

APPENDIX B

Well Impact Studies – 2005, 2006, 2007

APPENDIX B

WELL IMPACT STUDIES

This appendix includes several water resources studies that were completed, including:

- Final Well Impact Report for the Desert Rock Energy Project, dated September 2005;
- Revision No. 1 to the Final Well Impact Report, dated October 2006, which incorporates new geologic and hydrogeologic data;
- Revision No. 2 to the Final Well Impact Report, dated February 2007, which presents revisions to the model inputs;
- Water Quality Comparison Report A Comparison of 2006 Burnham Chapter Water Well Data to Historical Morrison Formation Water Well Data; and
- Water Quality Comparison Report A Comparison of 2006 Sanostee Chapter Water Well Data to Historical Morrison Formation Water Well Data.

FINAL WELL IMPACT REPORT

DESERT ROCK ENERGY PROJECT FOUR CORNERS AREA, NEW MEXICO

SITHE GLOBAL POWER, LLC.

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LIST OF ACRONYMS

af/yr	cre-feet per year
b	saturated aquifer thickness
cm/sec	centimeters per second
bgs ft ²	below ground surface
ft^2	feet squared
ft/d	feet per day
ft/ft	feet per foot
ft ² /d	feet squared per day
gpd	gallons per day
gpd/ft	gallons per day per foot
gpd/ft ²	gallons per day per square foot
gpm	gallons per minute
Κ	hydraulic conductivity
K_h/K_v	horizontal to vertical conductivity ratio
NNDWR	Navajo Nation Department of Water Resources
NTUA	Navajo Tribe Utilities Authority
URS	URS Corporation
Sithe	Sithe Global Power, LLC.
Т	Transmissivity
USGS	U.S. Geological Survey



1.0 INTRODUCTION

This report provides the results of a well impact study conducted by URS Corporation (URS) on behalf of Sithe Global Power, LLC (Sithe) for the proposed Desert Rock Energy Project power plant in Northwestern New Mexico. The Desert Rock Energy Project is a joint venture between Sithe and Diné Power Authority to develop and construct a coal-fired electric-power-generating plant and associated facilities. Sithe is a privately held, independent power company based in Houston, Texas. Diné Power Authority was established by the Navajo Nation Council to promote the Navajo Nation's development of energy resources.

The study area evaluated for this study encompasses approximately 1,420 square miles of the San Juan Basin in the northwestern portion of New Mexico south of Shiprock and Farmington (Figure 1). This well impact study is intended to estimate the availability and impact associated with the withdrawal of groundwater to meet the projected 40-year consumption demands of the Desert Rock Energy Project from a series of simulated wells constructed in the Morrison Aquifer. The average annual water consumption demand of the Desert Rock Energy Project is estimated to be 4,950 acre-feet per year (af/yr), or 3,070 gallons per minute (gpm), of continuous flow for a period of 40 consecutive years. Based on our evaluation of the hydrogeologic characteristics of the Morrison Aquifer in the study area and the results of our well impact analysis, URS estimates that ten (10) new production wells could meet this demand.

Please note that the well locations simulated in this report are arbitrary locations based upon limited hydrologic and geologic data in the area. In addition, permitting and land ownership issues were not factored into the well locations used in our simulations. Final well locations will be determined conjunctively with personnel that may include but not be limited to: Navajo Nation and local Chapter representatives, Dine Power Authority, Sithe, URS, Bureau of Land Management, Bureau of Indian Affairs, Navajo Nation Department of Water Resources, and others as identified necessary by the Navajo Nation and other Desert Rock Energy project team members.



2.0 STATEMENT OF PURPOSE AND SCOPE

The purpose of this study is to demonstrate that: (1) sufficient groundwater resources are physically available in the Morrison Aquifer for the proposed water uses at the Desert Rock Energy Project for the next 40 years, and; (2) withdrawal of the proposed water from the Morrison Aquifer from a newly constructed well field will not adversely impact the production capabilities of pre-existing and adjacent Navajo Nation wells constructed in the same aquifer. This report describes elements of demand, supply, and impact associated with the anticipated groundwater withdrawals.

Water demand volumes used in our well impact analysis were provided by Sithe (2005). The groundwater supply portion of this study includes an evaluation of hydrogeologic conditions to assess the local groundwater resource availability in the Morrison Aquifer. The impact portion of this study was estimated using the U.S. Geological Survey's (USGS) MODFLOW-96 (Harbaugh and McDonald 1996), which models groundwater systems in 3-dimesnions. The MODFLOW-96 code is widely accepted in the hydrogeologic professional community as a valid numerical model to simulate groundwater flow. The graphical interface Groundwater Vistas® (Rumbaugh and Rumbaugh 1996) was used to generate the drawdown impact contours included in this report. Initially, a more simplified 2-dimensional model was constructed to evaluate withdrawal impacts using the computer code THWELLS© (Van der Heijde 1992). However, due to the complexity of the Morrison Aquifer system and the limitations of the THWELLS© program in simulating such an aquifer, the impacts predicted using the more sophisticated MODFLOW-96 code made more hydrological sense and are therefore the ones presented in this impact report.



3.0 PROJECTED GROUNDWATER DEMAND

The average water demand for the Desert Rock Energy Project for the first 40 years of operation is calculated to be 4,950 af/yr (equivalent to 3,070 gpm of continuous flow) (Sithe 2005). This is the volume used in our well impact modeling analysis. Based upon the simulated location of the well field and the aquifer parameters of the Morrison Formation obtained from the hydrogeologic data reviewed, our analysis assumes this volume will require the construction of ten (10) new production wells, each producing 307 gpm.



4.0 ELEMENTS OF GROUNDWATER SUPPLY

4.1 REGIONAL HYDROGEOLOGIC CONDITIONS

The study area is located in the northwestern portion of the San Juan Basin in Northwestern New Mexico (Figure 1). The San Juan Basin lies on the eastern edge of the Colorado Plateau and extends from northwestern New Mexico into portions of northwestern Arizona along the New Mexico/Arizona border, southeastern Colorado, and the southeastern most corner of Utah. The San Juan basin is approximately 140 miles wide by 200 miles long, and covers a total area of 21,600 square miles (Dam et al. 1990) (Figure 1).

The San Juan basin is a northwest-treading asymmetrical structural depression that formed during the Laramide Orogeny (Late Cretaceous-early Tertiary) at the eastern edge of the Colorado Plateau. Structural boundaries of the basin consist of large, elongate, dormal uplifts; low, marginal platform; and abrupt monoclines (Kelley 1951). The most distinctive structural feature in the study area is the Hogback monocline (see Figure 2), which forms a sharp boundary between the marginal platforms and the central basin. The interior of the basin contains a thick sequence of sedimentary rocks from Cambrian to Tertiary in age, but primarily Pennsylvanian through Tertiary. These rocks consist primarily of stacked sequences of sandstone, siltstone, mudstone, limestone, and shale. A generalized stratigraphic sequence of the San Juan basin is included in Figure 2. These rock sequences dip from the basin margins toward the center of the basin. Older sedimentary rocks in the basin is over 14,000 feet (as recorded in an oil well) at the center of the basin east of the Hogback monocline (Fassett and Hinds 1971).

The primary source of groundwater in the San Juan Basin is derived from wells completed within surficial valley-fill deposits of Quaternary age and sandstones of Tertiary, Cretaceous, Jurassic, and Triassic age (Stone et al. 1983). Groundwater in the sandstone sequences is generally under confined conditions, resulting in an artesian flow from wells completed in these units.

4.2 LOCAL HYDROGEOLOGIC CONDITIONS

Groundwater in the study area is encountered primarily at or near land surface under artesian conditions (see Figure 3). Artesian flow from a well occurs when it penetrates an aquifer that is overlain by an impermeable or semi-impermeable unit, such as shale. Under pressure (or confined/semi-confined conditions), that water will rise to the well's *potentiometer surface*



without the use of a pump. *Potentiometer surface* is defined as the surface representative of the level to which water will rise in a well cased to the aquifer (Fetter 1988). Figure 3 provides contours of the potentiometric surface of waters in the Morrison Formation for the study area.

There are three distinct geologic units that supply the majority of groundwater to existing wells completed in the study area (NNDWR 2005). With increasing depth these include: the Gallup Sandstone, the Dakota Sandstone, and the Morrison Formation. Aside from Quaternary surficial valley-fill deposits, the Morrison Formation has been identified in numerous hydrologic studies as the primary groundwater-bearing unit in the San Juan Basin (Dam et al. 1990). Within the Morrison Formation, the Westwater Canyon Member (a coarse sequence of sandstone, conglomeritic sandstone, and mudstone) is considered the most productive unit (Stone, et al., 1983) (Dam et al. 1990). According to NNDWR (2005) records, wells screened within these three geologic units produce the majority of their water from the Morrison Formation (see Figure 1 and Table 3).

A geologic cross-section extending from south to north across the simulated well field area is provided as Figure 4. The location of that cross section is depicted on Figure 1. Lithologic data provided from NNDWR (2005) was used to compile the cross section (see Table 3). A contour map depicting the approximate depth to the top of the Morrison Formation and the approximate thickness of the Morrison Formation are provided as Figures 5 and 6, respectively. Depth to top of the Morrison Formation in the simulated well field area is between 1,000 and 1,500 feet below ground surface (bgs) (Figure 5), with an estimated thickness ranging from 900 to 1,000 feet (Figure 6). Depth to the Morrison Formation near the proposed Desert Rock Project generating facility deepens steeply from west to east as it crosses the western edge of the Hogback monocline (see Figure 5). The Westwater Canyon Member in the simulated well field area is estimated to be 200 to 300 feet thick (see Figure 4 and Table 3).

The Morrison Formation was selected as the target aquifer for this well impact analysis because: (1) it has a relatively higher water-bearing potential than the overlying formations in the study area, and; (2) withdral of groundwater from the Morrison Formation will result in the least amount of drawdown to existing wells in the study area. This is because the majority of those wells derive their production from confined geologic units above the Morrison Formation (i.e., the Gallup Sandstone and the Dakota Sandstone) (see Table 3).

Recharge to the Morrison Aquifer is derived from precipitation infiltration, streamflow infiltration along outcrop areas, and from downward leakage (Dam et al 1990). As will be discussed later, our modeling analysis takes into account downward leakage from the semiconfining geologic unit above the Morrison sediments, but it does not account for recharge from



precipitation or streamflow infiltration. Simulating these recharge components would require a much more rigorous and time consuming modeling effort.

4.3 EXISTING WELLS

Existing wells in the study area are presented in Figure 1 and listed in Tables 1 and 2. Wells shown include those registered with the New Mexico Office of the State Engineer (2005) (wells in red) and wells with records maintained by the Navajo Nation Department of Water Resources (NNDWR) (2005) (wells in blue). Also depicted on Figure 1 is the relative contribution of Morrison Aquifer-derived groundwater to wells completed in portions of the Morrison Formation (where data available). Well inventory tables showing construction and well use information are included as Tables 1 and 2^1 .

4.4 AQUIFER CHARACTERISTICS

The transmissivity (T) of an aquifer describes its ability to transmit groundwater to a pumping well. The T value is dependent upon the hydraulic conductivity (K) and the saturated thickness (b) of the aquifer, and is defined by the relationship T = Kb. Transmissivity is expressed in gallons per day per foot (gpd/ft), or square feet per day (ft²/d). Hydraulic conductivity is expressed in units of gallons per day per square foot (gpd/ft²), or feet per day (ft/d).

The most reliable estimates of aquifer transmissivity and hydraulic conductivity are derived from well aquifer test data. In the study area however, aquifer test data is limited. In addition, much of the aquifer test data comes from wells that are screened in multiple aquifers and not exclusively the Morrison Formation. Given available test data, the transmissivity of the Morrison Formation within the study area ranges from $2 \text{ ft}^2/\text{d}$ to $95 \text{ ft}^2/\text{d}$, and K values range from 0.025 to 0.39 ft/d (Stone et al. 1983; Riser et al. 1984; Dam et al 1990). A map showing the approximate distribution of transmissivity values for the Morrison Aquifer in the study area is presented in Figure 7.

To further evaluate T and K values, URS analyzed data from a step test and a 15-hour constant rate aquifer test conducted in September 2002 at the "Sanostee Wash Well." This well is screened in multiple aquifers, which produce water from the Morrison Formation, the Dakota Sandstone, and the Gallup Sandstone (NNDWR, 2005), with its primary water production coming from the Morrison Formation. This well is located just north of the Little River on the Sanostee Chapter, as shown on Figure 7. Our analysis of the recovery test data resulted in a T

¹ For ease of reference, the well identifiers on the well location map (Figure 1) match those on the well inventory tables.



value of 69 ft^2/d , and a K value of 0.345 ft/day (K=T/b) (see Figure 8) (Theis 1935). Although this well is not screened exclusively in the Morrison Formation, the calculated T and K values fall within the published values obtained from other well test data for wells constructed in the Morrison Aquifer, thus providing a useful comparison. For our modeling analysis, we assumed a more conservative value of 0.2 ft/d. This value was computed by taking the median published values from numerous aquifer tests for well completed in the Morrison Aquifer (Dam et al 1990).

