			1.05	1.05	1.05	1.05	1.05	1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	189	40
Potential Capacity: (pcph)	1111	1321
Movement Capacity: (pcph)	1111	1321
Prob. of Queue-free State:	1.00	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		48
Potential Capacity: (pcph)		1626
Movement Capacity: (pcph)		1626
Prob. of Queue-free State:		0.98
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:		0.98

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	260	
Potential Capacity: (pcph)	797	
Capacity Adjustment Factor due to Impeding Movements	0.98	
Movement Capacity: (pcph)	782	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	255	252
Potential Capacity: (pcph)	754	757
Major LT, Minor TH Impedance Factor:	0.98	0.98
Adjusted Impedance Factor:	0.98	0.99
Capacity Adjustment Factor due to Impeding Movements	0.97	0.99
Movement Capacity: (pcph)	735	746

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
SB L	8	746 >	954	3.8	A	3.8
SB R	8	1321 >		>	>	
EB L	27	1626		2.3	A	0.2

Intersection Delay = 0.4

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 03-20-2000
Center For Microcomputers In Transportation

Streets: (E-W) I-10 ramps (N-S) Wintersburg Road
Analyst: EJD File Name: 10WSAM02.HC9
Area Type: Other 3-20-0 6-7 am
Comment: Construction traffic, AM Peak Hour, 2002

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes				1		1		> 1			1	<
Volumes				684		12	2		7		48	2
PHF or PK15				0.90		0.90	0.90		0.90		0.90	0.90
Lane Width				12.0		12.0		12.0			12.0	
Grade					0			3			0	
% Heavy Veh				5		2	5		5		5	5
Parking				(Y/N) N			(Y/N) N			(Y/N) N		
Bus Stops						0			0			0
Con. Peds			0			0			0			0
Ped Button				(Y/N) N			(Y/N) N			(Y/N) N		
Arr Type				3		3		3			3	
RTOR Vols						0			0			0
Lost Time				3.00		3.00	3.00		3.00		3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4			5	6	7	8
EB Left					NB	Left	*			
Thru						Thru	*			
Right						Right				
Peds						Peds				
WB Left		*			SB	Left				
Thru		*				Thru	*			
Right		*				Right	*			
Peds						Peds				
NB Right					EB	Right				
SB Right					WB	Right				
Green	40.0A				Green		22.0P			
Yellow/AR	4.0				Yellow/AR		4.0			

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	L	1007	1719	0.755	0.586	9.3	B	9.2	B
	R	927	1583	0.014	0.586	3.9	A		
NB	LT	576	1754	0.017	0.329	10.3	B	10.3	B
SB	TR	532	1619	0.103	0.329	10.6	B	10.6	B

Intersection Delay = 9.3 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.521

Center For Microcomputers In Transportation
HCS: Unsignalized Intersection Release 2.1 Page 1
****

File Name 10WUPM02.HC0
Streets: (N-S) Wintersburg Road (E-W) I-10 Eastbound ramps
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/20/0
Other Information..... Construction traffic, PM Peak Hour, 2002

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0>	1<	0	0	0	0
Stop/Yield			N			N						
Volumes		42	595	13	35		0	0	4			
PHF		.9	.9	.9	.9		.9	.9	.9			
Grade		0			0			0			0	
MC's (%)		0	0	0	0		0	0	0			
SU/RV's (%)		0	0	0	0		0	0	0			
CV's (%)		5	5	5	5		5	5	5			
PCE's		1.05	1.05	1.05	1.05		1.05	1.05	1.05			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		35
Potential Capacity: (pcph)		1329
Movement Capacity: (pcph)		1329
Prob. of Queue-free State:		1.00

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	637	
Potential Capacity: (pcph)	852	
Movement Capacity: (pcph)	852	
Prob. of Queue-free State:	0.98	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.98	

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		685
Potential Capacity: (pcph)		477
Capacity Adjustment Factor due to Impeding Movements		0.98
Movement Capacity: (pcph)		468
Prob. of Queue-free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		388
Potential Capacity: (pcph)		631
Major LT, Minor TH Impedance Factor:		0.98
Adjusted Impedance Factor:		0.98
Capacity Adjustment Factor due to Impeding Movements		0.98
Movement Capacity: (pcph)		620

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
EB	R	4	1329 >	1329	> 2.7	> A	
SB	L	15	852		4.3	A	1.2

Intersection Delay = 0.1

APPENDIX D

OPERATION TRAFFIC (2003)
HIGHWAY CAPACITY SOFTWARE OUTPUT

****

File Name ENTAM03.HC0
Streets: (N-S) Plant entrance (E-W) Elliot
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/21/0
Other Information..... Operational volumes, AM Peak Hour, 2003

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0>	1<	0	0	0	0
Stop/Yield			N			N						
Volumes		4	9	1	22		9	0	1			
PHF		.9	.9	.9	.9		.9	.9	.9			
Grade		0			0			0			0	
MC's (%)		0	0	0	0		0	0	0			
SU/RV's (%)		0	0	0	0		0	0	0			
CV's (%)		5	5	5	5		5	5	5			
PCE's		1.05	1.05	1.05	1.05		1.05	1.05	1.05			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	8	
Potential Capacity: (pcph)	1372	
Movement Capacity: (pcph)	1372	
Prob. of Queue-free State:	1.00	

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	13	
Potential Capacity: (pcph)	1690	
Movement Capacity: (pcph)	1690	
Prob. of Queue-free State:	1.00	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	1.00	

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	32	
Potential Capacity: (pcph)	1050	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	1049	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	32	
Potential Capacity: (pcph)	1015	
Major LT, Minor TH Impedance Factor:	1.00	
Adjusted Impedance Factor:	1.00	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	1014	

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
NB	L	10	1014 >	1039	> 3.5	> A	3.5
NB	R	1	1372 >		>	>	
WB	L	1	1690		2.1	A	0.1

Intersection Delay = 0.8

****

File Name ENTPM03.HC0
Streets: (N-S) Plant entrance (E-W) Elliot
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/21/0
Other Information..... Operational volumes, PM Peak Hour, 2003

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0>	1<	0	0	0	0
Stop/Yield			N			N						
Volumes		22	12	4	5		9	0	1			
PHF		.9	.9	.9	.9		.9	.9	.9			
Grade		0			0			0			0	
MC's (%)		0	0	0	0		0	0	0			
SU/RV's (%)		0	0	0	0		0	0	0			
CV's (%)		5	5	5	5		5	5	5			
PCE's		1.05	1.05	1.05	1.05		1.05	1.05	1.05			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	28	
Potential Capacity: (pcph)	1340	
Movement Capacity: (pcph)	1340	
Prob. of Queue-free State:	1.00	

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	34	
Potential Capacity: (pcph)	1652	
Movement Capacity: (pcph)	1652	
Prob. of Queue-free State:	1.00	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	1.00	

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	37	
Potential Capacity: (pcph)	1043	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	1040	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	37	
Potential Capacity: (pcph)	1008	
Major LT, Minor TH Impedance Factor:	1.00	
Adjusted Impedance Factor:	1.00	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	1006	

****

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
NB L	10	1006 >	1029	3.5	A	3.5
NB R	1	1340 >		>	>	
WB L	4	1652		2.2	A	1.0

Intersection Delay = 0.8

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Elliot Road at Proposed Plant, 2003
ANALYST..... EJD
TIME OF ANALYSIS..... AM Peak Hour
DATE OF ANALYSIS..... 03-21-2000
OTHER INFORMATION.... Operational Traffic

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	5
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	4
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.9
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	42 / 58
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	10

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.95	.91
B	2.2	2	2.5	1	.95	.89
C	2.2	2	2.5	1	.95	.89
D	2	1.6	1.6	1	.95	.93
E	2	1.6	1.6	1	.95	.93

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 44
ACTUAL FLOW RATE: 49

LOS	SERVICE FLOW RATE	V/C
A	363	.15
B	641	.27
C	1021	.43
D	1585	.64
E	2477	1

LOS FOR GIVEN CONDITIONS: A

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... ELLIOT ROAD AT PROPOSED PLANT, 2003
ANALYST..... EJD
TIME OF ANALYSIS..... PM PEAK HOUR
DATE OF ANALYSIS..... 03-21-2000
OTHER INFORMATION.... OPERATIONAL TRAFFIC

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	5
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	4
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	.9
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	26 / 74
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	10

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.87	.91
B	2.2	2	2.5	1	.87	.89
C	2.2	2	2.5	1	.87	.89
D	2	1.6	1.6	1	.87	.93
E	2	1.6	1.6	1	.87	.93

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 43
ACTUAL FLOW RATE: 48

LOS	SERVICE FLOW RATE	V/C
A	333	.15
B	587	.27
C	935	.43
D	1452	.64
E	2268	1

LOS FOR GIVEN CONDITIONS: A

Center For Microcomputers In Transportation
HCS: Unsignalized Intersection Release 2.1 Page 1
****

File Name PVAM03RT.HC0
Streets: (N-S) Palo Verde entrance (E-W) Wintersburg Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/21/0
Other Information..... Operational Traffic, AM Peak Hour, 2003

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0	0	0	0>	0<	0
Stop/Yield			N			N						
Volumes		15	39	589	14					0		24
PHF		.9	.9	.9	.9					.9		.9
Grade		0			0			0			0	
MC's (%)		0	0	0	0					0		0
SU/RV's (%)		0	0	0	0					0		0
CV's (%)		5	5	5	5					5		5
PCE's		1.05	1.05	1.05	1.05					1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	34	
Potential Capacity: (pcph)	1331	
Movement Capacity: (pcph)	1331	
Prob. of Queue-free State:	0.98	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	54	
Potential Capacity: (pcph)	1616	
Movement Capacity: (pcph)	1616	
Prob. of Queue-free State:	0.57	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.57	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	638	
Potential Capacity: (pcph)	452	
Major LT, Minor TH Impedance Factor:	0.57	
Adjusted Impedance Factor:	0.57	
Capacity Adjustment Factor due to Impeding Movements	0.57	
Movement Capacity: (pcph)	258	

****

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
WB R	28	1331 >	1331	> 2.8	> A	
SB L	687	1616		3.9	A	3.7

Intersection Delay = 3.3

****

File Name PVPM03RT.HC0
Streets: (N-S) Palo Verde entrance (E-W) Wintersburg Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/21/0
Other Information..... Operational Traffic, PM Peak Hour, 2003

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0	0	0	0>	0<	0
Stop/Yield			N			N						
Volumes		12	1	37	14					8		504
PHF		.9	.9	.9	.9					.9		.9
Grade		0			0			0			0	
MC's (%)		0	0	0	0					0		0
SU/RV's (%)		0	0	0	0					0		0
CV's (%)		5	5	5	5					5		5
PCE's		1.05	1.05	1.05	1.05					1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	12	
Potential Capacity: (pcph)	1365	
Movement Capacity: (pcph)	1365	
Prob. of Queue-free State:	0.57	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	13	
Potential Capacity: (pcph)	1690	
Movement Capacity: (pcph)	1690	
Prob. of Queue-free State:	0.97	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.97	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	64	
Potential Capacity: (pcph)	972	
Major LT, Minor TH Impedance Factor:	0.97	
Adjusted Impedance Factor:	0.97	
Capacity Adjustment Factor due to Impeding Movements	0.97	
Movement Capacity: (pcph)	947	

****

Intersection Performance Summary

Movement	FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
WB L	9	947 >		>	>	
			1356	4.7	A	4.7
WB R	588	1365 >		>	>	
SB L	43	1690		2.2	A	1.2

Intersection Delay = 4.2

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Wintersburg Road s/o Salome Highway
ANALYST..... EJD
TIME OF ANALYSIS..... AM Peak Hour
DATE OF ANALYSIS..... 03-23-2000
OTHER INFORMATION.... Operational Traffic (2003)

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	1
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	1
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	7 / 93
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	16

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.74	.99
B	2.2	2	2.5	1	.74	.99
C	2.2	2	2.5	1	.74	.99
D	2	1.6	1.6	1	.74	.99
E	2	1.6	1.6	1	.74	.99

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 689
ACTUAL FLOW RATE: 689

LOS	SERVICE FLOW RATE	V/C
A	246	.12
B	491	.24
C	798	.39
D	1272	.62
E	2051	1

LOS FOR GIVEN CONDITIONS: C

1985 HCM:TWO-LANE HIGHWAYS
****

FACILITY LOCATION.... Wintersburg Road s/o Salome Highway
ANALYST..... EJD
TIME OF ANALYSIS..... PM Peak Hour
DATE OF ANALYSIS..... 03-23-2000
OTHER INFORMATION.... Operational Traffic (2003)

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	1
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	1
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	9 / 91
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	14
PERCENT NO PASSING ZONES.....	16

B) CORRECTION FACTORS

LEVEL TERRAIN

LOS	E_T	E_B	E_R	f_w	f_d	f_{HV}
A	2	1.8	2.2	1	.75	.99
B	2.2	2	2.5	1	.75	.99
C	2.2	2	2.5	1	.75	.99
D	2	1.6	1.6	1	.75	.99
E	2	1.6	1.6	1	.75	.99

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 607
ACTUAL FLOW RATE: 607

LOS	SERVICE FLOW RATE	V/C
A	250	.12
B	498	.24
C	809	.39
D	1289	.62
E	2079	1

LOS FOR GIVEN CONDITIONS: C

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 03-21-2000
Center For Microcomputers In Transportation

Streets: (E-W) Salome Highway (N-S) Wintersburg Road
Analyst: EJD File Name: WSALAM03.HC9
Area Type: Other 3-21-0 6-7 AM
Comment: Operational traffic, AM Peak Hour, 2003

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	<	1	1	<		> 1	1
Volumes	2	11	30	124	5	10	3	35	12	2	541	2
PHF or PK15	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Lane Width	11.0	11.0	11.0	10.0	12.0		12.0	12.0			12.0	12.0
Grade		0			0			0			0	
% Heavy Veh	5	5	5	5	5	5	5	5	5	5	5	5
Parking	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type	3	3	3	3	3		3	3			3	3
RTOR Vols			15			5			6			1
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	*				NB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
WB	Left	*				SB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		19.0A				Green		43.0P			
Yellow/AR		4.0				Yellow/AR		4.0			

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	460	1611	0.004	0.286	11.6	B	11.6	B
	T	500	1749	0.024	0.286	11.6	B		
	R	425	1487	0.038	0.286	11.7	B		
WB	L	443	1551	0.311	0.286	12.8	B	12.7	B
	TR	482	1687	0.023	0.286	11.6	B		
NB	L	183	291	0.016	0.629	3.2	A	3.2	A
	TR	1115	1774	0.040	0.629	3.2	A		
SB	LT	1137	1809	0.530	0.629	5.1	B	5.1	B
	R	967	1538	0.001	0.629	3.1	A		

Intersection Delay = 6.6 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.462

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 03-21-2000
Center For Microcomputers In Transportation

Streets: (E-W) Salome Highway (N-S) Wintersburg Road
Analyst: EJD File Name: WSALPM03.HC9
Area Type: Other 3-21-0 ~~6-7 AM~~ 5-6PM
Comment: Operational traffic, PM Peak Hour, 2003

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	<	1	1	<	>	1	1
Volumes	2	13	7	10	15	3	25	454	120	11	30	8
PHF or PK15	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Lane Width	11.0	11.0	11.0	10.0	12.0		12.0	12.0			12.0	12.0
Grade		0			0			0			0	
% Heavy Veh	5	5	5	5	5	5	5	5	5	5	5	5
Parking	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Bus Stops			0			0			0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N		(Y/N)	N		(Y/N)	N		(Y/N)	N	
Arr Type	3	3	3	3	3		3	3			3	3
RTOR Vols			3			1			60			4
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4			5	6	7	8
EB	Left	*				NB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
WB	Left	*				SB	Left	*			
	Thru	*					Thru	*			
	Right	*					Right	*			
	Peds						Peds				
NB	Right					EB	Right				
SB	Right					WB	Right				
Green		20.0A				Green		42.0P			
Yellow/AR		4.0				Yellow/AR		4.0			

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	472	1573	0.004	0.300	11.1	B	11.1	B
	T	525	1749	0.027	0.300	11.2	B		
	R	446	1487	0.011	0.300	11.1	B		
WB	L	463	1542	0.024	0.300	11.2	B	11.2	B
	TR	534	1780	0.036	0.300	11.2	B		
NB	L	929	1513	0.030	0.614	3.4	A	5.2	B
	TR	1092	1777	0.522	0.614	5.3	B		
SB	LT	886	1443	0.051	0.614	3.5	A	3.5	A
	R	945	1538	0.005	0.614	3.4	A		

Intersection Delay = 5.5 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.363

Center For Microcomputers In Transportation
HCS: Unsignalized Intersection Release 2.1 Page 1
****

File Name 339SAM03.HC0
Streets: (N-S) 339th Avenue (E-W) Salome Highway
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/21/0
Other Information..... Operational traffic - AM Peak Hour - 2003

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0>	1	0	0	1<	0	0>	1<	0	0>	0<	0
Stop/Yield			N			N						
Volumes	7	26			130	5	2	0	0	8		25
PHF	.9	.9			.9	.9	.9	.9	.9	.9		.9
Grade		0			0			0			0	
MC's (%)	0	0			0	0	0	0	0	0		0
SU/RV's (%)	0	0			0	0	0	0	0	0		0
CV's (%)	5	5			5	5	5	5	5	5		5
PCE's	1.05	1.05			1.05	1.05	1.05	1.05	1.05	1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	26	132
Potential Capacity: (pcph)	1343	1187
Movement Capacity: (pcph)	1343	1187
Prob. of Queue-free State:	1.00	0.98

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		135
Potential Capacity: (pcph)		1478
Movement Capacity: (pcph)		1478
Prob. of Queue-free State:		0.99
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	168	
Potential Capacity: (pcph)	890	
Capacity Adjustment Factor due to Impeding Movements	0.99	
Movement Capacity: (pcph)	885	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	178	166
Potential Capacity: (pcph)	835	849
Major LT, Minor TH Impedance Factor:	0.99	0.99
Adjusted Impedance Factor:	0.99	1.00
Capacity Adjustment Factor due to Impeding Movements	0.97	1.00
Movement Capacity: (pcph)	810	845

****

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)		SharedCap Csh(pcph)	Avg.Total Delay		LOS	Delay By App
NB	L	2	810	>	810	>	4.5	> A	
SB	L	9	845	>		>		>	
					1083		3.4	A	3.4
SB	R	29	1187	>		>		>	
EB	L	8	1478			2.4		A	0.5

Intersection Delay = 0.7

****

File Name 339SPM03.HC0
Streets: (N-S) 339th Avenue (E-W) Salome Highway
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/21/0
Other Information..... Operational traffic, PM Peak Hour, 2003

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0>	1	0	0	1<	0	0>	1<	0	0>	0<	0
Stop/Yield			N			N						
Volumes	18	150			32	17	0	0	0	7		8
PHF	.9	.9			.9	.9	.9	.9	.9	.9		.9
Grade		0			0			0			0	
MC's (%)	0	0			0	0	0	0	0	0		0
SU/RV's (%)	0	0			0	0	0	0	0	0		0
CV's (%)	5	5			5	5	5	5	5	5		5
PCE's	1.05	1.05			1.05	1.05	1.05	1.05	1.05	1.05		1.05

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	150	40
Potential Capacity: (pcph)	1162	1321
Movement Capacity: (pcph)	1162	1321
Prob. of Queue-free State:	1.00	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		49
Potential Capacity: (pcph)		1625
Movement Capacity: (pcph)		1625
Prob. of Queue-free State:		0.99
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	217	
Potential Capacity: (pcph)	839	
Capacity Adjustment Factor due to Impeding Movements	0.99	
Movement Capacity: (pcph)	827	
Prob. of Queue-free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	212	208
Potential Capacity: (pcph)	798	802
Major LT, Minor TH Impedance Factor:	0.99	0.99
Adjusted Impedance Factor:	0.99	0.99
Capacity Adjustment Factor due to Impeding Movements	0.98	0.99
Movement Capacity: (pcph)	781	793

****

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
SB	L	8	793 >	1006	> 3.6	> A	3.6
SB	R	9	1321 >		>	>	
EB	L	21	1625		2.2	A	0.2

Intersection Delay = 0.4

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 03-21-2000
Center For Microcomputers In Transportation

Streets: (E-W) I-10 ramps (N-S) Wintersburg Road
Analyst: EJD File Name: 10WSAM03.HC9
Area Type: Other 3-21-0 6-7 am
Comment: Operational traffic, AM Peak Hour, 2003

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes				1		1		> 1			1	<
Volumes				485		12	2		8		34	2
PHF or PK15				0.90		0.90	0.90	0.90			0.90	0.90
Lane Width				12.0		12.0		12.0			12.0	
Grade					0			3			0	
% Heavy Veh				5		2	5	5			5	5
Parking				(Y/N) N			(Y/N) N			(Y/N) N		
Bus Stops						0			0			0
Con. Peds			0			0			0			0
Ped Button				(Y/N) N			(Y/N) N			(Y/N) N		
Arr Type				3		3		3			3	
RTOR Vols						6			0			1
Lost Time				3.00		3.00	3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left					NB Left	*		
Thru					Thru	*		
Right					Right			
Peds					Peds			
WB Left		*			SB Left			
Thru		*			Thru	*		
Right		*			Right	*		
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	35.0A				Green	27.0P		
Yellow/AR	4.0				Yellow/AR	4.0		

Cycle Length: 70 secs Phase combination order: #1 #5

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	L	884	1719	0.610	0.514	8.7	B	8.6	B
	R	814	1583	0.007	0.514	5.4	B		
NB	LT	706	1764	0.016	0.400	8.2	B	8.2	B
SB	TR	648	1621	0.060	0.400	8.3	B	8.3	B

Intersection Delay = 8.6 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.369

Center For Microcomputers In Transportation
HCS: Unsignalized Intersection Release 2.1 Page 1
****

File Name 10WUPM03.HC0
Streets: (N-S) Wintersburg Road (E-W) I-10 Eastbound ramps
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... EJD
Date of Analysis..... 3/21/0
Other Information..... Operational traffic, PM Peak Hour, 2003

Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1<	0	0>	1	0	0>	1<	0	0	0	0
Stop/Yield			N			N						
Volumes		28	396	13	36		0	0	4			
PHF		.9	.9	.9	.9		.9	.9	.9			
Grade		0			0			0			0	
MC's (%)		0	0	0	0		0	0	0			
SU/RV's (%)		0	0	0	0		0	0	0			
CV's (%)		5	5	5	5		5	5	5			
PCE's		1.05	1.05	1.05	1.05		1.05	1.05	1.05			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

****

WorkSheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		36
Potential Capacity: (pcph)		1328
Movement Capacity: (pcph)		1328
Prob. of Queue-free State:		1.00

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	424	
Potential Capacity: (pcph)	1077	
Movement Capacity: (pcph)	1077	
Prob. of Queue-free State:	0.99	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-free State:	0.99	

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		473
Potential Capacity: (pcph)		616
Capacity Adjustment Factor due to Impeding Movements		0.99
Movement Capacity: (pcph)		607
Prob. of Queue-free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		275
Potential Capacity: (pcph)		734
Major LT, Minor TH Impedance Factor:		0.99
Adjusted Impedance Factor:		0.99
Capacity Adjustment Factor due to Impeding Movements		0.99
Movement Capacity: (pcph)		724

****

Intersection Performance Summary

Movement		FlowRate v(pcph)	MoveCap Cm(pcph)	SharedCap Csh(pcph)	Avg.Total Delay	LOS	Delay By App
EB	R	4	1328	> 1328	> 2.7	> A	
SB	L	15	1077		3.4	A	0.9

Intersection Delay = 0.1

Exhibit J-2
Cultural Resources

A CULTURAL RESOURCE SURVEY OF 440 ACRES OF PRIVATE LAND NEAR THE PALO VERDE NUCLEAR GENERATING STATION MARICOPA COUNTY, ARIZONA

Prepared for:

SA&B
Environmental & Chemical Consultants
for
Sempra Energy Resources, Inc.

Prepared by:

Mary-Ellen Walsh

Environmental Services Group
ENTRANCO, Inc.

Project Report 1999-010

January 2000

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ABSTRACT

Client: SA&B

Land: Private

Project Title: Sempra Survey

Project Description: Class III Survey for Proposed Electric Power Plant

Location: One mile south of the Palo Verde Nuclear Generating Station south of Elliott Road near Arlington, Arizona. Legal description is the West half and Southwest quarter, Northeast quarter and Northwest quarter, Southeast quarter of Section 15, Township 1 South, Range 6 West, Gila & Salt River, Baseline & Meridian. (Map Reference: USGS 7.5' Arlington Quad).

Number of Acres Surveyed: 440

Number of Sites: 2

List of Eligible Sites: None

List of Ineligible Sites: AZ T:9:58 (ASM) and AZ T:9:59 (ASM).

Comments: The survey resulted in the identification and recording of 11 isolated occurrences, three isolated features that are possibly historic in age, and two sites that are possibly historic. The information potential of these finds has been realized through their recording and none are considered to be eligible for inclusion in the National or Arizona Registers of Historic Places.

INTRODUCTION

This report presents the results of a non-collection cultural resource survey (intensive field inventory) of 440 acres of privately owned land located one mile south of the Palo Verde Nuclear Generating Station south of Elliott Road near Arlington, Maricopa County, Arizona. The survey was requested by SA&B Environmental & Chemical Consultants (SA&B) for Sempra Energy Resources (Sempra) to determine whether significant cultural resources exist within the parcel and could be negatively affected by the purchase and development of the parcel for a proposed electrical power generating station. For purposes of this investigation, the term "cultural resources" refers to prehistoric or historic archaeological sites or objects and potentially significant historic buildings or structures. Historic sites are those that are 50 years or older.

The survey was conducted under Entranco's Arizona Antiquities Act permits (1999-68BL and 2000-19BL). The original notice of intent was submitted to the Arizona State Museum (ASM) on November 28, 1999 and field survey of 400 acres occurred between November 30 and December 2, 1999. A second day of fieldwork was undertaken January 12, 2000 for an additional 40 acres after the ASM was notified. The survey was conducted by archaeologists Mary-Ellen Walsh (project director), Laurene Montero (principal investigator), Donelle Huffer and Linda Countryman (crew members). A total of 20 person days was expended on the field effort for this project, which was completed as Entranco Project No. 2-30-99250.

This project is considered a federal undertaking as defined in 36 CFR 800.16(y), because it will require permits from the US Environmental Protection Agency and the Federal Energy Regulatory Commission. The survey methods conformed to accepted professional standards and policies including the *Secretary of the Interior's Standards and Guidelines for Archeological and Historic Preservation Projects* and the ASM *Archaeological Site Recording Manual* (1993).

PROJECT CHARACTERISTICS

The 440-acre project area (study area) is located on the south side of Elliott Road approximately one mile south of the Palo Verde Nuclear Generating Station in Maricopa County (Figure 1) [west half (W ½) and southwest quarter (SW ¼) of the northeast quarter (NE ¼) and W ½ of the southeast quarter (SE ¼) of Section 15, Township 1 South, Range 6 West, Gila and Salt Baseline and Meridian.] A 500kV transmission line marks the center section line. The Southern-Pacific railroad (RR) track lies approximately 131 feet (ft.) west of the transmission line. A utility (telephone) line delineates the western boundary of the project area and a wire fence marks the southern edge.

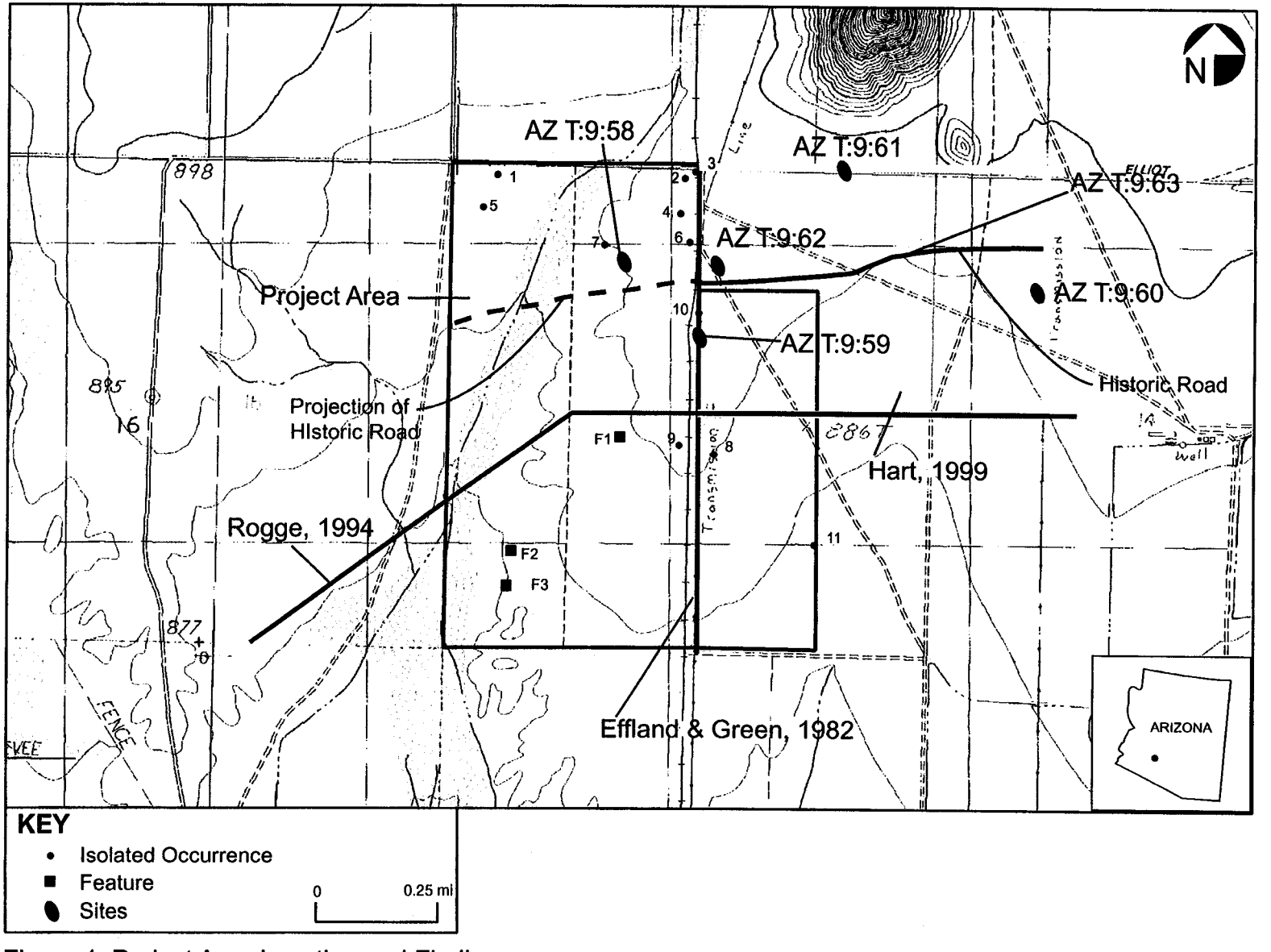

Figure 1. Project Area Location and Findings (Base Map USGS 7.5', Arlington Quad, 1996 provisional)

ENVIRONMENTAL SETTING

The study area lies at an elevation of between 868 and 895 ft. above mean sea level (amsl) and is located within the Lower Colorado subdivision of the Sonoran Desertscrub community (Brown 1984). The parcel is undeveloped and contains scattered scrub vegetation, including palo verde and mesquite, creosotebush, and various cacti, grasses and forbs (weeds). The Hassayampa River is located about seven miles to the east; however, several unnamed, small and ephemeral drainages traverse the project area (and are not necessarily indicated on the corresponding topographic map). A large, unnamed drainage located in the west half of the study area is densely vegetated with mesquite, paloverde, and grasses.

PREVIOUS RESEARCH

A Class I literature search of the project area and surrounding land was recently completed by SWCA, Inc., Environmental Consultants (SWCA) for SCS Engineers (Goodson 1999). SWCA examined records at the State Historic Preservation Office (SHPO) and the ASM. They reported no relevant information in the SHPO files. Site files at the ASM, however, listed two surveys in the project area (see Figure 1). These projects are briefly discussed below. Overall, the literature search indicated that there is very little evidence of prehistoric occupation or use in the study area. Historic activity represents short-term use and homesteading during the 1920s and 1930s. The record search indicated that there are no properties listed on the National Register of Historic Places (NRHP) within, or close to, the study area.

Archaeological Consulting Services, Ltd., conducted a north/south oriented survey for a 500 kV transmission line along the center section line but recorded no sites (Effland and Green 1982). A pipeline survey was conducted by Dames and Moore, Inc., and no cultural resources were recorded (Rogge 1994).

Entranco examined General Land Office (GLO) maps and title plats at the Bureau of Land Management (BLM) Public Records Office in Phoenix. The 1916 plat map, which is the only one available, does not indicate the presence of any structures in Section 15. According to related title plats, separate land claims for 320 acres in the E ½ of the section, for 160 acres in the W ½ of the W ½ of the section, and for 160 acres in the E ½ of the W ½ of Section 15 were filed during the 1920's.

Henry D. Wilkie, of Arlington, Arizona filed two claims for 160 acres each in the W ½ of Section 15 in 1926. There is no entry of the claim being contested, but a land patent for the entire 320 acres was granted to Mr. Bernard A. Van Wormer on August 12, 1930.

Luther L. Washam, also from Arlington, filed a claim with the GLO on November 30, 1923 for the East ½ of Section 15. Tully W. Benson contested the claim in March and September of 1927 (abated) and again in January of 1928. In July of 1928, Mr. Washam cancelled the entry for the claim. The E ½ of Section 15 was patented to Mr. Benson on September 27, 1933.

Northland Research, Inc., (Northland) conducted a Class III survey of 230 acres for the Salt River Project concurrent with the survey by Entranco. Northland's project area included the NE ¼ of Section 15 and the W ½ NW ¼ of Section 14 (see Figure 1). The two surveys overlapped coverage in the SW ¼ of the NE ¼ of Section 15. Northland's survey resulted in the discovery of a historic homestead site (AZ T:9:62 [ASM]), a historic road segment (AZ T:9:63 [ASM], and two historic trash scatters (AZ T:9:60 and 61 [ASM]) (David Hart, personal communication 1999). According to the GLO map, AZ T:9:63 (ASM), the historic road, traversed the western half of Section 15, which was surveyed by Entranco archaeologists. The road, however, was not visible during survey. Both Northland and Entranco archaeologists identified AZ T:9:59(ASM) in the overlapping survey area; the site was recorded by Entranco and is discussed below.

SURVEY METHODS AND RESULTS

The initial survey of 400 acres was conducted by three archaeologists on November 28 (Walsh, Montero, Huffer) and November 29, 1999 (Walsh, Huffer, Countryman). Two archaeologists (Walsh and Huffer) continued the survey on November 30 and recorded sites on December 1, 1999. An additional 40 acres was later added to the project; Walsh and Countryman completed the additional survey on January 12, 2000.

The survey was accomplished by walking a series of east/west transects, spaced between 15 and 20 meters (m) apart. Ground surface visibility varied between 60 and 100%. Only the wash in the western portion of the project area was relatively obscured due to the dense concentration of palo verde, mesquite and grasses. One hundred percent (100%) visibility and coverage, however, characterized all open areas.

This survey resulted in the identification and recording of 11 isolated occurrences (IO's), three isolated features and two archaeological sites. These findings are plotted in Figure 1. Some of the IO's are prehistoric artifacts, and others may date to within the past 50 to 80 years (Table 1). Three of the isolated occurrences are flakes (IO-1, IO2, and IO9). They are prehistoric in age, but cannot be assigned to a particular cultural phase due to the absence of diagnostic characteristics. A buffware sherd (IO-8), however, is typical of Hohokam manufacture, probably manufactured during the Sedentary or Classic period. The other IO's are historic or possibly historic in age and may represent

activity in the area as early as the 1920's, which corresponds to the time when homestead applications were first filed at the General Land Office.

Table 1. Isolated Occurrences

Field Number	Description	Quantity
1	Prehistoric Flake, tertiary; purple basalt	1
2	Prehistoric Core fragment; chert	1
3	Historic/modern vent-hole can	1
4	Historic/modern vent-hole can	1
5	Historic/modern vent-hole can	1
6	Historic/modern vent-hole can	1
7	Historic/modern vent-hole can	6
8	Prehistoric Buff Ware ceramic	1
9	Prehistoric Flake, primary; purple rhyolite	1
10	Historic/modern metal bucket	1
11	Historic/modern property corner marker identied as "49-A-1"	1

The three isolated rock features are probably historic to modern in age (Table 2). One feature is circular and two are possible linear alignments. None of the features are associated with artifacts. One possibility is that the features are property corner markers related to early homesteading.

Table 2. Isolated Features

Field Number	Description	Age
1	Rock Feature; circular; no artifacts	Historic to modern
2	Rock Feature; alignment; no artifacts	Historic to modern
3	Possible Rock Feature (cluster); no artifacts	Historic to modern

All pertinent information from the IO's and the three isolated features was recorded completely during the cultural resource survey. The isolated features

lack diagnostic temporal information and only minimal temporal information was obtained from the IO's. The IO's and features do not meet ASM site definition criteria and they are not considered to be National or Arizona-Register quality resources.

SITE DESCRIPTIONS

Both of the archaeological sites are trash deposits containing artifacts that may date beyond 50 years in age. One site, AZ T:9:58 (ASM), is located west of the RR track; the other site, AZ T:9:59(ASM) is located east of the RR track under the transmission line. Neither of the sites appears to have subsurface deposits.

AZ T:9:58 (ASM)

Location. This site is a historic/modern trash dump situated on a low ridge at an elevation of 890 ft. (271 m) amsl. It is located in the SW ¼ NE ¼ NW ¼ of Section 15 approximately 300 m south of Elliott Road and 240 m west of the railroad tracks.

Description. The site measures 42 m north/south by 55 m east/west and comprises five loci that may represent individual dumping events. Most of the site area is located on a low ridge, although several of the loci extend beyond the ridge top (Figure 2). A high density of disarticulated, burnt animal bones, possibly goat, is scattered across the ridge and in a few isolated areas down slope. The densest concentration of these remains is located along the southern half of the ridge. Historic and modern trash items occur above the burnt bone in six concentrations. In several areas, nondiagnostic medicine bottles are found in direct association with the bone deposits. The age of the burnt animal bone is not known. Because it underlies the trash, it may predate it. However, the trash may represent an older, secondary deposit that was dumped after the animal remains. Modern trash, including pull-tab cans, bottles and other glass, coffee cans and fence wire, is also present across the site.

Locus A is roughly 3 m north/south by 5 m east/west and contains around 30 vent-hole (matchstick filler) cans, a few other unspecified cans, and a paint bucket. Several of the vent-hole cans were measured in order to obtain temporal information. They all have diameters of 2-15/16 inch and heights of 3-14/16 inch. The cans each have crimped seams and two embossed rings. They fit the description for the Type 12 milk can in the guide compiled by Don Simonis (1997). These cans were manufactured between 1917 and 1929.

Locus B is situated about 25 m down slope (southeast) of Locus A and has a diameter of 3 m. It contains about 75 items, most of which are modern trash. However, about 10 possibly historic vent-hole cans and three meat cans are also

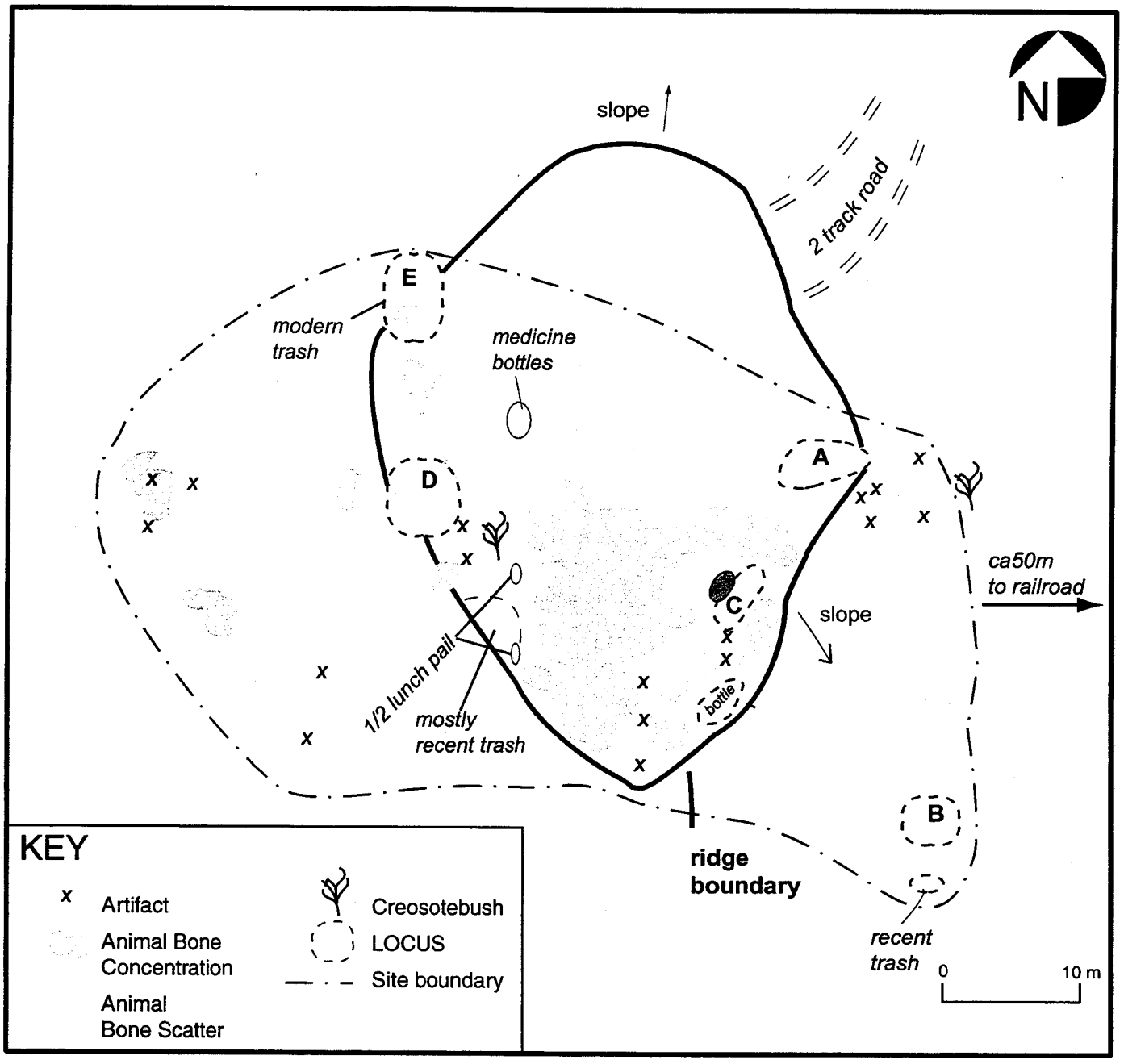

Figure 2. AZ T:9:58 (ASM)

present. Measured milk cans are Type 12, like those described above. The meat cans are nondiagnostic.

Locus C is about 6 m southwest of Locus A; it is about 4 m in length and 2 m in width. This area contains more modern trash than historic. Only a few (<5) Type 12 vent-hole cans were observed. Each can is stamped on top with the words "**EVAP MILK**" and the number "**923**".

Locus D is about 30 m west of Locus A and contains roughly one dozen Type 12 vent-hole cans among a greater deposit of modern trash (50-75 items). This area measures about 7 m north/south and 5 m east/west.

Locus E is located 10 m north of Locus D and comprises only modern trash including cans, bottles, small jars and containers for hair products. Between 30 and 50 items were observed.

Summary/Interpretation. The site is a multicomponent site containing historic and modern trash. Only a few of the artifacts are clearly historic in age. Most material spans historic and modern times. All of the trash lies above an extensive scatter of disarticulated and burnt animal remains. Although a concentration of medicine bottles appears to be associated with the faunal remains, the bottles are nondiagnostic and cannot be used to date the deposit. Consequently, it is not clear if the historic trash is a secondary deposit that pre-dates the faunal remains, or if it post-dates the faunal remains as suggested by its superposition. It is possible that the trash is associated with early homesteading. The faunal remains represent livestock/farming activity, but no data are available to determine its age or association.

Recommendations. Site AZ T:9:58 (ASM) is recommended as ineligible for inclusion in either the Arizona Register of Historic Places (ARHP) or the NRHP because it does not meet established criteria for inclusion. Although some of the material may date to the historic period (over 50 years ago), the site (a) is not associated with an event that has made a significant contribution to the broad patterns of history; (b) is not associated with the life of an individual significant in Arizona or national history; (c) does not represent the work of a master or a unique form of architecture and (d) is not likely to yield information important in history. The information potential of AZ T:9:58 (ASM) has been realized through its recording.

AZ T:9:59(ASM)

Location. This possibly historic trash scatter site is located in the NW ¼ SW ¼ NE ¼ of Section 15 under the 500 kV transmission line and approximately 540-m south of Elliott Road. The site lies on flat terrain at an elevation of approximately 895 ft. (272.7 m) amsl.

Description. The site measures roughly 5.5 m north/south by 3 m east/west (Figure 3). It comprises between 30 and 40 items, mostly cans, of which at least six styles are represented. The site also includes five pieces of clear glass, wire, an indeterminate metal disk, and an unknown metal object with a 4-inch flathead nail. One each of the different types of cans was measured (Table 3). One vent-hole milk corresponds to Type 14 of the milk can typology, which dates between 1920 and 1930 (Simonis 1997). A meat can is marked with the word "**ESTAB**", which occurred on meat cans after 1907 by federal mandate, and the number "**183**." None of the rest of the material is dateable.

Table 3. Can Measurements and Possible Type Correlations at AZ T:9:59(ASM)

Dimensions				
Height	**Width/ Diameter**	**Attributes**	**Type Category**	**Suggested Manufacture Date***
2 8/16"	2 7/16"	Vent-hole	Type 14 milk can	1920-1930
4 10/16"	3"	No vent-hole	Unknown	Historic to modern
4 8/16"	3 2/16" x 4 7/16"	Marking: **"TO OPEN PUNCH BOTH CORNERS"**	Probable Syrup	Probably Historic
1 15/16"	4 4/16"	Marking: **"ESTAB"** and **"183"**	Meat Can	Post 1907
6 12/16"	3 4/16"	Marking: **G**	Possible baking power	Probably Historic
4 10/16"	4"	Vent-hole	Possible fruit/vegetable	Historic to modern

*Vent-hole milk can dates from Simonis (1997)

Summary/Interpretation. This is a single-component site containing between 30 and 40 items of metal and glass. Only a few artifacts were diagnostic of the historic period (more than 50 years ago). Although the site may be associated with homesteading in the area during the 1920s and 1930s, it likely has a later component, as well.

Recommendations. This site is recommended as ineligible for either the ARHP or the NRHP because it does not meet established criteria for inclusion. Although some of the material may date to the historic period, the site (a) is not associated with an event that has made a significant contribution to the broad patterns of history; (b) is not associated with the life of an individual significant in Arizona or national history; (c) does not represent the work of a master or a unique form of architecture and (d) is not likely to yield information important in

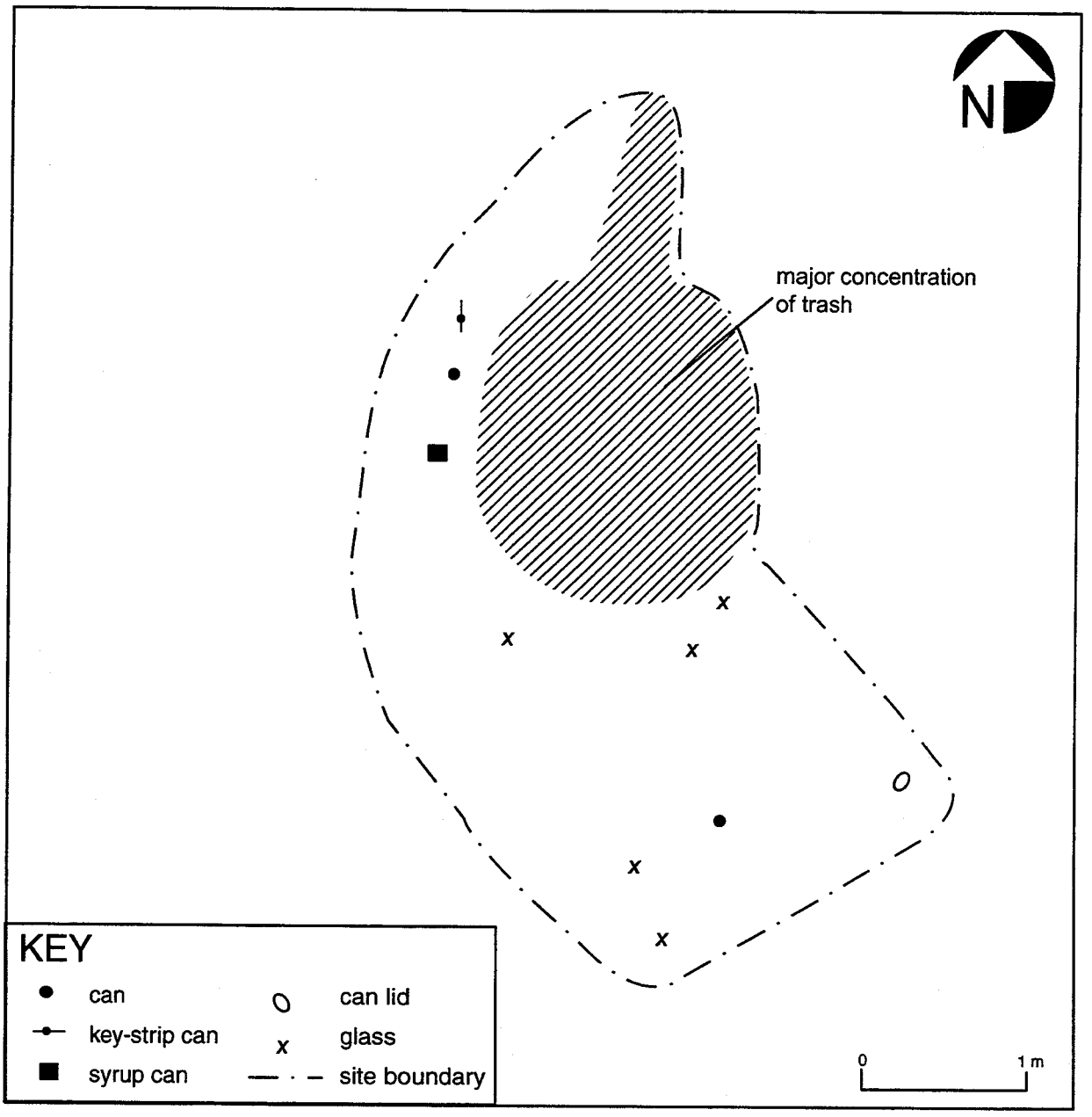

Figure 3. AZ T:9:59 (ASM)

history. The information potential of AZ T:9:59 (ASM) has been realized through its recording.

Conclusions and Recommendations

A cultural resource survey of 440 acres was conducted for SA&B in order to determine the presence, if any, of significant cultural resources in an area proposed for an electric power generating station. The survey was completed by Entranco archaeologists who identified and recorded 11 IO's, three isolated features and two historic sites, which are designated as AZ T:9:58 (ASM) and AZ T:9:59 (ASM).

The isolated features lack diagnostic temporal information and only minimal temporal information was obtained from the IO's. The IO's and isolated features do not meet ASM site definition criteria, and they are not considered to be National or Arizona-Register quality resources. Their limited information potential has been realized through recording.

AZ T:9:58 (ASM) is a multi-component site containing historic and modern trash and burnt animal bone. The earlier material may date to the 1920s and 1930s. AZ T:9:59 (ASM) represents a single dumping episode of historic trash. Limited diagnostic material also suggests the site may be contemporaneous with AZ T:9:59 (ASM).

The information potential of the two sites, AZ T:9:58(ASM) and AZ T:9:59(ASM), has been realized through their recording during survey. They are recommended as ineligible for both the NRHP and the ARHP because they do not meet any of the criteria of significance. Neither site (a) is associated with an event that has made a significant contribution to the broad patterns of history; (b) is associated with the life of an individual significant in Arizona or national history; (c) represents the work of a master or a unique form of architecture and (d) is likely to yield information important in history.

Based on these findings, Entranco recommends that no further cultural resource investigations are necessary in the project area. Pursuant to 36 CFR 800.4 (d), Entranco recommends a finding of "no historic properties affected" for the proposed undertaking. In the event that previously unreported cultural resources are identified during ground-disturbing activities, however, all work in the immediate vicinity should cease and a qualified archaeologist should be consulted to evaluate the nature and significance of the find.

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Exhibit J-3
Public Involvement Program

Community Relations Program
Mesquite Power, LLC

Introduction

Sempra Energy Resources (SER), in constructing and operating the proposed Mesquite Generating Station, will have a physical presence in the Greater Arlington community for years to come. It is therefore important that we also establish a strong community presence. Tapping into more than 100 years of Sempra Energy tradition, all efforts will be made to give back to those communities where we plan to operate and conduct business.

It is Sempra Energy's belief that that presence can only be firmly established by listening more than talking, particularly early on in the relationship building process. Aside from providing critical information to area residents and others about the proposed Mesquite Power project, Sempra representatives have listened from the beginning of this process to local, state and federal elected officials about community issues and needs.

Following their lead and counsel, Sempra representatives have listened as intently to neighbors, school superintendents, farmers, firemen, and others who truly make up the fabric of the community. Out of this process was formed a group of advisors, un-elected community members, who would help guide Sempra's community outreach program in the right direction.

The Mesquite Power Advisory Group has, and will provide:

- Input on community needs and issues, and
- Honest, critical review of construction and operating plans

SER has followed this process and we believe in doing so have developed a solid community relations program. The program and resulting relationships have allowed us to identify and address key community issues and needs that are of importance to residents now, and for years to come.

Below is a step by step process of our community relations evolvement in the Greater Arlington and Tonopah areas, and how that process has helped Sempra better understand how we can best become a valuable part of the community fabric.

Local, County and State Governmental Officials

<u>County Government</u>

Initial project meetings were held with Maricopa County Supervisors Mary Rose Wilcox and Jan Brewer. Their districts either have residents close to the proposed generating station, or are host to the project. The main objectives accomplished during these meetings included:

- Introduction to Sempra Energy and the Mesquite Power Project

- Request for a list of community leaders
- Obtaining input on major community issues concerning the project
- Discussion on potential community needs
- Invitation to visit Sempra Energy Resources El Dorado facility located in Boulder City, Nevada.

Supervisor Wilcox toured the El Dorado Project. Supervisor Brewer has been invited.

Meetings were held with the following other county supervisors to introduce Sempra Energy and the project, and to obtain their thoughts as it concerned the proposed project from a county-wide perspective. Issues surfacing included water use, air emissions, and transmission lines.

- Chairman Andy Kunasek
- Supervisor Fulton Brock
- Supervisor Don Stapely

State Government

Meetings were held with the following members of the State House of Representatives and the State Senate:

- Senator Ed Cirrillo
- Representative Mike Gleason
- Rep. Jerry Overton
- Speaker Pro Tem Joe Hart

In addition to introducing the company and the project, these introductions were valuable as there were several legislative measures being introduced at the time of those meetings concerning proposed merchant power plant projects in Arizona. The following is a summary of issues brought up during these meetings:

- Water
- Air quality
- Using Arizona resources and sending power out of state
- Land use

United States Government

To the extent it was necessary we briefed staff at Congressman Bob Stump's office, and Congressman Ed Pastor. We also notified United States Senator John McCain's and U.S. Senator's John Kyl's local Administrative Assistants.

Community Advisory Group

A community advisory group was developed based on input from these elected officials. Members of these groups are typically not elected officials but individuals respected by their peers. They were from the beginning known to be involved with and concerned about the facility and its potential impact on the community.

The first community advisory group meeting was held December 20 at a local restaurant in Avondale. Personal phone calls were made to invitees, and follow-up calls delivered the day before as a reminder. Supervisor Wilcox was present and introduced the Sempra Energy team to approximately 13 attendees. After a presentation by Sempra, a discussion of the proposed project took place wherein questions were asked and answered. Many issues were raised and some were identified as needing further review to ensure a proper response.

[It is important to understand that the Sempra meeting was perhaps the third or fourth merchant power plant meeting that some had attended, hosted by developers of other projects. The Sempra emphasis throughout this meeting, therefore, was less to tell about our project and what we thought the community needed, than to listen to their concerns and understand their needs as a community.]

A list of the names of community advisor attendees and issues raised can be found in **Attachment A.**

A second, follow-up advisory group meeting was held. Again, personal calls were made to invitees. On February 1, 2000, 17 invited members of the community attended this gathering including the proposed project's nearest neighbors, the local school superintendent, local farmers, and representatives from political offices, among others.

The focus of this meeting was (1) to provide feedback on issues raised at the December meeting, particularly concerning water impact to area wells and (2) determine the best way to provide information to the greater Arlington / Tonopah communities. The advisory group decided it was best to have two public Open Houses, one in Arlington and one in Tonopah. These gatherings should be developed, it was suggested, with stations set up to address specific issues and concerns. Individual meetings with key locals and neighbors were also encouraged.

A list of the names of community advisor attendees to the February 1 meeting can be found in **Attachment B,** and a list of the final Advisory Group members can found in **Attachment C.**

Individual Meetings

While plans were being made to hold Open House events in both Arlington and Tonopah, meetings with individual landowners, neighbors, and other suggested persons began. While there were a number of one-on-one meetings with political leaders and others prior to our first leaders meeting, numerous other meetings commenced upon the suggestion of our advisory group.

A list and chronological review of individuals with whom we met can be found in **Attachment D.**

While our initial meetings with county supervisors and members of the state legislature were important, Sempra had always maintained that it is the people nearest our proposed facility whose opinions mattered most; they are the ones most affected by all the issues surrounding this merchant power plant.

In our discussions with these individuals it became clear that the over-riding issue of concern was groundwater. We met and discussed the issue not only with elected officials, but also with our nearest neighbors and those who have farmed in the area for years.

On January 22, 2000 we had our first meeting with adjoining property owners to discuss each of the key issues. Water was the issue of greatest concern. Sempra took the unique approach – as a result of both the leaders and individual meetings – of committing to a groundwater study. This study includes monitoring of neighbor's wells during the on-site pump tests to determine not just the Sempra project impact on wells, but the cumulative impact of the additional proposed projects.

Sempra has worked closely with the neighbors on the issue of water in particular; we feel we have involved them every step of the way, and believe they would testify to that account. Such involvement has included invitations for residents to join the testing team at any and all of the actual tests.

Other issues addressed as a result of these individual meetings included noise, traffic, lighting impact, and land use for remaining unused site property and water property. Land use is also considered by Sempra Energy to be a driving issue among neighbors. As a result we proactively began to work with a Buckeye firm on developing a land use plan that addresses the needs and concerns of all of our neighbors.

A full list of issues raised by adjacent property owners and others can be found in **Attachment E.**

Answers to critical questions concerning air quality, lighting and noise had been prepared and shared with neighbors in many of these on-on-one meetings. Those that were not answered were subsequently researched and presented at either or both the Arlington and Tonopah Open Houses.

Open House

The objective of the Open House was to present all of the information possible about the proposed electric generating facility in a way that (1) could be appreciated by the layperson and (2) allowed people to meet informally with Sempra Energy representatives at a time of their choosing.

The first Open House was held at Arlington Elementary School on Saturday, March 4 from 10:00 a.m. to 2 p.m. Refreshments were served in the morning and a barbecue in the afternoon. Sempra Energy wanted to provide enough of an attraction for people to attend so that they could meet project representatives, and learn about the proposed facility.

An invitation letter, signed by members of the leaders group, was distributed to Arlington residents (see **Attachment F**).

The Open House successfully attracted approximately 130 people from the Greater Arlington community. Mesquite Power included as part of the program a fundraiser for the Arlington Lion's Club, as well as a fundraiser for the 8th grade class at Arlington Elementary. The leaders group distributed about 460 invitations. In addition, another

600 invitation letters were distributed to business organizations throughout the Buckeye, Palo Verde, Wintersburg, Arlington, and Tonopah area.

School children were given 100 letters to take home to their parents.

"Booths," or stations were set up so that the attendee could move at his or her leisure from issue to issue. Sempra Energy representatives -- experts covering everything from water to air quality – were on hand to meet and discuss the issues with interested residents.

Elected officials and their staff were also present. A full list of attendees can be found in **Attachment G.**

On Saturday, April 8, 2000, Sempra Energy duplicated these efforts at an Open House event held at the Ruth Fisher School in Tonopah, Arizona. Working through the Tonopah Valley Community Council nearly 1,000 letters were sent by mail inviting residents of the Greater Tonopah community to attend the second Sempra Energy / Mesquite Power Open House **(Attachment H)**. As before, members of the leaders group, requesting that people spend part of their morning or afternoon learning about the company and the project, signed and distributed invitation letters.

A list of those who signed in can be found in **Attachment I** (while only 59 signed the welcome sheet, there was a head count of approximately 140 people throughout the day).

Sempra Energy was encouraged by the response to these events and the overall favorable comments received about how information was provided and the accessibility of Sempra representatives. If our leaders group deems it necessary, we would consider similar Open Houses in the future as the project progresses.

Agency Meetings

As part of our effort to engage all necessary agencies affected by our project, or to provide information to those, whom could benefit from the existence of our facility, the following meetings have been held with representatives of:

- Arizona Game & Fish
- ASU College of Business – L. William Seidman Research Institute
- Duck Unlimited
- Buckeye Valley Fire District
- Tonopah Fire District
- Tonopah Valley Association
- Tonopah Valley Community Council
- University of Arizona, Arid Land Studies
- Ruth Fisher School District
- Arlington School District
- Maricopa County Planning and Zoning Community Meetings in Arlington & Harquahala.
- Buckeye Irrigation District
- Phoenix Zoo

Sempra Energy / Mesquite Power feels that ongoing communication with these and other groups is key to our success.

Conclusion

The Mesquite Power project by Sempra Energy offers a clean, safe and reliable source of energy. The team at Sempra also feels it is important to listen to the needs and concerns of the community. From there we hope to provide a project that is not only technologically efficient, but also sensitive to concerns, and responsive to the needs of our nearest neighbors and members of the Greater Arlington / Tonopah communities.

ATTACHMENT A

SEMPRA / Mesquite Power Community Advisory Group Meeting
December 20, 1999 / Attendees

Community Representatives

1. Abraham Harris, Member, Maricopa County Planning & Zoning Commission
2. Lyle King, Farmer
3. Ron Fletcher, Arlington School Superintendent
4. Les Meredith, Lions Club
5. Doris Heisler, Tonopah Valley Community Council, Tonopah Valley Authority
6. Bill Lanford, Buckeye Valley Fire District
7. Ron Sattelmaier, Tonopah Valley Fire District
8. Carter Gable, Arlington Canal Company
9. Stan Ashby, Roosevelt Irrigation District
10. Barbara Downing, Arlington Water Company

Public Official Representatives

Supervisor Mary Rose Wilcox
Kevin Tyne representing Supervisor Jan Brewer

Issues/Needs

1. Water;
    a. Volume, effect of pull down on cumulative basis
    b. Transport process
    c. Depth of wells
2. Air Quality
3. Visual Impact (i.e. lighting)
4. Number of new transmission power lines and their location
5. Traffic
6. Enhance school resources, parks, transportation buses
7. Parks and recreation / wildlife preserve / no golf course
8. End use of water, salt content problems. Can water be recharged?

ATTACHMENT A

9. Use of local workforce / vendors
10. Training workforce
11. Host fee / create a fund for community impacted by project
12. Land use planning
13. Water recharge rate. Estmate of water drawdown rate
14. Life span of plant (30 years)
15. How to get word out to community regarding this project
16. Public meetings – how to structure
17. Use feedback cards for additional community input

ATTACHMENT B

SEMPRA/Mesquite Energy Community Advisory Group Meeting
February 1, 2000

Community Representatives

1. Donna Staggs, Resident
2. Neil Peters, Retired
3. Abraham Harris, Member, Maricopa County Planning & Zoning Commission
4. Pam Miller, Retired Teacher
5. Lyle King, Farmer
6. Ron Fletcher, Arlington School Superintendent
7. Les Meredith, Lions Club
8. Chris Larson, CATS CLUB
9. Cheryl Sawyer, 4-H Agriculture
10. Patti Kuhn, Resident
11. Doris Heisler, Tonopah Valley Community Council, Tonopah Valley Authority
12. Bill Lanford, Buckeye Valley Fire District
13. Jan Hauk, Buckeye Valley Fire District
14. Harold Branch, Neighbor
15. Ginger Hammock, Neighbor
16. Ron Sattelmaier, Tonopah Valley Fire District
17. Carter Gable, Arlington Canal Company

ATTACHMENT C

SEMPRA/Mesquite Energy Community Advisory Group

Attendees

	Name	Community Represented
1.	Cheryl Sawyer	4-H Agriculture
2.	Chris Larson	CATS CLUB
3.	Patty Kuhn	Resident
4.	Bill Lanford	Buckeye Valley Fire District
5.	Martina Chaffin	Hispanic Community
6.	Rosa Valdez	Hispanic Community
7.	Les Meredith	Lions Club
8.	Barbara Downing	Arlington Water Co.
9.	Carter Gable	Arlington Canal Co.
10.	Neil Peters	Retired Resident
11.	Donna Staggs	Resident
12.	Ron Fletcher	Arlington School Superintendent
13.	Buck Larson	Lions Club
14.	Doris Heisler	TVCC, TVA, etc.
15.	Lyle King	Farmer
16.	Aracelia Soto	Hispanic Community
17.	Jackie Meck	Buckeye Irrigation Dist.
18.	Pam Miller	Retired Teacher
19.	Stan Ashby	Roosevelt Irrigation Dist.
20.	Jan Hauk	Buckeye Irrigation Dist.
21.	Ginger Hammock	Resident
22.	Jim Thoreson	Resident
23.	Rosemary Majors	Community Outreach
24.	Abraham Harris	P&Z Commission
25.	Ron Sattelmaier	Tonopah Valley Fire Dist.

ATTACHMENT D

Key Individual Meetings

December, 1999

Supervisor Mary Rose Wilcox (including Supervisor and staff visit to Sempra's El Dorado power generating facility in Boulder City, Nevada)

Supervisor Jan Brewer

Visit to Buckeye Municipal office

Visit to Buckeye Valley Chamber of Commerce

Jackie Meck, Buckeye Irrigation District

Sempra / Mesquite Power Advisory Group Meeting

January, 2000

Ron Sattelmeir, Tonopah Valley Fire District

Ron Fletcher, Superintendent, Arlington School District

Lyle King, Area Farmer

Rick King, Area Farmer

Jan Hauk, Buckeye Valley Fire District

Bill Lanford, Buckeye Valley Fire District

Donna Staggs, Resident

Neil Peters, Retired, Resident

Jim Thoreson, Neighbor

Allan Gustovson, President, Tonopah Valley Community Council

Doris Heisler, Tonopah Valley Community Council, Tonopah Valley Authori

Carter Gable, Arlington Canal Company

Ginger Hammock, neighbor

Meeting with neighbors located across the street from SEMPRA water property (Jim Thoreson, Susan Thoreson, Bill Weidlich, Terry Youngblood, Holly Youngblood, Ginger Hammock, Tom Hammock, Bill Smaltz, Kathleen Johnston, Jordan Johnston)

Abe Harris, Member, Maricopa County Planning & Zoning Commission

February, 2000

Sempra / Mesquite Power Advisory Group Meeting

Pam Miller, Retired Teacher

Jan Hauk

Bill Lanford

Rex Miller

Meeting with neighbors located across the street from SEMPRA water property (Jim Thoreson, Susan Thoreson, Bill Weidlich, Bill Smaltz, Kathleen Johnston, Jordan Johnston)

Ron Fletcher

Ron King, Lyle King

Ruben Jimenez, Principal, Ruth Fisher Elementary School

Allan Gustavsen

Jackie Meck

North Palo Verde Nuclear Plant residents

Harold Branch, Neighbor

Meeting with neighbors located across the street from SEMPRA water property (Wayne & Esther Winter, Nathan & Carolyn Boldeo, Sherrie Payne, Thurman Payne, Alicia Payne, Kevin and Nannette Carswell, Bobby Smith)

March, 2000

Open House, Arlington Elementary

Sofia Kennedy and Tonya Kanady, North Arlington School Rd. neighbors

Jim Thoreson.

Tom Hammock, Neighbor

Dr. Tim Hogan, ASU College of Business

Bill Knowles & Mark Stewart – Arizona Game & Fish

Doris Heisler

Lyle & Rick King

Art Gardner, Neighbor

Pam Miller.

Katherine Waser, staff at University of Arizona Arid Land Studies

ATTACHMENT E

Summary of Issues Resulting from One-On-One Meetings

1. Water; cumulative effect of water drawdown by all three plants on neighbors domestic wells
2. Visual (i.e. lighting, height of stacks, minimize the number of new transmission lines, use of industrial art as part of plant entrance. Plant landscape and appearance)
3. Air quality
4. Traffic and need for EMS plan
5. Use of local workforce/vendors
6. Land use plan for water property
7. Need to support local community needs
8. Fire services for Tonopah area
9. Arlington School in need of basketball court and playground equipment
10. Minimize the number of public meetings, one-on-one meetings more effective
11. Use of native vegetation when developing Land Use Plan for water property
12. Dust control related to construction traffic and Land Use for water property
13. Three plants (SEMPRA, DUKE, PINNWEST) need to coordinate activities
14. Desire for written contract from power plants assuring continued water availability for domestic wells
15. Noise generated by plant
16. Maintain open space – rural atmosphere
17. How will power plants effect real estate values?
18. Public safety issues (i.e. How safe are the power plants? Do they pose a safety or health problem for nearby residents?)
19. Keep lines of communication open with local residents, keep them informed
20. Need for literacy program for area

ATTACHMENT F

COMMUNITY OPEN HOUSE

Dear Neighbors:

For two months we have been meeting with Sempra Energy Resources to discuss their plans to develop a state-of-the-art natural gas fired electric generating plant next to the Palo Verde facility.

The proposed Sempra Energy Resources project has unique characteristics that set it apart from other proposed facilities. Marty Swartz, the project manager, has been open about the impact of this plant on our community and has responded to every suggestion we have made.

One suggestion was to have a Community Open House that provides local citizens an opportunity to have their questions answered on a one-to-one basis. To this end, Sempra Energy Resources has scheduled the following event:

What:	**Mesquite Energy Open House**
Where:	**Arlington Elementary School Cafeteria** **16351 Arlington School Road** **Arlington, AZ 85322**
When:	**Saturday, March 4, 2000 10:00 a.m. to 2:00 p.m.**

Coffee and danish will be served from 10:00 a.m. to 11:30 a.m., followed by a BBQ with hamburgers and hot dogs from 11:30 a.m. to 2:00 p.m. At this event, Sempra will help to raise money for our 8th grade class annual summer trip. As part of that effort, the class will be hosting an ice-cream cart at the Open House.

If you cannot join us on March 4th, please feel free to call John Reyna, a Sempra representative, at 602-284-6119. He will be happy to answer your questions.

Sincerely,

Stan Ashby
Martina Chaffin
Barbara Downing
Ron Fletcher
Carter Gable
Ginger Hammock
Jan Hauk

Doris Heisler
Lyle King
Patty Kuhn
Bill Lanford
Buck Larson
Chris Larson
Jackie Meck
Les Meredith

Pam Miller
Neil Peters
Ron Sattelmaier
Cheryl Sawyer
Aracelia Soto
Donna Staggs
Jim Thoreson

ATTACHMENT G

Arlington Open House Community Attendance

Latoya Sawyer
Anacelia Soto
Francisco Soto
Gabrid Soto
Javier Rios
Brandon McGuinis
Devon Getman
Anthony Martinez
Araceli Toledo
Marin Bautista
Andrea Gonzalez
Sonoa Villa
Cristino Carlos
Diane Marie Gonzalez
Angelica Gonzalez
Francisca Villa
Rosa M. Villa
Belia Mendoza
Lyle King
Jimmie Garner
Roman Chavez
Bill Lanford
Pam Lanford
Mary King
Mark Wheaton
Caitlin Roach
Rick King
Donna Staggs
Neil Peters
Martha Peters
Bryce Larson
Brent Larson
Meckenzie Larson
Willie Hightower
*Mary Rose Wilcox
Terri Leja
Devon Meadows
Staci Meadows
Chelsea Hernandez
Graci Chaffin
Susan Thoreson
Shirley Gleason
Mike Gleason

Silvero Garcia Jr.
Noah Niff
Sally Mauatt
Wayne Winter
Esther Winter
Chris Larson
Francisco M. Soto
Ron Fletcher
Darryl Henning
Harold Branch
Nanette Carswell
Jan Hauk
Tyler Hauk
Timothy Horn
Kevin Richardson
Barbara Downing
Huey Downing
H. Paul Downing II
Darloe Downing
Angela Downing
Dakota Downing
Cotton Downing
Ann Babcock
Antonio Martinez
Lupe Mejia
Angie Mejia
Maurita Mejia
Kelsie Faulkner
Cheryl Sawyer
Concepcion Maya
Cristie Roach
John Roach
Candace Roach
Chuck Neff
Jim Thoreson
Tom Hammock
Jackie Meck
Martina Chaffin
James Chaffin
JD Chaffin
JJ Chaffin
Gaymi Chaffin

Daniel Downing
Jessica Downing
Shelby Downing
Chelsey King
Kim King
Trevor King
Doris King
Chad Linema
Cassandra Roach
Eulogio Gonzalez
Ginger Hammock
Sonja Hammock
Carmen Rios
Ceya Soto
Sng Maotgoes
Emmanuel Martinez
Luz Martinez
Angelica Martinez
Jesus Martinez
Ignacio Martinez
Patricia Martinez
Gesna Branch
Harold Branch
Jani Branch
Jim Sawyer
Pam Miller
Buck Larson
Ray King
Sofia Kennedy
Tanya Kanady
Abel Rios
Maria Rios
Rudy Rios
Christopher Rios
Pat Meinhold
James Meinhold
Dan Blackson
June Blackson
Maria A. Soto
Ms. Kinley
Drebin
Cleo

Sempra Staff/Consultants

Joe Rowley
Marty Swartz
Mark Haarer
David Yost

Cecil Sterling
Art Larson
Kelley Prasser
Peter Mock

John Reyna
Mike Sullivan
Ron Ober
Bill Collins

*Represented by staff

ATTACHMENT H

COMMUNITY OPEN HOUSE

Dear Neighbors:

For the past few months some area residents have been meeting with Sempra Energy Resources to discuss its plans to develop a state-of-the-art natural gas fired electric generating station next to the Palo Verde Nuclear facility.

Because Sempras representatives have not had an opportunity to meet many of the local people from the Tonopah area, they are going to hold a Community Open House that will provide citizens an opportunity to have their questions about the proposed station answered on a one-to-one basis. To this end, Sempra Energy Resources has scheduled the following event:

What:	**Mesquite Power Open House**
Where:	**Ruth Fisher Elementary School/Cafeteria** **38201 W. Indian School Road** **Tonopah**
When:	**Saturday, April 8, 2000 10:00 a.m. to 2:00 p.m.**

Coffee and danish will be served in the morning, followed by a BBQ with hamburgers and hot dogs from 11:30 a.m. to closing. At this event, Sempra will help to raise money for the Fourth of July Fireworks Celebration, as well as Ruth Fisher School extra-curricular activities.

As members of the advisory group working with Sempra, we are joining with company representatives in inviting you to attend this event. If you cannot join us on April 8th, please feel free to call John Reyna, a local Sempra representative, at 602-284-6119. He will be happy to answer your questions.

Sincerely,

Stan Ashby
Martina Chaffin
Barbara Downing
Ron Fletcher
Carter Gable
Ginger Hammock
Jan Hauk

Doris Heisler
Lyle King
Patty Kuhn
Bill Lanford
Buck Larson
Chris Larson
Jackie Meck
Les Meredith

Pam Miller
Neil Peters
Ron Sattelmaier
Cheryl Sawyer
Aracelia Soto
Donna Staggs
Jim Thoreson

ATTACHMENT I

Mesquite Power Open House
Tonopah, Arizona / April 8, 2000

Donald Page
Bob Hathaway
Elmer Sisk
Marita Lowell
Cindy Buckner
Carl Karstetter
Doris Heisler
Evelyn Wainwright
Rob Ash
Aaron Barnes
Chris Larson
Bob Morell
Claire Elsner
Charlie Marks
Gayle Thompson
Ron Sattelmaier
Ron Fletcher
Madeline LaMont
Jim LeForce
Jackie Meck

Donald M. Sally
Percival "Mark" Lowell, Jr.
Celia Sisk
Lori Carter
Benjamin Dean
Franky Dean
Ruben Jimenez
Toni Klich
Maggie Ash
Ed Chapman
Carter Gable
Ron Horvath
Donna Staggs
Neil Peters
Mark Dryscoll
Vicky Sattelmaier
Allan Gustavson
Robert G. Regenos
R. Terral
Rex Miller

Pat Hathaway
John Tradifid
Linda Remington
Kelly Karsteller
Jessica Zatcoff
Nancy Dean
Frank Wainwright
Jane Klich
Fran Barnes
J.E. Gaune
Pam Miller
Tom Martin
Kathy Parker
Glenn Archer
Sheryl Dryscoll
Hiedi Kelten
Dave LaMont
Gerald E. High
Celia Cameron

Sempra Staff / Consultants

Joe Rowley
Marty Swartz
Cecil Sterling
Kelly Prasser
Lloyd Brown
Mike Sullivan
Peter Mock
John Reyna
John Kaites

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EXHIBIT A-1

Sempra E. Resources

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Fax: 619.696.2911
jrowley@sempra-res.com

April 14, 2000

Ms. Deborah Scott
Director, Utilities Division
Arizona Corporation Commission
1200 West Washington Street
Phoenix, AZ 85007

Re: Application for a Certificate of Environmental Compatibility for the Mesquite Generating Station

Dear Ms. Scott:

Mesquite Power, LLC is pleased to [illegible] original and 25 copies of our Application for a Certifica[illegible]ity (CEC). This CEC application is for the Mesquite [illegible] near the unincorporated area of Arlington in Maricopa C[illegible]

101

Pursuant to the provisions of A.R.[illegible] [illegible]eck in the amount of $10,000.00.

We request that the public hearing be [illegible]e Power Plant and Transmission Line Siting Committee for consideration of this CEC application be set on the first available date.

If you should have any questions concerning this CEC application, please do not hesitate to contact Mr. Marty Swartz at (619) 696-2943.

Sincerely,

Joseph H Rowley

Joseph H. Rowley

enclosures

Sempra Energy Resources is not the same company as the utility, SDG&E or SoCalGas, and Sempra Energy Resources is not regulated by the California Public Utilities Commission.

PART II

Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station

Submitted By
Mesquite Power, LLC

Prepared By
Black & Veatch

February 2000

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Sempra Energy™
Resources

101 Ash Street
San Diego, CA 92101-3017

Sempra Energy Resources
101 Ash Street
San Diego, CA 92101-3017

Certification of Truth, Accuracy, and Completeness

I, Cecil D. Sterling, as Responsible Official for the Mesquite Power, Mesquite Project, pursuant to Maricopa County Air Pollution Control Rule 210, Section 301.7, certify that based on information and belief formed after reasonable inquiry, the statements and information contained within this application, the *Prevention of Significant Deterioration and Title V Air Permit Application for the Mesquite Power LLC, Mesquite Project are true, accurate, and complete.*

In addition, I certify that:

- This facility is in compliance with all of the applicable requirements set forth in Section 3 of this Application.
- The methods used for determining compliance with these requirements included site observations, records review, and monitoring, record keeping and reporting requirements and test methods specified in the requirements set forth in Section 7 of this application;
- This facility will submit compliance certifications annually, or more frequently if specified by underlying applicable requirements or by Maricopa County;
- This facility is in compliance with all currently applicable enhanced monitoring and compliance certification requestiments;
- An acid rain permit application will be prepared and submitted (a draft of this application is included in Appendix D of this application).

Date: 2/11/00

Cecil D. Sterling
Permitting Manager
Sempra Energy Resources

Sempra Energy Resources is not the same company as the utility, SDG&E or SoCalGas, and Sempra Energy Resources is not regulated by the California Public Utilities Commission.

EXECUTIVE SUMMARY

This Prevention of Significant Deterioration (PSD) and Title V Air Permit Application contains the information necessary, and details the analyses performed to support the proposed Mesquite Power, LLC, Mesquite Generating Station. The proposed project would consist of four (4) General Electric 7FA or Westinghouse 501F combustion turbines (CTs) driving electrical generators. These CTs will be operating in a combined cycle mode of operation, routing their exhaust through heat recovery steam generators (HRSGs). Steam formed in the four HRSGs will be routed through two steam turbines to generate additional electricity. Duct firing will be used in the HRSG to generate additional heat, as needed. The CTs are rated at approximately 170 megawatts (MW) each, and the two steam turbines are rated at approximately 300 MW each. The facility will provide approximately 1,000 MW of electricity to the grid for sale on the open market. The location of the proposed project is in western Maricopa County, near Arlington, Arizona.

The proposed facility will be classified as a major stationary source and will be subject to the PSD program, and the need to obtain a Title V operating permit. Under the PSD rules, all PSD regulated pollutants emitted by the proposed facility must be compared to the PSD significant emission levels in order to determine applicability to PSD review. The required PSD analyses were conducted for each of these regulated pollutants. Included, as part of the PSD application, is a Best Available Control Technology (BACT) analysis, an ambient air quality impact analysis (AAQIA), and an additional impact analysis (AIA).

The AAQIA demonstrates that emissions of nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter with a diameter of less than or equal to ten microns (PM_{10}) are emitted in significant quantities. Based on the air dispersion modeling analysis performed for this application, these emissions will not cause or contribute to a violation of the National Ambient Air Quality Standards, or consume the available PSD increment for NO_2 or PM_{10}.

The BACT analysis demonstrates that the proposed pollution controls meet or exceed the criteria set by BACT. The AIA shows that operation of the proposed facility will not cause a significant impairment to visibility or have a detrimental impact on surrounding soils and vegetation.

Because a specific combustion turbine vendor (GE or Westinghouse) has not yet been selected for this project, emissions from both types of CTs have been evaluated throughout this document and are presented as alternative operating scenarios. The facility may be constructed using either of these CTs.

MARICOPA COUNTY
ENVIRONMENTAL SERVICES DEPARTMENT
DIVISION OF AIR POLLUTION CONTROL

1001 N. Central Ave., Ste 201
Phoenix, AZ 85004
(602) 506-6010

STANDARD PERMIT APPLICATION FORM

Internet Copy

(As required by A.R.S. § 49-480, and Chapter 3, Article 3, Arizona Administrative Code)

1. Permit to be issued to: (Business license name of organization that is to receive permit)
   Mesquite Generating Station
2. Mailing Address: 101 Ash Street
   City: San Diego State: CA ZIP: 92101
3. Plant Name (if different from item #1 above): Same
4. Name (or names) of Owner or Operator: Mesquite Power, LLC
   Phone: (619) 696-4455
5. Name of Owner's Agent: Cecil Sterling
   Phone: (619) 696-2940
6. Plant/Site Manager or Contact Person: Marty C. Swartz/ Cecil D. Sterling
   Phone: (619)696-2943/ (619)696-2940
7. Proposed Equipment/Plant Location Address: See attached
   City: _____ County: MARICOPA ZIP: _____
   Indian Reservation (if applicable): NA
   Section/Township/Range: Section 15, Township 1 South, Range 6 west of the Gila and Salt River Base and Merdian
   Latitude: 33°20'40" Longitude: 112°20'40" Elevation: 890 ft.
8. General Nature of Business: Electric Power Generation
   Standard Industrial Classification Code: 4911
9. Type of Organization: [x] Corporation [ ] Individual Owner [ ] Partnership
   [ ] Government Entity (Government Facility Code: _____)
   [ ] Other: _____
10. Permit Application Basis: [x] New Source [ ] Revision [ ] Renewal of Existing Permit
    [ ] Portable Source [ ] General Permit (Check all that apply)
    For renewal or modification, include existing permit number: NA
    Date of Commencement of Construction or Modification: 02/01/2001
    Is **any** of the equipment to be leased to another individual or entity? [ ] Yes [x] No
11. Signature of Responsible Official of Organization Joseph H Rowley
    Official Title of Signer: Vice President - Project Development
12. Typed or Printed Name of Signer: Joseph H. Rowley
    Date: 01/26/2000 Phone Number: (619) 696-4455

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					EMISSION POINT DISCHARGE PARAMETERS									
EMISSION POINT (1) General Electric		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE		UTM COORDINATES OF EMISSION POINT (5)			STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
										EXIT DATA				
NUMBER	Combustion Turbine and Duct Burner NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
1	unit 1	NOx	22.2	92.4	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
1	unit 1	CO	21.6	89.8	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
1	unit 1	PM/PM10	30.4	126.6	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
1	unit 1	SO2	2.1	8.8	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
1	unit 1	VOC	16.6	64.8	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
2	unit 2	NOx	22.2	92.4	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA
2	unit 2	CO	21.6	89.8	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA
2	unit 2	PM/PM10	30.4	126.6	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA
2	unit 2	SO2	2.1	8.8	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

(2) Components to be listed include regulated air pollutants as defined in R18-2-101. Examples of typical component names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC), particulate matter (PM), particulate less than 10 microns (PM_{10}), etc. Abbreviations are O.K.

(3) Pounds per hour (#/HR) is maximum potential emission rate expected by applicant.

(4) Tons per year is annual maximum potential emission expected by applicant, which takes into account process operating schedule.

(5) As a minimum applicant shall furnish a facility plot plan as described in the filing instructions. UTM coordinates are required only if the source is a major source or is required to perform refined modeling for the purposes of demonstrating compliance with ambient air quality guidelines.

(6) Supply additional information as follows if appropriate:
(a) Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if horizontal discharge with a note.
(b) Stack's height above supporting or adjacent structures if structure is within 3 "stack height above the ground" of stack.

(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

EMISSION POINT (1)		REGULATED AIR POLLUTANT DATA			UTM COORDINATES OF EMISSION POINT (5)			EMISSION POINT DISCHARGE PARAMETERS STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
General Electric		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE							EXIT DATA				
NUMBER	NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
2	Combustion Turbine and Duct Burner unit 2	VOC	16.6	64.8	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA
3	unit 3	NOx	22.2	92.4	12	326601.8	3690836.8	170	80	18	64.1	172.1	NA	NA
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3	unit 3	NOx	22.2	92.4	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA
4	unit 4	CO	21.6	89.8	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA
4	unit 4	PM/PM10	30.4	126.6	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA
4	unit 4													

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

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(b) Stack's height above supporting or adjacent structures if structure is within 3 "stack height above the ground" of stack.

(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternatives Operating Scenarios

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					UTM COORDINATES OF EMISSION POINT (5)			EMISSION POINT DISCHARGE PARAMETERS STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
EMISSION POINT (1)		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE							EXIT DATA				
General Electric														
NUMBER	Combustion Turbine and Duct Burner NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
4	unit 4	SO2	2.1	8.8	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA
4	unit 4	VOC	16.6	64.8	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

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(6) Supply additional information as follows if appropriate:
(a) Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if horizontal discharge with a note.
(b) Stack's height above supporting or adjacent structures if structure is within 3 "stack height above the ground" of stack.

(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					UTM COORDINATES OF EMISSION POINT (5)			EMISSION POINT DISCHARGE PARAMETERS						
EMISSION POINT (1)		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE					STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
Westinghouse										EXIT DATA				
NUMBER	NAME Combustion Turbine and Duct Burner	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
1	unit 1	NOx	23.6	98.6	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
1	unit 1	CO	23.0	95.9	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
1	unit 1	PM/PM10	28.8	118.7	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
1	unit 1	SO2	2.24	9.3	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
1	unit 1	VOC	16.1	67.0	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
2	unit 2	NOx	23.6	98.6	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA
2	unit 2	CO	23.0	95.9	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA
2	unit 2	PM/PM10	28.8	118.7	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA
2	unit 2	SO2	2.24	9.3	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet

ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

(2) Components to be listed include regulated air pollutants as defined in R18-2-101. Examples of typical component names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC), particulate matter (PM), particulate less than 10 microns (PM_{10}), etc. Abbreviations are O.K.

(3) Pounds per hour (#/HR) is maximum potential emission rate expected by applicant.

(4) Tons per year is annual maximum potential emission expected by applicant, which takes into account process operating schedule.

(5) As a minimum applicant shall furnish a facility plot plan as described in the filing instructions. UTM coordinates are required only if the source is a major source or is required to perform refined modeling for the purposes of demonstrating compliance with ambient air quality guidelines.

(6) Supply additional information as follows if appropriate:

(a) Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if horizontal discharge with a note.

(b) Stack's height above supporting or adjacent structures if structure is within 3 "stack height above the ground" of stack.

(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					EMISSION POINT DISCHARGE PARAMETERS									
EMISSION POINT (1) Westinghouse		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE		UTM COORDINATES OF EMISSION POINT (5)			STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
										EXIT DATA				
NUMBER	Combustion Turbine and Duct Burner NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
2	unit 2	VOC	16.1	67.0	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA
3	unit 3	NOx	23.6	98.6	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
3	unit 3	CO	23.0	95.9	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
3	unit 3	PM/PM10	28.8	118.7	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
3	unit 3	SO2	2.24	9.3	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
3	unit 3	VOC	16.1	67.0	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
4	unit 4	NOx	23.6	98.6	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA
4	unit 4	CO	23.0	95.9	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA
4	unit 4	PM/PM10	28.8	118.7	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

(2) Components to be listed include regulated air pollutants as defined in R18-2-101. Examples of typical component names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC), particulate matter (PM), particulate less than 10 microns (PM_{10}), etc. Abbreviations are O.K.

(3) Pounds per hour (#/HR) is maximum potential emission rate expected by applicant.

(4) Tons per year is annual maximum potential emission expected by applicant, which takes into account process operating schedule.

(5) As a minimum applicant shall furnish a facility plot plan as described in the filing instructions. UTM coordinates are required only if the source is a major source or is required to perform refined modeling for the purposes of demonstrating compliance with ambient air quality guidelines.

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(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

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EMISSION POINT (1) Westinghouse		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE					STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
										EXIT DATA				
NUMBER	NAME Combustion Turbine and Duct Burner	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
4	unit 4	SO2	2.24	9.3	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA
4	unit 4	VOC	16.1	67.0	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

(2) Components to be listed include regulated air pollutants as defined in R18-2-101. Examples of typical component names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_X), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC), particulate matter (PM), particulate less than 10 microns (PM_{10}), etc. Abbreviations are O.K.

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COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES

DATE 1/19/2000

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REGULATED AIR POLLUTANT DATA					UTM COORDINATES OF EMISSION POINT (5)			EMISSION POINT DISCHARGE PARAMETERS						
EMISSION POINT (1)		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE					STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
										EXIT DATA				
NUMBER	NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
CT1	Cooling Tower 1	PM/PM10	3.86	16.89	12	326441.2	3690969.4	45	10	32	25.30	122.0	NA	NA
CT2	Cooling Tower 2	PM/PM10	3.86	16.89	12	326438.9	3690793.4	45	10	32	25.30	122.0	NA	NA
FWP	Fire Water Pump	NOx	5.59	0.145	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA
FWP	Fire Water Pump	CO	1.00	0.026	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA
FWP	Fire Water Pump	PM/PM10	0.15	0.004	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA
FWP	Fire Water Pump	SO2	0.54	0.014	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA
FWP	Fire Water Pump	VOC	0.30	0.008	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

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(7) Dimensions of nonpoint sources as defined in R18-2-101.

1.0 PROPOSED PROJECT

The proposed Mesquite Generating Station will consist of a natural gas-fired combined cycle power plant and associated linear facilities. The project will have a nominal electrical output of 1,000 MW, and commercial operation is planned for the summer of 2003. The combined cycle power plant will be fueled exclusively with natural gas. The natural gas for the project will be supplied from existing El Paso pipelines, which are located 3 to 4 miles southwest of the plant site. The project includes a new 230 kV switchyard and 500 kV transformer for connection into the Palo Verde Nuclear Generating Station's new satellite switchyard, which is to be located directly east of the plant site. Water for the project will be well water pumped from a location approximately 2 miles west of the plant site. Wastewater from the project will be pumped to evaporation ponds located on the plant site. The project owner and applicant submitting this application is Mesquite Power, LLC.

1.1 FACILITY LOCATION AND SITE DESCRIPTION

The site for the Mesquite Generating Station is located in the unincorporated community of Arlington, Arizona, in the county of Maricopa. The site is located approximately 40 miles west of Phoenix and approximately 8 miles south of Interstate 10. Please refer to the general area map provided on Figure 1-1. The approximately 276 acre site is situated south of the existing Palo Verde nuclear generating station on a 400 acre parcel. The approximate coordinates of the Mesquite site are latitude 33° 20' north, longitude 112° 51' east. the approximate legal description of the site is; the west half of Section 15, Township 1 South, Range 6 west of the Gila and Salt River base and meridian, Maricopa County, Arizona, excepting the east half of the Northeast quarter of the Northwest quarter of said Section 15.

Access to the site is via Elliot Road, which borders the site to the north. The entire 276 acre site will be fenced. Figure 1-2 shows the specific location of the plant site. The site contains few existing structures and consists of relatively flat topography with relatively sparse desert vegetation. Surrounding land is primarily undeveloped. The terrain slopes generally to the south and west. Elevations vary from approximately 893 MSL in the northeast corner of the property to 966 MSL in the southwest corner. Excluding evaporation ponds or the adjacent substation, the improved portion of the overall site is expected to cover approximately 40 acres of the 276 acre site, including 12 acres for a 230 kV to 500 kV switchyard. Additionally, two evaporation ponds are expected to cover approximately 90 acres each.

Mesquite Generating Station
Area Map

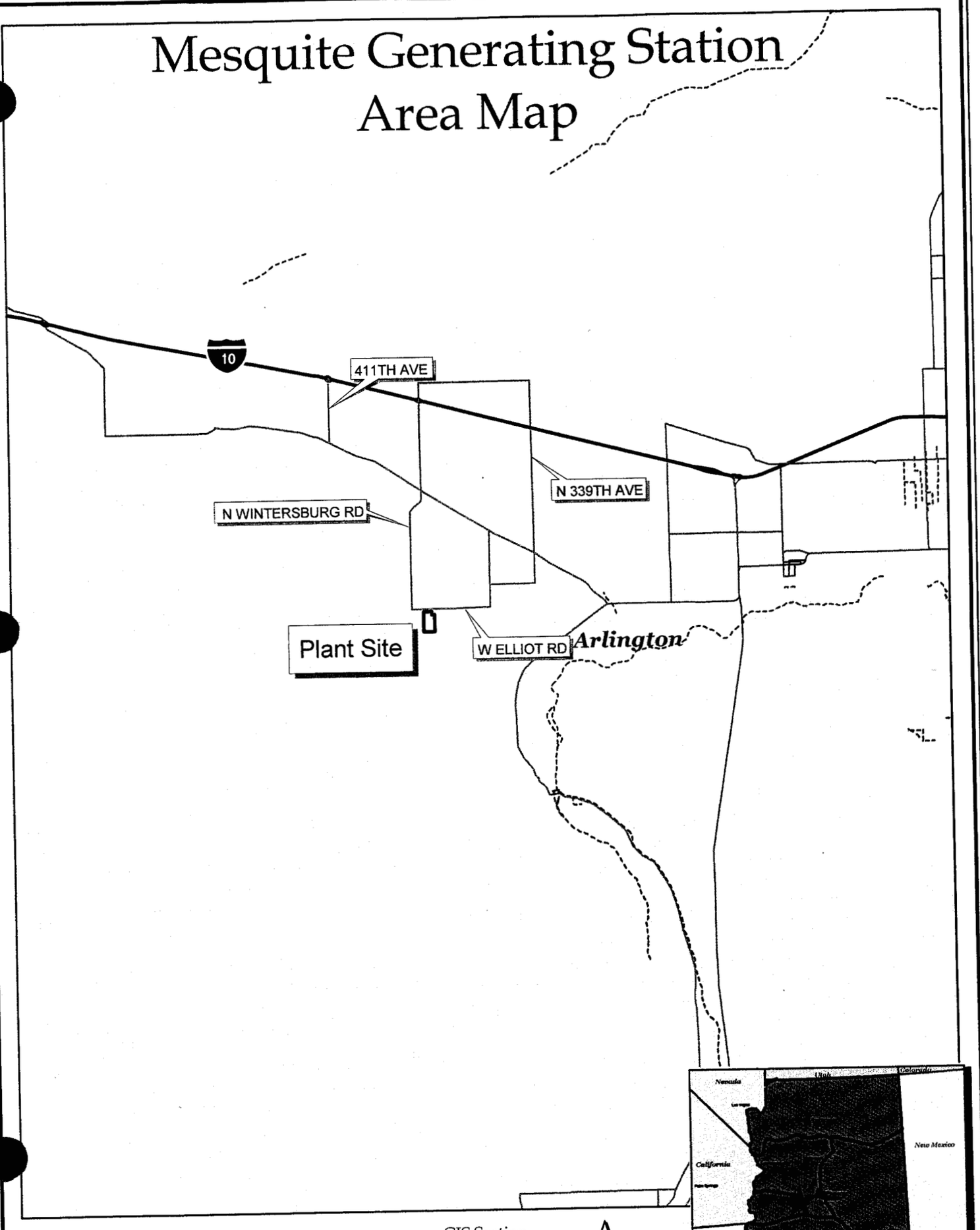

Figure 1-1

GIS Section
Real Estate and Facilities
January 25, 2000

N

Scale
1:352000

e:/people/jpulaul/gz/gz_powerplant.apr 01/24/00 sk

Mesquite Generating Station
Plant Site Location

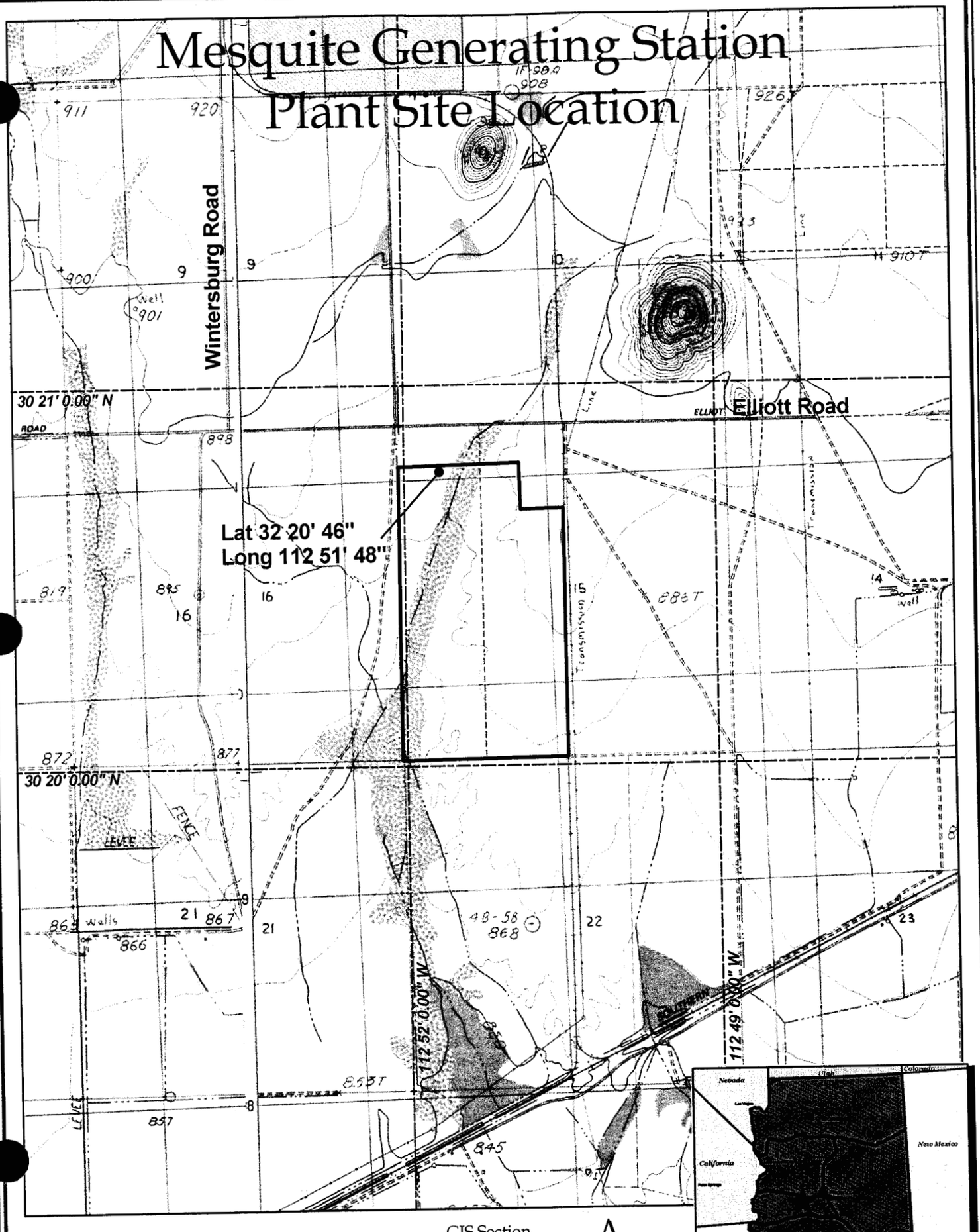

Figure 1-2

GIS Section
Real Estate and Facilities
January 25, 2000

N

Scale
1:24000

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1.2 PROCESS DESCRIPTION

The Mesquite Generating Station will consist of two combined cycle power blocks, each in a two-on-one configuration. Each of the two-on-one combined cycle power blocks will consist of two combustion turbine generators (CTGs) equipped with dry-low NO_x burners, an inlet air filter, and an inlet air evaporative cooler; two heat recovery steam generators (HRSGs) equipped with duct burners, a selective catalytic reduction (SCR) system, and an oxidizing catalyst system; a steam turbine generator (STG); and associated auxiliary systems and equipment. Each power block will be equipped with a 100 percent steam turbine bypass system, which will bypass steam to the condenser during startup or in the event of a sudden load rejection. The steam turbine bypass will not bypass the SCR or oxidizing catalyst.