As previously discussed, our modeling analysis accounts for downward leakage of the semiconfining geologic unit above the Morrison Formation. The variable required to compute downward leakage in our modeling analysis is the hydraulic conductivity (K) of the confining unit above the Morrison Formation. In the study area this is the Mancos Shale (see Figure 4). Since there are no available measured K values for the Mancos Shale, published values were relied upon. Estimates of hydraulic conductivity (K) for shale range from 2.6e-³ to 1.16e-¹⁰ centimeters per second (cm/sec), or 7.37 to 3.9e-⁷ ft/d (Spitz and Moreno 1996). A conservative value of 2e-⁵ cm/sec, or 0.0567 ft/day, was used in our modeling analysis.

As shown in Figure 6, the aquifer thickness (b) of the Morrison Formation in the study area ranges from 750 feet to just over 1,000 feet thick, and from 900 to 1,000 feet in the simulated well field area used in our modeling analysis (Stone et al. 1983; Dam et al 1990; NNDWR 2005).

4.5 WATER QUALITY

Although not a component that affects our modeling analysis, quality of groundwater produced from the Morrison Formation is of concern in regards to the intake assumptions made for design of the Desert Rock Energy Project. Due to very limited water quality data for waters produced from the Morison Formation in the study area, URS and Sithe personnel collected water quality samples from three wells screened within in the Morrison Formation on May 11, 2005. Those sampled included wells 12K-320, 12T-633, and 12T-655. Two of the three wells sampled (12T-633 and 12T-655) are domestic drinking water wells owned and operated by Navajo Tribe Utilities Authority (NTUA) and are located on the Sanostee Navajo Chapter. The third well sampled (12K-320) is a stock irrigation well owned and maintained by NTUA, located approximately 10 miles north of the Sanostee Navajo Chapter (NNDWR 2005) (see Figure 1). The analytical results from that sampling effort are summarized in Table 4. Copies of all laboratory analytical data are provided in Appendix A. Generally speaking the water sampled is of good quality. No analytes tested for were detected above Federal Primary or Secondary Drinking Water standards.



5.0 IMPACT ANALYSIS

5.1 MODEL ASSUMPTIONS

The groundwater model code selected for this study was the USGS's MODFLOW-96 (Harbaugh and McDonald 1996) with the advanced graphical interface Groundwater Vistas® (Rumbaugh and Rumbaugh 1996). The MODFLOW-96 code is widely accepted in the hydrogeologic professional community as a valid numerical model to simulate groundwater flow in three dimensions. Initially, a more simplified two-dimensional model code called THWELLS© (Van der Heijde 1992) was evaluated for this study, but due to the program's code limitations for the modeled aquifer system the results obtained from that analysis were considered less hydrologically sensible as those predicted using MODFLOW-96.

5.2 MODEL INPUT

The input parameters used in our MODFLOW-96 simulation include the following:

- A total model domain area of 144 square miles, with a total of 280 columns, 279 rows, and 78,120 model calculation cells. The model domain area was intentionally set very large to reduce the impact of the modeled boundaries on the area of interest (the well field).
- Grid spacing ranged from 100 ft^2 in the simulated well field area to 500 ft^2 elsewhere.
- Two flat model layers.
 - Layer 1 (the upper model layer) represents the Mancos Shale and represents the upper semi-confining geologic unit located stratigraphically above the Morrison Formation (see Figure 4). An average thickness of 650 feet was used for model layer 1 (see Figure 4).
 - Layer 2 (the lower model layer) represents the Morrison Formation, which is the target aquifer for this study. The Morrison Formation is located stratigraphically beneath the Mancos Shale (see Figure 4). A uniform thickness of 1,000 feet was used (see Figures 4 and 6).
- A hydraulic conductivity (K) of 0.0567 ft/day for model layer 1 (see Section 4.4). The horizontal to vertical conductivity ratio (K_h/K_v) was set conservatively at 10:1 based upon published values for shale (Spitz and Moreno 1996).

- A hydraulic conductivity (K) of 0.2 ft/day for model layer 2 (see Section 4.4). The horizontal to vertical conductivity ratio (K_h/K_v) was set conservatively at 10:1 based upon published values for sandstone (Spitz and Moreno 1996).
- A storage coefficient for both layer 1 and 2 of 0.00011(unitless). This value resents the median published values from nine wells tested in the Morrison Aquifer (Dam et al. 1990).
- A specific yield for layer 1 of 0.03 (unitless) (Spitz and Moreno 1996).
- A specific yield for layer 2 of 0.2 (unitless) (Spitz and Moreno 1996).
- A well field consisting of ten (10) equally spaced pumping wells located west of Highway 491 and south of Table Mesa, as shown on Figures 9 and 10. Wells were placed equally apart at ¹/₄ mile spacing.
- The simulated wells are screened entirely and exclusively in model layer 2.
- Each simulated well pumps at a continuous rate of 442,080 gallons per day (gpd), or 307 gpm, for a period of 14,600 consecutive days, or 40 years. This equals the total annualized project demand of 4,950 af/yr (Sithe 2005), or 3,070 gpm.
- A uniform model layer 1 thickness of 650 feet (see Figure 4).
- A uniform model layer 2 thickness of 1,000 feet (see Figure 6).
- A specified head boundary was set along the northern and southern model boundaries according to a calculated hydraulic gradient of 0.0038 ft/ft. This value was derived using the potentiometric surface contour map compiled for the Morrison Aquifer (Figure 3)².
- No flow boundaries were set along the western and eastern model boundaries to simulate groundwater flow from south to north.

5.3 MODEL PREDICTIONS

Drawdown predictions following 20 years and 40 years of continuous pumping are graphically presented in Figures 9 and 10, respectively. Based upon the input assumptions presented in

² Regional groundwater declines in the Morrison aquifer were not factored into the specified head boundaries due to insufficient water level data in the study area.



Section 5.2, the maximum cumulative 20-year and 40-year impact resulting from the annual projected withdrawal of 4,950 af/yr, or 3,070 gpm, is predicted to be approximately 800 feet and 1,000 feet, respectively. The maximum drawdown predicted occurs at the center of the simulated pumping wells and decreases with distance from the well centers. *Note: Assuming the potentiometric surface of waters in the Morrison formation is roughly equivalent to the land surface elevation (see Figure 3), the model predicted drawdown presented in Figures 9 and 10 represents the decline in the potentiometric surface relative from land surface.*

The wells with predicted drawdown impacts equal to or greater than 50 feet after 20 years of continuous pumping include wells 12T-646 and 12K-320 (see Figure 9). The predicted potentiometric surface decline at these two wells is approximately 50 feet and 350 feet, respectively. The wells with predicted drawdown impacts equal to or greater than 50 feet after 40 years of continuous pumping include wells 12T-654, 12T-646, and 12K-320 (see Figure 10). The predicted potentiometric surface decline at these three wells is approximately 75, 90, and 450 feet. According to NNDWR (2005) records, well 12K-320 derives it production from the Dakota Sandstone and the Morrison Formation, with its primary production coming from the later (see Figure 1 and Table 3). Therefore, the predicted impact from our modeling analysis over simulates impact on the potentiometric surface at this well. Records on water production volumes relative to geologic formations were not available for wells 12T-654 and 12T-654. Assuming all water production from these two wells is derived from the Morrison Formation, the model predicted drawdown represents a worst-case scenario in terms of potentiometric surface impacts, based on the limited data available for this analysis.



6.0 CONCLUSIONS

Given the assumptions presented herein, our modeling analysis indicates that sufficient local groundwater resources are available from the Morrison Aquifer (at the modeled location) to meet the projected withdrawal demands of 4,950 af/yr, or 3,069 gpm, for the proposed Desert Rock Energy Project for the next 40 years. Our MODFLOW-96 analysis predicts that three existing wells could experience more than 50 feet of potentiometric surface declines after 40 years of pumping from the simulated well field. The wells with over 50 feet of predicted potentiometric surface declines include wells 12T-654, 12T-646, and 12K-320. The well with most predicted impact is stock irrigation well 12K-320, which is an artesian flowing well used to water livestock in the area (NNDWR 2005). Because well 12K-320 reportedly derives most of its water from the Morrison Formation (see Figure 1 and Table 3), it is possible that the anticipated withdrawals for the other two wells is uncertain because it is not know which aquifer(s) these wells derive their water from (see Figure 1 and Table 3).

It should be noted that very conservative aquifer parameters were used in our modeling analysis, thus representing what we believe should represent a worst-case scenario. In addition, very limited aquifer test data were available from wells screened exclusively and entirely in the Morrison Aquifer for the study area and in particular the area of the simulated well field. Also, the modeling analysis does not account for recharge from precipitation infiltration or streamflow infiltration along outcrop areas, therefore the modeled potentiometric surface declines may be over-predicted.

7.0 RECOMMENDATIONS

Based upon the results of this well impact study, URS makes the following recommendations:

- 1. Due to the limited aquifer test data from wells screened solely in the Morrison Aquifer in the vicinity of the simulated well field area, Sithe should consider drilling and constructing one large diameter production well and at a minimum, one adjacent smaller diameter monitor well. Testing would include evaluating local lithology (drill cuttings and geophysical logging) to identify the most productive zones (i.e., secondary flow from fracture zones), long-term aquifer production potentials (from aquifer testing data), and zonal water quality of varying formations (from zonal sampling).
- 2. The test data obtained from the drilling and testing of the new production well and monitor well should be used to refine the modeling analysis. In addition to modifying aquifer parameters, wells may be added, removed, repositioned, or modified (i.e., pump rates, screen interval, etc.) in the model. Predictions from the revised model would be more indicative of potentiometric surface drawdown of the Morrison Aquifer than the currently modeling analysis suggests.



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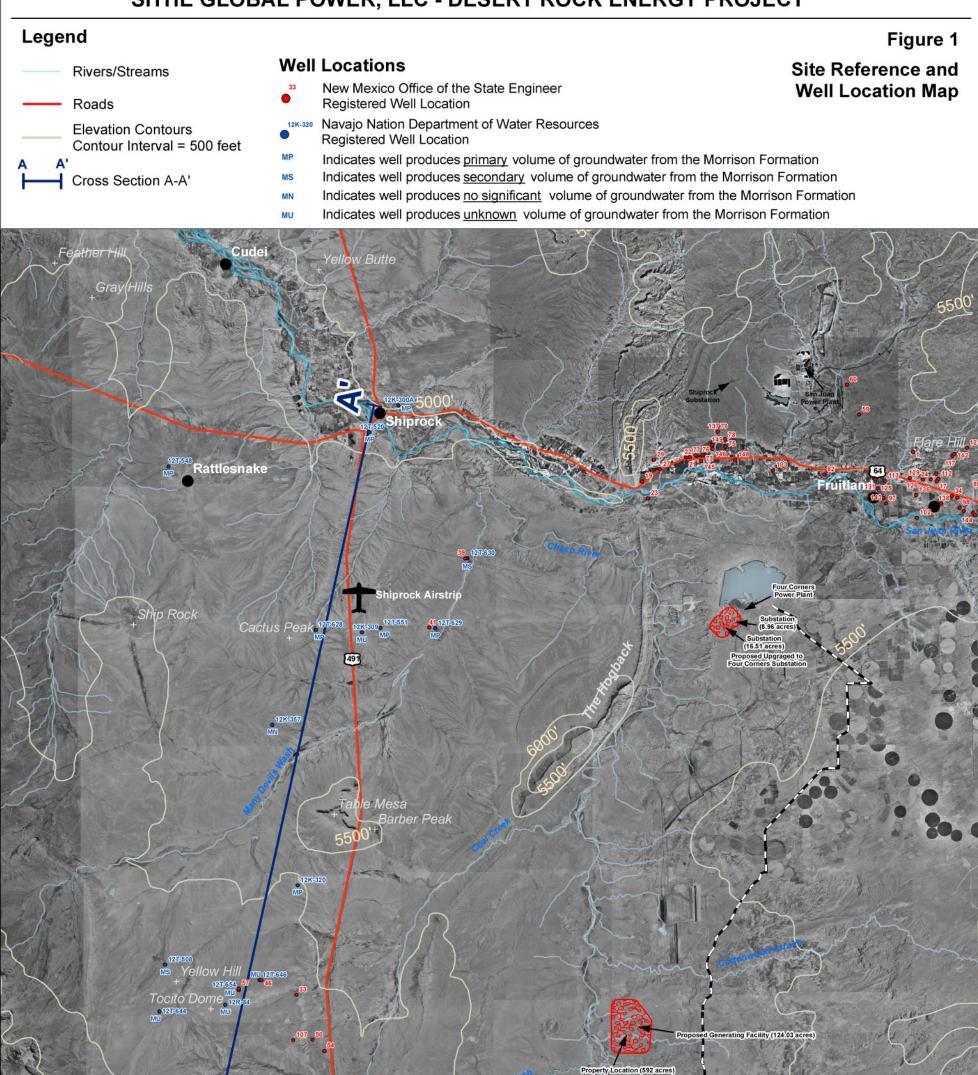