Air flows through the inlet air filter, evaporative cooler, and associated inlet air ductwork of each CTG and is then compressed in the CTG compressor section. At times when power augmentation is employed, steam is injected at the CTG compressor discharge. As a result, steam injection has no effect on CTG emissions and is solely for the purpose of power augmentation. Natural gas fuel is injected into the combustor section and ignited. The hot combustion gases expand through the CTG turbine section to drive the entire CTG. The hot combustion gases exit the turbine section and enter an HRSG dedicated to each CTG. Duct burners installed immediately upstream of each HRSG are used to further heat the CTG exhaust gases at times when power augmentation is employed.

In the HRSGs, heat from the combustion gases is transferred to water pumped into the HRSG pressure parts (economizers, evaporators, drums, etc.). The water is converted to steam and is delivered to the STG. Steam leaving the STG enters a surface condenser, gives up its latent heat to circulating water, and is condensed to a liquid. The circulating water flows through a wet cooling tower where the heat is rejected to the atmosphere, and the circulating water is then pumped back to the surface condenser. Refer to the process flow diagram on Figure 1-3.

Each of the four CTGs generates approximately 170 MW at design ambient conditions without employing power augmentation. With the duct burners out-of-service, all of the steam exiting the HRSGs is directed to the STGs, which each generate approximately 170 MW at design ambient conditions. The overall gross output of the power plant is approximately 1,000 MW at design ambient conditions.

Each of the four CTGs generates approximately 180 MW at design ambient conditions while employing maximum power augmentation. With the duct burners in service, most of the steam exiting the HRSGs is directed to the STG, which generates approximately 290 MW at design ambient conditions. Steam not directed to the STG is injected into the CTGs for power augmentation. The overall gross output of the power plant with the duct burners in service and maximum power augmentation is approximately 1,300 MW at design ambient conditions.

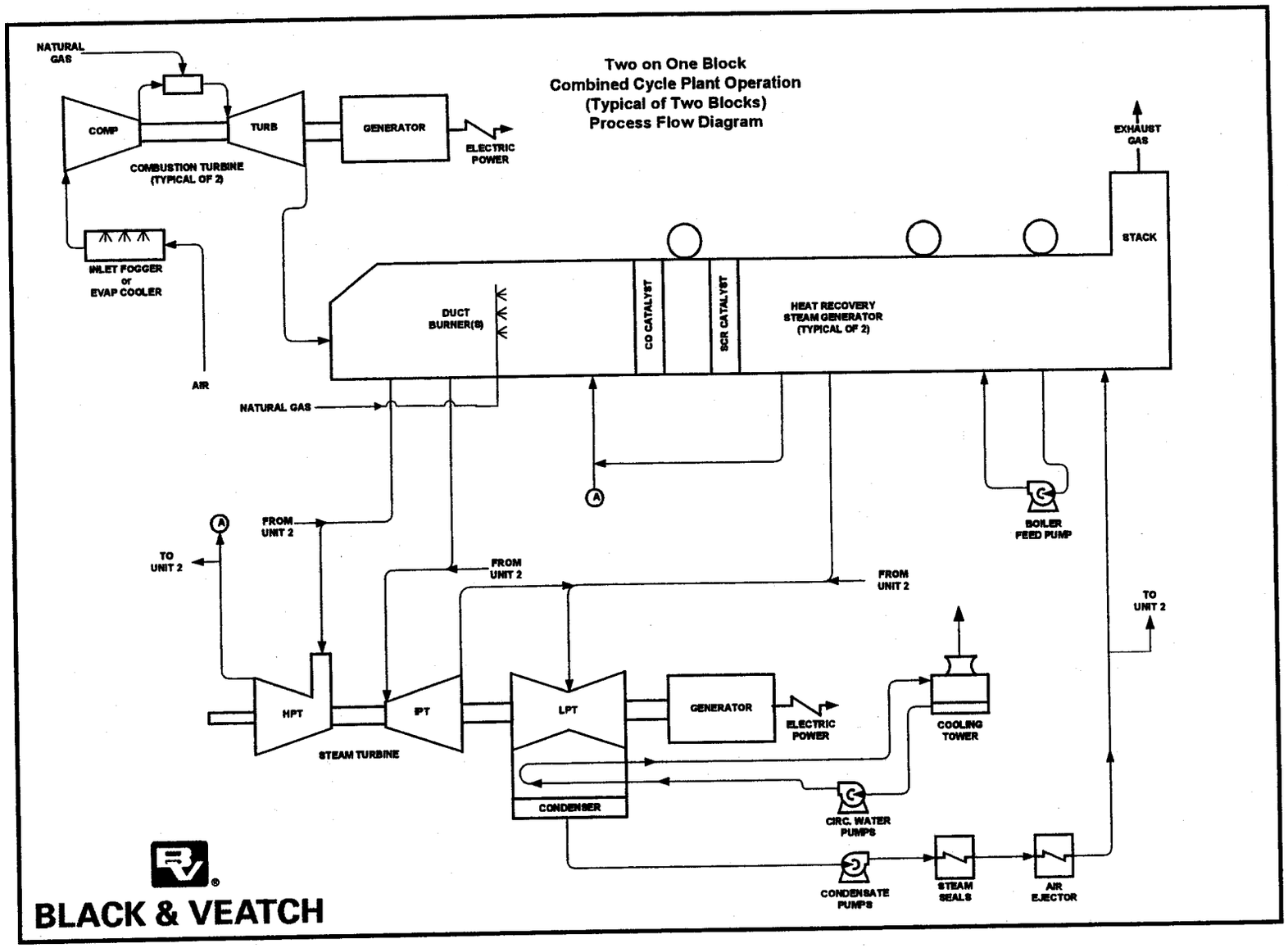

Two on One Block
Combined Cycle Plant Operation
(Typical of Two Blocks)
Process Flow Diagram
NATURAL GAS
COMP
TURB
COMBUSTION TURBINE (TYPICAL OF 2)
GENERATOR
ELECTRIC POWER
EXHAUST GAS
STACK
INLET FOGGER or EVAP COOLER
AIR
DUCT BURNER(S)
CO CATALYST
SCR CATALYST
HEAT RECOVERY STEAM GENERATOR (TYPICAL OF 2)
NATURAL GAS
A
FROM UNIT 2
TO UNIT 2
FROM UNIT 2
FROM UNIT 2
BOILER FEED PUMP
TO UNIT 2
HPT
IPT
LPT
STEAM TURBINE
GENERATOR
ELECTRIC POWER
COOLING TOWER
CONDENSER
CIRC. WATER PUMPS
CONDENSATE PUMPS
STEAM SEALS
AIR EJECTOR
BLACK & VEATCH

Figure 1-3

2.0 EQUIPMENT AND FACILITIES

A list of this major equipment, buildings, and structures is provided below. This includes all items identified on the site arrangement drawing provided in Appendix A and other major equipment, systems, and structures.

2.1 EQUIPMENT LIST

- Four (4) Combustion Turbine Generating units (heat input of approximately 1,630 to 1,730 mmBtu/h each at 73° F) each containing the following:
  - Inlet air filters and on-line filter cleaning system.
  - Inlet air evaporative coolers.
  - Dry-low NO_x burners (heat input of approximately 540 to 590 mmBtu/h at 73° F).
  - Metal acoustical enclosures.
  - Fire detection and protection system.
  - Lubrication oil system.
  - Generator coolers.
  - Water wash skids (one per two CTGs).
  - Starting system, auxiliary power system, and control system.
- Four (4) heat recovery steam generators, each containing the following:
  - Multipressure, natural circulation boiler with economizer, evaporate and superheater sections.
  - Integral deareator.
  - Duct burner .
  - SCR system.
  - Oxidizing catalyst system.
- Two (2) steam turbine generators, each containing the following:
  - Governor system.
  - Gland Steam System.
  - Lubrication oil system.
  - Generator coolers.
- Two (2) water cooled condensers.
- Two (2) mechanical draft cooling towers.
- Four (4) 18 feet diameter (inside) 170 feet high stacks.
- One (1) natural gas conditioning station.
- Six (6) 13.8 kV/230 kV step-up transformers.
- 230 kV ring bus switchyard.
- 230 kV/500 kV step-up transformer.

- Electrical system for plant auxiliaries.
- Emergency diesel-fire pump (348 BHP).
- Continuous emissions monitoring (CEM) system.
- Service and Instrumentation compressors.

2.2 BUILDINGS AND STRUCTURES

- Control and administration building.
- Water Treatment Building.
- Circulation water treatment building.
- Fire water pump house.
- Raw water storage tank.
- RO water storage tank.
- Demineralized water storage tank.
- Required fencing and access roads.

3.0 APPLICABLE REQUIREMENTS

3.1 FEDERAL APPLICABLE REQUIREMENTS

Federal applicable requirements include those developed under the authority of the Clean Air Act (CAA) and its amendments. Major programs considered in this review include the Prevention of Significant Deterioration (PSD) program (40 CFR 52.21), New Source Performance Standards (NSPS) (40 CFR 60), the Title V Operating Permit program (40 CFR 70), and the Acid Rain Permit program (40 CFR 72-75). A summary of the applicable requirements under these programs is provided in Table 3-1.

3.1.1 PREVENTION OF SIGNIFICANT DETERIORATION

The proposed facility will be classified as a major stationary source and will be subject to the Prevention of Significant Deterioration (PSD) program and the need to obtain a Title V operating permit. The PSD rules include applicable new source performance standards (NSPS), referenced at 40 CFR 60, that will apply to the proposed facility.

Subpart A of 40 CFR 60 contains general requirements and provisions applicable to all emissions units regulated under an NSPS.

Subpart Da will apply to only the duct burner portion of the combined cycle combustion turbine/duct burner emission unit. The affected units will comply with the PM emissions limitation of 0.03 lb/mmBtu, and the opacity limitation 20 percent opacity (40 CFR 60.42a). The affected units will also comply with the sulfur dioxide emissions limitation of 0.20 lb/mmBtu (40 CFR 60.43a), and the nitrogen oxides emissions limitations of 0.20 lb/mmBtu and 1.6 lb/MW-h, and a minimum 25 percent reduction of potential nitrogen oxides emissions, based on a 30 day rolling average (40 CFR 60.44a). A continuous monitoring system for monitoring NO_X, as well as either oxygen or carbon dioxide content of the flue gas (40 CFR 60.47a). A performance test required under 40 CFR 60.8, as well as within this Subpart, must be performed using the methods identified in Appendix A of 40 CFR 60, as well as within 40 CFR 60.48a.

Subpart GG applies to the combustion turbines and includes emission standards for NO_X and SO_2 (40 CFR 60.332 and 40 CFR 60.333). Additional requirements exist for monitoring (40 CFR 60.334) and testing of the emission units (40 CFR 60.335).

3.1.2 CHEMICAL ACCIDENT PREVENTION PROVISIONS

Facilities that store or use hazardous chemicals listed under this Subpart (40 CFR 68) are required to assess the risk and identify the consequences of a spill or release of these hazardous materials. Ammonia is utilized by the SCR emissions control system and is a listed hazardous material. A risk assessment and risk management plan (RMP) will need to be prepared for this facility prior to the introduction of ammonia to the site because the ammonia will be stored in quantities exceeding the threshold quantity.

Table 3-1 Federal Applicable Requirements		
Citation	Description/Summary	Comment
40 CFR 52.21	Prevention of Significant Deterioration	
40 CFR 60	New Source Performance Standards	
Subpart A	General Provisions	
Subpart Da	Standards of Performance for Electric Utility Steam Generating Units for Which Construction is Commenced After September 18, 1978	Duct burners
Subpart GG	Standards of Performance for Stationary Gas Turbines	
40 CFR 64	Compliance Assurance Monitoring	
40 CFR 68	Chemical Accident Prevention Provisions	
40 CFR 70	State Operating Permit Programs	
40 CFR 72	Permits Regulation	Title IV Acid Rain Program
Subpart A	Acid Rain Program General Provisions	
Subpart B	Designated Representative	
Subpart C	Acid Rain Permit Applications	
Subpart D	Acid Rain Compliance Plan and Compliance Options	
Subpart H	Permit Revisions	
Subpart I	Compliance Certification	
Appendix A	Methodology for Annualization of Emissions Limits	
Appendix B	Methodology for Conversion of Emissions Limits	
Appendix C	Annual 1985 Yearly SO_2 Emissions Calculation	
Appendix D	Calculation of Potential Electric Output Capacity	
40 CFR 73	Sulfur Dioxide Allowance System	
Subpart A	Background and Summary	
Subpart B	Allowance Allocations	
Subpart C	Allowance Tracking System	
Subpart D	Allowance Transfers	
Subpart E	Auctions, Direct Sales, and Independent Power Producers Written Guarantee	

Table 3-1 (Continued) Federal Applicable Requirements		
Citation	Description/Summary	Comment
40 CFR 75	Continuous Emissions Monitoring	
Subpart A	General	
Subpart B	Monitoring Provisions	
Subpart C	Operation and Maintenance Requirements	
Subpart D	Missing Data Substitution Procedures	
Subpart E	Alternative Monitoring Systems	
Subpart F	Recordkeeping Requirements	
Subpart G	Reporting Requirements	
Appendix A	Specification and Test Procedures	
Appendix B	Quality Assurance and Quality Control Procedures	
Appendix C	Missing Data Estimation Procedures	
Appendix D	Optional SO_2 Emissions Data Protocol For Gas-Fired and Oil-Fired Units	
Appendix E	Optional NO_x Emissions Estimation Protocol For Gas-Fired Peaking Units and Oil-Fired Peaking Units	
Appendix F	Conversion Procedures	
Appendix G	Determination of CO_2 Emissions	
Appendix H	Revised Traceability Protocol No. 1	
Appendix I	Optional F Factor/Fuel Flow Method	
Appendix J	Compliance Dates For Revised Recordkeeping Requirements and Missing Data Procedures	
40 CFR 82	Protection Of Stratospheric Ozone	
82.150	Purpose and Scope	
82.152	Definitions	
82.154	Prohibitions	
82.156	Required practices	
82.158	Standards for recycling and recovery equipment	
82.161	Technician certification	
Note: Each Part, Subpart, or Section listed above may be assumed to contain requirements applicable to this Facility. Other Parts, Subparts, or Sections not listed are applicable to this Facility.		

3.1.3 STATE OPERATING PERMIT PROGRAM

Under Subpart 40 CFR 70, because the proposed facility is classified as a major source for the purposes of the Title V program, the facility will be required to obtain an operating permit. The facility, through the submittal of this permit application, will comply with the requirements of this regulation.

3.1.4 ACID RAIN PERMIT PROGRAM

The Title IV Acid Rain Permit requirements are included in 40 CFR 72-75. These regulations are designed to control emissions of SO_2 and NO_X from large fossil fuel fired utility sources. The combustion sources proposed for this facility will be subject to the Acid Rain Permit Program. The requirements of this program include the identification of a Designated Representative and the submittal of an Acid Rain Permit application. A draft of the permit application is included as an appendix to this document.

The Acid Rain Permit will require monitoring of SO_2, CO_2, and NO_X. The facility will comply with all applicable requirements of these rules, and will install, maintain and operate the required monitoring systems, or acceptable alternate monitoring systems in the case of SO_2, as allowed in Appendix D of Part 75.

3.1.5 COMPLIANCE ASSURANCE MONITORING

The Compliance Assurance Monitoring Rule (40 CFR 64) addresses monitoring for certain emission units at major sources, in order to assure proper operation of air pollution equipment and compliance with emissions limitations or standards.

The rule does not apply to sources regulated under a New Source Performance Standard (NSPS) or the National Emission Standards for Hazardous Air Pollutants (NESHAP) adopted after November 15, 1990. The emission units potentially subject to the Compliance Assurance Monitoring Rule would consist of the combustion turbines, duct burners, and cooling tower. Emissions of CO and NO_X from the combustion turbines and duct burners are limited by an active control device, and thus subject to the standard. They will be exempt from the requirements of this rule; however, a continuous method of compliance is specified in the part 70 operating permit issued for this facility. The cooling tower PM emissions will be controlled by drift eliminators. The cooling tower source is, therefore, not subject to the requirements of this rule.

3.2 STATE APPLICABLE REQUIREMENTS

While Maricopa County has been delegated full authority to administer and enforce the air quality programs required under the Clean Air Act, there are several "pass-through" Arizona SIP regulations that were reviewed for applicability to the proposed facility. There were no specific state requirements found to apply to the proposed facility.

3.3 LOCAL APPLICABLE REQUIREMENTS

Maricopa County has been delegated full authority from the United States Environmental Protection Agency, and authority under AR S 49-402, to enforce the air quality programs required under the Clean Air Act. Their regulations are considered, therefore, federally enforceable. Maricopa County SIP-approved regulations are identified in Appendix B-1. These regulations have generally been supplemented by the currently adopted rules, but are still considered the federally enforceable version. Current Maricopa County Air Pollution Control Regulations are identified in Appendix B-2. Some of the more significant provisions and requirements applicable to this project include:

- Rule 200 of Regulation II--Permits and Fees, describes the requirement to obtain a permit. A Title V permit is required for any major source. Provisions are identified for a request for accelerated permitting. Fees, confidentiality issues, and selection of air dispersion models for air quality impact analyses are also described.
- Rule 210--Title V Permit Provisions, provides for the review of new Title V sources through the issuance of Title V permits. Describes the requirements of the Title V permit application and the "Standard Permit Application Form."
- Rule 240--Permits for New Major Sources and Major Modifications to Existing Major Sources, describes the procedures for review of New Major Sources requiring permits. Provides for the implementation of the new source review (NSR) permit process. Major sources are defined, significant ambient concentrations of specified pollutants are identified, and the specific requirements for an air quality impact analysis are described. The proposed facility will comply with all applicable requirements of this rule, as contained in this permit application.
- Rule 241--Permits for New Sources and Modifications to Existing Major Sources, provides for control technology review of nonmajor sources requiring permits. Requires the implementation of Best Available Control Technology (BACT) or Reasonably Available Control Technology (RACT) on affected sources. The cooling tower and emergency diesel firewater pump will be subject to this rule. The required BACT analysis is provided in Section 5.3 of this permit application.
- Rule 245--Continuous Source Emissions Monitoring, describes continuous source emission monitoring requirements for fossil fuel-fired generators. The CTs and duct burners are exempt from these provisions; however, because the rule specifically exempts sources that are subject to an NSPS and the monitoring requirements therein.

- Rule 270--Performance Tests, includes supportive data for good maintenance and operating practices, performance test requirements, and testing criteria of stationary sources.
- Rule 300--Visible Emissions, describes standards for visible emissions and opacity. Establishes a 20 percent opacity limitation, except for periods of startup, shutdown, and malfunction. Provisions for compliance monitoring using Method 9 are also provided.
- Rule 310--Fugitive Dust Sources, establishes limits for the emissions of particulate matter into the ambient air from any property, operation or activity that may serve as an open fugitive dust source. This regulation is designed to limit PM emissions from any fugitive dust source. A Dust Control Plan describing the total area of land surface disturbed and the proposed activities will be prepared prior to the start of construction of this facility, as well as the proposed control measures, dust suppressants, and/or specific surface treatments, and/or other control measures to be employed at the facility.
- Rule 320--Odors and Gaseous Air Contaminants, establishes limits for the emissions of odors and other gaseous air contaminants into the atmosphere. This regulation establishes limitations on sulfur dioxide and nitrogen oxide emissions from electric power plants. The limitation of 0.2 lbs/mmBtu of NO_X emissions will apply to this facility. The sulfur dioxide limit does not apply to gas fired facilities.
- Rule 360--New Source Performance Standards, describes acceptable design and performance criteria for specified new or modified emission sources. Subpart Da will apply to only the duct burner portion of the combined cycle combustion turbine/duct burner emission unit. Subpart GG will apply to the combustion turbines.
- Rule 370--Hazardous Air Pollutants, describes emissions standards for federally listed hazardous air pollutants. This facility is not currently subject to any NESHAP or maximum achievable control technology (MACT) requirement and is therefore, not currently subject to this rule.
- Rule 371--Acid Rain, incorporates by reference the Acid Rain federal regulations in order to obtain delegated authority to enforce portions of the Clean Air Act Amendments of 1990 (CAAA). The generating units proposed for this facility will be subject the provisions of this rule. A DRAFT Acid Rain Permit application is included in Appendix C of this permit application.

3.4 INSIGNIFICANT AND TRIVIAL ACTIVITIES

A draft list of insignificant activities was developed for the proposed project based on the draft Maricopa County Appendix D List of Insignificant Activities dated December 16, 1999. This list is provided in Table 3-2.

Trivial activities, as defined in the draft Maricopa County Appendix E List of trivial activities, will also occur at the proposed Facility. In accordance with the guidance in that document, a Title V source is not required to list these activities in the permit application. These trivial activities generally include activities that emit no regulated pollutant and have no applicable requirements. Trivial activities include such items as; analyzer vents, office air conditioning units, consumer use of office equipment and products, bathroom vents, plant maintenance and upkeep activities, maintenance shop activities, demineralizer tanks and vents, lubricating system vents, boiler water treatment, oxygen scavenging of water, natural gas regulator vents, and any other activity approved by the Control Officer and Administrator of the USEPA.

Table 3-2 Summary Listing of Typical Insignificant Activities Expected at the Facility Based on the December 16, 1999, DRAFT Appendix D List
Nonquantifiable Insignificant Activities
Roadways:
Construction, repair, and maintenance activities.
Fugitive dust from mobile equipment.
Water and Wastewater Treatment and Storage:
Water treatment and storage for use as process water and in cooling systems and cooling towers.
Wastewater neutralization treatment and tank storage.
Chemical storage associated with water and wastewater treatment.
Miscellaneous Activities:
Air conditioning and cooling equipment.
Transferring chemicals.
Power generation unit gas vents including lube oil extractor vents, and mist eliminator vents.
Unheated storage tanks containing aqueous acid or caustic solutions that have minimal fumes that would not emit HAPs.
Quantifiable Insignificant Activities:
Use of handheld aerosol cans.
Solvent cleaning equipment.
Unheated cleaning or coating equipment that does not include control enclosures.
Laboratories and pilot plants.
Laboratory equipment used exclusively for physical, biological, or chemical analysis.
Storage and Distribution:
Chemical or petroleum storage tanks or containers 250 gallons or less.
Any emission unit, operation, or activity that handles or stores a liquid with a vapor pressure less than 1.5 psia.
Any stationary gasoline dispensing operation less than 60,000 gallons of gasoline annually.

Table 3-2 (Continued) Summary Listing of Typical Insignificant Activities Expected at the Facility Based on the December 16, 1999, DRAFT Appendix D List
Nonquantifiable Insignificant Activities **Miscellaneous Activities:** Acetylene, butane, and propane torches. Any other activity not otherwise subject to an applicable requirement, as approved by the Control Officer and the Administer of the USEPA, because of its size or production rate. **From the ADEQ Rules:** Landscaping, building maintenance, or janitorial activities. Gasoline storage tanks less than 10,000 gallons. Diesel and fuel oil storage tanks less than 40,000 gallons.

4.0 EMISSION CALCULATION

4.1 PROJECT EMISSIONS

Emissions from the Project will be generated from the following emissions units:

- Four combustion turbines/HRSGs with duct burners.
- One diesel firewater pump engine.
- Two mechanical draft cooling towers.

4.1.1 COMBUSTION TURBINE/HRSG DUCT BURNER EMISSIONS

CTG emissions are based on manufacturer's provided performance data, for each range of load condition and operating temperature, except for SO_2. Twenty operating scenarios were evaluated for each turbine make (GE and Westinghouse) to arrive at an operating envelope that represents worst case emissions for each unit. These data and worst case emissions calculations are shown in Appendix C. These scenarios include Performance data for the combustion turbines and HRSG duct burners at ambient air temperatures of 17° F, 59° F, 73° F, and 122° F. These temperatures were selected based on historical (30 to 60 years) meteorological data from Phoenix, Arizona. An ambient temperature of 17° F represents the lowest measured site temperature and corresponds to the highest heat input rate. An ambient temperature of 59° F is included as an ISO-condition for comparison purposes. An ambient temperature of 73° F corresponds to the average annual site temperature; this temperature is representative of the average heat input rate. An ambient temperature of 122° F represents the highest measured site temperature. This temperature corresponds to the lowest heat input rate for each turbine, resulting in the maximum required duct firing rates to maintain the desired plant electrical output. This is achieved with the evaporative coolers turned on and steam injection for power augmentation.

SO_2 emission calculations are based on a fuel sulfur content of 0.30 grains/100 SCF and an assumed lower heating value of 20,558 Btu/lb (AP-42, Volume I, Fifth Edition).

All particulate matter was conservatively assumed to have an aerodynamic diameter less than 10 microns and referred to as PM_{10} for all applicable standards. Particulate Matter emissions include estimates of all suspended particulates of all sizes, including back-half condensables in the form of sulfuric acid (H_2SO_4) mist and ammonium sulfate particulates. Most of the H_2SO_4 in the flue gas will form ammonium sulfates and will be emitted as PM_{10}, reducing sulfuric acid mist below significance levels.

The proposed combustion turbine/HRSGs will be operated in combined cycle mode up to a maximum of 8,760 hours per year. Supplemental heat (duct firing), inlet air foggers, and steam injection will occur as needed during full load operation. Based

on these considerations, at an average annual ambient temperature of 73° F, the per CTG and total CTG potential to emit is presented in Table 4-1.

4.1.1.1 STARTUP EMISSIONS

Startup emissions will result from operation of the combustion turbines only. Duct firing and steam injection for power augmentation occurs only at full load, and will not occur during startup or shutdown. Typically, emissions of VOC, SO_2, and PM_{10} are directly related to the firing rate and will be lower during low load and startup/shutdown operation. Emission rates of these pollutants will therefore be higher at the already evaluated full load PTE. Therefore, only emissions of CO and NO_x will be discussed further.

Startup emissions were evaluated for a worst case period of up to 4 hours in duration. Startup emissions of NO_x were conservatively calculated assuming a 33 percent control of the worst case CT emissions (17° F) at low load (50 percent of load for the GE Frame 7FA and 70 percent of load for the Westinghouse 501 FD CT) for a 4 hour startup period. CO startup emissions were estimated based on 0 percent control of the worst case CT emissions (17° F) at low load for a 4 hour startup period.

Estimated hourly NO_x emissions during startup are 26.1 lb/h for the GE Frame 7FA and 88.2 lb/h for the Westinghouse 501F combustion turbine. These can be compared to the normal full load emission rates of 21.1 lb/h for the GE Frame 7FA and 22.5 lb/h for the Westinghouse 501F combustion turbine. While these startup emission rates are somewhat higher than the full load emission rate, it should be noted that this is because the CT and the associated emission control system (the SCR) had been previously shut down. This period of no emissions should be considered in evaluating actual startup emissions. This would significantly lower overall startup emissions to levels below the full load emission rate for either type of CTs. In order to provide a conservative estimate of the 24 hour average emission rate of NO_x during startup, the 4 hour startup emission rate for each combustion turbine was averaged with the corresponding full load emission rate for each CT. For the GE Frame 7FA, this can be calculated as:

((26.1 lb/h x 4 hours) + (21.1 lb/h x 20 hour))/(24 hours) = 21.9 lb/h

For the Westinghouse 501F combustion turbine, the 24 hour average emission rate of NO_X during startup can be calculated as:

((88.2 lb/h x 4 hours) + (22.5 lb/h x 20 hour))/(24 hours) = 33.5 lb/h

Therefore, NO_x emissions resulting from startup/shutdown operations may also be eliminated from further review.

Table 4-1
Combustion Turbine/Duct Burners Air Pollutant Emissions Summary

	Startup (lb/h)	Full Load Hourly	Annual Emissions (tpy)
General Electric - 7F			
NO_x	26.1	21.1	369.7
CO	19.9	20.5	359.2
VOC	1.9	15.3	259.3
PM_{10}	18.0	28.9	506.3
SO_2	1.0	2.0	35.0
Westinghouse 501F			
NO_x	88.2	22.5	394.2
CO	28.3	21.9	383.7
VOC	3.7	14.8	268.1
PM_{10}	13.7	27.1	474.8
SO_2	1.2	2.1	37.3

NO_x--Startup emissions are based on 33 percent control at 17° F at low load.
Full load hourly emissions are based on the 73° F full load case, at 2.5 ppmvd, with full SCR controls (CT + STIG + Duct Burner).

CO--Startup emissions are based on 0 percent control at 17° F at low load.
Full load hourly emissions are based on the 73° F full load case, at 4.0 ppmvd, with full oxidation catalyst.

VOC--Startup emissions are based on 0 percent control at 17° F at low load.
Full load hourly emissions are based on the 73° F full load case.
Annual emissions are based on the 73° F base load case.

PM_{10}--Startup emissions are based on front and back half catch at 17° F at low load.
Full load hourly emissions are based on front and back half catch at 73° F.
Annual emissions based on front and back half catch at 73° F.

SO_2--Startup emissions are based on the 17° F case at low load, with a fuel sulfur content of 0.3 gr/100 scf.
Full load hourly emissions are based on the 73° F case at low load, with a fuel sulfur content of 0.3 gr/100 scf.

CO emissions may be considered in a similar manner. Estimated CO emissions during startup are 19.9 lb/h for the GE Frame 7FA combustion turbine and 28.3 lb/h for the Westinghouse 501F combustion turbine. These can be compared to the full load emission rates of 20.5 lb/h for the GE Frame 7FA and 21.9 lb/h for the Westinghouse 501F combustion turbine. Because the GE Frame 7FA CO startup emission rate is less than the normal full load PTE emission rate, CO emissions form the GE Frame 7FA combustion turbine need not be further evaluated.

For either combustion turbine, startup emissions occur after the combustion turbine has been shut down for an extended period, during which time it has no emissions. Note that as with the NO_x emissions, startup emissions for either combustion turbine, when averaged with the down time periods of no emissions, result in average emissions less than that already calculated for the full load PTE. These overall startup emissions do not effect the already calculated full load PTE.

Because CO has a short-term ambient air quality standard (1 and 8 hour averaging periods), short-term startup emissions for the Westinghouse 501F combustion turbine should be evaluated. For an 8 hour averaging period, the average emission rate should consider a period of normal operation of 4 hours, and a worst case 4 hour startup period. The worst case 8 hour startup emission rate of NO_x for the Westinghouse 501F combustion turbine then becomes:

((28.3 lb/h x 4 hours) + (23 lb/h x 4 hour))/(8 hours) = 25.7 lb/h

The worst case 1 hour CO emission rate is 28.3 lb/h. These short-term startup emissions will be evaluated in the Air Quality Impact Analysis for this facility.

The actual operating scenario of the proposed facility will depend on market conditions and dispatch requirements. The number of startups per CT per year is expected to be approximately 250, although this may vary. As mentioned above, overall startup emission rates are less than the full load emission rates. The number of startups does not affect facility PTE. In addition, and consistent with the provisions of 40 CFR 60.8(c), CT startup and shutdown emissions do not constitute representative conditions. Therefore, emissions during startup and shutdown in excess of the applicable emission limits are not considered a violation of the applicable standard.

4.1.1.2 HOURLY EMISSIONS

Worst case hourly emissions were determined from the full range of operating loads and temperatures. As shown in Table 4-1, maximum hourly emissions occurred at 73°F, at full load conditions for all pollutants. Mesquite Power, LLC requests that startup emissions be exempted from the emission limits established in the Permit to Operate.

4.1.1.3 ANNUAL EMISSIONS

Annual emissions are based on full load operation at 8,760 hours per year at the average annual temperature (73° F).

4.1.2 EMERGENCY DIESEL FIREWATER PUMP ENGINE POTENTIAL TO EMIT

Small quantities of air pollutant emissions may be produced from the operation of the proposed emergency diesel firewater pump engine. These emission rates are considered representative of a diesel engine with this electrical output. The diesel engine will be operated for approximately one hour per week for test and maintenance purposes and will fire No. 2 distillate fuel oil. The estimated diesel engine emissions are summarized in Table 4-2.

4.1.3 COOLING TOWER POTENTIAL TO EMIT

Particulate matter emissions will occur from the cooling tower as a result of drift. The maximum PM_{10} emission rate was calculated based on a design circulating water flow of 163,050 gpm, a controlled drift rate of 0.0005 percent, and a circulating water total dissolved solids (TDS) value of 30,000 ppm (based on well water grab samples). The mass balance calculation is shown below where 8.34 lb/gal represents the density of water:

(2 towers)(163,050 gpm)(8.34 lb/gal)(0.0005%/100)(30,000 ppm/10^6)
(60 min/h) = 24.48 lb/h

Assuming 8,760 hours of operation per year, this results in an annual PM emission rate of 107.2 tpy. It should be noted that only a fraction of the particulate matter from the cooling tower drift is PM_{10}. Therefore, it was conservatively assumed that 31.5 percent of the particulate matter from the cooling tower is PM_{10}, resulting in 33.8 tpy of PM_{10}. (The fraction of particulate matter assumed to be PM_{10} is found in technical paper 73-01 *Cooling Tower Drift Its Measurement, Control and Environmental Effects* by Wistrom and Ovard, presented at the 1973 Cooling Tower Institute Annual Meeting.)

4.2 OTHER SOURCE OF EMISSIONS

There are no other stationary sources proposed at the site that could cause the emission of contaminants.

Table 4-2 Emergency Diesel Firewater Pump		
	lb/h	tpy
NO_x	5.6	0.15
CO	1.0	0.30
VOC	0.3	0.01
PM_{10}	0.15	0.004
SO_2	0.54	0.01
Based on manufacturer estimated emissions for a 360 hp diesel firewater pump operating for 52 h/y.		

4.3 MAXIMUM FACILITY POTENTIAL TO EMIT

The Project's PTE for each pollutant and applicable PSD significant emission levels are summarized in Table 4-3.

4.4 PSD APPLICABILITY AND PROJECT'S POTENTIAL TO EMIT EMISSIONS

The Project is listed as one of the major source categories requiring application of the 100 tpy threshold. PSD applicability is determined on a pollutant by pollutant basis by comparing the net emissions of each pollutant against the PSD significant emission rates (i.e., 40 tpy for NO_x, 40 tpy for SO_2, 25 tpy for TSP, 15 tpy for PM_{10}, 100 tpy for CO, and 40 tpy for VOCs).

The proposed project will be classified as a PSD major stationary source. The Project's PTE for each pollutant is summarized in Table 4-3. The applicable PSD significant emission levels for each pollutant are included for comparison purposes in the table. The PTE emissions for NO_x, CO, PM_{10}, and VOC are greater than the applicable PSD significant emission rates, and these pollutants are subject to PSD review.

Table 4-3
Project Potential to Emit and PSD Applicability

Pollutant	Combustion Turbine/HRSG Maximum PTE[a] (tpy)	Diesel Firewater Pump PTE (tpy)	Cooling Towers PTE (tpy)	Project PTE[c] (tpy)	PSD Significant Emission Rate (tpy)	PSD Review Required?
NO_x	394.2[a]	0.145	-	394.3	40	**Yes**
CO	383.7[a]	0.026	-	383.7	100	**Yes**
SO_2	37.3[a]	0.014	-	37.3	40	No
VOC	268.1[a]	0.008	-	268.1	40	**Yes**
PM_{10}	506.3[a,b]	0.004	33.77	540.1	25/15	**Yes**
Total Reduced Sulfur	Negligible	Negligible	-	Negligible	10	No
Total Fluorides	Negligible	Negligible	-	Negligible	3	No
Lead	Negligible	Negligible	-	Negligible	0.6	No

[a]Based on the maximum PTE for both turbine vendors considered as presented in the 'Total' column of Table 4-1.

[b]Assumes front and back half PM_{10} emissions.

[c]Summation of 4 combustion turbine/HRSG duct burners, 1 diesel firewater pump, and 2 cooling towers.

5.0 BEST AVAILABLE CONTROL TECHNOLOGY

5.1 INTRODUCTION

The 1977 Clean Air Act (CAA) established revised conditions for the approval of preconstruction permit applications under the Prevention of Significant Deterioration (PSD) program. One of these requirements is that Best Available Control Technology (BACT) be installed for all regulated criteria pollutants that are emitted in significant amounts from New Major Sources or modifications. Another requirement is that the Lowest Achievable Emission Rate (LAER) be installed for ozone precursurs above a certain threshold for sources that are located in a nonattainment area. Because this project is located in an area classified as being attainment for all regulated pollutants, the emissions units must comply with BACT requirements only. Individual point sources for this project include four combustion turbines with duct firing, an emergency diesel-fire pump, and cooling towers.

5.2 COMBUSTION TURBINE BACT ANALYSIS

This section describes the basis of this BACT analysis. Information is provided on the BACT methodology and approach used. The parameters and factors used in developing the analysis are identified.

Regulatory and Methodology Basis

The United States Environmental Protection Agency (USEPA) has authorized the development of a guidance document (March 15, 1990) on the use of the "top-down" approach to BACT determinations. The first step in a top-down BACT analysis is to determine, for the pollutant in question, the most stringent control technology and emission limit available for a similar source or source category. Technologies required under Lowest Achievable Emission Rate (LAER) determinations must be considered. These technologies represent the top control alternative under the BACT analysis. LAER is defined as the most stringent emission limitation achievable. If it can be shown that this level of control is infeasible on the basis of technical, economic, energy, or environmental impacts for the source in question, then the next most stringent level of control is identified and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any technical, economic, energy, or environmental consideration.

The following is a summary of these requirements and the assumptions on which this BACT analysis is based:

- Federal and state ambient air quality standards, emission limitations, and other applicable regulations will be met.
- Federal New Source Performance Standards (NSPS) for combustion turbines with heat input greater than 10 mmBtu/h (40 CFR 60 Subpart

GG) establish limiting criteria for NO_x emissions. No NSPS criteria have been established for limiting CO, VOC, and PM_{10} emissions.

The following flue gas emission limits are established by NSPS for Subpart GG units:

NO_x: 75 ppmvd at 15 percent O_2, corrected for fuel nitrogen content and turbine heat rate.

Federal NSPS for electric utility steam generating units with fuel burn rates greater than 250 mmBtu/h (40 CFR 60 Subpart Da) establish limiting criteria for SO_2, NO_x, and PM_{10} only. No NSPS criteria have been established for limiting CO and VOC emissions. NSPS limits NO_x emissions to 0.5 lb/mmBtu, a minimum 25 percent reduction in potential concentration, and 1.6 lb/MWh for natural gas fired sources in Subpart Da. Particulate matter is limited to 0.03 lb/mmBtu. Additional standards for SO_2 do not apply to sources firing natural gas only.

As defined in the air permit application, the project will have potential to emit (PTE) emissions of NO_x, CO, VOC, and PM_{10} in excess of the major modification PSD threshold levels established for these pollutants. As a result, BACT is required for NO_x, CO, VOC emissions. BACT is defined as an emission limitation established based on the maximum degree of pollutant reduction determined on a case-by-case basis considering technical, economic, energy, and environmental considerations. However, BACT cannot be less stringent than the emissions limits established by an applicable Federal NSPS.

Operations/Emissions Basis

The following are summaries of the operating emission requirements and assumptions for which this BACT analysis is based:

- Both types of combustion turbines considered for the Project will be evaluated separately. The CTs' performance and emissions will be based on operating at full load (including duct burners in operation) using 73° F performance data.
- As mentioned previously, the proposed operating scenario for each CT consists of operating up to 8,760 hours per year.

Economic Basis

The economic criteria used to determine capital and annual costs of the control technologies are based on EPA methodologies shown in the EPA Best Available Control Technology Draft Guidance Document (October 1990), EPA BACT Guidelines, Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual (Fourth Edition), internal project developer cost factors, and vendor budgetary cost quotes.

Table 5-1 lists the assumptions for the economic criteria used in the analysis of BACT alternatives.

Table 5-1
Project Economic Evaluation Criteria

Economic Parameters	Value
Contingency, percent	20
Real Interest Rate, percent	7
Economic Life, years	20
Labor Cost, $/man-h	40
Energy Cost, $/kWh (1999)	0.03
Catalyst Life, years	3

5.2.1 COMBUSTION TURBINE NO_X BACT ANALYSIS

The objective of this analysis is to determine BACT for NO_x emissions from the combustion turbines and duct burners. Unless otherwise noted, the NO_x emission rates described in this section are corrected to 15 percent oxygen.

5.2.1.1 BACT/LAER CLEARINGHOUSE REVIEWS

A review of the BACT/LAER Clearinghouse documents (CAPCOA, 1985-1992; USEPA, 1990 to present) indicates that the lowest emission achieved for a natural gas fired CT is 2.0 ppmvd for the Federal Cold Storage Cogeneration facility located in California. The 2.0 ppmvd was achieved for six months (June 1997 to December 1997). Region IX of the EPA has deemed that the limit of 2.0 ppmvd at 15 percent oxygen was achieved in practice with three-hour averaging. Emissions from the unit are controlled through the use of water injection and a $SCONO_x$ system. The Federal Cold Storage Cogeneration facility is configured in a mode of operation similar to that proposed for this Project. It should be noted that the Federal Cold Storage facility is located in a nonattainment area for ozone, with NO_x regulated as a nonattainment pollutant. Thus, this emission level represents LAER for combined cycle CTs. It should also be noted that this is a small, 222 mmBtu/h GE model LM2500 combined cycle gas turbine that is producing 32 MW (cogeneration). The use designation is limited to the specific application of small, combined cycle CT projects (e.g., units under 30 MW), and is not considered applicable to the proposed Project.

It should also be noted that the Sacramento Power Authority located in California has set a 3.0 ppmvd NO_x emission limit for a natural gas fired CT. The unit is a 1,257 mmBtu/h combined cycle natural gas fired Siemens V84.2 gas turbine generator with water injection for power augmentation and 200 mmBtu/h of supplemental firing capacity that can produce 103 MW. The emissions from this unit are controlled through the use of standard combustors, water injection, and selective catalytic reduction (SCR). This combustion turbine emission limit is noted in the Clearinghouse as being representative of LAER for large CTs. Another stringent NO_x emissions limit for a gas fired CT is 3.5 ppmvd for the Brooklyn Navy Yard Cogeneration Project located in New York. The emissions from that unit are controlled through the use of dry-low NO_x burners and SCR.

5.2.1.2 ALTERNATIVE NO_X EMISSION REDUCTION SYSTEMS

During combustion, NO_x is formed through the oxidation of the fuel-bound nitrogen (fuel NO_x) or through the oxidation of a portion of the nitrogen contained in the combustion air (thermal NO_x), and are a function of combustion temperature. NO_x production in a gas turbine combustor occurs predominantly within the flame zone, where localized high temperatures sustain the NO_x-forming reactions. The overall

average gas temperature required to drive the turbine is well below the flame temperature, but the flame region is required to achieve stable combustion.

Nitrogen oxides control methods may be divided into two categories: in-combustor NO_x formation control and postcombustion emission reduction. An in-combustor NO_x formation control process reduces the quantity of NO_x formed in the combustion process. A postcombustion technology reduces the NO_x emissions in the flue gas stream after the NO_x has been formed in the combustion process. Both of these methods may be used alone or in combination to achieve the required NO_x emissions. The six different types of emission controls reviewed by this BACT analysis are as noted below:

- In-Combustor Type:
  - Water/Steam Injection
  - Dry-low NO_x Burner
  - Xonon
- Postcombustion Type:
  - SNCR
  - SCR
  - $SCONO_x$

Water or Steam Injection

NO_x emissions from the combustion turbines can be controlled by either water or steam injection. With this type of control, water or steam is injected into the primary combustion zone with the fuel. The water or steam serves to reduce NO_x formation by reducing the peak flame temperature. The degree of reduction in NO_x formation is proportional to the amount of water injected into the combustion turbine. Since the combustion turbine NSPS was last revised in 1982, manufacturers have improved combustion turbine tolerances to water injection. However, there is a point at which the amount of water injected into the combustion turbine seriously degrades its reliability and operational life. This type of control can also be counterproductive with regard to carbon monoxide (CO) and volatile organic compound (VOC) emissions that are formed as a result of incomplete combustion.

The development of dry-low-NO_x (DLN) burners has replaced the use of water injection except for certain cases such as oil firing. The only fuel for this project is natural gas; therefore, the water or steam injection method of postcombustion control will not be considered further in this BACT analysis.

Dry-low NO_x Burners

NO_x can be limited by lowering combustion temperatures and by staging combustion (i.e., creating a reducing atmosphere followed by an oxidizing atmosphere). The use of DLN burners as a way to reduce flame temperature is one common NO_x

control method. These combustor designs are called DLN burners because no water needs to be injected into the combustion chamber to achieve lower NO_x emissions. Most industry gas turbine manufacturers today have developed this type of lean premix combustion system as the state-of-the-art for NO_x controls in combustion turbines.

DLN combustion turbine burner designs use improved air/fuel mixing and reduced flame temperatures to limit thermal NO_x formation. DLN burner technology uses a two-stage combustor that premixes a portion of the air and fuel in the first stage with the remaining air and fuel being injected in the second stage. This two-stage process ensures good mixing of the air and fuel and minimizes the amount of air required, resulting in lower NO_x emissions.

The controlled emissions levels of combustion turbines will vary from manufacturer to manufacturer. NO_x emission levels of approximately 9 ppmvd for GE 7FA CTs and 25 ppmvd, using DLN SW 501F CTs, is considered feasible for this project. Also, as with the standard combustor with water injection, the DLN burners can also be counterproductive with regard to CO and VOC emissions, in that the staged combustion and lower combustion temperatures may cause higher CO and VOC emissions.

Due to the proven performance of the DLN burner technology, this method of NO_x emissions control will be considered in this BACT analysis. The combination of DLN burner technology with the addition of an SCR will represent BACT for the CTs proposed for the Project.

XONON

Another form of in-combustor control is Xonon. This technology, being developed by Catalytica Combustion Systems, is designed to avoid the high temperatures created in conventional combustors. The XONON combustor operates below 2,700° F at full power load, which significantly reduces NO_x emissions without raising, and possibly even lowering, emissions of carbon monoxide and VOC. XONON uses a proprietary flameless process in which fuel and air react on the surface of a catalyst in the turbine combustor to produce energy in the form of hot gases, which drive the turbine. To date, commercialization of this technology on utility size combustion turbines such as proposed for the Project has not yet occurred.

Due to the technical and commercial limitations of this technology, this method of postcombustion control will be eliminated from further evaluation for control of NO_x emissions in this BACT analysis.

Selective Noncatalytic Reduction

Selective noncatalytic reduction (SNCR) is one method of postcombustion NO_x control. SNCR reduces NO_x into nitrogen and water vapor through a reaction of the flue gas with a reagent. The SNCR system is dependent upon the reagent injector location

and temperature to achieve proper reagent/flue gas mixing for maximum NO_x reduction. SNCR systems can use either ammonia or urea as reagents. The use of these reagents for NO_x reduction is patented under the trade names Thermal $DeNO_x$ and NOXOUT, respectively. Ammonia for a thermal $DeNO_x$ system is received and stored as a liquid and vaporized prior to injection into the flue gas stream. Injection is accomplished using either compressed air or steam as a carrier. The injected ammonia then reacts with NO_x in the flue gas to form nitrogen and water. Urea for a NOXOUT system is stored as a 50 percent solution in water. This solution is atomized at the injection point to optimize mixing. The urea molecule dissociates to form two molecules of ammonia that reacts with NO_x in the flue gas to form nitrogen and water. Injector location requirements would be similar for both ammonia-based and urea-based SNCR systems.

SNCR systems require a fairly narrow temperature range for reagent injection in order to achieve effective NO_x reduction. The optimum temperature range for injection of ammonia or urea is 1,500° to 1,900° F. The NO_x reduction efficiency of an SNCR system decreases rapidly at temperatures outside the optimum temperature range. Operation below this temperature range results in excessive ammonia emissions (slip). Operation above the temperature range results in increased NO_x emissions. Injection of hydrogen or other additives can increase the effective temperature window required for SNCR operation. However, regardless of the magnitude of the temperature window, residence times in the temperature range are limited, resulting in less than optimum performance.

A portion of the ammonia used or generated by the SNCR process reacts with NO_x in the flue gas and decomposes into nitrogen and water vapor. The remaining unreacted ammonia exits the system as ammonia slip. Control of ammonia or urea in an SNCR system is difficult. The use of an SNCR system could potentially result in stack emissions of between 20 and 50 ppmvd of ammonia. Unreacted ammonia from the SNCR system and sulfur trioxide in the flue gas can react to form ammonium bisulfate and ammonium sulfate salts. Resultant particle diameters are on the order of 1 to 3 microns. The creation of these salts will increase plant PM_{10} emissions. Ammonium bisulfate is a sticky substance that can deposit on downstream equipment. Once liquefied (at temperatures below 410° F), it can resolidify, build up on, and foul equipment located downstream.

The use of an SNCR system will increase energy requirements for a given application, requiring fans, air compressors, or a steam source to provide the necessary energy for the dilution, atomization, and injection of reagent into the flue gas stream. These additional energy requirements will result in increased annual emissions of other pollutants as well. In general, an SNCR system is a less efficient NO_x reduction system than an SCR system.

Moreover, the exhaust temperature at the exit of a combustion turbine, which ranges from about 1,000° to 1,150° F for these units, is too low for any consideration of this technology.

Due to the technical and operational limitations on temperature and available reaction time, this method of postcombustion control will be eliminated from further evaluation in this BACT analysis.

Selective Catalytic Reduction

Another postcombustion method is selective catalytic reduction (SCR). SCR systems have been used quite extensively in combined cycle CT projects for the past 5 years. The SCR process combines vaporized ammonia with NO_x in the presence of a catalyst to form nitrogen and water. The vaporized ammonia is injected into the combustion turbine exhaust gases prior to passage through the catalyst bed. The use of a SCR system results in small levels of ammonia emissions (ammonia slip). As the catalyst degrades, ammonia slip will increase to approximately 10 ppm, ultimately requiring catalyst replacement.

The performance and effectiveness of SCR systems are directly dependent on the temperature of the flue gas when it passes through the catalyst. Vanadium/titanium catalysts have been used on the majority of SCR system installations (greater than 95 percent). The flue gas temperature range for optimum SCR operation using a conventional vanadium/titanium catalyst is approximately 500° to 750° F. At temperatures above 800° F permanent damage to the vanadium/titanium catalyst may occur. This temperature window can exist if the SCR catalyst is placed in the HRSG at an optimum position. The temperature out of the combustion turbine and into the HRSG is approximately 1,000° to 1,150° F. The temperature of the flue gas will have decreased to an acceptable level by the time it reaches the SCR catalyst. Accordingly, a vanadium/titanium catalyst can be installed for this project.

Mesquite Power, LLC, proposes to use a combination of DLN burners and SCR for controlling nitrogen oxides. This combination of control will be considered BACT to control NO_x emissions.

$SCONO_x$

A third, relatively new postcombustion technology from Goal Line Environmental Technologies is $SCONO_x$, which utilizes a coated oxidation catalyst to remove both NO_x and carbon monoxide (CO). The system utilizes hydrogen (H_2) (which is created by reforming natural gas) as the basis for a proprietary catalyst regeneration process. The system uses of a platinum-based catalyst coated with potassium carbonate (K_2CO_3) to oxidize both NO_x and CO and thereby reduce plant emissions. CO emissions are decreased by the oxidation of CO to carbon dioxide (CO_2). The catalyst is installed in the flue gas at a point where the temperature is between 280° to 650° F.

Flue gas temperatures above 550° F are preferred since the need for both an auto-thermal reformer and carbon scrubber can be avoided. In addition, the $SCONO_x$ catalyst is more efficient at higher temperatures, although the $SCONO_x$ system has yet to have proven reliable performance at temperatures greater than 550° F. Goal Line addresses the higher temperature issue by offering an additional section of catalyst to the HRSG to allow for adequate NO_x reduction. For placement in a low temperature region of the HRSG , additional catalyst would not be needed. Goal Line guarantees the performance of the catalyst for 3 years. When the catalyst reaches the end of its service life, it can be recycled to recover the precious metal contained within the catalyst. This recycled material can account for as much as one-third the cost of the replacement catalyst.

The $SCONO_x$ catalyst simultaneously oxidizes CO to CO_2 and NO to NO_2, then absorbs the NO_2 onto the catalyst surface through the use of a potassium carbonate absorber coating. The reactions of this oxidation/absorption cycle are shown as Equations [1], [2], and [3]:

$$CO + \tfrac{1}{2}O_2 \rightarrow CO_2 \qquad [1]$$

$$NO + \tfrac{1}{2}O_2 \rightarrow NO_2 \qquad [2]$$

$$2NO_2 + K_2CO_3 \rightarrow CO_2 + KNO_2 + KNO_3 \qquad [3]$$

The CO_2 in reactions [1] and [3] are exhausted out of the stack. The potassium carbonate coating reacts with NO_x to form potassium nitrites and nitrates that remain on the surface of the catalyst. The $SCONO_x$ catalyst eventually becomes saturated and must be regenerated. When all of the carbonate absorber coating on the surface of the catalyst has been reacted to form potassium nitrides and nitrates, NO_x will no longer be absorbed, and the catalyst must enter the regeneration cycle.

The regeneration of the catalyst is accomplished by passing a regeneration gas across the catalyst surface. The gas de-absorbs NO_2 from the catalyst surface and reduces it to nitrogen (N_2) and water vapor which is emitted to the atmosphere. For systems where the $SCONO_x$ catalyst is located in an area with low flue gas temperatures, the regeneration gas is produced by processing a small stream of natural gas through a separate skid-mounted processing unit or auto-thermal reformer. The $SCONO_x$ catalyst is susceptible to poisoning by SO_2, requiring the natural gas to be scrubbed to remove the sulfur. The resulting regenerating gas is approximately 3 percent N_2, 1.5 percent CO_2, and 4 percent H_2, with steam making up the balance (the steam is used as a carrier). For systems where the $SCONO_x$ catalyst is located in an area with the flue gas temperatures above 500° F, the regeneration gas can be produced in the flue gas before it regenerates the catalyst. In the high temperature case, a separate processing unit is not required. The regeneration gas must contain

minimal amounts of free oxygen. The carrier gas should be free of oxygen. The low concentrations of both hydrogen and free oxygen minimize the risk of any explosion. The appropriate reactions are shown in Equations [4] and [5]:

$$CH_4 + \tfrac{1}{2}O_2 + 1.88N_2 \rightarrow CO + 2H_2 + 1.88N_2 \qquad [4]$$

$$CO + 2H_2 + H_2O + 1.88N_2 \rightarrow CO_2 + 3H_2 + 1.88N_2 \qquad [5]$$

The hydrogen in this reaction combines with the potassium nitrites and nitrates to form water vapor and elemental nitrogen. Carbon dioxide in the regeneration gas reacts with potassium nitrites and nitrates to form potassium carbonate, which is the absorber coating that was on the surface of the catalyst before the oxidation/absorption cycle began. The appropriate reaction is shown in Equation [6]:

$$KNO_2 + KNO_3 + 4H_2 + CO_2 \rightarrow K_2CO_3 + 4H_2O(g) + N_2 \qquad [6]$$

Water vapor (steam) and elemental nitrogen are exhausted to the atmosphere and the potassium carbonate is returned to the surface of the catalyst. There is no net gain or net loss of potassium carbonate after the completion of the oxidation/absorption and regeneration cycle.

Dampers are used to isolate a portion of the catalyst for regeneration. At any time, one portion of the catalyst would be out of service, undergoing regeneration. The regenerative gas is passed through the isolated portion of the catalyst while the remaining catalyst stays in contact with the flue gas. After the isolated portion has been regenerated, the next set of dampers close and the next portion of the catalyst is isolated and regenerated. This cycle repeats continuously with each section of the catalyst regenerated about once every fifteen minutes. Homogeneous distribution of the regeneration gas over the surface of the isolated section of the catalyst is critical.

A $SCONO_x$ system for an F class combustion turbine has not been demonstrated, but is estimated to require 12 to 16 sections of catalyst. At any given time, 75 percent of these sections operate in the oxidation/absorption cycle while the remaining 25 percent are undergoing the regeneration cycle. The catalyst is sized to allow for on-line regeneration without a need to reduce unit load. The duration of the regeneration cycle for each catalyst section is flexible and can be programmed into the system's programmable logic controller (PLC). The duration between regeneration cycles will become shorter as the catalyst approaches the need to be recoated.

The $SCONO_x$ catalyst is very susceptible to fouling by sulfur in the flue gas. Sulfur causes the catalyst to become deactivated. As an example, at the Federal Cold Storage facility, one of the only two existing $SCONO_X$ installations, the natural gas contains 6 to 12 ppm of sulfur and requires frequent recoating or "washing" periods. A

carbon absorption scrubber was used to reduce the sulfur in the incoming natural gas. Before the sulfur scrubber was installed, NO_x emissions were typically about 3 to 4 ppm with peak values sometimes occurring at 7 ppm. After installation of the scrubber, typical emissions were reduced to 2 ppm with peaks at approximately 2.5 ppm.

The impact of sulfur can be minimized by a sulfur absorption $SCOSO_x$ catalyst. The $SCOSO_x$ catalyst is located upstream of the $SCONO_x$ catalyst. The SO_2 is oxidized to sulfur trioxide (SO_3) by the $SCOSO_x$ catalyst. The SO_3 is then deposited on the catalyst and removed from the catalyst when it is regenerated. The $SCOSO_x$ catalyst is regenerated along with the $SCONO_x$ catalyst. The resulting byproduct of the regeneration is either hydrogen sulfide (H_2S) (flue gas temperatures below 450° F at the $SCONO_x$ catalyst) or SO_2 (flue gas temperatures above 450° F). The H_2S byproduct can be removed from the regeneration gas through a carbon scrubber. In the case of an SO_2 byproduct, the regeneration gas is piped back into the combustion turbine exhaust downstream of the $SCONO_x$ catalyst. The higher the sulfur content of fuel burned, the more frequently the $SCOSO_x$ catalyst will require recoating. When both $SCOSO_x$ and $SCONO_x$ catalyst are installed, the regeneration gas is distributed within the space between these two isolated catalysts. The regeneration gas is discharged from the isolated catalyst chamber either upstream of the $SCOSO_x$ or downstream from the $SCONO_x$ catalyst. In this way, the SO_2 discharged from the $SCOSO_x$ catalyst is prevented from contacting the $SCONO_x$ catalyst. When the regeneration gas is subsequently discharged into the flue gas stream downstream of both catalysts, the SO_2 exits the stack along with the rest of the flue gas. In this case, no additional SO_2 emissions will occur beyond that typically found during natural gas firing.

Natural gas and carrier steam consumption is a function of the installed catalyst surface area. Likewise, the required catalyst surface area is a function of the flue gas temperature at the $SCONO_x$ catalyst location; the NO_x production rate of the combustion turbine, and the design of the combustion turbine. In general, for a $SCONO_x$ catalyst installed in a temperature region greater than 550° F for an F class combustion turbine, approximately 3,200 to 3,800 scfh of natural gas will be required for the production of the regeneration gas and 20,000 to 26,000 lb/h of superheated steam will be needed as the regeneration gas carrier. A facility may have difficulties operating within these parameters which are dependent on the combustion turbine selected.

The $SCONO_x$ catalyst will require that it be recoated or "washed" every six months to one year. The frequency of washing is dependent on the sulfur content in the fuel and the effectiveness of the $SCOSO_x$ catalyst. The "washing" consists of removing the catalyst modules from the unit and placing each module with a potassium carbonate reagent. The $SCOSO_x$ catalyst will also require washing, but due to limited operating experience with the $SCOSO_x$ catalyst, it is uncertain how often it will be required. However, it is expected that the $SCOSO_x$ catalyst will require annual washing.

Recoating is accomplished on the plant site using a series of four tanks. Three of the tanks use a potassium carbonate solution containing 8.5 to 10 percent K_2CO_3 by weight. The fourth tank contains deionized water for rinsing. One section of catalyst is dipped through a series of tanks and then dried with low-pressure compressed air following recoating. After two batches of catalyst are recoated, the solution on the initial dip tank must be changed out. For an F class combustion turbine, there would be approximately 12 to 16 $SCONO_x$ catalyst sections. The recoating sequence cascades the potassium carbonate solution forward, as fresh K_2CO_3 is required. Therefore, the freshest K_2CO_3 solution is used for the last recoating stage. The spent K_2CO_3 solution and deionized water are stored in a tank and treated with acid to adjust pH prior to discharge. Depending upon local discharge permits, treatment with acid to adjust the pH may or may not be required. Recoating arrangements are flexible and can be optimized for each site.

There are three main options for the recoating process of the catalyst. The first option requires the unit to be shut down for approximately one week (for a frame F size machine) to remove, recoat, and replace all of the $SCONO_x$ catalyst. This has the disadvantage of eliminating the ability to produce power during the recoating process. The second alternative is to develop a method of removing the catalyst while the unit is online and replacing the catalyst with a clean, previously recoated catalyst while the other catalyst is "washed." This alternative would require purchasing extra sets of catalyst and providing safe access to protect personnel from exposure to the hot flue gas while the catalyst is being replaced and reinstalled. This method of operation has not been demonstrated in practice and raises significant safety concerns. The third option is to bring the unit off line long enough to remove the old catalyst and replace it with a clean catalyst. The removed catalyst is then recoated and prepared for reinstallation during the next recoating outage. This would require a shorter outage than the first outage, but would require the purchase of two full sets of catalyst (one operating and one spare).

The Federal Cold Storage facility has demonstrated that $SCONO_x$ is capable of achieving NO_x emission concentrations as low as 2 ppm based on a maximum inlet concentration of 25 ppm (92 percent reduction) and a CO reduction of 90 percent based on a maximum inlet concentration of 50 ppm for a small (25 MW) machine. Although the $SCONO_x$ catalyst appears to be achieving the advertised NO_x control efficiencies, uncertainties still exist regarding the new catalyst technology. Although this system has been proven on a small size unit (32 MW), scale up concerns exist with regard to the use of this technology on large F frame units. Dampers would have to be scaled up and issues such as operator size requirements, damper blade shaft design, (prevent over-torque conditions), and shaft bearing loading would all have an impact with a larger system. The regeneration process would require the operation of the dampers to maintain a proper seal to isolate the catalyst from the flue gas, thus limiting ambient oxygen concentrations. Also, if replacing catalyst section with the unit online, personnel

safety requires that the damper seal must approach zero leakage when a section is isolated.

Another concern is the removal and replacement of the catalyst for recoating without adversely impacting unit availability. The larger volume of catalyst used in an F class combustion turbine will require a significant period of washing or will necessitate the purchase of several spare catalyst modules.

The current $SCONO_x$ catalyst technology is in its second generation. The first generation operated for approximately ten months on a small LM-2500 combined cycle CT unit before it was taken out of service because of poor regeneration gas distribution.

$SCONO_x$ is a technology that has effectively reduced emissions at the Federal Cold Storage facility thus far. While mechanically very complicated, $SCONO_x$ technology allows for transient operation (load changes) and no ammonia issues, such as transportation, storage, or slip emissions, are present. In addition, the wide operating temperature range has the potential for flexibility for future projects. The $SCONO_x$ catalyst can be placed in the most cost effective location in an HRSG. The $SCONO_x$ catalyst can also significantly reduce CO emissions, thus reducing the need for an oxidation catalyst. However, there are a number of serious concerns regarding $SCONO_x$ which still need to be addressed. They include the following:

- Design issues, such as damper size and proper distribution of regeneration gas for "scale-up" from a LM-2500 to a frame F combustion turbine.
- Mechanical system reliability: Damper and damper bearings are moving parts in the flue gas system that may present maintenance problems.
- On-line removal of catalyst for washing, including mechanics of how it is to be accomplished, time period, labor (cost), and safety issues.
- $SCOSO_x$ reliability: The SO_2 guard catalyst bed ($SCOSO_x$) can cause contaminated regeneration gas (containing sulfur and sulfur acids) to be handled, thereby questioning the effectiveness and reliability of the catalyst.
- Increased pressure drop.
- Proprietary Issue: $SCONO_x$ catalyst is a proprietary catalyst leading to concerns regarding long-term pricing.
- Financial Concerns: Lenders will have to assume performance and operational risks associated with the use of $SCONO_x$.

The application for this technology is currently limited to combined cycle CT units under 30 MW and cannot, therefore be considered to have been demonstrated in practice for "F" class machines. $SCONO_x$ cannot be considered to be BACT for this project because there are serious technical and economic concerns with using this new technology related to the operating plant size proposed for the Project.

5.2.1.3 CONCLUSIONS

Based on the technology evaluation for this process, a combination of both in-combustion and postcombustion NO_x emission control technology will be utilized to achieve the proposed BACT NO_x emission rate as follows.

SCR catalysts have proven emissions reduction capabilities and low maintenance requirements at a variety of different facilities throughout the United States, Europe, and Asia. SCR systems are representative of the BACT level of NO_x emissions reduction. SCR systems have been successfully used on numerous combined cycle combustion turbine applications. The combination of DLN burners and SCR technology has the lowest proven emission rate on an operating combined cycle CT and is considered technically feasible from both a control and measurement perspective.

A level of 2 ppmvd at 15 percent O_2 based on a combination of water injection and a $SCONO_x$ catalyst is unproven and technically unacceptable for this project. Although the system appears to be successful on a 32 MW CT, the effort and effect of scaling the technology for a CT of the size proposed for this facility (more than 5 times larger) raises serious technical concerns with this new technology. Therefore, in-combustor NO_x control consisting of dry-low NO_x burners firing natural gas only, followed by postcombustion NO_x control consisting of a selective catalytic reduction system to reduce NO_x emissions to 2.5 ppmvd at 15 percent O_2 for both the SW 501F and GE 7FA combustion turbines and duct burners is considered BACT for this Project. Because this low level of emissions is also representative LAER technology, a cost analysis is not required.

5.2.2 COMBUSTION TURBINE CO BACT ANALYSIS

The objective of this analysis is to determine BACT for CO emissions from the combustion turbines and duct burners. Unless otherwise noted, the CO emission rates described in this section are corrected to 15 percent oxygen.

A review of the BACT/LAER Clearinghouse documents indicates that the most stringent CO emission level for a combustion turbine is 1.8 ppmvd at 15 percent O_2 for the Newark Bay Cogeneration L.P. project located in New Jersey. These emissions are achieved by reducing CO emissions through the use of an oxidation catalyst. It should be noted that the use of the oxidation catalyst represents LAER. This Newark Bay Project is located in a nonattainment area for both CO and ozone (VOC control required). It should also be noted that the Saranac Energy Company located in Plattsburgh, New York has set a 3.0 ppmvd CO emission limit for a natural gas fired 1,123 mmBtu/h combined cycle CT. The emissions from this unit are controlled through the use of an oxidation catalyst.

5.2.2.1 ALTERNATIVE CO EMISSION REDUCTION SYSTEMS

Typically, measures taken to minimize the formation of NO_x during combustion inhibit complete combustion, which may increase the emissions of CO. CO is formed

during the combustion process due to incomplete oxidation of the carbon contained in the fuel. CO formation is limited by ensuring complete and efficient combustion of the fuel in the combustion turbine. High combustion temperatures, adequate excess air, and good air/fuel mixing during combustion minimize CO emissions. The development of good state-of-the-art DLN burners has reduced CO emissions lower than as compared to those previously obtained by the use of water injection as the main NO_x control method.

These improved combustion characteristics have allowed minimization of CO emissions without sacrificing NO_x control performance. For this reason, the use of low NO_x burners that use good combustion practices is the standard method of also controlling CO emissions.

The only CO reduction technology available that will not impact NO_x emissions is the use of an oxidation catalyst to convert the CO to CO_2. The oxidation catalyst is typically a precious metal catalyst and is not considered toxic. No reagent injection is necessary and oxidizing catalysts, depending on the uncontrolled emission level, are capable of reducing CO emissions by up to 90 percent.

This technology evaluation indicates that an oxidation catalyst is the only control technology suitable for further evaluation beyond the use of good combustion practices, as provided by a DLN burner. The estimated CO emissions for the GE 7FA and SW 501F CTs and duct burners, and the corresponding control technologies are listed in Table 5-2.

5.2.2.2 EVALUATION OF FEASIBLE TECHNOLOGIES

The following evaluation considers economic, energy, and environmental impacts on the potential BACT scenario's evaluated.

Economic Impacts

The use of an oxidation catalyst has a significant negative economic impact on the Project. Analysis of the economic impacts is provided below. The CO BACT costs presented in this analysis are based on operating the General Electric FA and Siemens Westinghouse 501F units at 100 percent of full load for 8,760 hours per year on natural gas.

Capital Costs

Tables 5-3a and 5-3b present the capital costs for installing an oxidation catalyst system on a GE PG7241(FA) and SW 501F combustion turbine with duct burners. The capital costs for the systems includes the oxidation catalyst reactor and balance of plant equipment, and were based on budgetary quotations from equipment manufacturers and other engineering estimates.

Table 5-2 Estimated CO Emissions From Alternate Control Technologies Per CT/Duct Burner Unit		
	Control Technologies	
	Dry-low NO_x Combustors	Oxidation Catalyst
GE 7FA Emissions		
Concentration, ppmvd	16.5	4.0
Percent Removal	N/A	75 percent
SW 501F Emissions		
Concentration, ppmvd	23.6	4.0
Percent Removal	N/A	83 percent

Table 5-3a
CO Reduction System Capital Cost Per GE 7FA Unit

	Oxidation Catalyst	Good Combustion Controls	Remarks
Direct Capital Cost			
Catalysts	577,000	NA	Scaled from an estimate from Engelhard Corporation
Catalyst Reactor	268,000	NA	Estimated from Engelhard Corporation based on catalyst size
Control/Instrumentation	40,000	NA	Estimated
Balance of Plant	133,000	NA	15% For Foundations and Supports, Erection, Electrical Installation, Painting, Insulation, Vendor Engineering.
Total Direct Capital Cost	1,018,000	Base	
Indirect Capital Costs			
Contingency	204,000	NA	20% of Direct Capital Cost
Engineering and Supervision	51,000	NA	5% of Direct Capital Cost
Construction and Field Expense	20,000	NA	2% of Direct Capital Cost
Construction Fee	10,000	NA	1% of Direct Capital Cost
Startup Assistance	10,000	NA	1% of Direct Capital Cost
Performance Test	5,000	NA	0.5% of Direct Capital Cost
Total Indirect Capital Costs	300,000	Base	
Total Installed Cost	1,318,000	Base	

Table 5-3b
CO Reduction System Capital Cost Per SW 501F Unit

	Oxidation Catalyst	Good Combustion Controls	Remarks
Direct Capital Cost			
Catalysts	589,000	NA	Scaled from an estimate from Engelhard Corporation
Catalyst Reactor	268,000	NA	Estimated from Engelhard Corporation based on catalyst size
Control/Instrumentation	40,000	NA	Estimated
Balance of Plant	135,000	NA	15% For Foundations and Supports, Erection, Electrical Installation, Painting, Insulation, Vendor Engineering.
Total Direct Capital Cost	1,032,000	Base	
Indirect Capital Costs			
Contingency	206,000	NA	20% of Direct Capital Cost
Engineering and Supervision	52,000	NA	5% of Direct Capital Cost
Construction and Field Expense	21,000	NA	2% of Direct Capital Cost
Construction Fee	10,000	NA	1% of Direct Capital Cost
Startup Assistance	10,000	NA	1% of Direct Capital Cost
Performance Test	5,000	NA	0.5% of Direct Capital Cost
Total Indirect Capital Costs	304,000	Base	
Total Installed Cost	1,336,000	Base	

Operating Costs

Tables 5-4a and 5-4b present the annual operating costs using an oxidation catalyst to achieve a 75 and 83 percent reduction of CO on the GE 7FA and SW 501F CTIs and duct burners, respectively. CO outlet emissions would be reduced to a maximum of approximately 4.0 ppmvd for the SW 501F and GE 7FA units (with duct burners) during natural gas firing. Annual operating costs for the system include catalyst replacement, operating personnel, maintenance costs, and lost power generation. Throughout the life of the plant, catalyst elements will require periodic replacement. Currently, catalyst manufacturers are willing to guarantee a catalyst life of 3 years or equivalent operating hours for an oxidation catalyst. The catalyst life is adjusted to account for the operating hours each year of the base load unit.

Total Annual Costs

Total 1999 annual cost for the oxidation catalyst system is calculated as the sum of the 1999 annual operating costs plus capital recovery. The total capital costs for an oxidation catalyst are estimated to be $1,318,000 and $1,336,000 for the GE 7FA and SW 501F units, respectively. The total annual operating costs for an oxidation catalyst are estimated to be $509,000 and $527,000 for the GE 7FA and SW 501F units, respectively. This corresponds to an incremental CO removal cost of $1,868 and $1,185 per ton for the GE 7FA and SW 501F combustion turbines, respectively.

Energy Impacts

An oxidation catalyst reactor located downstream of the combustion turbine exhaust will increase the backpressure on the combustion turbine. The additional backpressure of 0.8 inches, water gauge, will reduce the combustion turbine output by approximately 0.1 percent. The cost of lost power revenue due to the back pressure is included in the economic analysis.

Environmental Impacts

The major environmental disadvantage that exists when using an oxidation catalyst to reduce CO emissions is that a percentage of the SO_2 in the flue gas will oxidize to SO_3. The higher the operating temperature, the higher the SO_2 to SO_3 oxidation potential. It is estimated that approximately 30 percent of the SO_2 in the flue gas will oxidize to SO_3 as a result of the CO oxidation catalyst being installed. The SO_3 will react with the moisture in the flue gas to form sulfuric acid mist in the atmosphere. The increase in H_2SO_4 emissions would increase PM_{10} emissions.

Table 5-4a CO Reduction System Annual Cost Per GE 7FA Unit			
	Oxidation Catalyst	Good Combustion Controls	Remarks
Direct Annual Cost			Cost based on emissions in Table 5-1
Catalyst Replacement	221,000	NA	Catalyst life of 3 yr of equivalent operating hours
Operation and Maintenance	26,000	NA	2% of Capital Cost
Lost Power Generation	47,000	NA	From Westinghouse curve, dependent upon catalyst pressure drop and nominal CT rating
Total Direct Annual Cost	294,000	NA	
Indirect Annual Costs Indirect Annual Costs			
Overhead	16,000	NA	60% of Operating and Maintenance Labor
Administrative Charges	26,000	NA	2% of Total Installed Cost
Property Taxes	36,000	NA	2.75% of Total Installed Cost
Insurance	13,000	NA	1% of Total Installed Cost
Capital Recovery	124,000	NA	Capital Recovery Factor * Total Installed Cost
Total Indirect Annual Costs	215,000	NA	
Total Annual Cost	509,000	NA	
Annual Emissions, tpy	87.2	359.6	Emissions taken from Table 5-1
Emissions Reduction, tpy	272.4	NA	Emissions calculated from Table 5-1
Total Cost Effectiveness, $/ton	1,868	NA	Total Annual Cost/Emissions Reduction

Table 5-4b
CO Reduction System Annual Cost Per SW 501F Unit

	Oxidation Catalyst	Good Combustion Controls	Remarks
Direct Annual Cost			Cost based on emissions in Table 5-1
Catalyst Replacement	226,000	NA	Catalyst life of 3 yr of equivalent operating hours
Operation and Maintenance	27,000	NA	2% of Capital Cost
Lost Power Generation	55,000	NA	From Westinghouse curve, dependent upon catalyst pressure drop and nominal CT rating
Total Direct Annual Cost	308,000	NA	
Indirect Annual Costs Indirect Annual Costs			
Overhead	16,000	NA	60% of Operating and Maintenance Labor
Administrative Charges	27,000	NA	2% of Total Installed Cost
Property Taxes	37,000	NA	2.75% of Total Installed Cost
Insurance	13,000	NA	1% of Total Installed Cost
Capital Recovery	126,000	NA	Capital Recovery Factor * Total Installed Cost
Total Indirect Annual Costs	219,000	NA	
Total Annual Cost	527,000	NA	
Annual Emissions, tpy	90.8	535.7	Emissions taken from Table 5-1
Emissions Reduction, tpy	444.9	NA	Emissions calculated from Table 5-1
Total Cost Effectiveness, $/ton	1,185	NA	Total Annual Cost/Emissions Reduction

5.2.2.3 CONCLUSIONS

Mesquite Power, LLC, has proposed using an oxidation catalyst to reduce CO emissions in the SW 501F and GE 7FA CTs and duct burners to 4.0 ppmvd. Installation of an oxidation catalyst system designed to reduce CO emissions to 4 ppmvd would add approximately $509,000 to the annual operating cost of a GE 7FA unit. The capital cost for a GE-7FA unit would be about $1,318,000. The resultant cost effectiveness on a per ton of CO removed basis is $1,868. Installing an oxidation catalyst system to reduce CO emissions to 4.0 ppmvd would add about $527,000 to the annual operating cost for the SW 501F unit. The capital cost for a SW 501F unit would be about $1,336,000. The cost effectiveness on a per ton of CO removed basis is $1,185. Mesquite Power, LLC has proposed using an oxidation catalyst to reduce CO emissions in whichever CT it chooses for the Project. The CO emission level proposed for both the GE 7FA and SW 501F combustion turbines and duct burners during natural gas firing represents an emission level lower than any other recent projects that have been permitted. Therefore, the proposed CO BACT for the control of CO emissions from each combustion turbine and duct burner is good combustion practice using advanced combustion control and the addition of an oxidation catalyst.

5.2.3 COMBUSTION TURBINE PM_{10} EMISSIONS CONTROL

The emissions of PM_{10} from the Project will be controlled by ensuring as complete combustion of the fuel as possible and by minimizing SO_2 to SO_3 oxidation. The New Source Performance Standards (NSPS) for combustion turbines do not establish a PM_{10} emission limit. Natural gas contains only trace quantities of noncombustible material.

The manufacturer's standard operating procedures include filtering the turbine inlet air and combustion controls. The BACT/LAER Clearinghouse documents do not list any postcombustion PM_{10} control technologies being used on combustion turbines. Consistent with the previous BACT applications and with determinations recently referenced by states within the Southwest and Pacific regions, such as the Milagro Williams Field Service in New Mexico and the Northern California Power Agency in the San Joaquin Valley Unified APCD, the use of natural gas, combustion air filters, good combustion controls, and maintenance is considered BACT for particulate matter. This is proposed for this Project. PM_{10} emissions (front and back) will be approximately 0.0138 lb/mmBtu (28.9 lb/h at full load) while firing natural gas for the GE 7FA CT and duct burner unit and 0.0124 lb/mmBtu (27.1 lb/h at full load) while firing natural gas for the SW 501F CT and duct burner unit.

5.2.4 COMBUSTION TURBINE VOC BACT ANALYSIS

The objective of this analysis is to determine BACT for VOC emissions from the combustion turbines and duct burners. Unless otherwise noted, the VOC emission rates described in this section are corrected to 15 percent oxygen.

A review of the EPA BACT/LAER Clearinghouse Bulletin Board and the California Air Resource Board (BACT/LAER) indicates that the most stringent VOC emission control for a gas fired CT is 0.0022 lb/mmBtu at 15 percent O_2. This occurs at the Sacramento Power Authority Campbell Soup facility located in the Sacramento Metropolitan AQMD. The emission levels from a combined cycle natural gas fired 103 MW Siemens V84.2 gas turbine with water injection for power augmentation and 200 mmBtu/h of supplemental duct firing capacity are achieved through the application of an oxidation catalyst (assumed 5 percent destruction). In addition, the Sacramento Cogeneration Proctor and Gamble facility has a VOC emission control level for a GE LM-6000 combined cycle CT of 0.00221 lb/mmBtu (1.1 lb/h) using an oxidation catalyst. Most oxidation catalyst applications listed in the BACT/LAER database assumed destruction rates of 10 percent. The Saranac Energy Company located in New York uses an oxidation catalyst to control VOC emissions for a gas fired combustion turbine to as level of 0.0045 lb/mmBtu at O_2.

Only two projects show an emission reduction rate of any significance; the Combined Energy Resources project in the San Joaquin Valley Unified district and the Crockett Cogeneration (C&H Sugar) project in the Bay Area AQMD. The 44 and 50 percent removals reportedly achieved on these projects can be discounted, due to the high uncontrolled VOC emission rate for the projects. Mesquite Power, LLC, has proposed a VOC limit of approximately 5.2 ppmvd at 15 percent O_2 by using an oxidation catalyst for both the GE 7FA and the SW 501F CTs and duct burners. This corresponds to an approximate 10 percent reduction in emissions.

5.2.4.1 ALTERNATIVE VOC EMISSION REDUCTION SYSTEMS

Volatile organic compounds are formed during the combustion process due to incomplete oxidation of the carbon contained in the fuel. VOCs are typically defined as nonmethane, nonethane hydrocarbons that are emitted from the combustion turbine. VOC formation is limited by ensuring complete and efficient combustion of the fuel in the combustion turbine. High combustion temperatures, adequate excess air, and good air/fuel mixing during combustion minimize VOC emissions. Therefore, lowering combustion temperatures through steam/water injection or staged combustion, which is used to reduce combustor-based NO_x formation, can be counterproductive with regard to VOC emissions.

An alternative control method is catalytic oxidation, which is a postcombustion method reducing VOC emissions. This process is identical to that used for CO reduction where the same oxidation catalyst is used to promote the oxidation of VOC to CO_2 and

H_2O. The oxidation catalyst is typically a precious metal catalyst and reagent injection is necessary.

Two factors affect the ability of the catalyst to promote oxidation of VOC. Those factors are the temperature of the flue gas as it passes through the catalyst and the species of VOC present in the flue gas. Higher temperatures promote better oxidation of VOC. Long-chain hydrocarbons are also easier to oxidize than short-chain hydrocarbons. Therefore, the ability of the catalyst to oxidize VOC depends directly on the specific hydrocarbons that are in the flue gas.

The exact reduction that may be achieved can not be easily quantified. This uncertainty and the limited amount of removal that may be expected are reflected in the permitting of past projects with oxidation catalyst. As previously noted, most of the oxidation catalyst applications identified in the BACT/LAER databases indicate only an assumed destruction rate varying from 5 to 10 percent. Even with the oxidation catalyst included on their projects, the controlled emission rates on the Combined Energy Sources project and the Crockett Project are still significantly higher than the uncontrolled emission rate for the Project. The estimated VOC emissions for the units with the applicable control technology for the CTs and duct burners are listed in Table 5-5.

5.2.4.2 CONCLUSIONS

The VOC removal process is identical to that used for CO reduction where the same oxidation catalyst is used to promote the oxidation of VOC to CO_2 and H_20. Mesquite Power, LLC, has proposed to use an oxidation catalyst to control CO emissions. The use of this catalyst would allow for an approximate 10 percent reduction in VOC emissions as well. Therefore, the proposed BACT for the control of VOC emissions from each combustion turbine and duct burner is to use advanced combustion controls design and an oxidation catalyst, which represents good combustion practices.

5.2.5 COMBUSTION TURBINE SO_2 BACT ANALYSIS

Typically, natural gas has only trace amounts of sulfur, which is used as an odorant. The selection of this fuel provides inherently low SO_2 emissions. No supplemental SO_2 emission controls have been imposed on natural gas fired combustion turbines by regulatory agencies. Therefore, using natural gas as the only fuel is considered BACT for this project.

5.3 EMERGENCY DIESEL-FIRE PUMP BACT ANALYSIS

The (348 bhp) emergency diesel-fire pump will be operated for no more than 52 hours per year for routine maintenance and will fire only No. 2 fuel oil.

Table 5-5 Estimated VOC Emissions From Alternate Control Technologies Per CT Unit		
	Control Technologies	
	Dry-Low NO_x Combustors	Oxidation Catalyst
GE 7FA Emissions		
ppmvd	5.8	5.2
Percent Removal	N/A	10%
SW 501F Emissions		
ppmvd	5.8	5.2
Percent Removal	N/A	10%

The following is a summary of the requirements and assumptions on which the diesel-fire pump is based:

- Federal ambient air quality standards, emissions limitations, and applicable regulations will be met.
- No NSPS criteria have been established for diesel-fire pump emissions.

5.3.1 NO_X EMISSION CONTROL

The objective of the analysis is to determine BACT for NO_x emissions from the emergency diesel-fire pump which has the potential to emit NO_x at a rate of 5.6 lb/h.

A review of the BACT/LAER Clearinghouse documents (CAPCOA, November 1999 web site review; USEPA, November 1999 web site review) indicates that the most stringent NO_x emissions limit for a diesel-fired internal combustion engine is 94 percent reduction (no limit), which was achieved using an SCR at the Western Pacific Dredging Company located in the South Coast AQMD in southern California. The diesel-fired internal combustion engines are General Motors (Model 12-567) and Cooper Bessemer (Models JS-8-1 and LSV-16), which are separately manifolded together with two other engines to common control devices. It should be noted that the unit is located in a nonattainment area for ozone. Since NO_x is a precursor to ozone, the emission level is representative of LAER.

5.3.1.1 ALTERNATIVE NO_X EMISSION REDUCTION SYSTEMS

This section discusses two methods of NO_x control. The first method is the use of selective catalytic reduction and the second will be fuel injection timing retardation.

Selective Catalytic Reduction

SCR is a postcombustion method of controlling NO_x emissions. A detailed discussion of SCR is included in Section 5.2.1.2 This option represents the LAER for a diesel engine. SCR is not considered cost-effective for controlling NO_x emissions for the diesel-fire pump for this Project. This is due to the emergency status of the diesel-fire pump, which would not be in operation for a significant percentage of the year. The diesel-fire pump will not be operated for more than 52 hours per year for maintenance purposes Therefore, SCR will not be considered further in this BACT analysis.

Fuel Injection Timing Retardation

Fuel injection timing retardation delays the start of fuel injection in order to reduce the engine's maximum combustion pressure, thereby lowering the combustion temperature. Typically, fuel injection timing on these size units and unit service is retarded by three to four degrees. The maximum amount of retardation possible is controlled by such factors as piston, cylinder, manifold shape and materials, expected life, and the impact of modifying the combustion process on other pollutant emissions.

Retarding the fuel injection timing can reduce NO_x emissions by 20 to 30 percent, depending upon unit service, size, and design. However, the diesel engine combustion efficiency decreases with an increase in timing retardation; the emissions of other pollutants such as CO, VOC, and PM_{10} subsequently increase.

5.3.1.2 CONCLUSIONS

SCR is not considered to be a cost effective NO_x reduction alternative for the emergency diesel-fire pump in this Project. This is mainly because the maximum number of hours the diesel-fire pump will operate is 52 hours per year. Therefore, the recommended BACT for the emergency diesel-fire pump is fuel injection timing retardation.

5.3.2 CO AND VOC EMISSION CONTROL BACT ANALYSIS

The objective of this analysis is to determine BACT for CO and VOC emissions from the emergency diesel-fire pump. The emission rate of CO and VOC is limited to approximately 1.0 and 0.3 lb/h, respectively.

A review of the BACT/LAER Clearinghouse documents (CAPCOA, November 1999 web site review; USEPA, November 1999 web site review) indicates that the most stringent CO emission level for a diesel-fired internal combustion engine is 0.371 lb/mmBtu (8.27 lb/h). The 22 mmBtu/h unit is located at the Kamine/Besicorp Syracuse LP facility in New York. No add-on controls are required to meet this emission level.

The most stringent VOC emission level for a diesel-fired internal combustion engine is for the Western Pacific Dredging Company located in the South Coast AQMD in southern California. The diesel-fired internal combustion engines are General Motors (Model 12-567) and Cooper Beddemer (Models JS-8-1 and LSV-16) that are separately manifolded together with two other engines to common control devices. An oxidation catalyst applied to the diesel engine at the facility reduces the VOC emissions by 80 percent (no limit). The units are located in a nonattainment area for ozone. Since VOC is a precursor to ozone, the emission level is representative of LAER.

Alternative CO Emission Reduction Systems

CO and VOCs are formed during the combustion process due to incomplete oxidation of the carbon contained in the fuel. CO formation is limited by ensuring complete and efficient combustion of the fuel in the diesel engine. High combustion temperatures, adequate excess air, and good air/fuel mixing during combustion will minimize CO and VOC formation. However, lowering combustion temperatures to reduce NO_x formation can be counterproductive with regard to CO and VOC emissions. NO_x emission control technologies must always be considered when determining CO and VOC emission controls.

Postcombustion control technologies, such as an oxidation catalysts, may reduce CO and VOC emissions. An oxidation catalyst can be located at the diesel engine

exhaust. The reactions and catalyst used are identical to the catalyst oxidation technology previously described for the combustion turbines (Section 5.2.2). However, catalytic oxidation is not considered to be a cost effective control device for controlling CO and VOC emissions for the diesel-fire pump in this Project. This is due to the emergency status of the diesel-fire pump, which would be operated for no more than 52 hours per year for maintenance purposes. Therefore, an oxidation catalyst will not be considered further in this BACT analysis. BACT for the emergency diesel-fire pump proposed for the Project is to use good combustion controls.

5.3.3 PM_{10} EMISSION CONTROL BACT ANALYSIS

The objective of this analysis is to determine BACT for PM_{10} emissions from the emergency diesel-fire pump. A review of the BACT/LAER Clearinghouse documents (CAPCOA, November 1999 web site review; USEPA, November 1999 web site review) indicates that the most stringent PM_{10} emission level for a diesel-fired internal combustion engine is 1.0 g/bhp-h for Parker Hannifin Corporation, located in the San Joaquin Valley Unified APCD. The 450 hp diesel-fired (Detroit Diesel model 6V92) engine drives an electrical generator that is limited to 227 gallons per day. This diesel engine is required to burn low sulfur diesel fuel that is not to exceed 0.05 percent sulfur by weight and to use a positive crankcase control device that is 90 percent efficient. Because the diesel-fire pump will typically operate a maximum of 52 hours per year, it is anticipated that emission of particulate matter from the unit will be minimal. The emission of PM_{10} will be controlled by filtering the source inlet combustion air and by ensuring as complete combustion of the fuel as possible. The manufacturer's standard operating practices will ensure as complete combustion of the diesel fuel as possible. The PM_{10} emission rate of the emergency diesel-fire pump proposed for the Project is limited to approximately 0.2 lb/h. Therefore, the recommended BACT for the emergency diesel-fire pump for controlling PM_{10} is to be inlet air filtering and good combustion control.

5.3.4 SO_2 EMISSION CONTROL BACT ANALYSIS

The objective of this analysis is to determine BACT for SO_2 emissions from the emergency diesel-fire pump. The diesel engine proposed for the Project is required to burn low sulfur diesel fuel that is not to exceed 0.05 percent sulfur by weight. Furthermore, the diesel-fire pump will only be in operation for a maximum of 52 hours per year. The SO_2 emission rate of the emergency diesel-fire pump proposed for the Project is limited to approximately 0.5 lb/h. Therefore, the recommended BACT for the emergency diesel-fire pump for controlling SO_2 is to use low sulfur fuel oil with a maximum content of 0.05 percent by weight and to limit operation to a maximum of 52 hours per year.

5.4 COOLING TOWER BACT ANALYSIS

Uncontrolled cooling towers can be high emitters of PM_{10} under certain conditions. PM_{10} from cooling towers is generated by the presence of dissolved and suspended solids in the cooling tower circulation water, which is potentially lost as drift. A portion of the water droplets emitted from the tower exhausts will evaporate leaving the suspended or dissolved solids in the atmosphere, thus subject to dispersion. Typically, drift eliminators are used to minimize drift (droplet) losses. The drift eliminator control efficiency for the proposed cooling towers is 0.0005 percent resulting in emissions of 3.86 lb/h per tower. The drift eliminators are proposed as BACT for PM_{10} for the cooling towers.

5.5 SUMMARY

The following is a summary of the BACT determination and associated emission rates proposed for the pollutant emitting equipment for this project.

Nitrogen Oxides (NO_x) Emissions

- GE 7FA units - BACT was determined to be the use of dry-low NO_x burners during natural gas firing with an SCR to achieve an emission limit of 2.5 ppmvd at 15 percent O_2.
- SW 501F units - BACT was determined to be the use of dry-low NO_x burners during natural gas firing with an SCR to achieve an emission limit of 2.5 ppmvd at 15 percent O_2.
- Emergency Diesel-Fire Pump – BACT is fuel injection timing retardation.

Carbon Monoxide (CO) Emissions

- GE 7FA units – BACT was determined to be the use of good combustion controls during natural gas firing with an oxidation catalyst to achieve an emission limit of 4.0 ppmvd at 15 percent O_2.
- SW 501F units – BACT was determined to be the use of good combustion controls during natural gas firing with an oxidation catalyst to achieve an emission limit of 4.0 ppmvd at 15 percent O_2.
- Emergency Diesel-Fire Pump – BACT is good combustion controls during fuel oil firing.

Particulate Emissions

- BACT is the use of natural gas, combustion air filters, good combustion controls, and maintenance for both the GE 7FA and SW 501F units.
- Emergency Diesel-Fire Pump – BACT is inlet air filtering and good combustion control.

- Cooling Tower - BACT was determined to be the use of drift eliminators at an efficiency of 0.0005 percent.

VOC Emissions

- GE 7FA units – BACT was determined to be the use of good combustion controls during natural gas firing with an oxidation catalyst to achieve an emission limit of 5.2 ppmvd at 15 percent O_2 (10 percent removal).
- SW 501F units – BACT was determined to be the use of good combustion controls during natural gas firing with an oxidation catalyst to achieve an emission limit of 5.2 ppmvd at 15 percent O_2 (10 percent removal).
- Emergency Diesel-Fire Pump – BACT is good combustion controls during fuel oil firing.

Sulfur Dioxide (SO_2) emissions

- GE 7FA units – BACT is the use of good combustion controls using natural gas.
- SW 501F units – BACT is the use of good combustion controls using natural gas.
- Emergency Diesel-Fire Pump – BACT is the use of low sulfur fuel oil with a maximum content of 0.05 percent by weight and limiting operation to a maximum of 52 hours per year.

6.0 AIR QUALITY IMPACT ANALYSIS

6.1 SUMMARY OF FINDINGS

These findings are based on the results of the analyses conducted:

Applicability to PSD Review. Based on the Project's calculated potential to emit (PTE) emissions, the proposed facility will be a major stationary source. The regulated pollutants, NO_x, CO, PM_{10}, and VOC, exceed the PSD significant emission levels (SELs) and are subject to PSD review. The PTE calculations are presented in Section 4.0:

- Ambient Air Quality Impact Analysis. The results of the AAQIA demonstrate that predicted maximum CO emissions (1 and 8 hour averaging periods) do not exceed PSD Class II Significant Impact Levels (SILs). Thus, a PSD increment consumption analysis and a National Ambient Air Quality Standards (NAAQS) analysis are not required for this pollutant. Predicted NO_x (annual averaging period) and PM_{10} (annual and 24 hour averaging periods) ambient air quality impacts exceed the PSD Class II SILs. Both PSD Class II increment consumption and NAAQS analyses were performed for NO_2 (annual averaging period) and PM_{10} (annual and 24 hour averaging periods). The results of the Class II AAQIA, the NAAQS AAQIA results, and the Additional Impact Analyses results are presented in Sections 6.4, 6.6, and 6.8 respectively. These results show that neither the increment nor NAAQS standards are exceeded.
- Preconstruction Ambient Monitoring. The results of the AAQIA for NO_2, CO, and PM_{10} (annual averaging period) are less than the PSD de minimis monitoring levels, while the PM_{10} (24 hour averaging period) results are above the de minimis monitoring levels. Under PSD rules, ambient monitoring data gathering may be required by the Maricopa County Environmental Services Department Air Quality Division (ESDAQD) for PM_{10} unless representative data exists. The ESDAQD has approved the use of representative PM_{10} ambient monitoring data from an existing nearby monitor as representative of site conditions. The ESDAQD has also approved representative NO_2 monitoring data for use in the NAAQS analysis. A discussion of both representative monitoring data sets is presented in this Section.
- Additional Impacts Analysis. The proposed Project will not result in any secondary growth in the area, nor will the Project's air quality impacts have a significant adverse effect on surrounding soils and vegetation. Visibility, acid deposition, and ground level concentration analyses were performed for certain agreed-upon, sensitive Class II areas in Arizona. Groundlevel concentrations were also determined for Class I areas near the proposed Project. The results of the AIA demonstrate that the

operation of the proposed Project will not have a significant effect on the assessed areas.

The air dispersion modeling analysis was conducted in accordance with EPA's air dispersion modeling guidelines (incorporated as Appendix W of 40 CFR 51), as well as the Mesquite Power, LLC, Mesquite Generating Station Ambient Air Quality Impact Analysis Workplan (hereinafter referred to as the "workplan") submitted to ESDAQD on behalf of Mesquite Power, LLC, a copy of which is included in Appendix E.

6.2 MODEL SELECTION

The Industrial Source Complex Short-Term 3 (ISCST3 Version 99155) air dispersion model is capable of assessing impacts in simple, intermediate, and complex terrain, and was used to predict maximum ground level concentrations associated with the operation of the Project. The ISCST3 model is an EPA-approved, steady-state, straight-line Gaussian plume model, which may be used to assess pollutant concentrations from a wide variety of sources, associated with an industrial source complex. In addition, ISCST3 incorporates the COMPLEX1 dispersion algorithm for determining intermediate and complex terrain concentration impacts in accordance with EPA guidance.

6.3 MODEL INPUT AND OPTIONS

Model input parameters, source and emission parameters, as well as the ISCST3 model default options and input databases were chosen to adequately represent the Project.

6.3.1 MODEL INPUT SOURCE PARAMETERS

The ISCST3 model was used to determine the maximum predicted ground-level concentration for each pollutant and applicable averaging period over the typical operating ranges and four ambient temperatures (i.e., 17° F, 59° F, 73° F, and 122° F). The representative stack parameters and emission rates modeled for each load over the range of ambient temperatures considered in the analysis are presented in Table 6-1.

6.3.2 LAND USE DISPERSION COEFFICIENT DETERMINATION

The EPA's land use method was used to determine whether rural or urban dispersion coefficients should be used in the ISCST3 air dispersion model. In this procedure, land circumscribed within a 3 km radius of the Project was classified as rural or urban using the Auer land use classification method. Based on a visual inspection of the USGS 7.5 minute topographic map of the location of the Project and a site visit, it was concluded that over 50 percent of the area surrounding the Project is classified as rural. Accordingly, the rural dispersion modeling option was used in the ISCST3 air dispersion modeling.

Table 6-1
Summary of Combustion Turbine/HRSG Parameters and Emission Rates
Used in the AAQIA

Source Parameter	Combustion Turbine/HRSG Typical Operating Parameters							
	General Electric[b]				Westinghouse[b]			
	Short-term Scenario Loads			Annual Scenario[c]	Short-term Scenario Loads			Annual Scenario[c]
	100%[d]	75%[e]	50%[e]		100%[d]	85%[e]	75%[e]	
Units 1 – 4								
Base Elevation (ft)	890	890	890	890	890	890	890	890
Stack Height (ft)	170	170	170	170	170	170	170	170
Stack Diameter (ft)	18	18	18	18	18	18	18	18
Exit Temperature (F)	168.9	178.1	167.5	172.1	173.1	194.7	187.8	174.9
Exit Velocity (ft/s)	61.2	46.7	40.3	64.1	61.7	55.1	50.4	65.4
Emission Rates(lb/h)								
NO_x – Annual[a,c]				21.1				22.5
CO – Short-term[a]	21.6	13.1	10.5		23.0	14.9	12.8	
PM_{10} - Annual[a,c]				28.9				27.1
PM_{10} - Short-term[a]	30.4	18.0	18.0		28.8	15.5	13.7	

[a]Source parameters are listed on a per unit basis.
[b]Representative of the typical operating load ranges of the combustion turbines operating with the HRSGs (i.e., combined cycle mode).
[c]Determined from average annual temperature of 73° F at full load operation.
[d]Worst case full load operation over full range of ambient temperatures.
[e]Worst case operation over full range of ambient temperatures.

6.3.3 GEP STACK HEIGHT DETERMINATION

The dispersion of a plume can be affected by nearby structures when the stack is short enough to allow the plume to be significantly influenced by surrounding building turbulence. This phenomenon, known as structure induced downwash, generally results in higher model predicted ground level concentrations near the influencing structure. The Project's proposed buildings and structures were analyzed to determine their potential to influence the dispersion of stack emissions. EPA's Guideline for Determination of Good Engineering Practice Stack Height guidance document was followed in this evaluation. When a stack is constructed to good engineering practice (GEP) stack height, it avoids the modeled turbulent flow associated with nearby influencing structures. If a GEP stack height is used, structural downwash need not be considered in the analysis.

Structure dimensions and relative locations were entered into EPA's Building Profile Input Program (BPIP) to produce an ISCST3 input file with the proper Huber-Snyder or Schulman-Scire direction specific building downwash parameters. An output of GEP stack heights for each of the Project's emission sources is also produced. The structures and emission points included in the BPIP analysis are presented in Tables 6-2 and 6-3 and are illustrated on Figures 6-1 and 6-2, respectively. Results of the BPIP GEP analysis indicate that the proposed stack height for each stack is less than the respective GEP stack height, as shown in Table 6-4. Direction-specific building downwash parameters for all of the Project's stacks were incorporated into the ISCST3 air dispersion modeling analysis. A complete printout of the BPIP output file is included in Appendix F.