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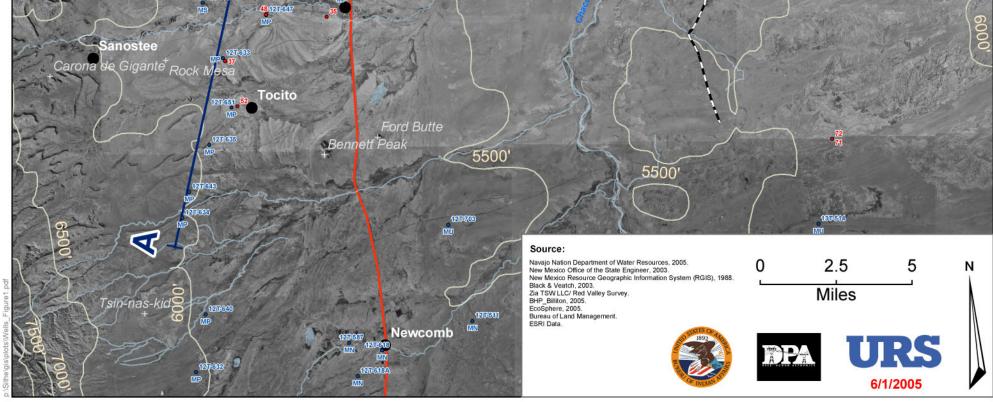


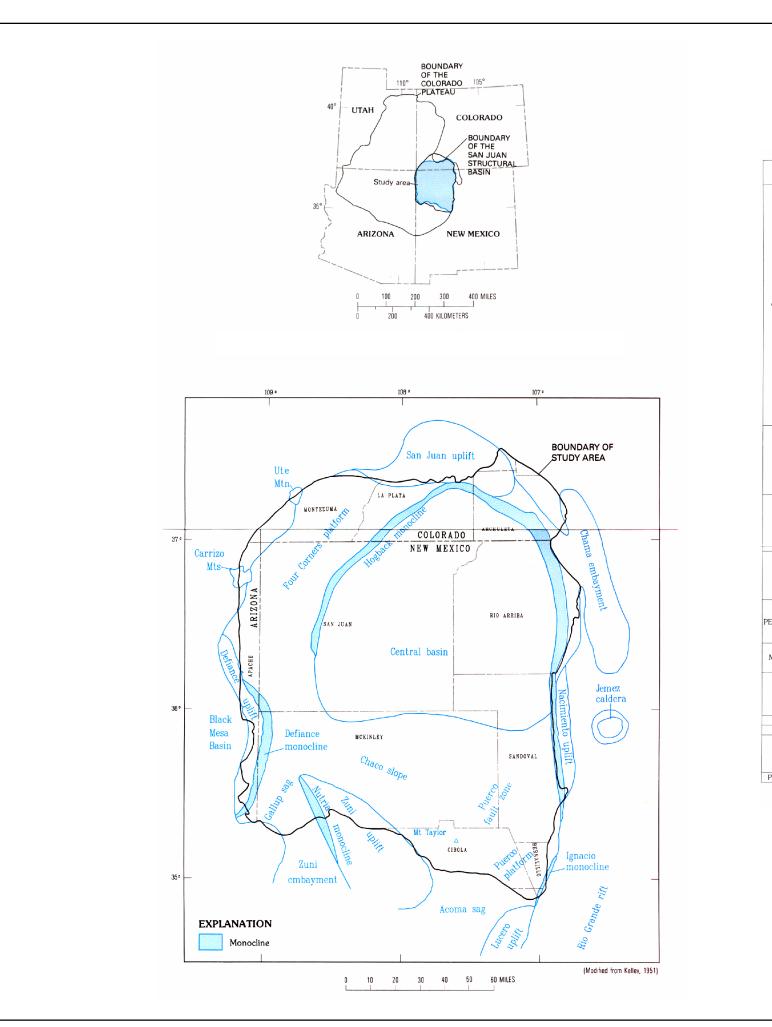
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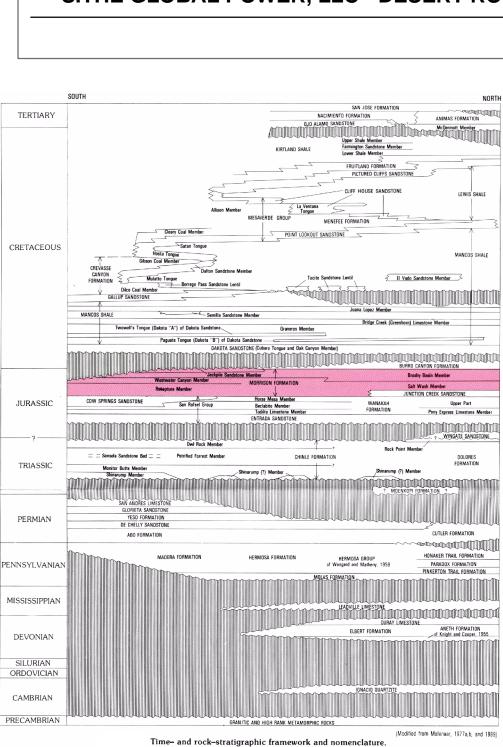




12TE-519 12TE-520 Little Water







Source:

USGS, 1990.

Dam et. al.



SITHE GLOBAL POWER, LLC - DESERT ROCK ENERGY PROJECT

Regional Stratigraphy and Major Structural Features of the San Juan Basin





Figure 2

URS

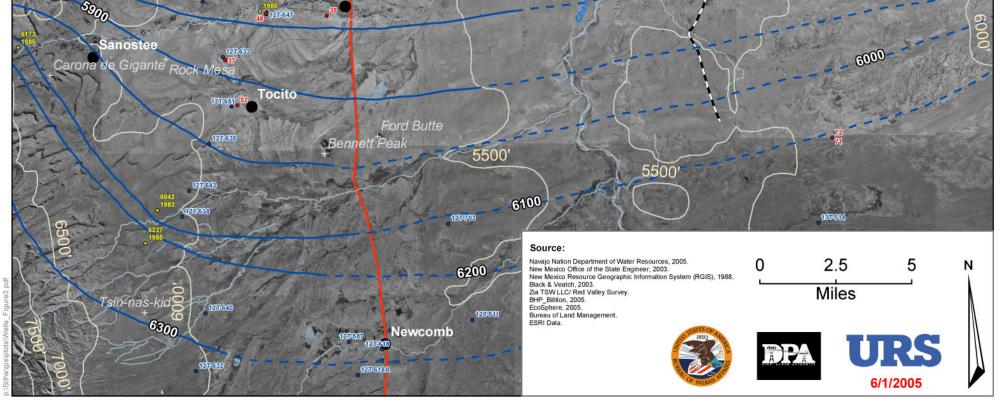
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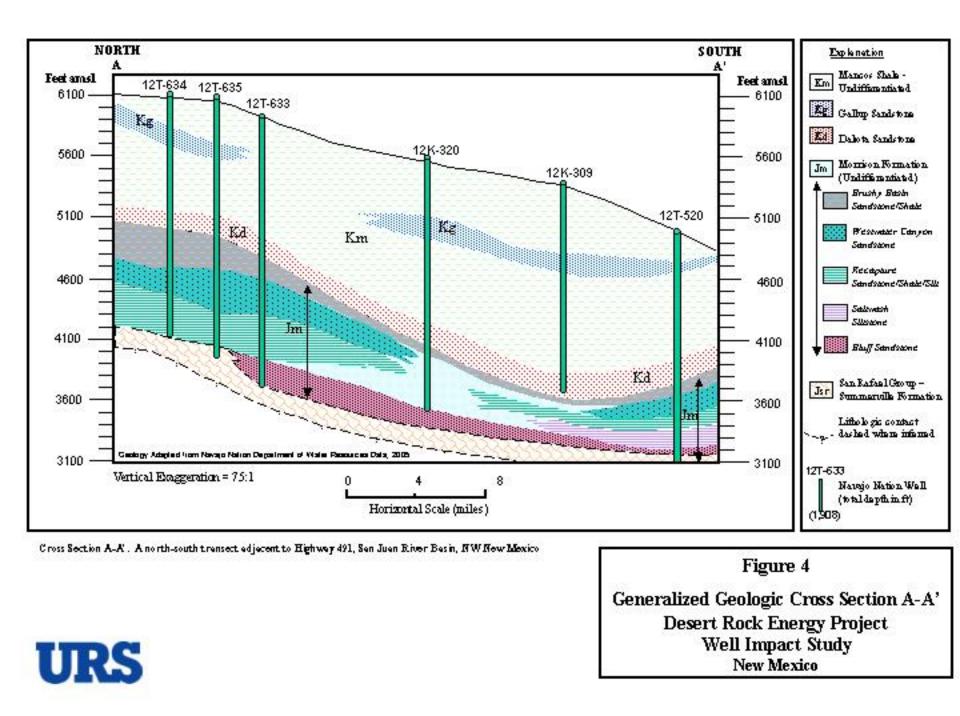
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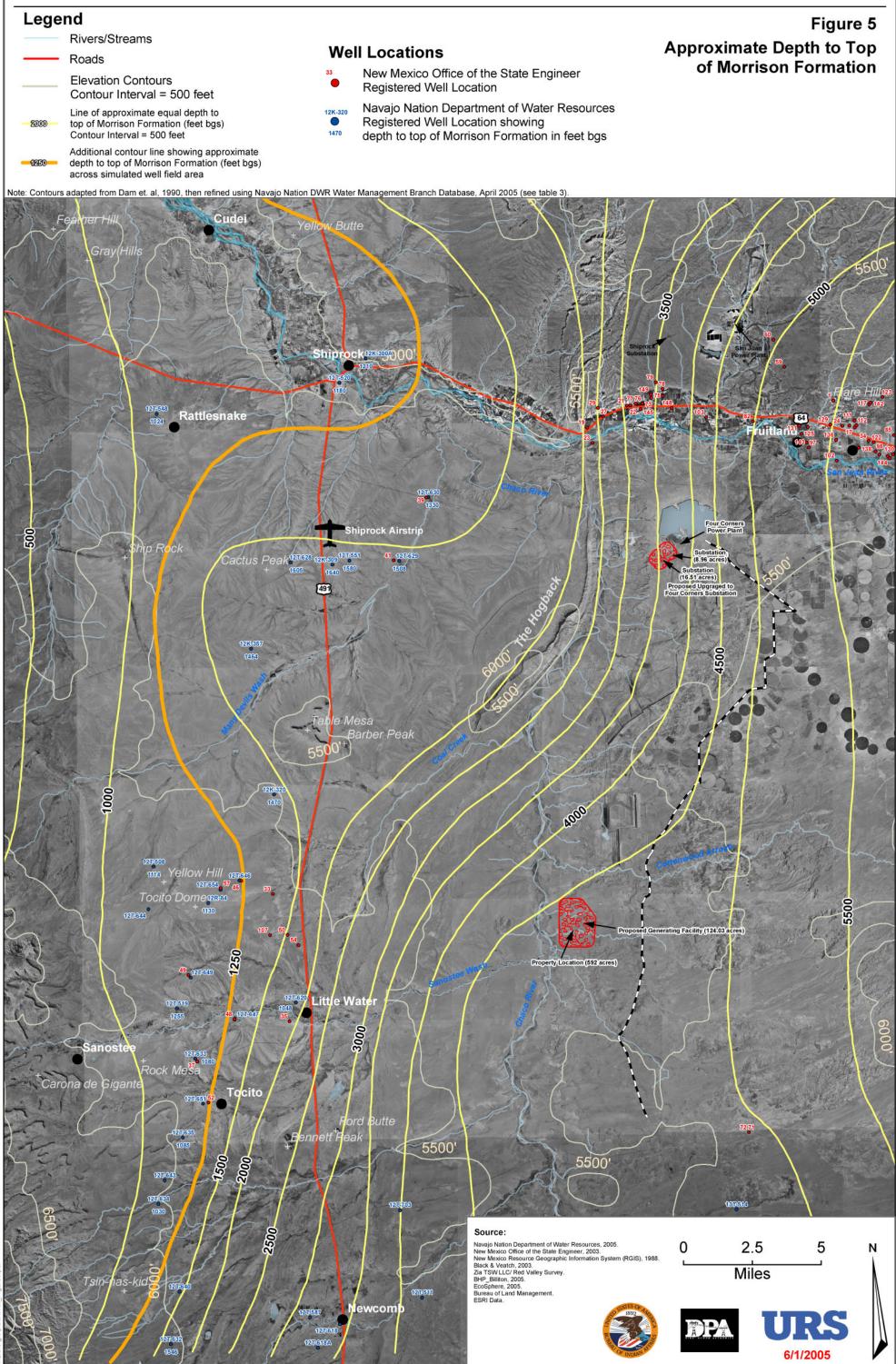
SITHE GLOBAL POWER, LLC - DESERT ROCK ENERGY PROJECT Legend Figure 3 Approximate Attitude of Well Locations **Rivers/Streams Potentiometric Surface of Waters** New Mexico Office of the State Engineer 33 Roads Registered Well Location in the Morrison Formation Navajo Nation Department of Water Resources Registered Well Location **Elevation Contours** Contour Interval = 500 feet (1985) (1985) Line of equal altitude of Potentiometric Elevation of Potentiometric surface (feet amsl) surface in the Morrison Formation (year data collected) in feet amsl (dashed where infered) Note: Potentiometric surface elevations obtained from Dam et. al, 1990. Cude ther Hil Butte Gray(Hills 5200 5200 Rattlesnake 5300 5400 5500 hiprock Airstrip hip Rock Peak, 12T-62 5600 arber Peak 5700 K-320 5800 Tocito Dom g Facility (124.03 a Property Location (592 acres)

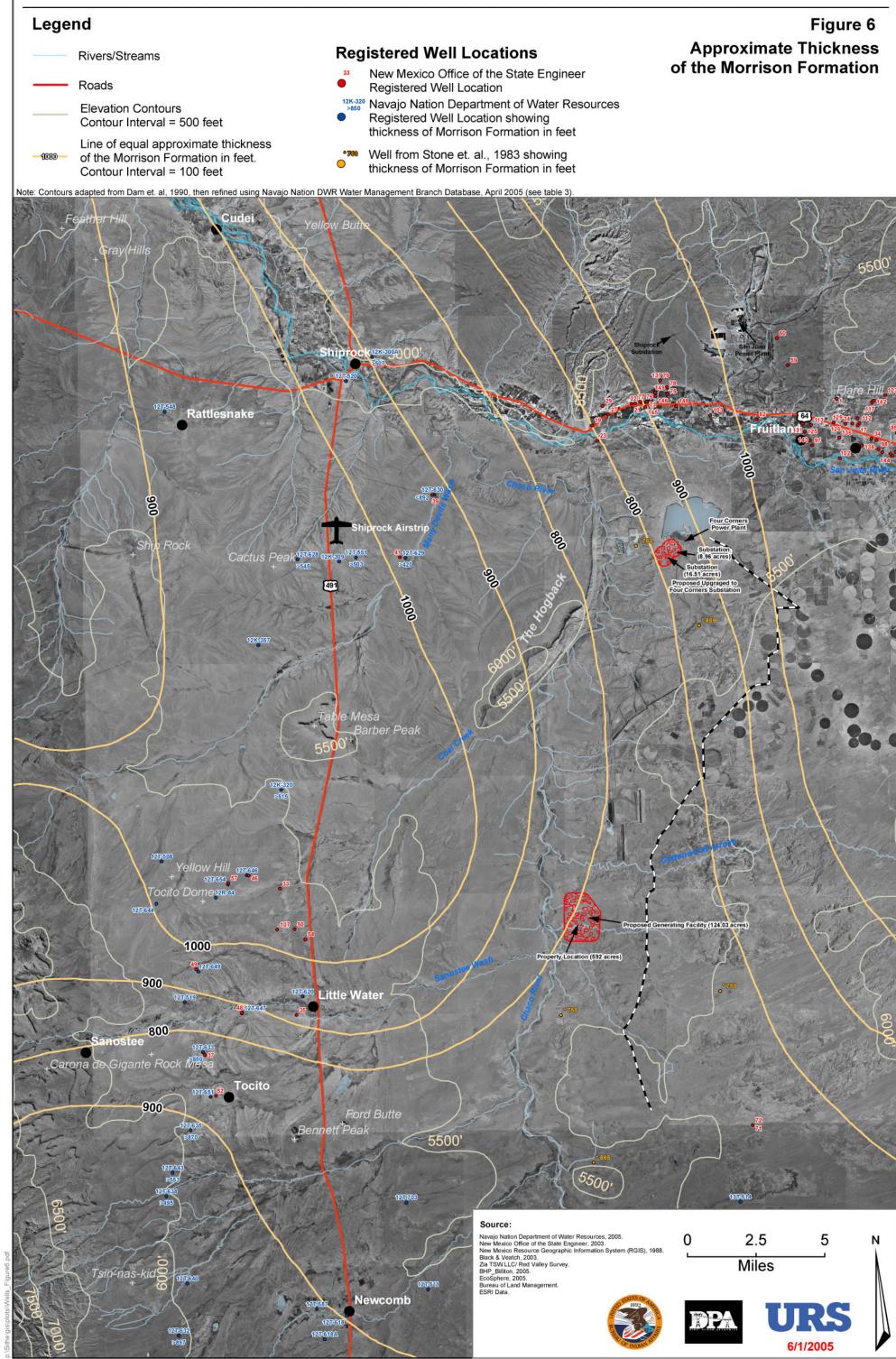
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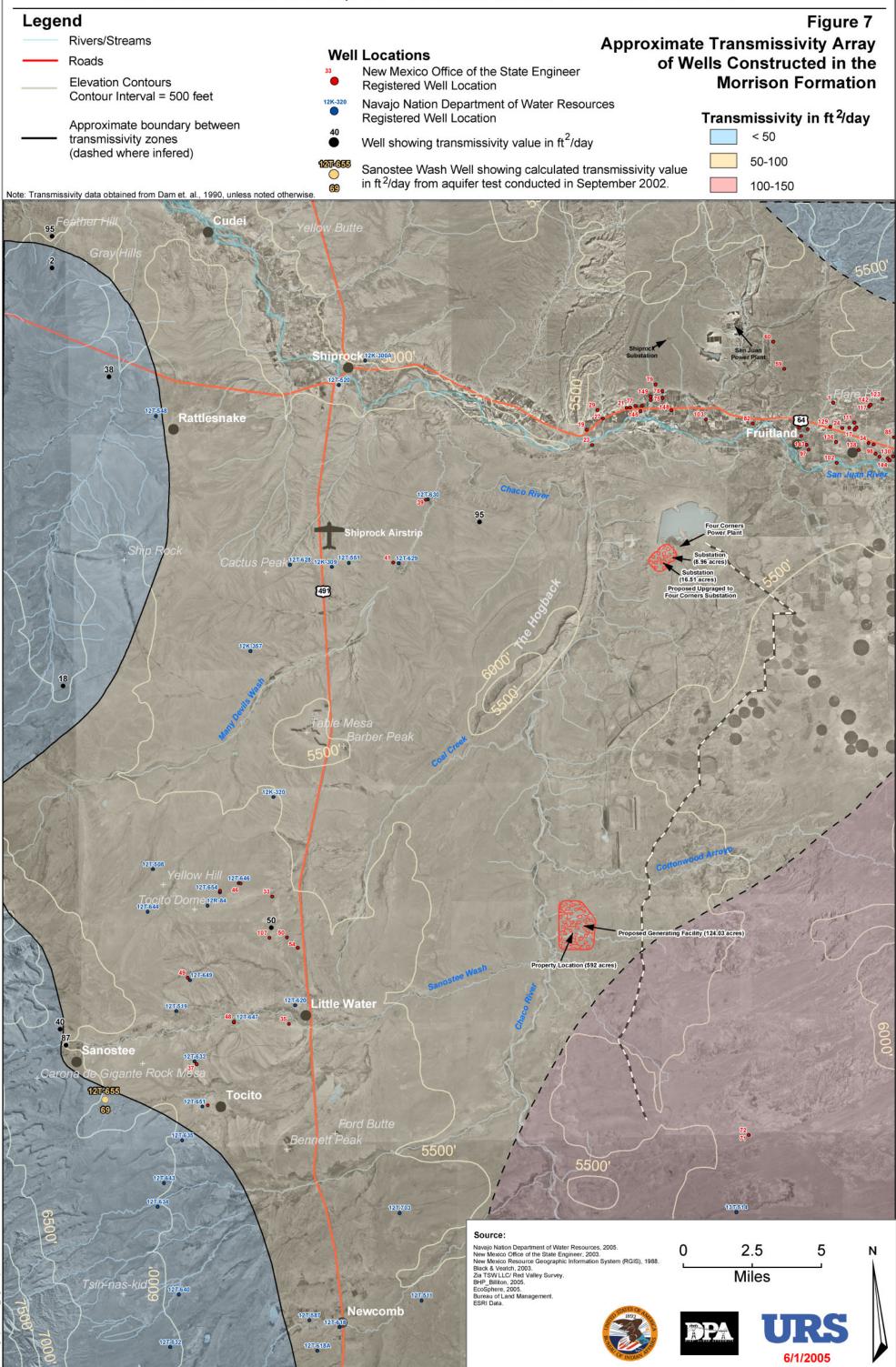
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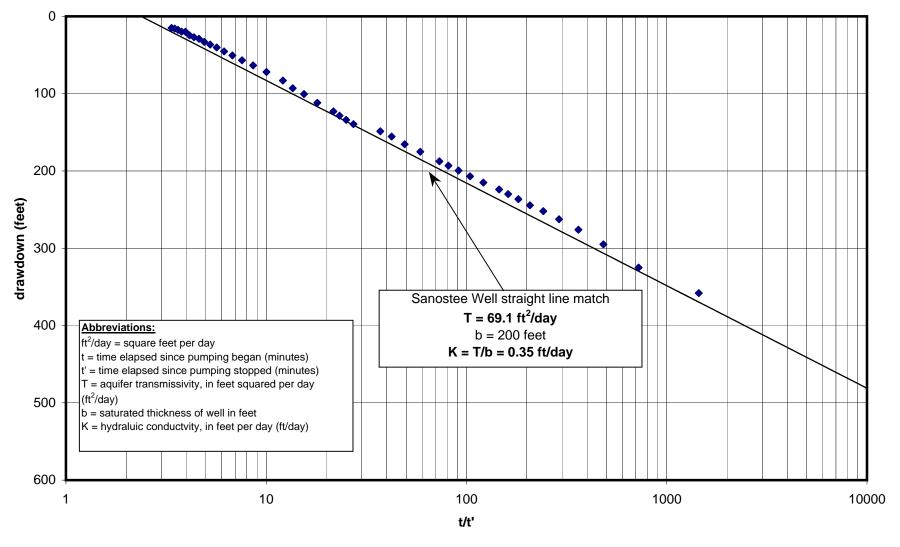
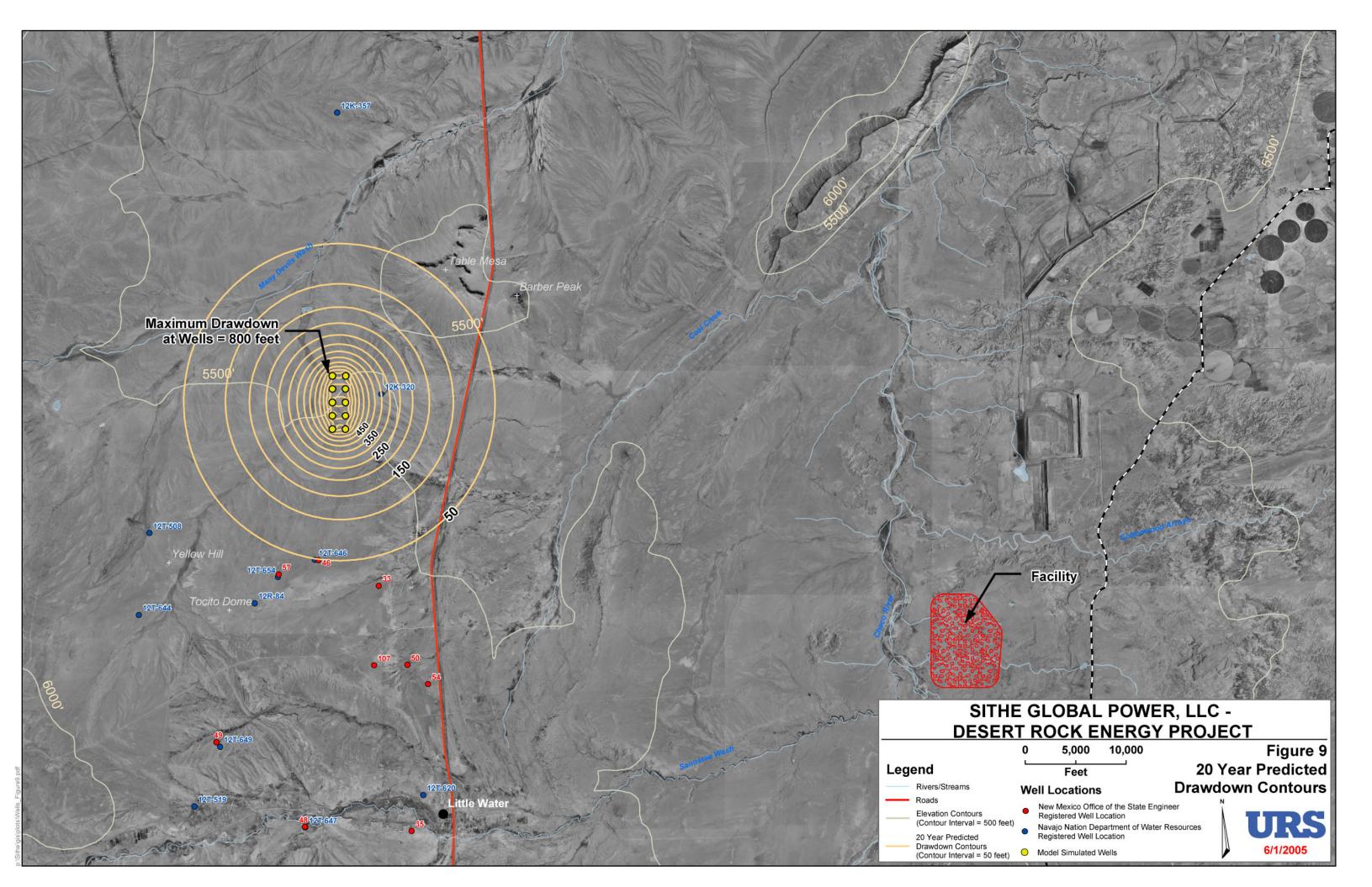
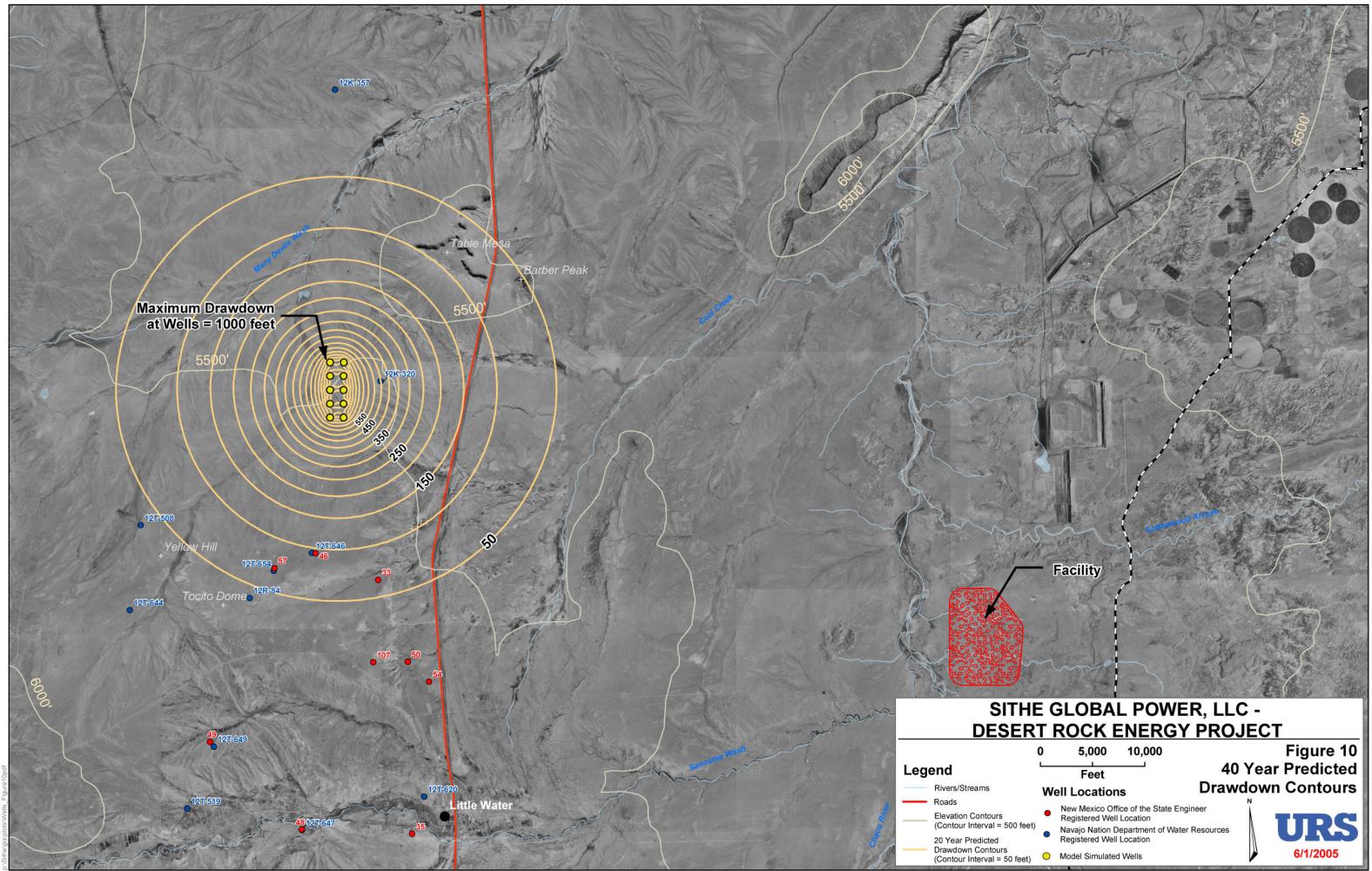