6.3.4 MODEL DEFAULTS

The following standard USEPA default regulatory modeling options were initialized in the ISCST3 air dispersion modeling:

- Final plume rises.
- Stack-tip downwash.
- Buoyancy induced dispersion.
- Default vertical wind profile exponents and vertical potential temperature gradient values.
- Calm processing option.
- Terrain elevations were incorporated.

6.3.5 RECEPTOR LOCATIONS

The air dispersion modeling receptor locations were established at appropriate distances to ensure sufficient density and aerial extent to adequately characterize the pattern of pollutant impacts in the area. Specifically, a nested rectangular grid network that extends 10 km from the center of the Project was used. The rectangular grid

Table 6-2 Structures Included in the BPIP Analysis			
Structure ID Number	Structure Designation*	Structure Base Elevation (ft)	Structure Height (ft)
1	HRSG 1	890	90
2	Combustion Turbine 1	890	45
3	Air Inlet 1	890	45
4	Electrical Control Center 1	890	10
5	HRSG 2	890	90
6	Combustion Turbine 2	890	45
7	Air Inlet 2	890	45
8	Firewater Storage Tank	890	60
9	Demineralized Water Tank	890	40
10	Cooling Tower 1	890	35
11	Cooling Tower 2	890	35
12	HRSG 3	890	90
13	Combustion Turbine 3	890	45
14	Air Inlet 3	890	45
15	HRSG 4	890	90
16	Combustion Turbine 4	890	45
17	Air Inlet 4	890	45
18	Electrical Control Center 2	890	10
19	Electrical Control Center 3	890	10
20	Electrical Control Center 4	890	10
21	Firewater Pump Housing	890	20
22	Demineralized H_2O Treatment	890	20
23	Waste Chemical Storage	890	20
24	Circulation Water Treatment	890	35
25	Control/Administration Area	890	60
26	Steam Turbine Area 1	890	60
27	Steam Turbine Area 2	890	60
28	Switchyard Control Building	890	20
29	SCR Ammonia Storage 1	890	25

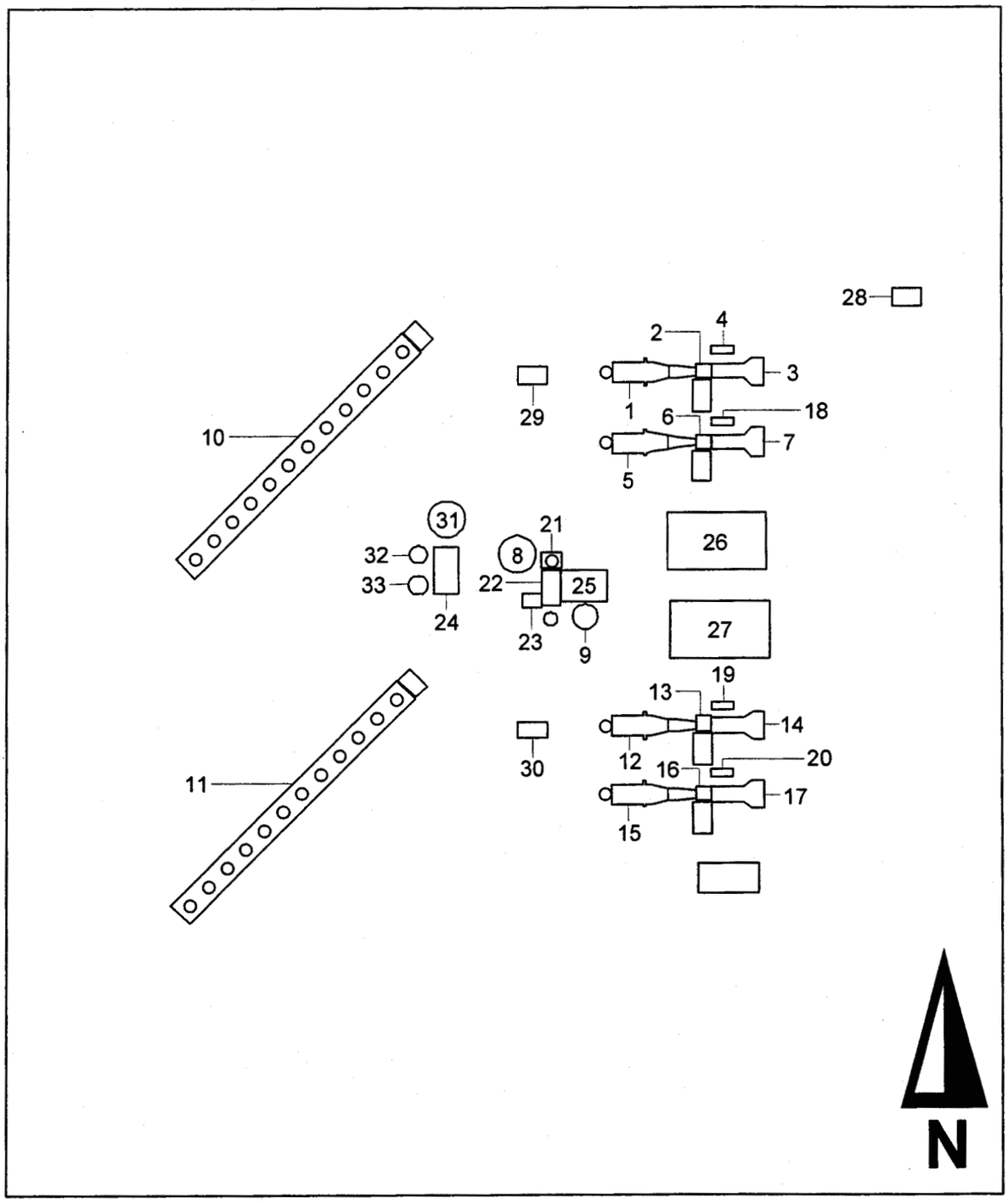
Table 6-2 (Continued) Structures Included in the BPIP Analysis			
Structure ID Number	Structure Designation*	Structure Base Elevation (ft)	Structure Height (ft)
30	SCR Ammonia Storage 2	890	25
31	Raw Water Storage Tank	890	60
32	Tank 1	890	20
33	Tank 2	890	20

*Proposed structures to be located at the Project. Refer to Figure 6-1 for locations.

Table 6-3
Emission Points Included in the BPIP Analysis

Emission ID Number	Emission Designation*	Base Elevation (ft)	Height (ft)
1	HRSG Stack 1	890	170
2	HRSG Stack 2	890	170
3	HRSG Stack 3	890	170
4	HRSG Stack 4	890	170
5	Cooling Tower Cell 1	925	10
6	Cooling Tower Cell 2	925	10
7	Cooling Tower Cell 3	925	10
8	Cooling Tower Cell 4	925	10
9	Cooling Tower Cell 5	925	10
10	Cooling Tower Cell 6	925	10
11	Cooling Tower Cell 7	925	10
12	Cooling Tower Cell 8	925	10
13	Cooling Tower Cell 9	925	10
14	Cooling Tower Cell 10	925	10
15	Cooling Tower Cell 11	925	10
16	Cooling Tower Cell 12	925	10
17	Cooling Tower Cell 13	925	10
18	Cooling Tower Cell 14	925	10
19	Cooling Tower Cell 15	925	10
20	Cooling Tower Cell 16	925	10
21	Cooling Tower Cell 17	925	10
22	Cooling Tower Cell 18	925	10
23	Cooling Tower Cell 19	925	10
24	Cooling Tower Cell 20	925	10
25	Cooling Tower Cell 21	925	10
26	Cooling Tower Cell 22	925	10
27	Cooling Tower Cell 23	925	10
28	Cooling Tower Cell 24	925	10
29	Diesel Firewater Pump	910	1

*Proposed emissions to be located at the Project. Refer to Figure 6-2 for locations.

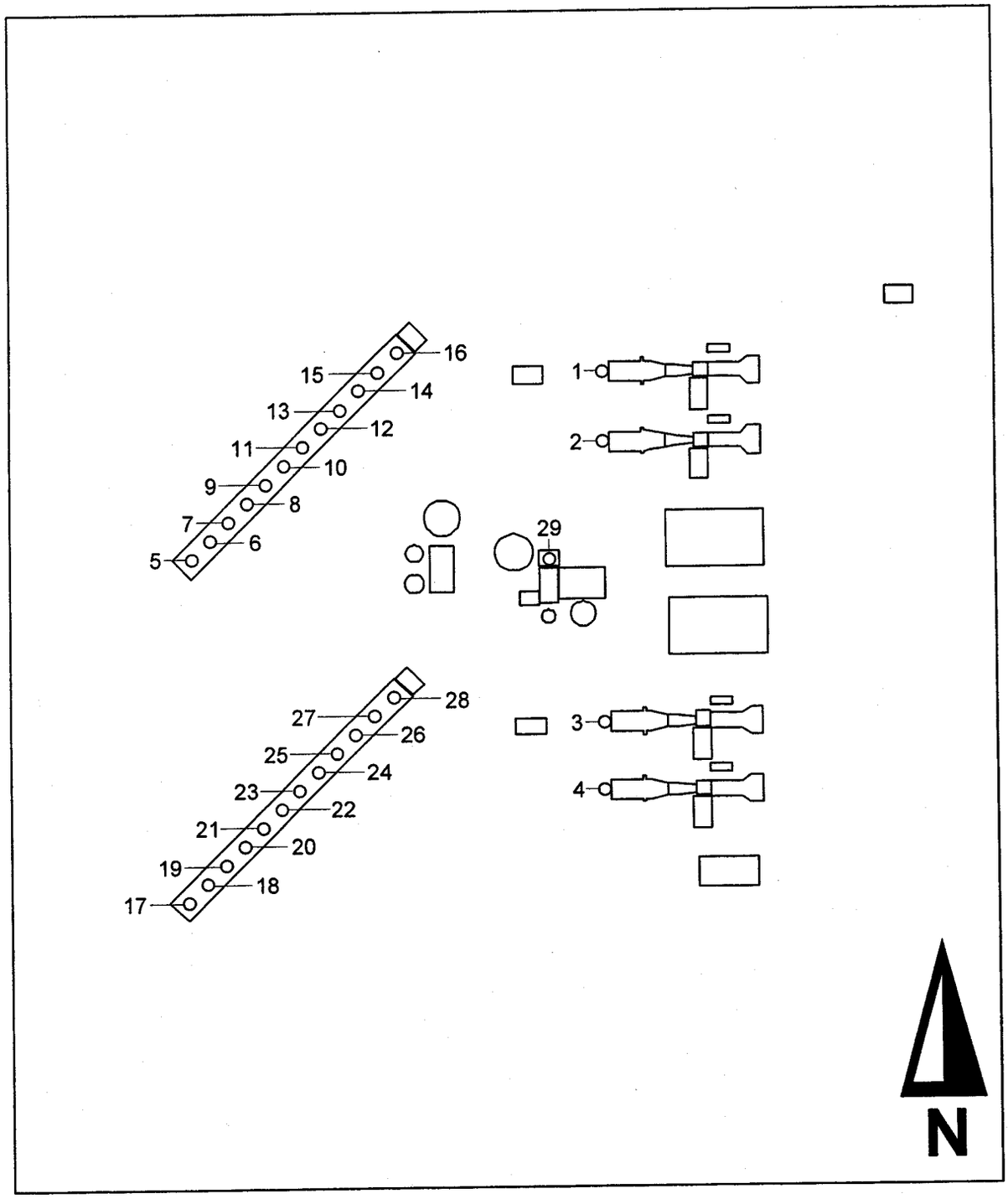


Buildings and Stuctures Included in the BPIP Analysis*

*See Table 6-2 for building/structure identification and dimensions.

Figure 6-1

building.srf



Emission Points Included in the Analysis*

*See Table 6-3 for description of sources.

Figure 6-2

sources.srf

Table 6-4
Results of BPIP GEP Analysis*

Emission ID Number	Emission Designation	Stack Height (ft)	GEP Height (ft)
1	HRSG Stack 1	170	225
2	HRSG Stack 2	170	225
3	HRSG Stack 3	170	225
4	HRSG Stack 4	170	225
5	Cooling Tower Cell 1	10	52.5
6	Cooling Tower Cell 2	10	52.5
7	Cooling Tower Cell 3	10	52.5
8	Cooling Tower Cell 4	10	115
9	Cooling Tower Cell 5	10	115
10	Cooling Tower Cell 6	10	115
11	Cooling Tower Cell 7	10	115
12	Cooling Tower Cell 8	10	115
13	Cooling Tower Cell 9	10	115
14	Cooling Tower Cell 10	10	115
15	Cooling Tower Cell 11	10	115
16	Cooling Tower Cell 12	10	176.6
17	Cooling Tower Cell 13	10	52.5
18	Cooling Tower Cell 14	10	52.5
19	Cooling Tower Cell 15	10	52.5
20	Cooling Tower Cell 16	10	52.5
21	Cooling Tower Cell 17	10	52.5
22	Cooling Tower Cell 18	10	52.5
23	Cooling Tower Cell 19	10	52.5
24	Cooling Tower Cell 20	10	52.5
25	Cooling Tower Cell 21	10	52.5
26	Cooling Tower Cell 22	10	52.5
27	Cooling Tower Cell 23	10	52.5
28	Cooling Tower Cell 24	10	177.2
29	Diesel-Fire Pump	1	205

*The complete BPIP output file is included in Appendix F.

network consists of 100 m spacing from the fence line out to 1,000 m, 500 m spacing out to 5 km, and then 1,000 m spacing from 5 to 10 km. Receptor spacing at 50 m intervals was used along the fence line. At the request of ESDAQD, additional receptors were placed on the peaks of surrounding buttes within the 10 km grid. Preliminary modeling showed that PM_{10} (24 hour averaging period) impacts, exceeding the PSD Class II SILs, fell on the edge of the 10 km grid. As a result, the grid was extended to capture all the Project's significant impacts. Figure 6-3 illustrates the 10 km nested rectangular grid, additional peaks, fence line receptors, and the relative location of the emission sources and downwash structures. Figure 6-4 shows the extended grid used for the PM_{10} (24 hour averaging period) PSD Class II SIL modeling as well as the PM_{10} annual averaging period modeling. The elevated terrain option was used for all receptor points.

Terrain elevations at the receptor locations were obtained using 30 meter Digital Elevation Model (DEM) terrain data from 7.5 minute USGS topographic maps. The terrain elevation values were calculated by choosing the highest elevation using the highest of the four DEM terrain elevations that encompassed each receptor.

6.3.6 METEOROLOGICAL DATA

The ISCST3 air dispersion model requires hourly input of specific surface and upper air meteorological data. These data include the wind flow vector, wind speed, ambient temperature, stability category, and the mixing height. Five years (1994-1998) of surface upper air meteorological data from the Palo Verde Nuclear Generating Station and data from Tucson International Airport was used in the ISCST3 air dispersion modeling analysis. This meteorological data was obtained from the Maricopa County ESDAQD for use in the air dispersion modeling analysis.

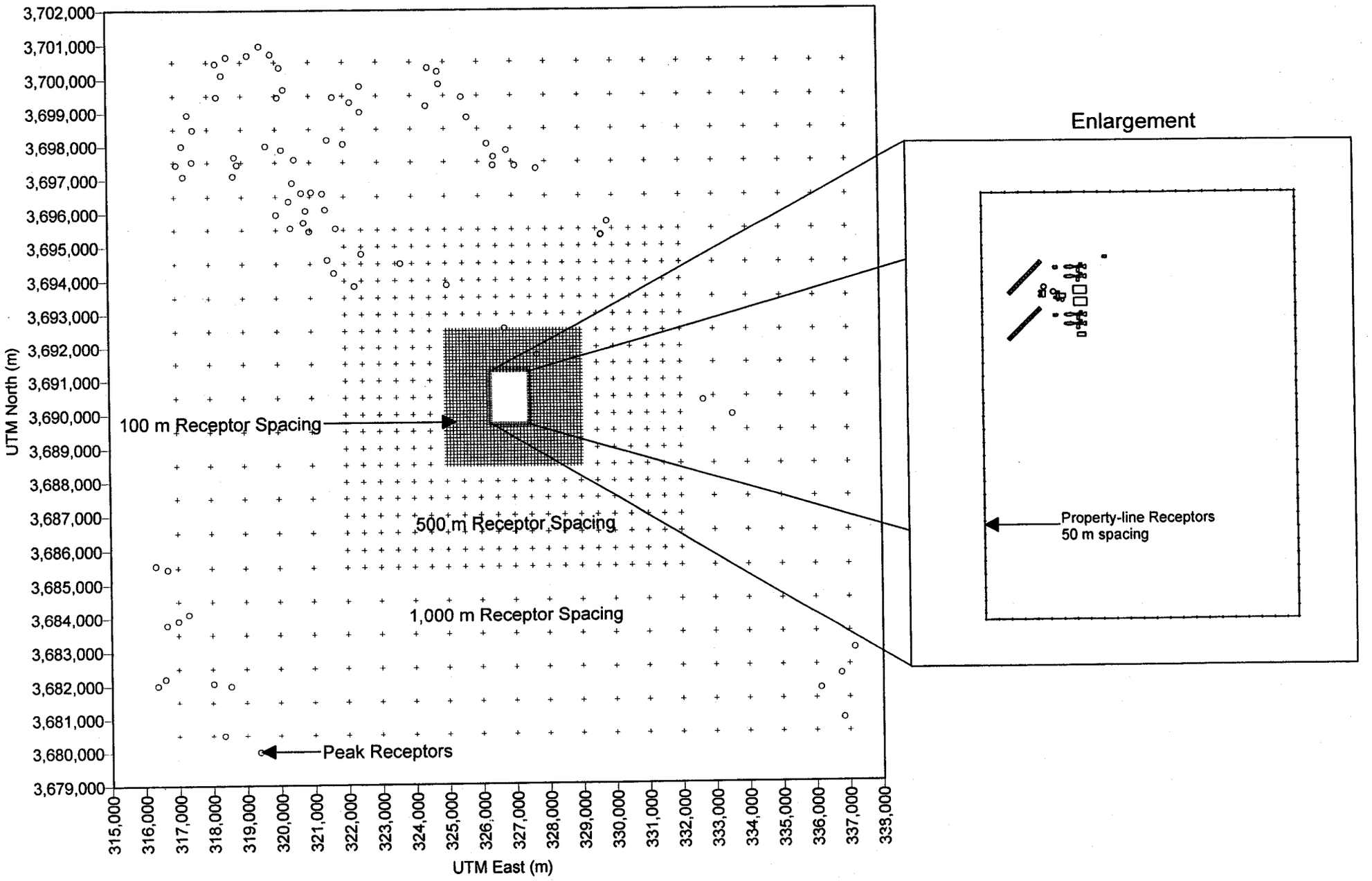
The Palo Verde Nuclear Generating Station is located approximately 2 miles north of the proposed Project location. The elevation, terrain, and surface roughness characteristics at the meteorological station are very similar to the Project site. Therefore, the meteorological data is representative of the Project site.

6.4 MODEL RESULTS

In accordance with the air modeling Workplan, ISCST3 air dispersion modeling was performed using the emission rates for NO_x, CO, and PM_{10}, and operational parameters by load, as presented in Table 6-5 for each applicable averaging period.

6.4.1 COMPARISON TO PSD CLASS II SIGNIFICANT IMPACT LEVELS AND PRECONSTRUCTION MONITORING REQUIREMENTS

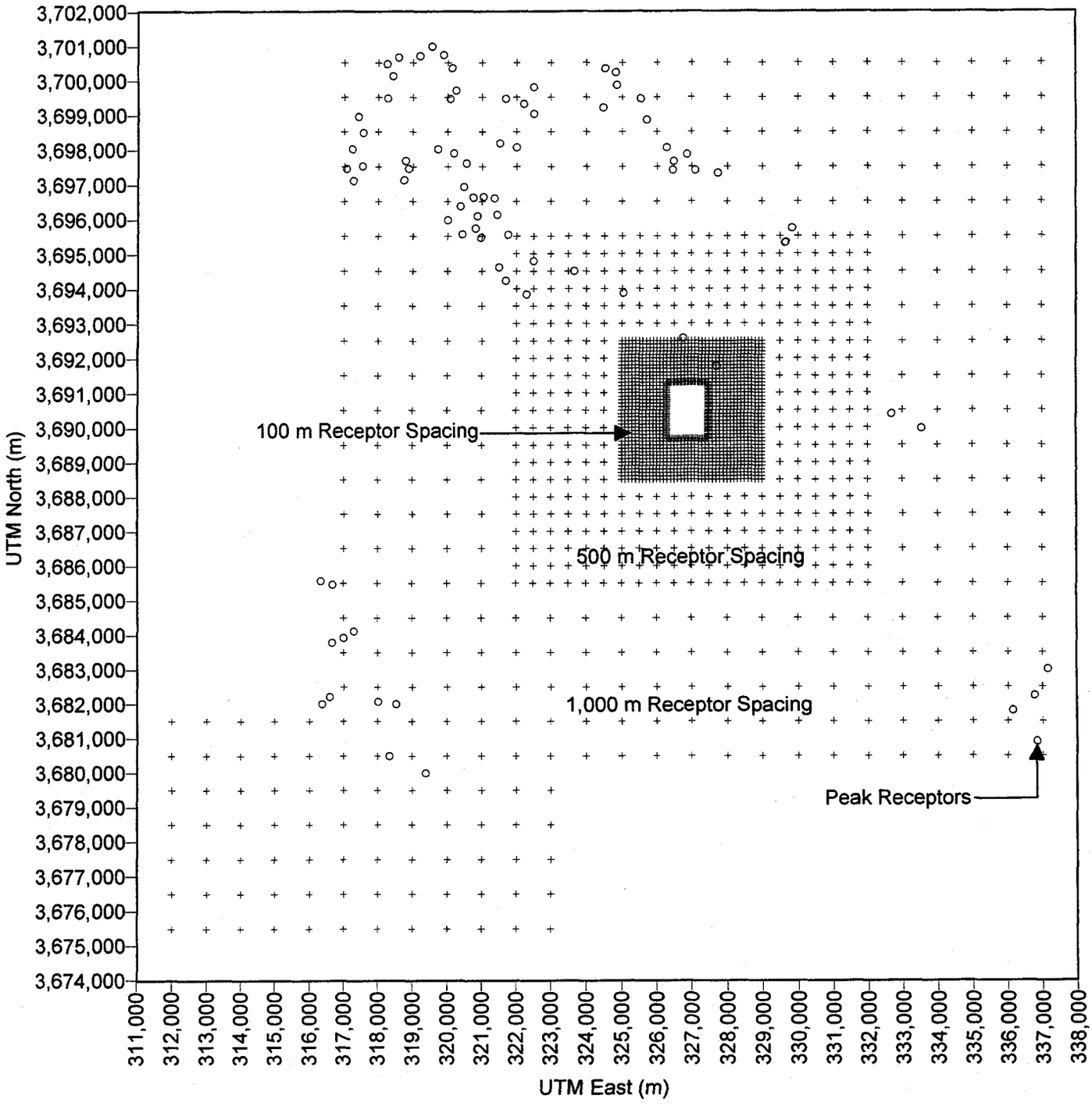
Table 6-5 presents the maximum predicted NO_x, CO, and PM_{10} impacts for the Project using the ISCST3 air dispersion model and 5 years of meteorological data (1994 to 1998) for each pollutant and averaging period. A complete listing of all modeled



Receptor Grid and Project Location

Figure 6-3

Facilitygrid.srf



Extended PM/PM_{10} Grid

Figure 6-4

PMGrid.srf

Table 6-5
Comparison of Maximum Predicted Project Impacts with the PSD Class II Significant Impact Levels and the PSD De Minimis Monitoring Levels

Pollutant	Averaging Period	General Electric			Westinghouse			PSD Class II Significant Impact Level[b] ($\mu g/m^3$)	Further Analysis Required[c]	PSD De Minimis Monitoring Level[d] ($\mu g/m^3$)	Monitoring Data Required?
		Max. Predicted Impact[a] ($\mu g/m^3$)	UTM Location (m)		Max. Predicted Impact[a] ($\mu g/m^3$)	UTM Location (m)					
			East	North		East	North				
NO_x	Annual	2.37	327711.5	3691769.3	2.39	327711.5	3691769.3	1	**Yes**	14	No
CO	1 Hour	479.69	326286.4	3690600.0	479.69	326286.4	3690600.0	2,000	**No**	-	-
	8 Hour	34.72	327711.5	3691769.3	35.12	327711.5	3691769.3	500	**No**	575	No
PM_{10}	Annual	3.95	327711.5	3691769.3	3.59	327711.5	3691769.3	1	**Yes**	-	-
	24 Hour	32.28	327711.5	3691769.3	29.50	327711.5	3691769.3	5	**Yes**	10	**Yes**

[a]For a complete listing of all impacts by year, pollutant, operating scenario, and averaging period refer to Appendix G.

[b]Predicted impacts from the Project that are below the specified level indicate that the Project will not have predicted significant impacts for that pollutant and further modeling is not necessary for that pollutant.

[c]If required, further analysis includes ambient air quality impact analysis of the Project and all nearby sources to determine compliance with PSD increment consumption and NAAQS.

[d]This criteria is used to determine if preconstruction ambient air monitoring is required to assess current and future compliance with NAAQS.

impacts by pollutant, operating scenario, and averaging period are contained in Appendix G.

Table 6-5 also compares the maximum model predicted concentrations for each pollutant and applicable averaging period with the PSD Class II SILs and the pre-construction monitoring requirements. The Project's CO (1 and 8 hour averaging periods) maximum predicted impacts are less than the PSD Class II significant impact levels. Therefore, under the PSD program, further air quality impact analyses are not required for this pollutant. Further air quality analyses are required for NO_x and PM_{10} (annual and 24 hour averaging periods). The additional analyses included the following assessments for both NO_x and annual and 24 hour PM_{10}.

- A NAAQS analysis.
- A PSD increment analysis.

The NAAQS analysis requires that the air quality from both the Project and all nearby "large" sources be combined with existing background air quality levels to determine whether the addition of the Project will result in the potential violation of the NAAQS. The NO_x and PM_{10} NAAQS analyses are presented in Section 6.6.

The PSD increment analysis requires that the air quality impact from the Project be combined with air quality impacts from other nearby increment consuming sources to determine whether total PSD related impacts are less than the allowable PSD increment level. The NO_x and PM_{10} Class II increment analyses are presented in Section 6.7.

As shown in Table 6-5, the maximum modeled 24 hour average PM_{10} impact of 40.42 $\mu g/m^3$ exceeds the PSD monitoring criterion of 10 $\mu g/m_3$ for PM_{10}. The predicted impacts for all other pollutants are less than the corresponding PSD monitoring criteria. The ESDAQD has approved the use of existing PM_{10} ambient monitoring data to represent the existing ambient PM_{10} concentration near the Project.

Even though the NO_2 ambient monitoring criterion was not exceeded, the maximum NO_x impact from the project exceeds the PSD NO_2 SIL. The ESDAQD approved the use of existing NO_2 ambient monitoring data for the NAAQS analysis. The existing monitoring data used in the NAAQS analysis are contained in Section 6.6.

6.4.2 STARTUP EMISSIONS ANALYSIS

Pollutant emission rates may vary significantly during low load transient conditions experienced during periods of startup. This is due to low load instability in the combustion turbine's dry-low NO_x combustor, and because the SCR and the oxidation catalyst are at suboptimum temperatures. Section 4 contains a discussion of emissions of SO_2, PM_{10}, VOC, CO, and NO_x during startups and shutdowns.

CO emissions from Westinghouse 501F combustion turbine were higher during startup than normal full load operation. CO has a short-term ambient air quality standard (1 and 8 hour averaging periods), short-term startup emissions for the Westinghouse 501F combustion turbine will be evaluated. The worst case 1 hour CO emission rate is 28.3 lb/h during startup. For an 8 hour averaging period, the average emission rate should consider a period of normal operation of 4 hours, and a worst case 4 hour startup period. The worst case 8 hour startup emission rate of CO for the Westinghouse turbine becomes:

(28.3 lb/h x 4 hours) + (23 lb/h x 4 hours)) / (8 hours) = 25.7 lb/h

Since the CO impacts (as presented in Table 6-5) are significantly below the PSD significant impact levels, a modeling analysis to determine the impacts from these startup emissions is unnecessary. Applying a ratio to the impacts that reflects the increase in emissions will give adequate representation of the CO impacts during startup. Table 6-6 presents the CO impacts during startup processes. The impacts remain well below the PSD significant impact levels for the CO 1 and 8 hour averaging periods.

6.5 SIGNIFICANT IMPACT AREA AND EMISSION INVENTORY DETERMINATION

As concluded in Section 6.4, further air quality impact analyses of NO_x and PM_{10} (annual and 24 hour averaging periods) are necessary to demonstrate compliance with PSD increments and the NAAQS. In accordance with EPA guidance, all nearby sources are required to be modeled as part of the NAAQS and increment analyses. The Modeling Guideline defines a "nearby" source as any point source expected to cause a significant contribution gradient in the vicinity of the proposed new source. For PSD purposes, "vicinity" is defined as the impact area. The "significant impact area" is then defined as a circle whose radius is the farthest distance from the Project for which there is a predicted significant impact. A significant impact is further defined as a modeled concentration more than the PSD significant impact levels, as shown in Table 6-7. A separate radius is determined for each pollutant and averaging period.

6.5.1 SIGNIFICANT IMPACT AREAS

The radii of significant impact were determined for the Project by finding the farthest receptor distance for which the predicted maximum impact was above the significance level. The results of this determination are contained in Table 6-7. As indicated in Table 6-7, the significant impact area for NO_x is 1.46 kilometers (km), for PM_{10} (annual average) is 5.41 km, and for PM_{10} (24 hour average) is 14.03 km from the Project location. Rather than model only those receptors that fall within the Project's significant impact areas, the full grids presented on Figures 6-3 and 6-4 were used in the NAAQS and increment analyses.

Table 6-6
CO Startup Emissions and Impacts[a]

Averaging Period	Normal Operation Impacts ($\mu g/m^3$)[b]	Startup Operation Impacts ($\mu g/m^3$)	PSD Class II Significant Impact Level[b] ($\mu g/m^3$)
1 hour	479.69	590.02[c]	2,000
8 hour	35.12	39.33[d]	500

[a]For the Westinghouse 501F combustion turbines.

[b]From Table 6-5.

[c]Applies a ratio of 1.23 to the impacts during normal operation. (28.3 lb/h startup emission rate/23 lb/h normal emission rate.)

[d]Applies a ratio of 1.12 to the impacts during normal operation. (25.7 lb/h startup emission rate/23 lb/h normal emission rate.)

Table 6-7 EPA Designated Significant Impact Levels			
Pollutant	Averaging Period	PSD Significant Impact Level ($\mu g/m^3$)	Distance of Significant Impact[a] (km)
NO_x	Annual	1.0	1.46
PM_{10}	Annual	1.0	5.41
PM_{10}	24 Hour	5.0	14.03

[a]The significant impact area for each pollutant and averaging period is defined by the distance shown and is the largest distance of the two turbine vendors' machines (General Electric and Westinghouse).

6.5.2 EMISSION INVENTORY OF NEARBY SOURCES

EPA guidance states that modeling must include those sources which have received PSD permits but have not yet begun to operate, as well as any complete PSD applications for which a permit has not yet been issued. As a compilation of emission sources for the emissions inventory, Mesquite Power, LLC, has gathered data for the nearby facilities of Duke, Pinnacle West, and Palo Verde Nuclear Generating Station. The emission inventory used is conservatively high because the Palo Verde Nuclear Generating Station is an existing facility, and its impacts are already accounted for in the background data. The source names, locations, and modeling parameters are shown in Table 6-8. The modeling parameters were identified through inspection of source permit application information obtained from the Maricopa County ESDAQD. The nearby sources presented in Table 6-8 will be included in the PSD increment and NAAQS analyses.

6.6 NAAQS ANALYSIS

The National Ambient Air Quality Standards (NAAQS) cumulative impact analysis was accomplished by adding the predicted ambient impact of the Project to the impact of nearby sources, then adding the representative background ambient concentration. The total was compared to the applicable NAAQS for the pollutant. This procedure was applied to NO_2 on an annual average basis and PM_{10} on an annual and 24 hour average basis.

6.6.1 EXISTING SOURCES

The emission inventory of sources included in the NAAQS analyses for NO_2 and PM_{10} is shown in Table 6-8. Source emissions used in the analyses were obtained from the air permit applications for the previously mentioned facilities. Stack modeling parameters (including height, diameter, flow rate, and temperature) were included as part of the inventory.

6.6.2 BACKGROUND CONCENTRATIONS

In accordance with EPA guidance, air quality data may be used to establish background concentrations in the impact area resulting from existing sources that are not considered nearby. Representative background concentration values have been developed from existing ambient data collected in the area. Table 6-9 shows the monitoring site used, its location relative to the Project, and the representative ambient monitoring concentrations. The Palo Verde Nuclear Generating Station monitoring site (AIRS #04-013-9993) was used exclusively for NO_2 and PM_{10}.

Table 6-8
Emission Inventory of Nearby Sources for NAAQS Modeling Analysis

Source*	Location		Emission Rate (g/s)		Stack Height, (m)	Stack Diameter, (m)	Stack Velocity, (m/s)	Stack Temp., (K)	Facility Elevation, (m)
	UTM-E	UTM-N	NO_x	PM_{10}					
Duke1	324282	3690470	3.02	4.03	48.77	5.49	21.34	359.82	268.5
Duke2	324330	3690470	3.02	4.03	48.77	5.49	21.34	359.82	268.5
DukBoilr	324255	3690476	0.39	0.04	11.28	0.61	10.67	505.37	268.5
DukCol01	324182	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol02	324198	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol03	324214	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol04	324231	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol05	324247	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol06	324264	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol07	324280	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol08	324297	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol09	324313	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
DukCol10	324330	3690358	0	0.14	14.33	9.24	9.14	294.26	268.5
PWStack1	328939.8	3690244.1	3.06	1.91	53.34	5.49	19.81	349.82	266.7
PWStack2	328939.8	3690200.4	3.06	1.91	53.34	5.49	19.81	349.82	266.7
PWStack3	328939.8	3690091.1	3.06	1.91	53.34	5.49	19.81	349.82	266.7
PWStack4	328939.8	3690047.5	3.06	1.91	53.34	5.49	19.81	349.82	266.7
PWStack5	328939.8	3689878.4	3.06	1.91	53.34	5.49	19.81	349.82	266.7
PWStack6	328939.8	3689834.7	3.06	1.91	53.34	5.49	19.81	349.82	266.7
PWStack7	328939.8	3689725.4	3.06	1.91	53.34	5.49	19.81	349.82	266.7
PWStack8	328939.8	3689681.8	3.06	1.91	53.34	5.49	19.81	349.82	266.7
PWT1C1	329019.8	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C2	329036.3	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C3	329052.8	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C4	329069.3	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C5	329085.8	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C6	329102.3	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C7	329118.8	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C8	329135.3	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C9	329151.8	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C10	329168.3	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7

Table 6-8 (Continued)
Emission Inventory of Nearby Sources for NAAQS Modeling Analysis

Source*	Location		Emission Rate (g/s)		Stack Height, (m)	Stack Diameter, (m)	Stack Velocity, (m/s)	Stack Temp., (K)	Facility Elevation, (m)
	UTM-E	UTM-N	NO_x	PM_{10}					
PWT1C11	329184.9	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT1C12	329201.4	3690251.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C1	329019.8	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C2	329036.3	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C3	329052.8	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C4	329069.3	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C5	329085.8	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C6	329102.3	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C7	329118.8	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C8	329135.3	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C9	329151.8	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C10	329168.3	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C11	329184.9	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT2C12	329201.4	3690098.1	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C1	329019.8	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C2	329036.3	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C3	329052.8	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C4	329069.3	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C5	329085.8	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C6	329102.3	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C7	329118.8	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C8	329135.3	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C9	329151.8	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C10	329168.3	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C11	329184.9	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT3C12	329201.4	3689885.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C1	329019.8	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C2	329036.3	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C3	329052.8	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C4	329069.3	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C5	329085.8	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C6	329102.3	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C7	329118.8	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7

Table 6-8 (Continued)
Emission Inventory of Nearby Sources for NAAQS Modeling Analysis

Source*	Location		Emission Rate (g/s)		Stack Height, (m)	Stack Diameter, (m)	Stack Velocity, (m/s)	Stack Temp., (K)	Facility Elevation, (m)
	UTM-E	UTM-N	NO_x	PM_{10}					
PWT4C8	329135.3	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C9	329151.8	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C10	329168.3	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C11	329184.9	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PWT4C12	329201.4	3689732.4	0	0.08	16.76	6.10	10.0	295.93	266.7
PVFurnce	327365.7	3696635.0	0.32	0.05	28.04	0.46	0.99	322.04	289.6
PVColTr1	326684.3	3696157.6	0	0.56	19.36	9.14	9.63	316.48	289.6
PVColTr2	326375.1	3695819.2	0	0.56	19.36	9.14	9.63	316.48	289.6
PVColTr3	326176.7	3695361.1	0	0.56	19.36	9.14	9.63	316.48	289.6

Source: Air permit applications for the respective facilities.

*Duk = Duke
PW = Pinnacle West
PV = Palo Verde Nuclear Generating Station

Table 6-9
Representative Ambient Background Monitoring Data

Monitoring Site	Location Latitude/ Longitude (degrees)	Distance from Project (km)	Direction from Project	Pollutant Monitored	Averaging Period	Representative Background Concentration ($\mu g/m^3$)
Palo Verde[a]	33.349/ 112.832	3.0	N	NO_2	Annual	58[b]
Palo Verde[a]	33.349/ 112.832	3.0	N	PM_{10}	Annual	20[c]
Palo Verde[a]	33.349/ 112.832	3.0	N	PM_{10}	24 hour	70[d]

[a]Palo Verde Nuclear Generating Station (AIRS #04-013-9993).

[b]Represents the maximum 1 hour NO_2 monitored value for a portion of 1998. This is conservatively higher than the annual average maximum.

[c]Represents the maximum annual mean for 1997.

[d]Represents the maximum high second high value for 1997.

NO_2 CONCENTRATIONS

A background NO_2 concentration of 58 μg/m^3 was assumed in the NAAQS analysis. This representative background concentration, as contained in Table 6-9, was calculated as the maximum 1 hour concentration of NO_2 for a portion of the calendar year 1998 at the monitoring site. The monitoring site began operation in April and has recorded 7 months of data. The ESDAQD determined that these NO_2 data are representative for the Project and as such are used in the NAAQS analysis.

PM_{10} CONCENTRATIONS

The background annual average PM_{10} concentration assumed in the NAAQS analysis is 20 μg/m^3. This value is the highest reported annual mean for the period of record of 1996-1999 at the monitor site. The background 24 hour average PM_{10} concentration assumed in the NAAQS analysis is 70 μg/m^3. This conservative background concentration, as presented in Table 6-9, is the high second high measured value for any given calendar year for the period of record of 1996 to 1999 at the monitor site. The monitor has been determined by the ESDAQD to be representative of the PM_{10} background concentration near the Project.

6.6.3 RECEPTOR LOCATIONS

The receptor grid is based on the same receptor grid utilized for the maximum air quality impact determination, as discussed in Section 6.3.5, which consists of a rectangular grid network of 100 m spacing from the fence line out to 1,000 m, 500 m spacing out to 5 km, and then 1,000 m spacing from 5 km to 10 km. Receptor spacing at 50 m intervals was used along the property boundary.

6.6.4 MODELING METHODOLOGY

The basis of the NAAQS analysis is the summation of impacts from the Project, nearby sources, and a representative background concentration. The modeling procedure used was similar to that used to determine maximum impacts from the Project, as described in Section 6.3. The ISCST3 model was operated with the 5 years (1994 to 1998) of meteorological data described in Section 6.3.6. However, for the NAAQS analysis the Project's emissions were simultaneously modeled with other nearby sources and added to a representative ambient background concentration.

6.6.5 RESULTS

For the annual averaging periods, the highest predicted impacts produced by the operating load and existing source combination were determined. For the PM_{10} 24 hour averaging period, the modeled high sixth high concentration was determined. NO_2 emissions from the Project and other nearby sources were conservatively assumed to be emitted as NO_x. As shown in Table 6-10, both NO_x and PM_{10} show no violation of the

Table 6-10
Comparison of NO_x and PM_{10} with NAAQS

Turbine Vendor	Pollutant	Averaging Period	Maximum Interactive Source Impacts[a,b] ($\mu g/m^3$)	Location		Representative Background Concentration[c] ($\mu g/m^3$)	Total Concentration[d] ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
				UTM-E (m)	UTM-N (m)			
General Electric	NO_x	Annual	3.53	327711.5	3691769	58	61.53	100
	PM_{10}	Annual	5.96	327711.5	3691769	20	25.96	50
	PM_{10}	24 hour[e]	24.76	327711.5	3691769	70	94.76	150
Westinghouse	NO_x	Annual	3.55	327711.5	3691769	58	61.55	100
	PM_{10}	Annual	5.62	327711.5	3691769	20	25.62	50
	PM_{10}	24 hour[e]	23.00	327711.5	3691769	70	93.00	150

[a]Modeled sum of the Project's impacts and other nearby sources.

[b]A complete listing of results is presented in Appendix H.

[c]As contained in Table 6-9.

[d]Arithmetic sum of the maximum interactive source impacts and the representative background concentration.

[e]High sixth high modeled impact.

NAAQS. A complete listing of NAAQS predicted impacts by pollutant, operating scenario, and averaging period are contained in Appendix H.

6.7 PSD CLASS II INCREMENT ANALYSIS

6.7.1 SOURCE INVENTORY

EPA guidance for the development of a cumulative inventory considers emissions from both the proposed Project and from sources in the significant impact area (SIA). There may be the need to include other sources outside the SIA that cause significant impacts in the Project's SIA. As detailed in the Pinnacle Northwest Combined Cycle Project Application, the recent APS West Phoenix Power Plant expansion project was evaluated to determine if a large source in the Phoenix area could contribute to a significant concentration in that project's SIA. The APS Plant's modeled impacts were insignificant. It is expected that sources of this size and location will not have an impact on the Project's SIA. Thus, as a compilation of emission sources for the emissions inventory, Mesquite has gathered data for the nearby facilities of Duke, Pinnacle West, and Palo Verde Nuclear Generating Station. The source names, locations, and modeling parameters are presented in Table 6-8. As previously discussed, the modeling parameters were identified through inspection of source permit application information obtained from the Maricopa County ESDAQD. The nearby sources presented in Table 6-8 are included in the PSD increment analyses.

6.7.2 INCREMENT ANALYSIS METHODOLOGY

The basis of the increment analysis follows the modeling methodology presented in the NAAQS analysis in Section 6.4 without the addition of a representative background concentration. The PSD increment levels of comparison are presented in Table 6-11.

6.7.3 CONCLUSION

The predicted maximum impact from the Project for NO_2 and PM_{10} were compared to the PSD Class II increments as shown in Table 6-12. The results shown in the table indicate that the operation of the Project will not result in consumption of the available PSD Class II increments. A complete listing of all increment modeled impacts by pollutant, operating scenario, and averaging period are contained in Appendix I.

Table 6-11 PSD Class II Increments for NO_x and PM_{10}		
Pollutant	Averaging Period	PSD Increment ($\mu g/m^3$)
NO_2	Annual	25
PM_{10}	Annual	17
PM_{10}	24 Hour	30

Table 6-12
Results of PSD Class II Increment Analysis

Turbine Vendor	Pollutant	Averaging Period	Maximum Modeled Increment Consumption[a,b] ($\mu g/m^3$)	Location		PSD Class II Increment ($\mu g/m^3$)	Increment Consumed?
				UTM-E (m)	UTM-N (m)		
General Electric	NO_x	Annual	3.53	327711.5	3691769	25	No
	PM_{10}	Annual	5.96	327711.5	3691769	17	No
	PM_{10}	24 hour[c]	24.76	327711.5	3691769	30	No
Westinghouse	NO_x	Annual	3.55	327711.5	3691769	25	No
	PM_{10}	Annual	5.62	327711.5	3691769	17	No
	PM_{10}	24 hour[c]	23.00	327711.5	3691769	30	No

[a]Arithmetic sum of the Project impacts and other nearby sources.

[b]A compete listing of results is presented in Appendix I.

[c]High sixth high modeled impact.

6.8 ADDITIONAL IMPACT ANALYSES

6.8.1 NONATTAINMENT AREAS NEAR THE PROJECT

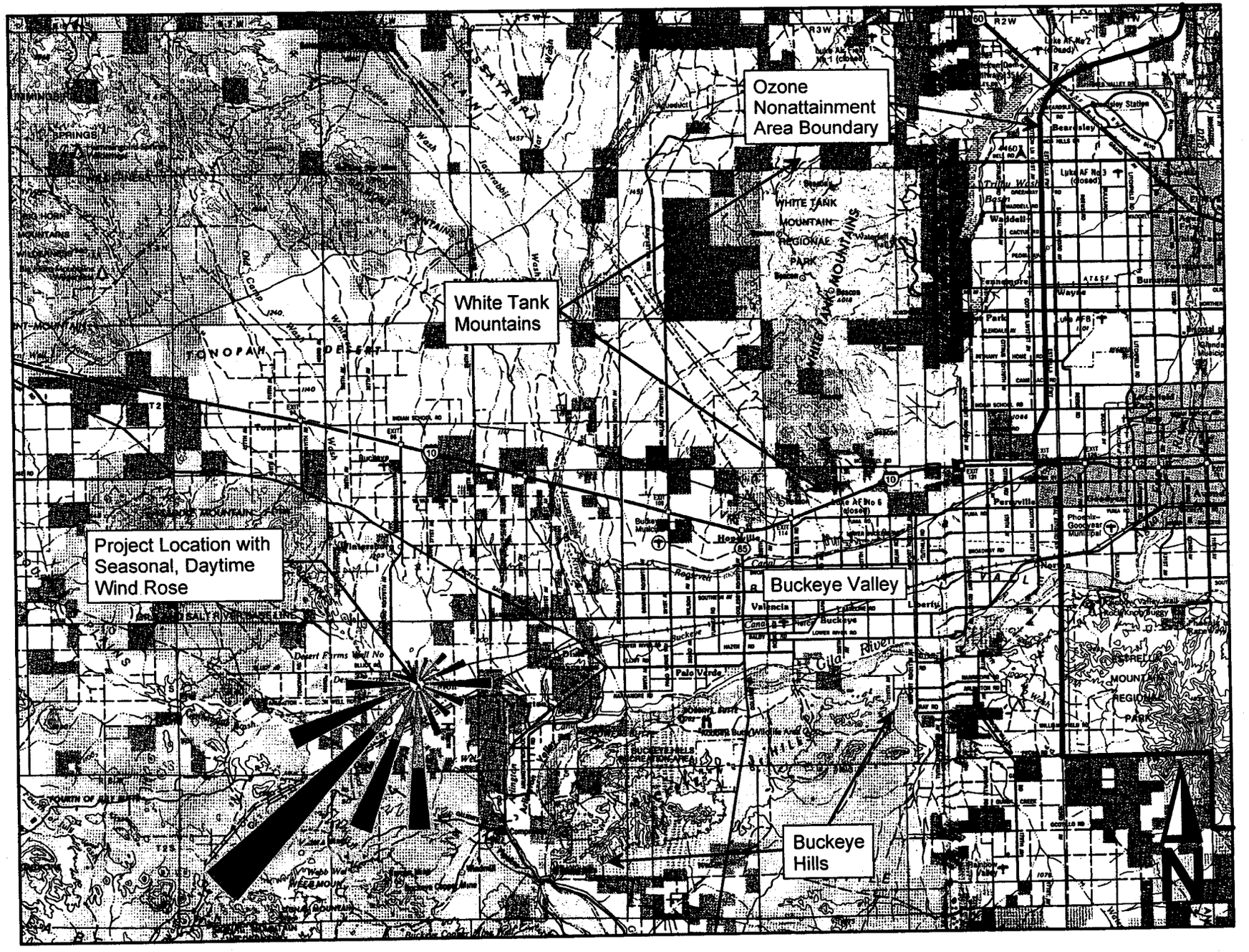
The Project will be located approximately 15 miles west of the Phoenix nonattainment area for PM_{10} and 25 miles west of the Phoenix nonattainment area for CO and NO_x (as a precursor to O_3) PSD pollutants. Maricopa County Rule 240 Section 308.1(e) presumes that any major source of VOCs and NO_x located within 50 km (31 miles) of an ozone nonattainment area contributes to ozone violations unless it can be demonstrated that topographical, meteorological, or other physical factors in the vicinity of the new major source are such that emissions are not expected to contribute to violations of the ozone standards in the adjacent nonattainment areas.

Figure 6.5 shows a seasonal, daytime wind rose for the Project, the boundary for the ozone nonattainment area, as well as the surrounding terrain and topography. The wind rose represents the hottest months (May through October) and the daylight hours (8 am to 8 pm). These bounds are used to represent the summer ozone period. The prevailing wind is from the southwest (with smaller components from the south). Considering these winds, emissions from the Project would be transported to the northeast along the river valley towards the White Tank Mountains. This keeps the emissions from making further eastward progression towards the ozone nonattainment area. Thus it is not likely, based on meteorological and topographical considerations, that emissions from the Project would be transported through the Buckeye Valley into the ozone nonattainment area of the Phoenix air basin. As further consideration of the transport of emissions from the Project into both the ozone and PM_{10} nonattainment areas, each area was evaluated with a modeling analysis.

These areas were modeled with the ISCST3 air dispersion model to demonstrate there would be no significant impacts into the areas. Receptors were placed along the boundaries of the nonattainment areas and were modeled against PSD Class II significant impact levels. Figure 6-6 illustrates the receptors with respect to the proposed Project location. Table 6-13 provides the maximum impacts on these receptors and compares them to PSD Class II SILs. As can be seen from Table 6-13, the Project will not have a significant impact on these nonattainment areas.

6.8.2 COMMERCIAL, RESIDENTIAL, AND INDUSTRIAL GROWTH

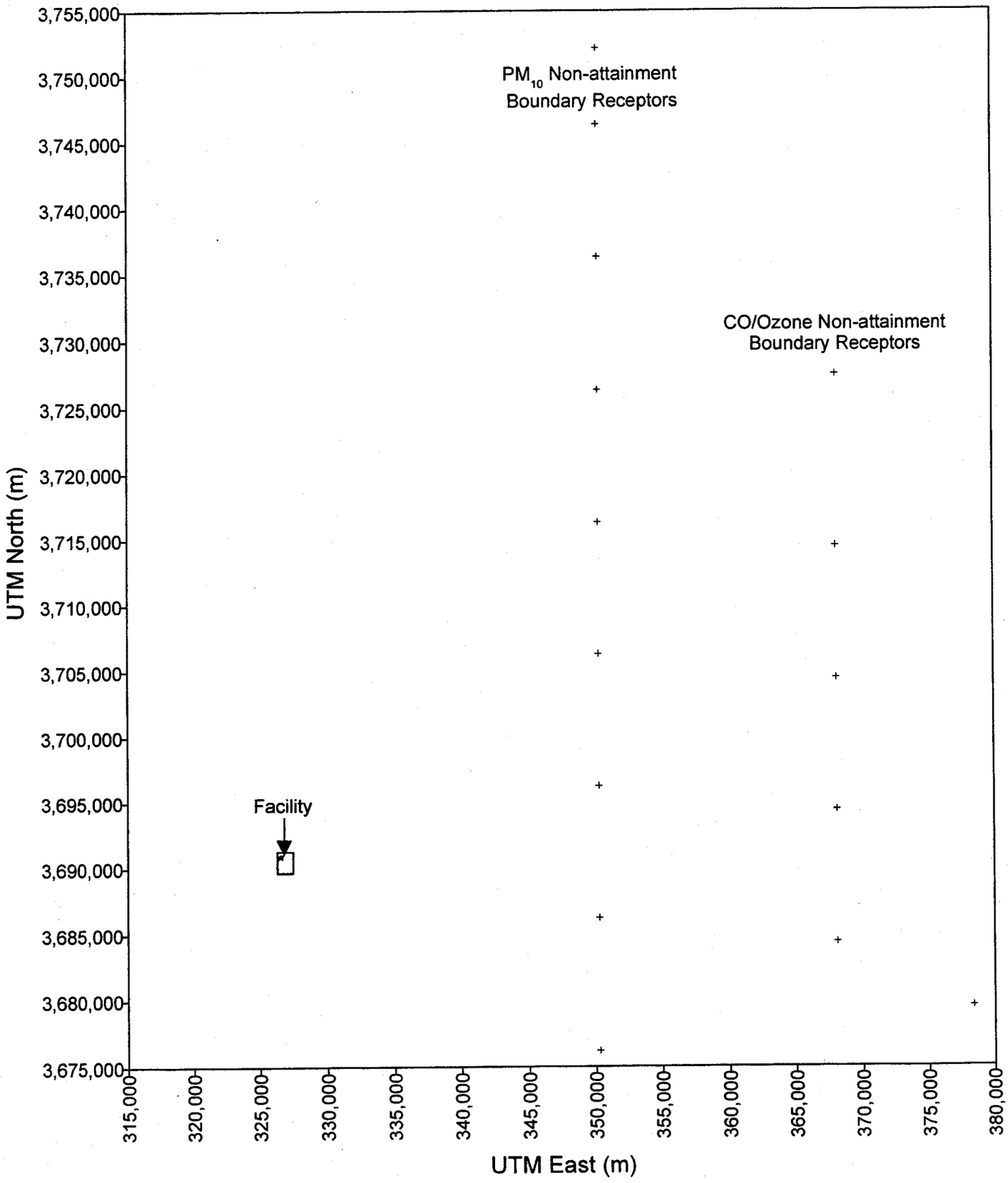
The Project will be constructed near Arlington, Arizona. There will be an increase in the local labor force during the construction phase of the Project, but this increase will be temporary, short-lived, and will not result in permanent or significant commercial and residential growth occurring in the vicinity of the Project. It is anticipated that most of the labor force during the construction phase will commute from nearby communities. The electrical generating capacity created by the Project will not have a significant effect upon the industrial growth in the immediate area considering that the



Wind Rose, Topography, & Ozone Nonattainment Area

Figure 6-5

nonattainment.srf



Non-attainment Boundary Receptors

Figure 6-6

NAgrid.srf

Table 6-13
Maximum Predicted Impacts on Nonattainment Areas

Pollutant	Averaging Period	General Electric			Westinghouse			PSD Class II Significant Impact Level* ($\mu g/m^3$)
		Max. Predicted Impact ($\mu g/m^3$)	UTM Location (m)		Max. Predicted Impact ($\mu g/m^3$)	UTM Location (m)		
			East	North		East	North	
NO_x	Annual	0.16	350268.6	3706266	0.17	350268.6	3706266	1
CO	1 Hour	12.33	350268.6	3706266	12.63	350268.6	3706266	2,000
	8 Hour	3.48	350268.6	3706266	3.64	350268.6	3706266	500
PM_{10}	Annual	0.24	350268.6	3706266	0.23	350268.6	3706266	1
	24 Hour	1.86	350268.6	3706266	1.73	350268.6	3706266	5

*Predicted impacts from the Project that are below the specified level indicate that the Project will not have predicted significant impacts for that pollutant and further modeling is not necessary for that pollutant.

Table 6-14 Comparison of Maximum Impacts to NAAQS				
Pollutant	Averaging Period	Maximum Impact ($\mu g/m^3$)		NAAQS ($\mu g/m^3$)
		General Electric	Westinghouse	
NO_x	Annual	2.37	2.39	100
CO	8 hour	34.72	35.12	10,000
	1 hour	479.69	479.69	40,000
PM_{10}	Annual	3.95	3.59	50
	24 hour	32.28	29.50	150

electrical generating capacity will be sold to the grid as opposed to a nearby industrial host.

Population increase is a secondary growth indicator of potential increases in air quality levels. Changes in air quality due to population increase is related to the amount of vehicle traffic, commercial/institution facilities, and home fuel use. Approximately 25 to 30 new permanent jobs will be created as a result of the Project, thus, it can be concluded that there will not be any significant air quality impacts associated with secondary growth.

6.8.3 SOILS AND VEGETATION

The NAAQS have been established to protect public health and welfare from any adverse effects of criteria pollutants, which include impacts on soil and vegetation. As shown in Table 6-14, the Project will have predicted impacts significantly below all NAAQS. It is concluded, therefore, that no adverse effects on soils and terrestrial vegetation are expected.

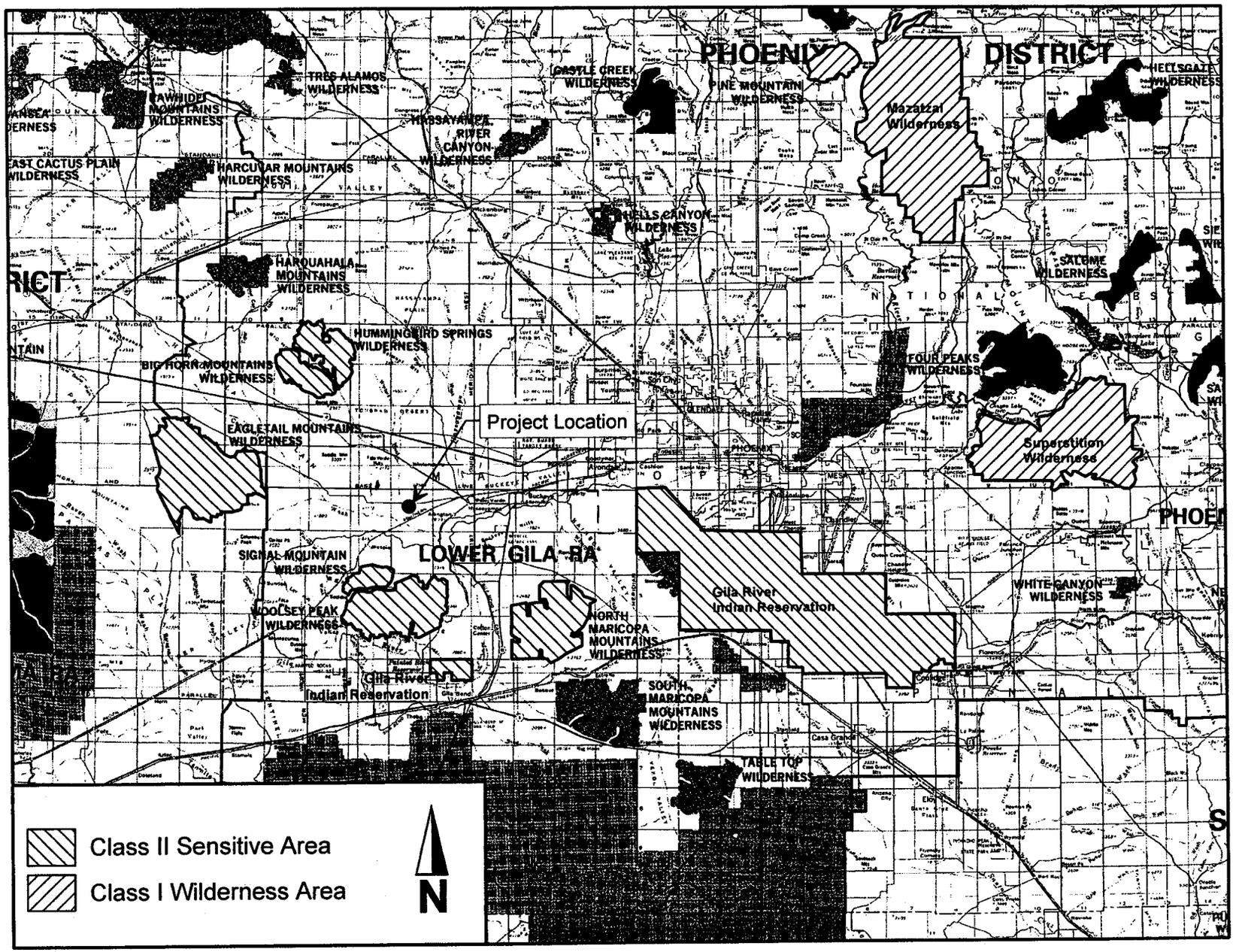
6.8.4 CLASS II SENSITIVE AREA IMPACT ANALYSIS

A Class II impact analysis was performed to evaluate the potential for visibility impairment, ground level impacts, and acid deposition. The following sensitive areas were identified by the Federal Land Manager (FLM) and Maricopa County ESDAQD in a meeting with a representative of Mesquite Power, LLC: Hummingbird Springs, Big Horn Mountain, Eagletail Mountain, Signal Mountain, Woolsey Peak, and North Maricopa Mountains Wilderness areas, as well as the Gila Bend and Gila River Indian Reservations. Figure 6-7 illustrates the locations of these sensitive areas with respect to the Project location.

6.8.4.1 VISIBILITY

Distinct from a Class I visibility analysis, the additional impact analysis presented here is concerned with visibility impairment within the Class II sensitive areas. The general components of a visibility impairment analysis include:

- Determination of the visual quality of the area.
- Determination of the potential for visibility impairment with a screening level assessment.
- If warranted, a more in-depth analysis of the visibility impairment potential.



Class I and Class II Areas Modeled for the Project

Figure 6-7

Class I & II Areas.srf

Visual Quality of the Area: The Project will be located in an area of southwestern Arizona, which is generally used for agricultural purposes. The climate of the area is characterized as extremely arid, typical of the low elevation desert valley. The low relative humidity and abundant sunshine result in generally good visibility throughout much of the year.

Visual Impairment Screening Assessment: A visibility impairment screening analysis was conducted at each of the Class II sensitive areas to provide a conservative indication of the perceptibility of plumes from the proposed emission sources. The analyses were performed in accordance with EPA's Workbook for Plume Visual Impact Screening and Analysis (EPA-450/4-88-015, September 1988, hereinafter referred to as the 'Workbook'), using the VISCREEN model.

In accordance with Workbook visual screening procedures, the VISCREEN plume visual impact-screening model was used with default worst case Level 1 screening parameters as presented in Table 6-15. Results of the conservative Level 1 visual screening analysis indicated a potential for visibility impairment at all locations. As such, less conservative Level 2 screening analyses with situation-specific input parameters were conducted.

Table 6-16 presents the Level 2 visual screening parameters used in the VISCREEN modeling. As Table 6-16 illustrates, many of the input parameters for a Level 2 analysis are the same as the default worst case values for a Level 1 analysis specified in the Workbook. However, the shaded parameters in Table 6-16 designate the situation-specific inputs of the Level 2 analysis, which are more representative of the specific region and operating conditions of the Project. The situation-specific Level 2 screening parameters are described below:

Emissions: The worst case maximum hourly emissions of NO_x and PM_{10} from the combustion turbine/HRSGs (refer to Table 6-1) were used in the Level 1 and Level 2 visibility analyses.

Background Visual Range: Figure 8 of the Workbook indicates that the background visual range for all the Class II sensitive areas is 110 km. This background visual range was used in the screening Level 1 approach. However, based on a November 14, 1999 meeting between representatives of Marcopa County, Mesquite Power, LLC, and Mr. Peter Lahm (representing the Federal Land Managers), it was recommend by Mr. Lahm to use a more current background visual range from the Superstition Class I Wilderness area to represent the visual ranges at the Class II sensitive areas.

Table 6-15
VISCREEN Level 1 Model Inputs

VISCREEN Modeling Parameter	Level 1 (Worst Case Analysis)			
	Hummingbird Springs	Eagletail Mountain	Signal Mountain	Woolsey Peak
Worst Case Emissions				
General Electric				
Particulate Emissions	15.32 g/s	15.32 g/s	15.32 g/s	15.32 g/s
NO_x (as NO_2) Emissions	11.20 g/s	11.20 g/s	11.20 g/s	11.20 g/s
Worst Case Emissions				
Westinghouse				
Particulate Emissions	14.52 g/s	14.52 g/s	14.52 g/s	14.52 g/s
NO_x (as NO_2) Emissions	11.88 g/s	11.88 g/s	11.88 g/s	11.88 g/s
Primary NO_2 Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Soot Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Sulfate Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Source-Observer Distance	32.1 km	33.2 km	14.9 km	15.3 km
Minimum Source-Class I Distance	32.1 km	33.2 km	14.9 km	15.3 km
Maximum Source-Class I Distance	49.8 km	61.7 km	25.1 km	32.8 km
Background Visual Range	110 km	110 km	110 km	110 km
Plume-Source-Observer Angle	11.25 degrees	11.25 degrees	11.25 degrees	11.25 degrees
Background Ozone Concentration	0.04 ppm	0.04 ppm	0.04 ppm	0.04 ppm
Stability Class	F	F	F	F
Wind Speed	1.00 m/s	1.00 m/s	1.00 m/s	1.00 m/s
Threshold-delta E	2.00	2.00	2.00	2.00
Threshold-Green Contrast	0.05	0.05	0.05	0.05
Background Fine Particulate Density	1.50 g/cm^3	1.50 g/cm^3	1.50 g/cm^3	1.50 g/cm^3
Background Fine Particulate Size Index	0.3 μm	0.3 μm	0.3 μm	0.3 μm
Background Coarse Particulate Density	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3

Table 6-15 (Continued)
VISCREEN Level 1 Model Inputs

VISCREEN Modeling Parameter	Level 1 (Worst Case Analysis)			
	Hummingbird Springs	Eagletail Mountain	Signal Mountain	Woolsey Peak
Background Coarse Particulate Size Index	6.0 μm	6.0 μm	6.0 μm	6.0 μm
Plume Particulate Density	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3
Plume Particulate Size Index	2.0 μm	2.0 μm	2.0 μm	2.0 μm
Plume Soot Density	2.0 g/cm^3	2.0 g/cm^3	2.0 g/cm^3	2.0 g/cm^3
Plume Soot Size Index	0.1 μm	0.1 μm	0.1 μm	0.1 μm
Plume Primary SO_4 Density	1.5 g/cm^3	1.5 g/cm^3	1.5 g/cm^3	1.5 g/cm^3
Plume Primary SO_4 Size Index	0.5 μm	0.5 μm	0.5 μm	0.5 μm
Worst Case Emissions				
General Electric				
Particulate Emissions	15.32 g/s	15.32 g/s	15.32 g/s	15.32 g/s
NO_x (as NO_2) Emissions	11.20 g/s	11.20 g/s	11.20 g/s	11.20 g/s
Worst Case Emissions				
Westinghouse				
Particulate Emissions	14.52 g/s	14.52 g/s	14.52 g/s	14.52 g/s
NO_x (as NO_2) Emissions	11.88 g/s	11.88 g/s	11.88 g/s	11.88 g/s
Primary NO_2 Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Soot Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Sulfate Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Source-Observer Distance	32.8 km	35.3 km	53.2 km	32.1 km
Minimum Source-Class I Distance	32.8 km	35.3km	53.2 km	32.1 km
Maximum Source-Class I Distance	51.5 km	42.8 km	132.3 km	47.8 km
Background Visual Range	110 km	110 km	110 km	110 km
Plume-Source-Observer Angle	11.25 degrees	11.25 degrees	11.25 degrees	11.25 degrees
Background Ozone Concentration	0.04 ppm	0.04 ppm	0.04 ppm	0.04 ppm
Stability Class	F	F	F	F
Wind Speed	1.00 m/s	1.00 m/s	1.00 m/s	1.00 m/s

Table 6-15 (Continued) VISCREEN Level 1 Model Inputs				
	Level 1 (Worst Case Analysis)			
VISCREEN Modeling Parameter	Hummingbird Springs	Eagletail Mountain	Signal Mountain	Woolsey Peak
Threshold-delta E	2.00	2.00	2.00	2.00
Threshold-Green Contrast	0.05	0.05	0.05	0.05
Background Fine Particulate Density	1.50 g/cm^3	1.50 g/cm^3	1.50 g/cm^3	1.50 g/cm^3
Background Fine Particulate Size Index	0.3 µm	0.3 µm	0.3 µm	0.3 µm
Background Coarse Particulate Density	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3
Background Coarse Particulate Size Index	6.0 µm	6.0 µm	6.0 µm	6.0 µm
Plume Particulate Density	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3
Plume Particulate Size Index	2.0 µm	2.0 µm	2.0 µm	2.0 µm
Plume Soot Density	2.0 g/cm^3	2.0 g/cm^3	2.0 g/cm^3	2.0 g/cm^3
Plume Soot Size Index	0.1 µm	0.1 µm	0.1 µm	0.1 µm
Plume Primary SO_4 Density	1.5 g/cm^3	1.5 g/cm^3	1.5 g/cm^3	1.5 g/cm^3
Plume Primary SO_4 Size Index	0.5 µm	0.5 µm	0.5 µm	0.5 µm

Table 6-16
VISCREEN Level 2 Model Inputs

VISCREEN Modeling Parameter	Level 2 (Situation-Specific Analysis)			
	Hummingbird Springs	Eagletail Mountain	Signal Mountain	Woolsey Peak
Worst Case Emissions				
General Electric				
Particulate Emissions	15.32 g/s	15.32 g/s	15.32 g/s	15.32 g/s
NO_x (as NO_2) Emissions	11.20 g/s	11.20 g/s	11.20 g/s	11.20 g/s
Worst Case Emissions				
Westinghouse				
Particulate Emissions	14.52 g/s	14.52 g/s	14.52 g/s	14.52 g/s
NO_x (as NO_2) Emissions	11.88 g/s	11.88 g/s	11.88 g/s	11.88 g/s
Primary NO_2 Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Soot Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Sulfate Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Source-Observer Distance	32.1 km	33.2 km	14.9 km	15.3 km
Minimum Source-Class I Distance	32.1 km	33.2 km	14.9 km	15.3 km
Maximum Source-Class I Distance	49.8 km	61.7 km	25.1 km	32.8 km
Background Visual Range	102.9 km	102.9 km	102.9 km	102.9 km
Plume-Source-Observer Angle	11.25 degrees	11.25 degrees	11.25 degrees	11.25 degrees
Background Ozone Concentration	0.09 ppm	0.09 ppm	0.09 ppm	0.09 ppm
Stability Class	D	D	F	E
Wind Speed	5 m/s	5 m/s	3 m/s	2 m/s
Threshold-delta E	2.00	2.00	2.00	2.00
Threshold-Green Contrast	0.05	0.05	0.05	0.05
Background Fine Particulate Density	1.50 g/cm^3	1.50 g/cm^3	1.50 g/cm^3	1.50 g/cm^3
Background Fine Particulate Size Index	0.3 µm	0.3 µm	0.3 µm	0.3 µm
Background Coarse Particulate Density	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3

Table 6-16 (Continued)
VISCREEN Level 2 Model Inputs

VISCREEN Modeling Parameter	Level 2 (Situation-Specific Analysis)			
	Hummingbird Springs	Eagletail Mountain	Signal Mountain	Woolsey Peak
Background Coarse Particulate Size Index	6.0 µm	6.0 µm	6.0 µm	6.0 µm
Plume Particulate Density	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3
Plume Particulate Size Index	10.0 µm	10.0 µm	10.0 µm	10.0 µm
Plume Soot Density	2.0 g/cm^3	2.0 g/cm^3	2.0 g/cm^3	2.0 g/cm^3
Plume Soot Size Index	0.1 µm	0.1 µm	0.1 µm	0.1 µm
Plume Primary SO_4 Density	1.5 g/cm^3	1.5 g/cm^3	1.5 g/cm^3	1.5 g/cm^3
Plume Primary SO_4 Size Index	0.5 µm	0.5 µm	0.5 µm	0.5 µm
Worst Case Emissions				
General Electric				
Particulate Emissions	15.32 g/s	15.32 g/s	15.32 g/s	15.32 g/s
NO_x (as NO_2) Emissions	11.20 g/s	11.20 g/s	11.20 g/s	11.20 g/s
Worst Case Emissions				
Westinghouse				
Particulate Emissions	14.52 g/s	14.52 g/s	14.52 g/s	14.52 g/s
NO_x (as NO_2) Emissions	11.88 g/s	11.88 g/s	11.88 g/s	11.88 g/s
Primary NO_2 Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Soot Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Sulfate Emissions	0.0 g/s	0.0 g/s	0.0 g/s	0.0 g/s
Source-Observer Distance	32.8 km	35.3 km	53.2 km	32.1 km
Minimum Source-Class I Distance	32.8 km	35.3km	53.2 km	32.1 km
Maximum Source-Class I Distance	51.5 km	42.8 km	132.3 km	47.8 km
Background Visual Range	102.9 km	102.9 km	102.9 km	102.9 km
Plume-Source-Observer Angle	11.25 degrees	11.25 degrees	11.25 degrees	11.25 degrees
Background Ozone Concentration	0.09 ppm	0.09 ppm	0.09 ppm	0.09 ppm
Stability Class	E	E	E	C
Wind Speed	3 m/s	2 m/s	4 m/s	5 m/s

Table 6-16 (Continued) VISCREEN Level 2 Model Inputs				
	Level 2 (Situation-Specific Analysis)			
VISCREEN Modeling Parameter	Hummingbird Springs	Eagletail Mountain	Signal Mountain	Woolsey Peak
Threshold-delta E	2.00	2.00	2.00	2.00
Threshold-Green Contrast	0.05	0.05	0.05	0.05
Background Fine Particulate Density	1.50 g/cm^3	1.50 g/cm^3	1.50 g/cm^3	1.50 g/cm^3
Background Fine Particulate Size Index	0.3 µm	0.3 µm	0.3 µm	0.3 µm
Background Coarse Particulate Density	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3
Background Coarse Particulate Size Index	6.0 υm	6.0 µm	6.0 µm	6.0 µm
Plume Particulate Density	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3	2.5 g/cm^3
Plume Particulate Size Index	10.0 µm	10.0 µm	10.0 µm	10.0 µm
Plume Soot Density	2.0 g/cm^3	2.0 g/cm^3	2.0 g/cm^3	2.0 g/cm^3
Plume Soot Size Index	0.1 µm	0.1 µm	0.1 µm	0.1 µm
Plume Primary SO_4 Density	1.5 g/cm^3	1.5 g/cm^3	1.5 g/cm^3	1.5 g/cm^3
Plume Primary SO_4 Size Index	0.5 µm	0.5 µm	0.5 µm	0.5 µm

The National Park Service's web site on visibility monitoring indicated that the annual mean reconstructed background visual range for the Tonto National Monument (approximately 2 miles north of the Superstition Class I Wilderness area) is 102.9 km. Thus, a more representative background visual range of 102.9 km was used in the Level 2 analyses.

Background Ozone Concentration: The default background ozone concentration in the Level 1 analysis is 0.04 ppm. A more representative background ozone concentration of 0.09 ppm was used in the Level 2 analysis. This value was obtained from the AIRS database for the Palo Verde Nuclear Generating Station monitor (#04-013-9993) for 1999. It is the maximum 1 hour ozone value reported for that year.

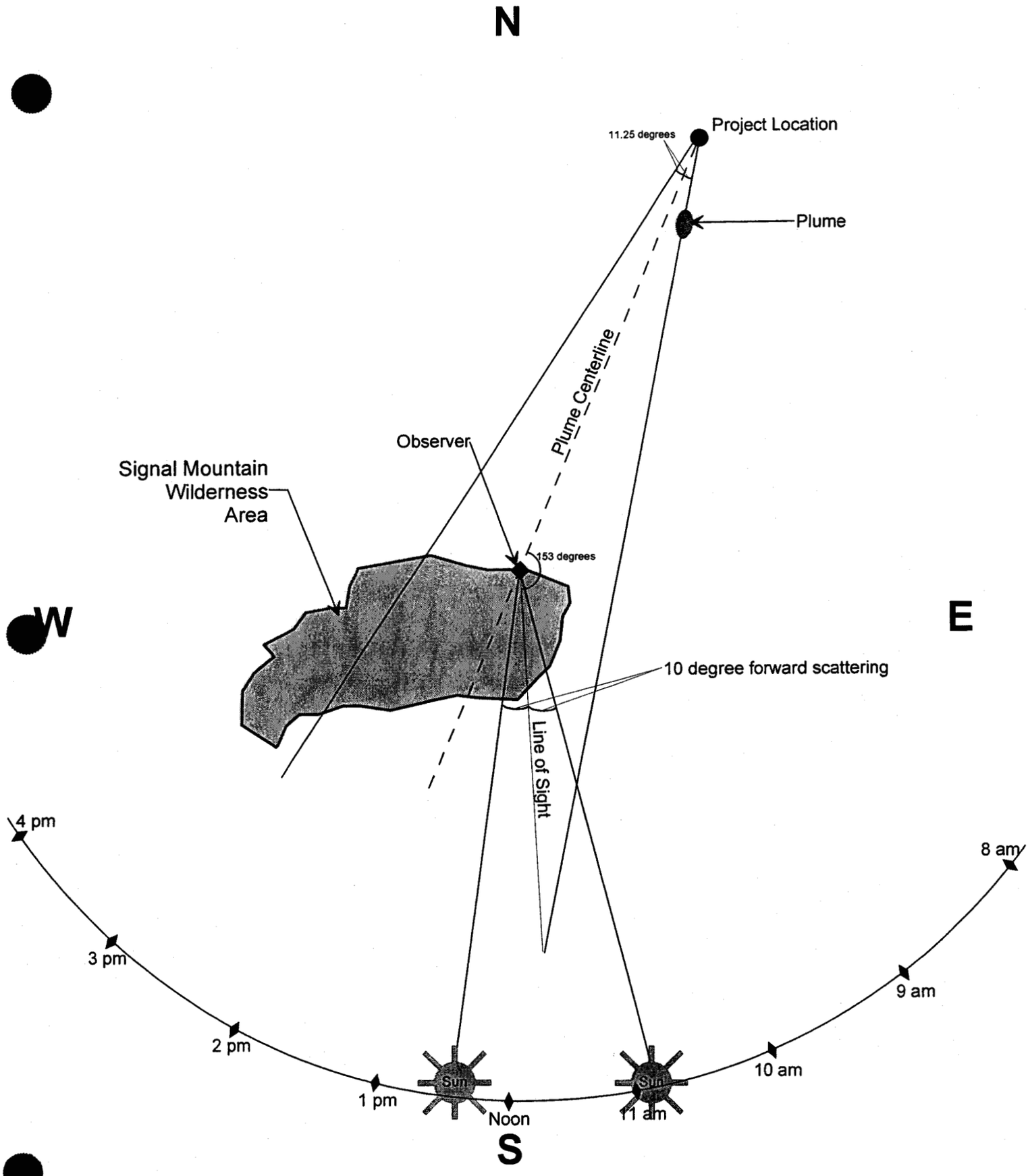
Stability Class and Wind Speed: The Level 1 VISCREEN stability class default value of 'F' and wind speed of 1.0 m/s were found not to be representative of the general climatological conditions in the vicinity of the Project. Therefore, stability class and wind speed information contained in the most recent year (1998) of the previously discussed five year meteorological data set (1994 to 1998) was analyzed to determine a more representative stability class and wind speed. Joint frequency distributions for stability classes A through F were performed for the meteorological data. These analyses were consistent with the Workbook. They consider the persistence as well as the frequency of the occurrence of the stabilities and wind speeds insomuch as the transport times to the Class II areas may be of sufficient length to allow the plume to break up and not remain visible. The results of the analyses are presented in Table 6-16 as a shaded value next to the stability class and wind speed headings.

Plume Particle Size Index: The default plume particulate size index value (i.e., mass median diameter) used in the worst case Level 1 analysis was 2.0 μm. A mass median diameter of 10 μm was used in the Level 2 analysis.

6.8.4.2 VISUAL IMPAIRMENT MODELING RESULTS

The VISCREEN model was used again with the aforementioned situation specific Level 2 input parameters as identified in Table 6-16. Results of the VISCREEN modeling are included in Appendix J. The results of the Level 2 screening analyses reveal that the Project's potential for visibility impairment is negligible, as potential plume delta-E and green contrast indices inside the Class II areas are less than the conservative Level 1 screening thresholds for all previously mentioned sensitive areas except for Signal Mountain Wilderness Area.

Signal Mountain exceeds only 1 of the 4 tests by approximately 8 percent for the Westinghouse CT (3 percent for the General Electric machines) of the conservative Class I, Level 1 screening criteria. Figure 6-8 illustrates the geometry of the occurrence



Possible Sun Locations (Angles) During the
Viscreen Level 2 Exceedance

Figure 6-8

Signal Mtn.srf

of the exceedance. The exceedance occurs when viewing the plume along a line of sight (azimuth) of 153 degrees from plume centerline while the sun is in the forward scattering position. This geometry would restrict the exceedance to the sun angles given on Figure 6-8 (i.e., a high noon type of geometry). As can be seen in Table 6-16, the Level 2 meteorological data chosen for this wilderness area is a wind speed of 3 m/s and a stability of F. An analysis of the meteorological data for the given year and wind sector in which the wilderness area lies reveals that the meteorological conditions only occurred in the early morning (001 to 600) or late evening (1801 to 2400) times of the day. These times do not correspond to the sun angle geometry found on Figure 6-8. Therefore, because the exceedance of the Level 2 visual screening criteria occurred during an unrealistic scenario, that particular scenario may be ignored in accordance with EPA guidelines.

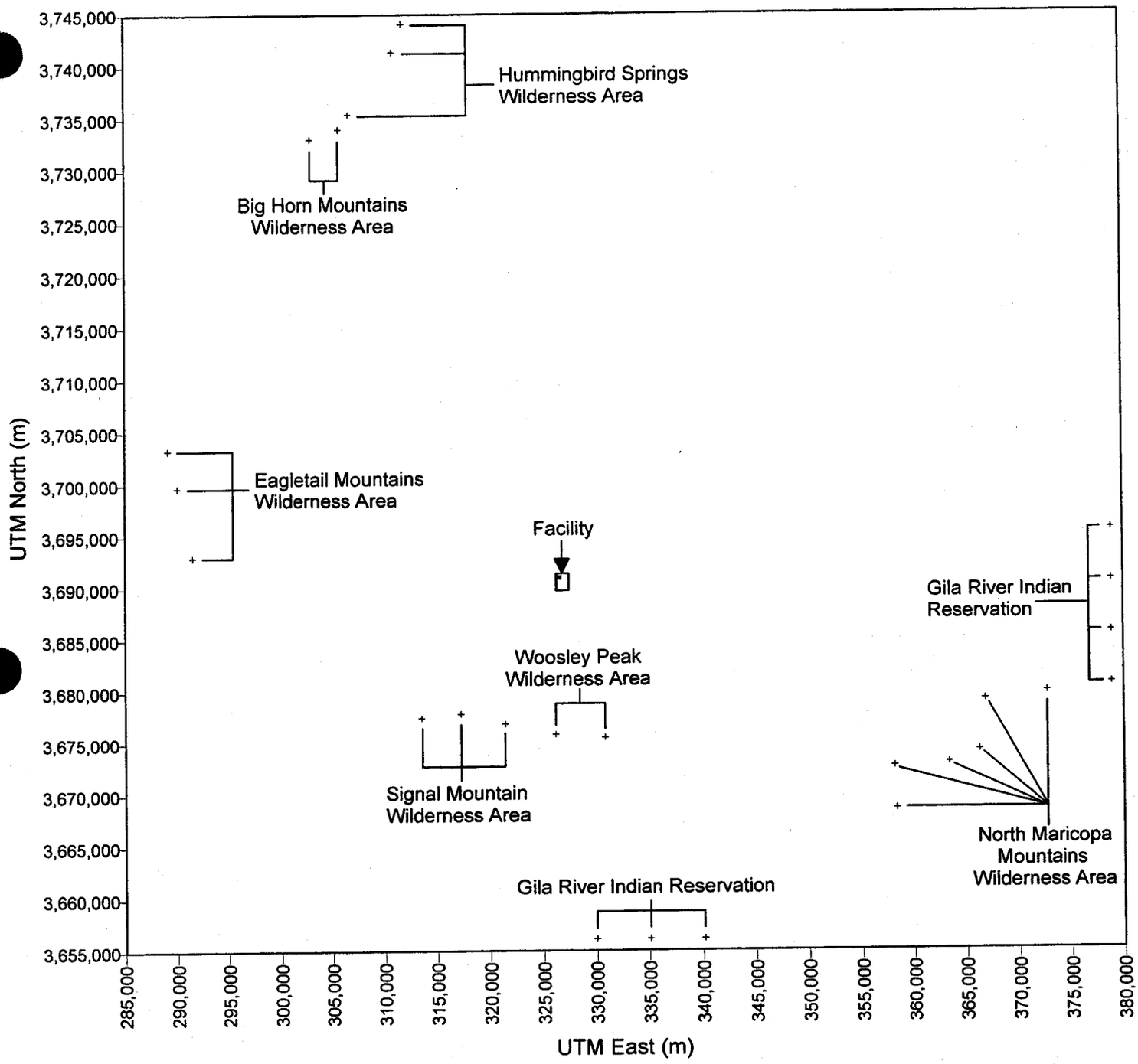
Views outside of these Class II areas were not considered in the analyses. The views in the Viscreen model represent views outside a Class I area and are defined as integral vistas or views leading up to a Class I area. There were no such integral vistas in the vicinity of the Project. Further analyses to quantify the extent of any reductions in visibility due to emissions from the Project are not warranted based on the results of the Level 2 visual impairment screening analysis.

6.8.4.3 CLASS II GROUNDLEVEL IMPACT MODELING RESULTS

The ISCST3 air dispersion model was used to assess maximum groundlevel pollutant concentrations at the special Class II sensitive areas. As shown on Figure 6-9, receptors were placed at the nearest point of each Class II area to the Project. Elevations were obtained with the USGS 7.5-minute digital elevation models (DEMs). The maximum predicted concentrations are presented in Table 6-17 for each year and compared with the Class II increments. As the results indicate, the maximum predicted concentrations are considerably less than the Class II increment values.

6.8.4.4 NITRATE DEPOSITION ANALYSIS

A Level I nitrate deposition analysis was performed for the Class II sensitive areas in accordance with the IWAQM Phase I Report (EPA-454/R-93-015). The same receptors discussed in Section 6.8.4.3 were used in this analysis. The ISCST3 air dispersion model was used to assess maximum predicted 24 hour NO_x ground-level concentrations at each receptor. Assuming that concentrations of NO_x are deposited as, HNO_3 and using the conversion equations provided by the National Park Service, nitrate depositions were calculated for the Class II sensitive areas. The deposition estimates are assumed to be conservative because the steady state ISCST3 Guassian plume model does not actually remove any mass from the plume in calculating the ground level concentration. Table 6-18 presents nitrate 24 hour concentrations and deposition impacts at each of the Class II sensitive areas. While no formal significance levels exist



Class II Sensitive Area Receptors

Figure 6-9

ClassIIgrid.srf

Table 6-17
Class II Groundlevel Impacts Increment Modeling Results

Pollutant	Averaging Period	Turbine*	Class II Sensitive Areas								
			Hummingbird Springs	Big Horn Mountain	Eagletail Mountain	Signal Mountain	Woolsey Peak	North Maricopa Mountains	Gila Bend Indian Reservation	Gila River Indian Reservation	Class II Increment ($\mu g/m^3$)
NO_x	Annual	GE	0.01	0.01	0.05	0.22	0.18	0.06	0.02	0.03	25
		WES	0.01	0.01	0.05	0.23	0.18	0.06	0.02	0.04	25
PM_{10}	Annual	GE	0.02	0.01	0.07	0.34	0.27	0.09	0.03	0.05	17
		WES	0.02	0.01	0.07	0.32	0.25	0.08	0.03	0.05	17
	24 hour	GE	0.29	0.25	1.22	2.69	2.80	1.65	0.46	0.75	30
		WES	0.27	0.24	1.14	2.51	2.58	1.55	0.43	0.71	30

*GE = General Electric, WES = Westinghouse

Table 6-18
Nitrate Concentration and Deposition Impacts onto Class II Wilderness Areas and Gila Bend and Gila River Indian Reservations

Class II Area	General Electric		Westinghouse	
	HNO_3 Deposition Values ($\mu g/m^2/s$)	Nitrate Deposition (kg/hectare)	HNO_3 Deposition Values ($\mu g/m^2/s$)	Nitrate Deposition (kg/hectare)
Hummingbird Springs	1169.48	0.01	1249.97	0.01
Big Horn Mountain	1008.50	0.01	1080.11	0.01
Eagletail Mountain	4851.31	0.05	5011.11	0.05
Signal Mountain	10422.30	0.10	10781.55	0.11
Woolsey Peak	10918.86	0.11	11198.8	0.11
North Maricopa Mountains	6626.83	0.07	6941.69	0.07
Gila Bend Indian Reservation	1789.72	0.02	1853.64	0.02
Gila River Indian Reservation	2978.73	0.03	3108.94	0.03

by which to compare the results presented in Table 6-18, the impacts on these Class II sensitive areas are minimal. An example nitrate deposition calculation is presented in Appendix J.

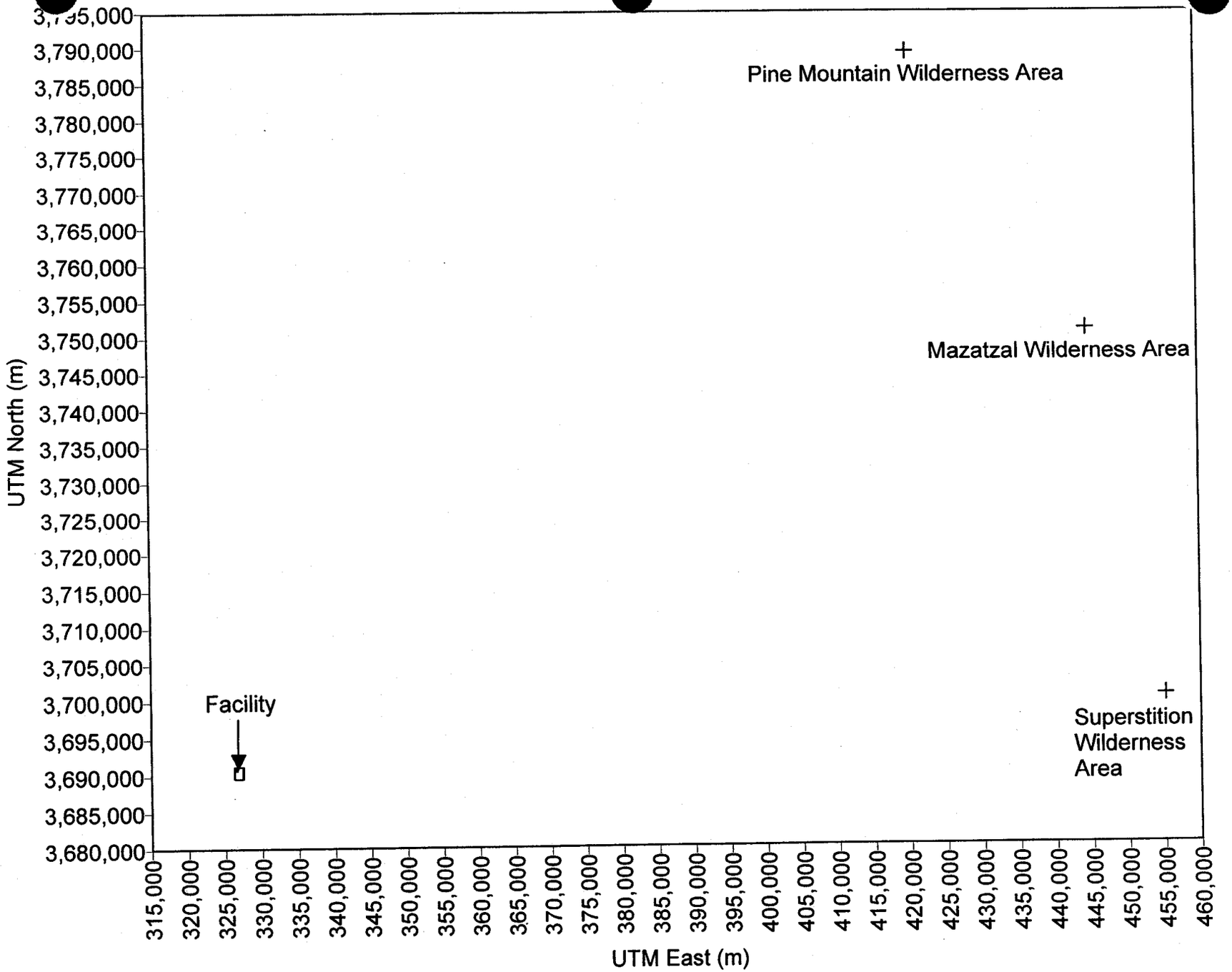
6.8.5 CLASS I AREA AIR QUALITY IMPACT ANALYSIS

Air dispersion modeling was performed to determine the Project's maximum predicted impact at the closest boundaries of the Superstition Wilderness Area, Mazatzal Wilderness Area, and the Pine Mountain Wilderness Area. These areas were presented on Figure 6-7. The ISCST3 air dispersion model was used to determine the maximum predicted impacts of NO_x and PM_{10} at the respective park boundaries. The 5 year meteorological data set, model options, and operating scenario emission rates that were used in the refined modeling analysis presented in Section 6.3, were also used in the Class I air quality impact analyses. As shown on Figure 6-10, receptors were placed at the closest boundary point of each park with respect to the Project.

Table 6-19 presents the results of the Class I SIL modeling for each pollutant and the applicable averaging period. In the table, the maximum predicted concentrations are presented and compared with the Class I SILs. The Class I SILs were calculated as 4 percent of the PSD Class I increments, as recommended by the National Park Service. As the results indicate, the maximum predicted concentrations of NO_x and PM_{10} are considerably less than the applicable Class I SILs.

6.8.6 HAZARDOUS AIR POLLUTANTS ANALYSIS

A hazardous air pollutants (HAPs) analysis was performed for the Project in accordance with current draft Maricopa County ESDAQD guidance documents (*Air Toxics/Hazardous Air Pollutant Permitting Procedure* December 14, 1999, and *Arizona Ambient Air Quality Guidelines (AAAQGs)* 1999 Update). AAAQGs are residential screening values that are protective of human health by considering the risk from inhalation of contaminants in ambient air. Emissions of HAPs from the Project were estimated using the California Air Toxics Emission Factor (CATEF) program and AP-42, Volume I, Fifth Edition. A modeling analysis was performed using worst case annual average performance parameters for the General Electric combustion turbine. These parameters were assumed to represent emissions from the Project. The modeling analysis used the ISCST3 air dispersion model to model a nominal 1 g/s emission rate with the fence line receptors and the standard grid referenced in Section 6.3.5. The emission factors and input assumptions for the HAPs analysis are found in Table 6-20. The results of the modeling analysis, shown in Table 6-21, indicate that the Project will not be a major source of HAPs, with the impacts being orders of magnitude below the AAAQGs.



Class I Area Receptors

Figure 6-10

Classigrid.srf

Table 6-19
Class I SIL Modeling Results

Pollutant	Averaging Period	Turbine[a]	Mandatory Class I Area			Class I SIL[b] ($\mu g/m^3$)
			Superstition ($\mu g/m^3$)	Mazatzal ($\mu g/m^3$)	Pine Mtn. ($\mu g/m^3$)	
NO_x	Annual	GE	0.01	0.01	0.01	0.10
		WES	0.01	0.01	0.01	0.10
PM_{10}	Annual	GE	0.01	0.01	0.01	0.16
		WES	0.01	0.01	0.01	0.16
	24 hour	GE	0.14	0.08	0.05	0.32
		WES	0.13	0.08	0.05	0.32

[a]GE = General Electric, WES = Westinghouse.

[b]Calculated as a 4 percent of the PSD Class I increment values.

Table 6-20
Hazardous Air Pollutants Analysis Emission Factors and Total Emissions

Pollutant	CAS Number	CATEF[a]/AP-42 Emission Factor	Fuel Burn Rate (MMscf/h)[b]	Emission Rate	
				lb/h	tpy
Acetaldehyde	75-07-0	4.83E-02	2.224	1.07E-01	1.88E+00
Acrolein	107-02-8	1.44E-02	2.224	3.20E-02	5.61E-01
Arsenic	7440-38-2	2.00E-04	2.224	4.45E-04	7.79E-03
Barium	7440-39-3	4.40E-03	2.224	9.79E-03	1.71E-01
Benzene	71-43-2	2.10E-03	2.224	4.67E-03	8.18E-02
Benz(a)anthracene	56-55-3	3.61E-06	2.224	8.03E-06	1.41E-04
Benzo(a)pyrene	50-32-8	4.63E-07	2.224	1.03E-06	1.80E-05
Beryllium	7440-41-7	1.20E-05	2.224	2.67E-05	4.68E-04
1,3-Butadiene	106-99-0	1.24E-04	2.224	2.76E-04	4.83E-03
Cadmium	7440-43-9	1.10E-03	2.224	2.45E-03	4.29E-02
Chromium	7440-47-3	1.40E-03	2.224	3.11E-03	5.46E-02
Cobalt	7440-48-4	8.40E-05	2.224	1.87E-04	3.27E-03
Copper	7440-50-8	8.50E-04	2.224	1.89E-03	3.31E-02
Dibenz(a,h)anthracene	53-70-3	3.03E-06	2.224	6.74E-06	1.18E-04
Ethylbenzene	100-41-4	9.74E-03	2.224	2.17E-02	3.80E-01
Formaldehyde	50-00-0	8.45E-02	2.224	1.88E-01	3.29E+00
Hexane	110-54-3	2.19E-01	2.224	4.87E-01	8.53E+00
Manganese	7439-96-5	3.80E-04	2.224	8.45E-04	1.48E-02
Mercury	7439-97-6	2.60E-04	2.224	5.78E-04	1.01E-02
2-Methylchloranthrene	56-49-5	5.07E-06	2.224	1.13E-05	1.98E-04
Naphthalene	91-20-3	9.26E-04	2.224	2.06E-03	3.61E-02
Nickel	7440-02-0	2.10E-03	2.224	4.67E-03	8.18E-02
Propylene Oxide	75-56-9	4.48E-02	2.224	9.96E-02	1.75E+00
Selenium	7782-49-2	2.40E-05	2.224	5.34E-05	9.35E-04
Toluene	108-88-3	5.91E-02	2.224	1.31E-01	2.30E+00
Vanadium	7440-62-2	2.30E-03	2.224	5.12E-03	8.96E-02
Xylene (Total)	1330-20-7	1.93E-02	2.224	4.29E-02	7.52E-01
Total HAPs					20.08[d]

[a]California Air Toxics Emission Factor database (CATEF Version 1.2).

[b] Determined from annual average performance parameters for the General Electric combustion turbine.

Fuel burn rate = (HHV turbine heat input (mmBtu/h) + HHV duct burner heat input (mmBtu/h))/AP-42 conversion factor for mmBtu to MMscf.
(1725.74 mmBtu/h + 542.7 mmBtu/h) / 1020 mmBtu/MMscf = 2.224 MMscf/h.

[c]Assumes operation of 4 turbines.

[d]Total tons per year of all HAPs listed. This value falls below the 25 tpy MACT standard.

Table 6-21
Hazardous Air Pollutants Modeling Results and AAAQGs

Pollutant	CAS Number	Emission Rate (lb/h)	Annual Impact ($\mu g/m^3$)[a]	Annual AAAQG ($\mu g/m^3$)[b]	24 hour Impact ($\mu g/m^3$)[a]	24 hour AAAQG ($\mu g/m^3$)[b]	1 hour Impact ($\mu g/m^3$)[a]	1 hour AAAQG ($\mu g/m^3$)[b]
Acetaldehyde	75-07-0	1.07E-01	1.20E-02	4.50E-01	8.87E-02	1.70E+02	3.61E-01	6.30E+02
Acrolein	107-02-8	3.20E-02	-	-	2.65E-02	2.00E+00	1.07E-01	6.30E+00
Arsenic	7440-38-2	4.45E-04	4.99E-05	2.30E-04	3.67E-04	1.60E-02	1.49E-03	6.00E-02
Barium	7440-39-3	9.79E-03	-	-	8.08E-03	4.00E+00	3.28E-02	1.50E+01
Benzene	71-43-2	4.67E-03	5.24E-04	1.20E-01	3.86E-03	4.40E+01	1.57E-02	1.70E+02
Benz(a)anthracene	56-55-3	8.03E-06	9.00E-07	4.80E-03	6.63E-06	1.60E+00	2.69E-05	6.00E+00
Benzo(a)pyrene	50-32-8	1.03E-06	1.15E-07	4.80E-04	8.51E-07	1.80E-01	3.46E-06	6.70E-01
Beryllium	7440-41-7	2.67E-05	2.99E-06	4.20E-04	2.20E-05	1.60E-02	8.96E-05	6.00E-02
1,3-Butadiene	106-99-0	2.76E-04	3.09E-05	3.60E-03	2.28E-04	1.30E+00	9.26E-04	5.00E+00
Cadmium	7440-43-9	2.45E-03	2.74E-04	5.60E-04	2.02E-03	2.00E-01	8.21E-03	7.70E-01
Chromium	7440-47-3	3.11E-03	-	-	2.57E-03	4.00E+00	1.04E-02	1.50E+01
Cobalt	7440-48-4	1.87E-04	-	-	-	-	-	-
Copper	7440-50-8	1.89E-03	-	-	1.56E-03	7.90E-01	6.34E-03	3.00E+00
Dibenz(a,h)anthracene	53-70-3	6.74E-06	7.56E-07	4.80E-04	5.57E-06	1.80E-01	2.26E-05	6.70E-01
Ethylbenzene	100-41-4	2.17E-02	-	-	1.79E-02	3.50E+03	7.27E-02	4.50E+03
Formaldehyde	50-00-0	1.88E-01	2.11E-02	7.60E-02	1.55E-01	1.60E+01	6.31E-01	2.50E+01
Hexane	110-54-3	4.87E-01	-	-	4.02E-01	1.40E+03	1.63E+00	5.40E+03
Manganese	7439-96-5	8.45E-04	-	-	6.98E-04	7.90E+00	2.84E-03	2.50E+01
Mercury	7439-97-6	5.78E-04	-	-	4.78E-04	4.00E-01	1.94E-03	1.50E+00
2-Methylchloranthrene	56-49-5	1.13E-05	-	-	-	-	-	-
Naphthalene	91-20-3	2.06E-03	-	-	1.70E-03	4.00E+02	6.91E-03	6.30E+02
Nickel	7440-02-0	4.67E-03	5.24E-04	2.10E-03	3.86E-03	1.20E-01	1.57E-02	4.50E-01
Propylene Oxide	75-56-9	9.96E-02	1.12E-02	2.70E-01	8.23E-02	9.80E+01	3.34E-01	3.70E+02
Selenium	7782-49-2	5.34E-05	-	-	4.41E-05	1.60E+00	1.79E-04	6.00E+00
Toluene	108-88-3	1.31E-01	-	-	1.09E-01	3.00E+03	4.41E-01	4.40E+03
Vanadium	7440-62-2	5.12E-03	-	-	4.23E-03	4.00E-01	1.72E-02	1.50E+00
Xylene (Total)	1330-20-7	4.29E-02	-	-	3.55E-02	3.50E+03	1.44E-01	5.40E+03

[a] Derived by multiplying the nominal 1 g/s annual, 24 hour, or 1 hour impact by the emission rate (g/s) of each pollutant.
Nominal 1 g/s: annual impact = 0.8893 ($\mu g/m^3$)
24 hour impact = 6.54986 ($\mu g/m^3$)
1 hour impact = 26.61199 ($\mu g/m^3$)
Example calculation: acetaldehyde emission rate of 1.07E-01 lb/h * (453.59 g/lb / 3600 s/h) = 1.35E-02 g/s
1.35E-02 * annual 1 g/s impact of 0.8893 ($\mu g/m^3$)
= annual acetaldehyde impact 1.20E-02 $\mu g/m^3$

[b] Obtained from draft guidance document *Arizona Ambient Air Quality Guidelines (AAAQGs)* 1999 Update.