Figure 8 Theis (1935) Residual Drawdown Solution for 15-Hour Recovery Test Data Sanostee Wash Well September 17-18, 2002 Desert Rock Energy Project New Mexico





TABLES



Table 1Well Inventory - Navajo Nation Department of Water ResourcesDesert Rock Energy ProjectNew Mexico

		00504700			TOTAL WELL DEPTH TO DEPTH WATER	DIAMETER 1	DEPTH	CASING DIAMETER 2	DEPTH	CASING DIAMETER 3	DEPTH	CASING DIAMETER 4		DEPTH INTERVAL (1	it well of only	DEPTH INTERVAL		DEPTH INTERVAL (ft		DEPTH INTERVAL		DEPTH INTERVAL	
MAP WELL NO.		OPERATOR		FINISH DATE	(feet) (feet bgs)		(ft bgs)	(inches)	(ft bgs)	(inches)	(ft bgs)	(inches)	(ft bgs)	bgs)	WELL CASING	(0)	WELL CASING		WELL CASING	(ft bgs)	WELL CASING	(ft bgs)	WELL CASING
12K-300A	12K-300A	UNKNOWN	UNK	Sep-28	2170 N/A	12.50			0-503		0-1270		3 0-1693	1492-1529	Screen	1574-1668	Screen	1693-1717	Blank				
	12K-309	UNKNOWN	UNK	Sep-40	1640 N/A		0-40		40-829		829-1456		1456-1570	1570-1640	Blank		-						
	12K-320		DOM	Aug-60	1992 ART		0-826		826-1340	6.62	1332-1400	6.62	2 1349-1800	1745-1992	Screen								
		TRIBE O&M	LIV	Jul-57	1464 ART		0-909		0-60.5					909-1464	Blank								
	12R-84		DOM	N/A	1430 75		N/A		0-1136					1136-1430	Blank								
	12T-508		DOM	Jul-59	1172 ART		0-950	10.00	0-212					950-1172	Blank								
		UNKNOWN	LIV	Oct-59	4274 ART		0-2000							773-779	Screen	903-909	Screen	1680-1686	Screen	1699-1711	Screen	1781-1799	Screen
	12T-519	TRIBE O&M	LIV	Oct-60	1287 N/A		0-271		270-1035					1035-1287	Blank		-						
	12T-520		DOM	Feb-61	1850 ART	16.00			0-530	9.62	0-1339	7.00	844-1482	1482-1777	Blank								
	12T-548	TRIBE O&M		Mar-27	2013 ART		0-1062	5.19	1062-1733					1733-2013	Blank								
	12T-551	TRIBE O&M		Jul-63	7833 ART		0-1637							1637-1950	Blank	0.40.050		000.040		4000 4000			
		NTUA	DOM	Feb-67	1140 N/A		0-1140							782-821	Screen	840-850	Screen	900-940	Screen	1080-1090	Screen	1114-1128	Screen
		NTUA TRIBE O&M	DOM	May-05	1440 N/A	16.00	N/A	40.00	0.740	0.00	700 4 4 4 7			700 740	0	000.040	0	4040 4000	0	1100 1010	0	4050 4000	
		TRIBE O&M		Jan-81	1447 ART			12.02	0-742	0.02	790-1447			720-740 1200-2034	Screen	800-940	Screen	1040-1060	Screen	1180-1210	Screen	1250-1320	Screen
	12T-620			Sep-77	2034 ART 2597 ART		0-1200	0.00	400 4007						Blank								
	12T-628	TRIBE O&M TRIBE O&M		Dec-78			0-109 0-1764	2.38	109-1827					1827-2597 1764-2511	Blank		1						
		TRIBE O&M		Nov-77	2520 ART										Blank								
	12T-630	TRIBE O&M		Nov-77	2300 ART 2518 ART		0-1512 0-200	2.00	0.1750					1512-2300 1743-2518	Blank								
	12T-632 12T-633		LIV MUN	Oct-77 Oct-77	2125 ART		0-200		0-1750 0-17					1512-2125	Blank Blank								
	12T-633		DOM	Nov-77	1908 ART		0-1312		0-17					1407-1908	Blank								
	12T-635	TRIBE O&M		Oct-77	2108 N/A		0-200		35-1176					1176-2108	Blank								
	12T-640	TRIBE O&M		Dec-77	2349 N/A		0-33		0-120					1491-2349	Blank								
	12T-643		DOM	Jul-78	1632 N/A		0-1323		2-101					1323-1632	Blank								
	12T-644	TRIBE O&M	LIV	Jul-78	1912 0		0-1386	5.00	2.01					1386-1912	Blank								
	12T-646	TRIBE O&M	UNK	Jul-78	1748 N/A		0-1281	6.62	0-79					1281-1748	Blank		1						
	12T-647	TRIBE O&M		Aug-78	1912 46		0-1407		0-85					1407-1912	Blank								
	12T-649	TRIBE O&M		Aug-78	2047 N/A		0-1595		0-96					1575-2047	Blank								
	12T-651		LIV	Aug-78	1691 N/A		0-96		96-1281					1281-1691	Blank								
		TRIBE O&M		Sep-78	1656 0		0-1302	6.63						1302-1656	Blank								
		TRIBE O&M		N/A	1940 N/A	1	0-1940							180-460	Screen	830-940	Screen	1140-1400	Screen	1520-1940	Screen		
			LIV	Sep-52	1165 429		0-885							885-1120	Blank								
		TRIBE O&M		Aug-73	5250 N/A		0-100	5.50	0-5000					5000-5250	Blank								
		TRIBE O&M		Oct-68	1368 263		0-1337	10.75						450-460	Screen	484-498	Screen	660-666	Screen	1040-1042	Screen	1337-1368	Blank
BRNHM WSW1			LIV	Aug-73	5250 702		0-100		0-5000					5000-5250	Blank								

Data Source: Navajo Nation Department of Water Resource, Water Management Branch Well Database-April 2005

Abbreviations:	Use Codes:	
ART = Artesian (flow encountered above ground surface)	DOM	Domestic
ft bgs = feet below ground surface	LIV	Livestock
N/A = Not Available	MUN	Municipal

Table 2 Well Inventory - New Mexico Office of the State Engineer Desert Rock Energy Project New Mexico