7.0 COMPLIANCE PLAN

The applicable requirements for the facility are identified in the Section 3.0. The facility will comply with all applicable rules and requirements in the issued permit, and that become effective during the term of the permit. The Compliance Plan proposed for the facility is provided in Table 7-1.

7.1 PERMIT SHIELD

Any requirement not specifically identified in this application is considered not applicable to this facility. Therefore, the applicant requests a permit shield to include all adopted federal, state and local regulations not identified as applicable in the tables provided herein.

7.2 OPERATION AND MAINTENANCE PLAN

Because the specific equipment and emission control devices proposed for the facility have not yet been selected. An operation and maintenance plan will be developed for the facility, as applicable, prior to operation of the facility. This plan will address the requirements of the Maricopa County O&M guidelines, including the establishment of equipment specific operating parameters and limits, maintenance procedures and schedules, and documentation methods that will demonstrate that emissions control devices are being properly operated and maintained.

7.3 PERFORMANCE TEST METHODS

The performance tests required for this facility will conform to the requirements of Rule 270, as applicable. The specific test proposed for each pollutant are identified in Table 7-2. Alternative and equivalent test methods may be proposed for use to the Control Officer for approval, prior to any required testing.

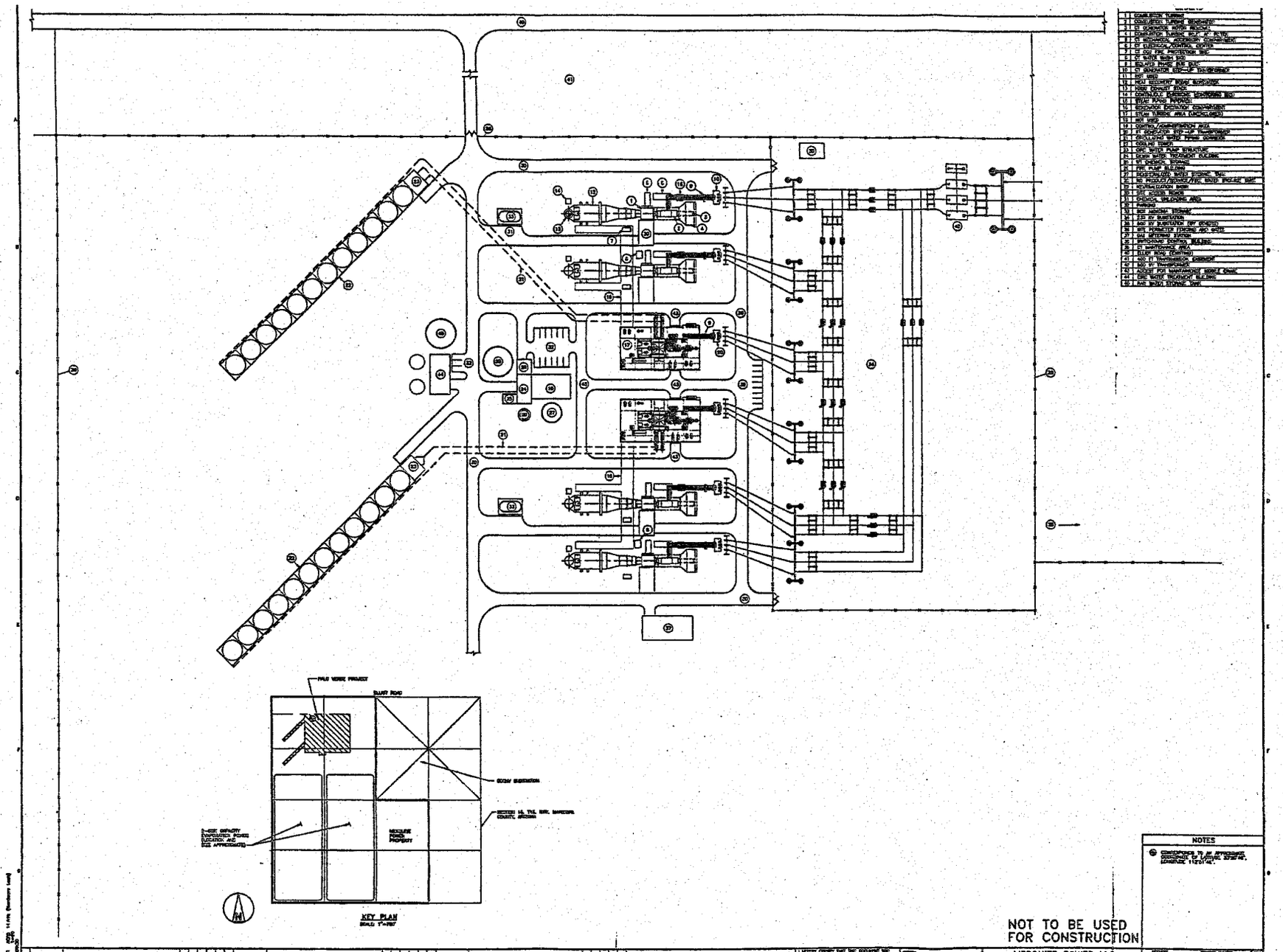
Table 7-1 Compliance Plan		
Applicable Requirement	Applicable Source	Compliance Monitoring Determination Method
40 CFR 60 Subpart A	Combustion Turbines and Duct Burners	Conduct performance tests and submit the required notifications and documentation and maintain required recordkeeping.
40 CFR 60 Subpart Da, Rule 360	Duct Burners	Maintain NO_X emissions less than 0.2 lb/mm Btu and 1.6 lb/MWh. Keep records and report as set forth in Subpart Da.
40 CFR 60, Subpart GG, Rule 360	Combustion Turbines	Monitor, keep records, and report as set forth in Subpart GG.
40 CFR 68	Plant	Review the facility to identify, prevent and minimize the consequences of accidental releases.
40 CFR 68	Ammonia Storage	Maintain records supporting implementation of the Risk Management Plan once ammonia or other regulated substances are present onsite above the threshold quantity.
40 CFR 72, Rule 371	Combustion Turbines and Duct Burners	Maintain records of Designated Representative Certification and other Part 72 submittals, including a complete Title IV Acid Rain permit application.
40 CFR 73	Combustion Turbines and Duct Burners	Maintain documentation of all Part 73 submittals.
40 CFR 75	Combustion Turbines and Duct Burners	Install, certify, operate, and maintain emission monitors and submit reports and keep records as required by Part 75.
40 CFR 82	Plant	Comply with 40 CFR §82.156 practices when servicing or disposing of applicable units.
Regulation I Rule 100	Plant	Perform requirements listed in this permit application; do not circumvent the rules; allow proper inspections; report emergencies in accordance with Rule 100 §501; maintain required records; prepare and submit required emission statements and annual emissions inventory questionnaires.

Table 7-1 (Continued) Compliance Plan		
Applicable Requirement	Applicable Source	Compliance Monitoring Determination Method
Regulation II Rule 200, 210, 240, 271, 280	Plant	Obtain required permits; post and not modify the permit when issued; transfer the permit only as provided in Rule 200 §414; perform modeling and testing as required using applicable procedures in Rule 270; pay applicable fees; make appropriate notifications under Rule 210 §403 and revise permit pursuant to the applicable requirements.
Rule 30 (SIP) Rule 300	Plant	Monitor visible emissions using EPA Ref. Method 9.
Rule 31.A (SIP) Rule 310 (SIP and County)	Open Areas, Parking Lots, Disturbed Soil, Surfaces, Storage Piles, Roadways and Streets, Material Handling, Unpaved Haul, Access Roads, Material Transport	Submit, implement and post a control plan as required in Rule 310 §303 and §401; monitor opacity using EPA Ref. Method 9; maintain a written log of implementation of RACM as required by Rule 310 §503; and maintain records and retain records for 3 years.
Rule 31.H.1.a (SIP)	Combustion Turbines and Duct Burners	Perform initial calculation for fuel burning based on AP42 (5th Edition) emission factors. Recalculate when applicable factors change. Track compliance.
Rule 32.A,C,E and F (SIP) Rule 320 §300, §302 and §304	Plant	Contain volatile and other listed materials and employ reasonable available controls to prevent unreasonable discharge into the air, the plant does not emit hydrogen sulfide and only insignificant amounts of sulfur oxide; demonstrate compliance with Rule 32.F and Rule 320 §304 by modeling.
Rule 33 (SIP)	Diesel Storage Tank	Conduct periodic inspections to ensure repair of visible leaks within 15 days as required by Rule 33(1).
Rule 34.E, G, K (SIP) Rule 330	Volatile Organic Compounds	Maintain good operating practices by containing any nonarchitectural spray painting operation, discharge no more than 40 lbs/day or 1-1/2 gallons per day to atmosphere, maintain records and retain for a minimum of five years as required by Rule 34 and Rule 330 §503.
Rule 34.C (SIP) Rule 331	Solvent Cleaning	Maintain good operating practices, post-operating requirements, and maintain records as required by Rule 331 §501.

Table 7-1 (Continued) Compliance Plan		
Applicable Requirement	Applicable Source	Compliance Monitoring Determination Method
Rule 335	Architectural Coatings	Restrict use of any prohibited coatings for architectural application.
Rule 40 (SIP)	Combustion Turbines and Duct Burners	Maintain and retain records and submit required reports.
Rule 41 (SIP)	Combustion Turbines and Duct Burners	Provide, install, and maintain monitoring devices and associated records as required.
Rule 42 (SIP)	Combustion Turbines and Duct Burners	Perform all testing and sampling as required by rule.
Rule 43 (SIP)	Combustion Turbines and Duct Burners	Provide access to emission units as required by rule.

Table 7-2 Performance Test Methods	
Pollutant	Performance Test Method
General	Methods 1 through 4
NO_x	Methods 19/20
CO	Method 10
PM_{10}	Methods 5 and 202, or 201a and 202
Opacity	Method 9
SO_2	Gas Supplier S Content Guarantee
TDS	Monthly Conductivity Test

APPENDIX A
SITE ARRANGEMENT DRAWING


PALO VERDE PROJECT
SUNNY ROAD
SCONI SUBSTATION
MESQUITE POWER PROJECT
KEY PLAN
NOT TO BE USED FOR CONSTRUCTION
NOTES
BLACK & VEATCH
MESQUITE POWER LLC
PALO VERDE POWER PROJECT
SITE ARRANGEMENT
96210-CSTU-S1001
2

APPENDIX B1
MARICOPA COUNTY SIP-APPROVED REGULATIONS

Table B-1 Maricopa County State Implementation Plan Applicable Requirements		
Citation	Description/Summary	Comment
Regulation I	General Provisions	
Rule 3	Air Pollution Prohibited	
Regulation II	Permits	
Rule 220	Permits to Operate	
§301	Permit Requirements	
§401	Application Procedures for Permits to Operate	
§410	Fees Required	
Rule 21	Permit Conditions	
A.	Form and content of permit applications	
Rule 22	Permit-Denial-Action-Transfer-Posting-Revocation-Compliance-Expiration	
D.	Permit-Denial-Action-Transfer-Posting-Revocation-Compliance-Expiration	
F.	Permit Nontransferable	
Rule 25	Posting of Permit	
Rule 26	Emissions Test Methods and Procedures	
Regulation III	Control of Air Contaminants	
Rule 30	Visible Emissions – Opacity <40 percent as determined by reference Method 9	
Rule 31	Emissions of Particulate Matter	
A.	Nonpoint Sources of Particulate Matter	
1.	Open Areas – Take reasonable measures to prevent excessive amounts of particulate matter from becoming airborne.	
2.	Parking lots – Take all effective measures to prevent excessive amounts of dust from becoming airborne.	
3.	Disturbed Soil Surfaces – Do not disturb or place soil on any area greater than 5 acres and permit fragile soil conditions to remain vacant for more than 6 months or leave an open area vacant for more than 24 months without taking reasonable and semipermanent precautions to prevent excessive amounts of fugitive dust from becoming airborne.	

Table B-1 (Continued) Maricopa County State Implementation Plan Applicable Requirements		
Citation	Description/Summary	Comment
4.	Storage Piles – Do not allow dust-producing material to be stored without taking reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne.	
6.	Roadways and Streets – Take reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne when using, repairing, or constructing any roadway or when transporting materials likely to give rise to airborne dust. Remove material deposited by trucking and earth-moving equipment of paved streets.	
7.	Material Handling and Practices – Do not conduct sandblasting or other abrading operations, or conduct other operations which may cause airborne dust, without taking reasonable precautions to prevent excessive amounts of particulate matter from becoming airborne.	
H.	Fuel Burning	
1.a.	For equipment having a heat input rate of 4200 million Btu per hour or less, the maximum allowable particulate emissions rate in pounds-mass per hour (E)=1.02Q0.769 where Q=Heat input in million BTU per hour.	
Rule 300	Visible Emissions	
Rule 310	Open Fugitive Dust Sources [Approved 4/10/95]	
§301	Limitation – Opacity: Opacity from sources of fugitive dust must not exceed 20 percent or any other stricter limitation imposed by county, state, or federal regulations.	
§302	Dust Generating Operations Permits Required	
§303	Control Plan Required With Permit Application	
§304	Control Plan Revision	
§305	Vehicle Use in Open Areas and Vacant Parcels – Do not allow motor vehicles to drive on open areas without first implementing RACM.	
§306	Unpaved Parking Areas/Staging Areas – Do not use unpaved area larger than 5,000 square feet for parking, storing, servicing, or dispatching motor vehicles without first implementing RACM.	

Table B-1 (Continued) Maricopa County State Implementation Plan Applicable Requirements		
Citation	Description/Summary	Comment
§307	Unpaved Haul/Access Roads – Do not allow use of unpaved road more than 100 feet in length unless no more than 20 vehicular trips per day and speed does not exceed 15 mph. Alternatively, effectively treat and maintain road dust with dust suppressant or gravel.	
§308	Disturbed Surface Areas – Do not disturb soil without implementing RACM. Within 8 months of terminating dust-generating operations, stabilize disturbed area with permanent RACM.	
§309	Vacant Areas – Do not leave open area vacant for more than 15 days without implementing RACM. Within 8 months implement permanent RACM.	
§310	Material Handling – No material handling without implementing RACM.	
§311	Material Transport – Do not transport bulk materials without implementing RACM. Remove particulate matter from the exterior surface of equipment and deposited on paved roads using RACM. Remove deposits of bulk materials from vehicles onto roads within 6 hours of occurrence.	
§311.2	Haul Trucks – Standards	
§312	Roadways, Streets, and Alleys – Do not use, repair, or construct a roadway without implementing RACM.	
§313	Erosion, Sedimentation, and Deposition of Bulk Materials Onto Paved Surfaces – Standards for removing deposition of bulk material onto paved roadway, paved parking, or paved storage area from adjacent real property.	
§401	Information Required to be Included in a Control Plan	
§402	Permit and Control Plan Posting Required	
§501	Opacity Determination – Use EPA Reference Method 9	
§502	Wind Speed Determination	
§503	Recordkeeping – Daily written log of implementation of Control Plan	
§504	Records Retention – 3 years	
Rule 32	Odors and Gaseous Emissions	

Table B-1 (Continued) Maricopa County State Implementation Plan Applicable Requirements		
Citation	Description/Summary	Comment
2.	Use no architectural coating containing photochemically reactive solvents.	
G.	Discharge no more than 40lbs/day of organic material into the atmosphere from any device for employing, applying, evaporating, or drying any photochemically reactive solvent.	
K.	Dispose no more than 1-1/2 gallons per day of any photo-chemically reactive solvent by means which will permit the evaporation of the solvent.	
Rule 300	Visible Emissions	
Rule 335	Architectural Coatings	
§301	Prohibition – Bituminous Pavement Sealers	
§302	Interim Limits – Nonflat Architectural Coatings	
§303	Final Limits – Flat Architectural Coatings	
§304	Limits – Flat Architectural Coatings	
§305	Do not apply or sell any architectural coating that exceeds listed limits.	
§306	Exemptions – Specific Use Coatings	
§307	Exemption – Small Containers	
Regulation IV	Production of Records: Monitoring, Testing, and Sampling Facilities	
Rule 40	Recordkeeping and Reporting	
Rule 41	Monitoring	
A.	Provide, install, maintain, and operate such air contaminant monitoring devices as are reasonable and required to determine compliance.	
Rule 42	Testing and Sampling	
Rule 43	Right of Inspection	

APPENDIX B2
MARICOPA COUNTY AIR POLLUTION CONTROL REGULATIONS

Table B-2 Current Maricopa County Air Pollution Control Regulations		
Citation	Description/Summary	Date Adopted/Amended
Regulation I	General Provisions	
Rule 100	General Provisions and Definitions	5/20/98
Rule 110	Violations	2/15/95
Rule 120	Conditional Orders	11/15/93
Regulation II	Permits and Fees	
Rule 200	Permit Requirements	5/20/98
Section 301	Permits Required	
Section 302	Title V Permit	
Section 305	Earth Moving Permit	
Section 308	Standards for Applications	
Section 309	Permit Conditions	
Section 310	Prohibition – Permit Modification	
Section 311	Permit Posting Required	
Section 312.2	Title V Sources with an Installation, Operating, or Conditional Permit	
Section 313	Accelerated Permitting	
Section 402	Permit Openings: Revocation and Reissuance; Termination	
Section 404	Permit Transfers	
Section 407	Air Quality Impact Models	
Section 408	Testing Procedures	
Section 409	Permit Fees	
Rule 210	Title V Permit Provisions	5/20/98
Section 301	Permit Application Processing Procedures	
Section 302	Permit Contents	
Section 304	Emission Standards and Limitations	
Section 305	Compliance Plan; Certification	
Section 401	Fees Required	
Section 402	Permit Term	
Section 403	Source Changes Allowed Without Permit Revisions	

Table B-2 (Continued) Current Maricopa County Air Pollution Control Regulations		
Citation	Description/Summary	Date Adopted/Amended
Section 404	Administrative Permit Amendments	
Section 405	Minor Permit Revisions	
Section 406	Significant Permit Revisions	
Section 407	Permit Shields	
Section 408.6	Public Participation	
Rule 240	Permits for New Major Sources and Major Modifications to Existing Major Sources	2/15/95
Section 301	Permit or Permit Revision Required	
Section 302	Application Completeness	
Section 303	Air Impact Analysis for Any Geographical Area	
Section 308	Permit Requirements for Sources Located in Attainment and Unclassified Areas	
Section 501	Pollutants to be Included in Analysis of Ambient Air Quality	
Section 508	Visibility and Air Quality Impact Analysis	
Section 510	Air Quality Models	
Rule 241	Permits for New Sources and Modifications to Existing Sources	6/19/96
Section 301	Best Available Control Technology (BACT) Required	
Section 302	Reasonable Available Control Technology (RACT) Required	
Section 303	Circumvention	
Rule 270	Performance Tests	11/15/93
Section 301.1	Applicable Procedures and Testing Methods	
Section 301.2	Opacity Determination by Reference Method 9 of the Arizona Testing Manual	
Section 401	Performance Test Required	
Section 402	Testing Criteria	
Section 403	Testing Conditions	
Section 404	Notice of Testing	
Section 405	Testing Facilities Provided	

Table B-2 (Continued) Current Maricopa County Air Pollution Control Regulations		
Citation	Description/Summary	Date Adopted/Amended
Section 406	Minimum Testing Required	
Section 407	Compliance With Emissions Limits	
Section 408	Additional Testing	
Rule 280	Fees	8/19/98
Section 301	Title V Fees	
Section 304	Calculation of Emission Fees	
Section 310	Earth Moving Permit Fee	
Section 312	Hourly Rate	
Section 401	Payment of Fees	
Regulation III	Control of Air Contaminants	
Rule 300	Visible Emissions	8/5/94
Section 301	Limitations – Opacity /General: Opacity <20%	
Section 302	Exceptions	
Section 501	Compliance Determination – Opacity	
Section 502	Compliance Determination – Opacity of Visible Emissions from Intermittant Sources	
Rule 310	Fugitive Dust Sources	6/16/99
Section 301	Opacity Limitation for Fugitive Dust Sources	
Section 302	Stabilization Requirements for Fugitive Dust Sources	
Section 303	Dust Control Plan Requirements	
Section 304	Elements of a Dust Control Plan	
Section 305	Dust Control Plan Revision	
Section 306	Control Measures	
Section 307	Project Information Sign	
Section 308	Work Practices	
Section 401	Dust Control Plan Posting	
Section 402	Compliance Schedule	
Section 501	Opacity Observations	
Section 502	Stabilization Observations	

Table B-2 (Continued) Current Maricopa County Air Pollution Control Regulations		
Citation	Description/Summary	Date Adopted/Amended
Section 503	Wind Gust Determination	
Section 504	Recordkeeping	
Section 505	Records Retention	
Section 506	Test Methods Adopted by Reference	
Rule 311	Particulate Matter from Process Industries	8/2/93
Section 304	Limitations – Fuel Burning Equipment	
Section 502	Recordkeeping and Reporting	
Section 503	Record Retention	
Section 504	Test Methods	
Rule 320	Odors and Gaseous Air Contaminants	7/13/88
Section 302	Material Containment Required	
Section 303	Reasonable Stack Height Requirement	
Section 308.1	Nitrogen Oxides from Electrical Power Plants – Gaseous Fossil Fuels	
Section 310	Carbon Monoxide	
Rule 330	Volatile Organic Compounds	6/19/96
Section 301	Limitations – Operations Involving Heat	
Section 302	Limitations – Noncomplying Solvents	
Section 304	Reductions Required	
Section 305	Equipment Cleanup	
Section 306	VOC Containment and Disposal	
Section 501	Providing and Maintaining Monitoring Devices	
Section 502	Determination of Compliance	
Section 503	Recordkeeping and Reporting	
Section 504	Test Methods	
Rule 331	Solvent Cleaning	4/7/99
Section 301	Solvent Handling Requirements	
Section 302	Equipment Requirements for all Cleaning Machines	
Section 303	Specific Operating and Signage Requirements for Cleaning Machines	

Table B-2 (Continued) Current Maricopa County Air Pollution Control Regulations		
Citation	Description/Summary	Date Adopted/Amended
Section 304	Solvent Specifications for Nonvapor Cleaning and Degreasing	
Section 305	Nonvapor Batch Cleaning Machines	
Section 307	Special Vapor Cleaning Situations	
Section 308	Exemptions	
Section 309	Requirements for Air Pollution Control Equipment and ECS Monitoring Equipment	
Section 501	Recordkeeping and Reporting	
Section 502	Compliance Determination and Test Methods	
Rule 335	Architectural Coatings	7/13/88
Section 301	Prohibition – Bituminous Pavement Sealers	
Section 302	Interim Limits – Nonflat Architectural Coatings	
Section 303	Final Limits – Nonflat Architectural Coatings	
Section 304	Limits – Flat Architectural Coating	
Section 305	Specialty Coatings	
Section 306	Exemptions – Specific-Use Coatings	
Section 307	Exemptions – Small Containers	
Rule 360	New Source Performance Standards	4/7/99
Section 300	Adopted Federal Standards 40 CFR 60 [July 1, 1998]	
Section 301	Subpart A – General Provisions	
Section 301	Subpart Da – Standards of Performance for Electric Utility Steam Generating Units for Which Construction is Commenced After September 18, 1978	
Section 301	Subpart GG – Standard of Performance for Stationary Gas Turbines	
Rule 370	Federal Hazardous Air Pollutant Program	8/19/98
Section 302	Standards of Performance for Federally Listed Hazardous Air Pollutants	
Section 302.1	Subpart A – General Provisions	
Section 303	Additional Requirements	
Rule 371	Acid Rain	4/3/96

Table B-2 (Continued) Current Maricopa County Air Pollution Control Regulations		
Citation	Description/Summary	Date Adopted/Amended
Section 301	Incorporates Subparts of the Federal Acid Rain Regulations	
Section 301.1	Subparts A through I of 40 CFR Part 72 (Permits Regulation) and all accompanying appendices, adopted as of January 1, 1996	
Section 301.2	40 CFR Part 74 (Sulfur Dioxide Opt-Ins), 40 CFR Part 75 (Continuous Emission Monitoring), and 40 CFR 76 (Acid Rain Nitrogen Oxides Emission Reduction Program) and all accompanying appendices, adopted as of January 1, 1996	
Regulation IV	The Hearing Board	
Rule 400	Procedure before the Hearing Board	11/15/93
Regulation V	Air Quality Standards and Area Classification	
Rule 500	Attainment Area Classification	11/15/93
Rule 510	Air Quality Standards	7/13/88
Regulation VI	Emergency Episodes	
Rule 600	Emergency Episodes	7/13/88
Appendix B	Standard Application Form and Filing Instructions	2/15/95
Appendix C	Describes methods to visually determine opacity of emissions from unpaved roads, unpaved haul/access roads, unpaved parking lots, and sources for time-averaged regulations. Also gives test methods for dust stabilization	6/16/99

APPENDIX C
PERFORMANCE DATA

Representative Emission Rates and Stack Parameters and Potential to Emit

Mesquite Power, LLC

Revised 2/1/00
Printed 02/14/2000 8:03 AM

Determination of Representative Emission and Stack Parameters and Potential to Emit Calculator

Combined Cycle Operation - Natural Gas

GE7FA

G = General Electric Turbine
NOTE Ref. 1/4/00 performance data.

Turbine Operation 100 percent GE7FA

Case Name	Case G1a	Case G1b	Case G1c	Case G2a	Case G2b	Case G2c	Case G3a	Case G3b	Case G3c	Case G4a	Case G4b	Case G4c
Ambient Temp (F)	73	73	73	122	122	122	59	59	59	17	17	17
Evap Cooler	X	X	X	X	X	X	X	X	X			
Duct Firing (g)	X		X	X		X	X		X	X		X
STIG			X			X			X			X
Exit Temp (F)	179.3	187.4	173.1	177.7	180.6	168.8	175	188.9	172.7	174.3	187.1	176
Exit Velocity (ft/s)	64.1	64.6	69.4	61.2	61.8	65.8	64.8	66.2	70.3	64.6	69.4	75.1
Emissions (lb/h)												
NOX (e)	20.4	15.5	21.1	18.2	14.7	20.5	20.7	15.7	21.2	22.3	16.8	22.1
CO	19.9	15.1	20.5	18.7	14.3	20	20.1	15.3	20.7	21.6	16.2	21.5
PM/PM10 (d)	24.9	18	28.7	26.1	18	29.3	29.1	18	28.7	30.4	18	28.5
SO2 (f)	1.8	1.5	2.0	1.8	1.4	1.8	2.0	1.5	2.0	2.1	1.6	2.1
VOC(h)	14.7	2.4	14.8	13.7	2.3	16.2	14.9	2.5	14.7	16.6	2.6	14.7

Turbine Operation 75 percent

Case Name	Case G1d	Case G2d	Case G3d	Case G4d
Ambient Temp (F)	73	122	59	17
Evap Cooler				
Duct Firing				
STIG				
Exit Temp (F)	179.5	181.1	179.5	178.1
Exit Velocity (ft/s)	51	46.7	52.1	54
Emissions (lb/h)				
NOX (e)	12.3	10.6	12.7	13.6
CO	12	10.4	12.5	13.1
PM/PM10 (d)	18	18	18	18
SO2 (f)	1.2	1.0	1.2	1.3
VOC(h)	2	1.8	2	2.1

Turbine Operation 50 percent

Case Name	Case G1e	Case G2e	Case G3e	Case G4e
Ambient Temp (F)	73	122	59	17
Evap Cooler				
Duct Firing				
STIG				
Exit Temp (F)	179.5	175.6	188.5	187.5
Exit Velocity (ft/s)	42	40.3	42.6	44
Emissions (lb/h)				
NOX (e)	9.6	8.7	10.1	10.8
CO	9.6	8.5	9.9	10.5
PM/PM10 (d)	18	18	18	18
SO2 (f)	0.8	0.6	1.0	1.0
VOC(h)	1.6	1.6	1.7	1.7

WEC501F

W = Westinghouse Turbine
NOTE Ref. 1/6/00 performance data.

Turbine Operation 100 percent WEC501F

Case Name	Case W1a	Case W1b	Case W1c	Case W2a	Case W2b	Case W2c	Case W3a	Case W3b	Case W3c	Case W4a	Case W4b	Case W4c
Ambient Temp (F)	73	73	73	122	122	122	59	59	59	17	17	17
Evap Cooler	X	X	X	X	X	X	X	X	X			
Duct Firing (g)	X		X	X		X	X		X	X		X
STIG			X			X			X			X
Exit Temp (F)	174.9	191.5	175.7	177.8	193.8	179.4	174.3	191.1	175.7	173.1	189.6	178.1
Exit Velocity (ft/s)	65.4	66.3	71	61.7	62.5	66.9	66.4	67.3	72.2	69	70	74.1
Emissions (lb/h)												
NOX (e)	21.3	16.8	22.5	19.8	14.8	21.6	21.7	16.2	22.7	22.6	17.0	23.6
CO	20.7	15.5	21.8	18.3	14.6	21	21.1	16.6	22.1	23	16.6	23
PM/PM10 (d)	27.1	15.2	26.7	34.9	14	28.2	27.5	15.4	26.7	28.8	16.4	27.8
SO2 (f)	2.0	1.6	2.1	1.9	1.4	2.1	2.1	1.5	2.2	2.1	1.8	2.2
VOC(h)	15.3	1.9	15	14.1	1.8	18.6	15.6	2	14.8	16.1	2.1	18

Turbine Operation 85 percent

Case Name	Case W1d	Case W2d	Case W3d	Case W4d
Ambient Temp (F)	73	122	59	17
Exit Temp (F)	194.7	194.7	194.6	188.3
Exit Velocity (ft/s)	61	56.1	62.6	66.7
NOX (e)	13.6	11.9	14.1	15.3
CO	13.3	11.6	13.8	14.8
PM/PM10 (d)	14.1	12.6	14.6	15.5
SO2 (f)	1.3	1.1	1.3	1.5
VOC(h)	3.5	3.1	3.6	3.8

Turbine Operation 70 percent

Case Name	Case W1e	Case W2e	Case W3e	Case W4e
Ambient Temp (F)	73	122	59	17
Exit Temp (F)	188.1	190.2	187.8	188.4
Exit Velocity (ft/s)	54	50.4	55	58.1
NOX (e)	11.8	10.4	12.2	13.2
CO	11.5	10.2	11.9	12.8
PM/PM10 (d)	12.6	11.6	12.9	13.7
SO2 (f)	1.1	1.0	1.2	1.3
VOC(h)	3.1	2.9	3.2	3.4

Both Turbines — Worst Case Load Representative Emissions and Stack Parameters

Exit Temp (F)	168.90	349.21	K
Exit Velocity (ft/s)	61.20	18.65	m/s
Emissions (lb/h)			
NOX	23.60	2.97	g/s
CO	23.00	2.90	g/s
PM/PM10	30.40	3.83	g/s
SO2	2.24	0.28	g/s
VOC	16.60	2.09	g/s
Exit Temp (F)	178.10	354.32	K
Exit Velocity (ft/s)	46.70	14.23	m/s
Emissions (lb/h)			
NOX	15.30	1.93	g/s
CO	14.80	1.86	g/s
PM/PM10	18.00	2.27	g/s
SO2	1.46	0.18	g/s
VOC	3.80	0.48	g/s
Exit Temp (F)	167.60	348.43	K
Exit Velocity (ft/s)	40.30	12.28	m/s
Emissions (lb/h)			
NOX	13.20	1.66	g/s
CO	12.80	1.61	g/s
PM/PM10	18.00	2.27	g/s
SO2	1.25	0.16	g/s
VOC	3.40	0.43	g/s

GE Turbine — Worst Case Load Representative Emissions and Stack Parameters (Short-term[i])

GE 100% Worst Case Parameters

Exit Temp (F)	168.90	349.21	K
Exit Velocity (ft/s)	61.20	18.65	m/s
Emissions (lb/h)			
NOX	22.20	2.80	g/s
CO	21.60	2.72	g/s
PM/PM10	30.40	3.83	g/s
SO2	2.10	0.26	g/s
VOC	16.60	2.09	g/s

GE 75% Worst Case Parameters

Exit Temp (F)	178.10	354.32	K
Exit Velocity (ft/s)	46.70	14.23	m/s
Emissions (lb/h)			
NOX	13.50	1.70	g/s
CO	13.10	1.65	g/s
PM/PM10	18.00	2.27	g/s
SO2	1.28	0.16	g/s
VOC	2.10	0.26	g/s

GE 50% Worst Case Parameters

Exit Temp (F)	167.60	348.43	K
Exit Velocity (ft/s)	40.30	12.28	m/s
Emissions (lb/h)			
NOX	10.80	1.36	g/s
CO	10.50	1.32	g/s
PM/PM10	18.00	2.27	g/s
SO2	1.03	0.13	g/s
VOC	1.70	0.21	g/s

WES Turbine — Worst Case Load Representative Emissions and Stack Parameters (Short-term[i])

WES 100% Worst Case Parameters

Exit Temp (F)	173.10	351.54	K
Exit Velocity (ft/s)	61.70	18.81	m/s
Emissions (lb/h)			
NOX	23.60	2.97	g/s
CO	23.00	2.90	g/s
PM/PM10	28.80	3.63	g/s
SO2	2.24	0.28	g/s
VOC	16.10	2.03	g/s

WES 85% Worst Case Parameters

Exit Temp (F)	194.70	363.54	K
Exit Velocity (ft/s)	56.10	16.79	m/s
Emissions (lb/h)			
NOX	15.30	1.93	g/s
CO	14.80	1.86	g/s
PM/PM10	15.50	1.95	g/s
SO2	1.46	0.18	g/s
VOC	3.80	0.48	g/s

WES 70% Worst Case Parameters

Exit Temp (F)	187.80	359.71	K
Exit Velocity (ft/s)	50.40	15.36	m/s
Emissions (lb/h)			
NOX	13.20	1.66	g/s
CO	12.80	1.61	g/s
PM/PM10	13.70	1.73	g/s
SO2	1.25	0.16	g/s
VOC	3.40	0.43	g/s

Emergency Fire Water Pump - Diesel Fuel(i)

Exit Temp (F)	668
Exit Velocity (ft/s)	227.46
Emissions (lb/h)	
NOX	[illegible]
CO	[illegible]
PM/PM10	[illegible]
SO2	[illegible]
VOC(j)	[illegible]

Exit Temp (F)	668.00	626.46	K
Exit Velocity (ft/s)	227.46	69.34	m/s
Emissions (lb/h)			
NOX	5.59	0.7047	g/s
CO	1.00	0.1256	g/s
PM/PM10	0.15	0.0193	g/s
SO2	0.64	0.0805	g/s
VOC	0.30	0.0377	g/s

Emergency Fire Water Pump

1 # of emergency fire water pumps
52 Hours of emergency fire water pump operation per year

NOX	5.59	lb/h	0.15	tpy
CO	1.00	lb/h	0.03	tpy
PM/PM10	0.15	lb/h	0.00	tpy
SO2	0.64	lb/h	0.01	tpy
VOC	0.30	lb/h	0.01	tpy

Cooling Towers

Exit Temp (F)	122
Exit Velocity (ft/s)	25.3
Emissions (lb/h)	
PM/PM10	0.32

Exit Temp (F)	122.00	323.15	K
Exit Velocity (ft/s)	25.30	7.71	m/s
Emissions (lb/h)			
PM/PM10	0.32	0.04	g/s

Cooling Towers

24 # of cooling tower cells
8760 Hours of emergency fire water pump operation per year

PM/PM10	0.32	lb/h	33.77	tpy

Potential To Emit Calculations

Facility Operating Parameters

GE CCCT

4 # of turbines
8760 Hours of CCCT natural gas operation per year
365 Equivalent days operation per year

GE Annual Worst Case Parameters[a]

PTE-COMBINED CYCLE OPERATION

Max lb/h at 73 F on NG (a)

NOX	21.1	lb/h	369.7	tpy	2.66	g/s
CO	20.50	lb/h	359.2	tpy	2.58	g/s
PM/PM10	28.90	lb/h	506.3	tpy	3.64	g/s
SO2	2.00	lb/h	35.0	tpy	0.25	g/s
VOC	14.80	lb/h	259.3	tpy	1.86	g/s
Exit Temp	172.10	F	350.98	K		
Exit Velocity	64.10	ft/s	19.54	m/s		

	Turbines PTE (tpy)	Fire Water Pump PTE (tpy)	Cooling Towers PTE (tpy)	Total Facility PTE (tpy)	PSD SEL (tpy)	Exceed SEL (Y/N)
NOx	369.67	0.15	N/A	369.82	40	Yes
CO	359.16	0.03	N/A	359.19	100	Yes
PM/PM10	506.33	0.00	33.77	540.10	25/15	Yes
SO2	35.04	0.01	N/A	35.05	40	no
VOC	259.30	0.01	N/A	259.30	40	Yes
H2SO4 (c)	4.29	0.0	N/A	4.29	7	no
Total Reduced Sulfur (TRS) (b)	negl.	negl.	N/A	negl.	10	no
Hydrogen Sulfide (H2S)	negl.	negl.	N/A	negl.	10	no
Total Fluorides (TF)	negl.	negl.	N/A	negl.	3	no
Lead (Pb)	negl.	negl.	N/A	negl.	0.6	no

Facility Operating Parameters

WES CCCT

4 # of turbines
8760 Hours of CCCT natural gas operation per year
365 Equivalent days operation per year

WES Annual Worst Case Parameters[a]

PTE-COMBINED CYCLE OPERATION

Max lb/h at 73 F on NG (a)

NOX	22.5	lb/h	394.2	tpy	2.83	g/s
CO	21.80	lb/h	383.7	tpy	2.76	g/s
PM/PM10	27.10	lb/h	474.8	tpy	3.41	g/s
SO2	2.13	lb/h	37.3	tpy	0.27	g/s
VOC	15.30	lb/h	268.1	tpy	1.93	g/s
Exit Temp	174.90	F	352.54	K		
Exit Velocity	65.40	ft/s	19.93	m/s		

	Turbines PTE (tpy)	Fire Water Pump PTE (tpy)	Cooling Towers PTE (tpy)	Total Facility PTE (tpy)	PSD SEL (tpy)	Exceed SEL (Y/N)
NOx	394.20	0.15	N/A	394.36	40	Yes
CO	383.68	0.03	N/A	383.71	100	Yes
PM/PM10	474.79	0.00	33.77	508.57	25/15	Yes
SO2	37.32	0.01	N/A	37.33	40	no
VOC	268.08	0.01	N/A	268.08	40	Yes
H2SO4 (c)	4.57	0.0	N/A	4.57	7	no
Total Reduced Sulfur (TRS) (b)	negl.	negl.	N/A	negl.	10	no
Hydrogen Sulfide (H2S)	negl.	negl.	N/A	negl.	10	no
Total Fluorides (TF)	negl.	negl.	N/A	negl.	3	no
Lead (Pb)	negl.	negl.	N/A	negl.	0.6	no

Notes

- a Worst Case emissions are from 100% load for both vendors at annual average temperature of 73 F.
- b Combined Total Reduced Sulfur Compounds (including H2S) and Total Reduced Sulfur (including H2S).
- c H2SO4 based on a 10% conversion of SO2 to SO3 and a molecular ratio of 1.22 from SO3 to H2SO4 (in the stack and SCR).
- d PM/PM10 emissions represent front (filterable) and back-half (condensable).
- e NOX emissions from the turbines included the effect of selective catalytic reduction (SCR) to 2.5 ppm for Natural Gas firing only.
- f Sulfur content assumed for the Natural Gas = 0.30 grains of sulfur per 100 SCF.
- g Stack emissions, where applicable, also include emissions caused by the duct burner.
- h VOC emissions are estimated to be 20% of the UHC emissions for the GE Turbines and 80% of the UHC emissions for the Westinghouse Turbines.
- i Emergency Fire Water Pump will be operated for 52 hours per year.
- j VOC emissions for the Emergency Fire Water Pump were considered to 100% of the Hydrocarbon emissions.
- k Both worst case short-term and annual parameters do not represent a single specific operating case; the values indicate worst case parameters over each load (short-term), or annual average operating scenario.

Supplement to the "Representative Emission Rates and Stack Parameters and Potential to Emit"

Mesquite Power, LLC

Supplement Document to the "Determination of Representative Emission and Stack Parameters and Potential to Emit Calculator"
Explination of the development of worst case modeling scenario parameters

Combined Cycle Operation - Natural Gas

GE7FA | WES501F

A | C | B | D

E | F

G | H

Short-term[a] | Short-term[a]

GE 100% Load Worst Case Parameters from C

WES 100% Load Worst Case Parameters from D

GE 75% Load Worst Case Parameters from E

WES 85% Load Worst Case Parameters from F

GE 50% Load Worst Case Parameters from G

WES 70% Load Worst Case Parameters from H

Emergency Fire Water Pump - Diesel Fuel(i

Cooling Towers

Potential To Emit Calculation:

GE Annual Worst Case Parameters from A

GE Annual Worst Case Parameters

PTE-COMBINED CYCLE OPERATION

	Turbines PTE (tpy)	Fire Water Pump PTE (tpy)	Cooling Towers PTE (tpy)	Total Facility PTE (tpy)	PSD SEL (tpy)	Exceed SEL (Y/N)
NOx	369.67	0.15	NA	369.82	40	Yes
CO	369.14	0.40	NA	369.19	100	Yes
PM/PM10	544.33	0.04	33.77	540.19	25/15	Yes
SO2	35.44	0.04	NA	35.46	40	no
VOC	259.34	0.01	NA	259.34	40	Yes
H2SO4 (c)	4.29	0.0	NA	4.29	7	no
Total Reduced Sulfur (TRS)	negl	negl	NA	negl	10	no
Hydrogen Sulfide (H2S)	negl	negl	NA	negl	10	no
Total Fluorides (TF)	negl	negl	NA	negl	3	no
Lead (Pb)	negl	negl	NA	negl	0.6	no

WES Annual Worst Case Parameters from B

WES Annual Worst Case Parameters

PTE-COMBINED CYCLE OPERATION

	Turbines PTE (tpy)	Fire Water Pump PTE (tpy)	Cooling Towers PTE (tpy)	Total Facility PTE (tpy)	PSD SEL (tpy)	Exceed SEL (Y/N)
NOx	394.20	0.16	NA	394.36	40	Yes
CO	383.68	0.03	NA	383.71	100	Yes
PM/PM10	474.78	0.00	33.77	508.67	25/15	Yes
SO2	37.32	0.01	NA	37.33	40	no
VOC	268.46	0.01	NA	268.46	40	Yes
H2SO4 (c)	4.57	0.0	NA	4.57	7	no
Total Reduced Sulfur (TRS)	negl	negl	NA	negl	10	no
Hydrogen Sulfide (H2S)	negl	negl	NA	negl	10	no
Total Fluorides (TF)	negl	negl	NA	negl	3	no
Lead (Pb)	negl	negl	NA	negl	0.6	no

Notes

[illegible]

General Electric Case A

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.45%	38.10%	60.00%	67.37%
CTG Compressor Inlet Temperature, F	81	58	52	17
CTG Compr. Inlet Relative Humidity, %	96	94	94	67
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Inlet Fogger In Service	Yes	Yes	Yes	No
Inlet Loss, in. H2O	3.0	3.0	3.0	3.0
Exhaust Loss, in. H2O	17.0	17.0	17.0	17.0
CTG Load Level (percent of Base Load)	100%	100%	100%	100%
Gross CTG Output, kW	151,500	164,700	167,400	181,300
Gross CTG Heat Rate, Btu/kWh (LHV)	9,687	9,438	9,388	9,179
CTG Heat Input, MBtu/h (LHV)	1,467.53	1,554.41	1,571.56	1,664.15
CTG Heat Input, MBtu/h (HHV)	1,629.29	1,725.74	1,744.78	1,847.58
CTG Fuel Flow, lb/h	71,390	75,610	76,440	80,950
CTG Steam Injection Flow, lb/h	0	0	0	0
Injection Ratio	0.000	0.000	0.000	0.000
CTG Exhaust Flow, lb/h	3,245,010	3,432,020	3,477,020	3,709,020
CTG Exhaust Temperature, F	1,148	1,126	1,117	1,072
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.91014%	0.92798%	0.93111%	0.94124%
CO2	3.74971%	3.78151%	3.77820%	3.76585%
H2O	10.73465%	8.94489%	8.62276%	7.57713%
N2	72.48334%	73.90389%	74.15274%	74.95933%
O2	12.12215%	12.44171%	12.51516%	12.75644%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	9.0	9.0	9.0	9.0
NOx, lb/h as NO2	52.7	55.9	56.5	59.8
CO, ppmvd	9.0	9.0	9.0	9.0
CO, lb/h	26.0	27.8	28.2	30.3
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.4	1.5	1.5	1.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	13.0	13.6	13.8	14.6
VOC, ppmvw	1.4	1.4	1.4	1.4
VOC, lb/h as CH4	2.6	2.7	2.8	2.9
Particulates, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
PM10, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
PM10, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	28.13	28.33	28.37	28.48
Gas Constant, ft-lbf/lbm-R	54.916	54.531	54.463	54.247
Specific Volume, ft^3/lb	41.32	40.47	40.19	38.89
Exhaust Gas Flow, acfm	2,234,730	2,314,897	2,329,024	2,404,063
Specific Volume, scf/lb	13.49	13.39	13.37	13.32
Exhaust Gas Flow, scfm	729,586	765,912	774,796	823,402
Specific Volume, Nm3/kg	0.7967	0.7911	0.7901	0.7870
Exhaust Gas Flow, Nm3/s	325.74	342.09	346.14	367.79
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	456.1	488.8	499.3	557.7
Duct Burner Heat Input, MBtu/h (HHV)	506.4	542.7	554.3	619.1
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/04/00
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CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.007	0.007	0.007	0.008
DB NOx, lb/h	50.6	54.3	55.4	61.9
DB CO, lb/h	50.6	54.3	55.4	61.9
DB UHC (as CH4), lb/h	30.4	32.6	33.3	37.1
DB VOC (as CH4), lb/h	12.7	13.6	13.9	15.5
DB Particulate, lb/h (front only)	5.1	5.4	5.5	6.2
DB Particulate, lb/h (front and back)	10.1	10.9	11.1	12.4
DB PM10, lb/h (front only)	5.1	5.4	5.5	6.2
DB PM10, lb/h (front and back)	10.1	10.9	11.1	12.4
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.89969%	0.91711%	0.92010%	0.92954%
CO2	4.85862%	4.91244%	4.91971%	4.96529%
H2O	12.86778%	11.14208%	10.84424%	9.92405%
N2	71.65365%	73.04283%	73.28072%	74.03314%
O2	9.71824%	9.98552%	10.03520%	10.14794%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	13.5	13.5	13.5	13.7
NOx, lb/h as NO2 w/o SCR	103.4	110.1	111.9	121.7
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	19.2	20.4	20.7	22.2
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	28.4	30.2	30.6	32.8
CO, ppmvd w/o Catalyst	26.9	26.9	27.0	27.7
CO, ppmvw w/o Catalyst	23.4	23.9	24.1	25.0
CO, ppmvd @ 15% O2 w/o Catalyst	16.4	16.5	16.6	17.1
CO, lb/h w/o Catalyst	76.6	82.1	83.7	92.3
CO, ppmvd w/ Catalyst	6.6	6.5	6.5	6.5
CO, ppmvw w/ Catalyst	5.7	5.8	5.8	5.8
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	18.7	19.9	20.1	21.6
SO2, ppmvd (with no conversion to H2SO4)	0.28	0.28	0.28	0.28
SO2, ppmvw (with no conversion to H2SO4)	0.24	0.25	0.25	0.25
SO2, lb/h (with no conversion to H2SO4)	1.82	1.93	1.96	2.10
Total S in Exhaust Gas, lb/h	0.91	0.97	0.98	1.05
Exhaust Gas SO3 (converted from SO2), ppmvw	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), ppmvd	0.05	0.05	0.05	0.05
Exhaust Gas SO3 (converted from SO2), lb/h	0.38	0.41	0.42	0.45
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.47	0.51	0.51	0.55
Remaining SO2 in Exhaust Gas, ppmvw	0.20	0.20	0.20	0.21
Remaining SO2 in Exhaust Gas, ppmvd	0.23	0.23	0.23	0.23
Remaining SO2 in Exhaust Gas, lb/h	1.51	1.60	1.62	1.74
UHC, ppmvd	26.6	26.4	26.5	27.2
UHC, ppmvw	23.2	23.5	23.6	24.5
UHC, ppmvd @ 15% O2	16.2	16.2	16.3	16.7
UHC, lb/h as CH4	43.3	46.2	47.0	51.8
VOC, ppmvd	8.4	8.4	8.4	8.7
VOC, ppmvw	7.3	7.5	7.5	7.8
VOC, ppmvd @ 15% O2	5.1	5.2	5.2	5.4
VOC, lb/h as CH4	13.7	14.7	14.9	16.6
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	14.1	14.4	14.5	15.2
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	28.1	28.9	29.1	30.4
PM10, lb/h (front only), excluding 2(NH4(SO4))	14.1	14.4	14.5	15.2
PM10, lb/h (front and back), excluding 2(NH4(SO4))	28.1	28.9	29.1	30.4
Particulates, lb/h (front only), including 2(NH3(SO4))	14.7	15.1	15.2	15.9
Particulates, lb/h (front and back), including 2(NH3(SO4))	28.8	29.5	29.8	31.1
PM10, lb/h (front only), including 2(NH3(SO4))	14.7	15.1	15.2	15.9
PM10, lb/h (front and back), including 2(NH3(SO4))	28.8	29.5	29.8	31.1
NOTE: SO2 converted to H2SO4 (assumed).	14.9%	17.1%	17.1%	17.2%
Remaining SO2 in Exhaust Gas, lb/h	1.51	1.60	1.62	1.74
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.47	0.51	0.51	0.55
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.63	0.68	0.69	0.75
Stack Exit Temperature, F	177.7	175.3	175	174.3
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	3,267,197	3,455,797	3,501,306	3,736,146
Stack Flow, scfm	737,842	775,250	784,293	833,783
Stack Flow, acfm	934,963	978,567	989,702	1,051,102
Stack Exit Velocity, ft/s	61.2	64.1	64.8	68.8

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
w/ SCR				
NOx Removed, lb/h as NO2	33.5	35.5	35.8	37.6
NOx Removed, percent	63.6%	63.5%	63.4%	62.9%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	12.4	13.1	13.2	13.9
NH3 Slip, lb/h	28.4	30.2	30.6	32.8
Total NH3 Consumption, lb/h	40.8	43.3	43.8	46.7

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvw
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particualtes assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cycledeck, a General Electric program, and similar project performance.

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General Electric Case B

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.43%	38.10%	60.00%	67.37%
CTG Compressor Inlet Temperature, F	81	58	52	17
CTG Compr. Inlet Relative Humidity, %	96	94	94	67
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Inlet Fogger In Service	Yes	Yes	Yes	No
Inlet Loss, in. H2O	3.0	3.0	3.0	3.0
Exhaust Loss, in. H2O	17.0	17.0	17.0	17.0
CTG Load Level (percent of Base Load)	100%	100%	100%	100%
Gross CTG Output, kW	151,500	164,700	167,400	181,300
Gross CTG Heat Rate, Btu/kWh (LHV)	9,687	9,438	9,388	9,179
CTG Heat Input, MBtu/h (LHV)	1,467.53	1,554.41	1,571.56	1,664.15
CTG Heat Input, MBtu/h (HHV)	1,629.29	1,725.74	1,744.78	1,847.58
CTG Fuel Flow, lb/h	71,390	75,610	76,440	80,950
CTG Steam Injection Flow, lb/h	0	0	0	0
Injection Ratio	0.000	0.000	0.000	0.000
CTG Exhaust Flow, lb/h	3,245,010	3,432,020	3,477,020	3,709,020
CTG Exhaust Temperature, F	1,148	1,126	1,117	1,072
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.91014%	0.92798%	0.93111%	0.94124%
CO2	3.74971%	3.78151%	3.77820%	3.76585%
H2O	10.73465%	8.94489%	8.62276%	7.57713%
N2	72.48334%	73.90389%	74.15274%	74.95933%
O2	12.12215%	12.44171%	12.51516%	12.75644%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	9.0	9.0	9.0	9.0
NOx, lb/h as NO2	52.7	55.9	56.5	59.8
CO, ppmvd	9.0	9.0	9.0	9.0
CO, lb/h	26.0	27.8	28.2	30.3
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.4	1.5	1.5	1.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	13.0	13.6	13.8	14.6
VOC, ppmvw	1.4	1.4	1.4	1.4
VOC, lb/h as CH4	2.6	2.7	2.8	2.9
Particulates, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
PM10, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
PM10, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	28.13	28.33	28.37	28.48
Gas Constant, ft-lbf/lbm-R	54.916	54.531	54.463	54.247
Specific Volume, ft^3/lb	41.32	40.47	40.19	38.89
Exhaust Gas Flow, acfm	2,234,730	2,314,897	2,329,024	2,404,063
Specific Volume, scf/lb	13.49	13.39	13.37	13.32
Exhaust Gas Flow, scfm	729,586	765,912	774,796	823,402
Specific Volume, Nm3/kg	0.7967	0.7911	0.7901	0.7870
Exhaust Gas Flow, Nm3/s	325.74	342.09	346.14	367.79
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	0.0	0.0	0.0	0.0
Duct Burner Heat Input, MBtu/h (HHV)	0.0	0.0	0.0	0.0
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

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CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.000	0.000	0.000	0.000
DB NOx, lb/h	0.0	0.0	0.0	0.0
DB CO, lb/h	0.0	0.0	0.0	0.0
DB UHC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB VOC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front only)	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front and back)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front only)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front and back)	0.0	0.0	0.0	0.0
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.91014%	0.92798%	0.93111%	0.94124%
CO2	3.74971%	3.78151%	3.77820%	3.76585%
H2O	10.73465%	8.94489%	8.62276%	7.57713%
N2	72.48334%	73.90389%	74.15274%	74.95933%
O2	12.12215%	12.44171%	12.51516%	12.75644%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	9.0	9.0	9.0	9.0
NOx, lb/h as NO2 w/o SCR	52.7	55.9	56.5	59.8
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	14.7	15.5	15.7	16.6
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	21.7	23.0	23.2	24.6
CO, ppmvd w/o Catalyst	9.0	9.0	9.0	9.0
CO, ppmvw w/o Catalyst	8.0	8.2	8.2	8.3
CO, ppmvd @ 15% O2 w/o Catalyst	7.3	7.4	7.4	7.5
CO, lb/h w/o Catalyst	26.0	27.8	28.2	30.3
CO, ppmvd w/ Catalyst	4.9	4.9	4.9	4.8
CO, ppmvw w/ Catalyst	4.4	4.5	4.5	4.4
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	14.3	15.1	15.3	16.2
SO2, ppmvd (with no conversion to H2SO4)	0.21	0.21	0.21	0.20
SO2, ppmvw (with no conversion to H2SO4)	0.19	0.19	0.19	0.19
SO2, lb/h (with no conversion to H2SO4)	1.39	1.47	1.49	1.58
Total S in Exhaust Gas, lb/h	0.70	0.74	0.74	0.79
Exhaust Gas SO3 (converted from SO2), ppmvw	0.03	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), ppmvd	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), lb/h	0.32	0.34	0.35	0.37
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.39	0.42	0.43	0.46
Remaining SO2 in Exhaust Gas, ppmvw	0.15	0.15	0.15	0.15
Remaining SO2 in Exhaust Gas, ppmvd	0.17	0.17	0.17	0.17
Remaining SO2 in Exhaust Gas, lb/h	1.13	1.20	1.21	1.28
UHC, ppmvd	7.8	7.7	7.7	7.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, ppmvd @ 15% O2	6.3	6.3	6.3	6.3
UHC, lb/h as CH4	13.0	13.6	13.8	14.6
VOC, ppmvd	1.4	1.4	1.4	1.4
VOC, ppmvw	1.3	1.3	1.3	1.3
VOC, ppmvd @ 15% O2	1.1	1.1	1.1	1.1
VOC, lb/h as CH4	2.3	2.4	2.5	2.6
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
PM10, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
PM10, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
Particulates, lb/h (front only), including 2(NH3(SO4))	9.5	9.6	9.6	9.6
Particulates, lb/h (front and back), including 2(NH3(SO4))	18.5	18.6	18.6	18.6
PM10, lb/h (front only), including 2(NH3(SO4))	9.5	9.6	9.6	9.6
PM10, lb/h (front and back), including 2(NH3(SO4))	18.5	18.6	18.6	18.6
NOTE: SO2 converted to H2SO4 (assumed).	18.5%	18.7%	18.7%	18.9%
Remaining SO2 in Exhaust Gas, lb/h	1.13	1.20	1.21	1.28
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.39	0.42	0.43	0.46
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.53	0.57	0.57	0.61
Stack Exit Temperature, F	190.6	187.4	186.9	187.1
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	3,245,010	3,432,020	3,477,020	3,709,020
Stack Flow, scfm	729,586	765,912	774,796	823,402
Stack Flow, acfm	943,216	985,562	996,166	1,058,925
Stack Exit Velocity, ft/s	61.8	64.6	65.2	69.4

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
w/ SCR				
NOx Removed, lb/h as NO2	38.1	40.3	40.8	43.2
NOx Removed, percent	72.2%	72.2%	72.2%	72.2%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	14.1	14.9	15.1	16.0
NH3 Slip, lb/h	21.7	23.0	23.2	24.6
Total NH3 Consumption, lb/h	35.8	37.9	38.3	40.6

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvw
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particualtes assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cycledeck, a General Electric program, and similar project performance.

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General Electric Case C

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BstV Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	Estimated	Estimated	Estimated	Estimated
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG On	STIG On	STIG On	STIG On
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.45%	38.10%	60.00%	67.37%
CTG Compressor Inlet Temperature, F	81	58	52	17
CTG Compr. Inlet Relative Humidity, %	96	94	94	67
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Inlet Fogger In Service	Yes	Yes	Yes	No
Inlet Loss, in. H2O	3.0	3.0	3.0	3.0
Exhaust Loss, in. H2O	17.0	17.0	17.0	17.0
CTG Load Level (percent of Base Load)	100%	100%	100%	100%
Gross CTG Output, kW	168,500	180,100	182,000	196,100
Gross CTG Heat Rate, Btu/kWh (LHV)	9,179	9,030	9,040	8,860
CTG Heat Input, MBtu/h (LHV)	1,546.66	1,626.24	1,645.20	1,737.52
CTG Heat Input, MBtu/h (HHV)	1,717.14	1,805.49	1,826.54	1,929.04
CTG Fuel Flow, lb/h	75,230	79,100	80,030	84,520
CTG Steam Injection Flow, lb/h	113,340	119,160	120,555	127,320
Injection Ratio	1.507	1.506	1.506	1.506
CTG Exhaust Flow, lb/h	3,471,690	3,670,340	3,718,130	3,969,660
CTG Exhaust Temperature, F	1,126	1,113	1,108	1,067
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.86399%	0.88110%	0.88404%	0.89412%
CO2	3.62592%	3.63106%	3.63082%	3.60614%
H2O	15.32525%	13.58415%	13.28338%	12.23130%
N2	68.80788%	70.17034%	70.40485%	71.20716%
O2	11.37696%	11.73334%	11.79688%	12.06127%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	15.0	15.0	15.0	15.0
NOx, lb/h as NO2	92.6	97.4	98.5	104.1
CO, ppmvd	9.0	9.0	9.0	9.0
CO, lb/h	26.8	28.8	29.2	31.4
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.5	1.5	1.6	1.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	14.1	14.8	15.0	15.9
VOC, ppmvw	1.4	1.4	1.4	1.4
VOC, lb/h as CH4	2.8	3.0	3.0	3.2
Particulates, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
PM10, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
PM10, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	27.62	27.81	27.84	27.96
Gas Constant, ft-lbf/lbm-R	55.938	55.554	55.488	55.264
Specific Volume, ft^3/lb	41.50	40.90	40.71	39.49
Exhaust Gas Flow, acfm	2,401,252	2,501,948	2,522,751	2,612,698
Specific Volume, scf/lb	13.74	13.64	13.63	13.57
Exhaust Gas Flow, scfm	795,017	834,391	844,635	897,805
Specific Volume, Nm3/kg	0.8115	0.8060	0.8050	0.8018
Exhaust Gas Flow, Nm3/s	354.97	372.74	377.12	401.04
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	506.8	483.8	480.0	473.4
Duct Burner Heat Input, MBtu/h (HHV)	562.6	537.2	532.9	525.5
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

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Palo Verde
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CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	Estimated	Estimated	Estimated	Estimated
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG On	STIG On	STIG On	STIG On
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.007	0.007	0.007	0.007
DB NOx, lb/h	56.3	53.7	53.3	52.6
DB CO, lb/h	56.3	53.7	53.3	52.6
DB UHC (as CH4), lb/h	33.8	32.2	32.0	31.5
DB VOC (as CH4), lb/h	14.1	13.4	13.3	13.1
DB Particulate, lb/h (front only)	5.6	5.4	5.3	5.3
DB Particulate, lb/h (front and back)	11.3	10.7	10.7	10.5
DB PM10, lb/h (front only)	5.6	5.4	5.3	5.3
DB PM10, lb/h (front and back)	11.3	10.7	10.7	10.5
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.85387%	0.87171%	0.87480%	0.88545%
CO2	4.75763%	4.66122%	4.64115%	4.54402%
H2O	17.44574%	15.53301%	15.19787%	14.01825%
N2	68.00726%	69.42702%	69.67338%	70.52054%
O2	8.93546%	9.50703%	9.61276%	10.03173%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	18.2	17.9	17.9	17.7
NOx, lb/h as NO2 w/o SCR	148.9	151.1	151.8	156.6
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	20.5	21.1	21.2	22.1
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	30.4	31.2	31.4	32.7
CO, ppmvd w/o Catalyst	28.3	26.1	25.7	24.3
CO, ppmvw w/o Catalyst	23.3	22.1	21.8	20.9
CO, ppmvd @ 15% O2 w/o Catalyst	16.6	16.1	16.0	15.6
CO, lb/h w/o Catalyst	83.1	82.5	82.5	84.0
CO, ppmvd w/ Catalyst	6.8	6.5	6.4	6.2
CO, ppmvw w/ Catalyst	5.6	5.5	5.5	5.4
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	20.0	20.5	20.7	21.5
SO2, ppmvd (with no conversion to H2SO4)	0.29	0.28	0.27	0.27
SO2, ppmvw (with no conversion to H2SO4)	0.24	0.23	0.23	0.23
SO2, lb/h (with no conversion to H2SO4)	1.94	2.00	2.01	2.09
Total S in Exhaust Gas, lb/h	0.97	1.00	1.01	1.05
Exhaust Gas SO3 (converted from SO2), ppmvw	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), ppmvd	0.05	0.05	0.05	0.05
Exhaust Gas SO3 (converted from SO2), lb/h	0.40	0.42	0.42	0.45
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.49	0.51	0.52	0.55
Remaining SO2 in Exhaust Gas, ppmvw	0.20	0.19	0.19	0.19
Remaining SO2 in Exhaust Gas, ppmvd	0.24	0.23	0.23	0.22
Remaining SO2 in Exhaust Gas, lb/h	1.63	1.66	1.67	1.73
UHC, ppmvd	28.4	26.0	25.6	24.0
UHC, ppmvw	23.5	22.0	21.7	20.6
UHC, ppmvd @ 15% O2	14.7	16.0	15.9	15.4
UHC, lb/h as CH4	47.9	47.0	47.0	47.5
VOC, ppmvd	9.0	8.2	8.0	7.4
VOC, ppmvw	7.4	6.9	6.8	6.4
VOC, ppmvd @ 15% O2	5.3	5.0	5.0	4.8
VOC, lb/h as CH4	15.2	14.8	14.7	14.7
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	14.6	14.4	14.3	14.3
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	29.3	28.7	28.7	28.5
PM10, lb/h (front only), excluding 2(NH4(SO4))	14.6	14.4	14.3	14.3
PM10, lb/h (front and back), excluding 2(NH4(SO4))	29.3	28.7	28.7	28.5
Particulates, lb/h (front only), including 2(NH3(SO4))	15.3	15.1	15.0	15.0
Particulates, lb/h (front and back), including 2(NH3(SO4))	29.9	29.4	29.4	29.2
PM10, lb/h (front only), including 2(NH3(SO4))	15.3	15.1	15.0	15.0
PM10, lb/h (front and back), including 2(NH3(SO4))	29.9	29.4	29.4	29.2
NOTE: SO2 converted to H2SO4 (assumed).	16.3%	16.7%	16.8%	17.1%
Remaining SO2 in Exhaust Gas, lb/h	1.63	1.66	1.67	1.73
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.49	0.51	0.52	0.55
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.65	0.69	0.70	0.74
Stack Exit Temperature, F	168.9	172.1	172.7	176
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	3,496,340	3,693,875	3,741,480	3,992,685
Stack Flow, scfm	804,158	843,435	853,057	906,339
Stack Flow, acfm	1,005,198	1,059,526	1,073,181	1,145,901
Stack Exit Velocity, ft/s	65.8	69.4	70.3	75.1

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	Estimated	Estimated	Estimated	Estimated
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG On	STIG On	STIG On	STIG On
w/ SCR				
NOx Removed, lb/h as NO2	72.1	76.3	77.3	82.0
NOx Removed, percent	77.9%	78.4%	78.5%	78.8%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	26.7	28.2	28.6	30.3
NH3 Slip, lb/h	30.4	31.2	31.4	32.7
Total NH3 Consumption, lb/h	57.0	59.4	60.0	63.0

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvw
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particualtes assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cycledeck, a General Electric program, and similar project performance.

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General Electric Case D

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	75.00%	75.00%	75.00%	75.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.45%	38.10%	60.00%	67.37%
CTG Compressor Inlet Temperature, F	122	73	59	17
CTG Compr. Inlet Relative Humidity, %	16	38	60	67
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Inlet Fogger In Service	No	No	No	No
Inlet Loss, in. H2O	3.0	3.0	3.0	3.0
Exhaust Loss, in. H2O	17.0	17.0	17.0	17.0
CTG Load Level (percent of Base Load)	75%	75%	75%	75%
Gross CTG Output, kW	93,500	117,400	123,300	136,000
Gross CTG Heat Rate, Btu/kWh (LHV)	11,399	10,473	10,284	9,926
CTG Heat Input, MBtu/h (LHV)	1,065.81	1,229.55	1,268.02	1,349.88
CTG Heat Input, MBtu/h (HHV)	1,183.29	1,365.08	1,407.79	1,498.67
CTG Fuel Flow, lb/h	51,840	59,810	61,680	65,660
CTG Steam Injection Flow, lb/h	0	0	0	0
Injection Ratio	0.000	0.000	0.000	0.000
CTG Exhaust Flow, lb/h	2,506,010	2,751,020	2,809,020	2,928,020
CTG Exhaust Temperature, F	1,200	1,171	1,160	1,131
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.92583%	0.93326%	0.93334%	0.94025%
CO2	3.54815%	3.73963%	3.77697%	3.86759%
H2O	8.93995%	8.36627%	8.39357%	7.77620%
N2	73.73164%	74.32377%	74.33065%	74.88077%
O2	12.85441%	12.63705%	12.56544%	12.53518%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	9.0	9.0	9.0	9.0
NOx, lb/h as NO2	38.3	44.2	45.6	48.5
CO, ppmvd	9.0	9.0	9.0	9.0
CO, lb/h	20.3	22.4	22.8	23.9
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.0	1.2	1.2	1.3
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	9.9	10.9	11.1	11.5
VOC, ppmvw	1.4	1.4	1.4	1.4
VOC, lb/h as CH4	2.0	2.2	2.2	2.3
Particulates, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
PM10, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
PM10, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	28.31	28.39	28.39	28.47
Gas Constant, ft-lbf/lbm-R	54.570	54.416	54.415	54.270
Specific Volume, ft^3/lb	42.39	41.53	41.25	40.40
Exhaust Gas Flow, acfm	1,770,496	1,904,164	1,931,201	1,971,533
Specific Volume, scf/lb	13.40	13.36	13.36	13.33
Exhaust Gas Flow, scfm	559,676	612,560	625,475	650,508
Specific Volume, Nm3/kg	0.7917	0.7895	0.7894	0.7873
Exhaust Gas Flow, Nm3/s	249.98	273.66	279.39	290.45
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	0.0	0.0	0.0	0.0
Duct Burner Heat Input, MBtu/h (HHV)	0.0	0.0	0.0	0.0
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	75.00%	75.00%	75.00%	75.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.000	0.000	0.000	0.000
DB NOx, lb/h	0.0	0.0	0.0	0.0
DB CO, lb/h	0.0	0.0	0.0	0.0
DB UHC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB VOC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front only)	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front and back)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front only)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front and back)	0.0	0.0	0.0	0.0
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.92583%	0.93326%	0.93334%	0.94025%
CO2	3.54815%	3.73963%	3.77697%	3.86759%
H2O	8.93995%	8.36427%	8.39357%	7.77620%
N2	73.73164%	74.32377%	74.33065%	74.88077%
O2	12.85441%	12.63705%	12.56544%	12.53518%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	9.0	9.0	9.0	9.0
NOx, lb/h as NO2 w/o SCR	38.3	44.2	45.6	48.5
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	10.6	12.3	12.7	13.5
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	15.8	18.2	18.7	20.0
CO, ppmvd w/o Catalyst	9.0	9.0	9.0	9.0
CO, ppmvw w/o Catalyst	8.2	8.2	8.2	8.3
CO, ppmvd @ 15% O2 w/o Catalyst	7.8	7.5	7.4	7.3
CO, lb/h w/o Catalyst	20.3	22.4	22.8	23.9
CO, ppmvd w/ Catalyst	4.6	4.8	4.9	4.9
CO, ppmvw w/ Catalyst	4.2	4.4	4.4	4.6
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	10.4	12.0	12.3	13.1
SO2, ppmvd (with no conversion to H2SO4)	0.20	0.20	0.21	0.21
SO2, ppmvw (with no conversion to H2SO4)	0.18	0.19	0.19	0.19
SO2, lb/h (with no conversion to H2SO4)	1.01	1.16	1.20	1.28
Total S in Exhaust Gas, lb/h	0.50	0.58	0.60	0.64
Exhaust Gas SO3 (converted from SO2), ppmvw	0.03	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), ppmvd	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), lb/h	0.24	0.27	0.28	0.30
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.29	0.34	0.34	0.37
Remaining SO2 in Exhaust Gas, ppmvw	0.14	0.15	0.15	0.16
Remaining SO2 in Exhaust Gas, ppmvd	0.16	0.17	0.17	0.17
Remaining SO2 in Exhaust Gas, lb/h	0.82	0.94	0.98	1.04
UHC, ppmvd	7.7	7.6	7.6	7.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, ppmvd @ 15% O2	6.7	6.4	6.3	6.1
UHC, lb/h as CH4	9.9	10.9	11.1	11.5
VOC, ppmvd	1.4	1.4	1.4	1.4
VOC, ppmvw	1.3	1.3	1.3	1.3
VOC, ppmvd @ 15% O2	1.2	1.1	1.1	1.1
VOC, lb/h as CH4	1.8	2.0	2.0	2.1
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
PM10, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
PM10, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
Particulates, lb/h (front only), including 2(NH3(SO4))	9.4	9.5	9.5	9.5
Particulates, lb/h (front and back), including 2(NH3(SO4))	18.4	18.5	18.5	18.5
PM10, lb/h (front only), including 2(NH3(SO4))	9.4	9.5	9.5	9.5
PM10, lb/h (front and back), including 2(NH3(SO4))	18.4	18.5	18.5	18.5
NOTE: SO2 converted to H2SO4 (assumed).	18.9%	18.0%	18.8%	18.8%
Remaining SO2 in Exhaust Gas, lb/h	0.82	0.94	0.98	1.04
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.29	0.34	0.34	0.37
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.39	0.45	0.46	0.49
Stack Exit Temperature, F	181.1	179.5	179.5	178.1
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	2,506,010	2,751,020	2,809,020	2,928,020
Stack Flow, scfm	559,676	612,560	625,475	650,508
Stack Flow, acfm	712,960	778,539	794,953	824,726
Stack Exit Velocity, ft/s	46.7	51.0	52.1	54.0

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BaCV Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	75.00%	75.00%	75.00%	75.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
w/ SCR				
NOx Removed, lb/h as NO2	27.7	31.9	32.9	35.0
NOx Removed, percent	72.2%	72.2%	72.2%	72.2%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	10.2	11.8	12.2	12.9
NH3 Slip, lb/h	15.8	18.2	18.7	20.0
Total NH3 Consumption, lb/h	26.0	30.0	30.9	32.9

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other encrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvw
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particualtes assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cycledeck, a General Electric program, and similar project performance.

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General Electric Case E

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	52.00%	50.00%	50.00%	50.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.45%	38.10%	60.00%	67.37%
CTG Compressor Inlet Temperature, F	122	73	59	17
CTG Compr. Inlet Relative Humidity, %	16	38	60	67
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Inlet Fogger In Service	No	No	No	No
Inlet Loss, in. H2O	3.0	3.0	3.0	3.0
Exhaust Loss, in. H2O	17.0	17.0	17.0	17.0
CTG Load Level (percent of Base Load)	52%	50%	50%	50%
Gross CTG Output, kW	64,900	78,200	82,200	90,600
Gross CTG Heat Rate, Btu/kWh (LHV)	13,520	12,584	12,355	11,957
CTG Heat Input, MBtu/h (LHV)	876.07	984.05	1,015.56	1,083.26
CTG Heat Input, MBtu/h (HHV)	972.63	1,092.52	1,127.50	1,202.66
CTG Fuel Flow, lb/h	42,610	47,870	49,400	52,690
CTG Steam Injection Flow, lb/h	0	0	0	0
Injection Ratio	0.000	0.000	0.000	0.000
CTG Exhaust Flow, lb/h	2,182,000	2,299,010	2,329,010	2,426,010
CTG Exhaust Temperature, F	1,200	1,200	1,200	1,180
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.92770%	0.93476%	0.93456%	0.94141%
CO2	3.35229%	3.58396%	3.65046%	3.74778%
H2O	8.56033%	8.06303%	8.14706%	7.54178%
N2	73.88006%	74.44292%	74.42753%	74.97328%
O2	13.27960%	12.97531%	12.84036%	12.79573%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	9.0	9.0	9.0	9.0
NOx, lb/h as NO2	31.5	35.4	36.5	38.9
CO, ppmvd	9.0	9.0	9.0	9.0
CO, lb/h	17.8	18.8	19.0	19.9
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	0.8	0.9	1.0	1.0
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	8.6	9.1	9.2	9.6
VOC, ppmvw	1.4	1.4	1.4	1.4
VOC, lb/h as CH4	1.7	1.8	1.8	1.9
Particulates, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
PM10, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
PM10, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	28.34	28.41	28.41	28.48
Gas Constant, ft-lbf/lbm-R	54.525	54.380	54.386	54.242
Specific Volume, ft^3/lb	42.35	42.24	42.25	41.63
Exhaust Gas Flow, acfm	1,540,128	1,618,503	1,640,011	1,683,247
Specific Volume, scf/lb	13.39	13.35	13.36	13.32
Exhaust Gas Flow, scfm	486,950	511,530	518,593	538,574
Specific Volume, Nm3/kg	0.7910	0.7889	0.7890	0.7869
Exhaust Gas Flow, Nm3/s	217.47	228.52	231.53	240.53
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	0.0	0.0	0.0	0.0
Duct Burner Heat Input, MBtu/h (HHV)	0.0	0.0	0.0	0.0
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BstV Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	52.00%	50.00%	50.00%	50.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.000	0.000	0.000	0.000
DB NOx, lb/h	0.0	0.0	0.0	0.0
DB CO, lb/h	0.0	0.0	0.0	0.0
DB UHC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB VOC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front only)	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front and back)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front only)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front and back)	0.0	0.0	0.0	0.0
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.92770%	0.93476%	0.93456%	0.94141%
CO2	3.35229%	3.58396%	3.65046%	3.74778%
H2O	8.56033%	8.06303%	8.14706%	7.54178%
N2	73.88006%	74.44292%	74.42753%	74.97328%
O2	13.27960%	12.97531%	12.84036%	12.79573%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	9.0	9.0	9.0	9.0
NOx, lb/h as NO2 w/o SCR	31.5	35.4	36.5	38.9
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	8.7	9.8	10.1	10.8
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	12.9	14.5	15.0	16.0
CO, ppmvd w/o Catalyst	9.0	9.0	9.0	9.0
CO, ppmvw w/o Catalyst	8.2	8.3	8.3	8.3
CO, ppmvd @ 15% O2 w/o Catalyst	8.3	7.8	7.7	7.5
CO, lb/h w/o Catalyst	17.8	18.8	19.0	19.9
CO, ppmvd w/ Catalyst	4.3	4.6	4.7	4.8
CO, ppmvw w/ Catalyst	3.9	4.2	4.3	4.4
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	8.5	9.6	9.9	10.5
SO2, ppmvd (with no conversion to H2SO4)	0.18	0.20	0.20	0.20
SO2, ppmvw (with no conversion to H2SO4)	0.17	0.18	0.18	0.19
SO2, lb/h (with no conversion to H2SO4)	0.83	0.93	0.96	1.03
Total S in Exhaust Gas, lb/h	0.42	0.47	0.48	0.51
Exhaust Gas SO3 (converted from SO2), ppmvw	0.03	0.03	0.03	0.04
Exhaust Gas SO3 (converted from SO2), ppmvd	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), lb/h	0.20	0.22	0.23	0.24
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.24	0.27	0.28	0.30
Remaining SO2 in Exhaust Gas, ppmvw	0.14	0.15	0.15	0.15
Remaining SO2 in Exhaust Gas, ppmvd	0.15	0.16	0.16	0.16
Remaining SO2 in Exhaust Gas, lb/h	0.67	0.75	0.78	0.83
UHC, ppmvd	7.7	7.6	7.6	7.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, ppmvd @ 15% O2	7.1	6.6	6.5	6.3
UHC, lb/h as CH4	8.6	9.1	9.2	9.6
VOC, ppmvd	1.4	1.4	1.4	1.4
VOC, ppmvw	1.3	1.3	1.3	1.3
VOC, ppmvd @ 15% O2	1.3	1.2	1.2	1.1
VOC, lb/h as CH4	1.6	1.6	1.7	1.7
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
PM10, lb/h (front only), excluding 2(NH4(SO4))	9.0	9.0	9.0	9.0
PM10, lb/h (front and back), excluding 2(NH4(SO4))	18.0	18.0	18.0	18.0
Particulates, lb/h (front only), including 2(NH3(SO4))	9.3	9.4	9.4	9.4
Particulates, lb/h (front and back), including 2(NH3(SO4))	18.3	18.4	18.4	18.4
PM10, lb/h (front only), including 2(NH3(SO4))	9.3	9.4	9.4	9.4
PM10, lb/h (front and back), including 2(NH3(SO4))	18.3	18.4	18.4	18.4
NOTE: SO2 converted to H2SO4 (assumed).	19.2%	19.0%	18.9%	18.9%
Remaining SO2 in Exhaust Gas, lb/h	0.67	0.75	0.78	0.83
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.24	0.27	0.28	0.30
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.33	0.37	0.38	0.40
Stack Exit Temperature, F	175.6	170.5	169.5	167.5
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	2,182,000	2,299,010	2,329,010	2,426,010
Stack Flow, scfm	486,950	511,530	518,593	538,574
Stack Flow, acfm	614,960	641,041	648,629	671,600
Stack Exit Velocity, ft/s	40.3	42.0	42.5	44.0

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/04/00
01:46 PM

CTG Load Level (percent of Base Load)	52.00%	50.00%	50.00%	50.00%
CTG Model	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)	GEPG7241(FA)
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	GE Cycledeck	GE Cycledeck	GE Cycledeck	GE Cycledeck
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
w/ SCR				
NOx Removed, lb/h as NO2	22.7	25.5	26.4	28.1
NOx Removed, percent	72.2%	72.2%	72.2%	72.2%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	8.4	9.4	9.7	10.4
NH3 Slip, lb/h	12.9	14.5	15.0	16.0
Total NH3 Consumption, lb/h	21.4	24.0	24.8	26.4

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvw
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particulates assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cycledeck, a General Electric program, and similar project performance.

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Westinghouse Case A

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.00%	39.00%	60.00%	51.00%
CTG Compressor Inlet Temperature, F	86	60	53	17
CTG Compr. Inlet Relative Humidity, %	76	87	93	51
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Evap Cooler In Service	Yes	Yes	Yes	No
Inlet Loss, in. H2O	3.0	3.9	4.0	4.2
Exhaust Loss, in. H2O	16.3	18.5	19.1	20.6
CTG Load Level (percent of Base Load)	100%	100%	100%	100%
Gross CTG Output, kW	154,685	168,923	172,820	182,154
Gross CTG Heat Rate, Btu/kWh (LHV)	9,616	9,443	9,411	9,348
CTG Heat Input, MBtu/h (LHV)	1,487.45	1,595.14	1,626.41	1,702.78
CTG Heat Input, MBtu/h (HHV)	1,651.40	1,770.96	1,805.68	1,890.47
CTG Fuel Flow, lb/h	72,350	77,590	79,110	82,830
CTG Steam Injection Flow, lb/h	0	0	0	0
Injection Ratio	0.000	0.000	0.000	0.000
CTG Exhaust Flow, lb/h	3,268,785	3,500,969	3,562,581	3,726,651
CTG Exhaust Temperature, F	1,140	1,121	1,117	1,096
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.91216%	0.92806%	0.93075%	0.94102%
CO2	3.77547%	3.80418%	3.81565%	3.83461%
H2O	10.55317%	8.95897%	8.69563%	7.66546%
N2	72.64438%	73.91001%	74.12414%	74.94230%
O2	12.11479%	12.39076%	12.43381%	12.61660%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	25.0	25.0	25.0	25.0
NOx, lb/h as NO2	148.5	159.2	162.3	170.0
CO, ppmvd	20.0	20.0	20.0	20.0
CO, lb/h	58.2	63.0	64.2	67.7
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.4	1.5	1.5	1.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	13.0	13.9	14.1	14.7
VOC, ppmvw	1.1	1.1	1.1	1.1
VOC, lb/h as CH4	2.0	2.2	2.2	2.3
Particulates, lb/h (front only), excluding 2(NH4(SO4))	7.0	7.6	7.7	8.2
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	14.0	15.2	15.4	16.4
PM10, lb/h (front only), excluding 2(NH4(SO4))	7.0	7.6	7.7	8.2
PM10, lb/h (front and back), excluding 2(NH4(SO4))	14.0	15.2	15.4	16.4
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	28.16	28.33	28.36	28.48
Gas Constant, ft-lbf/lbm-R	54.873	54.530	54.472	54.253
Specific Volume, ft^3/lb	41.15	40.20	39.99	39.16
Exhaust Gas Flow, acfm	2,241,842	2,345,649	2,374,460	2,432,261
Specific Volume, scf/lb	13.47	13.39	13.38	13.32
Exhaust Gas Flow, scfm	733,842	781,300	794,456	827,317
Specific Volume, Nm3/kg	0.7961	0.7911	0.7903	0.7871
Exhaust Gas Flow, Nm3/s	327.88	348.97	354.75	369.58
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	492.9	533.8	544.7	558.9
Duct Burner Heat Input, MBtu/h (HHV)	547.2	592.6	604.7	620.5
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.007	0.008	0.008	0.008
DB NOx, lb/h	54.7	59.3	60.5	62.0
DB CO, lb/h	54.7	59.3	60.5	62.0
DB UHC (as CH4), lb/h	32.8	35.6	36.3	37.2
DB VOC (as CH4), lb/h	13.7	14.8	15.1	15.5
DB Particulate, lb/h (front only)	5.5	5.9	6.0	6.2
DB Particulate, lb/h (front and back)	10.9	11.9	12.1	12.4
DB PM10, lb/h (front only)	5.5	5.9	6.0	6.2
DB PM10, lb/h (front and back)	10.9	11.9	12.1	12.4
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.90093%	0.91643%	0.91904%	0.92936%
CO2	4.96464%	5.01360%	5.02953%	5.03003%
H2O	12.84356%	11.30901%	11.03795%	10.00506%
N2	71.75456%	72.98891%	73.19683%	74.01878%
O2	9.53629%	9.77203%	9.79663%	10.01675%
SO2	0.00002%	0.00003%	0.00003%	0.00003%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	25.7	25.7	25.7	25.7
NOx, lb/h as NO2 w/o SCR	203.2	218.5	222.8	232.0
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	19.8	21.3	21.7	22.6
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	29.3	31.5	32.1	33.4
CO, ppmvd w/o Catalyst	39.3	39.3	39.4	38.8
CO, ppmvw w/o Catalyst	34.3	34.9	35.0	35.0
CO, ppmvd @ 15% O2 w/o Catalyst	23.5	23.6	23.6	23.6
CO, lb/h w/o Catalyst	112.9	122.3	124.7	129.7
CO, ppmvd w/ Catalyst	6.7	6.7	6.7	6.6
CO, ppmvw w/ Catalyst	5.8	5.9	5.9	5.9
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	19.3	20.7	21.1	22.0
SO2, ppmvd (with no conversion to H2SO4)	0.29	0.28	0.28	0.28
SO2, ppmvw (with no conversion to H2SO4)	0.25	0.25	0.25	0.25
SO2, lb/h (with no conversion to H2SO4)	1.87	2.02	2.06	2.14
Total S in Exhaust Gas, lb/h	0.94	1.01	1.03	1.07
Exhaust Gas SO3 (converted from SO2), ppmvw	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), ppmvd	0.05	0.05	0.05	0.05
Exhaust Gas SO3 (converted from SO2), lb/h	0.39	0.43	0.44	0.46
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.48	0.52	0.53	0.56
Remaining SO2 in Exhaust Gas, ppmvw	0.21	0.21	0.21	0.21
Remaining SO2 in Exhaust Gas, ppmvd	0.24	0.24	0.24	0.23
Remaining SO2 in Exhaust Gas, lb/h	1.56	1.67	1.71	1.77
UHC, ppmvd	27.9	27.8	27.8	27.1
UHC, ppmvw	24.3	24.6	24.7	24.4
UHC, ppmvd @ 15% O2	16.6	16.7	16.7	16.5
UHC, lb/h as CH4	45.9	49.4	50.4	51.9
VOC, ppmvd	8.6	8.6	8.6	8.4
VOC, ppmvw	7.5	7.6	7.6	7.6
VOC, ppmvd @ 15% O2	5.1	5.2	5.2	5.1
VOC, lb/h as CH4	14.1	15.3	15.6	16.1
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	12.5	13.5	13.7	14.4
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	24.9	27.1	27.5	28.8
PM10, lb/h (front only), excluding 2(NH4(SO4))	12.5	13.5	13.7	14.4
PM10, lb/h (front and back), excluding 2(NH4(SO4))	24.9	27.1	27.5	28.8
Particulates, lb/h (front only), including 2(NH3(SO4))	13.1	14.2	14.5	15.2
Particulates, lb/h (front and back), including 2(NH3(SO4))	25.6	27.8	28.2	29.6
PM10, lb/h (front only), including 2(NH3(SO4))	13.1	14.2	14.5	15.2
PM10, lb/h (front and back), including 2(NH3(SO4))	25.6	27.8	28.2	29.6
NOTE: SO2 converted to H2SO4 (assumed).	16.8%	16.9%	16.9%	17.1%
Remaining SO2 in Exhaust Gas, lb/h	1.56	1.67	1.71	1.77
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.48	0.52	0.53	0.56
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.65	0.70	0.72	0.75
Stack Exit Temperature, F	177.8	174.9	174.3	173.1
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	3,292,760	3,526,934	3,589,077	3,753,836
Stack Flow, scfm	743,066	791,209	804,551	837,731
Stack Flow, acfm	942,278	998,122	1,013,914	1,054,202
Stack Exit Velocity, ft/s	61.7	65.4	66.4	69.0

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
w/ SCR				
NOx Removed, lb/h as NO2	128.7	138.0	140.7	147.4
NOx Removed, percent	86.7%	86.7%	86.7%	86.7%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	47.6	51.0	52.0	54.5
NH3 Slip, lb/h	29.3	31.5	32.1	33.4
Total NH3 Consumption, lb/h	76.9	82.5	84.1	87.9

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvd @ 15% O2
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particulates assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cycledeck, a General Electric program, and similar project performance.

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Westinghouse Case B

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	B&V Estimate	B&V Estimate	B&V Estimate	B&V Estimate
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.00%	39.00%	60.00%	51.00%
CTG Compressor Inlet Temperature, F	86	60	53	17
CTG Compr. Inlet Relative Humidity, %	76	87	93	51
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Evap Cooler In Service	Yes	Yes	Yes	No
Inlet Loss, in. H2O	3.0	3.9	4.0	4.2
Exhaust Loss, in. H2O	16.3	18.5	19.1	20.6
CTG Load Level (percent of Base Load)	100%	100%	100%	100%
Gross CTG Output, kW	154,685	168,923	172,820	182,154
Gross CTG Heat Rate, Btu/kWh (LHV)	9,616	9,443	9,411	9,348
CTG Heat Input, MBtu/h (LHV)	1,487.45	1,595.14	1,626.41	1,702.78
CTG Heat Input, MBtu/h (HHV)	1,651.40	1,770.96	1,805.68	1,890.47
CTG Fuel Flow, lb/h	72,330	77,590	79,110	82,830
CTG Steam Injection Flow, lb/h	0	0	0	0
Injection Ratio	0.000	0.000	0.000	0.000
CTG Exhaust Flow, lb/h	3,268,785	3,500,969	3,562,581	3,726,651
CTG Exhaust Temperature, F	1,140	1,121	1,117	1,096
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.91216%	0.92806%	0.93075%	0.94102%
CO2	3.77547%	3.80418%	3.81565%	3.83461%
H2O	10.55317%	8.95897%	8.69563%	7.66546%
N2	72.64438%	73.91001%	74.12414%	74.94230%
O2	12.11479%	12.39876%	12.43381%	12.61660%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	25.0	25.0	25.0	25.0
NOx, lb/h as NO2	148.5	159.2	162.3	170.0
CO, ppmvd	20.0	20.0	20.0	20.0
CO, lb/h	58.2	63.0	64.2	67.7
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.4	1.5	1.5	1.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	13.0	13.9	14.1	14.7
VOC, ppmvw	1.1	1.1	1.1	1.1
VOC, lb/h as CH4	2.0	2.2	2.2	2.3
Particulates, lb/h (front only), excluding 2(NH4(SO4))	7.0	7.6	7.7	8.2
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	14.0	15.2	15.4	16.4
PM10, lb/h (front only), excluding 2(NH4(SO4))	7.0	7.6	7.7	8.2
PM10, lb/h (front and back), excluding 2(NH4(SO4))	14.0	15.2	15.4	16.4
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	28.16	28.33	28.36	28.48
Gas Constant, ft-lbf/lbm-R	54.873	54.530	54.472	54.253
Specific Volume, ft^3/lb	41.15	40.20	39.99	39.16
Exhaust Gas Flow, acfm	2,241,842	2,345,649	2,374,460	2,432,261
Specific Volume, scf/lb	13.47	13.39	13.38	13.32
Exhaust Gas Flow, scfm	733,842	781,300	794,456	827,317
Specific Volume, Nm3/kg	0.7961	0.7911	0.7903	0.7871
Exhaust Gas Flow, Nm3/s	327.88	348.97	354.75	369.58
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	0.0	0.0	0.0	0.0
Duct Burner Heat Input, MBtu/h (HHV)	0.0	0.0	0.0	0.0
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	B&V Estimate	B&V Estimate	B&V Estimate	B&V Estimate
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.000	0.000	0.000	0.000
DB NOx, lb/h	0.0	0.0	0.0	0.0
DB CO, lb/h	0.0	0.0	0.0	0.0
DB UHC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB VOC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front only)	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front and back)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front only)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front and back)	0.0	0.0	0.0	0.0
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.91216%	0.92806%	0.93075%	0.94102%
CO2	3.77547%	3.80418%	3.81565%	3.83461%
H2O	10.55317%	8.95897%	8.69563%	7.66546%
N2	72.64438%	73.91001%	74.12414%	74.94230%
O2	12.11479%	12.39876%	12.43381%	12.61660%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	25.0	25.0	25.0	25.0
NOx, lb/h as NO2 w/o SCR	148.5	159.2	162.3	170.0
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	14.8	15.9	16.2	17.0
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	22.0	23.6	24.0	25.2
CO, ppmvd w/o Catalyst	20.0	20.0	20.0	20.0
CO, ppmvw w/o Catalyst	17.9	18.2	18.3	18.5
CO, ppmvd @ 15% O2 w/o Catalyst	16.1	16.3	16.3	16.4
CO, lb/h w/o Catalyst	58.2	63.0	64.2	67.7
CO, ppmvd w/ Catalyst	5.0	4.9	4.9	4.9
CO, ppmvw w/ Catalyst	4.4	4.5	4.5	4.5
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	14.5	15.5	15.8	16.6
SO2, ppmvd (with no conversion to H2SO4)	0.21	0.21	0.21	0.21
SO2, ppmvw (with no conversion to H2SO4)	0.19	0.19	0.19	0.19
SO2, lb/h (with no conversion to H2SO4)	1.41	1.51	1.54	1.61
Total S in Exhaust Gas, lb/h	0.70	0.76	0.77	0.81
Exhaust Gas SO3 (converted from SO2), ppmvw	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), ppmvd	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), lb/h	0.33	0.35	0.36	0.38
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.40	0.43	0.44	0.46
Remaining SO2 in Exhaust Gas, ppmvw	0.15	0.16	0.16	0.16
Remaining SO2 in Exhaust Gas, ppmvd	0.17	0.17	0.17	0.17
Remaining SO2 in Exhaust Gas, lb/h	1.15	1.23	1.25	1.31
UHC, ppmvd	7.8	7.7	7.7	7.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, ppmvd @ 15% O2	6.3	6.2	6.2	6.2
UHC, lb/h as CH4	13.0	13.9	14.1	14.7
VOC, ppmvd	1.1	1.1	1.1	1.1
VOC, ppmvw	1.0	1.0	1.0	1.0
VOC, ppmvd @ 15% O2	0.9	0.9	0.9	0.9
VOC, lb/h as CH4	1.8	1.9	2.0	2.1
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	7.0	7.6	7.7	8.2
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	14.0	15.2	15.4	16.4
PM10, lb/h (front only), excluding 2(NH4(SO4))	7.0	7.6	7.7	8.2
PM10, lb/h (front and back), excluding 2(NH4(SO4))	14.0	15.2	15.4	16.4
Particulates, lb/h (front only), including 2(NH3(SO4))	7.5	8.2	8.3	8.8
Particulates, lb/h (front and back), including 2(NH3(SO4))	14.5	15.8	16.0	17.0
PM10, lb/h (front only), including 2(NH3(SO4))	7.5	8.2	8.3	8.8
PM10, lb/h (front and back), including 2(NH3(SO4))	14.5	15.8	16.0	17.0
NOTE: SO2 converted to H2SO4 (assumed).	18.5%	18.7%	18.7%	18.8%
Remaining SO2 in Exhaust Gas, lb/h	1.15	1.23	1.25	1.31
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.40	0.43	0.44	0.46
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.54	0.58	0.59	0.62
Stack Exit Temperature, F	193.8	191.5	191.1	189.6
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	3,268,785	3,500,969	3,562,581	3,726,651
Stack Flow, scfm	733,842	781,300	794,456	827,317
Stack Flow, acfm	953,940	1,011,780	1,027,805	1,068,307
Stack Exit Velocity, ft/s	62.5	66.3	67.3	70.0

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BzV Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	BzV Estimate	BzV Estimate	BzV Estimate	BzV Estimate
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
w/ SCR				
NOx Removed, lb/h as NO2	133.6	143.3	146.1	153.0
NOx Removed, percent	90.0%	90.0%	90.0%	90.0%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	49.4	53.0	54.0	56.5
NH3 Slip, lb/h	22.0	23.6	24.0	25.2
Total NH3 Consumption, lb/h	71.4	76.5	78.0	81.7

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvd @ 15% O2
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particualtes assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cycledeck, a General Electric program, and similar project performance.