MAP WELL NO.	WELL ID	OPERATOR	USE	тws	RNG	SEC	Q	Q2	Q3	FINISH DATE	TOTAL WELL DEPTH (ft bgs)	DEPTH TO WATER (ft bgs)
1	SJ 00027	N/A	NOT	29N	15W	1	1	2	3	10/17/1950	1005	ART
17	SJ 00226	N/A	DOM	29N	14W	7	1		3	5/20/1977	100	50
19	SJ 00248	N/A	DOM	29N	16W	4	3		3	4/23/1977	35	10
21	SJ 00257	N/A	DOM	29N	16W	3	2	2	3	4/25/1978	32	20
22	SJ 00258	N/A	SAN	29N	16W	3	2		4	4/26/1978	34	20
23	SJ 00264	N/A	STK	29N	16W	9	0	0		5/2/1977	35	10
24	SJ 00291	N/A	DOM	29N	15W	12	2	1		8/11/1977	0	110
27	SJ 00357	N/A	DOM	29N	16W	4	4		2	6/22/1977	45	29
29	SJ 00373	N/A	DOM	29N	16W	4	2	0		6/25/1977	55	30
30	SJ 00376	N/A	DOM	29N	14W	8	4	-	4	8/19/1977	80	50
31	SJ 00417	N/A	DOM	29N	14W	17	2	3		8/4/1977	38	7
32	SJ 00418	N/A	DOM	29N	14W	17	2	3		8/11/1977	35	7
33	SJ 00437	N/A	DOM	26N	18W	10	2	1		8/18/1977	2063	ART
34	SJ 00451	N/A	DOM	29N	14W	7	4		3	9/7/1977	39	24
35	SJ 00451 SJ 00465	N/A	DOM	26N	14W	35	4		3	9/8/1977	2034	ART
35	SJ 00465 SJ 00477	N/A N/A	STK	25N	18W	35 7	2		3 2	9/8/1977	2034 2125	ART
37	SJ 00477 SJ 00521	N/A N/A	STK	25N 29N	1800 17W	21	2 1		2	9/16/1977	2125	ART
39 41	SJ 00521 SJ 00522	N/A N/A	STK	29N 29N	17W	21	3		2	11/2/1977	2300	ART
41	SJ 00522 SJ 00754	N/A N/A	STK	29N 26N	17 W	23				7/26/1978	2520 1748	ART
-				-	-	-	3		2		-	
48	SJ 00778	N/A	STK	26N	18W	33	3	1		8/3/1978	1912	ART
49	SJ 00780	N/A	STK	26N	18W	19	3		4	8/3/1978	2047	ART
50	SJ 00781	N/A	STK	26N	18W	14	3	1		8/7/1978	1728	ART
52	SJ 00782	N/A	STK	25N	18W	17	3	1		8/8/1978	1691	ART
54	SJ 00783	N/A	STK	26N	18W	14	3		4	8/5/1978	2211	ART
56	SJ 00788	N/A	DOM	29N	14W	8	4	4		5/2/1979	100	70
57	SJ 00793	N/A	STK	26N	18W	5	4		2	9/4/1978	1656	ART
59	SJ 00815	N/A	MON	30N	15W	27	4		3	10/17/1978	231	ART
60	SJ 00815	N/A	MON	30N	15W	22	3	3	4	10/14/1978	240	ART
71	SJ 00846		MON	25N	15W	28	2	1		4/11/1979	593	50
72	SJ 00846	N/A	MON	25N	15W	28	2	1		4/26/1979	593	50
73	SJ 00861	N/A	DOM	29N	16W	2	1	2		3/31/1947	21	10
74	SJ 00862	N/A	DOM	29N	16W	2	1	1		2/28/1970	257	25
75	SJ 00863	N/A	DOM	30N	16W	36	3	3		5/31/1945	45	35
76	SJ 00864	N/A	DOM	29N	16W	2	1	2		3/31/1974	21	10
77	SJ 00865	N/A	DOM	29N	16W	2	1	1		8/31/1960	45	30
78	SJ 00866	N/A	IRR	30N	16W	36	3	1		3/31/1974	90	60
79	SJ 00876	N/A	DOM	30N	16W	35	2	4		6/30/1979	77	57
82	SJ 00931	N/A	DOM	29N	15W	4	3	4		4/25/1979	44	22
84	SJ 00944	N/A	DOM	30N	14W	3	1	3		6/6/1979	61	5
85	SJ 00947	N/A	DOM	29N	14W	8	0	0		5/18/1979	370	275
97	SJ 01016	N/A	DOM	29N	15W	11	3	4		7/22/1979	25	4
98	SJ 01034	N/A	DOM	29N	14W	18	2	2	1	11/12/1979	28	16
100	SJ 01136	N/A	DOM	29N	15W	12	2	2		3/26/1980	150	40
102	SJ 01223	N/A	DOM	29N	15W	13	2	4		7/21/1980	30	12
103	SJ 01237	N/A	DOM	29N	15W	6	4	1	4	8/7/1980	30	14
106	SJ 01259	N/A	DOM	29N	14W	17	1	0		9/9/1980	31	3
107	SJ 01266	N/A	STK	26N	18W	15	3	2	2	8/25/1980	N/A	N/A
111	SJ 01407	N/A	DOM	29N	14W	6	3		3	7/5/1981	70	52
112	SJ 01568	N/A	DOM	29N	14W	7	1	1		5/24/1982	72	30
113	SJ 01569	N/A	SAN	29N	15W	11	1	2		5/27/1982	60	45
117	SJ 01883	N/A	DOM	29N	14W	6	2	3		9/5/1984	75	30
119	SJ 02010	N/A	DOM	29N	15W	11	1	3		11/9/1985	25	9
119	SJ 02010	N/A	DOM	29N	14W	7	4	0		4/22/1986	62	9 15
122	SJ 02055	N/A N/A	DOM	29N 29N	14VV 14W	5	4	1		4/22/1980 5/12/1987	150	90
125	SJ 02055 SJ 02063	N/A N/A	DOM	29N 29N	14VV 15W	5 11	1	3		6/17/1986	26	90 ART
126	SJ 02071	N/A	DOM	29N	15W	12	1		2	10/30/1986	51	32
129	SJ 02081	N/A	DOM	29N	15W	12	1	1	2	11/11/1986	42	30

Table 2 Well Inventory - New Mexico Office of the State Engineer Desert Rock Energy Project New Mexico

MAP WELL NO.	WELL ID	OPERATOR	USE	тws	RNG	SEC	Q	Q2	Q3	FINISH DATE	TOTAL WELL DEPTH (ft bgs)	DEPTH TO WATER (ft bgs)
130	SJ 02143	N/A	DOM	29N	14W	17	1	2	4	1/29/1988	36	26
131	SJ 02165	N/A	DOM	29N	15W	11	1	1	1	3/5/1988	40	25
136	SJ 02375	N/A	DOM	29N	15W	12	3	2		1/18/1993	38	8
137	SJ 02392	N/A	PUB	30N	16W	35	2	4		8/10/1992	133	ART
138	SJ 02639	N/A	DOM	29N	14W	7	3	3	4	6/14/1995	18	6
141	SJ 02790	N/A	DOM	29N	14W	18	2	2	4	N/A	40	ART
142	SJ 02927	N/A	DOM	29N	14W	6	2	3	2	5/3/1999	150	ART
143	SJ 02976	N/A	DOM	29N	15W	11	3	2	3	1/24/2000	29	8
144	SJ 02999	N/A	DOM	29N	14W	17	1	4	1	8/22/2000	42	28
145	SJ 03012	N/A	DOM	29N	16W	2	1	4	1	6/22/2000	27	12
146	SJ 03015	N/A	DOM	30N	16W	35	4	3	4	6/22/2000	43	17
147	SJ 03074	N/A	DOM	29N	14W	9	1	3	1	N/A	70	ART
148	SJ 03139	N/A	DOM	29N	16W	1	1	4	2	N/A	45	ART
149	SJ 03232	N/A	DOM	30N	16W	35	4	3	2	N/A	40	ART

Data Source: New Mexico Office of the State Engineer, Water Administration and Technical Engineering Resource

System (W.A.T.E.R.S.) GIS Database, updated 3/17/03

Note: Duplicate wells, and wells with no completion date or a completion depth are excluded from this table and the well location map.

Footnotes:

ART = Artesian (flow encountered above ground surface)

ft bgs = feet below ground surface

N/A = Not Available

Use Codes:

- DOM Domestic one household
- IRR Irrigation
- MON Monitoring well
- NOT No use of right or pod
- PUB Construction of public works
- SAN Sanitary in conjuction with a commercial use
- STK Livestock watering

Table 3 Well Geologic Units Summary Desert Rock Energy Project New Mexico

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
12K-300A	DAKOTA	SANDSTONE	1080	1210	130	S		
1211-3007	MORRISON	SANDSTONE/SHALE	1210	1717	507	Р	>507	NE
	MANCOS	SHALE	0	662	662	N		
12K-309	GALLUP	SANDSTONE	662	698	36	N		
121(-505	MANCOS	SHALE	698	1502	804	N		
	DAKOTA	SANDSTONE/SHALE	1502	NR	??	Р	NE	NE
	MANCOS	SHALE	0	460	460	N		
	GALLUP	SANDSTONE	460	540	80	N		
	MANCOS	SHALE	540	1300	760	N		
12K-320	DAKOTA	SANDSTONE/SHALE	1300	1470	170	S		
	BRUSHY BASIN	SANDSTONE/SHALE	1470	1530	60	Р		
	MORRISON	SANDSTONE/SHALE	1530	1985	455	Р		
	BLUFF	SANDSTONE	1985	NR	??	N	>515	NE
12K-357	DAKOTA	SANDSTONE	1370	NR		Р	NE	NE
12R-84	DAKOTA	SANDSTONE	880	1130	250	U		
121(04	MORRISON	SANDSTONE/SHALE	1130	NR	??	U	UTC	NE
	MANCOS	SHALE	20	100	80	N		
	GALLUP	SANDSTONE	100	185	85	N		
12T-508	MANCOS		185	955	770	N		
	DAKOTA	SANDSTONE	955	1114	159	Р		
	BRUSHY BASIN	SANDSTONE/SHALE	1114	NR	??	S	UTC	NE

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	ALLUVIUM	SAND/GRAVEL	0	20	20	N		
	MENEFEE	SANDSTONE/SHALE	20	2006	1986	Р		
	POINT LOOKOUT	SANDSTONE/SHALE	2006	2275	269	N		
12T-511	MANCOS UPPER	SHALE	2275	3175	900	N		
	GALLUP	SANDSTONE	3175	3382	207	N		
	MANCOS LOWER	SHALE	3382	4112	730	N		
	DAKOTA	SANDSTONE/SHALE	4112	NR	??	Ν	NE	NE
12T-519	DAKOTA	SANDSTONE	1025	1255	230	Р		
121 010	MORRISON	SANDSTONE/SHALE	1255	NR	??	S	UTC	NE
	ALLUVIUM	SAND/GRAVEL	0	30	30	N		
	MANCOS UPPER	SHALE	30	248	218	N		
	GALLUP	SANDSTONE	248	330	82	N		
	MANCOS LOWER	SHALE	330	895	565	N		
		SHALE	895	1015	120	N		
12T-520	DAKOTA	SANDSTONE/SHALE	1015	1180	165	N		
	BRUSHY BASIN	MUDSTONE	1180	1342	162	N		
	WESTWATER CANYON	SANDSTONE	1342	1485	143	S		
	RECAPTURE	SILTSTONE	1485	1610	125	S		
	SALTWASH	SILTSTONE	1610	1760	150	Р		
	BLUFF	SANDSTONE	1760	1795	35	U		
	SUMMERVILLE	SANDSTONE/SHALE	1795	NR	??	Ν	615	143

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	MANCOS	SHALE	710	821	111	Ν		
12T-548	DAKOTA	SANDSTONE	821	1024	203	Р		
	MORRISON	SANDSTONE/SHALE	1024	NR	??	Р	UTC	NE
	MANCOS	SHALE	0	1410	1410	N		
	DAKOTA	SANDSTONE	1410	1580	170	Ν		
12T-551	BRUSHY BASIN	SANDSTONE/SHALE	1580	1785	205	Ν		
	WESTWATER CANYON	SANDSTONE	1785	2083	298	Р		
	RECAPTURE	SILTSTONE	2083	NR	??	N	>503	298
12T-587	MENEFEE	SANDSTONE/SHALE	0	1052	1052	Р		
121-007	POINT LOOKOUT	SANDSTONE/SHALE	1052	NR	??	S	NE	NE
12T-618A	MENEFEE	SANDSTONE/SHALE	0	1274	1274	S		
121-0104	POINT LOOKOUT	SANDSTONE/SHALE	1274	NR	??	Р	NE	NE
	MANCOS	SHALE	5	800	795	N		
	DAKOTA	SANDSTONE/SHALE	800	1040	240	N		
12T-620	BRUSHY BASIN	SANDSTONE/SHALE	1040	1175	135	Ν		
	WESTWATER CANYON	SANDSTONE	1175	1390	215	Р		
	RECAPTURE	SANDSTONE/SHALE	1390	1960	570	S	>920	215