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Westinghouse Case C

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BstV Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG On	STIG On	STIG On	STIG On
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.00%	39.00%	60.00%	51.00%
CTG Compressor Inlet Temperature, F	122	73	59	17
CTG Compr. Inlet Relative Humidity, %	16	39	60	51
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Evap Cooler In Service	No	No	No	No
Inlet Loss, in. H2O	3.0	3.9	4.0	4.2
Exhaust Loss, in. H2O	16.3	18.5	19.1	20.6
CTG Load Level (percent of Base Load)	100%	100%	100%	100%
Gross CTG Output, kW	176,650	192,910	197,360	208,020
Gross CTG Heat Rate, Btu/kWh (LHV)	9,145	8,980	8,950	8,890
CTG Heat Input, MBtu/h (LHV)	1,615.46	1,732.33	1,766.37	1,849.30
CTG Heat Input, MBtu/h (HHV)	1,793.52	1,923.28	1,961.07	2,053.14
CTG Fuel Flow, lb/h	78,580	84,270	85,920	89,960
CTG Steam Injection Flow, lb/h	109,990	117,970	120,260	90,810
Injection Ratio	1.400	1.400	1.400	1.009
CTG Exhaust Flow, lb/h	3,486,645	3,734,481	3,800,416	3,940,440
CTG Exhaust Temperature, F	1,127	1,108	1,104	1,083
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.87739%	0.88511%	0.88551%	0.90540%
CO2	3.79126%	3.80773%	3.81552%	3.88358%
H2O	14.11648%	13.34428%	13.31107%	11.34730%
N2	69.87585%	70.49083%	70.52262%	72.10630%
O2	11.33900%	11.47203%	11.46525%	11.75740%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	25.0	25.0	25.0	25.0
NOx, lb/h as NO2	161.3	172.9	176.3	184.6
CO, ppmvd	20.0	20.0	20.0	20.0
CO, lb/h	60.4	65.1	66.3	69.7
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.5	1.6	1.7	1.8
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	14.1	15.1	15.3	15.8
VOC, ppmvw	1.0	1.0	1.0	1.1
VOC, lb/h as CH4	2.1	2.2	2.3	2.4
Particulates, lb/h (front only), excluding 2(NH4(SO4))	7.0	7.6	7.7	8.2
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	14.0	15.2	15.4	16.4
PM10, lb/h (front only), excluding 2(NH4(SO4))	7.0	7.6	7.7	8.2
PM10, lb/h (front and back), excluding 2(NH4(SO4))	14.0	15.2	15.4	16.4
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	27.77	27.85	27.86	28.08
Gas Constant, ft-lbf/lbm-R	55.641	55.469	55.461	55.024
Specific Volume, ft^3/lb	41.39	40.55	40.38	39.38
Exhaust Gas Flow, acfm	2,405,204	2,523,887	2,557,680	2,586,242
Specific Volume, scf/lb	13.66	13.62	13.62	13.51
Exhaust Gas Flow, scfm	793,793	847,727	862,694	887,256
Specific Volume, Nm3/kg	0.8072	0.8047	0.8046	0.7983
Exhaust Gas Flow, Nm3/s	354.61	378.64	385.28	396.35
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	548.1	519.6	511.1	512.9
Duct Burner Heat Input, MBtu/h (HHV)	608.5	576.9	567.4	569.5
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG On	STIG On	STIG On	STIG On
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.008	0.008	0.008	0.008
DB NOx, lb/h	60.8	57.7	56.7	56.9
DB CO, lb/h	60.8	57.7	56.7	56.9
DB UHC (as CH4), lb/h	36.5	34.6	34.0	34.2
DB VOC (as CH4), lb/h	15.2	14.4	14.2	14.2
DB Particulate, lb/h (front only)	6.1	5.8	5.7	5.7
DB Particulate, lb/h (front and back)	12.2	11.5	11.3	11.4
DB PM10, lb/h (front only)	6.1	5.8	5.7	5.7
DB PM10, lb/h (front and back)	12.2	11.5	11.3	11.4
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.86628%	0.87515%	0.87587%	0.89578%
CO2	5.01324%	4.89405%	4.86595%	4.90796%
H2O	16.42532%	15.40585%	15.30504%	13.31408%
N2	68.99638%	69.70193%	69.75939%	71.34464%
O2	8.69875%	9.12299%	9.19373%	9.53751%
SO2	0.00003%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	25.7	25.6	25.6	25.6
NOx, lb/h as NO2 w/o SCR	222.1	230.6	233.1	241.6
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	21.6	22.5	22.7	23.6
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	32.0	33.3	33.7	34.9
CO, ppmvd w/o Catalyst	40.7	38.2	37.6	36.8
CO, ppmvw w/o Catalyst	34.0	32.3	31.8	31.9
CO, ppmvd @ 15% O2 w/o Catalyst	23.1	22.4	22.2	22.1
CO, lb/h w/o Catalyst	121.3	122.8	123.0	126.6
CO, ppmvd w/ Catalyst	7.1	6.8	6.8	6.7
CO, ppmvw w/ Catalyst	5.9	5.8	5.7	5.8
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	21.0	21.9	22.1	23.0
SO2, ppmvd (with no conversion to H2SO4)	0.30	0.29	0.29	0.28
SO2, ppmvw (with no conversion to H2SO4)	0.25	0.25	0.24	0.25
SO2, lb/h (with no conversion to H2SO4)	2.05	2.13	2.16	2.24
Total S in Exhaust Gas, lb/h	1.03	1.07	1.08	1.12
Exhaust Gas SO3 (converted from SO2), ppmvw	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), ppmvd	0.05	0.05	0.05	0.05
Exhaust Gas SO3 (converted from SO2), lb/h	0.41	0.44	0.44	0.47
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.51	0.54	0.54	0.57
Remaining SO2 in Exhaust Gas, ppmvw	0.21	0.21	0.20	0.20
Remaining SO2 in Exhaust Gas, ppmvd	0.25	0.24	0.24	0.24
Remaining SO2 in Exhaust Gas, lb/h	1.72	1.78	1.80	1.86
UHC, ppmvd	29.7	27.0	26.3	25.3
UHC, ppmvw	24.8	22.8	22.3	21.9
UHC, ppmvd @ 15% O2	16.8	15.8	15.6	15.2
UHC, lb/h as CH4	50.6	49.7	49.4	49.9
VOC, ppmvd	9.1	8.1	7.9	7.6
VOC, ppmvw	7.6	6.9	6.7	6.6
VOC, ppmvd @ 15% O2	5.2	4.8	4.7	4.6
VOC, lb/h as CH4	15.6	15.0	14.8	15.0
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	13.1	13.4	13.4	13.9
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	26.2	26.7	26.7	27.8
PM10, lb/h (front only), excluding 2(NH4(SO4))	13.1	13.4	13.4	13.9
PM10, lb/h (front and back), excluding 2(NH4(SO4))	26.2	26.7	26.7	27.8
Particulates, lb/h (front only), including 2(NH3(SO4))	13.8	14.1	14.1	14.7
Particulates, lb/h (front and back), including 2(NH3(SO4))	26.9	27.5	27.5	28.6
PM10, lb/h (front only), including 2(NH3(SO4))	13.8	14.1	14.1	14.7
PM10, lb/h (front and back), including 2(NH3(SO4))	26.9	27.5	27.5	28.6
NOTE: SO2 converted to H2SO4 (assumed).	16.1%	16.5%	16.5%	16.0%
Remaining SO2 in Exhaust Gas, lb/h	1.72	1.78	1.80	1.86
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.51	0.54	0.54	0.57
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.68	0.72	0.73	0.77
Stack Exit Temperature, F	179.4	175.7	175.7	175.1
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	3,513,305	3,759,756	3,825,276	3,965,390
Stack Flow, scfm	803,961	857,224	872,163	896,839
Stack Flow, acfm	1,021,786	1,083,436	1,101,679	1,132,119
Stack Exit Velocity, ft/s	66.9	71.0	72.2	74.1

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BstV Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	100.00%	100.00%	100.00%	100.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Fired NG	Fired NG	Fired NG	Fired NG
	SCR On	SCR On	SCR On	SCR On
	STIG On	STIG On	STIG On	STIG On
w/ SCR				
NOx Removed, lb/h as NO2	139.7	150.5	153.6	161.0
NOx Removed, percent	86.6%	87.0%	87.1%	87.2%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	51.6	55.6	56.8	59.5
NH3 Slip, lb/h	32.0	33.3	33.7	34.9
Total NH3 Consumption, lb/h	83.6	88.9	90.4	94.4

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvd @ 15% O2
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particulates assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cyclodeck, a General Electric program, and similar project performance.

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Westinghouse Case D

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	85.00%	85.00%	85.00%	85.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.00%	39.00%	60.00%	51.00%
CTG Compressor Inlet Temperature, F	122	73	59	17
CTG Compr. Inlet Relative Humidity, %	16	39	60	51
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Evap Cooler In Service	No	No	No	No
Inlet Loss, in. H2O	3.0	3.4	3.5	3.7
Exhaust Loss, in. H2O	11.7	14.0	14.7	16.5
CTG Load Level (percent of Base Load)	85%	85%	85%	85%
Gross CTG Output, kW	116,990	142,030	149,010	165,900
Gross CTG Heat Rate, Btu/kWh (LHV)	10,175	9,605	9,490	9,235
CTG Heat Input, MBtu/h (LHV)	1,190.37	1,364.20	1,414.10	1,532.09
CTG Heat Input, MBtu/h (HHV)	1,321.50	1,514.57	1,569.97	1,700.96
CTG Fuel Flow, lb/h	57,900	66,360	68,790	74,530
CTG Steam Injection Flow, lb/h	0	0	0	0
Injection Ratio	0.000	0.000	0.000	0.000
CTG Exhaust Flow, lb/h	2,895,976	3,216,108	3,300,794	3,517,804
CTG Exhaust Temperature, F	1,081	1,048	1,041	1,014
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.92753%	0.93492%	0.93517%	0.94274%
CO2	3.43179%	3.55182%	3.58770%	3.65801%
H2O	8.65480%	8.01560%	8.02479%	7.31982%
N2	73.86634%	74.45568%	74.47559%	75.07873%
O2	13.11954%	13.04196%	12.97673%	13.00068%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, *ppmvd* @15% O2	25.0	25.0	25.0	25.0
NOx, lb/h as NO2	118.8	136.2	141.2	152.9
CO, ppmvd	10.0	10.0	10.0	10.0
CO, lb/h	26.2	29.2	29.9	32.0
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.1	1.3	1.3	1.5
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	11.5	12.7	13.0	13.9
VOC, ppmvw	2.1	2.1	2.1	2.1
VOC, lb/h as CH4	3.4	3.8	3.9	4.2
Particulates, lb/h (front only), excluding 2(NH4(SO4))	6.3	7.1	7.3	7.8
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	12.6	14.1	14.5	15.5
PM10, lb/h (front only), excluding 2(NH4(SO4))	6.3	7.1	7.3	7.8
PM10, lb/h (front and back), excluding 2(NH4(SO4))	12.6	14.1	14.5	15.5
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	28.33	28.41	28.42	28.50
Gas Constant, ft-lbf/lbm-R	54.531	54.375	54.371	54.212
Specific Volume, ft^3/lb	39.84	38.65	38.40	37.44
Exhaust Gas Flow, acfm	1,922,928	2,071,710	2,112,508	2,195,110
Specific Volume, scf/lb	13.39	13.35	13.35	13.31
Exhaust Gas Flow, scfm	646,285	715,584	734,427	790,366
Specific Volume, Nm3/kg	0.7911	0.7889	0.7888	0.7865
Exhaust Gas Flow, Nm3/s	288.66	319.68	328.06	348.60
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	0.0	0.0	0.0	0.0
Duct Burner Heat Input, MBtu/h (HHV)	0.0	0.0	0.0	0.0
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/06/00
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CTG Load Level (percent of Base Load)	85.00%	85.00%	85.00%	85.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.000	0.000	0.000	0.000
DB NOx, lb/h	0.0	0.0	0.0	0.0
DB CO, lb/h	0.0	0.0	0.0	0.0
DB UHC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB VOC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front only)	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front and back)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front only)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front and back)	0.0	0.0	0.0	0.0
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.92753%	0.93492%	0.93517%	0.94274%
CO2	3.43179%	3.55182%	3.58770%	3.65801%
H2O	8.65480%	8.01560%	8.02479%	7.31982%
N2	73.86634%	74.45568%	74.47559%	75.07873%
O2	13.11954%	13.04196%	12.97673%	13.00068%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	25.0	25.0	25.0	25.0
NOx, lb/h as NO2 w/o SCR	118.8	136.2	141.2	152.9
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	11.9	13.6	14.1	15.3
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	17.6	20.2	20.9	22.6
CO, ppmvd w/o Catalyst	10.0	10.0	10.0	10.0
CO, ppmvw w/o Catalyst	9.1	9.2	9.2	9.3
CO, ppmvd @ 15% O2 w/o Catalyst	9.0	8.8	8.7	8.6
CO, lb/h w/o Catalyst	26.2	29.2	29.9	32.0
CO, ppmvd w/ Catalyst	4.4	4.5	4.6	4.6
CO, ppmvw w/ Catalyst	4.0	4.2	4.2	4.3
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	11.6	13.3	13.8	14.9
SO2, ppmvd (with no conversion to H2SO4)	0.19	0.19	0.20	0.20
SO2, ppmvw (with no conversion to H2SO4)	0.17	0.18	0.18	0.18
SO2, lb/h (with no conversion to H2SO4)	1.13	1.29	1.34	1.45
Total S in Exhaust Gas, lb/h	0.56	0.65	0.67	0.73
Exhaust Gas SO3 (converted from SO2), ppmvw	0.03	0.03	0.03	0.03
Exhaust Gas SO3 (converted from SO2), ppmvd	0.04	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), lb/h	0.27	0.31	0.32	0.35
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.33	0.38	0.39	0.42
Remaining SO2 in Exhaust Gas, ppmvw	0.14	0.14	0.15	0.15
Remaining SO2 in Exhaust Gas, ppmvd	0.15	0.16	0.16	0.16
Remaining SO2 in Exhaust Gas, lb/h	0.91	1.05	1.08	1.17
UHC, ppmvd	7.7	7.6	7.6	7.6
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, ppmvd @ 15% O2	6.9	6.7	6.6	6.5
UHC, lb/h as CH4	11.5	12.7	13.0	13.9
VOC, ppmvd	2.1	2.1	2.1	2.1
VOC, ppmvw	1.9	1.9	1.9	1.9
VOC, ppmvd @ 15% O2	1.9	1.8	1.8	1.8
VOC, lb/h as CH4	3.1	3.5	3.5	3.8
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	6.3	7.1	7.3	7.8
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	12.6	14.1	14.5	15.5
PM10, lb/h (front only), excluding 2(NH4(SO4))	6.3	7.1	7.3	7.8
PM10, lb/h (front and back), excluding 2(NH4(SO4))	12.6	14.1	14.5	15.5
Particulates, lb/h (front only), including 2(NH3(SO4))	6.7	7.6	7.8	8.3
Particulates, lb/h (front and back), including 2(NH3(SO4))	13.0	14.6	15.0	16.1
PM10, lb/h (front only), including 2(NH3(SO4))	6.7	7.6	7.8	8.3
PM10, lb/h (front and back), including 2(NH3(SO4))	13.0	14.6	15.0	16.1
NOTE: SO2 converted to H2SO4 (assumed).	19.1%	19.1%	19.0%	19.0%
Remaining SO2 in Exhaust Gas, lb/h	0.91	1.05	1.08	1.17
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.33	0.38	0.39	0.42
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.44	0.51	0.52	0.57
Stack Exit Temperature, F	194.7	194.7	194.8	196.3
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	2,895,976	3,216,108	3,300,794	3,517,804
Stack Flow, acfm	646,285	715,584	734,427	780,366
Stack Flow, acfm	840,798	931,063	955,580	1,017,818
Stack Exit Velocity, ft/s	55.1	61.0	62.6	66.7

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
B&V Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	85.00%	85.00%	85.00%	85.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
w/ SCR				
NOx Removed, lb/h as NO2	106.9	122.6	127.0	137.7
NOx Removed, percent	90.0%	90.0%	90.0%	90.0%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	39.5	45.3	47.0	50.9
NH3 Slip, lb/h	17.6	20.2	20.9	22.6
Total NH3 Consumption, lb/h	57.1	65.5	67.9	73.5

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvd @ 15% O2
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particulates assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cycledock, a General Electric program, and similar project performance.

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Westinghouse Case E

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BstV Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	70.00%	70.00%	70.00%	70.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
CTG Performance And Emissions				
Ambient Temperature, F	122	73	59	17
Ambient Relative Humidity, %	16.00%	39.00%	60.00%	51.00%
CTG Compressor Inlet Temperature, F	81	59	52	17
CTG Compr. Inlet Relative Humidity, %	96	94	94	51
Atmospheric Pressure, psia	14.223	14.223	14.223	14.223
Evap Cooler In Service	Yes	Yes	Yes	No
Inlet Loss, in. H2O	2.6	2.8	2.8	2.9
Exhaust Loss, in. H2O	9.9	11.3	11.7	12.9
CTG Load Level (percent of Base Load)	70%	70%	70%	70%
Gross CTG Output, kW	96,080	116,710	122,470	136,400
Gross CTG Heat Rate, Btu/kWh (LHV)	10,895	10,145	9,980	9,665
CTG Heat Input, MBtu/h (LHV)	1,046.79	1,184.02	1,222.25	1,318.31
CTG Heat Input, MBtu/h (HHV)	1,162.17	1,314.53	1,356.97	1,463.62
CTG Fuel Flow, lb/h	50,920	57,590	59,450	64,130
CTG Steam Injection Flow, lb/h	0	0	0	0
Injection Ratio	0.000	0.000	0.000	0.000
CTG Exhaust Flow, lb/h	2,653,408	2,875,229	2,931,632	3,103,301
CTG Exhaust Temperature, F	1,081	1,056	1,049	1,021
CTG Exhaust Analysis (Volume Basis - Wet)				
Ar	0.91501%	0.93109%	0.93389%	0.94361%
CO2	3.27798%	3.44285%	3.48943%	3.56935%
H2O	9.70375%	8.30197%	8.06079%	7.14630%
N2	72.86935%	74.15000%	74.37334%	75.14722%
O2	13.15389%	13.17407%	13.14252%	13.19350%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at CTG exhaust flange)				
NOx, ppmvd @15% O2	25.0	25.0	25.0	25.0
NOx, lb/h as NO2	104.5	118.2	122.0	131.6
CO, ppmvd	10.0	10.0	10.0	10.0
CO, lb/h	23.8	26.0	26.6	28.3
SO2, ppmvd (with no conversion to H2SO4)	0.2	0.2	0.2	0.2
SO2, lb/h (with no conversion to H2SO4)	1.0	1.1	1.2	1.2
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, lb/h as CH4	10.6	11.4	11.6	12.2
VOC, ppmvw	2.1	2.1	2.1	2.1
VOC, lb/h as CH4	3.1	3.4	3.5	3.7
Particulates, lb/h (front only), excluding 2(NH4(SO4))	5.8	6.3	6.5	6.9
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	11.6	12.6	12.9	13.7
PM10, lb/h (front only), excluding 2(NH4(SO4))	5.8	6.3	6.5	6.9
PM10, lb/h (front and back), excluding 2(NH4(SO4))	11.6	12.6	12.9	13.7
CTG Fuel LHV, Btu/lb	20,558	20,558	20,558	20,558
CTG Fuel HHV, Btu/lb	22,824	22,824	22,824	22,824
HHV/LHV Ratio	1.1102	1.1102	1.1102	1.1102
CTG Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00%	100.00%	100.00%	100.00%
CTG Wet (Total) Exhaust Gas Analysis				
Molecular Wt, lb/mol	28.20	28.37	28.40	28.51
Gas Constant, ft-lbf/lbm-R	54.797	54.454	54.396	54.191
Specific Volume, ft^3/lb	40.21	39.17	38.91	37.93
Exhaust Gas Flow, acfm	1,778,226	1,877,045	1,901,163	1,961,803
Specific Volume, scf/lb	13.46	13.37	13.36	13.31
Exhaust Gas Flow, scfm	595,248	640,497	652,777	688,416
Specific Volume, Nm3/kg	0.7950	0.7900	0.7892	0.7862
Exhaust Gas Flow, Nm3/s	265.79	286.20	291.51	307.41
Duct Burner Performance and Emissions				
Duct Burner Heat Input, MBtu/h (LHV)	0.0	0.0	0.0	0.0
Duct Burner Heat Input, MBtu/h (HHV)	0.0	0.0	0.0	0.0
Duct Burner Fuel Composition (Ultimate Analysis by Weight)				
Ar	0.00000%	0.00000%	0.00000%	0.00000%
C	72.75974%	72.75974%	72.75974%	72.75974%
H2	23.92314%	23.92314%	23.92314%	23.92314%
N2	0.70575%	0.70575%	0.70575%	0.70575%
O2	2.61040%	2.61040%	2.61040%	2.61040%
S	0.00097%	0.00097%	0.00097%	0.00097%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Duct Burner NOx, lb/MBtu (HHV)	0.100	0.100	0.100	0.100
Duct Burner CO, lb/MBtu (HHV)	0.100	0.100	0.100	0.100

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	70.00%	70.00%	70.00%	70.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
Duct Burner UHC (as CH4), lb/MBtu (HHV)	0.060	0.060	0.060	0.060
DB non-meth/non-eth VOC (as CH4), lb/MBtu (HHV)	0.025	0.025	0.025	0.025
Duct Burner Particulate, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner Particulate, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner PM10, lb/MBtu (HHV) (front only)	0.010	0.010	0.010	0.010
Duct Burner PM10, lb/MBtu (HHV) (front and back)	0.020	0.020	0.020	0.020
Duct Burner SO2, lb/h	0.000	0.000	0.000	0.000
DB NOx, lb/h	0.0	0.0	0.0	0.0
DB CO, lb/h	0.0	0.0	0.0	0.0
DB UHC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB VOC (as CH4), lb/h	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front only)	0.0	0.0	0.0	0.0
DB Particulate, lb/h (front and back)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front only)	0.0	0.0	0.0	0.0
DB PM10, lb/h (front and back)	0.0	0.0	0.0	0.0
Stack Exhaust Analysis (Volume Basis - Wet)				
Ar	0.91501%	0.93109%	0.93389%	0.94361%
CO2	3.27798%	3.44285%	3.48943%	3.56935%
H2O	9.78375%	8.30197%	8.06079%	7.14630%
N2	72.86935%	74.15000%	74.37334%	75.14722%
O2	13.15389%	13.17407%	13.14252%	13.19350%
SO2	0.00002%	0.00002%	0.00002%	0.00002%
Total	100.00000%	100.00000%	100.00000%	100.00000%
Emissions (at Stack exit)				
NOx, ppmvd @15% O2 w/o SCR	25.0	25.0	25.0	25.0
NOx, lb/h as NO2 w/o SCR	104.5	118.2	122.0	131.6
NOx, ppmvd @15% O2 w/ SCR	2.5	2.5	2.5	2.5
NOx, lb/h as NO2 w/ SCR	10.4	11.8	12.2	13.2
NH3, ppmvd @15% O2 w/o SCR	0.0	0.0	0.0	0.0
NH3, lb/h w/o SCR	0.0	0.0	0.0	0.0
NH3 slip, ppmvd @15% O2 w/ SCR	10.0	10.0	10.0	10.0
NH3 slip, lb/h w/ SCR	15.5	17.5	18.1	19.5
CO, ppmvd w/o Catalyst	10.0	10.0	10.0	10.0
CO, ppmvw w/o Catalyst	9.0	9.2	9.2	9.3
CO, ppmvd @ 15% O2 w/o Catalyst	9.3	9.0	8.9	8.8
CO, lb/h w/o Catalyst	23.8	26.0	26.6	28.3
CO, ppmvd w/ Catalyst	4.3	4.4	4.5	4.5
CO, ppmvw w/ Catalyst	3.9	4.1	4.1	4.2
CO, ppmvd @ 15% O2 w/ Catalyst	4.0	4.0	4.0	4.0
CO, lb/h w/ Catalyst	10.2	11.5	11.9	12.8
SO2, ppmvd (with no conversion to H2SO4)	0.18	0.19	0.19	0.19
SO2, ppmvw (with no conversion to H2SO4)	0.16	0.17	0.17	0.18
SO2, lb/h (with no conversion to H2SO4)	0.99	1.12	1.16	1.25
Total S in Exhaust Gas, lb/h	0.50	0.56	0.58	0.62
Exhaust Gas SO3 (converted from SO2), ppmvw	0.03	0.03	0.03	0.03
Exhaust Gas SO3 (converted from SO2), ppmvd	0.03	0.04	0.04	0.04
Exhaust Gas SO3 (converted from SO2), lb/h	0.24	0.27	0.28	0.30
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.29	0.33	0.34	0.37
Remaining SO2 in Exhaust Gas, ppmvw	0.13	0.14	0.14	0.14
Remaining SO2 in Exhaust Gas, ppmvd	0.15	0.15	0.15	0.16
Remaining SO2 in Exhaust Gas, lb/h	0.80	0.91	0.94	1.01
UHC, ppmvd	7.8	7.6	7.6	7.5
UHC, ppmvw	7.0	7.0	7.0	7.0
UHC, ppmvd @ 15% O2	7.3	6.9	6.8	6.7
UHC, lb/h as CH4	10.6	11.4	11.6	12.2
VOC, ppmvd	2.1	2.1	2.1	2.1
VOC, ppmvw	1.9	1.9	1.9	1.9
VOC, ppmvd @ 15% O2	1.9	1.9	1.9	1.8
VOC, lb/h as CH4	2.8	3.1	3.2	3.4
NOTE: Particulate and PM10 calculations do NOT include the effect of any SO2 conversions in the SCR catalyst.				
Particulates, lb/h (front only), excluding 2(NH4(SO4))	5.8	6.3	6.5	6.9
Particulates, lb/h (front and back), excluding 2(NH4(SO4))	11.6	12.6	12.9	13.7
PM10, lb/h (front only), excluding 2(NH4(SO4))	5.8	6.3	6.5	6.9
PM10, lb/h (front and back), excluding 2(NH4(SO4))	11.6	12.6	12.9	13.7
Particulates, lb/h (front only), including 2(NH3(SO4))	6.2	6.7	6.9	7.3
Particulates, lb/h (front and back), including 2(NH3(SO4))	12.0	13.0	13.4	14.2
PM10, lb/h (front only), including 2(NH3(SO4))	6.2	6.7	6.9	7.3
PM10, lb/h (front and back), including 2(NH3(SO4))	12.0	13.0	13.4	14.2
NOTE: SO2 converted to H2SO4 (assumed).	19.1%	19.1%	19.1%	19.1%
Remaining SO2 in Exhaust Gas, lb/h	0.80	0.91	0.94	1.01
Exhaust Gas H2SO4 (100% converted from SO3), lb/h	0.29	0.33	0.34	0.37
Exhaust Gas 2(NH3(SO4)) 100% from SO3, lb/h	0.39	0.44	0.46	0.49
Stack Exit Temperature, F	190.2	188.1	187.8	188.4
Stack Diameter, ft (estimated)	18	18	18	18
Stack Flow, lb/h	2,653,408	2,875,229	2,931,632	3,103,301
Stack Flow, scfm	595,248	640,697	652,777	688,416
Stack Flow, acfm	769,046	825,191	840,401	887,027
Stack Exit Velocity, ft/s	50.4	54.0	55.0	58.1

Sempra Energy
Palo Verde
Expected Combustion Turbine and HRSG Emissions (per unit)
BatV Project 96210.040

01/06/00
02:02 PM

CTG Load Level (percent of Base Load)	70.00%	70.00%	70.00%	70.00%
CTG Model	W501F	W501F	W501F	W501F
Diluent/NOx Emission Rate	Dry Low NOx	Dry Low NOx	Dry Low NOx	Dry Low NOx
CTG Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas
CTG Performance Reference	S / W	S / W	S / W	S / W
HRSG Firing	Unfired	Unfired	Unfired	Unfired
	SCR On	SCR On	SCR On	SCR On
	STIG Off	STIG Off	STIG Off	STIG Off
w/ SCR				
NOx Removed, lb/h as NO2	94.0	106.4	109.8	118.4
NOx Removed, percent	90.0%	90.0%	90.0%	90.0%
NH3 Reacted, lb/h (1:1 stoichiometric ratio)	34.8	39.3	40.6	43.8
NH3 Slip, lb/h	15.5	17.5	18.1	19.5
Total NH3 Consumption, lb/h	50.2	56.8	58.6	63.3

Notes:

1. Duct Burner fuel is same as CTG fuel, Sulfur content 0.30 grains / SCF
2. Particulate values do not contain cayalsyt fines or other entrained particulate
3. Stack exhaust analysis and emissions do not include effects of CO catalyst.
4. SCR controls NOx to 2.5 ppmvd @ 15% O2.
5. CO Catalyst controls CO stack emissions to 4.0 ppmvd @ 15% O2
6. VOC Reduction at stack due to CO catalyst assumed to be 10%
7. Emissions calculation do not include heavy particles such as lead, mercury,
8. Changes in fuel constituents from those provided and indicated in this table may change VOC, UHC, NOx, SOx, and other predicted emission levels.
9. VOC are assumed to be 0.2 * UHC's at the CTG exhaust flange
10. Back half particulates assumed equal to front half.
11. CTG manufacture provided front half particulate data only
12. Performance based Cyclodeck, a General Electric program, and similar project performance.

File: c:\bv-users_proj\sempra\palo_verde_emissions\westinghouse\new_emissions_1550_design\[palo_verde_emmision_wes_ct_heavy_fire_scenario.xls]a (2)

APPENDIX D
DRAFT ACID RAIN PERMIT APPLICATION FORMS

Sempra Energy℠
Resources

101 Ash Street
San Diego, CA 92101-3017

Dale Lieb
Title V and General Permits
Engineering Unit Manager
Maricopa County Environmental Services Department
Air quality Division
1001 N. Central Ave., Suite 200
Phoenix, AZ 85004-1942

RE: Delegation of Representative Official

Dear Mr. Lieb;

This letter is to request that Cecil D. Sterling, Manager of Permitting for Sempra Energy Resources, be recognized as the representative official for Mesquite Power, LLC, for purposes of the Compliance Certification required under Maricopa County Air Pollution Control Rule 210, Section 301.7. If you have any questions in this regard, please contact me at (619) 696-4455.

Date: 1/26/00

Joseph H Rowley

Joseph H. Rowley
Vice President-Project Development
Mesquite Power, LLC
101 Ash Street
San Diego, CA 92101-3017

Sempra Energy Resources is not the same company as the utility, SDG&E or SoCalGas, and Sempra Energy Resources is not regulated by the California Public Utilities Commission.

United States
Environmental Protection Agency
Acid Rain Program

OMB No. 2060-0258

EPA

Certificate of Representation

For more information, see instructions and refer to 40 CFR 72.24

This submission is: [X] New [ ] Revised (revised submissions must be completed in full; see instructions)

This submission includes combustion or process sources under 40 CFR part 74 [ ]

STEP 1
Identify the source by plant name, State, and ORIS code.

Plant Name	State	ORIS Code
Mesquite Generating Station	AZ	Pending

STEP 2
Enter requested information for the designated representative.

Name: Joseph H. Rowley	
Address: 101 Ash St. San Diego, CA 92101-3017	
Phone Number: 619-696-4455	Fax Number: 619-696-2791
E-mail address (if available): jrowley@sempra.res.com	

STEP 3
Enter requested information for the alternate designated representative, if applicable.

Name: Marty Swartz	
Phone Number: 619-696-2943	Fax Number: 619-696-2791
E-mail address (if available): mswartz@sempra.res.com	

STEP 4
Complete Step 5, read the certifications, and sign and date. For a designated representative of a combustion or process source under 40 CFR part 74, the references in the certifications to "affected unit" or "affected units" also apply to the combustion or process source under 40 CFR part 74 and the references to "affected source" also apply to the source at which the combustion or process source is located.

I certify that I was selected as the designated representative or alternate designated representative, as applicable, by an agreement binding on the owners and operators of the affected source and each affected unit at the source.

I certify that I have given notice of the agreement, selecting me as the designated representative for the affected source and each affected unit at the source identified in this certificate of representation, in a newspaper of general circulation in the area where the source is located or in a State publication designed to give general public notice.

I certify that I have all necessary authority to carry out my duties and responsibilities under the Acid Rain Program on behalf of the owners and operators of the affected source and of each affected unit at the source and that each such owner and operator shall be fully bound by my actions, inactions, or submissions.

I certify that I shall abide by any fiduciary responsibilities imposed by the agreement by which I was selected as designated representative or alternate designated representative, as applicable.

I certify that the owners and operators of the affected source and of each affected unit at the source shall be bound by any order issued to me by the Administrator, the permitting authority, or a court regarding the source or unit.

Where there are multiple holders of a legal or equitable title to, or a leasehold interest in, an affected unit, or where a utility or industrial customer purchases power from an affected unit under life-of-the-unit, firm power contractual arrangements, I certify that:

I have given a written notice of my selection as the designated representative or alternate designated representative, as applicable, and of the agreement by which I was selected to each owner and operator of the affected source and of each affected unit at the source; and

Allowances and the proceeds of transactions involving allowances will be deemed to be held or distributed in proportion to each holder's legal, equitable, leasehold, or contractual reservation or entitlement or, if such multiple holders have expressly provided for a different distribution of allowances by contract, that allowances and the proceeds of transactions involving allowances will be deemed to be held or distributed in accordance with the contract.

The agreement by which I was selected as the alternate designated representative, if applicable, includes a procedure for the owners and operators of the source and affected units at the source to authorize the alternate designated representative to act in lieu of the designated representative.

Mesquite Generating Station
Plant Name (from Step 1)

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

Signature (designated representative)	Date
Signature (alternate designated representative)	Date

STEP 5
Provide the name of every owner and operator of the source and identify each affected unit (or combustion or process source) they own and/or operate.

Name Mesquite Power L.L.C.					[X] Owner	[X] Operator
ID# 1	ID# 2	ID# 3	ID# 4	ID#	ID#	ID#
ID#	ID#	ID#	ID#	ID#	ID#	ID#

Name					[ ] Owner	[ ] Operator
ID#	ID#	ID#	ID#	ID#	ID#	ID#
ID#	ID#	ID#	ID#	ID#	ID#	ID#

Name					[ ] Owner	[ ] Operator
ID#	ID#	ID#	ID#	ID#	ID#	ID#
ID#	ID#	ID#	ID#	ID#	ID#	ID#

Name					[ ] Owner	[ ] Operator
ID#	ID#	ID#	ID#	ID#	ID#	ID#
ID#	ID#	ID#	ID#	ID#	ID#	ID#

Acid Rain Program
Instructions for Certificate of Representation (40 CFR 72.24)

Under the Acid Rain Program (at 40 CFR part 72 subpart B), the owners and operators for each affected source must designate a representative, and may designate an alternate, to act on their behalf. The owners and operators must choose the designated representative through a process that ensures that all owners and operators have notice regarding the selection.

All affected units at a source must have the same designated representative. The designated representative is responsible for all submissions and allowance transactions relating to the units at that source, and is liable for acts or omissions within the scope of his or her responsibilities under the Acid Rain Program.

Please type or print. If more space is needed, photocopy the second page. Indicate the page order and total number of pages (*e.g.*, 1 of 4, 2 of 4, etc.) in the boxes in the upper right hand corner of each page. ***Note:* A Certificate of Representation amending an earlier submission supersedes the earlier submission *in its entirety*. A revised Certificate of Representation must therefore *be complete*, including signature and dating by the designated representative (and the alternate designated representative, if applicable), as required under 40 CFR 72.24(a) and 72.25(a).**

Submit one Certificate of Representation form with *original* signatures. Remember that under 40 CFR 72.21, the designated representative must notify each owner and operator of all Acid Rain Program submissions.

For assistance, call the Acid Rain Hotline at (202) 564-9620.

STEP 1 An ORIS code is a 4 digit number assigned by the Energy Information Agency (EIA) at the U.S. Department of Energy to power plants owned by utilities. If the plant is not owned by a utility but has a 5 digit facility code (also assigned by EIA), use the facility code. If no code has been assigned or if there is uncertainty regarding what the code number is, contact EIA at (202) 426-1142 (for ORIS codes), or (202) 426-1269 (for facility codes).

For a combustion or process source under 40 CFR part 74, identify the ORIS or facility code, if one has been assigned. If not, leave blank.

STEP 2 The designated representative must be a natural person and cannot be a company. Please enter the firm name and address as it should appear on all correspondence. Note: All EPA correspondence is mailed to the designated representative *only*. An alternate designated representative must rely on the designated representative to forward information mailed by EPA to the designated representative.

STEP 4 Note that the certifications apply to the designated representative of combustion or process sources seeking to become opt-in sources under 40 CFR part 74.

STEP 5 See 40 CFR 72.2 for the definitions of "owner" and "operator." The owners and operators may be companies or natural persons.

Identify each affected unit at the affected source that is owned or operated by the named party by providing the appropriate unit identification number. The identification number entered for each unit should be consistent with previously submitted Certificates of Representation (if applicable), with unit identification numbers listed in NADB (for units that commenced operation prior to 1993), and with unit identification numbers used in reporting to DOE and/or EIA. For new units without identification numbers, owners and operators may assign such numbers consistent with EIA and DOE requirements. NADB is the National Allowance Data Base for the Acid Rain Program, and can be downloaded from the Acid Rain Program Website at "www.epa.gov/acidrain/" or obtained on diskette by calling the Acid Rain Hotline. This data file is in dBase format for use on an IBM-compatible PC and requires 2 megabytes of hard drive memory.

Mail this form to:

U.S. Environmental Protection Agency
Acid Rain Program (6204J)
Attention: Designated Representative

by regular mail:	or	overnight mail:
401 M St., SW Washington, DC 20460		501 3rd St., NW Washington, DC 20001

Submit this form prior to or concurrent with the first submission under the Acid Rain Program. This form must be submitted before participating in the annual auctions and sales of allowances. EPA will not issue proceeds from auctions or sales to a unit until it receives a complete Certificate of Representation.

Combustion or process sources seeking to become opt-in sources under 40 CFR part 74 must submit this form prior to or concurrent with the opt-in permit application under 40 CFR 74.14.

Submit a revised Certificate of Representation when any information in the existing Certificate of Representation changes. EPA must be notified of changes to owners and operators within 30 days.

Paperwork Burden Estimate

The burden on the public for collecting and reporting information under this request is estimated at 35 hours per response. Send comments regarding this collection of information, including suggestions for reducing the burden, to: Chief, Information Policy Branch (2136), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460; and to: Paperwork Reduction Project (OMB#2060-0221), Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503. ***Do not submit forms to these addresses; see the submission instructions above.***

United States
Environmental Protection Agency
Acid Rain Program

OMB No. 2060-0258

Phase II Permit Application

For more information, see instructions and refer to 40 CFR 72.30 and 72.31

This submission is: [X] New [ ] Revised

STEP 1
Identify the source by plant name, State, and ORIS code.

Plant Name	State	ORIS Code
Mesquite Generating Station	AZ	Pending

STEP 2
Enter the unit ID# for each affected unit, and indicate whether a unit is being repowered and the repowering plan being renewed by entering "yes" or "no" at column c. For new units, enter the requested information in columns d and e.

a	b	c	d	e
	Compliance Plan			
Unit ID#	Unit Will Hold Allowances in Accordance with 40 CFR 72.9(c)(1)	Repowering Plan	New Units Commence Operation Date	New Units Monitor Certification Deadline
1	Yes		X	X
2	Yes		X	X
3	Yes		X	X
4	Yes		X	X
	Yes			
	Yes			
	Yes			
	Yes			
	Yes			
	Yes			
	Yes			
	Yes			

STEP 3
Check the box if the response in column c of Step 2 is "Yes" for any unit.

[ ] For each unit that is being repowered, the Repowering Extension Plan form is included.

Mesquite Generating Station
Plant Name (from Step 1)

STEP 4
Read the standard requirements and certification, enter the name of the designated representative, and sign and date

Standard Requirements

Permit Requirements.

(1) The designated representative of each affected source and each affected unit at the source shall:
(i) Submit a complete Acid Rain permit application (including a compliance plan) under 40 CFR part 72 in accordance with the deadlines specified in 40 CFR 72.30; and
(ii) Submit in a timely manner any supplemental information that the permitting authority determines is necessary in order to review an Acid Rain permit application and issue or deny an Acid Rain permit;
(2) The owners and operators of each affected source and each affected unit at the source shall:
(i) Operate the unit in compliance with a complete Acid Rain permit application or a superseding Acid Rain permit issued by the permitting authority; and
(ii) Have an Acid Rain Permit.

Monitoring Requirements.

(1) The owners and operators and, to the extent applicable, designated representative of each affected source and each affected unit at the source shall comply with the monitoring requirements as provided in 40 CFR part 75.
(2) The emissions measurements recorded and reported in accordance with 40 CFR part 75 shall be used to determine compliance by the unit with the Acid Rain emissions limitations and emissions reduction requirements for sulfur dioxide and nitrogen oxides under the Acid Rain Program.
(3) The requirements of 40 CFR part 75 shall not affect the responsibility of the owners and operators to monitor emissions of other pollutants or other emissions characteristics at the unit under other applicable requirements of the Act and other provisions of the operating permit for the source.

Sulfur Dioxide Requirements.

(1) The owners and operators of each source and each affected unit at the source shall:
(i) Hold allowances, as of the allowance transfer deadline, in the unit's compliance subaccount (after deductions under 40 CFR 73.34(c)) not less than the total annual emissions of sulfur dioxide for the previous calendar year from the unit; and
(ii) Comply with the applicable Acid Rain emissions limitations for sulfur dioxide.
(2) Each ton of sulfur dioxide emitted in excess of the Acid Rain emissions limitations for sulfur dioxide shall constitute a separate violation of the Act.
(3) An affected unit shall be subject to the requirements under paragraph (1) of the sulfur dioxide requirements as follows:
(i) Starting January 1, 2000, an affected unit under 40 CFR 72.6(a)(2); or
(ii) Starting on the later of January 1, 2000 or the deadline for monitor certification under 40 CFR part 75, an affected unit under 40 CFR 72.6(a)(3).
(4) Allowances shall be held in, deducted from, or transferred among Allowance Tracking System accounts in accordance with the Acid Rain Program.
(5) An allowance shall not be deducted in order to comply with the requirements under paragraph (1) of the sulfur dioxide requirements prior to the calendar year for which the allowance was allocated.
(6) An allowance allocated by the Administrator under the Acid Rain Program is a limited authorization to emit sulfur dioxide in accordance with the Acid Rain Program. No provision of the Acid Rain Program, the Acid Rain permit application, the Acid Rain permit, or an exemption under 40 CFR 72.7, 72.8, or 72.14 and no provision of law shall be construed to limit the authority of the United States to terminate or limit such authorization.
(7) An allowance allocated by the Administrator under the Acid Rain Program does not constitute a property right.

Nitrogen Oxides Requirements. The owners and operators of the source and each affected unit at the source shall comply with the applicable Acid Rain emissions limitation for nitrogen oxides.

Excess Emissions Requirements.

(1) The designated representative of an affected unit that has excess emissions in any calendar year shall submit a proposed offset plan, as required under 40 CFR part 77.
(2) The owners and operators of an affected unit that has excess emissions in any calendar year shall:
(i) Pay without demand the penalty required, and pay upon demand the interest on that penalty, as required by 40 CFR part 77; and
(ii) Comply with the terms of an approved offset plan, as required by 40 CFR part 77.

Recordkeeping and Reporting Requirements.

(1) Unless otherwise provided, the owners and operators of the source and each affected unit at the source shall keep on site at the source each of the following documents for a period of 5 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 5 years, in writing by the Administrator or permitting authority:
(i) The certificate of representation for the designated representative for the source and each affected unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation, in accordance with 40 CFR 72.24; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such documents are superseded because of the submission of a new certificate of representation changing the designated representative;
(ii) All emissions monitoring information, in accordance with 40 CFR part 75, provided that to the extent that 40 CFR part 75 provides for a 3-year period for recordkeeping, the 3-year period shall apply.
(iii) Copies of all reports, compliance certifications, and other submissions and all records made or required under the Acid Rain Program; and,
(iv) Copies of all documents used to complete an Acid Rain permit application and any other submission under the Acid Rain Program or to demonstrate compliance with the requirements of the Acid Rain Program.
(2) The designated representative of an affected source and each affected unit at the source shall submit the reports and compliance certifications required under the Acid Rain Program, including those under 40 CFR part 72 subpart I and 40 CFR part 75.

Mesquite Generating Station
Plant Name (from Step 1)

Liability.

(1) Any person who knowingly violates any requirement or prohibition of the Acid Rain Program, a complete Acid Rain permit application, an Acid Rain permit, or an exemption under 40 CFR 72.7, 72.8, or 72.14, including any requirement for the payment of any penalty owed to the United States, shall be subject to enforcement pursuant to section 113(c) of the Act.
(2) Any person who knowingly makes a false, material statement in any record, submission, or report under the Acid Rain Program shall be subject to criminal enforcement pursuant to section 113(c) of the Act and 18 U.S.C. 1001.
(3) No permit revision shall excuse any violation of the requirements of the Acid Rain Program that occurs prior to the date that the revision takes effect.
(4) Each affected source and each affected unit shall meet the requirements of the Acid Rain Program.
(5) Any provision of the Acid Rain Program that applies to an affected source (including a provision applicable to the designated representative of an affected source) shall also apply to the owners and operators of such source and of the affected units at the source.
(6) Any provision of the Acid Rain Program that applies to an affected unit (including a provision applicable to the designated representative of an affected unit) shall also apply to the owners and operators of such unit. Except as provided under 40 CFR 72.44 (Phase II repowering extension plans) and 40 CFR 76.11 (NO_x averaging plans), and except with regard to the requirements applicable to units with a common stack under 40 CFR part 75 (including 40 CFR 75.16, 75.17, and 75.18), the owners and operators and the designated representative of one affected unit shall not be liable for any violation by any other affected unit of which they are not owners or operators or the designated representative and that is located at a source of which they are not owners or operators or the designated representative.
(7) Each violation of a provision of 40 CFR parts 72, 73, 74, 75, 76, 77, and 78 by an affected source or affected unit, or by an owner or operator or designated representative of such source or unit, shall be a separate violation of the Act.

Effect on Other Authorities. No provision of the Acid Rain Program, an Acid Rain permit application, an Acid Rain permit, or an exemption under 40 CFR 72.7, 72.8, or 72.14 shall be construed as:

(1) Except as expressly provided in title IV of the Act, exempting or excluding the owners and operators and, to the extent applicable, the designated representative of an affected source or affected unit from compliance with any other provision of the Act, including the provisions of title I of the Act relating to applicable National Ambient Air Quality Standards or State Implementation Plans;
(2) Limiting the number of allowances a unit can hold; *provided*, that the number of allowances held by the unit shall not affect the source's obligation to comply with any other provisions of the Act;
(3) Requiring a change of any kind in any State law regulating electric utility rates and charges, affecting any State law regarding such State regulation, or limiting such State regulation, including any prudence review requirements under such State law;
(4) Modifying the Federal Power Act or affecting the authority of the Federal Energy Regulatory Commission under the Federal Power Act; or,
(5) Interfering with or impairing any program for competitive bidding for power supply in a State in which such program is established.

Certification

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment.

Name Joseph H. Rowley	
Signature Joseph H Rowley	Date 1/26/00

Acid Rain Program
Instructions for Phase II
Permit Application (40 CFR 72.30- 72.31)

The Acid Rain Program regulations require the designated representative to submit an Acid Rain permit application for Phase II for each source with an affected unit. A complete Phase II permit application is binding on the owners and operators of the affected source and is enforceable in the absence of a permit until the permitting authority either issues a permit to the source or disapproves the application.

Please type or print. The alternate designated representative may sign in lieu of the designated representative. If assistance is needed, contact the title V permitting authority.

STEP 1 Use the plant name and ORIS Code listed on the Certificate of Representation for the plant. An ORIS code is a 4 digit number assigned by the Energy Information Agency (EIA) at the U.S. Department of Energy to power plants owned by utilities. If the plant is not owned by a utility but has a 5 digit facility code (also assigned by EIA), use the facility code. If no code has been assigned or if there is uncertainty regarding what the code number is, contact EIA at (202) 426-1234 (for ORIS codes), or (202) 426-1269 (for facility codes).

STEP 2 For column "a," identify each affected unit at the affected source by providing the appropriate unit identification numbers, consistent with the unit identification numbers entered on the Certificate of Representation, with unit identification numbers listed in NADB (for units that commenced operation prior to 1993), and with unit identification numbers used in reporting to DOE and/or EIA. For new units without identification numbers, owners and operators may assign such numbers consistent with EIA and DOE requirements. NADB is the National Allowance Data Base for the Acid Rain Program, and can be downloaded from the Acid Rain Program Website at "www.epa.gov/acidrain/" or obtained on diskette by calling the Acid Rain Hotline. This data file is in dBase format for use on an IBM-compatible PC and requires 2 megabytes of hard drive memory.

For column "c," enter "yes" only if a repowering technology petition has been approved for the unit by U.S. EPA, an initial repowering extension plan was approved by the title V permitting authority and activated by the designated representative, and a repowering extension plan renewing the original repowering extension plan has been included with the current acid rain permit application for that unit.

For columns "d" and "e," enter the commence operation date(s) and monitor certification deadline(s) for new units in accordance with 40 CFR 75.4. If the commence operation date or monitor certification date changes after the Phase II permit is issued, the designated representative must submit a request for an administrative permit amendment under 40 CFR 72.83.

Submission Deadlines

For new units, an initial Phase II permit application must be submitted to the title V permitting authority at least 24 months before the later of January 1, 2000 or the date the unit commences operation. Phase II acid rain renewal applications must be submitted at least 6 months in advance of the expiration of the acid rain portion of a title V permit, or such longer time as provided for under the title V permitting authority s operating permits regulation.

Submission Instructions

Submit this form and 1 copy to the appropriate title V air permitting authority. If you have questions regarding this form, contact your local, State, or EPA Regional acid rain contact, or call EPA's Acid Rain Hotline at (202) 564-9620.

Paperwork Burden Estimate

The burden on the public for collecting and reporting information under this request is estimated at 17 hours per response. Send comments regarding this collection of information, including suggestions for reducing the burden, to: Chief, Information Policy Branch (2136), U.S. Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460; and to: Paperwork Reduction Project (OMB#2060-0258), Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503. ***Do not submit forms to these addresses; see the submission instructions above.***

U.S. Department of Energy
Energy Information Administration
Form EIA-860A (1999)

Annual Electric Generator Report - Utility
as of January 1, 1999

Form Approved
OMB NO. 1905-0129
(Expires 12/31/01)

This report is mandatory under Public Law 93-275, the Federal Energy Administration Act of 1974. Information reported on the form EIA-860 is not considered confidential. Public reporting burden for this collection of information is estimated to average 15.3 hours per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this form, its burden estimate, or any aspect of the data collection to the Energy Information Administration, Statistics and Methods Group EI-70, 1000 Independence Avenue S.W., Forrestal Building, Washington, D.C. 20585-0670; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503. A person is not required to respond to the collection of information unless it displays a valid OMB number. If you need assistance, call the HELP CENTER on voice phone (202) 426-1191 or FAX phone (202) 426-1940 or contact the survey manager, Elsie Beas at (202) 426-1142 or E-Mail, elsie.beas@eia.doe.gov. To be completed by, or on behalf of, those utilities operating electric power plants.

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Identification and Certification ..... Schedule I
Power Plant Site Information ..... Schedule II
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Ownership of Generators Owned Jointly or by Others ..... Schedule IV

Schedule I
Identification and Certification

1. Operating utility: EIA utility code:
   Name: Mesquite Power, LLC

Return completed form to:

U.S. Department of Energy
Energy Information Admin. EI-53
Mail Stop: BG-076 (EIA-860A)
Washington, D.C. 20077-5651

2. Respondent Mailing Address:
   X

4. Certifying Official: X
   Name:
   Title:
   Date:
   Signature:

3. Contact Person: X
   Name:
   Title:
   Telephone: Ext.
   FAX: EMail:

Notes:

U.S. Department of Energy
Energy Information Administration
Form EIA-860A (1999)

Annual Electric Generator Report - Utility
as of January 1, 1999

Utility Code:
Utility Name:

Page :

Schedule II
Power Plant Site Information
(Existing Power Plants and Those Planned for Initial Commercial Operation within 5 Years)

Section A

1. Plant	Plant Name: Mesquite Generating Station; County Name: Maricopa; State: AZ; Plant Zip Code: X Name of Water Source (Cooling or Hydroelectric): Wells; Cogeneration: N

Section B

1. Plant	Plant Name: ; County Name: ; State: ; Plant Zip Code: Name of Water Source (Cooling or Hydroelectric): ; Cogeneration:

Section C

1. Plant	Plant Name: ; County Name: ; State: ; Plant Zip Code: Name of Water Source (Cooling or Hydroelectric): ; Cogeneration:

Specify with a "Y" which, if any of the above are mobile plants. A.____ B.____ C.____

Notes:

Check ☐ if no change to preprinted data on this page.

U.S. Department of Energy
Energy Information Administration
Form EIA-860A (1999)

Annual Electric Generator Report - Utility
as of January 1, 1999

Utility Code:
Utility Name:

Page:

Schedule III.
Generator Information
(Existing Generators and those Planned for Initial Commercial Operation within 5 Years)

Section A

1. Generator — Plant Name: Mesquite Generating Stat; Generator Id.: 1; Prime Mover: CT; Unit Code: ; Ownership: U

2. Existing Generators — Maximum Generator Nameplate Capacity (kW): NA; Status Code: NA; Commercial Operation Date(Mo/Yr): NA / ; Retirement Date(Mo/Yr): NA / ; Heat Rate (Btu/kWh): NA
Energy Source(s)*: NA ; Mode of Transportation: NA ; Net Capability (kW) Summer: NA Winter: NA

3. Proposed Generator or Proposed Changes — Maximum Generator Nameplate Capacity (kW): 170,000; Status Code: L; Effective Date(Mo/Yr) Original: X / X Current: / ; Net Capability (kW) Summer: 170,000 Winter: 170,000
Energy Source(s)*: NG ; Mode of Transportation: PL ; New Prime Mover: NA

Section B

1. Generator — Plant Name: Mesquite Generating Station; Generator Id.: 2; Prime Mover: CT; Unit Code: ; Ownership: U

2. Existing Generators — Maximum Generator Nameplate Capacity (kW): NA; Status Code: NA; Commercial Operation Date(Mo/Yr): NA / ; Retirement Date(Mo/Yr): NA / ; Heat Rate (Btu/kWh): NA
Energy Source(s)*: NA ; Mode of Transportation: NA ; Net Capability (kW) Summer: NA Winter: NA

3. Proposed Generator or Proposed Changes — Maximum Generator Nameplate Capacity (kW): 170,000; Status Code: L; Effective Date(Mo/Yr) Original: X / X Current: / ; Net Capability (kW) Summer: 170,000 Winter: 170,000
Energy Source(s)*: NG ; Mode of Transportation: PL ; New Prime Mover: NA

Section C

1. Generator — Plant Name: Mesquite Generating Sta.; Generator Id.: 3; Prime Mover: CT; Unit Code: ; Ownership: U

2. Existing Generators — Maximum Generator Nameplate Capacity (kW): NA; Status Code: NA; Commercial Operation Date(Mo/Yr): NA / ; Retirement Date(Mo/Yr): NA / ; Heat Rate (Btu/kWh): NA
Energy Source(s)*: NA ; Mode of Transportation: NA ; Net Capability (kW) Summer: NA Winter: NA

3. Proposed Generator or Proposed Changes — Maximum Generator Nameplate Capacity (kW): 170,000; Status Code: L; Effective Date(Mo/Yr) Original: X / X Current: / ; Net Capability (kW) Summer: 170,000 Winter: 170,000
Energy Source(s)*: NG ; Mode of Transportation: PL ; New Prime Mover: NA

Notes: * These are listed in order of preeminence of quantity of Btus consumed during the prior year.

Check ☐ if no change to preprinted data on this page.

U.S. Department of Energy
Energy Information Administration
Form EIA-860A (1999)

Annual Electric Generator Report - Utility
as of January 1, 1999

Utility Code:
Utility Name:

Page:

Schedule III
Generator Information
(Existing Generators and those Planned for Initial Commercial Operation within 5 Years)

Section A

1. Generator — Plant Name: Mesquite Generating Sta. Generator Id. 4 Prime Mover CT Unit Code ____ Ownership U

2. Existing Generators — Maximum Generator Nameplate Capacity (kW) NA; Status Code NA; Commercial Operation Date(Mo/Yr) NA / ____; Retirement Date(Mo/Yr) NA / ____; Heat Rate (Btu/kWh) NA
Energy Source(s)* NA ____; Mode of Transportation NA ____; Net Capability (kW) Summer NA Winter NA

3. Proposed Generator or Proposed Changes — Maximum Generator Nameplate Capacity (kW) 170,000; Status Code L; Effective Date(Mo/Yr) Original X / X; Current ____ / ____
Energy Source(s)* NG ____; Mode of Transportation PL ____; New Prime Mover NA; Net Capability (kW) Summer 170,000 Winter 170,000

Section B

1. Generator — Plant Name: Mesquite Generating Sta. Generator Id. 5 Prime Mover CW Unit Code ____ Ownership U

2. Existing Generators — Maximum Generator Nameplate Capacity (kW) NA; Status Code NA; Commercial Operation Date(Mo/Yr) NA / ____; Retirement Date(Mo/Yr) NA / ____; Heat Rate (Btu/kWh) NA
Energy Source(s)* NA ____; Mode of Transportation NA ____; Net Capability (kW) Summer NA Winter NA

3. Proposed Generator or Proposed Changes — Maximum Generator Nameplate Capacity (kW) 160,000; Status Code L; Effective Date(Mo/Yr) Original X / X; Current ____ / ____
Energy Source(s)* NG ____; Mode of Transportation PL ____; New Prime Mover NA; Net Capability (kW) Summer 160,000 Winter 160,000

Section C

1. Generator — Plant Name: Mesquite Generating Sta. Generator Id. 6 Prime Mover CW Unit Code ____ Ownership U

2. Existing Generators — Maximum Generator Nameplate Capacity (kW) NA; Status Code NA; Commercial Operation Date(Mo/Yr) NA / ____; Retirement Date(Mo/Yr) NA / ____; Heat Rate (Btu/kWh) NA
Energy Source(s)* NA ____; Mode of Transportation NA ____; Net Capability (kW) Summer NA Winter NA

3. Proposed Generator or Proposed Changes — Maximum Generator Nameplate Capacity (kW) 160,000; Status Code L; Effective Date(Mo/Yr) Original X / X; Current ____ / ____
Energy Source(s)* NG ____; Mode of Transportation PL ____; New Prime Mover NA; Net Capability (kW) Summer 160,000 Winter 160,000

Notes: * These are listed in order of predominance of quantity of Btus consumed during the prior year.

Check ☐ if no change to preprinted data on this page.

APPENDIX E

MESQUITE POWER, LLC, MESQUITE GENERATING STATION AMBIENT AIR QUALITY IMPACT ANALYSIS WORKPLAN

Ambient Air Quality Impact Analysis Workplan
For the
Mesquite Power LLC
Palo Verde Power Project

Prepared By

Black & Veatch

December, 1999

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1.0 Introduction

Mesquite Power LLC proposes to construct a natural gas fired, combined-cycle power generation facility in Maricopa County, near Arlington, Arizona. The proposed Palo Verde Power Project (hereinafter referred to as the Project) will be a new major stationary source, thus, subject to the Prevention of Significant Deterioration (PSD) review program. This Ambient Air Quality Impact Analysis Workplan (Workplan) describes the methodology for assessing ambient air quality impacts resulting from construction and operation of the proposed Project. Subject to Maricopa County Environmental Services Department review and approval, this Workplan will provide the basis of a mutually agreed upon procedure for the final ambient air quality impact analysis in support of the air construction permit application.

This Workplan describes site and source characteristics, determination of pollutants applicable to the air quality review, and the analytical procedures that will be used to conduct the ambient air quality impact analysis. The ambient air quality impact analysis includes a demonstration of compliance with the National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration (PSD) increments. The analysis will also include an additional impacts assessment.

2.0 Project Characterization

The following sections briefly characterize the combustion turbine Project including a general description of the Project, location, and emission units, as well as an overview of the local air quality status and New Source Review (NSR) applicability.

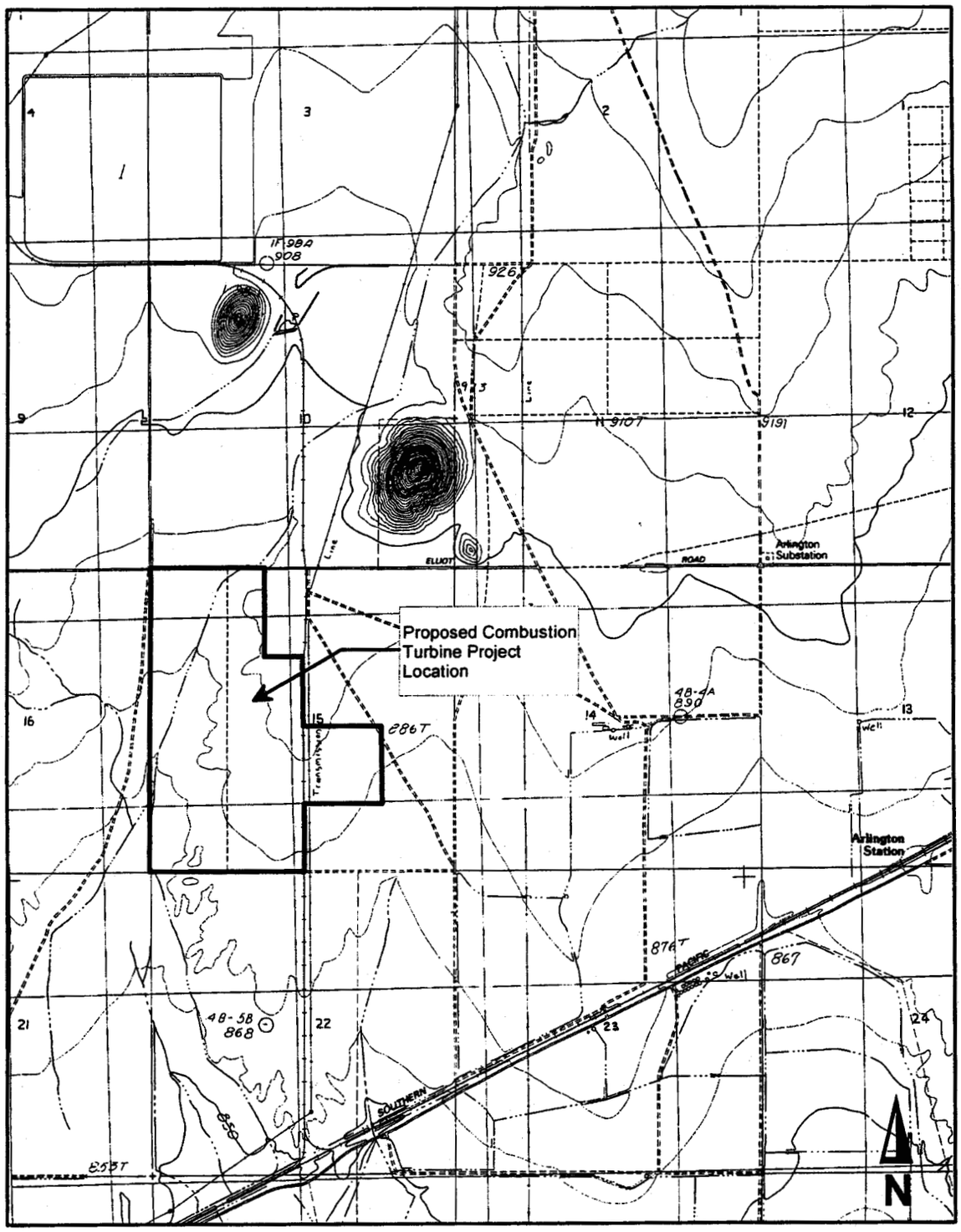
2.1 Project Description

The Project will consist of two 500 MW (nominal) combined-cycle power blocks. Each block will include two combustion turbine generators (CTGs), each directly connected to an electric generator. Exhaust heat from each CTG will be routed to a dedicated heat recovery steam generator (HRSG). Steam produced by the HRSGs will be combined and directed to a common steam turbine generator (STG). The Project will consist of four General Electric Model 7FA or Westinghouse 501F CTGs, four HRSGs, two STGs, two linear mechanical draft cooling towers, and associated support equipment. The HRSGs are also equipped with natural gas fired duct burners that add additional heat input to increase the steam generating capability of the HRSGs as needed. Each CTG/HRSG will have a single exhaust stack. Natural gas will be the only fuel fired in the CTGs and duct burners.

2.2 Project Location and Proximity to Mandatory Class I Areas

The Project is located in the unincorporated community of Arlington, Arizona (Figure 2-1). The site is approximately 40 miles west of Phoenix, and south of Interstate 10. The proposed site consists of a 300-acre rectangular parcel of land south of the Palo Verde Nuclear Station. The improved portion of the site for this Project is expected to cover approximately 35 acres of the total 300 acre site.

The nearest Mandatory Class I areas are the Superstition Wilderness Area, Mazatzal Wilderness Area, and the Pine Mountain Wilderness Area which are located approximately 127 km east-northeast, 132 km northeast, and 135 km northeast of the Project site, respectively. The Project is not expected to significantly impact the aforementioned Class I areas because of its distance



Base Map: 7.5' Quadrangle
Arlington, Arizona

Mesquite Power LLC Proposed Combustion
Turbine Project Location

Figure 2-1

Mesquite.srf

from the areas and the use of clean fuel technology (natural gas) with state-of-the-art pollution control equipment. As discussed in Section 3-3, a preliminary air quality analysis will be conducted for the Class I areas and compared to the applicable significant impact levels. As an outcome of a November 14, 1999 meeting between representatives of Maricopa County, Mesquite, the Federal Land Managers, and Black & Veatch neither a visibility nor regional haze analysis is
required for the Mandatory Class I areas. Mr. Peter Lahm, representing the Federal Land Managers, indicated that because the Project will fire very clean fuel (i.e., natural gas), will employ best available control technology (BACT) to obtain a low NO_x emission rate, and the great distance between the Project site and the Class I areas neither a visibility nor a regional haze analysis is required. Thus, a visibility and regional haze analysis is not expected for the Project.

2.3 Project Emissions

Air emissions sources at the proposed Project will consist of the four CTG/HRSGs, mechanical draft cooling towers, and an emergency diesel fire pump. Representative manufacturer's data and engineering estimates will be used to characterize and quantify the potential to emit (PTE) of the Project from these air emission units. As mentioned in Section 2.1, the Project will consist of four General Electric or Westinghouse CTG. Because a specific CTG manufacturer has not yet been selected, emissions data from two vendors (WEC and GE) will be used in the analysis.

2.4 Local Air Quality Attainment/Nonattainment Status

The air quality in any given area is generally designated as being in attainment for a pollutant if the monitored concentrations of that pollutant are less than the applicable NAAQS. Likewise, a given area is generally classified as nonattainment for a pollutant if the monitored concentrations of that pollutant in the area are above the NAAQS.

A review of the air quality status in the region reveals that the Project site near Arlington, Arizona is in attainment or unclassifiable for all pollutants. The Phoenix area of Maricopa County is, however, classified as a nonattainment area for ozone, carbon monoxide, and particulate matter.

2.5 New Source Review Applicability

The federal Clean Air Act (CAA) NSR provisions are implemented for new major stationary sources and major modifications under two programs; the PSD program outlined in 40 CFR 52.21, and the Nonattainment NSR program outlined in 40 CFR 51 and 52. As noted in Section 2.4, the Project will be located in an attainment area with respect to all pollutants. As such, the PSD program will apply to the Project, which is assumed to be a new major stationary source for one or more regulated pollutant.

The PSD regulations are designed to ensure that the air quality in existing attainment areas does not significantly deteriorate or exceed the NAAQS, while providing a margin for future industrial and commercial growth. PSD regulations apply to major stationary sources and major modifications at existing sources undergoing construction in areas designated as attainment or unclassifiable under Section 107 of the CAA for any criteria pollutant. The primary provisions of the PSD regulations require that new major stationary sources be carefully reviewed prior to construction to ensure compliance with the NAAQS, the applicable PSD air quality increments, and the requirements to apply BACT to minimize the Project's emissions of air pollutants.

A new stationary source is defined as a "major stationary source" if it is classified as any one of the listed major source categories which emits, or has the potential to emit, 100 tons per year (tpy) or more of any regulated pollutant, or 250 tpy or more of any regulated pollutant if the stationary source does not fall under one of the listed major source categories. Because the Project falls into one of the listed major source categories (i.e., fossil fuel fired steam electric plant greater than 250 MBtu/hr), the 100 tpy threshold is applicable to the Project. Because the Project is likely to exceed the 100 tpy threshold for at least one regulated pollutant, the Project will be subject to PSD review. Once the Project becomes applicable to PSD review, PSD applicability will then be determined on a pollutant-by-pollutant basis for the remaining regulated pollutants by comparing the net potential emissions increase of each pollutant against the PSD significant emission rate (i.e., 40 tpy for NO_x, 40 tpy for SO_x, 25 tpy for TSP, 15 tpy for PM_{10}, 100 tpy for CO, and 40 tpy for VOCs). Each regulated pollutant with a PTE above the PSD significant emission rates will be subject to PSD review, including a BACT assessment, ambient air quality impact analysis (AAQIA), and an additional impact analysis.

3.0 Ambient Air Quality Impact Analysis

The following sections discuss the air dispersion modeling methodology and Ambient Air Quality Impact Analysis (AAQIA) that are proposed for those regulated pollutants which are determined to have a PTE greater than the PSD significant emission rate and thus subject to PSD review. The AAQIA will be conducted in accordance with USEPA's air dispersion modeling guidelines (incorporated as Appendix W of 40 CFR 51), as well as a mutually agreed upon modeling methodology initiated by this Workplan.

3.1 Air Dispersion Modeling Methodology

The base elevation at the site location for the Project is approximately 890 ft above mean sea level. The site topography is generally flat, although occasional prominent terrain features (buttes) are expected to exceed stack heights within the domain of the modeling grid. As air dispersion modeling receptors will be located in simple, intermediate, and complex terrain, the Industrial Source Complex Short-Term (ISCST3 Version 99155) air dispersion model is proposed for the AAQIA.

The ISCST3 model is a USEPA approved, steady-state, straight-line gaussian plume model, which may be used to assess pollutant concentrations from a wide variety of sources associated with an industrial source complex. Necessary for this analysis, ISCST3, unlike its predecessors, incorporates the COMPLEX1 dispersion algorithm for determining intermediate and complex terrain concentration impacts in accordance with USEPA guidance.

The ISCST3 air dispersion model will be used in a refined mode (based on the worst-case combination of CTG operating load and ambient temperature, with five years of representative meteorological data) to determine the maximum predicted impact concentrations for the AAQIA. The refined ISCST3 modeling methodology is discussed below.

3.1.1 Model Input and Source Parameters

The AAQIA will be based on the worst-case combination of operating parameters. Manufacturer's data and engineering calculations will be used as inputs in the ISCST3 air dispersion model to determine the maximum predicted ground level concentrations from the Project based on various operating loads, duct firing, and ambient operating temperatures of the CTGs. In a process referred to as "enveloping", each load and operating condition analyzed will be represented

with a set of stack parameters and pollutant emission rates that will be conservatively selected to produce the worst-case plume dispersion conditions and highest model predicted concentrations. These conditions will also consider a range of ambient temperatures that include minimum and maximum temperatures, as well as average annual ambient temperatures.

Enveloping allows multiple operating scenarios to be conservatively considered in an AAQIA, while keeping the actual air dispersion modeling runs to a minimum. However, it is possible that because of the specific characteristics of the sources, this analysis approach could result in overly conservative modeling impacts. In this case, an AAQIA may be performed without enveloping. Regardless of the input source data, actual sequential hourly meteorological data will be used to predict concentrations of each pollutant for each applicable averaging period.

3.1.2 GEP and Building Downwash Evaluation

All on-site buildings and structures, including the combustion turbine housings and HRSGs, will be analyzed to determine the potential to influence the plume dispersion from the CTG/HRSG stacks. The USEPA's Guideline for Determination of Good Engineering Practice Stack Height guidance document will be followed in this evaluation. Structure dimensions and relative locations will be entered into the USEPA's Building Profile Input Program (BPIP) to produce an ISCST3 input file with the proper Huber-Snyder or Schulman-Scire direction specific building downwash parameters. This same program will also determine a good engineering practice (GEP) stack height for each of the CTG/HRSG stacks.

3.1.3 Model Options

The following standard USEPA default regulatory modeling options will be invoked in the ISCST3 model:

- Final plume rise.
- Stack-tip downwash.
- Buoyancy induced dispersion.
- Default vertical wind profile exponents and vertical potential temperature gradient values.
- Calm processing option.
- Terrain elevations will be incorporated.

The USEPA default model options, in addition to the COMPLEX1 algorithm, will be used in the refined level air dispersion modeling runs.

3.1.4 Receptor Grids and Terrain Considerations

The air dispersion modeling receptor locations will be established at appropriate distances to ensure sufficient density and aerial extent to adequately characterize the pattern of pollutant impacts in the area. Specifically, a nested rectangular grid network is proposed that will extend 10 km from the center of the Project. The rectangular grid network will consists of 100 meter spacing out to 1 km, 500 meter spacing from 1 to 5 km, and then 1,000 meter spacing from 5 to 10 km. Receptor spacing at 50 meter intervals will be used along the property line. The receptor grid will be extended as necessary to ensure that the significant impact area is defined, and a 100 meter fine grid will be used around the maximum receptor points. In addition to the receptor grid, discrete receptors will be placed on the peaks of significant (i.e., complex) terrain features within the Project's 10 km nested grid.

Furthermore, discrete receptors will be placed at the closest boundary to the Project of the Phoenix nonattainment areas, Hummingbird Springs, Eagletail Mountains, Signal Mountain, Woolsey Peak, and North Maricopa Mountains Class II Wilderness areas, and the Gila Bend and Gila River Indian Reservations. Extra receptors may be added depending on the size and/or shape of the respective areas. In addition to the nonattainment areas, Class II Wilderness areas, and Indian Reservations, discrete receptors will also be placed at the closest points to the Mandatory Class I areas discussed in Section 2.2.

Receptor terrain elevations will be obtained from 30-meter Digital Elevation Model (DEM) terrain data based on United States Geological Survey (USGS) 7.5-minute digital quadrangles. The elevations will be determined with a method that will locate the maximum terrain elevation near the receptor. This method is similar to the "box" method in which the area considered for each receptor will consist of a "box" with boundaries drawn midway between the particular receptor and the adjacent receptor. This method will ensure that the highest (most conservative) elevations are used for each model receptor. The source receptor elevation will be compared with the actual USGS 7.5-minute quadrangle maps to ensure consistency.

3.1.5 Meteorological Data

The ISCST3 air dispersion model requires input of specific hourly surface and upper-air meteorological data. These data include the wind flow vector, wind speed, ambient temperature, stability category, and the mixing height. Five years (1994-1998) of processed meteorological data were obtained from the Maricopa County Environmental Services Department, Air Quality Division. The meteorological data consists of surface data from the Palo Verde Nuclear Generating Station and upper-air data from the Tucson, Arizona National Weather Service station.

The Palo Verde Nuclear Generating Station is located approximately 3 miles north of the proposed Project location. The elevation, terrain, and surface roughness characteristics at the meteorological station are very similar to the Project site. As such, the meteorological data are considered to be representative of the Project site.

3.1.6 Land Use Dispersion Coefficients

The USEPA's Auer land use method is used to determine whether rural or urban dispersion coefficients are used in the ISCST3 air dispersion model. In this procedure, the land area circumscribed within a 3 km radius of the site is classified as rural or urban using the Auer land use classification method. If rural land use types account for more than 50 percent of the land use area within the 3 km radius, then the rural dispersion coefficient option should be used. Otherwise, the urban coefficients are used.

Based on visual inspection of the USGS 7.5 minute topographic map of the proposed site location, it is conservatively concluded that over 50 percent of the area surrounding the proposed Project may be classified as rural. Accordingly, the rural dispersion modeling option will be used in the ISCST3 model.

3.2 Model Predicted Impacts

Based on the air dispersion modeling methodology outlined in the previous sections, the maximum model predicted ground level concentrations for the worst case operating scenario associated with the Project will be determined for each regulated pollutant and applicable averaging period that is subject to PSD review and for which a significant impact level exists. From the modeling results, the significant impact area, preconstruction monitoring requirements, and the need for a NAAQS and PSD increment consumption analyses will be determined.

3.2.1 PSD Class II Significant Impact Area

The predicted impacts for all PSD significant pollutants on both the 10 km nested grid and the discrete receptors along the nonattainment areas will be compared to the applicable PSD Class II significant impact levels (SILs) (25$\mu g/m^3$ for 3-hour SO_2, 5$\mu g/m^3$ for 24-hour SO_2, 1$\mu g/m^3$ for annual SO_2, 5$\mu g/m^3$ for 24-hour PM, 1$\mu g/m^3$ for annual PM, 1$\mu g/m^3$ for annual NO_x, 2,000$\mu g/m^3$ for 1-hour CO, and 500$\mu g/m^3$ for 8-hour CO). If the model-predicted maximum concentrations are less than the PSD SILs for all pollutants and applicable averaging periods, then no further air dispersion modeling analyses will be performed. However, if the predicted impact of one or more pollutants and applicable averaging periods are greater than the PSD SILs, then a significant impact area will be determined and interactive source modeling will be performed for those pollutants and applicable averaging periods. In this event, additional agency consultation will be requested and an inventory of PSD increment consuming sources and all nearby sources for the NAAQS analysis will be obtained and included as interactive sources in the AAQIA.

3.2.2 Determination of Preconstruction Monitoring Requirements

Existing ambient air quality data will be compared with the PSD significant monitoring concentrations. If ambient air quality data in the area are less than the applicable significant monitoring concentrations, then an exemption from pre-application monitoring requirements will be requested.

If the existing air quality concentration for a given pollutant is equal to or greater than the applicable PSD significant monitoring concentration, then the need for pre-application air quality data will be determined by comparing the pollutant's maximum model predicted concentration from the Project to the applicable PSD significant monitoring concentration. If the Project's maximum model predicted concentration for that pollutant is less than the applicable PSD significant monitoring concentration, then an exemption from pre-application monitoring requirements will be requested for that pollutant.

In the event both the ambient air quality data and maximum model predicted impacts exceed the applicable PSD significant monitoring concentration for a given pollutant, then the existing ambient air quality monitoring network will be evaluated for representativeness of these data to the site location pursuant to requesting a waiver from the pre-application monitoring requirements for that pollutant.

3.2.3 Class II Sensitive Area Analysis

As discussed in Section 3.1.4, receptors will be placed along the closest boundary to the Project of the Class II Wilderness areas and Indian Reservations within 50 km of the Project site. The Class II Wilderness areas to be modeled are Hummingbird Springs, Eagletail Mountains, Signal Mountain, Woolsey Peak, and North Maricopa Mountains. The Indian Reservations that will be included in the modeling are the Gila Bend and Gila River reservations.

3.2.3.1 Ground Level Impacts The Class II sensitive areas will be modeled with the ISCST3 air dispersion model to obtain the maximum ground level impacts at each of the receptors making up the nearest boundaries of these areas. The results from this analysis will be compared with the PSD Class II increment levels.

3.2.3.2 Visibility Analysis A visibility impairment screening analysis will be conducted for the Class II sensitive areas. The analysis will be performed in accordance with EPA's Workbook for Plume Visual Impact Screening and Analysis (EPA-450/4-88-015, September 1988), using the VISCREEN model. In accordance with the Workbook visual screening procedures, the VISCREEN plume visual impact screening model will be used with default worst-case Level-1 visual screening parameters for each sensitive area. If it is determined that a Level-1 analysis is overly conservative, a Level-2 screening analysis with situation-specific input parameters will be conducted for all sensitive areas.

3.2.3.3 Acid Deposition An acid deposition analysis for nitrates and sulfates will be performed for all previously mentioned Class II sensitive areas surrounding the Project site. The analysis will follow the methodology defined in the Interagency Workgroup on Air Quality Modeling (IWAQM) Phase I Report (EPA-454/R-93-015, April 1993).

3.3 Class I Area Impact Analysis

Class I areas are afforded special attention based on their value from a natural, scenic, recreational, or historic perspective. Emission sources subject to PSD review are analyzed to determine their potential for deteriorating the particular properties that make these areas worthy of their Class I or other relative designation. These properties are known as air quality related values (AQRVs),

and typically include such attributes as flora and fauna, visibility, and scenic value.

The Federal Land Manager (FLM) typically establishes indicators and thresholds to measure a source's potential for impacting the AQRV's of a Class I area. These indicators are typically measured by assessing the Project's impact on air quality. The model predicted concentrations at each of the Class I areas will be compared with the respective Class I SILs, which are based on 4 percent of the PSD Class I increments.

3.4 Additional Impact Analysis

Federal PSD regulations require the preparation of an analysis of additional impacts due to construction and operation of a new major stationary source or major modification to an existing major source. The analysis considers impairment to visibility, soils, and vegetation, as well as projected air quality impacts that may occur as the result of general commercial, residential, industrial, and other growth associated with the new major stationary source.

3.4.1 Commercial, Residential, and Industrial Growth

This analysis is typically conducted to predict the amount of commercial, residential, and industrial growth that may result from the operation of a proposed facility, and the effect this growth may have on the ambient air quality. Because the Project is not expected to generate additional commercial, residential or industrial growth in the immediate vicinity of the Project, the effects on ambient air quality due to growth associated with the Project are expected to be insignificant.

3.4.2 Vegetation and Soils

An analysis will be performed to examine the Project's predicted ambient air quality impacts on local soils and vegetation. The secondary NAAQS will serve as a basis for assessing the vegetation and soil impacts.

3.4.3 Visibility

The effects on visibility from the Project on the Class II sensitive areas will be evaluated using the VISCREEN model described previously in Section 3.2.3.2.

APPENDIX F
BPIP OUTPUT FILE

BUILDING PROFILE INPUT PROGRAM (BPIP)
Dated 95086
BREEZE BPIP
PC VERSION (3.0.0)
(C) COPYRIGHT 1994-1998 TRINITY CONSULTANTS, INC.

RUN INFORMATION
****
Building Data File:
Source Info. File:
BPIP Run File: D:\Sempra-PaloVerde\modeling\run20\170ft\downwash.bpi
Output List File: D:\Sempra-PaloVerde\modeling\run20\170ft\downwash.bpo
Output Wake File: D:\Sempra-PaloVerde\modeling\run20\170ft\downwash.WAK
Output EPA File: D:\Sempra-PaloVerde\modeling\run20\170ft\downwash.EPA

Run began on: 1/24/2000 at 9:42:07
****

BREEZE BPIP - D:\Sempra-PaloVerde\modeling\run20\170ft\downwash.bpi

Plant North: 0.00

Calculations for the ISCST3/AERMOD model 36 with radial directions.

Input Buildings: 45

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD1	1	271.27	1	1	27.43	15	326605.200	3691021.100
							326621.400	3691021.100
							326621.400	3691022.900
							326622.800	3691022.900
							326622.800	3691021.100
							326625.900	3691021.100
							326634.000	3691019.100
							326634.000	3691012.900
							326625.900	3691010.900
							326622.800	

3691010.900 326622.700
3691009.100 326621.500
3691009.100 326621.500
3691010.900 326605.300
3691010.900 326605.300
3691021.100

------ Building ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD3	2	271.27	1	7	27.43	6	326634.000	3691019.100
							326638.600	3691019.100
							326647.800	3691018.000
							326647.800	3691014.000
							326638.600	3691012.900
							326634.000	3691012.900

------ Building ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD6	3	271.27	1	13	13.72	4	326647.800	3691019.400
							326655.400	3691019.400
							326655.400	3691012.500
							326647.800	3691012.500

------ Building ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD7	4	271.27	1	19	13.72	8	326655.400	3691019.400
							326671.400	

3691019.400	326675.400
3691022.900	326681.500
3691022.900	326681.500
3691009.100	326675.400
3691009.100	326671.400
3691012.600	326655.400
3691012.600	

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD8	5	271.27	1	25	3.05	4	326655.200	3691028.400
							326666.600	3691028.400
							326666.600	3691024.600
							326655.200	3691024.600

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD9	6	271.27	1	31	0.00	4	326646.100	3691012.200
							326646.100	3690996.100
							326655.200	3690996.100
							326655.200	3691012.200

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD12	7	271.27	1	37	27.43	14	326605.100	3690985.300
							326621.300	3690985.300
							326621.300	

3690987.000	326622.700
3690987.000	326622.700
3690985.500	326633.700
3690983.500	326633.700
3690977.200	326625.800
3690975.400	326622.700
3690975.200	326622.700
3690973.700	326621.300
3690973.700	326621.300
3690975.200	326605.100
3690975.200	326605.100
3690985.300	

------ Building ID	------ #	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD14	8	271.27	1	43	27.43	6	326633.700	3690983.500
							326638.700	3690983.300
							326647.800	3690982.200
							326648.000	3690978.500
							326638.700	3690977.400
							326633.700	3690977.200

------ Building ID	------ #	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD15	9	271.27	1	49	13.72	5	326647.800	3690983.800
							326655.300	3690983.800
							326655.300	3690977.000
							326647.800	3690977.000

326648.100

3690983.800

------ Building ID	#	------ Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD4	10	271.27	1	55	13.72	8	326655.500	3690984.100
							326671.700	3690984.100
							326675.300	3690987.600
							326681.600	3690987.600
							326681.600	3690973.100
							326675.300	3690973.100
							326671.700	3690976.600
							326655.600	3690976.600

------ Building ID	#	------ Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD16	11	271.27	1	61	18.29	24	326556.900	3690933.600
							326559.380	3690933.270
							326561.700	3690932.310
							326563.690	3690930.790
							326565.210	3690928.800
							326566.170	3690926.480
							326566.500	3690924.000
							326566.170	3690921.520
							326565.210	3690919.200
							326563.690	3690917.210
							326561.700	3690915.690
							326559.380	3690914.730
							326556.900	

3690914.400	326554.420
3690914.730	326552.100
3690915.690	326550.110
3690917.210	326548.590
3690919.200	326547.630
3690921.520	326547.300
3690924.000	326547.630
3690926.480	326548.590
3690928.800	326550.110
3690930.790	326552.100
3690932.310	326554.420
3690933.270	

------ Building ------			Tier	Tier	Tier	# of	Corner	
ID	#	Elev. (m)	#	Ref.	hgt	corners	X (m)	Y (m)
BLD17	12	271.27	1	67	12.19	24	326591.300	3690898.600
							326592.930	3690898.390
							326594.450	3690897.760
							326595.750	3690896.750
							326596.760	3690895.450
							326597.390	3690893.930
							326597.600	3690892.300
							326597.390	3690890.670
							326596.760	3690889.150
							326595.750	3690887.850
							326594.450	3690886.840
							326592.930	3690886.210
							326591.300	3690886.000
							326589.670	3690886.210
							326588.150	

3690886.840	326586.850
3690887.850	326585.840
3690889.150	326585.210
3690890.670	326585.000
3690892.300	326585.210
3690893.930	326585.840
3690895.450	326586.850
3690896.750	326588.150
3690897.760	326589.670
3690898.390	

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD24	13	271.27	1	73	10.67	4	326393.500	3690912.200
							326384.100	3690922.100
							326498.000	3691036.000
							326507.500	3691026.300

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD26	14	271.27	1	79	0.00	4	326498.700	3691035.700
							326504.600	3691041.600
							326513.400	3691032.790
							326507.500	3691026.900

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)

BLD27	15	271.27	1	85	10.67	4	326391.300	3690736.400
							326381.400	3690746.300
							326495.900	3690860.200
							326505.200	3690850.400

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD28	16	271.27	1	91	0.00	4	326496.500	3690860.200
							326502.350	3690866.050
							326511.140	3690857.250
							326505.300	3690851.400

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD31	17	271.27	1	97	27.43	14	326605.000	3690841.900
							326621.200	3690841.900
							326621.200	3690843.400
							326622.700	3690843.400
							326622.700	3690841.900
							326625.400	3690841.900
							326633.600	3690840.100
							326633.600	3690833.900
							326625.400	3690831.900
							326622.700	3690831.900
							326622.700	3690830.300
							326621.200	3690830.300
							326621.200	3690831.900

326605.000
3690831.900

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD32	18	271.27	1	103	27.43	6	326633.600	3690839.900
							326638.500	3690839.900
							326647.700	3690838.800
							326647.700	3690835.200
							326638.900	3690833.700
							326633.600	3690833.700

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD35	19	271.27	1	109	0.00	4	326645.900	3690976.300
							326655.000	3690976.300
							326655.000	3690960.500
							326645.900	3690960.500

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD36	20	271.27	1	115	13.72	4	326647.800	3690841.600
							326655.100	3690841.600
							326655.100	3690833.400
							326647.800	3690833.400

------ Building ------ ID	#	Elev.	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X

Y (m) (m)

BLD37	21	271.27	1	121	13.72	8	326655.100	3690840.600
							326671.200	3690840.600
							326676.100	3690844.100
							326681.400	3690844.100
							326681.400	3690829.900
							326676.100	3690829.900
							326671.200	3690833.000
							326655.100	3690833.000

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD38	22	271.27	1	127	0.00	4	326646.100	3690833.000
							326646.100	3690817.000
							326655.500	3690817.000
							326655.500	3690833.000

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD39	23	271.27	1	133	27.43	14	326604.700	3690807.100
							326620.800	3690807.100
							326620.800	3690808.700
							326622.200	3690808.700
							326622.200	3690807.100
							326625.300	3690807.100
							326633.400	3690805.300

3690799.200	326633.400
3690797.200	326625.300
3690797.200	326622.200
3690795.600	326622.200
3690795.600	326620.800
3690797.200	326620.800
3690797.200	326604.700

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates Y (m)	X (m)
BLD40	24	271.27	1	139	27.43	6		
							3690805.300	326633.400
							3690805.300	326638.200
							3690803.900	326647.600
							3690800.200	326647.600
							3690799.000	326638.200
							3690799.000	326633.400

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates Y (m)	X (m)
BLD41	25	271.27	1	145	13.72	4		
							3690805.600	326647.600
							3690805.600	326654.900
							3690798.600	326654.900
							3690798.600	326647.600

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates Y (m)	X (m)
BLD42	26	271.27	1	151	13.72	8		

326654.900

3690805.900

326671.000

3690805.900

326675.000

3690809.200

326681.200

3690809.200

326681.200

3690795.200

326675.000

3690795.200

326671.000

3690798.300

326654.900

3690798.300

------ Building ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD43	27	271.27	1	157	0.00	4	326645.800	3690798.100
							326655.100	3690798.100
							326655.100	3690782.100
							326645.800	3690782.100

------ Building ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD23	28	271.27	1	163	3.05	4	326655.400	3690992.400
							326666.600	3690992.400
							326666.600	3690988.800
							326655.400	3690988.800

------ Building ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD25	29	271.27	1	169	3.05	4	326654.800	3690814.900

326665.800
3690814.900
326665.800
3690811.100
326654.800
3690811.100

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD30	30	271.27	1	175	3.05	4	326655.300	3690848.800
							326666.300	3690848.800
							326666.300	3690845.100
							326655.300	3690845.100

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD5	31	271.27	1	181	6.10	4	326569.300	3690925.100
							326579.500	3690925.100
							326579.500	3690916.600
							326569.300	3690916.600

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD10	32	271.27	1	187	6.10	4	326569.500	3690915.700
							326579.000	3690915.700
							326579.000	3690897.500
							326569.500	3690897.500

------ Building ------ ID	#	Elev.	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X

Y
(m) (m) (m)

BLD11 33 271.27 1 193 6.10 4
326559.700
3690903.500
326569.400
3690903.500
326569.400
3690896.900
326559.700
3690896.900

------ Building ------ Tier Tier Tier # of Corner coordinates
ID # Elev. # Ref. hgt corners X Y
(m) (m) (m)

BLD13 34 271.27 1 199 0.00 4
326648.300
3690767.200
326678.400
3690767.200
326678.400
3690752.300
326648.300
3690752.300

------ Building ------ Tier Tier Tier # of Corner coordinates
ID # Elev. # Ref. hgt corners X Y
(m) (m) (m)

BLD18 35 271.27 1 205 0.00 24
326574.000
3690894.400
326574.880
3690894.280
326575.700
3690893.940
326576.400
3690893.400
326576.940
3690892.700
326577.280
3690891.880
326577.400
3690891.000
326577.280
3690890.120
326576.940
3690889.300
326576.400
3690888.600
326575.700
3690888.060

3690887.720	326574.880
3690887.600	326574.000
3690887.720	326573.120
3690888.060	326572.300
3690888.600	326571.600
3690889.300	326571.060
3690890.120	326570.720
3690891.000	326570.600
3690891.880	326570.720
3690892.700	326571.060
3690893.400	326571.600
3690893.940	326572.300
3690894.280	326573.120

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD20	36	271.27	1	211	10.67	4	326514.300	3690928.200
							326526.700	3690928.200
							326526.700	3690903.600
							326514.300	3690903.600

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD21	37	271.27	1	217	18.29	4	326579.200	3690915.600
							326602.500	3690915.600
							326602.500	3690900.300
							326579.200	3690900.300

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD22	38	271.27	1	223	18.29	4	326633.200	3690944.700
							326682.700	3690944.700
							326682.700	3690915.900
							326633.200	3690915.900

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD33	39	271.27	1	229	18.29	4	326634.700	3690899.700
							326684.200	3690899.700
							326684.200	3690870.400
							326634.700	3690870.400

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD34	40	271.27	1	235	6.10	4	326745.200	3691058.200
							326759.600	3691058.200
							326759.600	3691049.000
							326745.200	3691049.000

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD44	41	271.27	1	241	7.62	4	326557.200	3691018.500

326572.000

3691018.500

326572.000

3691009.500

326557.200

3691009.500

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD45	42	271.27	1	247	7.62	4	326557.200	3690839.300
							326572.400	3690839.300
							326572.400	3690830.400
							326557.200	3690830.400

------ Building ------ ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner coordinates X (m)	Y (m)
BLD2	43	271.27	1	253	18.29	24	326520.800	3690951.200
							326523.210	3690950.880
							326525.450	3690949.950
							326527.380	3690948.480
							326528.850	3690946.550
							326529.780	3690944.310
							326530.100	3690941.900
							326529.780	3690939.490
							326528.850	3690937.250
							326527.380	3690935.320
							326525.450	3690933.850
							326523.210	3690932.920
							326520.800	3690932.600
							326518.390	3690932.920
							326516.150	

3690933.850	326514.220
3690935.320	326512.750
3690937.250	326511.820
3690939.490	326511.500
3690941.900	326511.820
3690944.310	326512.750
3690946.550	326514.220
3690948.480	326516.150
3690949.950	326518.390
3690950.880	

------ Building ------			Tier	Tier	Tier	# of	Corner coordinates	
ID	#	Elev. (m)	#	Ref.	hgt	corners	X (m)	Y (m)
BLD19	44	271.27	1	259	6.10	24		
							326506.500	3690928.600
							326507.660	3690928.450
							326508.750	3690928.000
							326509.680	3690927.280
							326510.400	3690926.350
							326510.850	3690925.260
							326511.000	3690924.100
							326510.850	3690922.940
							326510.400	3690921.850
							326509.680	3690920.920
							326508.750	3690920.200
							326507.660	3690919.750
							326506.500	3690919.600
							326505.340	3690919.750
							326504.250	3690920.200
							326503.320	3690920.920
							326502.600	

Y (m)	X (m)
3690921.850	326502.150
3690922.940	326502.000
3690924.100	326502.150
3690925.260	326502.600
3690926.350	326503.320
3690927.280	326504.250
3690928.000	326505.340
3690928.450	

------ Building ------ coordinates ID	#	Elev. (m)	Tier #	Tier Ref.	Tier hgt	# of corners	Corner
BLD29	45	271.27	1	265	6.10	24	

Y (m)	X (m)
3690913.400	326506.400
3690913.240	326507.640
3690912.760	326508.800
3690911.990	326509.790
3690911.000	326510.560
3690909.840	326511.040
3690908.600	326511.200
3690907.360	326511.040
3690906.200	326510.560
3690905.210	326509.790
3690904.440	326508.800
3690903.960	326507.640
3690903.800	326506.400
3690903.960	326505.160
3690904.440	326504.000
3690905.210	326503.010
3690906.200	326502.240
3690907.360	326501.760
	326501.600

3690908.600

3690909.840

3690911.000

3690911.990

3690912.760

3690913.240

326501.760

326502.240

326503.010

326504.000

326505.160

Input Stacks: 42

Stack #	Stack Name	Stack Height	Stack Elev.	Stack coordinates X (m)	Y (m)
1	SRC1	3.05	281.94	326394.000	3690921.900
2	SRC2	3.05	281.94	326403.400	3690931.500
3	SRC3	3.05	281.94	326412.800	3690941.000
4	SRC4	3.05	281.94	326422.200	3690950.400
5	SRC5	3.05	281.94	326431.800	3690960.000
6	SRC6	3.05	281.94	326441.200	3690969.400
7	SRC7	3.05	281.94	326451.000	3690979.100
8	SRC8	3.05	281.94	326460.300	3690988.600
9	SRC9	3.05	281.94	326470.000	3690997.600
10	SRC10	3.05	281.94	326479.200	3691007.600
11	SRC23	3.05	281.94	326486.300	3690841.000
12	SRC24	3.05	281.94	326496.000	3690850.400
13	SRC22	3.05	281.94	326476.800	3690831.400
14	SRC21	3.05	281.94	326467.400	3690821.900
15	SRC20	3.05	281.94	326457.900	3690812.600
16	SRC19	3.05	281.94	326448.200	3690802.900
17	SRC18	3.05	281.94	326438.900	3690793.400
18	SRC17	3.05	281.94	326429.300	3690783.900
19	SRC16	3.05	281.94	326419.900	3690774.400
20	SRC15	3.05	281.94	326410.500	3690765.100
21	SRC14	3.05	281.94	326400.900	3690755.500
22	SRC13	3.05	281.94	326391.400	3690746.100
23	SRC11	3.05	281.94	326488.800	3691016.600
24	SRC12	3.05	281.94	326498.400	3691026.400
25	100ST1	51.82	271.27	326601.900	3691016.000
26	100ST2	51.82	271.27	326601.900	3690980.400
27	100ST3	51.82	271.27	326601.800	3690836.800
28	100ST4	51.82	271.27	326601.500	3690802.200
29	FWP24	0.30	277.37	326574.700	3690920.400
30	FWPA	0.30	277.37	326574.700	3690920.400
31	ANNST1	51.82	271.27	326601.900	3691016.000
32	ANNST2	51.82	271.27	326601.900	3690980.400
33	ANNST3	51.82	271.27	326601.800	3690836.800
34	ANNST4	51.82	271.27	326601.500	3690802.200
35	85ST1	51.82	271.27	326601.900	3691016.000
36	85ST2	51.82	271.27	326601.900	3690980.400
37	85ST3	51.82	271.27	326601.800	3690836.800
38	85ST4	51.82	271.27	326601.500	3690802.200
39	70ST1	51.82	271.27	326601.900	3691016.000
40	70ST2	51.82	271.27	326601.900	3690980.400
41	70ST3	51.82	271.27	326601.800	3690836.800
42	70ST4	51.82	271.27	326601.500	3690802.200

Stack number: 1 Name: SRC1

Structure producing the greatest GEP stack height within 5L: (73)
Height: 10.67 Width: 123.40 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	10.67	152.08	16.00	S-S	(73)
300	10.67	159.46	16.00	S-S	(73)
310	10.67	162.01	16.00	S-S	(73)
320	10.67	161.51	16.00	S-S	(73)
330	10.67	158.97	16.00	S-S	(73)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 2 Name: SRC2

Structure producing the greatest GEP stack height within 5L: (73)
Height: 10.67 Width: 123.40 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)

20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	10.67	152.08	16.00	S-S	(73)
300	10.67	159.46	16.00	S-S	(73)
310	10.67	162.01	16.00	S-S	(73)
320	10.67	161.51	16.00	S-S	(73)
330	10.67	158.97	16.00	S-S	(73)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 3 Name: SRC3

Structure producing the greatest GEP stack height within 5L: (73)
Height: 10.67 Width: 123.40 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)

140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	10.67	152.08	16.00	S-S	(73)
300	10.67	159.46	16.00	S-S	(73)
310	10.67	162.01	16.00	S-S	(73)
320	10.67	161.51	16.00	S-S	(73)
330	10.67	158.97	16.00	S-S	(73)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 4 Name: SRC4

Structure producing the greatest GEP stack height within 5L: (253)
Height: 18.29 Width: 18.59 GEP: 35.05

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)

260	10.67	103.77	16.00	S-S	(73)
270	18.29	18.60	35.05	S-S	(253)
280	18.29	18.52	35.05	S-S	(253)
290	10.67	152.08	16.00	S-S	(73)
300	10.67	159.46	16.00	S-S	(73)
310	10.67	162.01	16.00	S-S	(73)
320	10.67	161.51	16.00	S-S	(73)
330	10.67	158.97	16.00	S-S	(73)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 5 Name: SRC5

Structure producing the greatest GEP stack height within 5L: (253)
Height: 18.29 Width: 18.51 GEP: 35.05

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	18.29	18.60	35.05	S-S	(253)
280	18.29	18.52	35.05	S-S	(253)
290	18.29	18.53	35.05	S-S	(253)
300	10.67	159.46	16.00	S-S	(73)
310	10.67	162.01	16.00	S-S	(73)
320	10.67	161.51	16.00	S-S	(73)
330	10.67	158.97	16.00	S-S	(73)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 6 Name: SRC6

Structure producing the greatest GEP stack height within 5L: (253)
Height: 18.29 Width: 18.58 GEP: 35.05

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	18.29	18.52	35.05	S-S	(253)
290	18.29	18.53	35.05	S-S	(253)
300	18.29	18.59	35.05	S-S	(253)
310	10.67	162.01	16.00	S-S	(73)
320	10.67	161.51	16.00	S-S	(73)
330	10.67	158.97	16.00	S-S	(73)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 7 Name: SRC7

Structure producing the greatest GEP stack height within 5L: (253)
Height: 18.29 Width: 18.48 GEP: 35.05

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure

10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	18.29	18.53	35.05	S-S	(253)
300	18.29	18.59	35.05	S-S	(253)
310	18.29	18.54	35.05	S-S	(253)
320	10.67	161.51	16.00	S-S	(73)
330	10.67	158.97	16.00	S-S	(73)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 8 Name: SRC8

Structure producing the greatest GEP stack height within 5L: (253)
Height: 18.29 Width: 18.59 GEP: 35.05

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)

130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	10.67	152.08	16.00	S-S	(73)
300	18.29	18.59	35.05	S-S	(253)
310	18.29	18.54	35.05	S-S	(253)
320	18.29	18.54	35.05	S-S	(253)
330	10.67	158.97	16.00	S-S	(73)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 9 Name: SRC9

Structure producing the greatest GEP stack height within 5L: (253)
Height: 18.29 Width: 18.56 GEP: 35.05

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)

250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	10.67	152.08	16.00	S-S	(73)
300	10.67	159.46	16.00	S-S	(73)
310	18.29	18.54	35.05	S-S	(253)
320	18.29	18.54	35.05	S-S	(253)
330	18.29	18.59	35.05	S-S	(253)
340	10.67	151.60	16.00	S-S	(73)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 10 Name: SRC10

Structure producing the greatest GEP stack height within 5L: (253)
Height: 18.29 Width: 18.51 GEP: 35.05

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	10.67	152.08	16.00	S-S	(73)
300	10.67	159.46	16.00	S-S	(73)
310	10.67	162.01	16.00	S-S	(73)
320	18.29	18.54	35.05	S-S	(253)
330	18.29	18.59	35.05	S-S	(253)
340	18.29	18.53	35.05	S-S	(253)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 11 Name: SRC23

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 12 Name: SRC24

Structure producing the greatest GEP stack height within 5L: (133 139)
Height: 27.43 Width: 24.83 GEP: 54.01

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant

Structure

10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	18.29	18.52	35.05	S-S	(253)
200	18.29	18.53	35.05	S-S	(253)
210	18.29	19.19	35.05	S-S	(61)
220	18.29	19.13	35.05	S-S	(61)
230	18.29	19.13	35.05	S-S	(61)
240	18.29	52.92	35.05	S-S	(61 217)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	27.43	20.97	48.22	S-S	(133 139)
300	27.43	24.83	54.01	S-S	(139 133 145)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 13 Name: SRC22

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)

100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 14 Name: SRC21

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)

220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 15 Name: SRC20

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)

340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 16 Name: SRC19

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 17 Name: SRC18

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 18 Name: SRC17

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)

90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 19 Name: SRC16

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)

210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 20 Name: SRC15

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)

330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 21 Name: SRC14

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 22 Name: SRC13

Structure producing the greatest GEP stack height within 5L: (85)
Height: 10.67 Width: 123.80 GEP: 16.00

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.84	16.00	S-S	(85)
20	10.67	80.73	16.00	S-S	(85)
30	10.67	55.16	16.00	S-S	(85)
40	10.67	27.92	16.00	S-S	(85)
50	10.67	27.60	16.00	S-S	(85)
60	10.67	54.91	16.00	S-S	(85)
70	10.67	80.56	16.00	S-S	(85)
80	10.67	103.76	16.00	S-S	(85)
90	10.67	123.80	16.00	S-S	(85)
100	10.67	140.08	16.00	S-S	(85)
110	10.67	152.11	16.00	S-S	(85)
120	10.67	159.51	16.00	S-S	(85)
130	10.67	162.07	16.00	S-S	(85)
140	10.67	161.75	16.00	S-S	(85)
150	10.67	159.26	16.00	S-S	(85)
160	10.67	151.94	16.00	S-S	(85)
170	10.67	140.00	16.00	S-S	(85)
180	10.67	123.80	16.00	S-S	(85)
190	10.67	103.84	16.00	S-S	(85)
200	10.67	80.73	16.00	S-S	(85)
210	10.67	55.16	16.00	S-S	(85)
220	10.67	27.92	16.00	S-S	(85)
230	10.67	27.60	16.00	S-S	(85)
240	10.67	54.91	16.00	S-S	(85)
250	10.67	80.56	16.00	S-S	(85)
260	10.67	103.76	16.00	S-S	(85)
270	10.67	123.80	16.00	S-S	(85)
280	10.67	140.08	16.00	S-S	(85)
290	10.67	152.11	16.00	S-S	(85)
300	10.67	159.51	16.00	S-S	(85)
310	10.67	162.07	16.00	S-S	(85)
320	10.67	161.75	16.00	S-S	(85)
330	10.67	159.26	16.00	S-S	(85)
340	10.67	151.94	16.00	S-S	(85)
350	10.67	140.00	16.00	S-S	(85)
360	10.67	123.80	16.00	S-S	(85)

Stack number: 23 Name: SRC11

Structure producing the greatest GEP stack height within 5L: (253)
Height: 18.29 Width: 18.59 GEP: 35.05

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)

80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)
190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	10.67	152.08	16.00	S-S	(73)
300	10.67	159.46	16.00	S-S	(73)
310	10.67	162.01	16.00	S-S	(73)
320	10.67	161.51	16.00	S-S	(73)
330	18.29	18.59	35.05	S-S	(253)
340	18.29	18.53	35.05	S-S	(253)
350	10.67	139.62	16.00	S-S	(73)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 24 Name: SRC12

Structure producing the greatest GEP stack height within 5L: (43 37)

Height: 27.43 Width: 24.70 GEP: 53.82

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	10.67	103.43	16.00	S-S	(73)
20	10.67	80.32	16.00	S-S	(73)
30	10.67	54.77	16.00	S-S	(73)
40	10.67	27.55	16.00	S-S	(73)
50	10.67	27.67	16.00	S-S	(73)
60	10.67	54.96	16.00	S-S	(73)
70	10.67	80.59	16.00	S-S	(73)
80	10.67	103.77	16.00	S-S	(73)
90	10.67	123.80	16.00	S-S	(73)
100	10.67	140.07	16.00	S-S	(73)
110	10.67	152.08	16.00	S-S	(73)
120	10.67	159.46	16.00	S-S	(73)
130	10.67	162.01	16.00	S-S	(73)
140	10.67	161.51	16.00	S-S	(73)
150	10.67	158.97	16.00	S-S	(73)
160	10.67	151.60	16.00	S-S	(73)
170	10.67	139.62	16.00	S-S	(73)
180	10.67	123.40	16.00	S-S	(73)

190	10.67	103.43	16.00	S-S	(73)
200	10.67	80.32	16.00	S-S	(73)
210	10.67	54.77	16.00	S-S	(73)
220	10.67	27.55	16.00	S-S	(73)
230	10.67	27.67	16.00	S-S	(73)
240	10.67	54.96	16.00	S-S	(73)
250	10.67	80.59	16.00	S-S	(73)
260	10.67	103.77	16.00	S-S	(73)
270	10.67	123.80	16.00	S-S	(73)
280	10.67	140.07	16.00	S-S	(73)
290	27.43	21.18	48.54	S-S	(37 43)
300	27.43	24.70	53.82	S-S	(43 37)
310	10.67	162.01	16.00	S-S	(73)
320	10.67	161.51	16.00	S-S	(73)
330	10.67	158.97	16.00	S-S	(73)
340	18.29	18.53	35.05	S-S	(253)
350	18.29	18.52	35.05	S-S	(253)
360	10.67	123.40	16.00	S-S	(73)

Stack number: 25 Name: 100ST1

Structure producing the greatest GEP stack height within 5L: (1)
Height: 27.43 Width: 28.62 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.57	68.58	H-S	(37)
20	27.43	29.65	68.58	H-S	(37)
30	27.43	29.04	68.58	H-S	(1)
40	27.43	37.20	68.58	H-S	(7 1)
50	27.43	32.82	68.58	H-S	(7 1)
60	27.43	27.45	68.58	H-S	(1 7)
70	27.43	21.24	59.29	H-S	(1 7)
80	27.43	14.86	49.72	ND	(1)
90	27.43	13.80	48.13	ND	(1)
100	27.43	14.86	49.72	ND	(1)
110	27.43	21.21	59.24	H-S	(1 7)
120	27.43	27.41	68.55	H-S	(37 43)
130	27.43	32.76	68.58	H-S	(7 1)
140	27.43	37.12	68.58	H-S	(7 1)
150	27.43	28.92	68.58	H-S	(37)
160	27.43	29.71	68.58	H-S	(37)
170	27.43	29.61	68.58	H-S	(37)
180	27.43	28.60	68.58	H-S	(37)
190	27.43	29.57	68.58	H-S	(37)
200	27.43	29.65	68.58	H-S	(37)
210	27.43	29.04	68.58	H-S	(1)
220	27.43	37.20	68.58	H-S	(7 1)
230	27.43	32.82	68.58	H-S	(7 1)
240	27.43	27.45	68.58	H-S	(1 7)
250	27.43	21.24	59.29	H-S	(1 7)
260	27.43	14.86	49.72	ND	(1)
270	27.43	13.80	48.13	ND	(1)
280	27.43	14.86	49.72	ND	(1)
290	27.43	21.21	59.24	H-S	(1 7)
300	27.43	27.41	68.55	H-S	(43 37)

310	27.43	32.76	68.58	H-S	(7 1)
320	27.43	37.12	68.58	H-S	(7 1)
330	27.43	28.92	68.58	H-S	(37)
340	27.43	29.71	68.58	H-S	(37)
350	27.43	29.61	68.58	H-S	(37)
360	27.43	28.60	68.58	H-S	(37)

Stack number: 26 Name: 100ST2

Structure producing the greatest GEP stack height within 5L: (1)
Height: 27.43 Width: 29.38 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.57	68.58	H-S	(37)
20	27.43	29.65	68.58	H-S	(37)
30	27.43	28.82	68.58	H-S	(37)
40	27.43	37.20	68.58	H-S	(7 1)
50	27.43	32.78	68.58	H-S	(43 37)
60	27.43	27.45	68.58	H-S	(1 7)
70	27.43	21.06	59.03	H-S	(37 43)
80	27.43	14.48	49.15	ND	(37)
90	27.43	13.30	47.38	ND	(37)
100	27.43	14.68	49.45	ND	(37)
110	27.43	21.18	59.21	H-S	(37 43)
120	27.43	27.41	68.55	H-S	(37 43)
130	27.43	32.81	68.58	H-S	(43 37)
140	27.43	37.21	68.58	H-S	(43 37)
150	27.43	28.92	68.58	H-S	(37)
160	27.43	29.71	68.58	H-S	(37)
170	27.43	29.61	68.58	H-S	(37)
180	27.43	28.60	68.58	H-S	(37)
190	27.43	29.57	68.58	H-S	(37)
200	27.43	29.65	68.58	H-S	(37)
210	27.43	28.82	68.58	H-S	(37)
220	27.43	37.20	68.58	H-S	(7 1)
230	27.43	32.78	68.58	H-S	(43 37)
240	27.43	27.45	68.58	H-S	(1 7)
250	27.43	21.06	59.03	H-S	(37 43)
260	27.43	14.48	49.15	ND	(37)
270	27.43	13.30	47.38	ND	(37)
280	27.43	14.68	49.45	ND	(37)
290	27.43	21.18	59.21	H-S	(37 43)
300	27.43	27.41	68.55	H-S	(43 37)
310	27.43	32.81	68.58	H-S	(43 37)
320	27.43	37.21	68.58	H-S	(43 37)
330	27.43	28.92	68.58	H-S	(37)
340	27.43	29.71	68.58	H-S	(37)
350	27.43	29.61	68.58	H-S	(37)
360	27.43	28.60	68.58	H-S	(37)

Stack number: 27 Name: 100ST3

Structure producing the greatest GEP stack height within 5L: (97)
Height: 27.43 Width: 28.46 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.55	68.58	H-S	(97)
20	27.43	29.61	68.58	H-S	(97)
30	27.43	28.77	68.58	H-S	(97)
40	27.43	37.02	68.58	H-S	(103 97)
50	27.43	32.58	68.58	H-S	(103 97)
60	27.43	51.18	68.58	H-S	(97 103 133)
70	27.43	20.90	58.78	H-S	(97 103)
80	27.43	14.50	49.18	ND	(97)
90	27.43	13.10	47.08	ND	(97)
100	27.43	14.40	49.03	ND	(97)
110	27.43	21.09	59.06	H-S	(97 103)
120	27.43	51.60	68.58	H-S	(133 97 139)
130	27.43	32.71	68.58	H-S	(139 133)
140	27.43	37.15	68.58	H-S	(103 97)
150	27.43	28.87	68.58	H-S	(97)
160	27.43	29.68	68.58	H-S	(97)
170	27.43	29.59	68.58	H-S	(97)
180	27.43	28.60	68.58	H-S	(97)
190	27.43	29.55	68.58	H-S	(97)
200	27.43	29.61	68.58	H-S	(97)
210	27.43	28.77	68.58	H-S	(97)
220	27.43	37.02	68.58	H-S	(103 97)
230	27.43	32.58	68.58	H-S	(103 97)
240	27.43	51.18	68.58	H-S	(97 103 133)
250	27.43	20.90	58.78	H-S	(97 103)
260	27.43	14.50	49.18	ND	(97)
270	27.43	13.10	47.08	ND	(97)
280	27.43	14.40	49.03	ND	(97)
290	27.43	21.09	59.06	H-S	(97 103)
300	27.43	51.60	68.58	H-S	(133 97 139)
310	27.43	32.71	68.58	H-S	(139 133)
320	27.43	37.15	68.58	H-S	(103 97)
330	27.43	28.87	68.58	H-S	(97)
340	27.43	29.68	68.58	H-S	(97)
350	27.43	29.59	68.58	H-S	(97)
360	27.43	28.60	68.58	H-S	(97)

Stack number: 28 Name: 100ST4

Structure producing the greatest GEP stack height within 5L: (97)
Height: 27.43 Width: 29.21 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.55	68.58	H-S	(97)

20	27.43	29.61	68.58	H-S	(97)
30	27.43	28.77	68.58	H-S	(97)
40	27.43	37.02	68.58	H-S	(103 97)
50	27.43	32.58	68.58	H-S	(103 97)
60	27.43	51.18	68.58	H-S	(97 103 133)
70	27.43	21.16	59.17	H-S	(133 139)
80	27.43	14.36	48.98	ND	(133)
90	27.43	13.10	47.08	ND	(133)
100	27.43	14.36	48.98	ND	(133)
110	27.43	20.97	58.88	H-S	(133 139)
120	27.43	51.60	68.58	H-S	(133 97 139)
130	27.43	32.71	68.58	H-S	(139 133)
140	27.43	37.17	68.58	H-S	(139 133)
150	27.43	28.90	68.58	H-S	(133)
160	27.43	29.68	68.58	H-S	(97)
170	27.43	29.59	68.58	H-S	(97)
180	27.43	28.60	68.58	H-S	(97)
190	27.43	29.55	68.58	H-S	(97)
200	27.43	29.61	68.58	H-S	(97)
210	27.43	28.77	68.58	H-S	(97)
220	27.43	37.02	68.58	H-S	(103 97)
230	27.43	32.58	68.58	H-S	(103 97)
240	27.43	51.18	68.58	H-S	(97 103 133)
250	27.43	21.16	59.17	H-S	(133 139)
260	27.43	14.36	48.98	ND	(133)
270	27.43	13.10	47.08	ND	(133)
280	27.43	14.36	48.98	ND	(133)
290	27.43	20.97	58.88	H-S	(133 139)
300	27.43	51.60	68.58	H-S	(133 97 139)
310	27.43	32.71	68.58	H-S	(139 133)
320	27.43	37.17	68.58	H-S	(139 133)
330	27.43	28.90	68.58	H-S	(133)
340	27.43	29.68	68.58	H-S	(97)
350	27.43	29.59	68.58	H-S	(97)
360	27.43	28.60	68.58	H-S	(97)

Stack number: 29 Name: FWP24

Structure producing the greatest GEP stack height within 5L: (37)
Height: 27.43 Width: 27.47 GEP: 62.48

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	18.29	19.12	39.62	S-S	(61)
20	18.29	19.12	39.62	S-S	(61)
30	18.29	19.19	39.62	S-S	(61)
40	18.29	19.13	39.62	S-S	(61)
50	18.29	19.13	39.62	S-S	(61)
60	27.43	27.34	62.34	S-S	(37 43)
70	18.29	19.12	39.62	S-S	(61)
80	18.29	19.11	39.62	S-S	(217)
90	18.29	19.20	39.62	S-S	(61)

100	18.29	18.52	39.62	S-S	(253)
110	18.29	18.53	39.62	S-S	(253)
120	18.29	18.59	39.62	S-S	(253)
130	18.29	18.54	39.62	S-S	(253)
140	18.29	19.13	39.62	S-S	(61)
150	18.29	19.19	39.62	S-S	(61)
160	18.29	19.12	39.62	S-S	(61)
170	18.29	19.12	39.62	S-S	(61)
180	18.29	19.20	39.62	S-S	(61)
190	27.43	29.79	62.48	S-S	(1)
200	27.43	29.65	62.48	S-S	(37)
210	27.43	28.82	62.48	S-S	(37)
220	27.43	37.20	62.48	S-S	(7 1)
230	27.43	32.78	62.48	S-S	(43 37)
240	27.43	27.34	62.34	S-S	(37 43)
250	18.29	19.12	39.62	S-S	(61)
260	18.29	19.11	39.62	S-S	(217)
270	18.29	19.20	39.62	S-S	(61)
280	18.29	19.11	39.62	S-S	(217)
290	18.29	19.12	39.62	S-S	(61)
300	18.29	19.19	39.62	S-S	(61)
310	18.29	19.13	39.62	S-S	(61)
320	27.43	37.15	62.48	S-S	(103 97)
330	27.43	28.87	62.48	S-S	(97)
340	27.43	29.68	62.48	S-S	(97)
350	27.43	29.67	62.48	S-S	(133)
360	18.29	19.20	39.62	S-S	(61)

Stack number: 30 Name: FWPA

Structure producing the greatest GEP stack height within 5L: (37)
Height: 27.43 Width: 27.47 GEP: 62.48

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	18.29	19.12	39.62	S-S	(61)
20	18.29	19.12	39.62	S-S	(61)
30	18.29	19.19	39.62	S-S	(61)
40	18.29	19.13	39.62	S-S	(61)
50	18.29	19.13	39.62	S-S	(61)
60	27.43	27.34	62.34	S-S	(37 43)
70	18.29	19.12	39.62	S-S	(61)
80	18.29	19.11	39.62	S-S	(217)
90	18.29	19.20	39.62	S-S	(61)
100	18.29	18.52	39.62	S-S	(253)
110	18.29	18.53	39.62	S-S	(253)
120	18.29	18.59	39.62	S-S	(253)
130	18.29	18.54	39.62	S-S	(253)
140	18.29	19.13	39.62	S-S	(61)
150	18.29	19.19	39.62	S-S	(61)
160	18.29	19.12	39.62	S-S	(61)
170	18.29	19.12	39.62	S-S	(61)
180	18.29	19.20	39.62	S-S	(61)
190	27.43	29.79	62.48	S-S	(1)
200	27.43	29.65	62.48	S-S	(37)
210	27.43	28.82	62.48	S-S	(37)

220	27.43	37.20	62.48	S-S	(7 1)
230	27.43	32.78	62.48	S-S	(43 37)
240	27.43	27.34	62.34	S-S	(37 43)
250	18.29	19.12	39.62	S-S	(61)
260	18.29	19.11	39.62	S-S	(217)
270	18.29	19.20	39.62	S-S	(61)
280	18.29	19.11	39.62	S-S	(217)
290	18.29	19.12	39.62	S-S	(61)
300	18.29	19.19	39.62	S-S	(61)
310	18.29	19.13	39.62	S-S	(61)
320	27.43	37.15	62.48	S-S	(103 97)
330	27.43	28.87	62.48	S-S	(97)
340	27.43	29.68	62.48	S-S	(97)
350	27.43	29.67	62.48	S-S	(133)
360	18.29	19.20	39.62	S-S	(61)

Stack number: 31 Name: ANNST1

Structure producing the greatest GEP stack height within 5L: (1)
Height: 27.43 Width: 28.62 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.57	68.58	H-S	(37)
20	27.43	29.65	68.58	H-S	(37)
30	27.43	29.04	68.58	H-S	(1)
40	27.43	37.20	68.58	H-S	(7 1)
50	27.43	32.82	68.58	H-S	(7 1)
60	27.43	27.45	68.58	H-S	(1 7)
70	27.43	21.24	59.29	H-S	(1 7)
80	27.43	14.86	49.72	ND	(1)
90	27.43	13.80	48.13	ND	(1)
100	27.43	14.86	49.72	ND	(1)
110	27.43	21.21	59.24	H-S	(1 7)
120	27.43	27.41	68.55	H-S	(37 43)
130	27.43	32.76	68.58	H-S	(7 1)
140	27.43	37.12	68.58	H-S	(7 1)
150	27.43	28.92	68.58	H-S	(37)
160	27.43	29.71	68.58	H-S	(37)
170	27.43	29.61	68.58	H-S	(37)
180	27.43	28.60	68.58	H-S	(37)
190	27.43	29.57	68.58	H-S	(37)
200	27.43	29.65	68.58	H-S	(37)
210	27.43	29.04	68.58	H-S	(1)
220	27.43	37.20	68.58	H-S	(7 1)
230	27.43	32.82	68.58	H-S	(7 1)
240	27.43	27.45	68.58	H-S	(1 7)
250	27.43	21.24	59.29	H-S	(1 7)
260	27.43	14.86	49.72	ND	(1)
270	27.43	13.80	48.13	ND	(1)
280	27.43	14.86	49.72	ND	(1)
290	27.43	21.21	59.24	H-S	(1 7)
300	27.43	27.41	68.55	H-S	(43 37)
310	27.43	32.76	68.58	H-S	(7 1)
320	27.43	37.12	68.58	H-S	(7 1)
330	27.43	28.92	68.58	H-S	(37)

340	27.43	29.71	68.58	H-S	(37)
350	27.43	29.61	68.58	H-S	(37)
360	27.43	28.60	68.58	H-S	(37)

Stack number: 32 Name: ANNST2

Structure producing the greatest GEP stack height within 5L: (1)
Height: 27.43 Width: 29.38 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.57	68.58	H-S	(37)
20	27.43	29.65	68.58	H-S	(37)
30	27.43	28.82	68.58	H-S	(37)
40	27.43	37.20	68.58	H-S	(7 1)
50	27.43	32.78	68.58	H-S	(43 37)
60	27.43	27.45	68.58	H-S	(1 7)
70	27.43	21.06	59.03	H-S	(37 43)
80	27.43	14.48	49.15	ND	(37)
90	27.43	13.30	47.38	ND	(37)
100	27.43	14.68	49.45	ND	(37)
110	27.43	21.18	59.21	H-S	(37 43)
120	27.43	27.41	68.55	H-S	(37 43)
130	27.43	32.81	68.58	H-S	(43 37)
140	27.43	37.21	68.58	H-S	(43 37)
150	27.43	28.92	68.58	H-S	(37)
160	27.43	29.71	68.58	H-S	(37)
170	27.43	29.61	68.58	H-S	(37)
180	27.43	28.60	68.58	H-S	(37)
190	27.43	29.57	68.58	H-S	(37)
200	27.43	29.65	68.58	H-S	(37)
210	27.43	28.82	68.58	H-S	(37)
220	27.43	37.20	68.58	H-S	(7 1)
230	27.43	32.78	68.58	H-S	(43 37)
240	27.43	27.45	68.58	H-S	(1 7)
250	27.43	21.06	59.03	H-S	(37 43)
260	27.43	14.48	49.15	ND	(37)
270	27.43	13.30	47.38	ND	(37)
280	27.43	14.68	49.45	ND	(37)
290	27.43	21.18	59.21	H-S	(37 43)
300	27.43	27.41	68.55	H-S	(43 37)
310	27.43	32.81	68.58	H-S	(43 37)
320	27.43	37.21	68.58	H-S	(43 37)
330	27.43	28.92	68.58	H-S	(37)
340	27.43	29.71	68.58	H-S	(37)
350	27.43	29.61	68.58	H-S	(37)
360	27.43	28.60	68.58	H-S	(37)

Stack number: 33 Name: ANNST3

Structure producing the greatest GEP stack height within 5L: (97)
Height: 27.43 Width: 28.46 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.55	68.58	H-S	(97)
20	27.43	29.61	68.58	H-S	(97)
30	27.43	28.77	68.58	H-S	(97)
40	27.43	37.02	68.58	H-S	(103 97)
50	27.43	32.58	68.58	H-S	(103 97)
60	27.43	51.18	68.58	H-S	(97 103 133)
70	27.43	20.90	58.78	H-S	(97 103)
80	27.43	14.50	49.18	ND	(97)
90	27.43	13.10	47.08	ND	(97)
100	27.43	14.40	49.03	ND	(97)
110	27.43	21.09	59.06	H-S	(97 103)
120	27.43	51.60	68.58	H-S	(133 97 139)
130	27.43	32.71	68.58	H-S	(139 133)
140	27.43	37.15	68.58	H-S	(103 97)
150	27.43	28.87	68.58	H-S	(97)
160	27.43	29.68	68.58	H-S	(97)
170	27.43	29.59	68.58	H-S	(97)
180	27.43	28.60	68.58	H-S	(97)
190	27.43	29.55	68.58	H-S	(97)
200	27.43	29.61	68.58	H-S	(97)
210	27.43	28.77	68.58	H-S	(97)
220	27.43	37.02	68.58	H-S	(103 97)
230	27.43	32.58	68.58	H-S	(103 97)
240	27.43	51.18	68.58	H-S	(97 103 133)
250	27.43	20.90	58.78	H-S	(97 103)
260	27.43	14.50	49.18	ND	(97)
270	27.43	13.10	47.08	ND	(97)
280	27.43	14.40	49.03	ND	(97)
290	27.43	21.09	59.06	H-S	(97 103)
300	27.43	51.60	68.58	H-S	(133 97 139)
310	27.43	32.71	68.58	H-S	(139 133)
320	27.43	37.15	68.58	H-S	(103 97)
330	27.43	28.87	68.58	H-S	(97)
340	27.43	29.68	68.58	H-S	(97)
350	27.43	29.59	68.58	H-S	(97)
360	27.43	28.60	68.58	H-S	(97)

Stack number: 34 Name: ANNST4

Structure producing the greatest GEP stack height within 5L: (97)
Height: 27.43 Width: 29.21 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.55	68.58	H-S	(97)
20	27.43	29.61	68.58	H-S	(97)
30	27.43	28.77	68.58	H-S	(97)
40	27.43	37.02	68.58	H-S	(103 97)

50	27.43	32.58	68.58	H-S	(103 97)
60	27.43	51.18	68.58	H-S	(97 103 133)
70	27.43	21.16	59.17	H-S	(133 139)
80	27.43	14.36	48.98	ND	(133)
90	27.43	13.10	47.08	ND	(133)
100	27.43	14.36	48.98	ND	(133)
110	27.43	20.97	58.88	H-S	(133 139)
120	27.43	51.60	68.58	H-S	(133 97 139)
130	27.43	32.71	68.58	H-S	(139 133)
140	27.43	37.17	68.58	H-S	(139 133)
150	27.43	28.90	68.58	H-S	(133)
160	27.43	29.68	68.58	H-S	(97)
170	27.43	29.59	68.58	H-S	(97)
180	27.43	28.60	68.58	H-S	(97)
190	27.43	29.55	68.58	H-S	(97)
200	27.43	29.61	68.58	H-S	(97)
210	27.43	28.77	68.58	H-S	(97)
220	27.43	37.02	68.58	H-S	(103 97)
230	27.43	32.58	68.58	H-S	(103 97)
240	27.43	51.18	68.58	H-S	(97 103 133)
250	27.43	21.16	59.17	H-S	(133 139)
260	27.43	14.36	48.98	ND	(133)
270	27.43	13.10	47.08	ND	(133)
280	27.43	14.36	48.98	ND	(133)
290	27.43	20.97	58.88	H-S	(133 139)
300	27.43	51.60	68.58	H-S	(133 97 139)
310	27.43	32.71	68.58	H-S	(139 133)
320	27.43	37.17	68.58	H-S	(139 133)
330	27.43	28.90	68.58	H-S	(133)
340	27.43	29.68	68.58	H-S	(97)
350	27.43	29.59	68.58	H-S	(97)
360	27.43	28.60	68.58	H-S	(97)

Stack number: 35 Name: 85ST1

Structure producing the greatest GEP stack height within 5L: (1)
Height: 27.43 Width: 28.62 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.57	68.58	H-S	(37)
20	27.43	29.65	68.58	H-S	(37)
30	27.43	29.04	68.58	H-S	(1)
40	27.43	37.20	68.58	H-S	(7 1)
50	27.43	32.82	68.58	H-S	(7 1)
60	27.43	27.45	68.58	H-S	(1 7)
70	27.43	21.24	59.29	H-S	(1 7)
80	27.43	14.86	49.72	ND	(1)
90	27.43	13.80	48.13	ND	(1)
100	27.43	14.86	49.72	ND	(1)
110	27.43	21.21	59.24	H-S	(1 7)
120	27.43	27.41	68.55	H-S	(37 43)

130	27.43	32.76	68.58	H-S	(7 1)
140	27.43	37.12	68.58	H-S	(7 1)
150	27.43	28.92	68.58	H-S	(37)
160	27.43	29.71	68.58	H-S	(37)
170	27.43	29.61	68.58	H-S	(37)
180	27.43	28.60	68.58	H-S	(37)
190	27.43	29.57	68.58	H-S	(37)
200	27.43	29.65	68.58	H-S	(37)
210	27.43	29.04	68.58	H-S	(1)
220	27.43	37.20	68.58	H-S	(7 1)
230	27.43	32.82	68.58	H-S	(7 1)
240	27.43	27.45	68.58	H-S	(1 7)
250	27.43	21.24	59.29	H-S	(1 7)
260	27.43	14.86	49.72	ND	(1)
270	27.43	13.80	48.13	ND	(1)
280	27.43	14.86	49.72	ND	(1)
290	27.43	21.21	59.24	H-S	(1 7)
300	27.43	27.41	68.55	H-S	(43 37)
310	27.43	32.76	68.58	H-S	(7 1)
320	27.43	37.12	68.58	H-S	(7 1)
330	27.43	28.92	68.58	H-S	(37)
340	27.43	29.71	68.58	H-S	(37)
350	27.43	29.61	68.58	H-S	(37)
360	27.43	28.60	68.58	H-S	(37)

Stack number: 36 Name: 85ST2

Structure producing the greatest GEP stack height within 5L: (1)
Height: 27.43 Width: 29.38 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.57	68.58	H-S	(37)
20	27.43	29.65	68.58	H-S	(37)
30	27.43	28.82	68.58	H-S	(37)
40	27.43	37.20	68.58	H-S	(7 1)
50	27.43	32.78	68.58	H-S	(43 37)
60	27.43	27.45	68.58	H-S	(1 7)
70	27.43	21.06	59.03	H-S	(37 43)
80	27.43	14.48	49.15	ND	(37)
90	27.43	13.30	47.38	ND	(37)
100	27.43	14.68	49.45	ND	(37)
110	27.43	21.18	59.21	H-S	(37 43)
120	27.43	27.41	68.55	H-S	(37 43)
130	27.43	32.81	68.58	H-S	(43 37)
140	27.43	37.21	68.58	H-S	(43 37)
150	27.43	28.92	68.58	H-S	(37)
160	27.43	29.71	68.58	H-S	(37)
170	27.43	29.61	68.58	H-S	(37)
180	27.43	28.60	68.58	H-S	(37)
190	27.43	29.57	68.58	H-S	(37)
200	27.43	29.65	68.58	H-S	(37)
210	27.43	28.82	68.58	H-S	(37)
220	27.43	37.20	68.58	H-S	(7 1)
230	27.43	32.78	68.58	H-S	(43 37)
240	27.43	27.45	68.58	H-S	(1 7)

250	27.43	21.06	59.03	H-S	(37 43)
260	27.43	14.48	49.15	ND	(37)
270	27.43	13.30	47.38	ND	(37)
280	27.43	14.68	49.45	ND	(37)
290	27.43	21.18	59.21	H-S	(37 43)
300	27.43	27.41	68.55	H-S	(43 37)
310	27.43	32.81	68.58	H-S	(43 37)
320	27.43	37.21	68.58	H-S	(43 37)
330	27.43	28.92	68.58	H-S	(37)
340	27.43	29.71	68.58	H-S	(37)
350	27.43	29.61	68.58	H-S	(37)
360	27.43	28.60	68.58	H-S	(37)

Stack number: 37 Name: 85ST3

Structure producing the greatest GEP stack height within 5L: (97)
Height: 27.43 Width: 28.46 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.55	68.58	H-S	(97)
20	27.43	29.61	68.58	H-S	(97)
30	27.43	28.77	68.58	H-S	(97)
40	27.43	37.02	68.58	H-S	(103 97)
50	27.43	32.58	68.58	H-S	(103 97)
60	27.43	51.18	68.58	H-S	(97 103 133)
70	27.43	20.90	58.78	H-S	(97 103)
80	27.43	14.50	49.18	ND	(97)
90	27.43	13.10	47.08	ND	(97)
100	27.43	14.40	49.03	ND	(97)
110	27.43	21.09	59.06	H-S	(97 103)
120	27.43	51.60	68.58	H-S	(133 97 139)
130	27.43	32.71	68.58	H-S	(139 133)
140	27.43	37.15	68.58	H-S	(103 97)
150	27.43	28.87	68.58	H-S	(97)
160	27.43	29.68	68.58	H-S	(97)
170	27.43	29.59	68.58	H-S	(97)
180	27.43	28.60	68.58	H-S	(97)
190	27.43	29.55	68.58	H-S	(97)
200	27.43	29.61	68.58	H-S	(97)
210	27.43	28.77	68.58	H-S	(97)
220	27.43	37.02	68.58	H-S	(103 97)
230	27.43	32.58	68.58	H-S	(103 97)
240	27.43	51.18	68.58	H-S	(97 103 133)
250	27.43	20.90	58.78	H-S	(97 103)
260	27.43	14.50	49.18	ND	(97)
270	27.43	13.10	47.08	ND	(97)
280	27.43	14.40	49.03	ND	(97)
290	27.43	21.09	59.06	H-S	(97 103)
300	27.43	51.60	68.58	H-S	(133 97 139)
310	27.43	32.71	68.58	H-S	(139 133)
320	27.43	37.15	68.58	H-S	(103 97)

330	27.43	28.87	68.58	H-S	(97)
340	27.43	29.68	68.58	H-S	(97)
350	27.43	29.59	68.58	H-S	(97)
360	27.43	28.60	68.58	H-S	(97)

Stack number: 38 Name: 85ST4

Structure producing the greatest GEP stack height within 5L: (97)
Height: 27.43 Width: 29.21 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.55	68.58	H-S	(97)
20	27.43	29.61	68.58	H-S	(97)
30	27.43	28.77	68.58	H-S	(97)
40	27.43	37.02	68.58	H-S	(103 97)
50	27.43	32.58	68.58	H-S	(103 97)
60	27.43	51.18	68.58	H-S	(97 103 133)
70	27.43	21.16	59.17	H-S	(133 139)
80	27.43	14.36	48.98	ND	(133)
90	27.43	13.10	47.08	ND	(133)
100	27.43	14.36	48.98	ND	(133)
110	27.43	20.97	58.88	H-S	(133 139)
120	27.43	51.60	68.58	H-S	(133 97 139)
130	27.43	32.71	68.58	H-S	(139 133)
140	27.43	37.17	68.58	H-S	(139 133)
150	27.43	28.90	68.58	H-S	(133)
160	27.43	29.68	68.58	H-S	(97)
170	27.43	29.59	68.58	H-S	(97)
180	27.43	28.60	68.58	H-S	(97)
190	27.43	29.55	68.58	H-S	(97)
200	27.43	29.61	68.58	H-S	(97)
210	27.43	28.77	68.58	H-S	(97)
220	27.43	37.02	68.58	H-S	(103 97)
230	27.43	32.58	68.58	H-S	(103 97)
240	27.43	51.18	68.58	H-S	(97 103 133)
250	27.43	21.16	59.17	H-S	(133 139)
260	27.43	14.36	48.98	ND	(133)
270	27.43	13.10	47.08	ND	(133)
280	27.43	14.36	48.98	ND	(133)
290	27.43	20.97	58.88	H-S	(133 139)
300	27.43	51.60	68.58	H-S	(133 97 139)
310	27.43	32.71	68.58	H-S	(139 133)
320	27.43	37.17	68.58	H-S	(139 133)
330	27.43	28.90	68.58	H-S	(133)
340	27.43	29.68	68.58	H-S	(97)
350	27.43	29.59	68.58	H-S	(97)
360	27.43	28.60	68.58	H-S	(97)

Stack number: 39 Name: 70ST1

Structure producing the greatest GEP stack height within 5L: (1)
Height: 27.43 Width: 28.62 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.57	68.58	H-S	(37)
20	27.43	29.65	68.58	H-S	(37)
30	27.43	29.04	68.58	H-S	(1)
40	27.43	37.20	68.58	H-S	(7 1)
50	27.43	32.82	68.58	H-S	(7 1)
60	27.43	27.45	68.58	H-S	(1 7)
70	27.43	21.24	59.29	H-S	(1 7)
80	27.43	14.86	49.72	ND	(1)
90	27.43	13.80	48.13	ND	(1)
100	27.43	14.86	49.72	ND	(1)
110	27.43	21.21	59.24	H-S	(1 7)
120	27.43	27.41	68.55	H-S	(37 43)
130	27.43	32.76	68.58	H-S	(7 1)
140	27.43	37.12	68.58	H-S	(7 1)
150	27.43	28.92	68.58	H-S	(37)
160	27.43	29.71	68.58	H-S	(37)
170	27.43	29.61	68.58	H-S	(37)
180	27.43	28.60	68.58	H-S	(37)
190	27.43	29.57	68.58	H-S	(37)
200	27.43	29.65	68.58	H-S	(37)
210	27.43	29.04	68.58	H-S	(1)
220	27.43	37.20	68.58	H-S	(7 1)
230	27.43	32.82	68.58	H-S	(7 1)
240	27.43	27.45	68.58	H-S	(1 7)
250	27.43	21.24	59.29	H-S	(1 7)
260	27.43	14.86	49.72	ND	(1)
270	27.43	13.80	48.13	ND	(1)
280	27.43	14.86	49.72	ND	(1)
290	27.43	21.21	59.24	H-S	(1 7)
300	27.43	27.41	68.55	H-S	(43 37)
310	27.43	32.76	68.58	H-S	(7 1)
320	27.43	37.12	68.58	H-S	(7 1)
330	27.43	28.92	68.58	H-S	(37)
340	27.43	29.71	68.58	H-S	(37)
350	27.43	29.61	68.58	H-S	(37)
360	27.43	28.60	68.58	H-S	(37)

Stack number: 40 Name: 70ST2

Structure producing the greatest GEP stack height within 5L: (1)
Height: 27.43 Width: 29.38 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.57	68.58	H-S	(37)
20	27.43	29.65	68.58	H-S	(37)
30	27.43	28.82	68.58	H-S	(37)

40	27.43	37.20	68.58	H-S	(7 1)
50	27.43	32.78	68.58	H-S	(43 37)
60	27.43	27.45	68.58	H-S	(1 7)
70	27.43	21.06	59.03	H-S	(37 43)
80	27.43	14.48	49.15	ND	(37)
90	27.43	13.30	47.38	ND	(37)
100	27.43	14.68	49.45	ND	(37)
110	27.43	21.18	59.21	H-S	(37 43)
120	27.43	27.41	68.55	H-S	(37 43)
130	27.43	32.81	68.58	H-S	(43 37)
140	27.43	37.21	68.58	H-S	(43 37)
150	27.43	28.92	68.58	H-S	(37)
160	27.43	29.71	68.58	H-S	(37)
170	27.43	29.61	68.58	H-S	(37)
180	27.43	28.60	68.58	H-S	(37)
190	27.43	29.57	68.58	H-S	(37)
200	27.43	29.65	68.58	H-S	(37)
210	27.43	28.82	68.58	H-S	(37)
220	27.43	37.20	68.58	H-S	(7 1)
230	27.43	32.78	68.58	H-S	(43 37)
240	27.43	27.45	68.58	H-S	(1 7)
250	27.43	21.06	59.03	H-S	(37 43)
260	27.43	14.48	49.15	ND	(37)
270	27.43	13.30	47.38	ND	(37)
280	27.43	14.68	49.45	ND	(37)
290	27.43	21.18	59.21	H-S	(37 43)
300	27.43	27.41	68.55	H-S	(43 37)
310	27.43	32.81	68.58	H-S	(43 37)
320	27.43	37.21	68.58	H-S	(43 37)
330	27.43	28.92	68.58	H-S	(37)
340	27.43	29.71	68.58	H-S	(37)
350	27.43	29.61	68.58	H-S	(37)
360	27.43	28.60	68.58	H-S	(37)

Stack number: 41 Name: 70ST3

Structure producing the greatest GEP stack height within 5L: (97)
Height: 27.43 Width: 28.46 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.55	68.58	H-S	(97)
20	27.43	29.61	68.58	H-S	(97)
30	27.43	28.77	68.58	H-S	(97)
40	27.43	37.02	68.58	H-S	(103 97)
50	27.43	32.58	68.58	H-S	(103 97)
60	27.43	51.18	68.58	H-S	(97 103 133)
70	27.43	20.90	58.78	H-S	(97 103)
80	27.43	14.50	49.18	ND	(97)
90	27.43	13.10	47.08	ND	(97)
100	27.43	14.40	49.03	ND	(97)
110	27.43	21.09	59.06	H-S	(97 103)
120	27.43	51.60	68.58	H-S	(133 97 139)
130	27.43	32.71	68.58	H-S	(139 133)

140	27.43	37.15	68.58	H-S	(103 97)
150	27.43	28.87	68.58	H-S	(97)
160	27.43	29.68	68.58	H-S	(97)
170	27.43	29.59	68.58	H-S	(97)
180	27.43	28.60	68.58	H-S	(97)
190	27.43	29.55	68.58	H-S	(97)
200	27.43	29.61	68.58	H-S	(97)
210	27.43	28.77	68.58	H-S	(97)
220	27.43	37.02	68.58	H-S	(103 97)
230	27.43	32.58	68.58	H-S	(103 97)
240	27.43	51.18	68.58	H-S	(97 103 133)
250	27.43	20.90	58.78	H-S	(97 103)
260	27.43	14.50	49.18	ND	(97)
270	27.43	13.10	47.08	ND	(97)
280	27.43	14.40	49.03	ND	(97)
290	27.43	21.09	59.06	H-S	(97 103)
300	27.43	51.60	68.58	H-S	(133 97 139)
310	27.43	32.71	68.58	H-S	(139 133)
320	27.43	37.15	68.58	H-S	(103 97)
330	27.43	28.87	68.58	H-S	(97)
340	27.43	29.68	68.58	H-S	(97)
350	27.43	29.59	68.58	H-S	(97)
360	27.43	28.60	68.58	H-S	(97)

Stack number: 42 Name: 70ST4

Structure producing the greatest GEP stack height within 5L: (97)
Height: 27.43 Width: 29.21 GEP: 68.58

Direction Specific Building Downwash

Degree	Height	Width	GEP	Method	Dominant Structure
10	27.43	29.55	68.58	H-S	(97)
20	27.43	29.61	68.58	H-S	(97)
30	27.43	28.77	68.58	H-S	(97)
40	27.43	37.02	68.58	H-S	(103 97)
50	27.43	32.58	68.58	H-S	(103 97)
60	27.43	51.18	68.58	H-S	(97 103 133)
70	27.43	21.16	59.17	H-S	(133 139)
80	27.43	14.36	48.98	ND	(133)
90	27.43	13.10	47.08	ND	(133)
100	27.43	14.36	48.98	ND	(133)
110	27.43	20.97	58.88	H-S	(133 139)
120	27.43	51.60	68.58	H-S	(133 97 139)
130	27.43	32.71	68.58	H-S	(139 133)
140	27.43	37.17	68.58	H-S	(139 133)
150	27.43	28.90	68.58	H-S	(133)
160	27.43	29.68	68.58	H-S	(97)
170	27.43	29.59	68.58	H-S	(97)
180	27.43	28.60	68.58	H-S	(97)
190	27.43	29.55	68.58	H-S	(97)
200	27.43	29.61	68.58	H-S	(97)
210	27.43	28.77	68.58	H-S	(97)

220	27.43	37.02	68.58	H-S	(103 97)
230	27.43	32.58	68.58	H-S	(103 97)
240	27.43	51.18	68.58	H-S	(97 103 133)
250	27.43	21.16	59.17	H-S	(133 139)
260	27.43	14.36	48.98	ND	(133)
270	27.43	13.10	47.08	ND	(133)
280	27.43	14.36	48.98	ND	(133)
290	27.43	20.97	58.88	H-S	(133 139)
300	27.43	51.60	68.58	H-S	(133 97 139)
310	27.43	32.71	68.58	H-S	(139 133)
320	27.43	37.17	68.58	H-S	(139 133)
330	27.43	28.90	68.58	H-S	(133)
340	27.43	29.68	68.58	H-S	(97)
350	27.43	29.59	68.58	H-S	(97)
360	27.43	28.60	68.58	H-S	(97)

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Run ended on: 1/24/2000 at 9:42:38
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Notes:
1) A structure refers to a single tier,combined tiers, or groups of both.
Wherever combined tiers or groups of tiers apply, BREEZE WAKE/BPIP lists
the tiers that comprise the structure.
2) L is the lesser of the height or maximumprojected width (width) of a structure.
3) GEP is an acronym for Good Engineering Practice.
4) The greatest GEP stack height within 5L is the greatest GEP stack height
calculated for the structure within 5L of a stack in any direction.
Calculations are made at 1/4 degree increments from 0 to 359.75 degrees.
5) If the direction-specific heights and widths are set to zero, then the
stack is assumed to be unaffected by building downwash in that direction.
6) The dominant structure is the structure producing the greatest GEP stack
height in a specific direction.
7) These are the wake-effect calculation methods:
a) Schulman and Scire (S-S).
Applies if the stack height is less than the dominant structure height (Hb) plus half the lesser of the dominant structure height
or width (L). The dominant structure is used to define the direction-specific height and width.
ISC2 performs an additional check using the gradual plume rise due to momentum alone at a distance of two structure heights downwind.
If the plume height given by the sum of the physical stack height and
momentum rise is greater than the structure height plus two times
the lesser of the structure height or width (Hb + 2L), then the plume
is assumed to be unaffected by the building wake. Otherwise,

the
plume is affected by the building wake.

b) Huber and Snyder (H-S).
Applies if the stack height is less than the dominant structure height (Hb) plus 1.5 times the lesser of the dominant structure height or width (Hb + 1.5L). The structure producing the greatest GEP stack height is used to define the direction-specific height and width.
ISC2 performs an additional check using the gradual plume rise due to momentum alone at a distance of two structure heights downwind.
If the plume height given by the sum of the physical stack height and momentum rise is greater than the structure height plus 1.5 times the lesser of the structure height or width (Hb + 1.5L), the plume is assumed to be unaffected by the building wake. Otherwise, the plume is affected by the building wake.

c) No Downwash (ND).
Applies if the stack height is greater than the dominant structure height plus 1.5 times the lesser of the dominant structure height and width (Hb + 1.5L).

8) In some cases, though the direction specific downwash table indicates ND for certain directions, the .WAK file might contain building heights and widths for those directions. This inconsistency in the BPIP program does not affect model results as ISC2 is capable of distinguishing between the different downwash regimes and correctly identifying directions where no downwash occurs.

9) In the direction specific building downwash table, dominant structure refers to tiers and not buildings. Though buildings are numbered consecutively, the first tier in each building is numbered in increments of six, because each building may have up to six tiers. For example, if building 1 has five tiers, building 2, three tiers and building 3, one tier, their tier numbers are as follows: Building 1 has tiers numbered 1 through 5, building 2 has tiers numbered 7, 8 and 9 and building 3 has tier numbered 13.

APPENDIX G
AAQIA MODELING RESULTS

Table G-1
Air Dispersion Modeling Predicted Impacts for the Project
General Electric Turbines/HRSGs

Year	Load	NO_x Annual[a] (µg/m³)	PM_{10} Annual[a] (µg/m³)	PM_{10} 24 Hour[a] (µg/m³)	CO 1 Hour (µg/m³)	CO 8 Hour (µg/m³)
1994	100[b]	2.19	3.62	21.69	186.97	27.99
	75			16.20	186.97	20.20
	50			19.79	186.97	20.34
1995	100[b]	1.97	3.25	20.70	479.69	23.07
	75			15.80	479.69	17.32
	50			19.55	479.69	17.74
1996	100[b]	2.37	3.95	23.41	85.98	26.48
	75			18.04	81.11	19.76
	50			21.85	81.11	20.34
1997	100[b]	2.11	3.48	32.28	441.00	34.72
	75			24.29	441.00	25.50
	50			29.19	441.00	25.76
1998	100[b]	1.98	3.26	22.50	100.07	34.25
	75			17.01	100.07	25.31
	50			20.34	100.07	26.11

[a]Underlined values indicate and exceedance of the PSD Class II Significant Impact Levels.

[b]100 percent load represents full load operation.

Table G-2
Air Dispersion Modeling Predicted Impacts for the Project
Westinghouse Turbines/HRSGs

Year	Load	NO_x	PM_{10}		CO	
		Annual[a] ($\mu g/m^3$)	Annual[a] ($\mu g/m^3$)	24 Hour[a] ($\mu g/m^3$)	1 Hour ($\mu g/m^3$)	8 Hour ($\mu g/m^3$)
1994	100[b]	2.22	3.29	19.76	186.97	28.25
	75			11.37	186.97	16.98
	50			11.65	186.97	16.90
1995	100[b]	1.99	2.96	18.93	479.69	23.10
	75			11.17	479.69	13.93
	50			11.45	479.69	13.94
1996	100[b]	2.39	3.59	21.36	85.64	26.72
	75			12.50	81.11	16.27
	50			13.04	81.11	16.36
1997	100[b]	2.13	3.16	29.50	441.00	35.12
	75			17.13	441.00	21.29
	50			17.52	441.00	21.23
1998	100[b]	2.00	2.97	20.66	100.07	34.44
	75			12.05	100.07	20.60
	50			12.25	100.07	20.78

[a]Underlined values indicate and exceedance of the PSD Class II Significant Impact Levels.

[b]100 percent load represents full load operation.

APPENDIX H
NAAQS PREDICTED IMPACTS

Table H-1
NAAQS Predicted Impacts for NO_x

Year	General Electric			Westinghouse		
	NO_x Annual Impact[a,b] ($\mu g/m^3$)	Location		NO_x Annual Impact[a,b] ($\mu g/m^3$)	Location	
		UTM-E (m)	UTM-N (m)		UTM-E (m)	UTM-N (m)
1994	61.53	327711.5	3691769	61.55	327711.5	3691769
1995	61.16	327711.5	3691769	61.18	327711.5	3691769
1996	61.40	327711.5	3691769	61.42	327711.5	3691769
1997	61.13	327711.5	3691769	61.16	327711.5	3691769
1998	61.16	327711.5	3691769	61.18	327711.5	3691769

[a]Annual impacts represent full load operation at the average annual temperature of 73° F.

[b]Impacts are the sum of the Project's impacts, inventory impacts, and a background value of 58 $\mu g/m^3$.

Table H-2
NAAQS Predicted Impacts for PM_{10} Annual Averaging Period

Year	General Electric			Westinghouse		
	PM_{10} Annual Impact[a,b] ($\mu g/m^3$)	Location		PM_{10} Annual Impact[a,b] ($\mu g/m^3$)	Location	
		UTM-E (m)	UTM-N (m)		UTM-E (m)	UTM-N (m)
1994	25.96	327711.5	3691769	25.62	327711.5	3691769
1995	25.27	327711.5	3691769	24.98	327711.5	3691769
1996	25.69	327711.5	3691769	25.32	327711.5	3691769
1997	25.28	327711.5	3691769	24.96	327711.5	3691769
1998	25.24	327711.5	3691769	24.95	327711.5	3691769

[a]Annual impacts represent full load operation at the average annual temperature of 73° F.

[b]Impacts are the sum of the Project's impacts, inventory impacts, and a background value of 20 $\mu g/m^3$.

Table H-3
NAAQS Predicted Impacts for PM_{10} 24 hour Averaging Period
General Electric

Load	PM_{10} 24 hour Impact[a,b] ($\mu g/m^3$)	UTM East (m)	UTM North (m)
100[c]	94.76	327711.5	3691769
75	89.90	327711.5	3691769
50	92.92	327711.5	3691769

[a]Impacts are the sum of the project impacts, inventory impacts, and a background value of 70 $\mu g/m^3$.

[b]High sixth high values over the 5 year period.

[c]100 percent load represents full load operation.

Table H-4
NAAQS Predicted Impacts for PM_{10} 24 hour Averaging Period
Westinghouse

Load	PM_{10} 24 hour Impact[a,b] ($\mu g/m^3$)	UTM East (m)	UTM North (m)
100[c]	93.00	327711.5	3691769
85	86.69	327711.5	3691769
70	86.69	327711.5	3691769

[a]Impacts are the sum of the project impacts, inventory impacts, and a background value of 70 $\mu g/m^3$.

[b]High sixth high values over the 5 year period.

[c]100 percent load represents full load operation.

APPENDIX I
INCREMENT MODELING RESULTS

Table I-1 Increment Air Dispersion Modeling Impacts for NO_x						
	General Electric			Westinghouse		
Year	NO_x Annual Impact* ($\mu g/m^3$)	Location		NO_x Annual Impact* ($\mu g/m^3$)	Location	
		UTM-E (m)	UTM-N (m)		UTM-E (m)	UTM-N (m)
1994	3.53	327711.5	3691769	3.55	327711.5	3691769
1995	3.16	327711.5	3691769	3.18	327711.5	3691769
1996	3.40	327711.5	3691769	3.42	327711.5	3691769
1997	3.13	327711.5	3691769	3.16	327711.5	3691769
1998	3.16	327711.5	3691769	3.18	327711.5	3691769

*Annual impacts represent full load operation at the average annual temperature of 73° F.

Table I-2
Increment Air Dispersion Modeling Impacts for PM_{10} Annual Averaging Period

Year	General Electric			Westinghouse		
	PM_{10} Annual Impact* ($\mu g/m^3$)	Location		PM_{10} Annual Impact* ($\mu g/m^3$)	Location	
		UTM-E (m)	UTM-N (m)		UTM-E (m)	UTM-N (m)
1994	5.96	327711.5	3691769	5.62	327711.5	3691769
1995	5.27	327711.5	3691769	4.98	327711.5	3691769
1996	5.69	327711.5	3691769	5.32	327711.5	3691769
1997	5.28	327711.5	3691769	4.96	327711.5	3691769
1998	5.24	327711.5	3691769	4.95	327711.5	3691769

*Annual impacts represent full load operation at the average annual temperature of 73° F.

Table I-3
Increment Air Dispersion Modeling Impacts for PM_{10} 24 hour Averaging Period
General Electric

Load	PM_{10} 24 hour Impact[a] ($\mu g/m^3$)	UTM East (m)	UTM North (m)
100[b]	24.76	327711.5	3691769
75	19.90	327711.5	3691769
50	22.92	327711.5	3691769

[a]High sixth high values over the 5 year period.

[b]100 percent load represents full load operation.

Table I-4
Increment Air Dispersion Modeling Impacts for PM_{10} 24 hour Averaging Period
Westinghouse

Load	PM_{10} 24 hour Impact[a] ($\mu g/m^3$)	UTM East (m)	UTM North (m)
100[b]	23.00	327711.5	3691769
85	16.69	327711.5	3691769
70	16.69	327711.5	3691769

[a]High sixth high values over the 5 year period.

[b]100 percent load represents full load operation.

APPENDIX J
ADDITIONAL IMPACT ANALYSIS

VISCREEN Level-1 Output

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Big Horn Mountain

*** Level-1 Screening ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	32.13 km
Min. Source-Class I Distance:	32.13 km
Max. Source-Class I Distance:	47.83 km
Plume-Source-Observer Angle:	11.25 degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	148.	47.8	21.	2.00	7.732*	.05	.126*
SKY	140.	148.	47.8	21.	2.00	2.003*	.05	-.077*
TERRAIN	10.	84.	32.1	84.	2.00	12.295*	.05	.107*
TERRAIN	140.	84.	32.1	84.	2.00	1.286	.05	.027

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	23.635*	.05	.400*
SKY	140.	0.	1.0	168.	2.00	5.949*	.05	-.206*
TERRAIN	10.	0.	1.0	168.	2.00	26.571*	.05	.302*
TERRAIN	140.	0.	1.0	168.	2.00	9.514*	.05	.285*

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Eagletail Mountain

*** Level-1 Screening ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	33.19 km
Min. Source-Class I Distance:	33.19 km
Max. Source-Class I Distance:	61.70 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	145.	47.3	24.	2.00	7.334*	.05	.121*
SKY	140.	145.	47.3	24.	2.00	1.958	.05	-.074*
TERRAIN	10.	84.	33.2	84.	2.00	11.864*	.05	.104*
TERRAIN	140.	84.	33.2	84.	2.00	1.246	.05	.027

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	23.075*	.05	.385*
SKY	140.	0.	1.0	168.	2.00	5.764*	.05	-.199*
TERRAIN	10.	0.	1.0	168.	2.00	25.645*	.05	.291*
TERRAIN	140.	0.	1.0	168.	2.00	9.199*	.05	.275*

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Gila Bend Indian Reserva

*** Level-1 Screening ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	35.32 km
Min. Source-Class I Distance:	35.32 km
Max. Source-Class I Distance:	42.76 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	128.	42.8	40.	2.00	6.138*	.05	.106*
SKY	140.	128.	42.8	40.	2.00	1.887	.05	-.065*
TERRAIN	10.	84.	35.3	84.	2.00	11.069*	.05	.099*
TERRAIN	140.	84.	35.3	84.	2.00	1.174	.05	.026

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	21.983*	.05	.357*
SKY	140.	0.	1.0	168.	2.00	5.413*	.05	-.184*
TERRAIN	10.	0.	1.0	168.	2.00	23.893*	.05	.269*
TERRAIN	140.	0.	1.0	168.	2.00	8.602*	.05	.256*

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Gila River Indian Reserv

*** Level-1 Screening ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04	ppm
Background Visual Range:	110.00	km
Source-Observer Distance:	53.19	km
Min. Source-Class I Distance:	53.19	km
Max. Source-Class I Distance:	132.33	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	140.	71.1	29.	2.00	3.420*	.05	.053*
SKY	140.	140.	71.1	29.	2.00	.803	.05	-.032
TERRAIN	10.	84.	53.2	84.	2.00	5.611*	.05	.055*
TERRAIN	140.	84.	53.2	84.	2.00	.636	.05	.017

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	169.	2.64	14.232*	.05	.190*
SKY	140.	0.	1.0	169.	2.00	3.207*	.05	-.098*
TERRAIN	10.	0.	1.0	169.	2.49	13.415*	.05	.141*
TERRAIN	140.	0.	1.0	169.	2.00	4.947*	.05	.137*

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Hummingbird Springs

*** Level-1 Screening ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04	ppm
Background Visual Range:	110.00	km
Source-Observer Distance:	32.13	km
Min. Source-Class I Distance:	32.13	km
Max. Source-Class I Distance:	49.78	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	150.	49.8	19.	2.00	7.708*	.05	.123*
SKY	140.	150.	49.8	19.	2.00	1.922	.05	-.075*
TERRAIN	10.	84.	32.1	84.	2.00	12.295*	.05	.107*
TERRAIN	140.	84.	32.1	84.	2.00	1.286	.05	.027

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	23.635*	.05	.400*
SKY	140.	0.	1.0	168.	2.00	5.949*	.05	-.206*
TERRAIN	10.	0.	1.0	168.	2.00	26.571*	.05	.302*
TERRAIN	140.	0.	1.0	168.	2.00	9.514*	.05	.285*

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: North Maricopa Mountains

*** Level-1 Screening ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04	ppm
Background Visual Range:	110.00	km
Source-Observer Distance:	32.76	km
Min. Source-Class I Distance:	32.76	km
Max. Source-Class I Distance:	51.49	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	145.	46.7	24.	2.00	7.479*	.05	.124*
SKY	140.	145.	46.7	24.	2.00	2.009*	.05	-.076*
TERRAIN	10.	84.	32.8	84.	2.00	12.036*	.05	.105*
TERRAIN	140.	84.	32.8	84.	2.00	1.262	.05	.027

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	23.301*	.05	.391*
SKY	140.	0.	1.0	168.	2.00	5.838*	.05	-.202*
TERRAIN	10.	0.	1.0	168.	2.00	26.016*	.05	.295*
TERRAIN	140.	0.	1.0	168.	2.00	9.326*	.05	.279*

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Signal Mountain

*** Level-1 Screening ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	14.89 km
Min. Source-Class I Distance:	14.89 km
Max. Source-Class I Distance:	25.10 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	153.	25.1	15.	2.00	14.742*	.05	.262*
SKY	140.	153.	25.1	15.	2.00	4.678*	.05	-.160*
TERRAIN	10.	84.	14.9	84.	2.00	25.729*	.05	.178*
TERRAIN	140.	84.	14.9	84.	2.00	2.676*	.05	.038

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	35.114*	.05	.732*
SKY	140.	1.	1.0	168.	2.00	10.521*	.05	-.377*
TERRAIN	10.	1.	1.0	168.	2.00	49.757*	.05	.563*
TERRAIN	140.	1.	1.0	168.	2.00	17.324*	.05	.498*

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Woolsey Peak

*** Level-1 Screening ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04	ppm
Background Visual Range:	110.00	km
Source-Observer Distance:	15.32	km
Min. Source-Class I Distance:	15.32	km
Max. Source-Class I Distance:	32.76	km
Plume-Source-Observer Angle:	11.25	degrees
Stability: 6		
Wind Speed: 1.00 m/s		

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	159.	32.8	10.	2.00	16.567*	.05	.276*
SKY	140.	159.	32.8	10.	2.00	4.406*	.05	-.169*
TERRAIN	10.	159.	32.8	10.	2.00	27.855*	.05	.299*
TERRAIN	140.	159.	32.8	10.	2.00	6.410*	.05	.177*

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	34.747*	.05	.721*
SKY	140.	1.	1.0	168.	2.00	10.346*	.05	-.371*
TERRAIN	10.	1.	1.0	168.	2.00	48.883*	.05	.554*
TERRAIN	140.	1.	1.0	168.	2.00	17.030*	.05	.492*

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Big Horn Mountain

*** Level-1 Screening ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04	ppm
Background Visual Range:	110.00	km
Source-Observer Distance:	32.13	km
Min. Source-Class I Distance:	32.13	km
Max. Source-Class I Distance:	47.83	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	148.	47.8	21.	2.00	7.422*	.05	.119*
SKY	140.	148.	47.8	21.	2.00	1.966	.05	-.074*
TERRAIN	10.	84.	32.1	84.	2.00	11.762*	.05	.102*
TERRAIN	140.	84.	32.1	84.	2.00	1.222	.05	.026

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	23.353*	.05	.394*
SKY	140.	0.	1.0	168.	2.00	5.856*	.05	-.203*
TERRAIN	10.	0.	1.0	168.	2.00	26.337*	.05	.299*
TERRAIN	140.	0.	1.0	168.	2.00	9.357*	.05	.280*

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Eagletail Mountain

*** Level-1 Screening ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	33.19 km
Min. Source-Class I Distance:	33.19 km
Max. Source-Class I Distance:	61.70 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	145.	47.3	24.	2.00	7.034*	.05	.114*
SKY	140.	145.	47.3	24.	2.00	1.927	.05	-.071*
TERRAIN	10.	84.	33.2	84.	2.00	11.348*	.05	.099*
TERRAIN	140.	84.	33.2	84.	2.00	1.184	.05	.026

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	22.800*	.05	.379*
SKY	140.	0.	1.0	168.	2.00	5.675*	.05	-.196*
TERRAIN	10.	0.	1.0	168.	2.00	25.416*	.05	.288*
TERRAIN	140.	0.	1.0	168.	2.00	9.048*	.05	.270*

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Gila Bend Indian Reserva

*** Level-1 Screening ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04	ppm
Background Visual Range:	110.00	km
Source-Observer Distance:	35.32	km
Min. Source-Class I Distance:	35.32	km
Max. Source-Class I Distance:	42.76	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 6
Wind Speed: 1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	128.	42.8	40.	2.00	5.866*	.05	.099*
SKY	140.	128.	42.8	40.	2.00	1.872	.05	-.062*
TERRAIN	10.	84.	35.3	84.	2.00	10.581*	.05	.094*
TERRAIN	140.	84.	35.3	84.	2.00	1.115	.05	.025

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	21.719*	.05	.352*
SKY	140.	0.	1.0	168.	2.00	5.330*	.05	-.182*
TERRAIN	10.	0.	1.0	168.	2.00	23.674*	.05	.266*
TERRAIN	140.	0.	1.0	168.	2.00	8.462*	.05	.251*

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Gila River Indian Reserv

*** Level-1 Screening ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	53.19 km
Min. Source-Class I Distance:	53.19 km
Max. Source-Class I Distance:	132.33 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	140.	71.1	29.	2.00	3.270*	.05	.050
SKY	140.	140.	71.1	29.	2.00	.782	.05	-.031
TERRAIN	10.	84.	53.2	84.	2.00	5.340*	.05	.052*
TERRAIN	140.	84.	53.2	84.	2.00	.603	.05	.016

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	169.	2.64	14.048*	.05	.187*
SKY	140.	0.	1.0	169.	2.00	3.162*	.05	-.097*
TERRAIN	10.	0.	1.0	169.	2.49	13.270*	.05	.140*
TERRAIN	140.	0.	1.0	169.	2.00	4.873*	.05	.135*

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Hummingbird Springs

*** Level-1 Screening ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	32.13 km
Min. Source-Class I Distance:	32.13 km
Max. Source-Class I Distance:	49.78 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	150.	49.8	19.	2.00	7.401*	.05	.116*
SKY	140.	150.	49.8	19.	2.00	1.881	.05	-.073*
TERRAIN	10.	84.	32.1	84.	2.00	11.762*	.05	.102*
TERRAIN	140.	84.	32.1	84.	2.00	1.222	.05	.026

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	23.353*	.05	.394*
SKY	140.	0.	1.0	168.	2.00	5.856*	.05	-.203*
TERRAIN	10.	0.	1.0	168.	2.00	26.337*	.05	.299*
TERRAIN	140.	0.	1.0	168.	2.00	9.357*	.05	.280*

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: North Maricopa Mountains

*** Level-1 Screening ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	32.76 km
Min. Source-Class I Distance:	32.76 km
Max. Source-Class I Distance:	51.49 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	145.	46.7	24.	2.00	7.174*	.05	.117*
SKY	140.	145.	46.7	24.	2.00	1.977	.05	-.073*
TERRAIN	10.	84.	32.8	84.	2.00	11.513*	.05	.100*
TERRAIN	140.	84.	32.8	84.	2.00	1.199	.05	.026

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	23.023*	.05	.385*
SKY	140.	0.	1.0	168.	2.00	5.748*	.05	-.199*
TERRAIN	10.	0.	1.0	168.	2.00	25.785*	.05	.292*
TERRAIN	140.	0.	1.0	168.	2.00	9.172*	.05	.274*

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Signal Mountain

*** Level-1 Screening ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	14.89 km
Min. Source-Class I Distance:	14.89 km
Max. Source-Class I Distance:	25.10 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	153.	25.1	15.	2.00	14.209*	.05	.248*
SKY	140.	153.	25.1	15.	2.00	4.641*	.05	-.155*
TERRAIN	10.	84.	14.9	84.	2.00	24.801*	.05	.170*
TERRAIN	140.	84.	14.9	84.	2.00	2.541*	.05	.036

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	34.653*	.05	.719*
SKY	140.	1.	1.0	168.	2.00	10.352*	.05	-.372*
TERRAIN	10.	1.	1.0	168.	2.00	49.426*	.05	.558*
TERRAIN	140.	1.	1.0	168.	2.00	16.996*	.05	.487*

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Woolsey Peak

*** Level-1 Screening ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	110.00 km
Source-Observer Distance:	15.32 km
Min. Source-Class I Distance:	15.32 km
Max. Source-Class I Distance:	32.76 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 1.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	159.	32.8	10.	2.00	16.059*	.05	.262*
SKY	140.	159.	32.8	10.	2.00	4.321*	.05	-.164*
TERRAIN	10.	159.	32.8	10.	2.00	27.078*	.05	.291*
TERRAIN	140.	159.	32.8	10.	2.00	6.162*	.05	.170*

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	34.294*	.05	.709*
SKY	140.	1.	1.0	168.	2.00	10.180*	.05	-.366*
TERRAIN	10.	1.	1.0	168.	2.00	48.555*	.05	.550*
TERRAIN	140.	1.	1.0	168.	2.00	16.709*	.05	.481*

VISCREEN Level-2 Output

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Big Horn Mountain

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	32.13 km
Min. Source-Class I Distance:	32.13 km
Max. Source-Class I Distance:	47.83 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	3
Wind Speed:	5.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	148.	47.8	21.	9.04	.020	.16	.000
SKY	140.	148.	47.8	21.	3.75	.009	.16	-.000
TERRAIN	10.	84.	32.1	84.	10.61	.013	.27	.000
TERRAIN	140.	84.	32.1	84.	4.62	.003	.27	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	.498	.05	-.002
SKY	140.	0.	1.0	168.	2.00	.223	.05	-.007
TERRAIN	10.	0.	1.0	168.	2.00	.557	.05	.007
TERRAIN	140.	0.	1.0	168.	2.00	.208	.05	.006

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Eagletail Mountain

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	33.19 km
Min. Source-Class I Distance:	33.19 km
Max. Source-Class I Distance:	61.70 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 4	
Wind Speed: 5.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	140.	44.4	29.	2.02	.130	.05	-.000
SKY	140.	140.	44.4	29.	2.00	.062	.05	-.001
TERRAIN	10.	84.	33.2	84.	2.49	.071	.06	.001
TERRAIN	140.	84.	33.2	84.	2.00	.017	.06	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	.886	.05	-.003
SKY	140.	0.	1.0	168.	2.00	.398	.05	-.014
TERRAIN	10.	0.	1.0	168.	2.00	1.026	.05	.014
TERRAIN	140.	0.	1.0	168.	2.00	.376	.05	.011

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Gila Bend Indian Reserva

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	35.32 km
Min. Source-Class I Distance:	35.32 km
Max. Source-Class I Distance:	42.76 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 5	
Wind Speed: 2.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	128.	42.8	40.	2.00	.599	.05	-.001
SKY	140.	128.	42.8	40.	2.00	.289	.05	-.005
TERRAIN	10.	84.	35.3	84.	2.00	.322	.05	.003
TERRAIN	140.	84.	35.3	84.	2.00	.081	.05	.001

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	1.983	.05	-.004
SKY	140.	0.	1.0	168.	2.00	.969	.05	-.039
TERRAIN	10.	0.	1.0	168.	2.00	3.062*	.05	.041
TERRAIN	140.	0.	1.0	168.	2.00	.954	.05	.032

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Gila River Indian Res.

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	53.19 km
Min. Source-Class I Distance:	53.19 km
Max. Source-Class I Distance:	132.33 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 5	
Wind Speed: 4.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	120.	61.3	49.	2.00	.190	.05	-.000
SKY	140.	120.	61.3	49.	2.00	.090	.05	-.002
TERRAIN	10.	84.	53.2	84.	2.00	.090	.05	.001
TERRAIN	140.	84.	53.2	84.	2.00	.026	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	169.	2.00	.440	.05	-.002
SKY	140.	0.	1.0	169.	2.00	.279	.05	-.012
TERRAIN	10.	0.	1.0	169.	2.00	.874	.05	.012
TERRAIN	140.	0.	1.0	169.	2.00	.288	.05	.011

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Hummingbird Springs

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	32.13 km
Min. Source-Class I Distance:	32.13 km
Max. Source-Class I Distance:	49.78 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 4	
Wind Speed: 5.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	145.	45.8	24.	2.00	.134	.05	-.000
SKY	140.	145.	45.8	24.	2.00	.063	.05	-.001
TERRAIN	10.	84.	32.1	84.	2.50	.075	.06	.001
TERRAIN	140.	84.	32.1	84.	2.00	.018	.06	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	.946	.05	-.003
SKY	140.	0.	1.0	168.	2.00	.424	.05	-.014
TERRAIN	10.	0.	1.0	168.	2.00	1.076	.05	.014
TERRAIN	140.	0.	1.0	168.	2.00	.398	.05	.011

Visual Effects Screening Analysis for
Source: PaloVerde GE Machines
Class I Area: North Maricopa Mountains

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	32.76 km
Min. Source-Class I Distance:	32.76 km
Max. Source-Class I Distance:	51.49 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 5	
Wind Speed: 3.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	140.	43.8	29.	2.00	.453	.05	-.001
SKY	140.	140.	43.8	29.	2.00	.215	.05	-.004
TERRAIN	10.	84.	32.8	84.	2.00	.238	.05	.002
TERRAIN	140.	84.	32.8	84.	2.00	.057	.05	.001

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	2.008*	.05	-.007
SKY	140.	0.	1.0	168.	2.00	.912	.05	-.033
TERRAIN	10.	0.	1.0	168.	2.00	2.433*	.05	.033
TERRAIN	140.	0.	1.0	168.	2.00	.869	.05	.026

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Signal Mountain

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09	ppm
Background Visual Range:	102.90	km
Source-Observer Distance:	14.89	km
Min. Source-Class I Distance:	14.89	km
Max. Source-Class I Distance:	25.10	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 6
Wind Speed: 3.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	153.	25.1	15.	2.00	2.065*	.05	-.004
SKY	140.	153.	25.1	15.	2.00	.995	.05	-.019
TERRAIN	10.	84.	14.9	84.	2.00	1.145	.05	.007
TERRAIN	140.	84.	14.9	84.	2.00	.165	.05	.001

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	6.830*	.05	-.008
SKY	140.	1.	1.0	168.	2.00	3.247*	.05	-.084*
TERRAIN	10.	1.	1.0	168.	2.00	8.420*	.05	.085*
TERRAIN	140.	1.	1.0	168.	2.00	2.768*	.05	.044

Visual Effects Screening Analysis for
Source: PaloVerde GE machines
Class I Area: Woolsey Peak

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	15.32	G	/S
NOx (as NO2)	11.20	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	15.32 km
Min. Source-Class I Distance:	15.32 km
Max. Source-Class I Distance:	32.76 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	5
Wind Speed:	2.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	27.2	14.	2.00	1.668	.05	-.003
SKY	140.	155.	27.2	14.	2.00	.796	.05	-.016
TERRAIN	10.	159.	32.8	10.	2.00	1.592	.05	.017
TERRAIN	140.	159.	32.8	10.	2.00	.648	.05	.010

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	6.623*	.05	-.009
SKY	140.	1.	1.0	168.	2.00	3.134*	.05	-.081*
TERRAIN	10.	1.	1.0	168.	2.00	8.012*	.05	.082*
TERRAIN	140.	1.	1.0	168.	2.00	2.684*	.05	.044

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Big Horn Mountain

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	32.13 km
Min. Source-Class I Distance:	32.13 km
Max. Source-Class I Distance:	47.83 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	3
Wind Speed:	5.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	148.	47.8	21.	9.04	.021	.16	.000
SKY	140.	148.	47.8	21.	3.75	.010	.16	-.000
TERRAIN	10.	84.	32.1	84.	10.61	.013	.27	.000
TERRAIN	140.	84.	32.1	84.	4.62	.003	.27	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	.519	.05	-.002
SKY	140.	0.	1.0	168.	2.00	.231	.05	-.007
TERRAIN	10.	0.	1.0	168.	2.00	.547	.05	.007
TERRAIN	140.	0.	1.0	168.	2.00	.216	.05	.006

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Eagletail Mountain

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	33.19 km
Min. Source-Class I Distance:	33.19 km
Max. Source-Class I Distance:	61.70 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 4	
Wind Speed: 5.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	140.	44.4	29.	2.02	.137	.05	-.000
SKY	140.	140.	44.4	29.	2.00	.065	.05	-.001
TERRAIN	10.	84.	33.2	84.	2.49	.068	.06	.001
TERRAIN	140.	84.	33.2	84.	2.00	.018	.06	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	.920	.05	-.003
SKY	140.	0.	1.0	168.	2.00	.412	.05	-.014
TERRAIN	10.	0.	1.0	168.	2.00	1.005	.05	.014
TERRAIN	140.	0.	1.0	168.	2.00	.387	.05	.011

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Gila Bend Indian Reserva

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09	ppm
Background Visual Range:	102.90	km
Source-Observer Distance:	35.32	km
Min. Source-Class I Distance:	35.32	km
Max. Source-Class I Distance:	42.76	km
Plume-Source-Observer Angle:	11.25	degrees

Stability: 5
Wind Speed: 2.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	128.	42.8	40.	2.00	.631	.05	-.001
SKY	140.	128.	42.8	40.	2.00	.304	.05	-.005
TERRAIN	10.	84.	35.3	84.	2.00	.307	.05	.003
TERRAIN	140.	84.	35.3	84.	2.00	.085	.05	.001

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	1.969	.05	-.005
SKY	140.	0.	1.0	168.	2.00	.950	.05	-.038
TERRAIN	10.	0.	1.0	168.	2.00	2.932*	.05	.039
TERRAIN	140.	0.	1.0	168.	2.00	.932	.05	.031

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Gila River Indian Res.

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	53.19 km
Min. Source-Class I Distance:	53.19 km
Max. Source-Class I Distance:	132.33 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 5	
Wind Speed: 4.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	120.	61.3	49.	2.00	.200	.05	-.000
SKY	140.	120.	61.3	49.	2.00	.095	.05	-.002
TERRAIN	10.	84.	53.2	84.	2.00	.087	.05	.001
TERRAIN	140.	84.	53.2	84.	2.00	.027	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	169.	2.00	.449	.05	-.003
SKY	140.	0.	1.0	169.	2.00	.277	.05	-.012
TERRAIN	10.	0.	1.0	169.	2.00	.846	.05	.012
TERRAIN	140.	0.	1.0	169.	2.00	.283	.05	.011

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Hummingbird Springs

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	32.13 km
Min. Source-Class I Distance:	32.13 km
Max. Source-Class I Distance:	49.78 km
Plume-Source-Observer Angle:	11.25 degrees

Stability: 4
Wind Speed: 5.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	145.	45.8	24.	2.00	.141	.05	-.000
SKY	140.	145.	45.8	24.	2.00	.066	.05	-.001
TERRAIN	10.	84.	32.1	84.	2.50	.071	.06	.001
TERRAIN	140.	84.	32.1	84.	2.00	.019	.06	.000

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	.984	.05	-.004
SKY	140.	0.	1.0	168.	2.00	.439	.05	-.014
TERRAIN	10.	0.	1.0	168.	2.00	1.055	.05	.014
TERRAIN	140.	0.	1.0	168.	2.00	.411	.05	.011

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: North Maricopa Mountains

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	32.76 km
Min. Source-Class I Distance:	32.76 km
Max. Source-Class I Distance:	51.49 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 5	
Wind Speed: 3.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	140.	43.8	29.	2.00	.476	.05	-.001
SKY	140.	140.	43.8	29.	2.00	.226	.05	-.004
TERRAIN	10.	84.	32.8	84.	2.00	.227	.05	.002
TERRAIN	140.	84.	32.8	84.	2.00	.060	.05	.001

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	0.	1.0	168.	2.00	2.077*	.05	-.008
SKY	140.	0.	1.0	168.	2.00	.938	.05	-.033
TERRAIN	10.	0.	1.0	168.	2.00	2.378*	.05	.032
TERRAIN	140.	0.	1.0	168.	2.00	.890	.05	.026

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Signal Mountain

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.5	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	14.89 km
Min. Source-Class I Distance:	14.89 km
Max. Source-Class I Distance:	25.10 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 6	
Wind Speed: 3.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	153.	25.1	15.	2.00	2.173*	.05	-.005
SKY	140.	153.	25.1	15.	2.00	1.044	.05	-.019
TERRAIN	10.	84.	14.9	84.	2.00	1.085	.05	.006
TERRAIN	140.	84.	14.9	84.	2.00	.172	.05	.001

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	6.850*	.05	-.010
SKY	140.	1.	1.0	168.	2.00	3.245*	.05	-.081*
TERRAIN	10.	1.	1.0	168.	2.00	8.097*	.05	.081*
TERRAIN	140.	1.	1.0	168.	2.00	2.760*	.05	.043

Visual Effects Screening Analysis for
Source: PaloVerde WES machines
Class I Area: Woolsey Peak

*** User-selected Screening Scenario Results ***

Input Emissions for

Particulates	14.52	G	/S
NOx (as NO2)	11.88	G	/S
Primary NO2	.00	G	/S
Soot	.00	G	/S
Primary SO4	.00	G	/S

PARTICLE CHARACTERISTICS

	Density	Diameter
Primary Part.	2.8	9
Soot	2.0	1
Sulfate	1.5	4

Transport Scenario Specifications:

Background Ozone:	.09 ppm
Background Visual Range:	102.90 km
Source-Observer Distance:	15.32 km
Min. Source-Class I Distance:	15.32 km
Max. Source-Class I Distance:	32.76 km
Plume-Source-Observer Angle:	11.25 degrees
Stability: 5	
Wind Speed: 2.00 m/s	

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	155.	27.2	14.	2.00	1.744	.05	-.004
SKY	140.	155.	27.2	14.	2.00	.829	.05	-.015
TERRAIN	10.	159.	32.8	10.	2.00	1.492	.05	.015
TERRAIN	140.	159.	32.8	10.	2.00	.672	.05	.009

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	1.	1.0	168.	2.00	6.595*	.05	-.012
SKY	140.	1.	1.0	168.	2.00	3.100*	.05	-.074*
TERRAIN	10.	1.	1.0	168.	2.00	7.115*	.05	.072*
TERRAIN	140.	1.	1.0	168.	2.00	2.636*	.05	.039

Nitrate Deposition Calculation

Example Nitrate Deposition Calculation:

Modeled NO_x 24 hour impact = 0.1976 $\mu g/m^3$

Conversion of NO_x to HNO_3 = (NO_x) x 1.37 = HNO_3
(0.1976) x 1.37 = 0.2707

Conversion from a 24 hour rate to a total rate
= (24 hour impact) x (number of seconds in averaging time)
= (0.2707) x (86,400s/24 hours) = 23,389.52 $\mu g/m^3$

Conversion to deposition units = (total rate) x (deposition velocity for HNO_3)
= (23,389.52) x (0.05 m/s) = 1169.48 $\mu g/m^2/s$

Conversion to kg/hectacre = (deposition impact) x (10^{-5})
= (1169.48) x (10^{-5}) = 0.01 kg/hectare

Modeling Files

All necessary and required original modeling files, including revisions, if any, supporting the Mesquite Generating Station Prevention of Significant Deterioration and Title V Air Permit Application were filed with the Maricopa County Environmental Services Department - Air Quality Division (ESDAQD).

The Maricopa County Environmental Services Department - Air Quality Division may be contacted at:

Maricopa County, Arizona
Environmental Services Department
Air Quality Division
1001 North Central Avenue, Suite 200
Phoenix, Arizona 85004-1942
Phone: (602) 506-1202
Fax: (602) 506-6985

BLACK & VEATCH

8400 Ward Parkway
P.O. Box 8405
Kansas City, Missouri 64114

Tel: (913) 458-2000

Black & Veatch Corporation

Mesquite Power, LLC
Mesquite Generating Station

B&V Project 96210.0020
March 22, 2000

Mr. Robert Arpino
Maricopa County Environmental Services Department
Air Quality Division
1001 N. Central Ave.
Suite 200
Phoenix, AZ 85004-1942

Subject: Response to IT's Protocol Comments

Dear Mr. Arpino:

On behalf of Mesquite Power, LLC, please find the attached response to the protocol comments from IT Corporation. We believe that all of the comments have been properly addressed. In addition, extra information has been inserted to ensure that every point in the ADEQ Protocol Checklist has been covered.

If you have any questions, please don't hesitate to call me at (913) 458-8269.

Very truly yours,

BLACK & VEATCH

William G. Collins
Permitting/Compliance Project Manager

cgd

Enclosure

cc:	M. Swartz	Sempra Energy Resources
	C. Sterling	Sempra Energy Resources
	P. Allard	SA&B
	R. Felty	IT Corporation
	K. Kading	IT Corporation
	E. Valis	IT Corporation
	S. Bohning	EPA Region 9
	D. Lieb	Maricopa County Environmental Services Department – Air Quality Division

Addendum

Introduction

This Addendum is in response to comments issued by Ed Valis of IT Corporation on behalf of Maricopa County Environmental Services Department – Air Quality Division (ESDAQD) for the Air Quality Impact Analysis Workplan For The Mesquite Generating Station submitted by Mesquite Power, LLC. Each comment is addressed by restating the comment received, and then presenting the response. Attachments, which are referenced in the responses, are included at the end of the Addendum.

Several areas of deficiency were addressed in the comments, including the absence of modeling parameters and results. It is the purpose of this Addendum to the Workplan to resolve these issues in accordance with the recommendations of Ed Valis and Maricopa County ESDAQD. In addition to the responses, included for ease of review are the comments and recommendations as well as an Arizona Department of Environmental Quality (ADEQ) checklist for a refined modeling protocol. Also included in the Addendum is an analysis/discussion intended to satisfy and address the need for possible pre-application monitoring of ozone for the facility. As a result of this discussion, Mesquite Power, LLC is requesting a waiver from conducting a full ozone impact analysis.

Note that additional information beyond that which addresses the specific comments has been included in this Addendum. This additional information is located after the comment/response portion of the Addendum. For example, information to address ozone transport is included. This additional information has been provided as a supplement with the purpose of making the Workplan/Addendum as complete as possible.

Comments on Ambient Air Quality Impact Analysis Workplan
Mesquite Power, LLC

ADEQ Protocol Checklist Section	Workplan Location	Comment	Recommendation	Response
Executive Summary	N/A	There was no Executive Summary presented in the Workplan	Provide an Executive Summary outlining the major points of each section of the Workplan	Comment is addressed in Addendum Executive Summary
ADEQ Completeness Checklist	N/A	The ADEQ Completeness Checklist was not presented in the Workplan	Provide a copy of a filled-in ADEQ Completeness Checklist	Comment is addressed in Addendum ADEQ Completeness Checklist
2.2 Area Classifications	Section 2.4, Page 2-3	There needs to be a better presentation of the location of the Nonattainment, Class 1, "sensitive" Class II, and Baseline Areas.	Describe the locations via direction and distance from the proposed site. In addition, a detailed, scaled map with the location of the Areas should be provided.	Comment is addressed in Addendum Section 2.2 Area Classifications
2.3 Baseline Dates	Section 2.5, Page 2-4	There is no discussion of the various PSD Baseline Dates in the Workplan	Provide a table of potential PSD applicable compounds with associated Major Source and Minor Source Baseline Dates	Comment is addressed in Addendum Section 2.3 Baseline Dates
2.4 Baseline Areas	Section 2.5, Page 2-4	There is no presentation of the Baseline Areas around the proposed source	If there are multiple Baseline Areas for PSD increment Consumption, present a map outlining these areas and discuss possible increment/impact scenarios. If there is one Baseline Area within the Metropolitan Phoenix Area, state this in the Workplan	Comment is addressed in Addendum Section 2.4 Baseline Areas

Comments on Ambient Air Quality Impact Analysis Workplan
Mesquite Power, LLC

ADEQ Protocol Checklist Section	Workplan Location	Comment	Recommendation	Response
2.5 Increment Consumption and Expansion	Section 2.5, Page 2-4	There is no discussion about the ramifications of a significant impact in the PSD and Nonattainment Area, the available PSD Increments or the applicability of NSR and the need for offsets	There should be a discussion and a table presenting the available PSD Increment and the approach to be taken for a significant impact in a Nonattainment Area	Comment is addressed in Addendum Section 2.5 Increment Consumption and Expansion
3.1 Pre-Application Air Quality Monitoring	Section 3.2.2, Page 3-5	See Comments for Section 3.4	If Comments and Recommendations from Section 7.1 are followed, then more detailed conclusions in this section can be developed	Comment is addressed in Addendum Section 3.1 Pre-Application Air Quality Monitoring
3.2 Post-Construction Air Quality Monitoring	Section 3.2.2, Page 3-5	There is no discussion provided on this subject	Proponent should provide some discussion on this subject, even if the proposed approach is to not have Post-Construction Monitoring	Comment is addressed in Addendum Section 3.2 Post-Construction Air Quality Monitoring
3.4 Background Concentrations	Section 3.2.2, Page 3-5	There are no background ambient air quality concentrations provided	A discussion and tables of the pollutants and averaging times, stations to be reviewed, years considered, and conclusions should be provided for review and approval.	Comment is addressed in Addendum Section 3.4 Background Concentrations
4.1 Source Emissions Inventory	Section 2.3, page 2-3 Section 2.5, Page 2-4	There is no presentation of preliminary/proposed source listing with associated stack locations, parameters and emission rates (grams/sec and tons/year). This is the basis of a modeling protocol/analysis and needs to be presented.	Provide a table of all relevant source parameters and locations that will be used in the analysis. Because Mesquite Power is a "listed major stationary source" making the major source level 100 tons/yr, then all fugitive sources (i.e. cooling towers, tanks, roads?) needs to be considered for	Comment is addressed in Addendum Section 4.1 Source Emissions Inventory

Comments on Ambient Air Quality Impact Analysis Workplan
Mesquite Power, LLC

ADEQ Protocol Checklist Section	Workplan Location	Comment	Recommendation	Response
			estimating potential emissions for major source/significant emission levels.	
4.2 The NAAQS Inventory	Section 3.0, Pages 3-1 through 3-7	This inventory is only required if model results show significant impact levels (SILs). No approach was discussed that would show how sources are to be identified, emission rates determined and criteria for source elimination proposed	The approach to be used should be discussed in case the SILs are exceeded	Comment is addressed in Addendum Section 4.2 The NAAQS Inventory
4.3 The Increment Inventory	Section 3.0, Pages 3-1 through 3-7	This inventory is only required if model results show significant impact levels (SILs). No approach was discussed that would show how sources are to be identified, emission rates determined and criteria for source elimination proposed	The approach to be used should be discussed in case the SILs are exceeded	Comment is addressed in Addendum Section 4.3 The Increment Inventory
4.4 Noncriteria Inventory	Section 3.0, Pages 3-1 through 3-7	Because the Arizona DEQ Air Toxics Rule compliance is being required, a Noncriteria Inventory should be provided	The source should provide a listing of all air toxic emitting sources along with emission rates and locations	Comment is addressed in Addendum Section 4.4 Noncriteria Inventory
5.1 Regional Topography	Section 3.1.4, Page 3-3	The comparison of the digital data terrain heights and other information with USGS topographic quadrangles may create data conflicts due to differing NAD's	Proposed an approach that account for the differing dates or propose another data validation scheme	Comment is addressed in Addendum Section 5.1 Regional Topography
5.3.1 Surface Meteorology	Section 3.1.5, Page 3-4	There is no technical discussion or information presented on the surface meteorological data.	Because the proposed met. data is not from a NWS Station (even though it is from Maricopa County), a presentation of data quality should be provided (focusing on missing data, review of data appropriateness,	Comment is addressed in Addendum Section 5.3.1 Surface Meteorology

Comments on Ambient Air Quality Impact Analysis Workplan
Mesquite Power, LLC

ADEQ Protocol Checklist Section	Workplan Location	Comment	Recommendation	Response
			etc.) for review and approval.	
6.2 Model Input Defaults/Options	Section 3.1.3, Page3-2,3	Intermediate Terrain option is not listed as a model options	Intermediate Terrain option should be added to the list of model options	Comment is addressed in Addendum Section 6.2 Model Input Default/Options
6.3 Rural/Urban Classification	Section 3.1.6, Page 3-4	There is no technical justification for use of rural dispersion coefficient	A colored USGS Topographic map should be provided in the Workplan in order to provide some presentation of justification	Comment is addressed in Addendum Section 6.3 Rural/Urban Classification
6.4 Receptor Network	Section 3.1.4, Page 3-3	Maricopa County Regulation Rule 240, Section 303 requires a 50-km grid. There is a 10-km grid with additional discrete receptors proposed in the Workplan.	A justification, using screening level modeling, needs to be made for use of a receptor grid other than those required by regulation. Discrete receptors proposed need to be presented via table (location: distance (x, y) or angle/distance from site) and presented on a detailed, scaled map in order to be considered for approval	Comment is addressed in Addendum Section 6.4 Receptor Network
6.5 Receptor Elevations	Section 3.1.4, Page 3-3	There is no presentation of proposed receptor elevations/heights. Also, the documentation of the "box" method of terrain height determination of digital terrain data has not been discussed in detail or provided for review.	A table of receptor elevations/heights needs to be presented prior to any modeling for approval. Also, documentation with technical description of the "box" method of terrain height determination of digital terrain data must be provided for review and approval.	Comment is addressed in Addendum Section 6.5 Receptor Elevations

Comments on Ambient Air Quality Impact Analysis Workplan
Mesquite Power, LLC

ADEQ Protocol Checklist Section	Workplan Location	Comment	Recommendation	Response
6.6 Source Characterization	Section 2.3, page 2-3 Section 2.5, Page 2-4	See Comment associated with Checklist Section 4.1	See Recommendation associated with Checklist Section 4.1	Comment is addressed in Addendum Section 6.6 Source Characterization
6.7 Source Location and Parameters	Section 2.3, page 2-3 Section 2.5, Page 2-4	See Comment associated with Checklist Section 4.1	See Recommendation associated with Checklist Section 4.1	Comment is addressed in Addendum Section 6.7 Source Locations and Parameters
6.8 Building Wake Downwash and GEP	Section 3.1.2, Page 3-2	The GEP and Building Downwash Analysis should take into account any structure on-site or off-site that may influence plume dispersion	Provide a site plan showing all on-site and off-site structures that have the potential to influence the proposed stacks	Comment is addressed in Addendum Section 6.8 Building Wake Downwash and GEP
7.1 Preliminary Analysis	Section 3.1.1, page 3-2	Preliminary modeling, traditionally referred to as screening level modeling, has not been presented in the protocol. An alternative approach referred to as "enveloping" has been proposed by Black & Veatch. The "enveloping" approach has not been adequately described by Black & Veatch and needs to be better explained to warrant approval.	The traditional approach is the use of traditional screening level, worst-case (i.e. 100%, 50%, idle load; all source) scenario modeling to determine the most appropriate operating scenario for maximum ambient impacts. The screening level analysis is also used to determine the most appropriate receptor network, show if any or all pollutants are below significant impact levels (SILs) (and therefore able to be left out of any refined analysis), and determine the need for pre-construction monitoring	Comment is addressed in Addendum Section 7.1 Preliminary Analysis

Comments on Ambient Air Quality Impact Analysis Workplan
Mesquite Power, LLC

ADEQ Protocol Checklist Section	Workplan Location	Comment	Recommendation	Response
7.2 Full Impact Analysis	Section 3.0, Page 3-1	There is no discussion or proposed approach to show compliance with the proposed Arizona DEQ Air Toxics Rule	If the use of Selective Catalytic Reduction (SCR) is being proposed, then ammonia slip associated with SCR should be considered along with any other air toxics listed under the Arizona DEQ Air Toxics Rule	Comment is addressed in Addendum Section 7.2 Full Impact Analysis
9.0 Class I Impact Analysis	Section 3.3, Pages 3-6,7	There appears to be an exemption from Class I Impact issues proposed in the Workplan	The proper authority (i.e. Maricopa County, Arizona DEQ, EPA, Federal Land Manager) to exempt the proponent from Class 1 area impacts should be confirmed. Also, a better discussion as to the technical reason for exemption should be provided.	Comment is addressed in Addendum Section 9.0 Class I Impact Analysis
11.0 Appendices	N/A	Minutes from the pre-application meeting and any other correspondence between the proponent and Maricopa County were not included in the Workplan	Provide any and all meeting notes and correspondences to ensure proper understanding and authority of procedures proposed	Comment is addressed in Addendum Section 11.0 Appendices

Responses to Comment on Ambient Air Quality Impact Analysis Workplan
Mesquite Power, LLC

EXECUTIVE SUMMARY

This Ambient Air Quality Impact Analysis Workplan contains the information necessary, and details the analyses that will be performed to support the proposed Mesquite Power, LLC, Mesquite Generating Station. The proposed project will consist of four (4) General Electric 7FA or Westinghouse 501F combustion turbines (CTs) driving electrical generators. These CTs will be operating in a combined cycle mode of operation, routing their exhaust through heat recovery steam generators (HRSGs). Steam formed in the four HRSGs will be routed through two steam turbines to generate additional electricity. Duct firing will be used in the HRSG to generate additional heat, as needed. The CTs are rated at approximately 170 megawatts (MW) each, and the two steam turbines are rated at approximately 300 MW each. The facility will provide approximately 1,000 MW of electricity to the grid for sale on the open market. The location of the proposed project is in western Maricopa County, near Arlington, Arizona.

The proposed facility will be classified as a major stationary source and will be subject to the PSD program, and will need to obtain a Title V operating permit. Under the PSD rules, all PSD regulated pollutants emitted by the proposed facility must be compared to the PSD significant emission levels in order to determine applicability to PSD review. The potential to emit analysis demonstrates that emissions of nitrogen oxides (NO_x), carbon monoxide (CO), and particulate matter with a diameter of less than or equal to ten microns (PM_{10}) are emitted in significant quantities. The required PSD analyses will be conducted for each of these regulated pollutants.

One of the PSD review requirements is an ambient air quality impact analysis (AAQIA). The Maricopa County ESDAQD provided the meteorological data for the AAQIA. The meteorological data was recorded at the Palo Verde Nuclear Generating Station and covers the five-year period of 1994-1998. The terrain surrounding the Project site ranges from simple to complex and the modeling procedures to handle this range in terrain are explained in this Workplan. Based on the air dispersion modeling performed for this workplan, CO impacts have been determined to be insignificant thus further impact analysis will not be required. Further analysis for NO_x and PM_{10} will be required and will be provided in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.*

Pre-construction monitoring is not being proposed for this project, because an ADEQ monitor site located approximately 3 km from the site. This monitor records values for Ozone, NO_x, and PM_{10} and data is available from 1997 to the present.

Because a specific combustion turbine vendor (GE or Westinghouse) has not yet been selected for this project, emissions from both types of CTs have been evaluated throughout the analysis and will be presented as alternative operating scenarios. The facility may be constructed using either of these CTs.

Is the Requirement Sufficiently Addressed? (✓ one)			Refined Modeling Protocol Contents (Headings and Chapters should be labeled as follows:)
Yes	No	N/A	
✓			Executive Summary
✓			ADEQ Completeness Checklist
			1.0 Introduction
✓			1.1 Site Description
✓			1.2 Project Description
		✓	1.3 Application Forms
			2.0 Regulatory Status
✓			2.1 Source Designation
✓			2.2 Area Classifications
✓			2.3 Baseline Dates
✓			2.3.1 Major Source Baseline Date
✓			2.3.2 Trigger Date
✓			2.3.3 Minor Source Baseline Date
✓			2.4 Baseline Area
✓			2.5 Increment Consumption and Expansion
			3.0 Ambient Data Requirements
✓			3.1 Pre-Application Air Quality Monitoring
✓			3.2 Post-Construction Air Quality Monitoring
✓			3.3 Meteorological Monitoring
✓			3.4 Background Concentrations
			4.0 Emissions Inventory
✓			4.1 Source Emissions Inventory

✓			4.1.1 The NAAQS Inventory
✓			4.1.2 The Increment Inventory
✓			4.1.3 Noncriteria Pollutants Inventory
			5.0 Topography, Climatology and Meteorology
✓			5.1 Regional Topography
✓			5.1.1 Simple Terrain
✓			5.1.2 Intermediate Terrain
✓			5.1.3 Complex Terrain
✓			5.2 Regional Climatology
✓			5.3 Regional Meteorology
✓			5.3.1 Surface Meteorology
✓			5.3.1.1 Wind Speed and Wind Directions
✓			5.3.1.2 Stability Class
✓			5.3.1.3 Data Capture
✓			5.3.1.4 Treatment of Calms
✓			5.3.2 Upper Air Data
			6.0 Modeling Analysis Design
✓			6.1 Modeling Selection
✓			6.1.1 Screen Modeling
✓			6.1.2 Refined Screen Modeling
✓			6.1.3 Refined Modeling
✓			6.2 Model Input Defaults/Options
✓			6.3 Rural/Urban Classification
✓			6.3.1 Land Use Classification
✓			6.3.2 Rural vs Urban
✓			6.4 Receptor Network

✓			6.4.1 Coarse Receptors
✓			6.4.2 Medium Receptors
✓			6.4.3 Fine Receptors
✓			6.4.4 Tight Receptors
✓			6.4.5 Discrete Receptors
✓			6.4.6 Class I Receptors
✓			6.4.7 Nonattainment Area Boundary Receptors
✓			6.5 Receptor Elevations
✓			6.6 Source Characterization
✓			6.6.1 Point Sources
		✓	6.6.2 Area Sources
		✓	6.6.3 Volume Sources
		✓	6.6.4 Line Sources
		✓	6.6.5 Mobile Sources
		✓	6.6.6 Open Pit/Pit Retention
		✓	6.6.7 Dry Deposition
✓			6.7 Source Locations and Parameters
✓			6.8 Building Wake Downwash and GEP
			7.0 Dispersion Modeling Impact Analysis
✓			7.1 Preliminary Analysis
✓			7.1.1 Preliminary Impact Determination
✓			7.1.2 Sources Within Area of Impact
✓			7.1.3 Sources Omitted
✓			7.1.4 Significant Impacts
✓			7.2 Full Impact Analysis
✓			7.2.1 The NAAQS Analysis

✓			7.2.2 The Increment Analysis
✓			7.2.3 AAAQG Pollutant Analysis
			8.0 Additional Impact Analysis
✓			8.1 Growth Analysis
✓			8.2 Soils and Vegetation Analysis
✓			8.3 Visibility Impairment Analysis
✓			8.3.1 Level One Screening
✓			8.3.2 Level Two Screening
		✓	8.3.3 Level Three Screening
		✓	8.4 Conclusions
			9.0 Class I Impact Analysis
✓			9.1 Class I Increments
		✓	9.2 Air Quality Related Values
		✓	9.2.1 Flora and Fauna
		✓	9.2.2 Water
		✓	9.2.3 Acid Deposition
		✓	9.3 Visibility Impact Analysis
			10.0 References
			11.0 Appendices
✓			Minutes from pre-application meetings
✓			Copies of all correspondence

2.2 Area Classifications

Comment

There needs to be a better presentation of the location of the Nonatttainment, Class I, "sensitive" Class II, and Baseline Areas.