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	MANCOS UPPER	SHALE	0	615	615	N		
	GALLUP	SANDSTONE/SHALE	615	785	170	N		
	MANCOS LOWER	SHALE	785	1460	675	N		
12T-628	DAKOTA	SANDSTONE/SHALE	1460	1605	145	N		
	BRUSHY BASIN	SANDSTONE/SHALE	1605	1810	205	N		
	WESTWATER CANYON	SANDSTONE	1810	2150	340	Р		
	RECAPTURE	SANDSTONE/SHALE	2150	NR	??	S	>545	340
	MANCOS UPPER	SHALE	0	460	460	N		
	GALLUP	SANDSTONE/SHALE	460	720	260	N		
	MANCOS LOWER	SHALE	720	1290	570	N		
12T-629	DAKOTA	SANDSTONE/SHALE	1290	1508	218	N		
	BRUSHY BASIN	SANDSTONE/SHALE	1508	1710	202	S		
	WESTWATER CANYON	SANDSTONE	1710	1928	218	Р		
	RECAPTURE	SANDSTONE/SHALE	1928	NR	??	S	>420	218

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	MANCOS UPPER	SHALE	0	250	250	N		
	GALLUP	SANDSTONE/SHALE	250	470	220	N		
	MANCOS LOWER	SHALE	470	1070	600	N		
	DAKOTA	SANDSTONE	1070	1330	260	N		
12T-630	BRUSHY BASIN	SANDSTONE/SHALE	1330	1478	148	N		
	WESTWATER CANYON	SANDSTONE	1478	1745	267	S		
	RECAPTURE	SANDSTONE/SHALE	1745	2124	379	S		
	SALTWASH	SANDSTONE/SHALE	2124	2222	98	S		
	BLUFF	SANDSTONE	2222	NR	??	S	>892	267
	MANCOS UPPER	SHALE	0	418	418	N		
	GALLUP	SANDSTONE	418	570	152	N		
	MANCOS LOWER	SHALE	570	1370	800	N		
12T-632	DAKOTA	SANDSTONE	1370	1546	176	N		
121 002	BRUSHY BASIN	SANDSTONE/SHALE	1546	1890	344	S		
	WESTWATER CANYON	SANDSTONE	1890	2100	210	P		
	RECAPTURE	SANDSTONE/SHALE	2100	2443	343	S		
	BLUFF	SANDSTONE	2443	NR	??	U	>897	210

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	GALLUP	SANDSTONE	0	59	59	N		
	MANCOS LOWER	SHALE	59	895	836	N		
	DAKOTA	SANDSTONE	895	1080	185	N		
12T-633	BRUSHY BASIN	SANDSTONE/SHALE	1080	1270	190	S		
	WESTWATER CANYON	SANDSTONE	1270	1547	277	Р		
	RECAPTURE	SANDSTONE/SHALE	1547	1930	383	S		
	BLUFF	SANDSTONE	1930	NR	??	S	>850	277
	MANCOS LOWER	SHALE	375	918	543	N		
	DAKOTA	SANDSTONE	918	1030	112	N		
12T-634	BRUSHY BASIN	SANDSTONE/SHALE	1030	1375	345	N		
	WESTWATER CANYON	SANDSTONE	1375	1525	150	Р		
	RECAPTURE	SANDSTONE/SHALE	1525	NR	??	S	>495	150

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	GALLUP	SANDSTONE	335	440	105	N		
	MANCOS LOWER	SHALE	440	905	465	N		
	DAKOTA	SANDSTONE/SHALE	905	1085	180	N		
12T-635	BRUSHY BASIN	SANDSTONE/SHALE	1085	1350	265	S		
	WESTWATER CANYON	SANDSTONE	1350	1670	320	Р		
	RECAPTURE	SANDSTONE/SHALE	1670	1955	285	S		
	SUMMERVILLE	SANDSTONE/SHALE	1955	NR	??	S	870	320
12T-640	MORRISON	SANDSTONE/SHALE	1487	NR	??	Р	UTC	NE
	MANCOS LOWER	SHALE	0	840	840	N		
12T-643	DAKOTA	SANDSTONE	840	1040	200	N		
121 010	MORRISON	SANDSTONE/SHALE	1065	NR	??	Р		
	WESTWATER CANYON	SANDSTONE	1345	1618	273	Р	>553	273
12T-647	MORRISON	SANDSTONE/SHALE	1323	NR	??	Р	UTC	NE
	MANCOS	SHALE	0	230	230	N		
	GALLUP	SANDSTONE	230	450	220	N		
12T-649	MANCOS LOWER	SHALE	450	1134	684	N		
	DAKOTA	SANDSTONE	1134	1354	220	N		
	MORRISON	SANDSTONE/SHALE	1354	NR	??	Р	UTC	NE

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
12T-651	MORRISON	SANDSTONE/SHALE	1060	1691	631	P	UTC	NE

Data Source: Navajo Nation Department of Water Resource, Water Management Branch Well Database-April 2005

Abbreviations:	Footnotes:
NR = Not Recorded	^A Contribution to Well Production: P = Primary; S = Secondary; N = None
ft bgs = feet below ground surface	^B Thickness of Morrison Formation: NE = Formation Not Encountered; UTC = Unable to calculate
	^C Thickness of Westwater Canyon Membern: NE = Member Not Encountered; UTC = Unable to calculate

Table 4 Water Quality Data from Wells Sampled on May 11, 2005 Desert Rock Energy Project New Mexico

General Chemistry

Sample ID	рН	Temperature (°C)	TDS (mg/L)	Turbidity (NTU)	Conductivity (µmhos/cm)	Nitrite (mg/L)	Nitrate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)
12K-655	8.1	21.8	160	< 0.02	270	< 0.020	< 0.50	4.5	< 0.50	6.6
12K-633	9	21.5	170	< 0.02	280	< 0.020	< 0.50	< 2.5	< 0.50	3.4
12K-320	9.3	21.5	300	< 0.02	500	< 0.020	< 0.50	4.5	< 0.50	52

Metals

Sample ID	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Calcium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)
12K-655	< 0.10	< 0.0030	< 0.0040	0.14	< 0.10	< 0.0030	20	< 0.010	< 0.010	0.29
12K-633	< 0.10	< 0.0030	< 0.0040	0.014	< 0.10	< 0.0030	1.3	< 0.010	< 0.010	< 0.010
12K-320	< 0.10	< 0.0030	< 0.0040	0.036	< 0.10	< 0.0030	1.1	< 0.010	< 0.010	< 0.010

Radiochemical Activity

Sample ID	Gross Alpha Activity Method 600 / 00-02 (pCi/L)	Radium 226 Activity Method 903.1 (pCi/L)	Radium 228 Activity Method 904 (pCi/L)	Total Radium (pCi/L)
12K-655	9.8 +/- 1.5	< 0.3	< 0.4	< 0.4
12K-633	12. +/- 1.7	< 0.3	< 0.3	< 0.3
12K-320	0.9 +/- 0.4			

Explanation:

TDS = Total Dissolved Solids

< = below laboratory reporting limits

mg/L = milligrams per Liter

µmhos/cm = micromhos per centimeter

Table 4 Water Quality Data from Wells Sampled on May 11, 2005 Desert Rock Energy Project New Mexico

General Chemistry (continued)

Sample ID	Alkalinity (mg/L)								
	Bicarbonate Carbonate Hydroxide Tota								
12K-655	140	< 20	< 20	140					
12K-633	89	50	< 20	140					
12K-320	100	97	< 20	200					

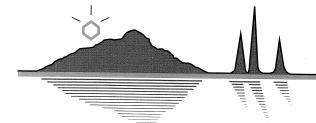
Metals (continued)

Sample ID	lron (mg/L)	Lead (mg/L)	Magnesium (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Silica (mg/L)	Silver (mg/L)	Sodium (mg/L)	Thallium (mg/L)
12K-655	< 0.10	0.0095	4	< 0.010	2.8	< 0.0030	19	< 0.0050	34	< 0.0020
12K-633	< 0.10	< 0.0030	< 1.0	< 0.010	< 2.0	< 0.0030	16	< 0.0050	68	< 0.0020
12K-320	< 0.10	< 0.0030	< 1.0	< 0.010	< 2.0	< 0.0030	18	< 0.0050	110	< 0.0020

APPENDIX A

LABORATORY ANALYTICAL DATA FOR SAMPLES COLLECTED ON MAY 11, 2005





Transwest Geochem

June 13, 2005

Chris Courtney URS Corporation 7720 N. 16th St. Suite 100 Phoenix, AZ 85020

RE: Desert Rock Energy/23444264.33202

Work Order No.: 0505165

Dear Chris,

Transwest Geochem, Inc. received 3 samples on 5/12/2005 11:20:00 AM for the analyses presented in the following report.

The Case Narrative of this report addresses any Quality Control and/or Quality Assurance issues associated with this Work Order.

If you have any questions regarding these test results, please feel free to call us at (602) 437-0330.

Sincerely,

Wachen

Carlene McCutcheon Project Manager

ADHS License No. AZM133/AZ0133

TRANSWEST

Client:	URS Corporation	Date Printed: 13-Jun-05
Work Order:	0505165	Case Narrative
Project Name:	Desert Rock Energy	Case Marrative
Project Number:	23444264.33202	

All method blanks, laboratory spikes, and/or matrix spikes met quality control objectives for the parameters associated with this Work Order except as detailed below or on the Data Qualifier page of this report. Data Qualifiers used in this report are in accordance with ADEQ Arizona Data Qualifiers, Revision 2.0 11/26/2003.

Data qualifiers ("flags") contained within this analytical report have been issued to explain a quality control deficiency, and do not affect the quality (validity) of the data unless noted otherwise in the case narrative.

-	TRANSWEST GEOCHEM	Date Printed09-Jun-05License No.AZM133/AZ0133
CLIENT:	URS Corporation	Case Narrative
Project Name:	Desert Rock Energy	
Project Number:	23444264.33202	Data Qualifiers
Work Order:	0505165	
Date Received:	12-May-05	

One or more of the following data qualifiers may be associated with your analytical and/or quality control data.

- H3 Sample was received and analyzed past holding time.
- D2 Sample required dilution due to high concentration of target analyte.

		<u>SWEST</u> DCHENI		Date Printed12-Jun-05License No.AZM133/AZ0133
	URS Corporation			
CLIENT: Project Name:	Desert Rock Energy		Work	ndar Campla Summar
Project Number:	23444264.33202		WORK U	order Sample Summary
Work Order:	0505165			
Date Received:	12-May-05			
Client Sample ID		Lab Sample ID	Test Code	Collection Date
2T-655		0505165-01A	EPA120.1	5/11/2005 2:00:00 PM
			EPA150.1	5/11/2005 2:00:00 PM
			EPA180.1	5/11/2005 2:00:00 PM
			EPA300	5/11/2005 2:00:00 PM
			SM 2540 C	5/11/2005 2:00:00 PM
			SM 4500-NO2 B	5/11/2005 2:00:00 PM
			SM2320 B	5/11/2005 2:00:00 PM
		0505165-01B	EPA353.2	5/11/2005 2:00:00 PM
		0505165-01C	EPA200.7	5/11/2005 2:00:00 PM
			EPA200.9	5/11/2005 2:00:00 PM
		0505165-01D		5/11/2005 2:00:00 PM
		0505165-01E		5/11/2005 2:00:00 PM
			EPA901.1	5/11/2005 2:00:00 PM
2T-633		0505165-02A	EPA120.1	5/11/2005 2:30:00 PM
			EPA150.1	5/11/2005 2:30:00 PM
			EPA180.1	5/11/2005 2:30:00 PM
			EPA300	5/11/2005 2:30:00 PM
			SM 2540 C	5/11/2005 2:30:00 PM
			SM 4500-NO2 B	5/11/2005 2:30:00 PM
			SM2320 B	5/11/2005 2:30:00 PM
		0505165-02B	EPA353.2	5/11/2005 2:30:00 PM
		0505165-02C	EPA200.7	5/11/2005 2:30:00 PM
			EPA200.9	5/11/2005 2:30:00 PM
		0505165-02D		5/11/2005 2:30:00 PM
		0505165-02E		5/11/2005 2:30:00 PM
			EPA901.1	5/11/2005 2:30:00 PM
12K-320		0505165-03A	EPA120.1	5/11/2005 3:10:00 PM
			EPA150.1	5/11/2005 3:10:00 PM
			EPA180.1	5/11/2005 3:10:00 PM
			EPA300	5/11/2005 3:10:00 PM
			SM 2540 C	5/11/2005 3:10:00 PM
			SM 4500-NO2 B	5/11/2005 3:10:00 PM
			SM2320 B	5/11/2005 3:10:00 PM
		0505165-03B	EPA353.2	5/11/2005 3:10:00 PM