Response

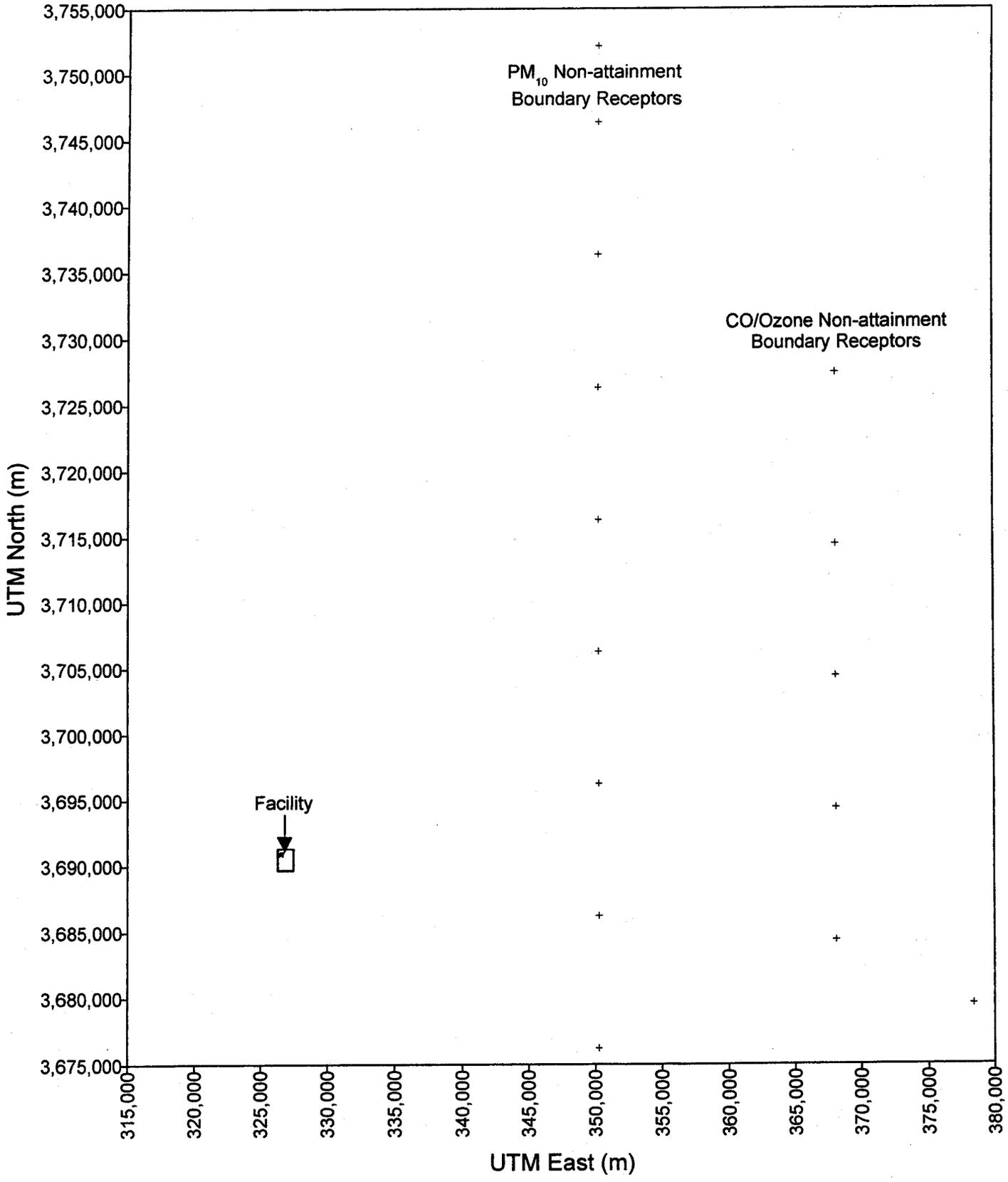
The Project will be located approximately 15 miles west of the Phoenix nonattainment area for PM_{10} and 25 miles west of the Phoenix nonattainment area for CO and NO_x (as a precursor to O_3) PSD pollutants. Receptors will be placed along the closest boundary of the each nonattainment area to the site. The proposed receptor locations are shown in Figure 1.

Air dispersion modeling will be performed to determine the Project's maximum predicted impact at the closest boundaries of the Superstition Wilderness Area, Mazatzal Wilderness Area, and the Pine Mountain Wilderness Area. These areas are presented on Figure 2. As shown on Figure 3, receptors will be placed at the closest boundary point of each park with respect to the Project.

A Class II impact analysis will be performed to evaluate the potential for visibility impairment, ground level impacts, and acid deposition. The following sensitive areas were identified by the Federal Land Manager (FLM) and Maricopa County ESDAQD in a meeting with a representative of Mesquite Power, LLC: Hummingbird Springs, Big Horn Mountain, Eagletail Mountain, Signal Mountain, Woolsey Peak, and North Maricopa Mountains Wilderness areas, as well as the Gila Bend and Gila River Indian Reservations. Figure 2 illustrates the locations of these sensitive areas with respect to the Project location. As shown on Figure 4, receptors will be placed along the closest boundary of each sensitive area with respect to the Project.

The above description for Nonattainment, Class I, and Class II Sensitive Area receptors is provided and applied in the modeling analysis shown in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* Section 6.0 Air Quality Impact Analysis.

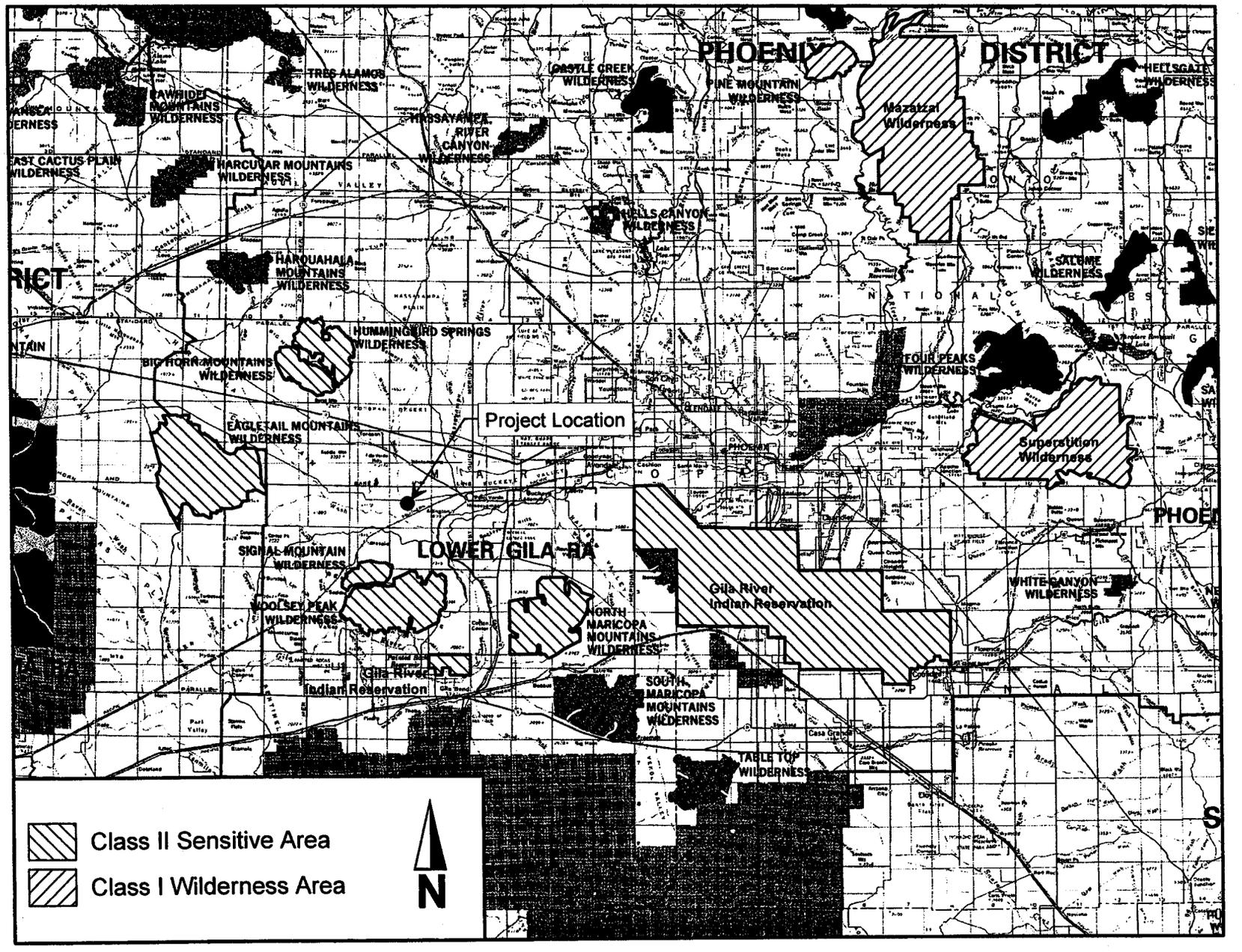
For a discussion and map of Baseline areas, please refer to response to Comment 2.4 Baseline Areas.



Non-attainment Boundary Receptors

Figure 1

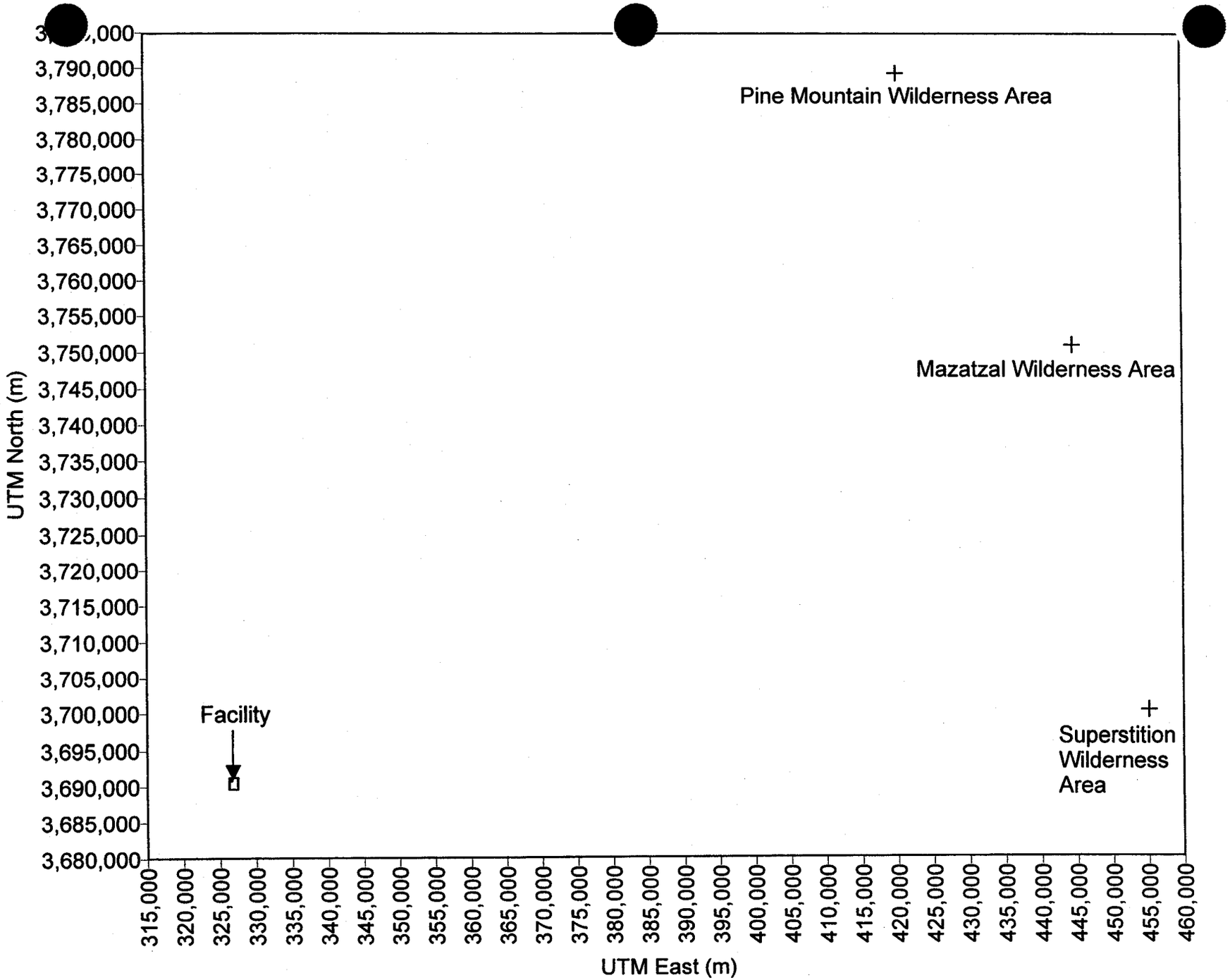
NAgrid.srf



Class I and Class II Areas Modeled for the Project

Figure 2

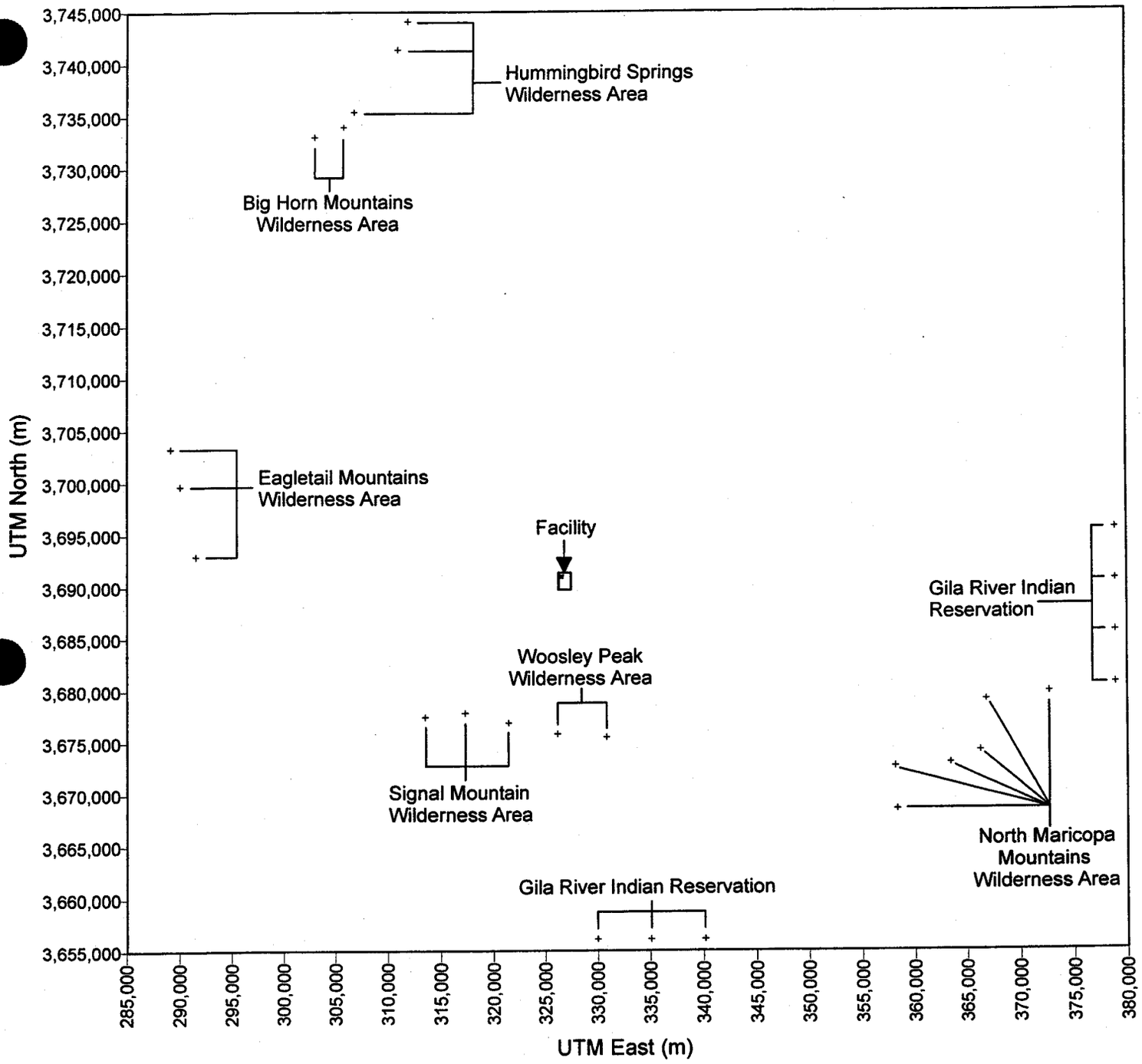
Class I & II Areas.srf



Class I Area Receptors

Figure 3

Classigrid.srf



Class II Sensitive Area Receptors

Figure 4

Classiigrid.srf

2.3 Baseline Dates

Comment

There is no discussion of the various PSD Baseline Dates in the Workplan.

Response

Rob Arpino of Maricopa County ESDAQD was contacted and he provided the necessary Baseline Dates on March 22, 2000.

NO_x and PM_{10} have been determined as the only pollutants needing further analysis. This further analysis will require inclusion of outside sources within the area of influence plus 50 km. These sources will include all new major stationary sources and major modifications since the major source baseline dates (February 8, 1988 for NO_x and January 6, 1975 for PM_{10}), and actual emission changes occurring at stationary sources since the minor source baseline date (January 20,1993 for NO_x and March 3, 1980 for PM_{10}). In addition, the trigger dates for this area are August 7, 1977 for NO_x and February 8, 1988 for PM_{10}.

2.4 Baseline Areas

Comment

There is no presentation of the Baseline Areas around the proposed source.

Response

Rob Arpino of Maricopa ESDAQD was contacted and he provided the necessary Baseline Area information on March 22, 2000. He indicated that each county is a Baseline Area in the state of Arizona. For a Baseline Area to be affected there must be an annual impact of 1 $\mu g/m^3$ or higher within the area from the proposed Project. The Project's annual impacts at or above 1 $\mu g/m^3$ are all located within 5.5 km. With this information, the only Baseline Area affected by the proposed source is the Maricopa Baseline Area.

2.5 Increment Consumption and Expansion

Comment

There is no discussion about the ramifications of a significant impact in the PSD and Nonattainment Area, the available PSD Increments or the applicability of NSR and the need for offsets.

Response

The analysis provided in the response to Comment 7.1 Preliminary Analysis, shows that the facility maximum impacts for NO_x and PM_{10} are above the significant impact level. As a result, an increment consumption analysis will be preformed. For this analysis, it is assumed that the full increment is available. The results of the increment consumption analysis are provided in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* – Section 6.7.

As a result of the analysis provided in the response to Comment 7.1 Preliminary Analysis, no significant impacts are expected in the Nonattainment areas and offsets will not be needed. The closest Nonattainment Area boundary is located 24 km from the site and the analysis showed no significant impacts beyond 14 km for any pollutant. A more detailed modeling analysis of the Nonattainment areas is provided in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* – Section 6.8.1.

3.1 Pre-Application Air Quality Monitoring

Comment

See Comments for Section 3.4 (Comment Section 3.4 – There are no background ambient air quality concentrations provided)

Response

One PSD review requirement is the collection of pre-application ambient monitoring data if existing monitoring data are not available. Mesquite Power, LLC proposes using the Palo Verde Nuclear Generating Station Air Quality Monitor (AIRS #04-013-9993) to fulfill the pre-construction monitoring requirement. The location, distance from project, and the representative ambient monitoring concentrations from the monitor are located in the response to Comment 3.4 Background Concentrations.

3.2 Post-Construction Air Quality Monitoring

Comment

There is no discussion provided on this subject.

Responses

Because the NAAQS will not be threatened and there are not uncertainties regarding the databases used in the dispersion modeling, no post-construction monitoring is currently proposed for Mesquite Generating Station at this time. In the case that monitoring is required, Mesquite Power, LLC proposes to use the Palo Verde Nuclear Generating Station Monitor data (AIRS #04-013-9993) to fulfill the requirement. For the location of the monitor relative to the Project location, please refer to the response on Comment 3.4 Background Concentrations.

3.4 Background Concentrations

Comment

There are no background ambient air quality concentrations provided.

Response

In accordance with EPA guidance, air quality data may be used to establish background concentrations in the impact area resulting from existing sources that are not considered nearby. Representative background concentration values have been developed from existing ambient data collected in the area. Table 1 shows the monitoring site used, its location relative to the Project, and the representative ambient monitoring values proposed for the analysis. The Palo Verde Nuclear Generating Station monitoring site (AIRS #04-013-9993) was used exclusively for NO_2 and PM_{10}.

The above description for Background Concentrations is provided and applied in the modeling analysis shown in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* Section 6.0 Air Quality Impact Analysis.

Table 1
Representative Ambient Background Monitoring Values
Proposed for Air Quality Impact Analysis

Monitoring Site	Location Latitude/ Longitude (degrees)	Distance from Project (km)	Direction from Project	Pollutant Monitored	Averaging Period	Representative Background Concentration ($\mu g/m^3$)
Palo Verde[a]	33.349/ 112.832	3.0	N	NO_2[e]	Annual	58[b]
Palo Verde[a]	33.349/ 112.832	3.0	N	PM_{10}[f]	Annual	20[c]
					24 hour	70[d]

[a]Palo Verde Nuclear Generating Station (AIRS #04-013-9993).

[b]Represents the maximum 1 hour NO_2 monitored value. This is conservatively higher than the annual average maximum.

[c]Represents the maximum annual mean.

[d]Represents the maximum high second high value.

[e]NO_2 data from May through October 1997 and April through mid-October 1998.

[f]PM_{10} data from November 1996 through June 1999.

4.1 Source Emissions Inventory

Comment

There is no presentation of preliminary/proposed source listing with associated stack locations, parameters and emissions rates (grams/sec and tons/year). This is the basis of a modeling protocol/analysis and needs to be presented.

Response

Attachment 1 of this document contains all of the source locations, parameters, emission rates, and potential to emit calculations evaluated for the Mesquite Generating Station. There are two operating scenarios presented in Attachment 1, Alternative Operating Scenario 1 applies to General Electric Turbines and Alternative Operating Scenario 2 applies to Westinghouse Turbines. The forms in Attachment 1 are also provided in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* Standard Forms Section. All of the sources included in the modeling analysis will be point sources.

4.2 The NAAQS Inventory

Comment

This inventory is only required if model results show significant impact levels (SILs). No approach was discussed that would show how sources are to be identified, emission rates determined and criteria for source elimination proposed.

Response

Modeling results show significant impact levels for NO_x and PM_{10}. Thus, a NAAQS cumulative analysis has been performed and is presented in Section 6.6 of the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.* The inventory was developed from a list of nearby existing NO_x and/or PM_{10} sources and from nearby proposed sources in the permitting process. These sources are listed in Table 6-8 of the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.* We have been notified by the Maricopa County ESDAQD that an additional source, the El Paso Natural Gas Compressor Station, needs to be added to the NO_x inventory. We have received the additional source data from Maricopa County ESDAQD and will remodel the NAAQS cumulative analysis with it added in. The revised modeling results will be forwarded to Maricopa County ESDAQD when complete. We do not anticipate any threats to the NAAQS with the addition of this source because it is relatively distant (approximately 11.5 km) from the proposed Project site.

4.3 The Increment Inventory

Comment

This inventory is only required if model results show significant impact levels (SILs). No approach was discussed that would show how sources are to be identified, emission rates determined and criteria for source elimination proposed.

Response

Modeling results show significant impact levels for NO_x and PM_{10}. Thus, a PSD increment analysis has been performed and is presented in Section 6.7 of the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.* The inventory was developed from a list of nearby existing NO_x and/or PM_{10} sources and from nearby proposed sources in the permitting process. These sources are listed in Table 6-8 of the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.* We have been notified by the Maricopa County ESDAQD that an additional source, the El Paso Natural Gas Compressor Station, needs to be added to the NO_x inventory. We have received the additional source data from Maricopa County ESDAQD and will remodel the PSD increment analysis with it added in. The revised modeling results will be forwarded to Maricopa County ESDAQD when complete. We do not anticipate complete consumption of the PSD increment with the addition of this source because it is relatively distant (approximately 11.5 km) from the proposed Project site.

Subsequent Comment

On March 21, 2000, an additional comment (via e-mail) regarding increment consumption from Interstate I-10 traffic was received from Robert Arpino of Maricopa County. The comment states, "Another issue has been brought to my attention, regarding the inclusion of mobile sources. If the facility is significant, then emissions from Interstate I-10 traffic will need to be included in the PSD increment modeling."

Response

According to EPA guidance on these analyses, PSD increment is consumed by increases in air quality impacts due to changes in mobile source activity since the minor source baseline date. The minor source baseline date for this project area is January 20, 1993 for NOx (as stated in the response to Item 2.3 in this Addendum). Thus, if air quality NOx impacts from Interstate I-10 have increased since January 20, 1993, then PSD increment has been consumed. Mobile source impacts are generally very small or have been decreasing as a result of lower vehicle emission standards associated with newer car models. Thus, increment consumption specifically by mobile sources is typically not a required element of a PSD air quality impact analysis. In response to the above referenced request, Mesquite Power, LLC proposes to assess the possibility of

PSD NOx increment consumption in the following manner. (Particulate emission from typical mobile sources is very small. Thus, only possible NOx increment consumption will be assessed.)

Although vehicle miles traveled (VMT) on Interstate I-10 since 1993 has likely increased, there has also been a decrease in NOx emission rates per VMT since 1993. This is a result of a lowering of the new vehicle emission limits imposed on the auto industry. When accounting for the combination of increased VMT and decreased emission rates per VMT, it is likely that the total emission level from Interstate I-10 has actually decreased since 1993. An analysis of the emissions increase/decrease from 1993 to the most recent year will be prepared by Mesquite Power, LLC and submitted to Maricopa County ESDAQD as a supplement to the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station*.

The approach of the analysis will be to obtain VMT data for Interstate I-10 for 1993 and for the most recent year available. These data should be available through the Arizona Department of Transportation. The percentage increase in VMT between 1993 and the most recent year on Interstate I-10 in the vicinity of the proposed source location will be calculated. The new vehicle NOx emission factor for 1993 will then be compared to the emission factor for the most recent year and the percentage decrease calculated. Then, the percentage increase in VMT and percentage decrease in emission factors will be combined to determine an estimate of the percentage decrease (or increase) in NOx emissions from Interstate I-10. If there has been a decrease in NOx emissions, as is expected, then PSD increment has not been consumed and emissions from the highway need not be further assessed. If this process shows an increase in NOx emissions, then Mesquite Power, LLC will discuss with Maricopa County ESDAQD alternative methods of determining whether incremental increases in NOx impacts in the vicinity of Interstate I-10 need to be specifically quantified. In making this determination, consideration must be given to whether these incremental highway impacts have the potential to threaten over-consumption of the full PSD NOx increment value.

4.4 Noncriteria Inventory

Comment

Because The Arizona DEQ Air Toxics Rule compliance is being required, a Noncriteria Inventory should be provided.

Response

The power generating units will be a source of hazardous air pollutant (HAP) emissions. The estimated HAP emissions from the power generating units are shown in Table 2. The air quality impact of these emissions have been modeled to determine compliance with the Arizona DEQ Air Toxic Rule. The impact analysis is contained in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.*

Table 2
Hazardous Air Pollutant Emissions from the Power Generating Units

Pollutant	CAS Number	CATEF[a]/AP-42 Emission Factor	Fuel Burn Rate (MMscf/h)[b]	Emission Rate[c] (lb/h)
Acetaldehyde	75-07-0	4.83E-02	2.224	1.07E-01
Acrolein	107-02-8	1.44E-02	2.224	3.20E-02
Ammonia[d]	7664-41-7	-	-	3.12E+01
Arsenic	7440-38-2	2.00E-04	2.224	4.45E-04
Barium	7440-39-3	4.40E-03	2.224	9.79E-03
Benzene	71-43-2	2.10E-03	2.224	4.67E-03
Benz(a)anthracene	56-55-3	3.61E-06	2.224	8.03E-06
Benzo(a)pyrene	50-32-8	4.63E-07	2.224	1.03E-06
Beryllium	7440-41-7	1.20E-05	2.224	2.67E-05
1,3-Butadiene	106-99-0	1.24E-04	2.224	2.76E-04
Cadmium	7440-43-9	1.10E-03	2.224	2.45E-03
Chromium	7440-47-3	1.40E-03	2.224	3.11E-03
Cobalt	7440-48-4	8.40E-05	2.224	1.87E-04
Copper	7440-50-8	8.50E-04	2.224	1.89E-03
Dibenz(a,h)anthracene	53-70-3	3.03E-06	2.224	6.74E-06
Ethylbenzene	100-41-4	9.74E-03	2.224	2.17E-02
Formaldehyde	50-00-0	8.45E-02	2.224	1.88E-01
Hexane	110-54-3	2.19E-01	2.224	4.87E-01
Manganese	7439-96-5	3.80E-04	2.224	8.45E-04
Mercury	7439-97-6	2.60E-04	2.224	5.78E-04
2-Methylchloranthrene	56-49-5	5.07E-06	2.224	1.13E-05
Naphthalene	91-20-3	9.26E-04	2.224	2.06E-03
Nickel	7440-02-0	2.10E-03	2.224	4.67E-03
Propylene Oxide	75-56-9	4.48E-02	2.224	9.96E-02
Selenium	7782-49-2	2.40E-05	2.224	5.34E-05
Toluene	108-88-3	5.91E-02	2.224	1.31E-01
Vanadium	7440-62-2	2.30E-03	2.224	5.12E-03
Xylene (Total)	1330-20-7	1.93E-02	2.224	4.29E-02

[a]California Air Toxics Emission Factor database (CATEF Version 1.2).

[b] Determined from annual average performance parameters for the General Electric combustion turbine.

Fuel burn rate = (HHV turbine heat input (mmBtu/h) + HHV duct burner heat input (mmBtu/h))/AP-42 conversion factor for mmBtu to MMscf.
(1725.74 mmBtu/h + 542.7 mmBtu/h) / 1020 mmBtu/MMscf = 2.224 MMscf/h.

[c]Assumes operation of 4 turbines.

[d]Emission rate is a worst-case value from the three GE 73 F 100% load cases.

5.1 Regional Topography

Comment

The comparison of the digital data terrain heights and other information with USGS topographic quadrangles may create data conflicts due to differing NAD's.

Response

The terrain around the Project site is relatively flat other than the numerous buttes that can rise well above the stack top elevation. Receptor terrain elevations have been obtained from 30-meter Digital Elevation Model (DEM) terrain data based on United States Geological Survey (USGS) 7.5-minute digital quadrangles. The receptor elevations have been compared with the actual USGS 7.5-minute quadrangle maps to ensure consistency.

5.3.1 Surface Meteorology

Comment

There is no technical discussion or information presented on the surface meteorological data.

Response

Maricopa County ESDAQD provided surface Meteorological data for use in the modeling analysis. At the kickoff meeting, Maricopa County ESDAQD requested that the Palo Verde Nuclear Generating Station Meteorological dataset be used in the modeling analysis. Upon receipt, the data was put through a QA/QC process. Errors in the original dataset were found and a letter explaining the error and the data substitution process was set to Elena Gorelik of Maricopa County ESDAQD. A copy of the letter is located in Attachment 2.

Attachment 3 contains a wind rose has been provided to illustrate the wind speeds and directions registered at the monitor from 1994-1998. The Frequency Distribution of Stability Classes is also presented in Attachment 3. Calm hours in the dataset will be processed using the regulatory default option in Industrial Source Complex Short-Term 3 (ISCST3 Version 99155).

6.2 Model Input Defaults/Options

Comment:

Intermediate Terrain option is not listed as a model options (SICS).

Response:

The ISCST3 air dispersion model contains no selectable switch or option for modeling intermediate terrain. Intermediate terrain is handled by the use of the simple terrain and complex terrain options in the model. Through the selection of both the simple and complex terrain options in ISCST3, the model internally evaluates receptors located in intermediate terrain by calculating impacts with both the simple terrain algorithm and the complex terrain algorithm. The model output result is given as the higher of the two impacts. This procedure is in accordance with EPA's air dispersion modeling guidelines (incorporated as Appendix W of 40 CFR 51).

6.3 Rural/Urban Classification

Comment:

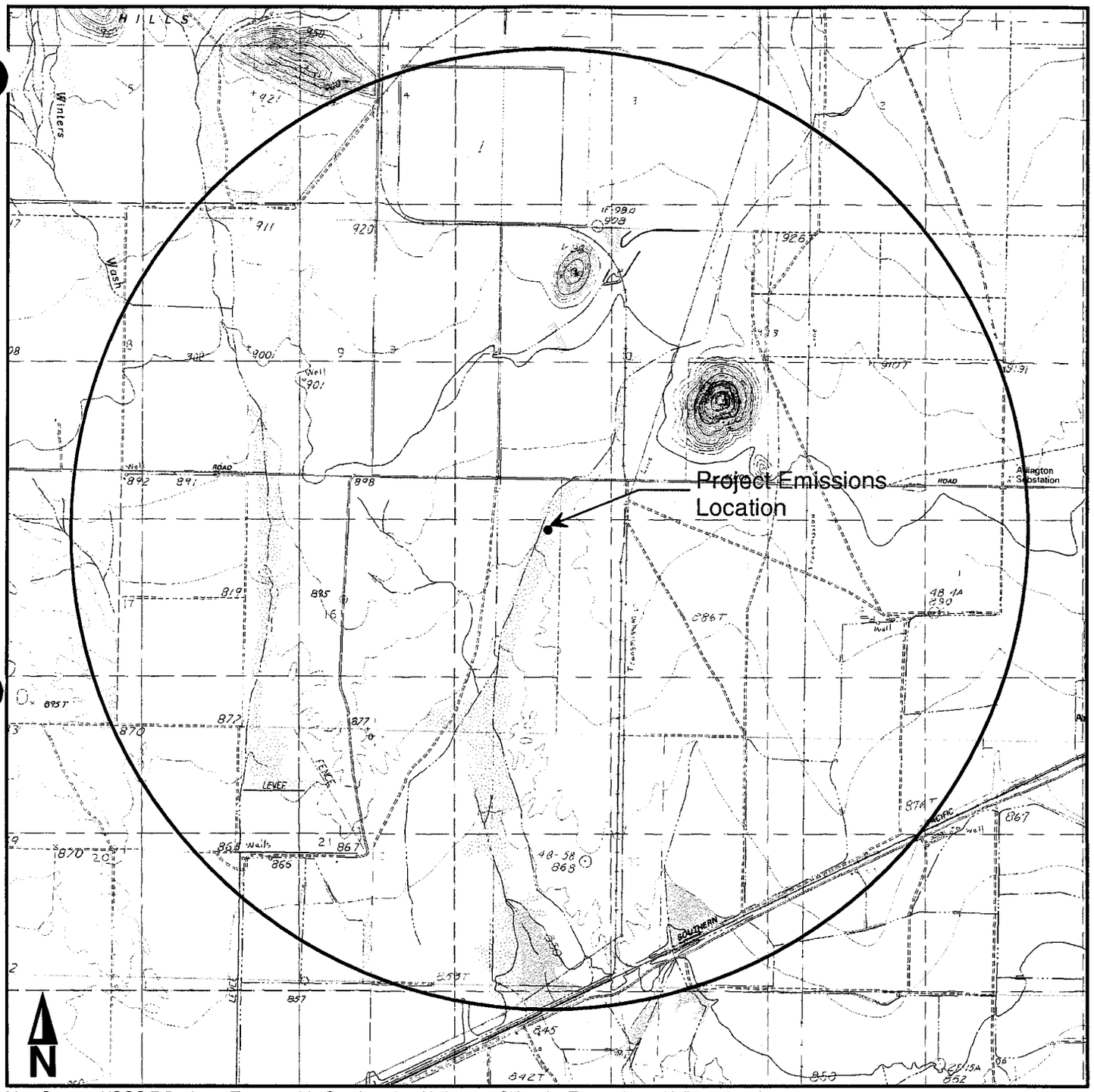
There is no technical justification for use of rural dispersion coefficient.

Response:

The EPA's land use method was used to determine whether rural or urban dispersion coefficients should be used in the ISCST3 air dispersion model. In this procedure, land circumscribed within a 3-km radius of the Project was classified as rural or urban using the Auer land use classification method. The area is shown in Figure 5. Table 3 presents the land-use classification types. Using the Auer method it was found that the urban land-use classification types I1, I2, C1, R2, and R3 account for significantly less than 50 percent of the three-kilometer radius. Therefore, the rural dispersion coefficients will be used for the air dispersion modeling analysis.

Table 3
Land-Use Classification Types

Type	Description	Class
I1	Heavy Industrial	Urban
I2	Light/Moderate Industrial	Urban
C1	Commercial	Urban
R1	Common Residential (Normal Easements)	Rural
R2	Compact Residential (Single Family)	Urban
R3	Compact Residential (Multi-Family)	Urban
R4	Estate Residential (Multi-Acre)	Rural
A1	Metropolitan Natural	Rural
A2	Agricultural	Rural
A3	Undeveloped (Grasses/Weeds)	Rural
A4	Undeveloped (Heavily Wooded)	Rural
A5	Water Surfaces	Rural



Map Source: USGS 7.5 minute Topographic Quadrangles (Arlington, Gillespie, Tonopah, and Wintersburg)

Kilometers

0 0.5 1.0 1.5

Auer Land-use Map
3 Kilometer Radius

Figure 5

Land-use.srf

6.4 Receptor Network

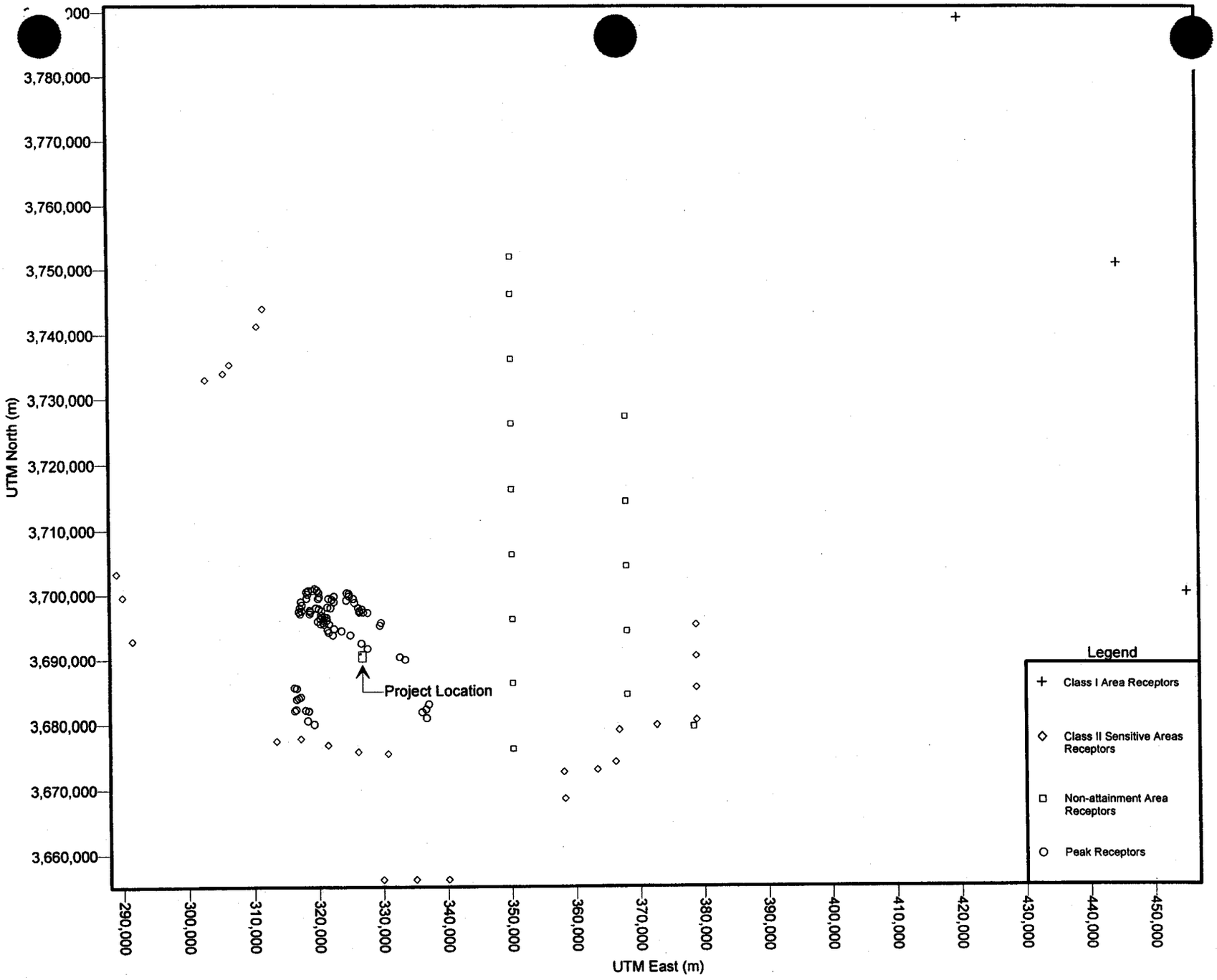
Comment:

Maricopa County Regulation Rule 240, Section 303 requires a 50-km grid. There is a 10-km grid with additional discrete receptors proposed in the Workplan.

Response:

We have already been notified by Maricopa County ESDAQD that a 50-km grid will be required for the analysis. Thus, the grid has been extended appropriately to meet this requirement. Now, the nested rectangular grid network consists of 100 meter spacing out to 1 km, 500 m spacing from 1 to 5 km, 1,000 m spacing from 5 to 10 km, 2,000 m spacing from 10 to 20 km, 5,000 m spacing from 20 to 40 km, and 10 km spacing from 40 to 50 km. Receptor spacing at 50-m intervals is used along the fenceline. These receptors are presented in Attachment 4. Numerous discrete receptors were also placed at the closest boundaries of the Phoenix nonattainment areas, Hummingbird Springs, Bighorn Mountain, Eagletail Mountains, Signal Mountain, Woolsey Peak, North Maricopa Mountains Class II Wilderness areas, Gila Bend and Gila River Indian Reservations, as well as on the peaks of significant (i.e., complex) terrain features. Attachment 5 presents a listing of these discrete receptors used in the air dispersion modeling analyses. Figures 2 illustrates the locations of these Class I and Class II sensitive areas while Figure 6 shows the receptors placed at them.

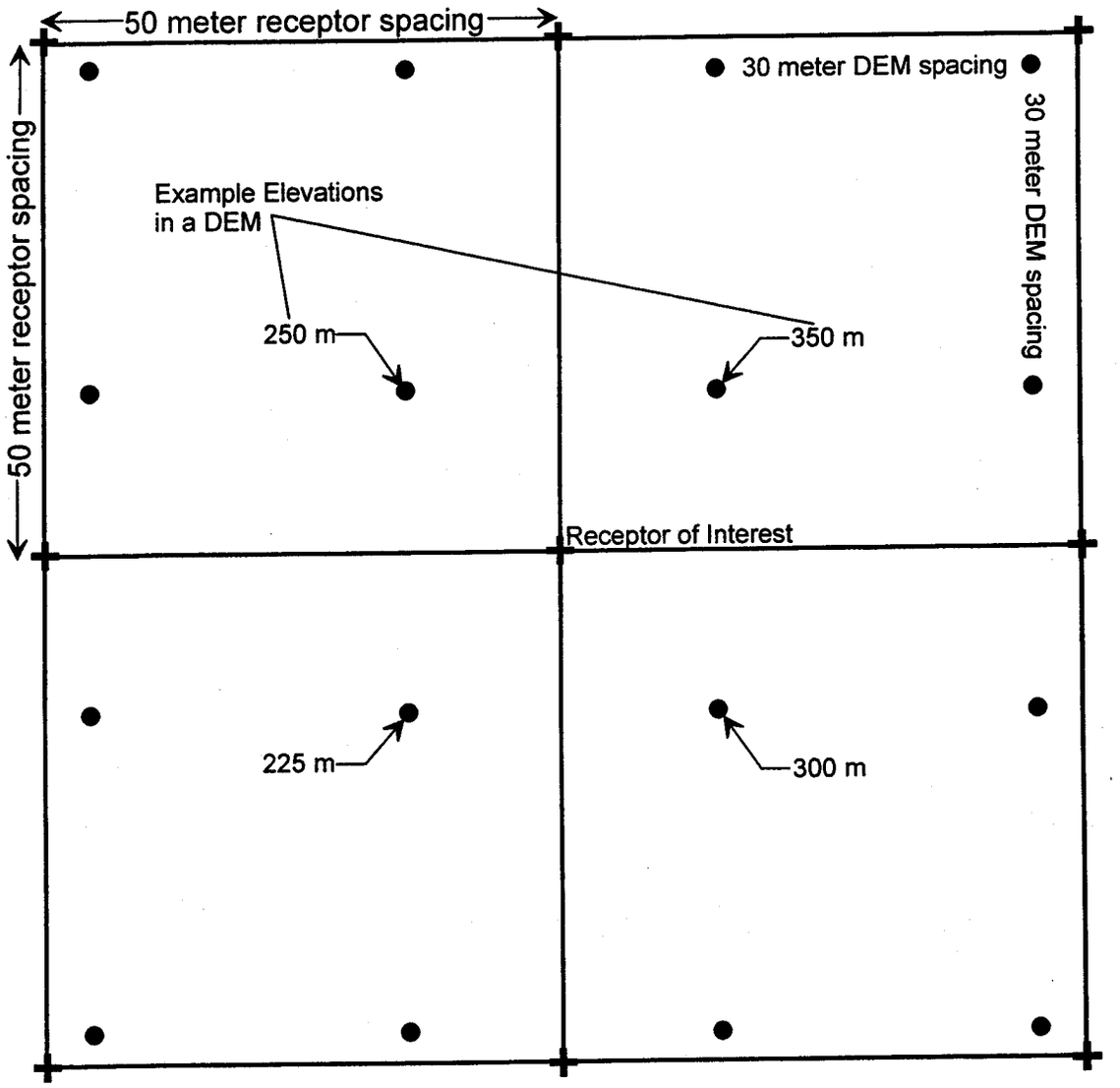
The air quality impact analysis presented in the air permit application is based on the 10-km grid. An analysis has recently been completed for the additional receptors associated with the 50-km extended grid. The results of this analysis show that the maximum air quality impacts were within the original 10-km grid. Extending the grid does not result in higher air quality impacts. The analysis with the 50-km extended grid will be provided to Maricopa County ESDAQD as a supplement to the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.*



Additional Discrete Receptor Locations

Figure 6

Discrete Receptors.srf



The receptor of interest in this example
(using the 'highest' option in the ISCST3 GUI)
would have an elevation of 350 m assigned to it.

Digital Elevation Model
Terrain Elevation Selection Procedure

Figure 7

DEM Procedure.srf

6.5 Receptor Elevations

Comment:

There is no presentation of proposed receptor elevations/heights. Also, the documentation of the "box" method of terrain height determination of digital terrain data has not been discussed in detail or provided for review.

Response:

The list in Attachment 4 of all nested receptors used in the air dispersion modeling analysis includes each receptor's elevation. Locations and elevations of extra discrete receptors were previously presented in the response to Comment 6.4 Receptor Network.

The graphical user interface (GUI) used with the ISCST3 air dispersion model contains options for the selection of a receptor's elevation from a digital elevation model (DEM). At any given receptor location, there are four DEM elevation points that surround the receptor. The method chosen in the GUI for determining terrain elevations is labeled 'highest.' Thus, the highest of those 4 DEM elevation points will be given to the receptor. Figure 7 illustrates an example of this process. In addition, the receptor elevations have been compared with the actual USGS 7.5-minute quadrangle maps to ensure consistency.

6.6 Source Characterization

Comment:

See Comment associated with Checklist Section 4.1. (Comment 4.1 Source Emission Inventory: There is no presentation of preliminary/proposed source listing with associated stack locations, parameters and emission rates (grams/sec and tons/year). This is the basis of a modeling protocol/analysis and needs to be presented.)

Response:

See response to Comment 4.1 Source Emission Inventory.

6.7 Source Location and Parameters

Comment:

See Comment associated with Checklist Section 4.1. (Comment 4.1 Source Emission Inventory: There is no presentation of preliminary/proposed source listing with associated stack locations, parameters and emission rates (grams/sec and tons/year). This is the basis of a modeling protocol/analysis and needs to be presented.)

Response:

See response to Comment 4.1 Source Emission Inventory.

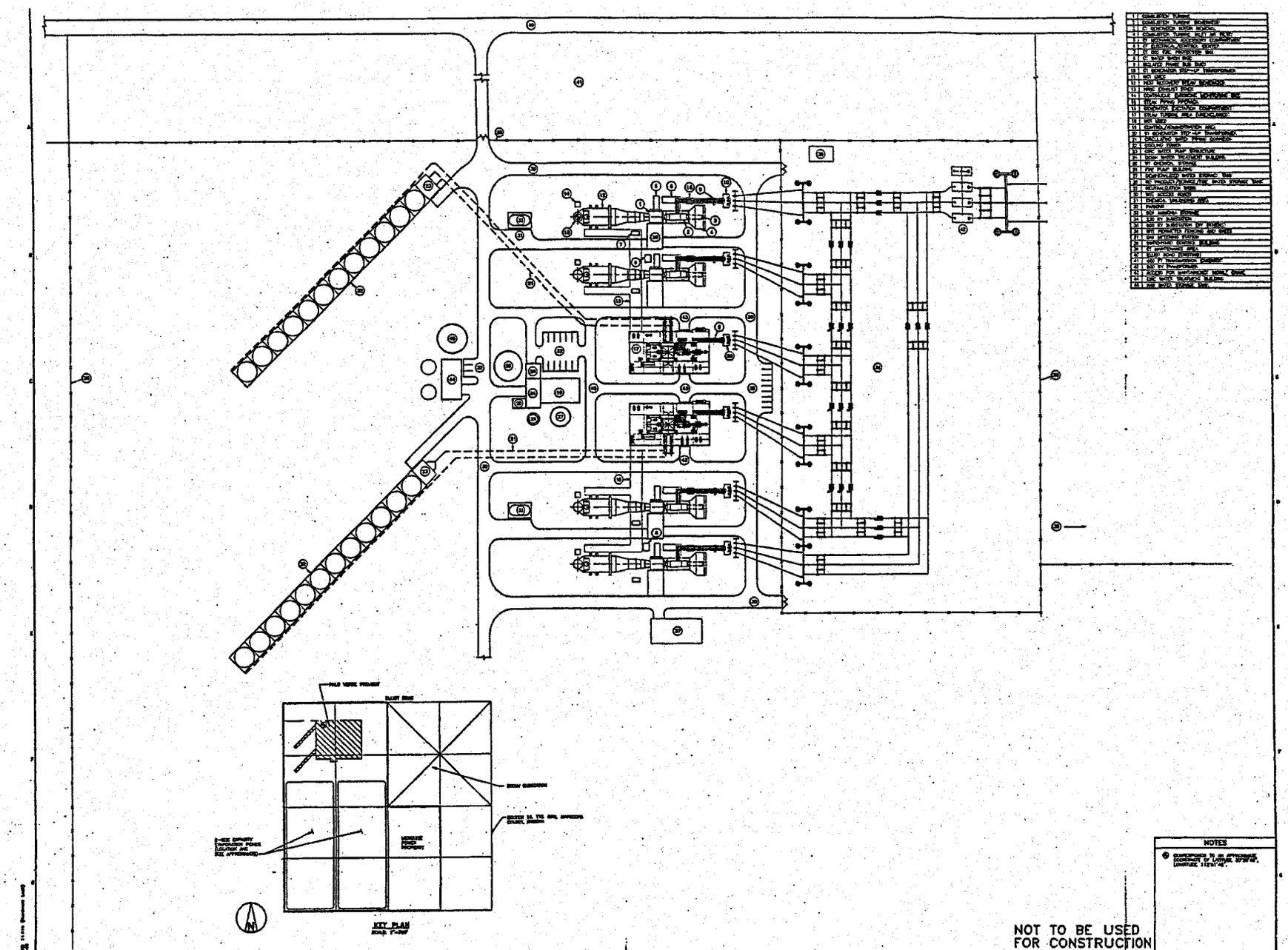
6.8 Building Wake Downwash and GEP

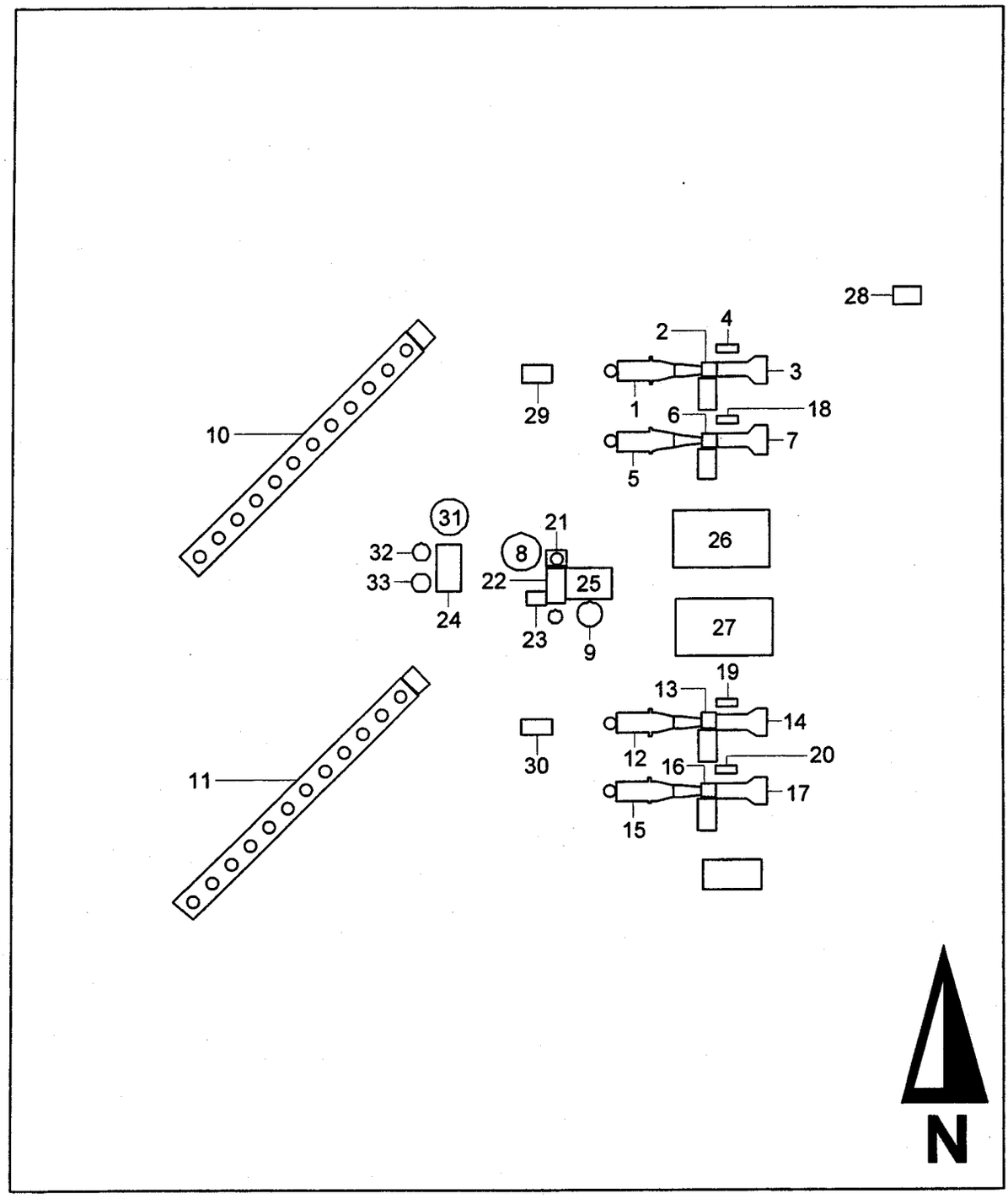
Comment:

The GEP and Building Downwash Analysis should take into account any structure on-site or off-site that may influence plume dispersion.

Response:

The Project's proposed buildings and structures have been analyzed to determine their potential to influence the dispersion of stack emissions. EPA's Guideline for Determination of Good Engineering Practice Stack Height guidance document have been followed in this evaluation. Structure dimensions and relative locations were entered into EPA's Building Profile Input Program (BPIP) to produce an ISCST3 input file with the proper Huber-Snyder or Schulman-Scire direction specific building downwash parameters. Figure 8 provides a site plan of the Project indicates locations and dimension of buildings and structures on-site. Figure 9 illustrates those building and structure included in the BPIP analysis. Table 4 lists the structures included in the BPIP analysis. A discussion of building downwash and GEP is included in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* Section 6.3.3.


KEY PLAN
NOTES
NOT TO BE USED FOR CONSTRUCTION
BLACK & VEATCH
MESQUITE POWER LLC
PALO VERDE POWER PROJECT
SITE ARRANGEMENT
96216-CSTU-S1001
2



Buildings and Stuctures Included in the BPIP Analysis*

*See Table 4 for building/structure identification and dimensions.

Figure 9

building.srf

Table 4 Structures Included in the BPIP Analysis			
Structure ID Number	Structure Designation*	Structure Base Elevation (ft)	Structure Height (ft)
1	HRSG 1	890	90
2	Combustion Turbine 1	890	45
3	Air Inlet 1	890	45
4	Electrical Control Center 1	890	10
5	HRSG 2	890	90
6	Combustion Turbine 2	890	45
7	Air Inlet 2	890	45
8	Firewater Storage Tank	890	60
9	Demineralized Water Tank	890	40
10	Cooling Tower 1	890	35
11	Cooling Tower 2	890	35
12	HRSG 3	890	90
13	Combustion Turbine 3	890	45
14	Air Inlet 3	890	45
15	HRSG 4	890	90
16	Combustion Turbine 4	890	45
17	Air Inlet 4	890	45
18	Electrical Control Center 2	890	10
19	Electrical Control Center 3	890	10
20	Electrical Control Center 4	890	10
21	Firewater Pump Housing	890	20
22	Demineralized H_2O Treatment	890	20
23	Waste Chemical Storage	890	20
24	Circulation Water Treatment	890	35
25	Control/Administration Area	890	60
26	Steam Turbine Area 1	890	60
27	Steam Turbine Area 2	890	60
28	Switchyard Control Building	890	20
29	SCR Ammonia Storage 1	890	25

Table 4 (Continued) Structures Included in the BPIP Analysis			
Structure ID Number	Structure Designation*	Structure Base Elevation (ft)	Structure Height (ft)
30	SCR Ammonia Storage 2	890	25
31	Raw Water Storage Tank	890	60
32	Tank 1	890	20
33	Tank 2	890	20
*Proposed structures to be located at the Project. Refer to Figure 9 for locations.			

7.1 Preliminary Analysis

Comment:

Preliminary modeling, traditionally referred to as screening level modeling, has not been presented in the protocol. An alternative approach referred to as "enveloping" has been proposed by Black & Veatch. The "enveloping" approach has not been adequately described by Black & Veatch and needs to be better explained to warrant approval.

Response:

Due to the significant increase in computing power (i.e., speed and file size handling), it is often more effective to jump directly to a refined level of modeling. Refined air dispersion modeling was performed for the Project to determine the maximum air quality impacts and significant impact area.

Enveloping is a process that considers all of the operating scenarios (i.e., high, ambient, or low temperature operation, steam injection on/off, inlet fogging on/off, etc.) for a particular operating load (i.e., 100%, 50%, etc.) and chooses the worst-case operating scenario per load (i.e., lowest exit velocity, lowest exit temperature, and highest emission rates per pollutant). This process results in worst-case plume dispersion conditions and highest model predicted concentrations. Table 5 presents the refined air dispersion modeling results for each of the pollutants evaluated (NOx, CO, and PM10). These maximum impacts were evaluated over the entire receptor network previously described including the added discrete receptors on the peaks of complex terrain.

The results indicate maximum impacts in excess of the Significant Impact Levels (SILs) for NO_x and PM_{10} (annual and 24-hour averaging periods). Thus, a PSD and NAAQS cumulative analysis is included in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.* Table 5 also indicates a maximum PM_{10} 24-hour impact above the De Minimis monitoring requirements. Mesquite Power, LLC proposes to use the existing Palo Verde air monitor to serve as a representative background value for the Project (see response to Comment 3.1 Pre-Application Air Quality Monitoring).

Table 6 presents the maximum extent of the significant impacts (i.e., the significant impact area) for the Project. As seen in the table, the maximum distance for any pollutant is 14.03 km. Projects located within this distance include Palo Verde Nuclear Generating Station, Duke's Arlington Valley Energy Project, Pinnacle West's Capitol Corporation Project, and the El Paso Natural Gas Compressor Station. A complete discussion as well as modeling results and comparisons to PSD Class II SILs, NAAQS, and increment can be found in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.*

Table 5
Comparison of Maximum Predicted Project Impacts with the PSD Class II Significant Impact Levels and the PSD De Minimis Monitoring Levels

Pollutant	Averaging Period	General Electric			Westinghouse			PSD Class II Significant Impact Level[b] ($\mu g/m^3$)	Further Analysis Required[c]	PSD De Minimis Monitoring Level[d] ($\mu g/m^3$)	PSD De Minimis Monitoring Level Exceeded?
		Max. Predicted Impact[a] ($\mu g/m^3$)	UTM Location (m)		Max. Predicted Impact[a] ($\mu g/m^3$)	UTM Location (m)					
			East	North		East	North				
NO_x	Annual	2.37	327711.5	3691769.3	2.39	327711.5	3691769.3	1	**Yes**	14	No
CO	1 Hour	479.69	326286.4	3690600.0	479.69	326286.4	3690600.0	2,000	**No**	-	-
	8 Hour	34.72	327711.5	3691769.3	35.12	327711.5	3691769.3	500	**No**	575	No
PM_{10}	Annual	3.95	327711.5	3691769.3	3.59	327711.5	3691769.3	1	**Yes**	-	-
	24 Hour	32.28	327711.5	3691769.3	29.50	327711.5	3691769.3	5	**Yes**	10	**Yes**

[a]For a complete listing of all impacts by year, pollutant, operating scenario, and averaging period refer to Appendix G of the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station.*

[b]Predicted impacts from the Project that are below the specified level indicate that the Project will not have predicted significant impacts for that pollutant and further modeling is not necessary for that pollutant.

[c]If required, further analysis includes ambient air quality impact analysis of the Project and all nearby sources to determine compliance with PSD increment consumption and NAAQS.

[d]This criteria is used to assist in the determination of whether preconstruction ambient air monitoring is required to assess current and future compliance with NAAQS.

Table 6
Significant Impact Areas

Pollutant	Averaging Period	PSD Significant Impact Level ($\mu g/m^3$)	Distance of Significant Impact[a] (km)
NO_x	Annual	1.0	1.46
PM_{10}	Annual	1.0	5.41
PM_{10}	24 Hour	5.0	14.03

[a]The significant impact area for each pollutant and averaging period is defined by the distance shown and is the largest distance of the two turbine vendors' machines (General Electric and Westinghouse).

7.2 Full Impact Analysis

Comment:

There is no discussion or proposed approach to show compliance with the proposed Arizona DEQ Air Toxics Rule.

Response:

A hazardous air pollutants (HAPs) analysis has been performed for the Project in accordance with current draft Maricopa County ESDAQD guidance documents (Air Toxics/Hazardous Air Pollutant Permitting Procedure December 14, 1999, and Arizona Ambient Air Quality Guidelines (AAAQGs) 1999 Update). AAAQGs are residential screening values that are protective of human health by considering the risk from inhalation of contaminants in ambient air. Emissions of HAPs, including ammonia slip associated with the use of Selective Catalytic Reduction (SCR), from the Project has been estimated using the California Air Toxics Emission Factor (CATEF) program and AP-42, Volume I, Fifth Edition. A modeling analysis has been performed using worst case annual average performance parameters for the General Electric combustion turbine. These parameters are assumed to represent emissions from the Project. The modeling analysis uses the ISCST3 air dispersion model to model a nominal 1 g/s emission rate with the fence line receptors and the 50 km nested receptor network. The emission factors and input assumptions for the Air Toxics/HAPs analysis are found back in Table 2. This discussion as well as modeling results and comparisons to the AAAQGs can be found in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* Section 6.8.6.

9.0 Class I Impact Analysis

Comment:

There appears to be an exemption from Class I Impact issues proposed in the Workplan.

Response:

As mentioned in Section 2.2 of the Workplan, neither visibility nor regional haze analyses were required for the Superstition, Mazatzal, and Pine Mountain Class I Wilderness Areas at the word of Mr. Peter Lahm of the U.S. Forest Service, representing the Federal Land Manager(s) of these areas. These Class I areas are located approximately 127 km, 132 km, and 135 km respectively from the Project. As justification for the exemption, in addition to the significant distances, the Project will employ the use of clean fuel technology (natural gas) with state-of-the-art pollution control equipment. The relative locations of the Class I areas to the Project also provide for the exemption from these analyses. The large Phoenix metropolitan area, including both NOx and PM10 nonattainment areas, lies between the Project location and the Class I areas. Thus, the transport of a plume from the Project across such an area will not likely adversely affect these Class I areas. Mesquite Power, LLC has, however, placed receptors at the closest boundaries to the Project and modeled maximum ground-level impacts at each of these areas. These ground-level impacts have been compared with the Class I SILs. The Class I SILs are calculated as 4 percent of the PSD Class I increments, as recommended by the National Park Service. This discussion as well as modeling results and comparisons to the Class I SILs can be found in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* Section 6.8.5.

11.0 Appendices

Comment:

Minutes from the pre-application meeting and any other correspondence between the proponent and Maricopa County ESDAQD were not included in the Workplan.

Response:

Official minutes for the kickoff meeting with Maricopa County ESDAQD were not recorded by any of the involved parties. A single letter of correspondence to Maricopa County ESDAQD pertaining to the errors found and corrected in the meteorological data set obtained from the county is contained in Attachment 2.

End of Comments and Responses.

Additional Information

Modeled impact on PM_{10} and Ozone Nonattainment Areas

The Project will be located approximately 15 miles west of the Phoenix nonattainment area for PM_{10} and 25 miles west of the Phoenix nonattainment area for CO and NO_x (as a precursor to O_3) PSD pollutants. Maricopa County Rule 240 Section 308.1(e) presumes that any major source of VOCs and NO_x located within 50 km (31 miles) of an ozone nonattainment area contributes to ozone violations unless it can be demonstrated that topographical, meteorological, or other physical factors in the vicinity of the new major source are such that emissions are not expected to contribute to violations of the ozone standards in the adjacent nonattainment areas.

Figure 10 shows a seasonal, daytime wind rose for the Project, the boundary for the ozone nonattainment area, as well as the surrounding terrain and topography. The wind rose represents the hottest months (May through October) and the daylight hours (8 am to 8 pm). These bounds are used to represent the summer ozone period. The prevailing wind is from the southwest (with smaller components from the south). Considering these winds, emissions from the Project would be transported to the northeast along the river valley towards the White Tank Mountains. This keeps the emissions from making further eastward progression towards the ozone nonattainment area. Thus it is not likely, based on meteorological and topographical considerations, that emissions from the Project would be transported through the Buckeye Valley into the ozone nonattainment area of the Phoenix air basin.

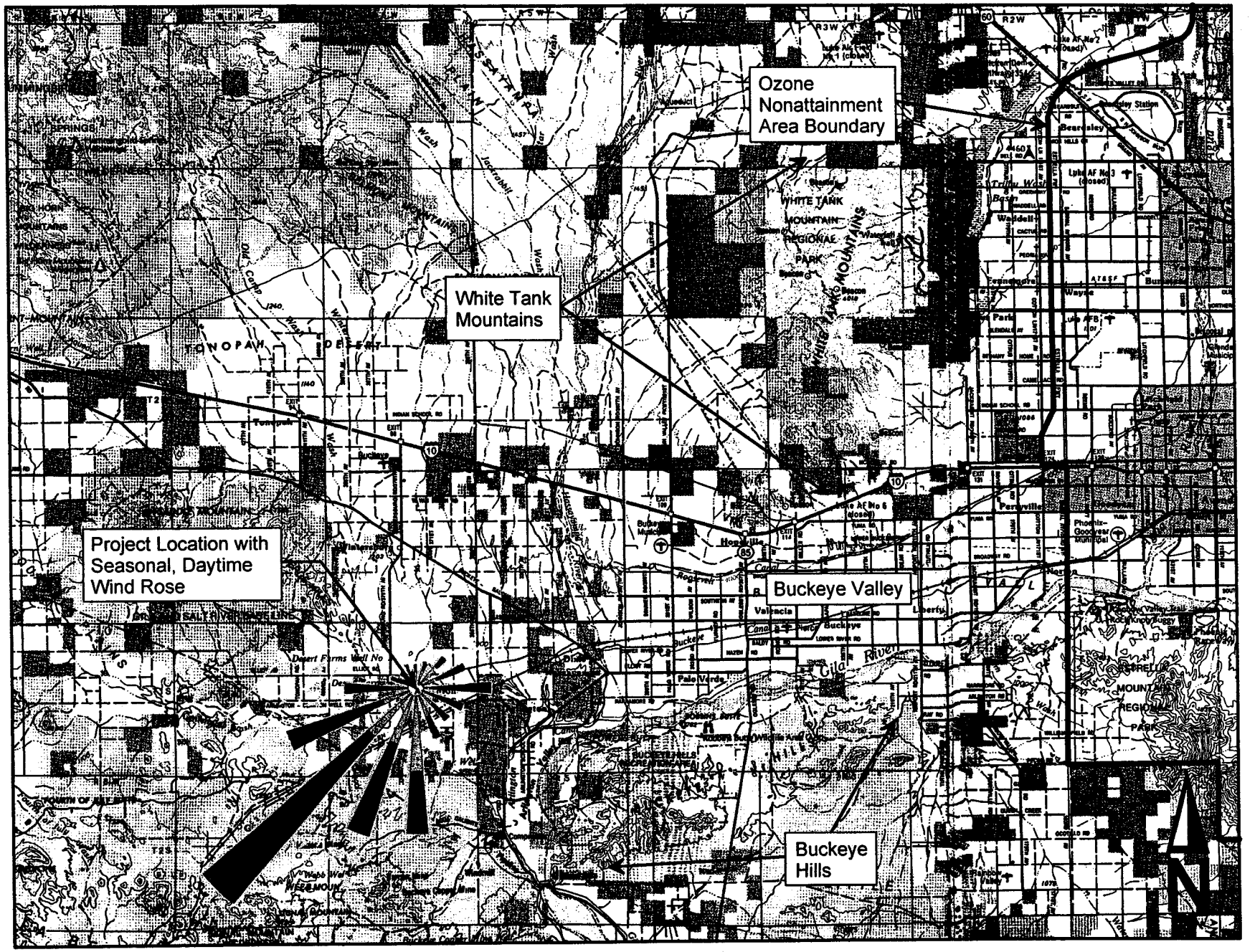
As further consideration of the transport of emissions from the Project into both the ozone and PM_{10} nonattainment areas, each area has been evaluated with a modeling analysis. These areas have been modeled with the ISCST3 air dispersion model to demonstrate there will be no significant impacts of PM_{10} into the PM_{10} nonattainment area and NO_x into the ozone nonattainment area (Because NO_x is a precursor to ozone formation, predicting an insignificant impact of NO_x can be used as a surrogate for determining, an insignificant impact on the ozone nonattainment area).

Receptors were placed along the boundaries of the nonattainment areas and modeled against PSD Class II significant impact levels. Figure 11 illustrates the receptors with respect to the proposed Project location. Modeling results show that the Project will not have a significant impact of NO_x or PM_{10} on the nonattainment areas. In fact, the maximum significant impact area for the Project is only 14.03 km while the distance to the nearest nonattainment boundary is 24 km. This discussion as well as modeling results and comparisons to the PSD Class II SILs can be found in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* Section 6.8.1.

In consideration of the above arguments and at the suggestion of Maricopa County ESDAQD, in a conference call on March 15, 2000, Mesquite Power, LLC is requesting a waiver from conducting an ozone impact analysis. Ozone is a regional issue insomuch as it is not entirely adequate to model a single source for its ozone

contribution. It is understood, however, that regional ozone transport may still be of certain concern. For this reason, Mesquite Power, LLC has included NO_x and VOC emission rates in these responses to comments on the Workplan and in the *Prevention of Significant Deterioration And Title V Air Permit Application For The Mesquite Generating Station* document. These data can be used for use in the Maricopa Association of Governments (MAG) analysis for regional ozone.

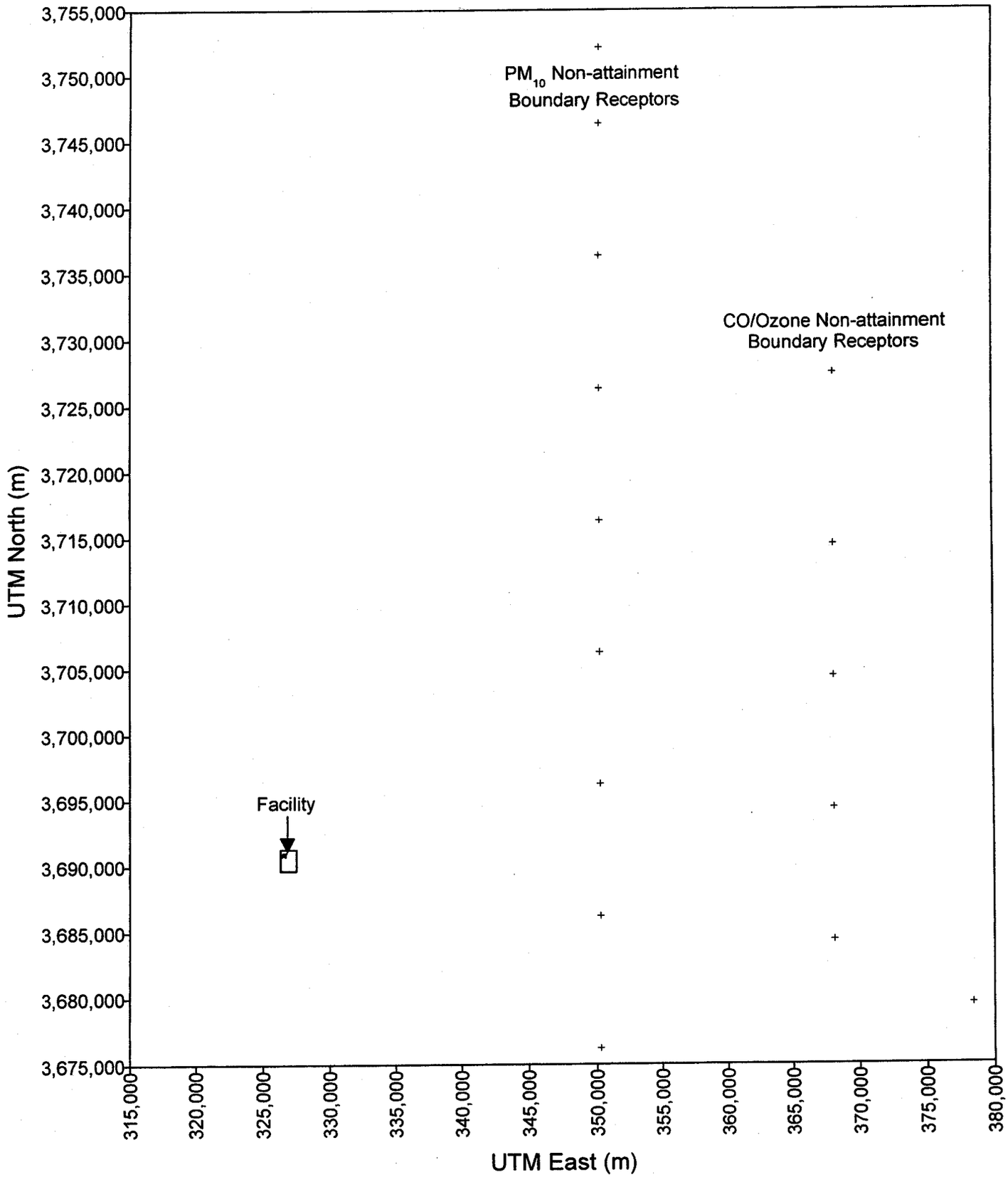
In accordance with PSD review guidelines, if a proposed source has potential VOC emissions in excess of 100 tpy, ozone monitoring may be required if representative data do not exist. The potential VOC emissions for the Mesquite Generating Station are greater than 100 tpy. Mesquite Power, LLC proposes to use the Palo Verde Nuclear Generating Station's air quality monitor (AIRS #04-013-9993) to address the possible need of ozone monitoring. This monitor, operated by the Arizona Department of Environmental Quality, is given periodic precision and accuracy checks consistent with NSR/PSD guidelines (as detailed in correspondence from Peter Hyde in Attachment 6). Background monitored ozone concentrations are given in Table 7. The specifics of this monitor are addressed in the response to Comment 3.4 Background Concentrations.



Wind Rose, Topography, & Ozone Nonattainment Area

Figure 10

nonattainment.srf



Non-attainment Boundary Receptors

Figure 11

NAgrid.srf

Table 7
Representative Ambient Background Monitoring Data

Monitoring Site	Location Latitude/ Longitude (degrees)	Distance from Project (km)	Direction from Project	Year And Pollutant Monitored	Averaging Period	Representative Background Concentration (ppm)
Palo Verde[a]	33.349/ 112.832	3.0	N	1997[b] O_3	1 hour[e]	0.099
Palo Verde[a]	33.349/ 112.832	3.0	N	1997[b] O_3	Monthly[f]	0.048
Palo Verde[a]	33.349/ 112.832	3.0	N	1998[c] O_3	1 hour[e]	0.099
Palo Verde[a]	33.349/ 112.832	3.0	N	1998[c] O_3	Monthly[f]	0.046
Palo Verde[a]	33.349/ 112.832	3.0	N	1999[d] O_3	1 hour[e]	0.090
Palo Verde[a]	33.349/ 112.832	3.0	N	1999[d] O_3	Monthly[f]	0.054

[a]Palo Verde Nuclear Generating Station (AIRS #04-013-9993).
[b]1997 data consists of 8 months of data (April – November).
[c]1998 data consists of 6 months of data (April – Semptember).
[d]1999 data consists of 7 months of data (April – October).
[e]Maximum 1 hour value for the given year.
[f]Maximum monthly average for the given year.

5.2 Regional Climatology

Temperatures range from very hot in summer to mild in winter. Many winter days reach over 70 degrees and typical high temperatures in the middle of the winter are in the 60s. The normal high temperature is over 90 degrees from early May through early October, and over 100 degrees from early June through early September. Many days each summer will exceed 110 degrees in the afternoon and remain above 85 degrees all night. In addition, the climate is very dry. Annual precipitation is only about 7 inches, and afternoon humidities range from about 30 percent in winter to only about 10 percent in June.

10.0 References

U.S. Environmental Protection Agency (EPA), 1985: *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations),* (Revised), EPA-450/4-80-023R. U.S. EPA Office of Air and Radiation, U.S. EPA Office of Air Quality Planning and Standards. Research Triangle Park, NC.

U.S. Environmental Protection Agency (EPA), 1997: *Guideline on Air Quality Models,* (Revised), EPA-450/2-78-027R-C. Office of Air and Radiation, Office of Air Quality Planning and Standards, Research Triangle Park, NC.

U.S. Environmental Protection Agency (EPA). February 1996. New Source Review Workshop Manual.

U.S. Environmental Protection Agency (EPA). 1998. Compilation of Air Pollutant Emission Factors, AP-42.

Attachments

Attachment 1
Stack Parameters and Emission Tables
&
PTE Spreadsheet

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					UTM COORDINATES OF EMISSION POINT (5)			EMISSION POINT DISCHARGE PARAMETERS STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
EMISSION POINT (1) General Electric		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE							EXIT DATA				
NUMBER	NAME Combustion Turbine and Duct Burner	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
1	unit 1	NOx	22.2	92.4	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
1	unit 1	CO	21.6	89.8	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
1	unit 1	PM/PM10	30.4	126.6	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
1	unit 1	SO2	2.1	8.8	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
1	unit 1	VOC	16.6	64.8	12	326601.9	3691016.0	170	80	18	64.1	172.1	NA	NA
2	unit 2	NOx	22.2	92.4	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA
2	unit 2	CO	21.6	89.8	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA
2	unit 2	PM/PM10	30.4	126.6	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA
2	unit 2	SO2	2.1	8.8	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet

ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

(2) Components to be listed include regulated air pollutants as defined in R18-2-101. Examples of typical component names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOC), particulate matter (PM), particulate less than 10 microns (PM_{10}), etc. Abbreviations are O.K.

(3) Pounds per hour (#/HR) is maximum potential emission rate expected by applicant.

(4) Tons per year is annual maximum potential emission expected by applicant, which takes into account process operating schedule.

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(6) Supply additional information as follows if appropriate:
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(b) Stack's height above supporting or adjacent structures if structure is within 3 "stack height above the ground" of stack.

(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					UTM COORDINATES OF EMISSION POINT (5)			EMISSION POINT DISCHARGE PARAMETERS						
EMISSION POINT (1) General Electric		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE					STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
NUMBER	NAME Combustion Turbine and Duct Burner	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	EXIT DATA DIA. (ft.)	EXIT DATA VEL. (fps.)	EXIT DATA TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
2	unit 2	VOC	16.6	64.8	12	326601.9	3690980.4	170	80	18	64.1	172.1	NA	NA
3	unit 3	NOx	22.2	92.4	12	326601.8	3690836.8	170	80	18	64.1	172.1	NA	NA
3	unit 3	CO	21.6	89.8	12	326601.8	3690836.8	170	80	18	64.1	172.1	NA	NA
3	unit 3	PM/PM10	30.4	126.6	12	326601.8	3690836.8	170	80	18	64.1	172.1	NA	NA
3	unit 3	SO2	2.1	8.8	12	326601.8	3690836.8	170	80	18	64.1	172.1	NA	NA
3	unit 3	VOC	16.6	64.8	12	326601.8	3690836.8	170	80	18	64.1	172.1	NA	NA
4	unit 4	NOx	22.2	92.4	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA
4	unit 4	CO	21.6	89.8	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA
4	unit 4	PM/PM10	30.4	126.6	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

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(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternatives Operating Scenarios

DATE 1/19/2000

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					UTM COORDINATES OF EMISSION POINT (5)			EMISSION POINT DISCHARGE PARAMETERS						
EMISSION POINT (1)		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE					STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
General Electric										EXIT DATA				
NUMBER	NAME Combustion Turbine and Duct Burner	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
4	unit 4	SO2	2.1	8.8	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA
4	unit 4	VOC	16.6	64.8	12	326601.5	3690802.2	170	80	18	64.1	172.1	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

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(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

Estimated Potential to Emit as per Rule 100.
Review of applications and issuance of permits will be expedited by supplying all necessary information on this Table.

REGULATED AIR POLLUTANT DATA					EMISSION POINT DISCHARGE PARAMETERS										
EMISSION POINT (1) Westinghouse		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE		UTM COORDINATES OF EMISSION POINT (5)			STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
NUMBER	Combustion Turbine and Duct Burner NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	EXIT DATA DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
1	unit 1	NOx	23.6	98.6	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
1	unit 1	CO	23.0	95.9	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
1	unit 1	PM/PM10	28.8	118.7	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
1	unit 1	SO2	2.24	9.3	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
1	unit 1	VOC	16.1	67.0	12	326601.9	3691016.0	170	80	18	65.4	174.9	NA	NA
2	unit 2	NOx	23.6	98.6	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA
2	unit 2	CO	23.0	95.9	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA
2	unit 2	PM/PM10	28.8	118.7	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA
2	unit 2	SO2	2.24	9.3	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

(1) Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits, and Emissions Inventory Questionnaire. Include fugitive emissions. Limit emission point number to eight (8) character spaces. For each emission point use as many lines as necessary to list regulated air pollutant data. Typical emission point names are: heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are O.K.

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COMPANY NAME & LOCATION Mesquite Power, L L C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

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REGULATED AIR POLLUTANT DATA					EMISSION POINT DISCHARGE PARAMETERS									
EMISSION POINT (1) Westinghouse		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE		UTM COORDINATES OF EMISSION POINT (5)			STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
										EXIT DATA				
NUMBER	Combustion Turbine and Duct Burner NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
2	unit 2	VOC	16.1	67.0	12	326601.9	3690980.4	170	80	18	65.4	174.9	NA	NA
3	unit 3	NOx	23.6	98.6	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
3	unit 3	CO	23.0	95.9	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
3	unit 3	PM/PM10	28.8	118.7	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
3	unit 3	SO2	2.24	9.3	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
3	unit 3	VOC	16.1	67.0	12	326601.8	3690836.8	170	80	18	65.4	174.9	NA	NA
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4	unit 4	CO	23.0	95.9	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA
4	unit 4	PM/PM10	28.8	118.7	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

General Instructions:

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(7) Dimensions of nonpoint sources as defined in R18-2-101.

COMPANY NAME & LOCATION Mesquite Power,L L.C

EMISSION SOURCES - One of Two Alternative Operating Scenarios

DATE 1/19/2000

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REGULATED AIR POLLUTANT DATA					EMISSION POINT DISCHARGE PARAMETERS									
EMISSION POINT (1) Westinghouse		CHEMICAL COMPOSITION OF TOTAL STREAM	R. AIR POLLUTANT EMISSION RATE		UTM COORDINATES OF EMISSION POINT (5)			STACK SOURCES (6) Annual Average Conditions					NONPOINT SOURCES (7)	
NUMBER	Combustion Turbine and Duct Burner NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	EXIT DATA DIA. (ft.)	EXIT DATA VEL. (fps.)	EXIT DATA TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
4	unit 4	SO2	2.24	9.3	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA
4	unit 4	VOC	16.1	67.0	12	326601.5	3690802.2	170	80	18	65.4	174.9	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
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EMISSION SOURCES

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										EXIT DATA				
NUMBER	NAME	REGULATED AIR POLLUTANT NAME (2)	#/HR. (3)	TONS /YEAR (4)	ZONE	EAST (Mtrs.)	NORTH (Mtrs.)	HEIGHT ABOVE GROUND /feet	HEIGHT ABOVE STRUC. /feet	DIA. (ft.)	VEL. (fps.)	TEMP. (°F)	LENGTH (ft.)	WIDTH (ft.)
CT1	Cooling Tower 1	PM/PM10	3.86	16.89	12	326441.2	3690969.4	45	10	32	25.30	122.0	NA	NA
CT2	Cooling Tower 2	PM/PM10	3.86	16.89	12	326438.9	3690793.4	45	10	32	25.30	122.0	NA	NA
FWP	Fire Water Pump	NOx	5.59	0.145	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA
FWP	Fire Water Pump	CO	1.00	0.026	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA
FWP	Fire Water Pump	PM/PM10	0.15	0.004	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA
FWP	Fire Water Pump	SO2	0.54	0.014	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA
FWP	Fire Water Pump	VOC	0.30	0.008	12	326574.7	3690920.4	21	1	0.5	227.49	668.0	NA	NA

GROUND ELEVATION OF FACILITY ABOVE MEAN SEA LEVEL 890 feet
ADEQ STANDARD CONDITIONS ARE 293K AND 101.3 KILOPASCALS (A.A.C. R18-2-101)

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   (b) Stack's height above supporting or adjacent structures if structure is within 3 "stack height above the ground" of stack.

(7) Dimensions of nonpoint sources as defined in R18-2-101.

Mesquite Power, LLC

Revised 3/1/00
Printed 03/01/2000 3:59 PM

Determination of Representative Emission and Stack Parameters and Potential to Emit Calculator

Combined Cycle Operation - Natural Gas

GE7FA

G = General Electric Turbine
NOTE Ref. 1/4/00 performance data.

Turbine Operation 100 percent 0ct25a

Case name	Case G1a	Case G1b	Case G1c	Case G2a	Case G2b	Case G2c	Case G3a	Case G3b	Case G3c	Case G4a	Case G4b	Case G4c
Ambient Temp (F)	73	73	73	122	122	122	59	59	59	17	17	17
Duct Firing	X	X	X	X	X	X	X	X	X			
Evap Cooler	X		X	X		X	X		X	X		X
Duct Firing (all)	X		X			X			X			X
Exit Temp (F)	172.3	167.4	172.1	177.7	169.4	175	168.3	172.7	174.3	167.1	165
Exit Velocity (fps)	64.1	64.6	66.4	61.2	61.6	63.5	64.5	65.2	70.3	66.6	69.4	70.1
Emissions (lb/hr)												
NOx (a)	20.4	15.8	21.1	18.3	14.7	20.5	20.7	18.7	21.3	22.3	19.9	22.1
CO	19.9	18.1	20.5	18.7	14.3	20	20.1	18.3	20.7	21.6	18.7	21.5
PM/PM10 (d)	30.5	19	30.7	29.1	19	30.5	29.1	19	29.7	30.4	19	29.5
SO2 (f)	1.9	1.8	2.0	1.9	1.4	1.9	2.0	1.8	2.0	2.1	1.8	2.1
VOC(h)	14.7	2.4	14.9	13.7	2.3	15.2	14.9	2.5	14.7	15.6	2.6	14.7

Turbine Operation 75 percent

Case name	Case G1d	Case G2d	Case G3d	Case G4d
Ambient Temp (F)	73	122	59	17
Evap Cooler				
Duct Firing				
Exit Temp (F)	176.8	181.1	176.8	174.1
Exit Velocity (fps)	64	45.7	65.1	64
Emissions (lb/hr)				
NOx (a)	15.3	16.6	15.7	15.5
CO	13	15.4	13.3	13.1
PM/PM10 (d)	18	18	18	18
SO2 (f)	1.3	1.6	1.3	1.3
VOC(h)	2	1.6	2	2.1

Turbine Operation 50 percent

Case name	Case G1e	Case G2e	Case G3e	Case G4e
Ambient Temp (F)	73	122	59	17
Evap Cooler				
Duct Firing				
Exit Temp (F)	179.9	175.6	169.5	167.2
Exit Velocity (fps)	42	45.3	43.6	44
Emissions (lb/hr)				
NOx (a)	8.4	8.7	16.1	16.4
CO	8.4	8.5	8.4	8.3
PM/PM10 (d)	16	16	16	16
SO2 (f)	0.9	0.9	0.9	0.9
VOC(h)	1.8	1.6	1.7	1.7

WESTINGHOUSE

W = Westinghouse Turbine
NOTE Ref. 1/4/00 performance data.

Turbine Operation 100 percent WES501F

Case name	Case W1a	Case W1b	Case W1c	Case W2a	Case W2b	Case W2c	Case W3a	Case W3b	Case W3c	Case W4a	Case W4b	Case W4c
Ambient Temp (F)	73	73	73	122	122	122	59	59	59	17	17	17
Duct Firing	X	X	X	X	X	X	X	X	X	X		
Evap Cooler	X		X	X		X	X		X	X		X
Duct Firing (all)	X		X			X	X		X	X		X
Exit Temp (F)	174.6	169.5	175.7	177.6	169.6	176.4	174.3	169.1	175.7	173.1	168.8	175.1
Exit Velocity (fps)	65.4	66.3	71	61.7	62.8	69.9	69.4	67.3	72.2	69	70	74.1
Emissions (lb/hr)												
NOx	21.3	16.9	22.5	19.0	14.8	21.8	21.7	18.3	22.7	22.6	17.8	23.5
CO	20.7	18.6	21.8	18.3	14.3	21	21.1	18.4	22.1	22	18.4	22
PM/PM10	27.1	15.3	28.7	24.9	14	26.3	27.8	16.4	28.7	28.8	16.4	27.8
SO2	2.0	1.8	2.1	1.9	1.4	2.1	2.1	1.8	2.2	2.1	1.8	2.2
VOC(h)	15.3	1.8	16	14.1	1.8	15.6	15.8	2	14.8	16.1	2.1	16

Turbine Operation 75 percent

Case name	Case W1d	Case W2d	Case W3d	Case W4d
Ambient Temp (F)	73	122	59	17
Exit Temp (F)	184.7	184.7	184.6	185.3
Exit Velocity (fps)	64	65.1	65.6	66.7
Emissions (lb/hr)				
NOx	13.4	11.8	14.1	15.3
CO	13.3	11.6	13.4	14.2
PM/PM10	14.1	12.6	14.2	15.5
SO2	1.3	1.1	1.3	1.5
VOC(h)	3.2	3.1	3.2	3.4

Turbine Operation 50 percent

Case name	Case W1e	Case W2e	Case W3e	Case W4e
Ambient Temp (F)	73	122	59	17
Exit Temp (F)	189.1	182.2	187.6	186.4
Exit Velocity (fps)	51	55.4	58	59.1
Emissions (lb/hr)				
NOx	11.2	10.4	12.3	13.3
CO	11.5	10.3	11.9	12.3
PM/PM10	12.6	11.5	12.9	13.7
SO2	1.1	1.0	1.3	1.3
VOC(h)	3.1	3.4	3.2	3.4

Gas Turbines

Worst Case Load Representative Emissions and Stack Parameters

	GE Turbine	WES Turbine
Exit Temp (F)	169.50	248.21 K
Exit Velocity (fps)	61.20	18.65 m/s
Emissions (lb/hr)		
NOx	23.00	2.97 g/s
CO	23.00	2.90 g/s
PM/PM10	30.40	3.83 g/s
SO2	2.24	0.28 g/s
VOC	16.00	2.02 g/s

Stack Data[1]

GE Turbine
Worst Case Load Representative Emissions and Stack Parameters

GE 100% Worst Case Parameters

	GE 100% Worst Case Parameters	
Exit Temp (F)	169.50	348.21 K
Exit Velocity (fps)	61.20	18.65 m/s
Emissions (lb/hr)		
NOx	23.00	2.97 g/s
CO	23.00	2.90 g/s
PM/PM10	30.40	3.83 g/s
SO2	2.24	0.28 g/s
VOC	16.00	2.02 g/s

GE 75% Worst Case Parameters

	GE 75% Worst Case Parameters	
Exit Temp (F)	176.18	354.33 K
Exit Velocity (fps)	46.70	14.23 m/s
Emissions (lb/hr)		
NOx	15.30	1.93 g/s
CO	13.40	1.69 g/s
PM/PM10	18.00	2.27 g/s
SO2	1.46	0.18 g/s
VOC	2.10	0.26 g/s

GE 50% Worst Case Parameters

	GE 50% Worst Case Parameters	
Exit Temp (F)	187.00	348.43 K
Exit Velocity (fps)	40.30	12.28 m/s
Emissions (lb/hr)		
NOx	13.30	1.68 g/s
CO	12.60	1.61 g/s
PM/PM10	16.00	2.01 g/s
SO2	1.30	0.16 g/s
VOC	3.40	0.43 g/s

WES Turbine
Worst Case Load Representative Emissions and Stack Parameters

WES 100% Worst Case Parameters

	WES 100% Worst Case Parameters	
Exit Temp (F)	172.10	351.54 K
Exit Velocity (fps)	61.70	18.81 m/s
Emissions (lb/hr)		
NOx	23.60	2.97 g/s
CO	23.00	2.90 g/s
PM/PM10	28.00	3.53 g/s
SO2	2.24	0.28 g/s
VOC	16.10	2.03 g/s

WES 75% Worst Case Parameters

	WES 75% Worst Case Parameters	
Exit Temp (F)	184.30	363.54 K
Exit Velocity (fps)	55.10	16.79 m/s
Emissions (lb/hr)		
NOx	16.20	1.98 g/s
CO	14.00	1.76 g/s
PM/PM10	19.00	2.39 g/s
SO2	1.46	0.18 g/s
VOC	3.60	0.45 g/s

WES 50% Worst Case Parameters

	WES 50% Worst Case Parameters	
Exit Temp (F)	187.60	360.71 K
Exit Velocity (fps)	59.40	18.10 m/s
Emissions (lb/hr)		
NOx	13.20	1.66 g/s
CO	13.00	1.61 g/s
PM/PM10	13.70	1.73 g/s
SO2	1.30	0.16 g/s
VOC	3.40	0.43 g/s

Emergency Fire Water Pump - Diesel Fuel(i)

Exit Temp (F)	655
Exit Velocity (fps)	227.40
Emissions (lb/hr)	
NOx	8.00
CO	8.667
PM/PM10	0.1334
SO2	0.046
VOC(j)	0.3362

Emergency Fire Water Pump

Exit Temp (F)	655.00
Exit Velocity (fps)	227.40
Emissions (lb/hr)	
NOx	8.00
CO	8.67
PM/PM10	0.13
SO2	0.04
VOC	0.34

1 # of emergency fire water pumps
52 Hours of emergency fire water pump operation per year

NOx	8.00 lb/h	0.12 ty	
CO	8.67 lb/h	0.13 ty	
PM/PM10	0.13 lb/h	0.00 ty	
SO2	0.04 lb/h	0.01 ty	
VOC	0.34 lb/h	0.01 ty	

Cooling Towers

Exit Temp (F)	122
Exit Velocity (fps)	26.3
Emissions (lb/hr)	
PM/PM10	0.32

Cooling Towers

Exit Temp (F)	122.00
Exit Velocity (fps)	26.30
Emissions (lb/hr)	
PM/PM10	0.32

24 # of cooling tower cells
8760 Hours of emergency fire water pump operation per year

PM/PM10 0.32 lb/h 10.77 ty

Potential To Emit Calculations

Facility Operating Parameters

GE 100%T

4 # of turbines
8760 Hours of CCGT natural gas operation per year
365 Equivalent days operation per year

GE Annual Worst Case Parameters[2]

PER-COMBINED CYCLE OPERATIONS

Max lb/h at 73 F on HO (a)

NOx	24.1 lb/h	105.7 ty	2.98 g/s
CO	20.60 lb/h	90.2 ty	2.54 g/s
PM/PM10	26.30 lb/h	115.3 ty	3.24 g/s
SO2	2.00 lb/h	8.8 ty	0.25 g/s
VOC	14.80 lb/h	64.9 ty	1.83 g/s
Exit Temp	172.10 F	350.93 K	
Exit Velocity	64.10 fps	19.54 m/s	

	Turbines PTE (Tpy)	Fire Water Pump PTE (Tpy)	Cooling Towers PTE (Tpy)	Total Facility PTE (Tpy)	PSD SIL (Tpy)	Exceed PSD (Yes)
NOx	105.67	0.12	NA	105.67	40	Yes
CO	90.16	0.13	NA	90.16	100	Yes
PM/PM10	115.32	0.00	10.77	115.32	25/15	Yes
SO2	8.77	0.01	NA	8.78	40	Yes
VOC	64.92	0.01	NA	64.93	40	Yes
HCHO (c)	4.29	0.0	NA	4.29	1	no
Total Reduced Sulfur (TRS) (k)	neg	neg	NA	neg	10	no
Hydrogen Sulfide (H2S)	neg	neg	NA	neg	10	no
Total Fluorides (TF)	neg	neg	NA	neg	3	no
Lead (Pb)	neg	neg	NA	neg	0.6	no

Facility Operating Parameters

WES 100%T

4 # of turbines
8760 Hours of CCGT natural gas operation per year
365 Equivalent days operation per year

WES Annual Worst Case Parameters[2]

PER-COMBINED CYCLE OPERATIONS

Max lb/h at 73 F on HO (a)

NOx	23.5 lb/h	104.2 ty	2.96 g/s
CO	21.80 lb/h	95.7 ty	2.70 g/s
PM/PM10	27.10 lb/h	119.2 ty	3.42 g/s
SO2	2.10 lb/h	9.2 ty	0.27 g/s
VOC	15.30 lb/h	67.1 ty	1.92 g/s
Exit Temp	174.80 F	352.54 K	
Exit Velocity	65.40 fps	19.93 m/s	

	Turbines PTE (Tpy)	Fire Water Pump PTE (Tpy)	Cooling Towers PTE (Tpy)	Total Facility PTE (Tpy)	PSD SIL (Tpy)	Exceed PSD (Yes)
NOx	104.20	0.12	NA	104.32	40	Yes
CO	95.70	0.13	NA	95.71	100	Yes
PM/PM10	119.20	0.00	10.77	119.20	25/15	Yes
SO2	9.20	0.01	NA	9.20	40	no
VOC	67.10	0.01	NA	67.10	40	no
HCHO (c)	4.57	0.0	NA	4.57	1	no
Total Reduced Sulfur (TRS) (k)	neg	neg	NA	neg	10	no
Hydrogen Sulfide (H2S)	neg	neg	NA	neg	10	no
Total Fluorides (TF)	neg	neg	NA	neg	3	no
Lead (Pb)	neg	neg	NA	neg	0.6	no

Notes

a Worst Case emissions per hour 100% load for both turbines at annual average temperature of 73 F.
b Combined Total Reduced Sulfur Compounds (including H2S) and Total Reduced Sulfur (including H2S).
c HCHO based on a 10% conversion of SO2 to SO3 and a conversion rate of 1.33 from SO3 to HCHO (in the stack and SCR).
d PM/PM10 emissions (filterable and back-half condensable).
e NOx emissions from the turbines included the effect of selective catalytic reduction (SCR) to 2.5 ppm for natural gas firing only.
f Sulfur content assumed for the natural gas = 0.20 grains of sulfur per 100 SCF.
g Stack pressure, stack temperature, stack velocity, stack diameter adjusted by the duct burner.
h VOC emissions are estimated to be 20% of the UHC emissions for the GE turbines and 50% of the UHC emissions for the Westinghouse Turbines.
i Emergency Fire Water Pump will be operated for 52 hours per year.
j VOC emissions for the Emergency Fire Water Pump were considered to 100% of the hydrocarbon emissions.
k Both worst case short-term and annual performance do not represent a single possible operating mode: the values include worst case performance over each load (short-term), or annual average operating scenario.

Attachment 2
Meteorological Data Correction Letter

BLACK & VEATCH

8400 Ward Parkway
P.O. Box 8405
Kansas City, Missouri 64114

Tel: (913) 458-2000

Black & Veatch Corporation

Sempra Energy Resources
Palo Verde Power Project

B&V Project 96210.0020
November 16, 1999

Ms. Elena Gorelik
Maricopa County Environmental Services Department
Air Quality Division
1001 N. Central Ave.
Suite 200
Phoenix, AZ 85004-1942

Subject: Palo Verde Meteorological Data Set

Dear Ms. Gorelik:

We recently received a copy, via Peter Allard (SA&B), of the meteorological data set used by Pinnacle West in their recently submitted air dispersion modeling analysis. This data set is identified as consisting of 1994-1998 Palo Verde Nuclear Generating Station surface meteorological data and 1994-1998 Tucson upper air data.

Upon receiving the data, we proceeded to put the data set through a brief QA/QC process. As part of this process, we checked the data for any extreme outliers. One of the parameters reviewed was ambient temperature. Ambient temperatures greater than 350 K (170 F) were considered to be an error. Several hours were identified in 1997 and 1998 that exceeded this value (a total of ten hours). The value in the data set for these hours was 810.9 K, in every case. The specific dates and hours are listed in the table below. Note that this value is equivalent to 999.9 F. "Four nines" is used in certain meteorological monitoring data processors as an error value. We believe this to the situation here.

Year	Date	Hour	Original Value (K)	Interpolated Value (K)
1997	4-16	14	810.9	302.8
	4-16	15	810.9	303.5
	4-16	16	810.9	304.2
	5-9	15	810.9	307.9
	5-9	16	810.9	308.8
	5-15	10	810.9	303.4
	12-22	2	810.9	282.4
1998	12-4	11	810.9	285.0
	12-4	12	810.9	287.0
	12-4	13	810.9	289.0

To correct this error, we are proposing to interpolate new temperature values for these hours using data immediately preceeding, and following, the "bad" hours. The values we propose to change are also included in the table, above. Screening-level modeling using the erroneously

high temperature values indicated a significant error in the resulting modeled concentrations. This is due to a stack plume temperature significantly less the ambient temperature, resulting a negative thermal buoyancy for the plume and resulting high modeled impacts. We will proceed with our analysis using the corrected data set.

If you have any questions, please don't hesitate to call me at (913) 458-7961.

Very truly yours,

BLACK & VEATCH

Mark J. Bareta
Air Quality Scientist

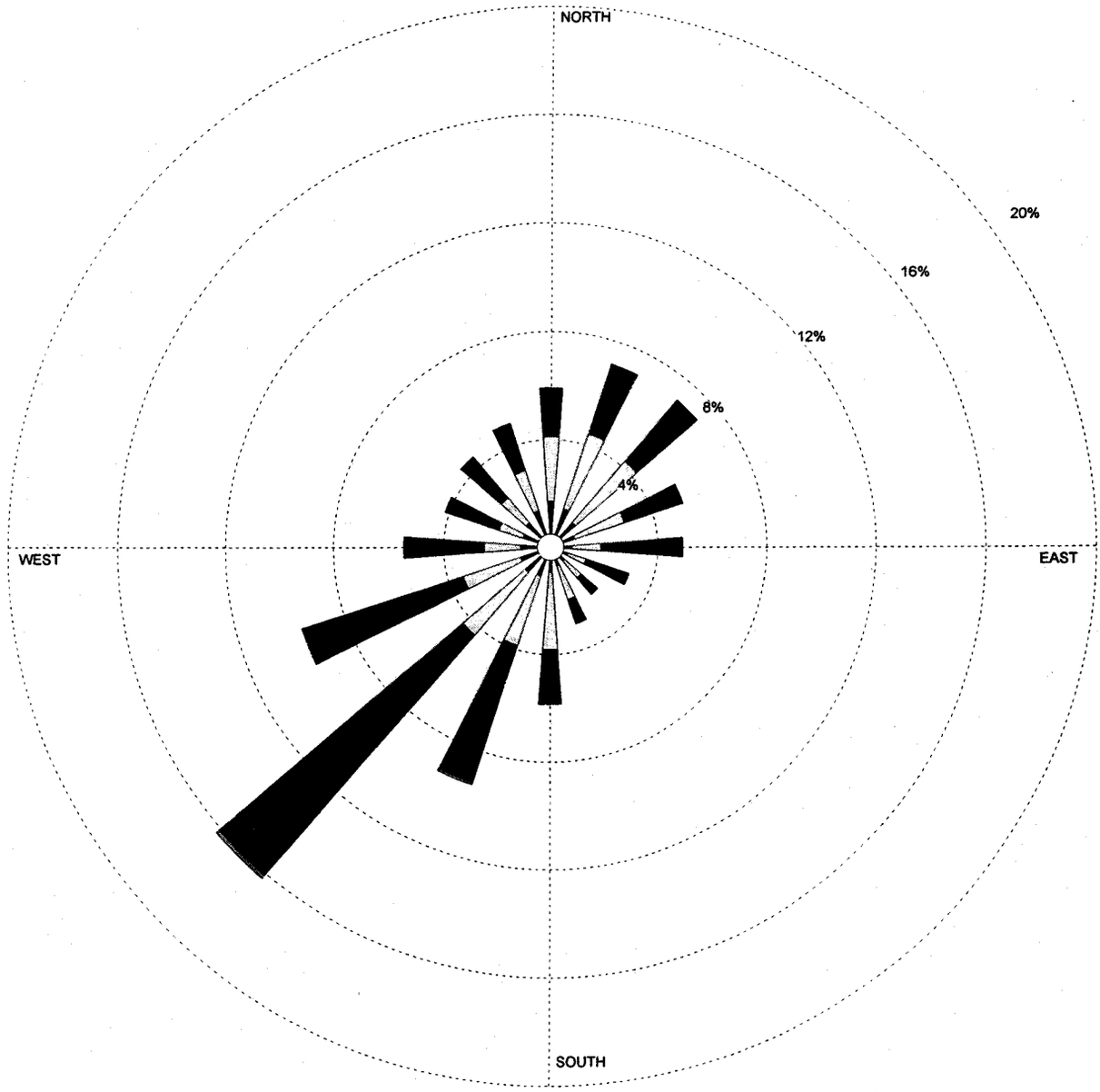
mjb

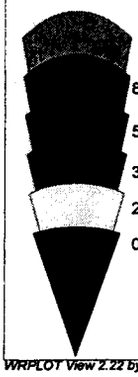
cc:	M. Swartz	Sempra Energy Resources
	C. Sterling	Sempra Energy Resources
	W. Collins	Black & Veatch

Attachment 3
Additional Surface Meteorology Materials

WIND ROSE PLOT

Palo Verde Nuclear Generating Station Meteorological Data 1994-1998





MODELER	DATE	COMPANY NAME
Chris Dillon	**03/24/2000**	**Black & Veatch**
DISPLAY	UNIT	COMMENTS
Wind Speed	**m/s**	**This wind rose contains data for 1994 through 1998.**
AVG. WIND SPEED	CALM WINDS	
3.92 m/s	**0.26%**	
ORIENTATION	PLOT YEAR-DATE-TIME	PROJECT/PLOT NO.
Direction (blowing from)	**23 23 23 23 23 January 1 - December 31 Midnight - 11 PM**	

WRPLOT View 2.22 by Lakes Environmental Software - www.lakes-environmental.com

Frequency Distribution
(Normalized)

Wind Direction (Blowing From) / Stability Classes

	A	B	C	D	E	F	Total
N	0.003468	0.003811	0.006161	0.015083	0.019145	0.012025	0.059693
NNE	0.003605	0.004655	0.006663	0.018095	0.019806	0.019190	0.072015
NE	0.005408	0.006686	0.010017	0.016931	0.018027	0.015905	0.072974
ENE	0.005499	0.007781	0.008671	0.012847	0.009515	0.008260	0.052574
E	0.004609	0.007325	0.010405	0.017388	0.005111	0.004929	0.049767
ESE	0.004564	0.006549	0.006617	0.008215	0.002738	0.002829	0.031512
SE	0.005545	0.005157	0.002464	0.004609	0.002989	0.003149	0.023914
SSE	0.008443	0.007370	0.003058	0.004609	0.003719	0.003628	0.030828
S	0.016247	0.013280	0.008192	0.009721	0.006549	0.005134	0.059123
SSW	0.014353	0.014809	0.014079	0.027519	0.016794	0.005933	0.093488
SW	0.012322	0.016361	0.025808	0.062317	0.036920	0.009173	0.162902
WSW	0.007462	0.009789	0.012938	0.035141	0.024325	0.007621	0.097275
W	0.004746	0.004609	0.006229	0.018346	0.015927	0.005089	0.054947
WNW	0.003195	0.002784	0.004541	0.016566	0.011044	0.004039	0.042169
NW	0.003309	0.002898	0.002966	0.015106	0.015334	0.005454	0.045067
NNW	0.003012	0.002556	0.004290	0.014490	0.016429	0.008420	0.049197
Total	0.105787	0.116420	0.133101	0.296983	0.224375	0.120779	

Frequency of Calm Winds : 0.26%
Average Wind Speed : 3.92 m/s

Attachment 4
Nested Receptor Grid Locations and Elevations

	UTM East	UTM North	Elevation (m)
RE DISCCART	322000.0	3685500.0	278.5
RE DISCCART	322500.0	3685500.0	271.6
RE DISCCART	323000.0	3685500.0	271.3
RE DISCCART	323500.0	3685500.0	268.1
RE DISCCART	324000.0	3685500.0	268.2
RE DISCCART	324500.0	3685500.0	268.1
RE DISCCART	325000.0	3685500.0	261.7
RE DISCCART	325500.0	3685500.0	259.4
RE DISCCART	322000.0	3686000.0	274.6
RE DISCCART	322500.0	3686000.0	271.3
RE DISCCART	323000.0	3686000.0	268.3
RE DISCCART	323500.0	3686000.0	266
RE DISCCART	324000.0	3686000.0	265.5
RE DISCCART	324500.0	3686000.0	264.1
RE DISCCART	325000.0	3686000.0	262.7
RE DISCCART	325500.0	3686000.0	256.7
RE DISCCART	322000.0	3686500.0	271.3
RE DISCCART	322500.0	3686500.0	268.8
RE DISCCART	323000.0	3686500.0	268.2
RE DISCCART	323500.0	3686500.0	265.2
RE DISCCART	324000.0	3686500.0	262.4
RE DISCCART	324500.0	3686500.0	261.9
RE DISCCART	325000.0	3686500.0	259.1
RE DISCCART	325500.0	3686500.0	258.2
RE DISCCART	322000.0	3687000.0	267.9
RE DISCCART	322500.0	3687000.0	268.2
RE DISCCART	323000.0	3687000.0	264.9
RE DISCCART	323500.0	3687000.0	262.2
RE DISCCART	324000.0	3687000.0	261.5
RE DISCCART	324500.0	3687000.0	259.1
RE DISCCART	325000.0	3687000.0	260.9
RE DISCCART	325500.0	3687000.0	259.1
RE DISCCART	322000.0	3687500.0	267.6
RE DISCCART	322500.0	3687500.0	265.2
RE DISCCART	323000.0	3687500.0	263.8
RE DISCCART	323500.0	3687500.0	262.4
RE DISCCART	324000.0	3687500.0	261.5
RE DISCCART	324500.0	3687500.0	260.8
RE DISCCART	325000.0	3687500.0	259.8
RE DISCCART	325500.0	3687500.0	259.1
RE DISCCART	322000.0	3688000.0	265.7
RE DISCCART	322500.0	3688000.0	265.2
RE DISCCART	323000.0	3688000.0	264.3
RE DISCCART	323500.0	3688000.0	262.5
RE DISCCART	324000.0	3688000.0	264.2
RE DISCCART	324500.0	3688000.0	262.3
RE DISCCART	325000.0	3688000.0	261.1
RE DISCCART	325500.0	3688000.0	260.4
RE DISCCART	322000.0	3688500.0	266.1
RE DISCCART	322500.0	3688500.0	265.2
RE DISCCART	323000.0	3688500.0	264.9
RE DISCCART	323500.0	3688500.0	265.2
RE DISCCART	324000.0	3688500.0	264.9
RE DISCCART	324500.0	3688500.0	262.5
RE DISCCART	322000.0	3689000.0	267.6
RE DISCCART	322500.0	3689000.0	267
RE DISCCART	323000.0	3689000.0	266.6
RE DISCCART	323500.0	3689000.0	267
RE DISCCART	324000.0	3689000.0	264.9
RE DISCCART	324500.0	3689000.0	264.3
RE DISCCART	322000.0	3689500.0	271.3
RE DISCCART	322500.0	3689500.0	269.1
RE DISCCART	323000.0	3689500.0	268
RE DISCCART	323500.0	3689500.0	268.9
RE DISCCART	324000.0	3689500.0	268.2
RE DISCCART	324500.0	3689500.0	265.6
RE DISCCART	322000.0	3690000.0	274.6
RE DISCCART	322500.0	3690000.0	271.9
RE DISCCART	323000.0	3690000.0	271.7
RE DISCCART	323500.0	3690000.0	268.2
RE DISCCART	324000.0	3690000.0	267.6
RE DISCCART	324500.0	3690000.0	267.3
RE DISCCART	322000.0	3690500.0	275.2
RE DISCCART	322500.0	3690500.0	273.3
RE DISCCART	323000.0	3690500.0	273.3
RE DISCCART	323500.0	3690500.0	271.3
RE DISCCART	324000.0	3690500.0	267.6
RE DISCCART	324500.0	3690500.0	267.6
RE DISCCART	322000.0	3691000.0	276.3
RE DISCCART	322500.0	3691000.0	275.2
RE DISCCART	323000.0	3691000.0	274.3
RE DISCCART	323500.0	3691000.0	270.7
RE DISCCART	324000.0	3691000.0	270.5
RE DISCCART	324500.0	3691000.0	269.9

RE	DISCCART	322000.0	3691500.0	277.1
RE	DISCCART	322500.0	3691500.0	277.1
RE	DISCCART	323000.0	3691500.0	274.7
RE	DISCCART	323500.0	3691500.0	274.3
RE	DISCCART	324000.0	3691500.0	272.8
RE	DISCCART	324500.0	3691500.0	271.7
RE	DISCCART	322000.0	3692000.0	279.7
RE	DISCCART	322500.0	3692000.0	278.5
RE	DISCCART	323000.0	3692000.0	276.8
RE	DISCCART	323500.0	3692000.0	275.7
RE	DISCCART	324000.0	3692000.0	274.3
RE	DISCCART	324500.0	3692000.0	273.9
RE	DISCCART	322000.0	3692500.0	281.9
RE	DISCCART	322500.0	3692500.0	280.7
RE	DISCCART	323000.0	3692500.0	278.6
RE	DISCCART	323500.0	3692500.0	277.5
RE	DISCCART	324000.0	3692500.0	276.6
RE	DISCCART	324500.0	3692500.0	276.1
RE	DISCCART	322000.0	3693000.0	283.7
RE	DISCCART	322500.0	3693000.0	282.2
RE	DISCCART	323000.0	3693000.0	279.9
RE	DISCCART	323500.0	3693000.0	278.9
RE	DISCCART	324000.0	3693000.0	278.3
RE	DISCCART	324500.0	3693000.0	277.1
RE	DISCCART	325000.0	3693000.0	278.9
RE	DISCCART	325500.0	3693000.0	280.7
RE	DISCCART	322000.0	3693500.0	286.2
RE	DISCCART	322500.0	3693500.0	283.6
RE	DISCCART	323000.0	3693500.0	280.2
RE	DISCCART	323500.0	3693500.0	279.8
RE	DISCCART	324000.0	3693500.0	279.5
RE	DISCCART	324500.0	3693500.0	279.3
RE	DISCCART	325000.0	3693500.0	281
RE	DISCCART	325500.0	3693500.0	283.2
RE	DISCCART	322000.0	3694000.0	291.5
RE	DISCCART	322500.0	3694000.0	283.2
RE	DISCCART	323000.0	3694000.0	282.3
RE	DISCCART	323500.0	3694000.0	282.4
RE	DISCCART	324000.0	3694000.0	280.7
RE	DISCCART	324500.0	3694000.0	281.7
RE	DISCCART	325000.0	3694000.0	316.5
RE	DISCCART	325500.0	3694000.0	283.2
RE	DISCCART	322000.0	3694500.0	286.7
RE	DISCCART	322500.0	3694500.0	290
RE	DISCCART	323000.0	3694500.0	284.3
RE	DISCCART	323500.0	3694500.0	293.3
RE	DISCCART	324000.0	3694500.0	277
RE	DISCCART	324500.0	3694500.0	278
RE	DISCCART	325000.0	3694500.0	277
RE	DISCCART	325500.0	3694500.0	282
RE	DISCCART	322000.0	3695000.0	297.2
RE	DISCCART	322500.0	3695000.0	314
RE	DISCCART	323000.0	3695000.0	286
RE	DISCCART	323500.0	3695000.0	286.6
RE	DISCCART	324000.0	3695000.0	282.7
RE	DISCCART	324500.0	3695000.0	280.8
RE	DISCCART	325000.0	3695000.0	278
RE	DISCCART	325500.0	3695000.0	282
RE	DISCCART	322000.0	3695500.0	298.8
RE	DISCCART	322500.0	3695500.0	287
RE	DISCCART	323000.0	3695500.0	287
RE	DISCCART	323500.0	3695500.0	286.8
RE	DISCCART	324000.0	3695500.0	287
RE	DISCCART	324500.0	3695500.0	284.4
RE	DISCCART	325000.0	3695500.0	283.4
RE	DISCCART	325500.0	3695500.0	285
RE	DISCCART	328500.0	3685500.0	247.2
RE	DISCCART	329000.0	3685500.0	247.8
RE	DISCCART	329500.0	3685500.0	246.6
RE	DISCCART	330000.0	3685500.0	246
RE	DISCCART	330500.0	3685500.0	245.7
RE	DISCCART	331000.0	3685500.0	246.7
RE	DISCCART	331500.0	3685500.0	250.2
RE	DISCCART	332000.0	3685500.0	248.2
RE	DISCCART	328500.0	3686000.0	249.6
RE	DISCCART	329000.0	3686000.0	249.9
RE	DISCCART	329500.0	3686000.0	248.4
RE	DISCCART	330000.0	3686000.0	247.8
RE	DISCCART	330500.0	3686000.0	247.1
RE	DISCCART	331000.0	3686000.0	248.5
RE	DISCCART	331500.0	3686000.0	250.1
RE	DISCCART	332000.0	3686000.0	247.3
RE	DISCCART	328500.0	3686500.0	251
RE	DISCCART	329000.0	3686500.0	250.2
RE	DISCCART	329500.0	3686500.0	250.1

RE	DISCCART	330000.0	3686500.0	250
RE	DISCCART	330500.0	3686500.0	249.6
RE	DISCCART	331000.0	3686500.0	252.9
RE	DISCCART	331500.0	3686500.0	249.6
RE	DISCCART	332000.0	3686500.0	247
RE	DISCCART	328500.0	3687000.0	253.6
RE	DISCCART	329000.0	3687000.0	252.7
RE	DISCCART	329500.0	3687000.0	253
RE	DISCCART	330000.0	3687000.0	252.1
RE	DISCCART	330500.0	3687000.0	252.9
RE	DISCCART	331000.0	3687000.0	253
RE	DISCCART	331500.0	3687000.0	249.9
RE	DISCCART	332000.0	3687000.0	250.2
RE	DISCCART	328500.0	3687500.0	259.3
RE	DISCCART	329000.0	3687500.0	258.7
RE	DISCCART	329500.0	3687500.0	256.6
RE	DISCCART	330000.0	3687500.0	255
RE	DISCCART	330500.0	3687500.0	256.3
RE	DISCCART	331000.0	3687500.0	254.3
RE	DISCCART	331500.0	3687500.0	252.9
RE	DISCCART	332000.0	3687500.0	249.6
RE	DISCCART	328500.0	3688000.0	262.2
RE	DISCCART	329000.0	3688000.0	261.6
RE	DISCCART	329500.0	3688000.0	259.5
RE	DISCCART	330000.0	3688000.0	257.9
RE	DISCCART	330500.0	3688000.0	260
RE	DISCCART	331000.0	3688000.0	258.5
RE	DISCCART	331500.0	3688000.0	255.4
RE	DISCCART	332000.0	3688000.0	252.3
RE	DISCCART	329500.0	3688500.0	260.9
RE	DISCCART	330000.0	3688500.0	260.9
RE	DISCCART	330500.0	3688500.0	264.3
RE	DISCCART	331000.0	3688500.0	260.2
RE	DISCCART	331500.0	3688500.0	256.9
RE	DISCCART	332000.0	3688500.0	255.6
RE	DISCCART	329500.0	3689000.0	263.8
RE	DISCCART	330000.0	3689000.0	264.8
RE	DISCCART	330500.0	3689000.0	265.2
RE	DISCCART	331000.0	3689000.0	262.1
RE	DISCCART	331500.0	3689000.0	260.5
RE	DISCCART	332000.0	3689000.0	256.2
RE	DISCCART	329500.0	3689500.0	265.5
RE	DISCCART	330000.0	3689500.0	267
RE	DISCCART	330500.0	3689500.0	266.9
RE	DISCCART	331000.0	3689500.0	264
RE	DISCCART	331500.0	3689500.0	261.3
RE	DISCCART	332000.0	3689500.0	257.9
RE	DISCCART	329500.0	3690000.0	267.9
RE	DISCCART	330000.0	3690000.0	268.8
RE	DISCCART	330500.0	3690000.0	267.6
RE	DISCCART	331000.0	3690000.0	265.5
RE	DISCCART	331500.0	3690000.0	261.8
RE	DISCCART	332000.0	3690000.0	259.7
RE	DISCCART	329500.0	3690500.0	270.6
RE	DISCCART	330000.0	3690500.0	271.8
RE	DISCCART	330500.0	3690500.0	269.4
RE	DISCCART	331000.0	3690500.0	266.5
RE	DISCCART	331500.0	3690500.0	263.9
RE	DISCCART	332000.0	3690500.0	264.3
RE	DISCCART	329500.0	3691000.0	274.7
RE	DISCCART	330000.0	3691000.0	273.7
RE	DISCCART	330500.0	3691000.0	270.4
RE	DISCCART	331000.0	3691000.0	267.6
RE	DISCCART	331500.0	3691000.0	266.7
RE	DISCCART	332000.0	3691000.0	268.2
RE	DISCCART	329500.0	3691500.0	277.5
RE	DISCCART	330000.0	3691500.0	275.2
RE	DISCCART	330500.0	3691500.0	272
RE	DISCCART	331000.0	3691500.0	269.4
RE	DISCCART	331500.0	3691500.0	271.3
RE	DISCCART	332000.0	3691500.0	268.2
RE	DISCCART	329500.0	3692000.0	280.3
RE	DISCCART	330000.0	3692000.0	277.7
RE	DISCCART	330500.0	3692000.0	274.1
RE	DISCCART	331000.0	3692000.0	271.8
RE	DISCCART	331500.0	3692000.0	271.5
RE	DISCCART	332000.0	3692000.0	267.1
RE	DISCCART	329500.0	3692500.0	281.9
RE	DISCCART	330000.0	3692500.0	279
RE	DISCCART	330500.0	3692500.0	276.2
RE	DISCCART	331000.0	3692500.0	275.2
RE	DISCCART	331500.0	3692500.0	271
RE	DISCCART	332000.0	3692500.0	267.6
RE	DISCCART	328500.0	3693000.0	281.3
RE	DISCCART	329000.0	3693000.0	283.2

RE	DISCCART	329500.0	3693000.0	283.5
RE	DISCCART	330000.0	3693000.0	280.4
RE	DISCCART	330500.0	3693000.0	279.2
RE	DISCCART	331000.0	3693000.0	277.6
RE	DISCCART	331500.0	3693000.0	271.6
RE	DISCCART	332000.0	3693000.0	270.1
RE	DISCCART	328500.0	3693500.0	282.5
RE	DISCCART	329000.0	3693500.0	284.8
RE	DISCCART	329500.0	3693500.0	285.7
RE	DISCCART	330000.0	3693500.0	283.2
RE	DISCCART	330500.0	3693500.0	281.9
RE	DISCCART	331000.0	3693500.0	277.7
RE	DISCCART	331500.0	3693500.0	273.3
RE	DISCCART	332000.0	3693500.0	273.3
RE	DISCCART	328500.0	3694000.0	284.1
RE	DISCCART	329000.0	3694000.0	286.1
RE	DISCCART	329500.0	3694000.0	286.8
RE	DISCCART	330000.0	3694000.0	286.6
RE	DISCCART	330500.0	3694000.0	285.3
RE	DISCCART	331000.0	3694000.0	280.2
RE	DISCCART	331500.0	3694000.0	276.3
RE	DISCCART	332000.0	3694000.0	277.2
RE	DISCCART	328500.0	3694500.0	286.2
RE	DISCCART	329000.0	3694500.0	288.2
RE	DISCCART	329500.0	3694500.0	289
RE	DISCCART	330000.0	3694500.0	289.9
RE	DISCCART	330500.0	3694500.0	285.1
RE	DISCCART	331000.0	3694500.0	280.9
RE	DISCCART	331500.0	3694500.0	277.7
RE	DISCCART	332000.0	3694500.0	277.9
RE	DISCCART	328500.0	3695000.0	287.4
RE	DISCCART	329000.0	3695000.0	290.2
RE	DISCCART	329500.0	3695000.0	289
RE	DISCCART	330000.0	3695000.0	290
RE	DISCCART	330500.0	3695000.0	285.8
RE	DISCCART	331000.0	3695000.0	283
RE	DISCCART	331500.0	3695000.0	280.3
RE	DISCCART	332000.0	3695000.0	283.2
RE	DISCCART	328500.0	3695500.0	289.3
RE	DISCCART	329000.0	3695500.0	292.6
RE	DISCCART	329500.0	3695500.0	331.4
RE	DISCCART	330000.0	3695500.0	292.3
RE	DISCCART	330500.0	3695500.0	287.2
RE	DISCCART	331000.0	3695500.0	283.3
RE	DISCCART	331500.0	3695500.0	283.3
RE	DISCCART	332000.0	3695500.0	286.8
RE	DISCCART	326000.0	3685500.0	255.7
RE	DISCCART	326500.0	3685500.0	253.3
RE	DISCCART	327000.0	3685500.0	249.9
RE	DISCCART	327500.0	3685500.0	249.9
RE	DISCCART	328000.0	3685500.0	249.6
RE	DISCCART	326000.0	3686000.0	254.3
RE	DISCCART	326500.0	3686000.0	253
RE	DISCCART	327000.0	3686000.0	250.4
RE	DISCCART	327500.0	3686000.0	249.9
RE	DISCCART	328000.0	3686000.0	249.9
RE	DISCCART	326000.0	3686500.0	255.6
RE	DISCCART	326500.0	3686500.0	253.7
RE	DISCCART	327000.0	3686500.0	253.6
RE	DISCCART	327500.0	3686500.0	252
RE	DISCCART	328000.0	3686500.0	250.7
RE	DISCCART	326000.0	3687000.0	257.4
RE	DISCCART	326500.0	3687000.0	256.3
RE	DISCCART	327000.0	3687000.0	254.8
RE	DISCCART	327500.0	3687000.0	252.7
RE	DISCCART	328000.0	3687000.0	253.6
RE	DISCCART	326000.0	3687500.0	258.7
RE	DISCCART	326500.0	3687500.0	257.4
RE	DISCCART	327000.0	3687500.0	255.7
RE	DISCCART	327500.0	3687500.0	256
RE	DISCCART	328000.0	3687500.0	258.5
RE	DISCCART	326000.0	3688000.0	259.4
RE	DISCCART	326500.0	3688000.0	258.8
RE	DISCCART	327000.0	3688000.0	259.2
RE	DISCCART	327500.0	3688000.0	258.8
RE	DISCCART	328000.0	3688000.0	261.3
RE	DISCCART	326000.0	3693000.0	281
RE	DISCCART	326500.0	3693000.0	280.7
RE	DISCCART	327000.0	3693000.0	276.1
RE	DISCCART	327500.0	3693000.0	276.8
RE	DISCCART	328000.0	3693000.0	280.4
RE	DISCCART	326000.0	3693500.0	282.5
RE	DISCCART	326500.0	3693500.0	281.8
RE	DISCCART	327000.0	3693500.0	279.2
RE	DISCCART	327500.0	3693500.0	279.2

RE	DISCCART	328000.0	3693500.0	279.8
RE	DISCCART	326000.0	3694000.0	283.5
RE	DISCCART	326500.0	3694000.0	283.5
RE	DISCCART	327000.0	3694000.0	280.6
RE	DISCCART	327500.0	3694000.0	281.7
RE	DISCCART	328000.0	3694000.0	281
RE	DISCCART	326000.0	3694500.0	285.2
RE	DISCCART	326500.0	3694500.0	285.3
RE	DISCCART	327000.0	3694500.0	283.2
RE	DISCCART	327500.0	3694500.0	282.3
RE	DISCCART	328000.0	3694500.0	282.5
RE	DISCCART	326000.0	3695000.0	286.8
RE	DISCCART	326500.0	3695000.0	287.9
RE	DISCCART	327000.0	3695000.0	286.8
RE	DISCCART	327500.0	3695000.0	286.4
RE	DISCCART	328000.0	3695000.0	285.8
RE	DISCCART	326000.0	3695500.0	288.3
RE	DISCCART	326500.0	3695500.0	290
RE	DISCCART	327000.0	3695500.0	289
RE	DISCCART	327500.0	3695500.0	288.6
RE	DISCCART	328000.0	3695500.0	288.4
RE	DISCCART	317000.0	3680500.0	329
RE	DISCCART	318000.0	3680500.0	432.8001
RE	DISCCART	319000.0	3680500.0	421.5
RE	DISCCART	320000.0	3680500.0	359.7
RE	DISCCART	321000.0	3680500.0	323.1
RE	DISCCART	317000.0	3681500.0	322.9
RE	DISCCART	318000.0	3681500.0	323.7
RE	DISCCART	319000.0	3681500.0	321.9
RE	DISCCART	320000.0	3681500.0	318.5
RE	DISCCART	321000.0	3681500.0	309.4
RE	DISCCART	317000.0	3682500.0	311.1
RE	DISCCART	318000.0	3682500.0	311.8
RE	DISCCART	319000.0	3682500.0	308.4
RE	DISCCART	320000.0	3682500.0	300.4
RE	DISCCART	321000.0	3682500.0	292
RE	DISCCART	317000.0	3683500.0	335.9
RE	DISCCART	318000.0	3683500.0	301.8
RE	DISCCART	319000.0	3683500.0	300.1
RE	DISCCART	320000.0	3683500.0	298.5
RE	DISCCART	321000.0	3683500.0	288.5
RE	DISCCART	317000.0	3684500.0	325.9
RE	DISCCART	318000.0	3684500.0	300.5
RE	DISCCART	319000.0	3684500.0	292.7
RE	DISCCART	320000.0	3684500.0	292.3
RE	DISCCART	321000.0	3684500.0	284.1
RE	DISCCART	317000.0	3685500.0	301.5
RE	DISCCART	318000.0	3685500.0	289.6
RE	DISCCART	319000.0	3685500.0	288.8
RE	DISCCART	320000.0	3685500.0	286.4
RE	DISCCART	321000.0	3685500.0	282.2
RE	DISCCART	317000.0	3686500.0	292.5
RE	DISCCART	318000.0	3686500.0	283.4
RE	DISCCART	319000.0	3686500.0	283.3
RE	DISCCART	320000.0	3686500.0	280
RE	DISCCART	321000.0	3686500.0	277.6
RE	DISCCART	317000.0	3687500.0	283.6
RE	DISCCART	318000.0	3687500.0	278.5
RE	DISCCART	319000.0	3687500.0	278.1
RE	DISCCART	320000.0	3687500.0	274.7
RE	DISCCART	321000.0	3687500.0	271.4
RE	DISCCART	317000.0	3688500.0	278.6
RE	DISCCART	318000.0	3688500.0	275.2
RE	DISCCART	319000.0	3688500.0	271.9
RE	DISCCART	320000.0	3688500.0	271
RE	DISCCART	321000.0	3688500.0	268.5
RE	DISCCART	317000.0	3689500.0	280.4
RE	DISCCART	318000.0	3689500.0	277.1
RE	DISCCART	319000.0	3689500.0	277.3
RE	DISCCART	320000.0	3689500.0	274.3
RE	DISCCART	321000.0	3689500.0	272
RE	DISCCART	317000.0	3690500.0	283.2
RE	DISCCART	318000.0	3690500.0	282.5
RE	DISCCART	319000.0	3690500.0	280.1
RE	DISCCART	320000.0	3690500.0	280
RE	DISCCART	321000.0	3690500.0	277.1
RE	DISCCART	317000.0	3691500.0	289.3
RE	DISCCART	318000.0	3691500.0	286.8
RE	DISCCART	319000.0	3691500.0	284
RE	DISCCART	320000.0	3691500.0	283.8
RE	DISCCART	321000.0	3691500.0	281.3
RE	DISCCART	317000.0	3692500.0	296
RE	DISCCART	318000.0	3692500.0	294.2
RE	DISCCART	319000.0	3692500.0	292.4
RE	DISCCART	320000.0	3692500.0	288.8

RE	DISCCART	321000.0	3692500.0	285
RE	DISCCART	317000.0	3693500.0	301.4
RE	DISCCART	318000.0	3693500.0	304.9
RE	DISCCART	319000.0	3693500.0	297.6
RE	DISCCART	320000.0	3693500.0	293.1
RE	DISCCART	321000.0	3693500.0	288.8
RE	DISCCART	317000.0	3694500.0	307
RE	DISCCART	318000.0	3694500.0	308
RE	DISCCART	319000.0	3694500.0	302
RE	DISCCART	320000.0	3694500.0	297
RE	DISCCART	321000.0	3694500.0	293
RE	DISCCART	317000.0	3695500.0	316.6
RE	DISCCART	318000.0	3695500.0	311
RE	DISCCART	319000.0	3695500.0	305.8
RE	DISCCART	320000.0	3695500.0	299.2
RE	DISCCART	321000.0	3695500.0	418
RE	DISCCART	317000.0	3696500.0	321
RE	DISCCART	318000.0	3696500.0	317
RE	DISCCART	319000.0	3696500.0	308
RE	DISCCART	320000.0	3696500.0	311
RE	DISCCART	321000.0	3696500.0	348.3
RE	DISCCART	317000.0	3697500.0	375
RE	DISCCART	318000.0	3697500.0	319
RE	DISCCART	319000.0	3697500.0	360.3
RE	DISCCART	320000.0	3697500.0	321.3
RE	DISCCART	321000.0	3697500.0	313
RE	DISCCART	317000.0	3698500.0	341.8
RE	DISCCART	318000.0	3698500.0	351.7
RE	DISCCART	319000.0	3698500.0	332.6
RE	DISCCART	320000.0	3698500.0	327.6
RE	DISCCART	321000.0	3698500.0	313
RE	DISCCART	317000.0	3699500.0	358.2
RE	DISCCART	318000.0	3699500.0	580.3
RE	DISCCART	319000.0	3699500.0	384
RE	DISCCART	320000.0	3699500.0	396.4
RE	DISCCART	321000.0	3699500.0	324.7
RE	DISCCART	317000.0	3700500.0	350.7
RE	DISCCART	318000.0	3700500.0	516
RE	DISCCART	319000.0	3700500.0	413.7
RE	DISCCART	320000.0	3700500.0	433.3
RE	DISCCART	321000.0	3700500.0	331
RE	DISCCART	333000.0	3680500.0	237.4
RE	DISCCART	334000.0	3680500.0	232
RE	DISCCART	335000.0	3680500.0	231
RE	DISCCART	336000.0	3680500.0	233.3
RE	DISCCART	337000.0	3680500.0	254.6
RE	DISCCART	333000.0	3681500.0	235.3
RE	DISCCART	334000.0	3681500.0	232
RE	DISCCART	335000.0	3681500.0	231.6
RE	DISCCART	336000.0	3681500.0	235.5
RE	DISCCART	337000.0	3681500.0	250.2
RE	DISCCART	333000.0	3682500.0	235.9
RE	DISCCART	334000.0	3682500.0	234.3
RE	DISCCART	335000.0	3682500.0	232.3
RE	DISCCART	336000.0	3682500.0	231.6
RE	DISCCART	337000.0	3682500.0	281
RE	DISCCART	333000.0	3683500.0	238.7
RE	DISCCART	334000.0	3683500.0	234.7
RE	DISCCART	335000.0	3683500.0	232.8
RE	DISCCART	336000.0	3683500.0	233.2
RE	DISCCART	337000.0	3683500.0	237.4
RE	DISCCART	333000.0	3684500.0	236.8
RE	DISCCART	334000.0	3684500.0	235.3
RE	DISCCART	335000.0	3684500.0	235
RE	DISCCART	336000.0	3684500.0	233.2
RE	DISCCART	337000.0	3684500.0	236.8
RE	DISCCART	333000.0	3685500.0	237.7
RE	DISCCART	334000.0	3685500.0	235.9
RE	DISCCART	335000.0	3685500.0	235
RE	DISCCART	336000.0	3685500.0	234.7
RE	DISCCART	337000.0	3685500.0	235.6
RE	DISCCART	333000.0	3686500.0	243.5
RE	DISCCART	334000.0	3686500.0	236.9
RE	DISCCART	335000.0	3686500.0	235.6
RE	DISCCART	336000.0	3686500.0	234.7
RE	DISCCART	337000.0	3686500.0	235.2
RE	DISCCART	333000.0	3687500.0	246.7
RE	DISCCART	334000.0	3687500.0	242.3
RE	DISCCART	335000.0	3687500.0	239
RE	DISCCART	336000.0	3687500.0	237.4
RE	DISCCART	337000.0	3687500.0	236.7
RE	DISCCART	333000.0	3688500.0	250.2
RE	DISCCART	334000.0	3688500.0	251
RE	DISCCART	335000.0	3688500.0	249.4
RE	DISCCART	336000.0	3688500.0	243.5

RE	DISCCART	337000.0	3688500.0	260.4
RE	DISCCART	333000.0	3689500.0	254.6
RE	DISCCART	334000.0	3689500.0	255.7
RE	DISCCART	335000.0	3689500.0	250.2
RE	DISCCART	336000.0	3689500.0	268.3
RE	DISCCART	337000.0	3689500.0	272
RE	DISCCART	333000.0	3690500.0	267.9
RE	DISCCART	334000.0	3690500.0	258.2
RE	DISCCART	335000.0	3690500.0	253.2
RE	DISCCART	336000.0	3690500.0	269.6
RE	DISCCART	337000.0	3690500.0	290.8
RE	DISCCART	333000.0	3691500.0	264.9
RE	DISCCART	334000.0	3691500.0	265.4
RE	DISCCART	335000.0	3691500.0	264.9
RE	DISCCART	336000.0	3691500.0	271
RE	DISCCART	337000.0	3691500.0	287.7
RE	DISCCART	333000.0	3692500.0	268.2
RE	DISCCART	334000.0	3692500.0	274.2
RE	DISCCART	335000.0	3692500.0	268.7
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RE	DISCCART	337000.0	3692500.0	275.4
RE	DISCCART	333000.0	3693500.0	274.2
RE	DISCCART	334000.0	3693500.0	280.2
RE	DISCCART	335000.0	3693500.0	273.3
RE	DISCCART	336000.0	3693500.0	278.3
RE	DISCCART	337000.0	3693500.0	280.4
RE	DISCCART	333000.0	3694500.0	279.5
RE	DISCCART	334000.0	3694500.0	283.6
RE	DISCCART	335000.0	3694500.0	277.5
RE	DISCCART	336000.0	3694500.0	284.1
RE	DISCCART	337000.0	3694500.0	281.4
RE	DISCCART	333000.0	3695500.0	285.9
RE	DISCCART	334000.0	3695500.0	287.9
RE	DISCCART	335000.0	3695500.0	283.2
RE	DISCCART	336000.0	3695500.0	287.3
RE	DISCCART	337000.0	3695500.0	284.8
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RE	DISCCART	334000.0	3696500.0	292.1
RE	DISCCART	335000.0	3696500.0	289.6
RE	DISCCART	336000.0	3696500.0	293.8
RE	DISCCART	337000.0	3696500.0	283.3
RE	DISCCART	333000.0	3697500.0	298.7
RE	DISCCART	334000.0	3697500.0	298.4
RE	DISCCART	335000.0	3697500.0	295.8
RE	DISCCART	336000.0	3697500.0	299
RE	DISCCART	337000.0	3697500.0	286.6
RE	DISCCART	333000.0	3698500.0	300.3
RE	DISCCART	334000.0	3698500.0	304.3
RE	DISCCART	335000.0	3698500.0	301.4
RE	DISCCART	336000.0	3698500.0	302.4
RE	DISCCART	337000.0	3698500.0	289.9
RE	DISCCART	333000.0	3699500.0	304.8
RE	DISCCART	334000.0	3699500.0	311.1
RE	DISCCART	335000.0	3699500.0	309.7
RE	DISCCART	336000.0	3699500.0	298.8
RE	DISCCART	337000.0	3699500.0	294.4
RE	DISCCART	333000.0	3700500.0	313.3
RE	DISCCART	334000.0	3700500.0	312.8
RE	DISCCART	335000.0	3700500.0	313.9
RE	DISCCART	336000.0	3700500.0	303
RE	DISCCART	337000.0	3700500.0	298.7
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RE	DISCCART	323000.0	3680500.0	301.6
RE	DISCCART	324000.0	3680500.0	290.9
RE	DISCCART	325000.0	3680500.0	289.6
RE	DISCCART	326000.0	3680500.0	284.8
RE	DISCCART	327000.0	3680500.0	272.2
RE	DISCCART	328000.0	3680500.0	264.9
RE	DISCCART	329000.0	3680500.0	265.5
RE	DISCCART	330000.0	3680500.0	253.1
RE	DISCCART	331000.0	3680500.0	249.8
RE	DISCCART	332000.0	3680500.0	243.7
RE	DISCCART	322000.0	3681500.0	300.8
RE	DISCCART	323000.0	3681500.0	289.5
RE	DISCCART	324000.0	3681500.0	294.5
RE	DISCCART	325000.0	3681500.0	286.9
RE	DISCCART	326000.0	3681500.0	282.9
RE	DISCCART	327000.0	3681500.0	271.6
RE	DISCCART	328000.0	3681500.0	267.9
RE	DISCCART	329000.0	3681500.0	256.2
RE	DISCCART	330000.0	3681500.0	253
RE	DISCCART	331000.0	3681500.0	243.9
RE	DISCCART	332000.0	3681500.0	240.9
RE	DISCCART	322000.0	3682500.0	286.4
RE	DISCCART	323000.0	3682500.0	284.6

RE	DISCCART	324000.0	3682500.0	281.3
RE	DISCCART	325000.0	3682500.0	277.3
RE	DISCCART	326000.0	3682500.0	267.9
RE	DISCCART	327000.0	3682500.0	266.7
RE	DISCCART	328000.0	3682500.0	264
RE	DISCCART	329000.0	3682500.0	259.5
RE	DISCCART	330000.0	3682500.0	251.8
RE	DISCCART	331000.0	3682500.0	242.7
RE	DISCCART	332000.0	3682500.0	238.3
RE	DISCCART	322000.0	3683500.0	287.2
RE	DISCCART	323000.0	3683500.0	277.4
RE	DISCCART	324000.0	3683500.0	279.2
RE	DISCCART	325000.0	3683500.0	277.8
RE	DISCCART	326000.0	3683500.0	265.1
RE	DISCCART	327000.0	3683500.0	259.8
RE	DISCCART	328000.0	3683500.0	257.4
RE	DISCCART	329000.0	3683500.0	254.6
RE	DISCCART	330000.0	3683500.0	249.6
RE	DISCCART	331000.0	3683500.0	240.5
RE	DISCCART	332000.0	3683500.0	239.1
RE	DISCCART	322000.0	3684500.0	279.7
RE	DISCCART	323000.0	3684500.0	274.4
RE	DISCCART	324000.0	3684500.0	273.3
RE	DISCCART	325000.0	3684500.0	267.7
RE	DISCCART	326000.0	3684500.0	261.6
RE	DISCCART	327000.0	3684500.0	254.6
RE	DISCCART	328000.0	3684500.0	250.2
RE	DISCCART	329000.0	3684500.0	248.4
RE	DISCCART	330000.0	3684500.0	243.6
RE	DISCCART	331000.0	3684500.0	243.2
RE	DISCCART	332000.0	3684500.0	245.4
RE	DISCCART	322000.0	3696500.0	301
RE	DISCCART	323000.0	3696500.0	289
RE	DISCCART	324000.0	3696500.0	290
RE	DISCCART	325000.0	3696500.0	288
RE	DISCCART	326000.0	3696500.0	290.5
RE	DISCCART	327000.0	3696500.0	293.7
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RE	DISCCART	329000.0	3696500.0	296.8
RE	DISCCART	330000.0	3696500.0	292.6
RE	DISCCART	331000.0	3696500.0	290.4
RE	DISCCART	332000.0	3696500.0	291.3
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RE	DISCCART	323000.0	3697500.0	292
RE	DISCCART	324000.0	3697500.0	292
RE	DISCCART	325000.0	3697500.0	291
RE	DISCCART	326000.0	3697500.0	295.8
RE	DISCCART	327000.0	3697500.0	312.7
RE	DISCCART	328000.0	3697500.0	296.6
RE	DISCCART	329000.0	3697500.0	299.8
RE	DISCCART	330000.0	3697500.0	295.7
RE	DISCCART	331000.0	3697500.0	296.3
RE	DISCCART	332000.0	3697500.0	294.7
RE	DISCCART	322000.0	3698500.0	300.2
RE	DISCCART	323000.0	3698500.0	296
RE	DISCCART	324000.0	3698500.0	295
RE	DISCCART	325000.0	3698500.0	294.5
RE	DISCCART	326000.0	3698500.0	298.3
RE	DISCCART	327000.0	3698500.0	301.8
RE	DISCCART	328000.0	3698500.0	302.7
RE	DISCCART	329000.0	3698500.0	304
RE	DISCCART	330000.0	3698500.0	298.5
RE	DISCCART	331000.0	3698500.0	303.5
RE	DISCCART	332000.0	3698500.0	299.5
RE	DISCCART	322000.0	3699500.0	342.8
RE	DISCCART	323000.0	3699500.0	299.8
RE	DISCCART	324000.0	3699500.0	300
RE	DISCCART	325000.0	3699500.0	312.4
RE	DISCCART	326000.0	3699500.0	302.8
RE	DISCCART	327000.0	3699500.0	306.8
RE	DISCCART	328000.0	3699500.0	306.6
RE	DISCCART	329000.0	3699500.0	308.2
RE	DISCCART	330000.0	3699500.0	301.3
RE	DISCCART	331000.0	3699500.0	307.5
RE	DISCCART	332000.0	3699500.0	303.5
RE	DISCCART	322000.0	3700500.0	308.7
RE	DISCCART	323000.0	3700500.0	305
RE	DISCCART	324000.0	3700500.0	304
RE	DISCCART	325000.0	3700500.0	307
RE	DISCCART	326000.0	3700500.0	307.2
RE	DISCCART	327000.0	3700500.0	311.5
RE	DISCCART	328000.0	3700500.0	310.1
RE	DISCCART	329000.0	3700500.0	312.5
RE	DISCCART	330000.0	3700500.0	308.5
RE	DISCCART	331000.0	3700500.0	310.3

RE	DISCCART	332000.0	3700500.0	310.1
RE	DISCCART	325000.0	3688500.0	261.8
RE	DISCCART	325100.0	3688500.0	261.8
RE	DISCCART	325200.0	3688500.0	261.8
RE	DISCCART	325300.0	3688500.0	261.8
RE	DISCCART	325400.0	3688500.0	261.9
RE	DISCCART	325500.0	3688500.0	261.8
RE	DISCCART	325600.0	3688500.0	261.8
RE	DISCCART	325700.0	3688500.0	261.5
RE	DISCCART	325800.0	3688500.0	261.2
RE	DISCCART	325900.0	3688500.0	260.9
RE	DISCCART	326000.0	3688500.0	260.9
RE	DISCCART	326100.0	3688500.0	260.6
RE	DISCCART	326200.0	3688500.0	259.9
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RE	DISCCART	326800.0	3688500.0	262.1
RE	DISCCART	326900.0	3688500.0	262.1
RE	DISCCART	327000.0	3688500.0	262.4
RE	DISCCART	327100.0	3688500.0	262.3
RE	DISCCART	327200.0	3688500.0	261.9
RE	DISCCART	327300.0	3688500.0	260.9
RE	DISCCART	327400.0	3688500.0	260.4
RE	DISCCART	327500.0	3688500.0	260.8
RE	DISCCART	327600.0	3688500.0	261.8
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RE	DISCCART	327800.0	3688500.0	262.6
RE	DISCCART	327900.0	3688500.0	264
RE	DISCCART	328000.0	3688500.0	264.9
RE	DISCCART	328100.0	3688500.0	264.6
RE	DISCCART	328200.0	3688500.0	264.9
RE	DISCCART	328300.0	3688500.0	265.2
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RE	DISCCART	328600.0	3688500.0	265.5
RE	DISCCART	328700.0	3688500.0	265.3
RE	DISCCART	328800.0	3688500.0	264.9
RE	DISCCART	328900.0	3688500.0	264.2
RE	DISCCART	329000.0	3688500.0	263.4
RE	DISCCART	325000.0	3688600.0	262.1
RE	DISCCART	325100.0	3688600.0	262.3
RE	DISCCART	325200.0	3688600.0	262.1
RE	DISCCART	325300.0	3688600.0	262.3
RE	DISCCART	325400.0	3688600.0	262.2
RE	DISCCART	325500.0	3688600.0	262.1
RE	DISCCART	325600.0	3688600.0	262.1
RE	DISCCART	325700.0	3688600.0	261.9
RE	DISCCART	325800.0	3688600.0	261.6
RE	DISCCART	325900.0	3688600.0	261.4
RE	DISCCART	326000.0	3688600.0	261.2
RE	DISCCART	326100.0	3688600.0	260.9
RE	DISCCART	326200.0	3688600.0	260.5
RE	DISCCART	326300.0	3688600.0	259.3
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RE	DISCCART	326700.0	3688600.0	262.1
RE	DISCCART	326800.0	3688600.0	262.6
RE	DISCCART	326900.0	3688600.0	262.3
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RE	DISCCART	327100.0	3688600.0	262.6
RE	DISCCART	327200.0	3688600.0	262.4
RE	DISCCART	327300.0	3688600.0	261.6
RE	DISCCART	327400.0	3688600.0	261.6
RE	DISCCART	327500.0	3688600.0	262
RE	DISCCART	327600.0	3688600.0	262.4
RE	DISCCART	327700.0	3688600.0	262.9
RE	DISCCART	327800.0	3688600.0	263.4
RE	DISCCART	327900.0	3688600.0	264.3
RE	DISCCART	328000.0	3688600.0	264.9
RE	DISCCART	328100.0	3688600.0	265.2
RE	DISCCART	328200.0	3688600.0	265.3
RE	DISCCART	328300.0	3688600.0	265.7
RE	DISCCART	328400.0	3688600.0	265.9
RE	DISCCART	328500.0	3688600.0	266.1
RE	DISCCART	328600.0	3688600.0	266.2
RE	DISCCART	328700.0	3688600.0	265.6
RE	DISCCART	328800.0	3688600.0	265
RE	DISCCART	328900.0	3688600.0	264.3
RE	DISCCART	329000.0	3688600.0	263.8
RE	DISCCART	325000.0	3688700.0	262.2
RE	DISCCART	325100.0	3688700.0	262.4

RE	DISCCART	325200.0	3688700.0	262.1
RE	DISCCART	325300.0	3688700.0	262.5
RE	DISCCART	325400.0	3688700.0	262.7
RE	DISCCART	325500.0	3688700.0	262.6
RE	DISCCART	325600.0	3688700.0	262.4
RE	DISCCART	325700.0	3688700.0	262.1
RE	DISCCART	325800.0	3688700.0	262
RE	DISCCART	325900.0	3688700.0	261.8
RE	DISCCART	326000.0	3688700.0	261.5
RE	DISCCART	326100.0	3688700.0	261.2
RE	DISCCART	326200.0	3688700.0	260.9
RE	DISCCART	326300.0	3688700.0	260.5
RE	DISCCART	326400.0	3688700.0	260.8
RE	DISCCART	326500.0	3688700.0	262.1
RE	DISCCART	326600.0	3688700.0	262.4
RE	DISCCART	326700.0	3688700.0	262.6
RE	DISCCART	326800.0	3688700.0	263.2
RE	DISCCART	326900.0	3688700.0	263.3
RE	DISCCART	327000.0	3688700.0	263.3
RE	DISCCART	327100.0	3688700.0	263.2
RE	DISCCART	327200.0	3688700.0	262.6
RE	DISCCART	327300.0	3688700.0	261.8
RE	DISCCART	327400.0	3688700.0	262.2
RE	DISCCART	327500.0	3688700.0	262.4
RE	DISCCART	327600.0	3688700.0	262.9
RE	DISCCART	327700.0	3688700.0	263.4
RE	DISCCART	327800.0	3688700.0	263.8
RE	DISCCART	327900.0	3688700.0	264.5
RE	DISCCART	328000.0	3688700.0	264.9
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RE	DISCCART	328200.0	3688700.0	265.5
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RE	DISCCART	328400.0	3688700.0	266.3
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RE	DISCCART	328600.0	3688700.0	266.8
RE	DISCCART	328700.0	3688700.0	266.2
RE	DISCCART	328800.0	3688700.0	265.4
RE	DISCCART	328900.0	3688700.0	264.7
RE	DISCCART	329000.0	3688700.0	264.1
RE	DISCCART	325000.0	3688800.0	263
RE	DISCCART	325100.0	3688800.0	263
RE	DISCCART	325200.0	3688800.0	263
RE	DISCCART	325300.0	3688800.0	263
RE	DISCCART	325400.0	3688800.0	263.1
RE	DISCCART	325500.0	3688800.0	263
RE	DISCCART	325600.0	3688800.0	262.7
RE	DISCCART	325700.0	3688800.0	262.5
RE	DISCCART	325800.0	3688800.0	262.4
RE	DISCCART	325900.0	3688800.0	262
RE	DISCCART	326000.0	3688800.0	261.6
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RE	DISCCART	326200.0	3688800.0	261.5
RE	DISCCART	326300.0	3688800.0	261.5
RE	DISCCART	326400.0	3688800.0	261.5
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RE	DISCCART	326600.0	3688800.0	262.9
RE	DISCCART	326700.0	3688800.0	263.7
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RE	DISCCART	326900.0	3688800.0	264.3
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RE	DISCCART	327100.0	3688800.0	263.6
RE	DISCCART	327200.0	3688800.0	263.1
RE	DISCCART	327300.0	3688800.0	262.4
RE	DISCCART	327400.0	3688800.0	262.7
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RE	DISCCART	327600.0	3688800.0	263.3
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RE	DISCCART	327800.0	3688800.0	264.3
RE	DISCCART	327900.0	3688800.0	264.9
RE	DISCCART	328000.0	3688800.0	265.3
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RE	DISCCART	328200.0	3688800.0	265.8
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RE	DISCCART	328400.0	3688800.0	266.7
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RE	DISCCART	328600.0	3688800.0	267.9
RE	DISCCART	328700.0	3688800.0	267.1
RE	DISCCART	328800.0	3688800.0	265.5
RE	DISCCART	328900.0	3688800.0	264.9
RE	DISCCART	329000.0	3688800.0	264.4
RE	DISCCART	325000.0	3688900.0	263.7
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RE	DISCCART	325300.0	3688900.0	264.1
RE	DISCCART	325400.0	3688900.0	263.9

RE	DISCCART	325500.0	3688900.0	263.4
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RE	DISCCART	325900.0	3689000.0	262.7
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RE	DISCCART	325800.0	3689500.0	264.6
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RE	DISCCART	326200.0	3689500.0	264.5
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RE	DISCCART	326400.0	3689500.0	265.4
RE	DISCCART	326500.0	3689500.0	265.2
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RE	DISCCART	325300.0	3689700.0	268.2
RE	DISCCART	325400.0	3689700.0	268.3
RE	DISCCART	325500.0	3689700.0	266.1
RE	DISCCART	325600.0	3689700.0	265.8
RE	DISCCART	325700.0	3689700.0	265.3
RE	DISCCART	325800.0	3689700.0	265.2
RE	DISCCART	325900.0	3689700.0	264.9
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RE	DISCCART	326100.0	3689700.0	264.6
RE	DISCCART	326200.0	3689700.0	264.6
RE	DISCCART	328000.0	3689700.0	267.9
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RE	DISCCART	328300.0	3689700.0	268.8

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RE	DISCCART	328600.0	3689700.0	268.8
RE	DISCCART	328700.0	3689700.0	268.5
RE	DISCCART	328800.0	3689700.0	268.2
RE	DISCCART	328900.0	3689700.0	268.2
RE	DISCCART	329000.0	3689700.0	267.9
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RE	DISCCART	325200.0	3689800.0	268.5
RE	DISCCART	325300.0	3689800.0	268.5
RE	DISCCART	325400.0	3689800.0	268.3
RE	DISCCART	325500.0	3689800.0	266.7
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RE	DISCCART	325700.0	3689800.0	265.8
RE	DISCCART	325800.0	3689800.0	265.3
RE	DISCCART	325900.0	3689800.0	265.1
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RE	DISCCART	326200.0	3689800.0	264.6
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RE	DISCCART	325400.0	3691100.0	273.2
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RE	DISCCART	325600.0	3691100.0	272.6
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RE	DISCCART	325800.0	3691100.0	271.6
RE	DISCCART	325900.0	3691100.0	271
RE	DISCCART	326000.0	3691100.0	270.7
RE	DISCCART	326100.0	3691100.0	270.4
RE	DISCCART	326200.0	3691100.0	270.2
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RE	DISCCART	327600.0	3691100.0	272.7
RE	DISCCART	327700.0	3691100.0	272.5
RE	DISCCART	327800.0	3691100.0	272.7
RE	DISCCART	327900.0	3691100.0	273
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RE	DISCCART	328100.0	3691100.0	273.1
RE	DISCCART	328200.0	3691100.0	273.3
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RE	DISCCART	328200.0	3691200.0	273.7
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RE	DISCCART	328400.0	3691200.0	274.2
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RE	DISCCART	328600.0	3691200.0	275
RE	DISCCART	328700.0	3691200.0	275.5
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RE	DISCCART	326300.0	3691300.0	270.8
RE	DISCCART	326400.0	3691300.0	270.8
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RE	DISCCART	326700.0	3691300.0	271

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RE	DISCCART	327400.0	3691300.0	273.8
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RE	DISCCART	327700.0	3691300.0	273.8
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RE	DISCCART	328500.0	3691300.0	274.9
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RE	DISCCART	328700.0	3691300.0	275.5
RE	DISCCART	328800.0	3691300.0	276.1
RE	DISCCART	328900.0	3691300.0	276.4
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RE	DISCCART	326800.0	3691500.0	271.3
RE	DISCCART	326900.0	3691500.0	271.3
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RE	DISCCART	327800.0	3691500.0	276.6
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RE	DISCCART	326800.0	3691600.0	271.9
RE	DISCCART	326900.0	3691600.0	271.7
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RE	DISCCART	328800.0	3691600.0	276.8
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RE	DISCCART	325500.0	3691700.0	275.7
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RE	DISCCART	325800.0	3691700.0	274.6
RE	DISCCART	325900.0	3691700.0	274
RE	DISCCART	326000.0	3691700.0	273.4
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RE	DISCCART	326800.0	3691700.0	272.3
RE	DISCCART	326900.0	3691700.0	272.2
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RE	DISCCART	327100.0	3691700.0	272.2
RE	DISCCART	327200.0	3691700.0	272.7
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RE	DISCCART	328600.0	3691700.0	276.5
RE	DISCCART	328700.0	3691700.0	276.7
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RE	DISCCART	328900.0	3691700.0	277.4
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RE	DISCCART	326800.0	3691800.0	272.8
RE	DISCCART	326900.0	3691800.0	272.6
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RE	DISCCART	328900.0	3691800.0	277.7
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RE	DISCCART	325200.0	3691900.0	275.3
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RE	DISCCART	328700.0	3691900.0	277.4
RE	DISCCART	328800.0	3691900.0	277.7
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RE	DISCCART	325100.0	3692000.0	274.5
RE	DISCCART	325200.0	3692000.0	275.5
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RE	DISCCART	325400.0	3692000.0	276.7
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RE	DISCCART	325900.0	3692000.0	275.4
RE	DISCCART	326000.0	3692000.0	274.7
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RE	DISCCART	326800.0	3692000.0	273.7
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RE	DISCCART	327800.0	3692000.0	283
RE	DISCCART	327900.0	3692000.0	278.6
RE	DISCCART	328000.0	3692000.0	277.4
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RE	DISCCART	328200.0	3692000.0	278
RE	DISCCART	328300.0	3692000.0	278
RE	DISCCART	328400.0	3692000.0	277.7
RE	DISCCART	328500.0	3692000.0	277.4
RE	DISCCART	328600.0	3692000.0	277.4
RE	DISCCART	328700.0	3692000.0	277.7
RE	DISCCART	328800.0	3692000.0	278
RE	DISCCART	328900.0	3692000.0	278.4
RE	DISCCART	329000.0	3692000.0	278.7
RE	DISCCART	325000.0	3692100.0	274.3
RE	DISCCART	325100.0	3692100.0	275.1
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RE	DISCCART	325300.0	3692100.0	276.9
RE	DISCCART	325400.0	3692100.0	277.6
RE	DISCCART	325500.0	3692100.0	277.4
RE	DISCCART	325600.0	3692100.0	277.4
RE	DISCCART	325700.0	3692100.0	277.2
RE	DISCCART	325800.0	3692100.0	277.1
RE	DISCCART	325900.0	3692100.0	276.4
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RE	DISCCART	326200.0	3692100.0	274.3
RE	DISCCART	326300.0	3692100.0	274.8
RE	DISCCART	326400.0	3692100.0	274.9
RE	DISCCART	326500.0	3692100.0	274.6
RE	DISCCART	326600.0	3692100.0	274.3
RE	DISCCART	326700.0	3692100.0	274.6
RE	DISCCART	326800.0	3692100.0	274.3
RE	DISCCART	326900.0	3692100.0	273.8
RE	DISCCART	327000.0	3692100.0	273.4
RE	DISCCART	327100.0	3692100.0	273.4
RE	DISCCART	327200.0	3692100.0	273.7
RE	DISCCART	327300.0	3692100.0	274.3
RE	DISCCART	327400.0	3692100.0	274.4
RE	DISCCART	327500.0	3692100.0	275.8
RE	DISCCART	327600.0	3692100.0	277.1
RE	DISCCART	327700.0	3692100.0	277.5
RE	DISCCART	327800.0	3692100.0	277.5
RE	DISCCART	327900.0	3692100.0	278.3

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RE	DISCCART	328200.0	3692100.0	278.6
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RE	DISCCART	328400.0	3692100.0	278.1
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RE	DISCCART	328600.0	3692100.0	277.5
RE	DISCCART	328700.0	3692100.0	278
RE	DISCCART	328800.0	3692100.0	278.6
RE	DISCCART	328900.0	3692100.0	278.9
RE	DISCCART	329000.0	3692100.0	279.2
RE	DISCCART	325000.0	3692200.0	275.1
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RE	DISCCART	325200.0	3692200.0	276.6
RE	DISCCART	325300.0	3692200.0	277.2
RE	DISCCART	325400.0	3692200.0	278
RE	DISCCART	325500.0	3692200.0	277.7
RE	DISCCART	325600.0	3692200.0	277.8
RE	DISCCART	325700.0	3692200.0	277.7
RE	DISCCART	325800.0	3692200.0	277.7
RE	DISCCART	325900.0	3692200.0	277.3
RE	DISCCART	326000.0	3692200.0	276.9
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RE	DISCCART	326600.0	3692200.0	275.7
RE	DISCCART	326700.0	3692200.0	275.3
RE	DISCCART	326800.0	3692200.0	274.9
RE	DISCCART	326900.0	3692200.0	274.2
RE	DISCCART	327000.0	3692200.0	273.8
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RE	DISCCART	327200.0	3692200.0	274.3
RE	DISCCART	327300.0	3692200.0	274.6
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RE	DISCCART	327500.0	3692200.0	275.5
RE	DISCCART	327600.0	3692200.0	276.3
RE	DISCCART	327700.0	3692200.0	277.1
RE	DISCCART	327800.0	3692200.0	277.6
RE	DISCCART	327900.0	3692200.0	278.4
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RE	DISCCART	328100.0	3692200.0	279.5
RE	DISCCART	328200.0	3692200.0	279.6
RE	DISCCART	328300.0	3692200.0	279.1
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RE	DISCCART	328600.0	3692200.0	278.3
RE	DISCCART	328700.0	3692200.0	278.6
RE	DISCCART	328800.0	3692200.0	278.9
RE	DISCCART	328900.0	3692200.0	279.3
RE	DISCCART	329000.0	3692200.0	279.6
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RE	DISCCART	325100.0	3692300.0	276.5
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RE	DISCCART	325300.0	3692300.0	277.4
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RE	DISCCART	325900.0	3692300.0	277.8
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RE	DISCCART	326200.0	3692300.0	276.5
RE	DISCCART	326300.0	3692300.0	276.1
RE	DISCCART	326400.0	3692300.0	276
RE	DISCCART	326500.0	3692300.0	276.3
RE	DISCCART	326600.0	3692300.0	276.7
RE	DISCCART	326700.0	3692300.0	276.7
RE	DISCCART	326800.0	3692300.0	276.1
RE	DISCCART	326900.0	3692300.0	274.7
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RE	DISCCART	327200.0	3692300.0	274.6
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RE	DISCCART	327400.0	3692300.0	275.5
RE	DISCCART	327500.0	3692300.0	275.9
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RE	DISCCART	327700.0	3692300.0	277.4
RE	DISCCART	327800.0	3692300.0	278.2
RE	DISCCART	327900.0	3692300.0	279.1
RE	DISCCART	328000.0	3692300.0	279.8
RE	DISCCART	328100.0	3692300.0	280.4
RE	DISCCART	328200.0	3692300.0	280.4

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RE	DISCCART	328400.0	3692300.0	279.1
RE	DISCCART	328500.0	3692300.0	278.9
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RE	DISCCART	328800.0	3692300.0	279.2
RE	DISCCART	328900.0	3692300.0	279.6
RE	DISCCART	329000.0	3692300.0	279.8
RE	DISCCART	325000.0	3692400.0	276.6
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RE	DISCCART	325200.0	3692400.0	277.4
RE	DISCCART	325300.0	3692400.0	277.8
RE	DISCCART	325400.0	3692400.0	278
RE	DISCCART	325500.0	3692400.0	278.6
RE	DISCCART	325600.0	3692400.0	278.6
RE	DISCCART	325700.0	3692400.0	278.6
RE	DISCCART	325800.0	3692400.0	278.3
RE	DISCCART	325900.0	3692400.0	278.3
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RE	DISCCART	326200.0	3692400.0	277
RE	DISCCART	326300.0	3692400.0	276.8
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RE	DISCCART	326700.0	3692400.0	283.2
RE	DISCCART	326800.0	3692400.0	277.7
RE	DISCCART	326900.0	3692400.0	275.7
RE	DISCCART	327000.0	3692400.0	274.3
RE	DISCCART	327100.0	3692400.0	274.6
RE	DISCCART	327200.0	3692400.0	274.9
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RE	DISCCART	327400.0	3692400.0	275.8
RE	DISCCART	327500.0	3692400.0	276.3
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RE	DISCCART	327700.0	3692400.0	277.8
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RE	DISCCART	328000.0	3692400.0	280.4
RE	DISCCART	328100.0	3692400.0	280.7
RE	DISCCART	328200.0	3692400.0	280.4
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RE	DISCCART	328400.0	3692400.0	279.6
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RE	DISCCART	328600.0	3692400.0	279.5
RE	DISCCART	328700.0	3692400.0	279.5
RE	DISCCART	328800.0	3692400.0	279.8
RE	DISCCART	328900.0	3692400.0	279.9
RE	DISCCART	329000.0	3692400.0	280.3
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RE	DISCCART	325100.0	3692500.0	277.4
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RE	DISCCART	325400.0	3692500.0	278.5
RE	DISCCART	325500.0	3692500.0	278.9
RE	DISCCART	325600.0	3692500.0	279
RE	DISCCART	325700.0	3692500.0	279
RE	DISCCART	325800.0	3692500.0	279
RE	DISCCART	325900.0	3692500.0	278.7
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RE	DISCCART	327200.0	3692500.0	275
RE	DISCCART	327300.0	3692500.0	275.5
RE	DISCCART	327400.0	3692500.0	276
RE	DISCCART	327500.0	3692500.0	276.5
RE	DISCCART	327600.0	3692500.0	277.1
RE	DISCCART	327700.0	3692500.0	277.9
RE	DISCCART	327800.0	3692500.0	279.2
RE	DISCCART	327900.0	3692500.0	280.4
RE	DISCCART	328000.0	3692500.0	280.7
RE	DISCCART	328100.0	3692500.0	280.7
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RE	DISCCART	328300.0	3692500.0	280.3
RE	DISCCART	328400.0	3692500.0	280
RE	DISCCART	328500.0	3692500.0	279.6

RE	DISCCART	328600.0	3692500.0	279.7
RE	DISCCART	328700.0	3692500.0	279.8
RE	DISCCART	328800.0	3692500.0	280.1
RE	DISCCART	328900.0	3692500.0	280.4
RE	DISCCART	329000.0	3692500.0	280.8
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RE	DISCCART	327600.0	3689800.0	267.3
RE	DISCCART	327700.0	3689800.0	267.3
RE	DISCCART	327800.0	3689800.0	267.3
RE	DISCCART	327900.0	3689800.0	267.6
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RE	DISCCART	327800.0	3689900.0	267.6
RE	DISCCART	327900.0	3689900.0	267.9
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RE	DISCCART	327600.0	3690000.0	267.6
RE	DISCCART	327700.0	3690000.0	267.9
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RE	DISCCART	327700.0	3690100.0	267.9
RE	DISCCART	327800.0	3690100.0	267.9
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RE	DISCCART	327700.0	3690200.0	267.9
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RE	DISCCART	327800.0	3690300.0	268.2
RE	DISCCART	327900.0	3690300.0	268.8
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RE	DISCCART	327700.0	3690400.0	268.8
RE	DISCCART	327800.0	3690400.0	269.1
RE	DISCCART	327900.0	3690400.0	269.4
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RE	DISCCART	311000.0	3682500.0	323
RE	DISCCART	313000.0	3682500.0	322
RE	DISCCART	315000.0	3682500.0	315.8
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RE	DISCCART	309000.0	3684500.0	324
RE	DISCCART	311000.0	3684500.0	324
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RE	DISCCART	315000.0	3684500.0	299.9

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RE	DISCCART	309000.0	3690500.0	303
RE	DISCCART	311000.0	3690500.0	298
RE	DISCCART	313000.0	3690500.0	296
RE	DISCCART	315000.0	3690500.0	429.8
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RE	DISCCART	309000.0	3704500.0	370
RE	DISCCART	311000.0	3704500.0	382
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RE	DISCCART	307000.0	3706500.0	357
RE	DISCCART	309000.0	3706500.0	363
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RE	DISCCART	307000.0	3708500.0	367
RE	DISCCART	309000.0	3708500.0	377
RE	DISCCART	311000.0	3708500.0	378
RE	DISCCART	313000.0	3708500.0	374
RE	DISCCART	315000.0	3708500.0	367
RE	DISCCART	307000.0	3710500.0	378
RE	DISCCART	309000.0	3710500.0	397
RE	DISCCART	311000.0	3710500.0	394
RE	DISCCART	313000.0	3710500.0	388
RE	DISCCART	315000.0	3710500.0	380
RE	DISCCART	287000.0	3650500.0	134
RE	DISCCART	292000.0	3650500.0	155.8
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RE	DISCCART	302000.0	3650500.0	202
RE	DISCCART	287000.0	3655500.0	152.1
RE	DISCCART	292000.0	3655500.0	150
RE	DISCCART	297000.0	3655500.0	203
RE	DISCCART	302000.0	3655500.0	152
RE	DISCCART	287000.0	3660500.0	177.7
RE	DISCCART	292000.0	3660500.0	174
RE	DISCCART	297000.0	3660500.0	203
RE	DISCCART	302000.0	3660500.0	185
RE	DISCCART	287000.0	3665500.0	214.9
RE	DISCCART	292000.0	3665500.0	216
RE	DISCCART	297000.0	3665500.0	303
RE	DISCCART	302000.0	3665500.0	208
RE	DISCCART	287000.0	3670500.0	253
RE	DISCCART	292000.0	3670500.0	281
RE	DISCCART	297000.0	3670500.0	282
RE	DISCCART	302000.0	3670500.0	243.84

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RE	DISCCART	292000.0	3680500.0	452
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RE	DISCCART	357000.0	3700500.0	325
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RE	DISCCART	352000.0	3710500.0	548
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RE	DISCCART	362000.0	3720500.0	441
RE	DISCCART	367000.0	3720500.0	388
RE	DISCCART	352000.0	3725500.0	507

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** Boundary
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RE DISCCART  326336.4  3689675.26  265.2
RE DISCCART  326386.4  3689675.26  267
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RE DISCCART  326536.4  3689675.26  267.9
RE DISCCART  326586.4  3689675.26  267.3
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RE DISCCART  326736.4  3689675.26  267.6
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RE	DISCCART	326828.05	3691300.0	271.3
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RE	DISCCART	326728.05	3691300.0	271
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RE	DISCCART	326528.05	3691300.0	271
RE	DISCCART	326478.05	3691300.0	270.7
RE	DISCCART	326428.05	3691300.0	271
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RE	DISCCART	326328.05	3691300.0	271
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RE	DISCCART	326286.4	3690950.0	269.4
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RE	DISCCART	326286.4	3690850.0	269.1
RE	DISCCART	326286.4	3690800.0	268.8
RE	DISCCART	326286.4	3690750.0	268.5
RE	DISCCART	326286.4	3690700.0	268.2
RE	DISCCART	326286.4	3690650.0	267.9
RE	DISCCART	326286.4	3690600.0	267.9
RE	DISCCART	326286.4	3690550.0	267.6
RE	DISCCART	326286.4	3690500.0	267.3
RE	DISCCART	326286.4	3690450.0	267
RE	DISCCART	326286.4	3690400.0	267
RE	DISCCART	326286.4	3690350.0	266.4
RE	DISCCART	326286.4	3690300.0	265.8
RE	DISCCART	326286.4	3690250.0	265.8
RE	DISCCART	326286.4	3690200.0	265.5
RE	DISCCART	326286.4	3690150.0	265.2
RE	DISCCART	326286.4	3690100.0	265.2
RE	DISCCART	326286.4	3690050.0	265.2
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RE	DISCCART	326286.4	3689950.0	264.9
RE	DISCCART	326286.4	3689900.0	264.6
RE	DISCCART	326286.4	3689850.0	264.6
RE	DISCCART	326286.4	3689800.0	264.6
RE	DISCCART	326286.4	3689750.0	264.6
RE	DISCCART	326286.4	3689700.0	264.6

Attachment 5
Additional Discrete Receptors

Additional Discrete Receptors			
	Location		
Receptor Description	UTM East (m)	UTM West (m)	Elevation (m)
Superstition Class I Area	455074.7	3700287.0	619.30
Pine Mountain Class I Area	420190.7	3789220.0	1534.00
Mazatzal Class I Area	444524.8	3751036.0	752.90
Class II Sensitive Receptors			
Gila Bend I.R. 1	329987.4	3656163.3	184.00
Gila Bend I.R. 2	335051.9	3656163.3	224.30
Gila Bend I.R. 3	340116.4	3656163.3	254.10
Signal Mountain W.A. 1	321471.3	3676873.0	329.10
Signal Mountain W.A. 2	317277.7	3677840.7	374.30
Signal Mountain W.A. 3	313535.8	3677453.7	310.90
Woosley Peak W.A. 1	326166.4	3675840.7	354.20
Woosley Peak W.A. 2	330826.1	3675518.2	300.90
Gila River I.R. 1	378890.6	3680550.4	596.90
Gila River I.R. 2	378890.6	3685518.2	505.00
Gila River I.R. 3	378890.6	3690485.9	312.80
Gila River I.R. 4	378890.6	3695389.1	288.00
Eagletail Mountains W.A. 1	291535.8	3692937.5	395.00
Eagletail Mountains W.A. 2	290051.9	3699647.2	395.60
Eagletail Mountains W.A. 3	289148.7	3703260.1	394.00
Big Horn Mountains W.A. 1	302955.2	3732937.5	766.40
Big Horn Mountains W.A. 2	305729.4	3733905.3	768.30
Hummingbird Springs W.A. 1	306697.1	3735324.6	748.30
Hummingbird Springs W.A. 2	310890.6	3741260.1	666.80
Hummingbird Springs W.A. 3	311858.4	3743969.8	693.30
North Maricopa Mountains W.A. 1	358310.0	3668550.4	438.30
North Maricopa Mountains W.A. 2	358116.4	3672679.5	401.60
North Maricopa Mountains W.A. 3	363406.8	3673002.0	368.30
North Maricopa Mountains W.A. 4	366245.5	3674163.3	339.00
North Maricopa Mountains W.A. 5	366826.1	3679066.6	317.00
North Maricopa Mountains W.A. 6	372697.1	3679776.2	365.00
Nonattainment Receptors			
PM_{10} Nonattainment Area	350268.6	3676266.0	311.80
PM_{10} Nonattainment Area	350268.6	3686266.0	267.70
PM_{10} Nonattainment Area	350268.6	3696266.0	286.70
PM_{10} Nonattainment Area	350268.6	3706266.0	421.40
PM_{10} Nonattainment Area	350268.6	3716266.0	630.70
PM_{10} Nonattainment Area	350268.6	3726266.0	498.30
PM_{10} Nonattainment Area	350268.6	3736266.0	521.10
PM_{10} Nonattainment Area	350268.6	3746266.0	596.40
PM_{10} Nonattainment Area	350268.6	3752036.0	682.70
Ozone Nonattainment Area	368091.0	3684418.0	335.90

Additional Discrete Receptors			
	Location		
Receptor Description	UTM East (m)	UTM West (m)	Elevation (m)
Ozone Nonattainment Area	368091.0	3694418.0	273.20
Ozone Nonattainment Area	368091.0	3704418.0	312.40
Ozone Nonattainment Area	368091.0	3714418.0	359.00
Ozone Nonattainment Area	368091.0	3727383.0	408.80
Ozone Nonattainment Area	378430.4	3679570.0	432.80
Receptors on Complex Peaks			
	318250.0	3700461.5	662.03
	320807.7	3695730.8	441.96
	329653.9	3695307.7	383.44
	317000.0	3683923.1	492.25
	318346.2	3680500.0	566.93
	325038.5	3693865.4	338.63
	321692.3	3694230.8	329.18
	318538.5	3682000.0	343.20
	327711.5	3691769.2	377.95
	326750.0	3692576.9	326.14
	332692.3	3690384.6	377.95
	333557.7	3689961.5	347.47
	336750.0	3682230.8	377.95
	336134.6	3681807.7	323.09
	337153.9	3683000.0	319.10
	336826.9	3680903.8	307.85
	319384.6	3680000.0	421.54
	317230.8	3698000.0	438.91
	320250.0	3699692.3	438.91
	321692.3	3699461.5	350.40
	322500.0	3699019.2	346.86
	324461.5	3699192.3	347.47
	320750.0	3696615.4	429.77
	320000.0	3695961.5	359.66
	320807.7	3695730.8	441.96
	321442.3	3696115.4	378.20
	321500.0	3694615.4	368.81
	322500.0	3694788.5	371.86
	323653.9	3694500.0	353.57
	325692.3	3698846.2	366.67
	327096.2	3697384.6	334.67
	329673.1	3695326.9	383.44
	329846.2	3695730.8	349.91
	316375.8	3682012.1	353.26
	318024.2	3682072.7	331.62
	316606.1	3682212.1	341.38
	316666.7	3683787.9	490.42

Additional Discrete Receptors			
	Location		
Receptor Description	UTM East (m)	UTM West (m)	Elevation (m)
Receptors on Complex Peaks (Continued)	317303.0	3684121.2	430.07
	316690.1	3685460.6	338.94
	316339.4	3685569.7	353.57
	322290.9	3693836.4	317.91
	320424.2	3695557.6	326.14
	321757.6	3695545.5	323.09
	320866.7	3696084.8	384.05
	320375.8	3696363.6	359.66
	321363.6	3696593.9	347.47
	321042.4	3696630.3	356.62
	320484.8	3696909.1	356.62
	318745.5	3697109.1	380.39
	317266.7	3697090.9	390.14
	317060.6	3697436.4	374.90
	317557.6	3698484.8	377.95
	318866.7	3697436.4	374.90
	322000.0	3698048.5	326.14
	321521.2	3698169.7	323.09
	320545.5	3697581.8	368.81
	319709.1	3698000.0	354.18
	318787.9	3697660.6	356.62
	318278.8	3699472.7	662.03
	317412.1	3698939.4	405.38
	320066.7	3699454.5	390.14
	318430.3	3700121.2	563.88
	322206.1	3699303.0	356.62
	322503.0	3699787.9	371.86
	324854.5	3699848.5	350.52
	324824.2	3700218.2	356.62
	320133.3	3700345.5	435.86
	319551.5	3700969.7	532.49
	319200.0	3700697.0	457.20
	318581.8	3700654.5	597.41
	326278.8	3698042.4	316.99
	326854.5	3697848.5	329.18
	327733.3	3697303.0	313.94
	326448.5	3697400.0	313.94
	326472.7	3697648.5	313.94
	320969.7	3695460.6	368.81
	317533.3	3697521.2	359.66
	320175.8	3697878.8	338.33
	319878.8	3700727.3	445.01
	325533.3	3699454.5	313.94
	324521.2	3700333.3	323.09

Attachment 6
Ozone Monitor Validity Verification

Dillon, Chris G.

From: Peter Hyde [Hyde.Peter@ev.state.az.us]
nt: Wednesday, March 15, 2000 5:33 PM
: dilloncg@bv.com
Cc: Sandra Wardwell
Subject: Palo Verde Nuclear Ozone Data (Arizona)

README.TXT PAVE1999.09 PAVE1999.10 PAVE1999.08 PAVE1999.07 PAVE1999.06

PAVE1999.05 PAVE1999.04 Quattro for windows Quattro for windows

March 15, 2000

Chris Dillon:

This ozone monitor, like all monitors operated by the Arizona Department of Environmental Quality, is given periodic precision and accuracy checks consistent with NSR/PSD guidelines. Data for 1997 and 1998 are available in column/row format now, and are attached as "wb1" files, an ancient form of Quatropro. Each spreadsheet is divided into pages, one month per page.

The 1999 data are available on an hour-by-hour basis and are attached as a series of text files, one for each month of April-September, the key to which is given in the readme.txt file.

You can reach me at (602) 207-2360 with any questions.

Cordially,

Peter Hyde

BLACK & VEATCH

8400 Ward Parkway
P.O. Box 8405
Kansas City, Missouri 64114

Tel: (913) 458-2000

Black & Veatch Corporation

Mesquite Power, LLC
Mesquite Generating Station

B&V Project 96210.0020
March 30, 2000

Mr. Robert Arpino
Maricopa County Environmental Services Department
Air Quality Division
1001 N. Central Ave.
Suite 200
Phoenix, AZ 850004-1942

Subject: Response to IT's Comments on Ambient Air Quality Impact Analysis Workplan Addendum

Dear Mr. Arpino:

On behalf of Mesquite Power, LLC, please find the attached supplemental responses to IT's comments on the Ambient Air Quality Impact Analysis Workplan Addendum.

Enclosed is the completed ADEQ Air Quality Permit Application – Refined Modeling Protocol Checklist and the Comments on Ambient Air Quality Impact Analysis Workplan Addendum table as provided by IT. These are being submitted for incorporation in, and as a supplement to, the Ambient Air Quality Impact Analysis Workplan Addendum.

We believe that we have now responded to all of IT's comments leading to a finding of administrative completeness for the Ambient Air Quality Impact Analysis Workplan Addendum.

If you have any questions, please don't hesitate to call me at (913) 458-8269.

Very truly yours,

BLACK & VEATCH CORPORATION

W.G. Collins

William G. Collins
Permitting/Compliance Project Manager

Attachments

cc:	M. Swartz	Sempra Energy Resources
	C. Sterling	Sempra Energy Resources
	P. Allard	SA&B
	R. Felty	IT Corporation
	K. Kading	IT Corporation
	E. Valis	IT Corporation
	S. Bohning	EPA Region 9
	D. Lieb	Maricopa County Environmental Services Department – Air Quality Division

Is the Requirement Sufficiently Addressed? (✓ one)			Refined Modeling Protocol Contents (Headings and Chapters should be labeled as follows:)
Yes	No	N/A	
✓			Executive Summary
✓			ADEQ Completeness Checklist
			1.0 Introduction
✓			1.1 Site Description
✓			1.2 Project Description
		✓	1.3 Application Forms
			2.0 Regulatory Status
✓			2.1 Source Designation
✓			2.2 Area Classifications
✓			2.3 Baseline Dates
✓			2.3.1 Major Source Baseline Date
✓			2.3.2 Trigger Date
✓			2.3.3 Minor Source Baseline Date
✓			2.4 Baseline Area
✓			2.5 Increment Consumption and Expansion
			3.0 Ambient Data Requirements
✓			3.1 Pre-Application Air Quality Monitoring
✓			3.2 Post-Construction Air Quality Monitoring
✓			3.3 Meteorological Monitoring
✓			3.4 Background Concentrations
			4.0 Emissions Inventory
✓			4.1 Source Emissions Inventory

✓			4.1.1 The NAAQS Inventory
✓			4.1.2 The Increment Inventory
✓			4.1.3 Noncriteria Pollutants Inventory
			5.0 Topography, Climatology and Meteorology
✓			5.1 Regional Topography
✓			5.1.1 Simple Terrain
✓			5.1.2 Intermediate Terrain
✓			5.1.3 Complex Terrain
✓			5.2 Regional Climatology
✓			5.3 Regional Meteorology
✓			5.3.1 Surface Meteorology
✓			5.3.1.1 Wind Speed and Wind Directions
✓			5.3.1.2 Stability Class
✓			5.3.1.3 Data Capture
✓			5.3.1.4 Treatment of Calms
✓			5.3.2 Upper Air Data
			6.0 Modeling Analysis Design
✓			6.1 Modeling Selection
✓			6.1.1 Screen Modeling
✓			6.1.2 Refined Screen Modeling
✓			6.1.3 Refined Modeling
✓			6.2 Model Input Defaults/Options
✓			6.3 Rural/Urban Classification
✓			6.3.1 Land Use Classification
✓			6.3.2 Rural vs Urban
✓			6.4 Receptor Network

✓			6.4.1 Coarse Receptors
✓			6.4.2 Medium Receptors
✓			6.4.3 Fine Receptors
✓			6.4.4 Tight Receptors
✓			6.4.5 Discrete Receptors
✓			6.4.6 Class I Receptors
✓			6.4.7 Nonattainment Area Boundary Receptors
✓			6.5 Receptor Elevations
✓			6.6 Source Characterization
✓			6.6.1 Point Sources
		✓	6.6.2 Area Sources
		✓	6.6.3 Volume Sources
		✓	6.6.4 Line Sources
		✓	6.6.5 Mobile Sources
		✓	6.6.6 Open Pit/Pit Retention
		✓	6.6.7 Dry Deposition
✓			6.7 Source Locations and Parameters
✓			6.8 Building Wake Downwash and GEP
			7.0 Dispersion Modeling Impact Analysis
✓			7.1 Preliminary Analysis
✓			7.1.1 Preliminary Impact Determination
✓			7.1.2 Sources Within Area of Impact
✓			7.1.3 Sources Omitted
✓			7.1.4 Significant Impacts
✓			7.2 Full Impact Analysis
✓			7.2.1 The NAAQS Analysis

✓			7.2.2 The Increment Analysis
✓			7.2.3 AAAQG Pollutant Analysis
			8.0 Additional Impact Analysis
✓			8.1 Growth Analysis
✓			8.2 Soils and Vegetation Analysis
✓			8.3 Visibility Impairment Analysis
✓			8.3.1 Level One Screening
✓			8.3.2 Level Two Screening
		✓	8.3.3 Level Three Screening
		✓	8.4 Conclusions
			9.0 Class I Impact Analysis
✓			9.1 Class I Increments
		✓	9.2 Air Quality Related Values
		✓	9.2.1 Flora and Fauna
		✓	9.2.2 Water
		✓	9.2.3 Acid Deposition
		✓	9.3 Visibility Impact Analysis
			10.0 References
			11.0 Appendices
✓			Minutes from pre-application meetings
✓			Copies of all correspondence

Comments on Ambient Air Quality Impact Analysis Workplan ADDENDUM
3/29/2000
Mesquite Power, LLC

ADEQ Protocol Checklist Section	Comment	Recommendation	Recommendation to be Addressed in
ADEQ Checklist	The ADEQ Checklist provided in the Addendum has Items 6.6.2 through 6.6.7 not marked as being significantly addressed/not applicable.	Complete form for these items as appropriate.	Workplan
2.5 Increment Consumption and Expansion	The approach of assuming that all increment is available for use is not correct. B&V (Chris Dillon) provided an e-mail on 3/29/99 clarifying what was meant by the prior statement.	The application will need to include the sources that have previously consumed increment and provide the amount of increment remaining.	Application
3.4 Background Concentrations	The use of the NO_2 1-hour average concentration in lieu of an NO_2 annual average is conservative, as noted in the Workplan. It would be beneficial to understand the technical reasoning for this approach (i.e. poor data quality for annual average, not enough data points, etc.)	Further discussion of the reasons for this approach and presentation of 1-hour and annual average NO_2 concentrations from other monitors in the general area would be valuable to confirm that the values are conservative.	Application
4.2 The NAAQS Inventory	Interactive sources should also include those sources (located outside the significant impact area created by the proposed Mesquite project) that have significant impacts in the SIL area created by Mesquite.	Review Maricopa County and ADEQ source inventory to determine potential interactive source candidates that may have a SIL in Mesquite's SIL area.	Application
4.4 Noncriteria Inventory	Table 2 presented as part of the Addendum for this Section, has some missing (i.e. units for the Emission Factors) and conflicting/unexplained (i.e. footnotes c and d conflicting number of	Clarification will be sought as part of the application technical review.	Application

Comments on Ambient Air Quality Impact Analysis Workplan ADDENDUM
3/29/2000
Mesquite Power, LLC

ADEQ Protocol Checklist Section	Comment	Recommendation	Recommendation to be Addressed in
	turbines, rationale for using GE Turbines vs. Westinghouse) information		
5.1 Regional Topography	The comparison of the digital data terrain heights and other information with USGS topographic quadrangles may create data conflicts due to differing datums (i.e. 1929? (topo. Maps) vs. 1983? (digital data))	Verify that the possible differing datums do not cause inaccurate receptors heights or conflicting /inaccurate information.	Application
6.5 Receptor Elevations	Are discrete receptor (i.e. Class 1, sensitive Class 2, Nonattainment boundary) elevations/heights "worst-case" values or actual elevation/height at that point?	Provide a discussion of the discrete receptor elevations/heights. The use of a "worst-case" elevation/height should have been used and described.	Application
11.0 Appendices/Additional Information – Modeled Impact on PM_{10} and Ozone Nonattainment	Sempra is requesting that its contribution of VOCs from operating the proposed plant be considered in a regional impact analysis. Rob Arpino of Maricopa Co. stated in an e-mail dated 3/21/99 that Sempra would be required to submit a proposal, for evaluation by the County, describing how to analyze the ozone impact on the non-attainment area.	Is the Addendum "Additional Information" portion Sempra's "proposal" for demonstrating how the VOC emissions may impact the ozone non-attainment area? If so, Sempra's proposal/request will be forwarded to Region IX EPA office and ADEQ.	Note: Modifications to the Workplan and/or Application may be requested depending upon EPA's and/or ADEQ's comments and requirements.

EXHIBIT
A-3
admitted

BILL KELLER

VICE PRESIDENT, DEVELOPMENT AND OPERATIONS
SEMPRA ENERGY RESOURCES

Bill Keller is Vice President of Project Development and Operations for Sempra Energy Resources, an unregulated subsidiary of Sempra Energy, a San Diego-based Fortune 500 energy services holding company whose subsidiaries provide electricity, natural gas and value-added products and services.

Sempra Energy was formed in June 1998 by the merger of Pacific Enterprises and Enova Corporation.

In his current role, Keller is responsible for assembling technical and manpower resources to develop new generating projects in target markets throughout the United States.

He was instrumental in developing El Dorado Energy, a 480-megawatt power plant jointly owned by Reliant Energy and Sempra Energy. That facility began commercial operation on May 1, 2000, selling electricity into the wholesale power markets of Nevada, California and the southwestern United States. The $280 million natural gas-fired power generating plant, located near Boulder City, Nev., about 40 miles southeast of Las Vegas, is designed to provide reliable, safe and cost-effective power to support the growing economies of the region.

Before joining Sempra Energy Resources, Keller worked for Enova Energy Management, a division of Enova Energy, Inc., from January 1997 to June 1998. A 20-year veteran of the utility industry, Keller previously held various project management and engineering positions, including the implementation of emissions reduction programs at San Diego Gas & Electric (SDG&E), the principal subsidiary of Enova Corporation.

A registered professional mechanical engineer, Keller holds a bachelor's degree in mechanical engineering from Villanova University in Villanova, Pa. and a master's degree in business administration from National University in San Diego. He also served in the United States Navy. Bill is married and has four daughters.

Joseph H. Rowley, P.E.

Sempra Energy Resources – Director, Project Development

EXPERIENCE SUMMARY

20 years of experience in the licensing, design, construction, and operation of power plant and electric transmission projects.

EDUCATION

BS, Chemical Engineering, Magna cum Laude, Bright Young University, 1980
Registered Professional Engineer in Mechanical Engineering, State of California, since 1983

REPRESENTATIVE PROJECT EXPERIENCE

Vice President - Elk Hills Power, LL. (February 1999 to present)
Sempra Energy Resources' project manager for the Elk Hills Power Project, a joint development with Occidental Energy Ventures Corp. Responsible for licensing of this project before the California Energy Commission.

Director, Project Development - Sempra Energy Resources (August 1998 to present)
Responsible for the development of merchant power plant projects in the western United States, including the 1000 MW Mesquite Power Project to be located in Maricopa County, Arizona, the 500 MW Elk Hills Power Project to be located in Ken County, California, and the 500 MW expansion of the El Dorado Energy Project located in Boulder City, Nevada.

Manager, System Operations & Generation - ID Power Dept. (February 1998 to August 1998)
Responsible for Id's energy resource assets, including the energy management center, power contracts, fuel contracts, and 28 generating units (3 steam units, 1 combined cycle, 9 gas turbines, and 15 hydra units) at 13 sites. Also responsible for id's transmission control area operations and telecommunications. Organization included 134 employees with annual OEM and routine capital budgets totaling over $120 million.

Manager, Planning/Engineering/Generation - ID Power Dept. (1993 to February 1998)
Planned and initiated implementation of ID's response to the restructuring of the power industry. Responsible for an organization of 145 professional, technical, and operations employees involved in planning, projects, and day-to-day operations. Organization included transmission planning, resource planning, generating plants (operations and projects), and telecommunications. Annual OEM and routine capital budgets totaled $20 million.

Directed ID transmission and resource planning, including response to FERRIC Order 888 regarding transmission open access, participation in the development of the California Independent System Operator and Power Exchange, and evaluation of resource options.

- Conceived the Metered Subsystem concept included in the Cal-ISO tariffs.
- Directed the Presidential permit application process for an ID transmission line to CFA's Aeropuerto Substation. Directed the CEQA process for several ID transmission lines.

Joseph H. Rowley, P.E.

- Conducted evaluation of ID resource options, including participation in the 1992, 1994, and 1996 Electricity Report proceedings before the CEC.

- Licensed the El Centro Unit 1 Repowering before the Imperial County APCD in 1994-95.

Established a new capital budgeting process based on rigorous resource planning and transmission planning. Directed development of ID's long-term capital budgets and cash flow projections to determine financing needs.

- Directed development of the ID Power Department capital and OEM budgets in 1996 and 1997. Overhauled the budgeting process to provide for greater accountability.

- Developed an improved Power Department cash balance sheet and spearheaded improvements in the accounting system used to track capital projects.

General Superintendent, Power Generation - ID Power Dept. (1991 to 1993)
Managed an organization of 97 employees and 28 generating units. Annual OEM and routine capital budgets totaled over $10 million. Concurrently managed the El Centro Unit 2 Repowering Project, conversion of a 30 MW steam unit into a 115 MW combined cycle.

As project manager/engineer of the El Centro Unit 2 Repowering, directed this project from the beginning of licensing in 1990 through engineering, procurement, construction, and start-up. Placed the project in service on schedule and under its $59.5 million budget in 1993.

- Licensed the Unit 2 Repowering before the California Energy Commission and Imperial County APCD in 1990-91.

- Worked with the CEC and APCD in the development of all permit conditions and was the project's primary witness in hearings before the CEC.

- Conducted permit application preparation, data responses, and workshop participation.

- Directed development of the project's Risk Management and Prevention Plan.

- Project engineer for conceptual engineering, design review, construction, and startup.

- Contract administrator for the project's engineering/procurement/construction contract.

The Unit 2 Repowering was the first fossil-fired project approved by the CEC that was not a cogeneration or R&D project, and was one of the first repowerings to enter service nationwide.

As General Superintendent, Power Generation, was responsible for the operation, maintenance, and regulatory compliance of all ID generating facilities.

- Directed all licensing compliance tasks for the El Centro Unit 2 Repowering.

- Directed stormwater permitting and NPDES permit renewal for the El Centro Generating Station and Rockwood Gas Turbine Plant before the Regional Water Quality Control Board in 1992-93.

Joseph H. Rowley, P.E.

- Directed projects for the abatement of asbestos and other hazardous materials at the El Centro Generating Station.
- Directed and conducted emissions sources tests for ID generating units. Developed responses to air quality data requests from the U.S. EPA Region IX in 1992.
- Supervised engineering of ID plant retrofit projects and design and construction of a major maintenance facility.

Assistant General Superintendent, Power Generation - ID Power Dept. (1990 to 1991)
Experience included under General Superintendent, above.

Senior Engineer - San Diego Gas & Electric Company (1985 to 1990)
Project manager of SDG&E's Gas Turbine Application Feasibility Study in 1988, which provided the basis for the 460 MW Combined Cycle Project and the South Bay Unit 3 Augmentation Project.

As project engineer of SDG&E's 460 MW Combined Cycle Project, directed conceptual design and preparation of a CEC Notice of Intention in 1989-90. Also directed conceptual design of SDG&E's South Bay Unit 3 Augmentation Project in 1989-90.

Provided engineering support of SDG&E resource planning, including participation in the CEC's 1990 Electricity Report process. Authored SDG&E's "Power Generation Options – Data Book" in 1989, which provided cost and performance characterizations of numerous resource options.

While at SDG&E, chaired the EPRI Coal Gasification Power Plant Program Committee from 1988 to 1990. Monitored the Cool Water Coal Gasification Combined Cycle Project through design, construction, and operation. Member of the EPRI Advanced Fossil Power Systems Task Force and subcommittees from 1983 to 1990.

Conducted various engineering projects at SDG&E's South Bay and Encina power plants.

Engineer - San Diego Gas & Electric Company (1982 to 1985)
Conducted various engineering projects at SDG&E' South Bay and Encina power plants. These included installation of cycling retrofits, heat exchangers, fire protection systems, safety relief valve systems, and other power plant systems and equipment.

Provided technical support regarding power plant siting during 1984 General Rate Case hearings concerning SDG&E's Blythe site. Directed the Blythe Site Generation Screening Study performed by Bechtel for SDG&E in 1982.

Conducted emissions sources tests and various power plant performance tests. Authored a combustion/emissions model used at both SDG&E and the ID Power Dept. for mass balance and thermal performance analysis.

Associate Engineer - San Diego Gas & Electric Company (1980 to 1982)
Completed various assignments in support of SDG&E generation facilities, including planning, engineering, and regulatory compliance activities. Provided engineering support of SDG&E resource planning during the CEC's 1982 Electricity Report process.

Marty Swartz
Manager, Project Development
Sempra Energy Resources

Marty Swartz is Manager, Project Development for Sempra Energy Resources, an unregulated subsidiary of Sempra Energy, a San Diego-based Fortune 500 energy services holding company whose subsidiaries provide electricity, natural gas, and value-added products and services. Sempra Energy was formed in June 1998 by merger of Pacific Enterprises and Enova Corporation.

In his current role, Marty Swartz is responsible for the day-to-day management of a Mesquite Power Project from the initial development phases through commercial operation of the plant. These day-to-day activities include the preparation, review, and approval of permit applications, support to obtain such permits, transmission and gas supply, community relations, construction of the facility, and start-up of the facility.

Before joining Sempra Energy Resources, Marty Swartz held various engineering and project management positions with Foster Wheeler Corporation, Ahlstrom-Pyropower Corporation, and Bechtel Power Corporation. These positions encompass 20 years of professional experience in the development, design and construction of gas, oil, coal and nuclear power plants.

Marty Swartz has a Bachelor of Chemical Engineering degree from Cleveland State University and is a registered Professional Engineer (PE) in the Commonwealth of Virginia.

William R. Engelbrecht

Biography

William earned a Bachelor of Science degree in Electrical Engineering from the University of Illinois in 1981, with a specialty in Power. He is a Registered Professional Engineer (PE) in Electrical Engineering in the State of California.

William has 20 years of professional experience in the power industry spending 17 years at San Diego Gas & Electric Co. in the areas of Transmission Planning, Resource Planning, Strategic Planning and Industry Restructuring.

William has spent the last 2½ years with Sempra Energy Resources. He is responsible for the development of the short and long-range assessment of the U.S. electric markets. Associated with this is determination of various "project" revenue sources and projected levels including energy, capacity and ancillary services. He is required to understand the various U.S. market structures including ISO and PX rules, protocols and structure, as well as transmission pricing policies and congestion management. He also identifies market and sub-market opportunities for further development work.

William helps support SER's development efforts by managing transmission planning and interconnection request/study efforts as well as other "market" studies. He also directs SER's Asset Portfolio Management activities, examining risk management options in the forward gas and electric commodity markets.

William has spoken at a number of national conferences, and has testified numerous times before the California Public Utilities Commission, the California Energy Commission, and once before the Connecticut Siting Council.