CLIENT:URS CorporationProject Name:Desert Rock EnergyProject Number:23444264.33202Work Order:0505165Date Received:12-May-05

Work Order Sample Summary

Lab Sample ID

Test Code EPA200.7 EPA200.9

Collection Date

12K-320

Client Sample ID

0505165-03D 0505165-03E

0505165-03C

5/11/2005 3:10:00 PM 5/11/2005 3:10:00 PM 5/11/2005 3:10:00 PM 5/11/2005 3:10:00 PM

CLIENT:	URS Corporation	Date Printed 09-Jun-05 License No. AZM133/AZ0133
Project Name: Project Number: Work Order: Date Received:	Desert Rock Energy 23444264.33202 0505165 12-May-05	Definitions
Analytical Spike (distilled, digested, or extracted and is re if the MS has failed. It is used to indica	analyte added to a sample after it has been eady for analysis. The AS is generally performed ate interference that arises from sample opposed to interference that is innate to the matrix.
Continuing Curve Verification (CCV) intervals during an analysis. The CCV	check. This is a standard analyzed at specified verifies the stability and accuracy of the CV recovery acceptance criteria for each method.
Dilution Factor (D	,	sample had to be diluted in order to quantitate it ed in the reported sample result. The sample PQL
Internal Standard (1 1	the organic compound of interest in terms of that it is rare in the environment. The same umple for some organic methods.
Laboratory Contro Sample (LCS)	of a target analyte (from the same source	pike. The LCS is an addition of a known amount ce as calibration standards or spikes) to an aliquot clean matrix. The LCS is processed through the anner as samples.
Matrix Spike (MS	The MS is a known amount of a target through the entire method procedure in	analyte added to a sample. The MS is processed the same manner as samples.
Method Blank (M	B) The MB is an aliquot of deionized wate to be free of the analyte in question. Th or analysis procedure and is used to ind	er or other appropriate clean matrix that is thought he MB is processed through the entire extraction licate contamination in the lab.
Method Detection Limit (MDL)	The MDL is the lowest level of detection	on of which a method is capable.
Practical Quantitat Limit (PQL)		Transwest Geochem can detect an analyte in e. The PQL will increase as the DF increases. MDL.
Relative Percent Difference (RPD)	The RPD is a measure of precision (the the same sample). It is calculated using its associated duplicate result.	ability to obtain the same result on re-analysis of g the result of a sample, MS, LCS, or LCSV and
Secondary Source Sample (LCSV)	same type of standard as a calibration of	nd source laboratory control sample. It is the or spiking standard but is obtained from a different he primary standard quality, method performance,
Surrogate	chemical composition but is unique in t	organic compound of interest in terms of that it is rare in the environment. When very sample, blank and standard. Surrogate raction and/or analytical success.
Trip Blank (TB)	The TB travels from the lab, to the field	preserved in the same manner as the samples. d, and then back to the lab with the samples from on of contamination introduced during sample

CLIENT:URS CorporationProject Name:Desert Rock EnergyProject Number:23444264.33202Work Order:0505165

12-May-05

Date Received:

Date Printed 09-Jun-05 License No. AZM133/AZ0133

References

Transwest Geochem, Inc. uses the methods outlined in the following references:

Code of Federal Regulations, 40CFR, Part 136, Appendix A, 1998.

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

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

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, Revised August 1993.

Methods for the Determination of Metals in Environmental Samples, Supplement 1: EPA/600/R-94/111, Revised May 1994.

Methods for the Determination of Organic Compounds in Drinking Water, EPA/600/4-88/039, Revised July, 1991; EPA-600/4-90/020, Supplement I, July 1990; EPA-600/R-92/129; Supplement II, August 1992; EPA-600/R-95/131, Supplement III, August 1995.

Hach, Water Analysis Handbook, 3rd Edition, 1997.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition, 1986 including Update I, July 1992; Update IIA, August 1993; Update II; September 1994; Update IIB, January 1995; Update III, December 1996

Bureau of Laboratory Services, State of Arizona Department of Health Services Method 418.1AZ: TPH in Soil, September 1994.

Bureau of Laboratory Services, State of Arizona Department of Health Services Method 8015AZ.R1, September 1998. (Comment: C6-C10 GRO reported by this method is not to be used in compliance situations)

ASTM MethodD4982, Annual Book of ASTM Standards, Volumes 11.01 and 11.02, 1995

The Determination of Polychlorinated Biphenyls in Transformer Fluid and Waste Oils, EPA-600 4-81-045, September 1982.

TRANSWEST GEOCHEM

Date Printed 12-Jun-05

License No. AZM133/AZ0133

CLIENT:URS CorporationWork Order:0505165Lab ID:0505165-01Project Name:Desert Rock EnergyProject Number:23444264.33202

1

Client Sample ID: 12T-655 Collection Date: 5/11/2005 2:00:00 PM

Collection Date: 5/11/2005 2:0 Matrix: Groundwater

	D 1	DOI	0.1	TT •	DE	Test	Date	Date	A 1	-t Detal ID
Analyte	Result	PQL	Qual	Units	DF	Code	Prepared	Analyzed	Analy	st Batch ID
Specific Conductance	270	1.0		µmhos/cm	1.0	EPA120.1	N/A	5/13/05	SO	COND_W-5/13/2005
рН	8.1	N/A	H3	-	1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Temperature °C.	21.8	N/A			1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Turbidity	<0.02	0.02		NTU	1.0	EPA180.1	N/A	5/13/05 7:55	SO	TURB_W-5/13/2005
Chloride	4.5	2.5		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Fluoride	<0.50	0.50		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Sulfate	6.6	3.0		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Nitrate (As N)	<0.50	0.50		mg/L	1.0	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Total Dissolved Solids	160	10		mg/L	1.0	SM 2540 C	N/A	5/16/05	BJK	TDS_DW-5/17/2005
Nitrite (As N)	<0.020	0.020		mg/L	1.0	SM 4500-NO2 B	N/A	5/13/05 9:49	KMB	NO2_DW-5/13/2005
Alkalinity, Bicarbonate (As C	140	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Carbonate (As CaCO3)	<20	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Hydroxide (As CaCO3)	<20	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Total (As CaCO3)	140	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Aluminum	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Barium	0.14	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Boron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Cadmium	<0.0030	0.0030		mg/L	1.0	EPA200.7	5/16/05	5/17/05 11:11	JM	9415
Calcium	20	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Chromium	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Cobalt	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Copper	0.29	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Iron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Magnesium	4.0	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Nickel	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Potassium	2.8	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Silica	19	0.43		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Silver	<0.0050	0.0050		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Sodium	34	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Antimony	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/16/05	KMB	20095/16/05
Arsenic	<0.0040	0.0040		mg/L	1.0	EPA200.9	N/A	5/23/05	KMB	20095/23/2005

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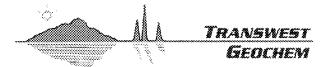
ALA	TRANSWEST
	Беоснем

License No. AZM133/AZ0133

Client Sample ID: 12T-655 Collection Date: 5/11/2005 2:00:00 PM Matrix: Groundwater

CLIENT:URS CorporationWork Order:0505165Lab ID:0505165-01Project Name:Desert Rock EnergyProject Number:23444264.33202

Test Date Date PQL DF Code Prepared Analyzed Analyst Batch ID Analyte Result Qual Units EPA200.9 N/A 5/18/05 20095/18/2005 0.0095 0.0030 mg/L 1.0 KMB Lead < 0.0030 0.0030 1.0 EPA200.9 N/A 5/17/05 KMB 2009_5/17/2005 Selenium mg/L 200.9_TL-5/26/2005 EPA200.9 5/26/05 <0.0020 0.0020 N/A KMB Thallium mg/L 1.0

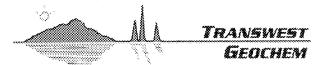


License No. AZM133/AZ0133

CLIENT:URS CorporationWork Order:0505165Lab ID:0505165-02Project Name:Desert Rock EnergyProject Number:23444264.33202

Client Sample ID: 12T-633 Collection Date: 5/11/2005 2:30:00 PM Matrix: Groundwater

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analy	st Batch ID
							-			
Specific Conductance	280	1.0		µmhos/cm	1.0	EPA120.1	N/A	5/13/05	SO	COND_W-5/13/2005
рН	9.0	N/A	H3		1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Temperature °C.	21.5	N/A			1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Turbidity	<0.02	0.02		NTU	1.0	EPA180.1	N/A	5/13/05 7:55	SO	TURB_W-5/13/2005
Chloride	<2.5	2.5		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Fluoride	<0.50	0.50		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Sulfate	3.4	3.0		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Nitrate (As N)	<0.50	0.50		mg/L	1.0	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Total Dissolved Solids	170	10		mg/L	1.0	SM 2540 C	N/A	5/16/05	BJK	TDS_DW-5/17/2005
Nitrite (As N)	<0.020	0.020		mg/L	1.0	SM 4500-NO2 B	N/A	5/13/05 9:49	KMB	NO2_DW-5/13/2005
Alkalinity, Bicarbonate (As C	89	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Carbonate (As Ca	50	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Hydroxide (As CaCO3)	<20	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Total (As CaCO3)	140	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Aluminum	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Barium	0.014	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Boron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Cadmium	< 0.0030	0.0030		mg/L	1.0	EPA200.7	5/16/05	5/17/05 11:14	JM	9415
Calcium	1.3	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Chromium	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Cobalt	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Copper	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Iron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Magnesium	<1.0	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Nickel	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Potassium	<2.0	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Silica	16	0.43		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Silver	<0.0050	0.0050		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Sodium	68	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Antimony	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/16/05	KMB	20095/16/05
Arsenic	<0.0040	0.0040		mg/L	1.0	EPA200.9	N/A	5/23/05	KMB	20095/23/2005

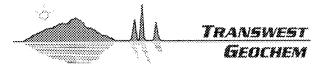


License No. AZM133/AZ0133

Client Sample ID: 12T-633 Collection Date: 5/11/2005 2:30:00 PM Matrix: Groundwater

CLIENT:URS CorporationWork Order:0505165Lab ID:0505165-02Project Name:Desert Rock EnergyProject Number:23444264.33202

						Test	Date	Date		
Analyte	Result	PQL	Qual	Units	DF	Code	Prepared	Analyzed	Analys	t Batch ID
Lead	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/18/05	KMB	20095/18/2005
Selenium	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/17/05	KMB	2009_5/17/2005
Thallium	<0.0020	0.0020		mg/L	1.0	EPA200.9	N/A	5/26/05	KMB	200.9_TL-5/26/2005

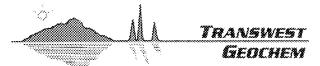


License No. AZM133/AZ0133

CLIENT:URS CorporationWork Order:0505165Lab ID:0505165-03Project Name:Desert Rock EnergyProject Number:23444264.33202

Client Sample ID: 12K-320 Collection Date: 5/11/2005 3:10:00 PM Matrix: Groundwater

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analys	st Batch ID
Specific Conductance	500	1.0		µmhos/cm	1.0	EPA120.1	N/A	5/13/05	SO	COND_W-5/13/2005
рН	9.3	N/A	H3		1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Temperature °C.	21.5	N/A			1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Turbidity	<0.02	0.02		NTU	1.0	EPA180.1	N/A	5/13/05 7:55	SO	TURB_W-5/13/2005
Chloride	4.5	2.5		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Fluoride	<0.50	0.50		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Sulfate	52	3.0		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Nitrate (As N)	<0.50	0.50		mg/L	1.0	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Total Dissolved Solids	300	10		mg/L	1.0	SM 2540 C	N/A	5/16/05	BJK	TDS_DW-5/17/2005
Nitrite (As N)	<0.020	0.020		mg/L	1.0	SM 4500-NO2 B	N/A	5/13/05 9:49	KMB	NO2_DW-5/13/2005
Alkalinity, Bicarbonate (As C	100	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Carbonate (As Ca	97	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Hydroxide (As CaCO3)	<20	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Total (As CaCO3)	200	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Aluminum	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Barium	0.036	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Boron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Cadmium	<0.0030	0.0030		mg/L	1.0	EPA200.7	5/16/05	5/17/05 11:18	JM	9415
Calcium	1.1	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Chromium	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Cobalt	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Copper	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
ron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Vlagnesium	<1.0	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Nickel	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Potassium	<2.0	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Silica	18	0.43		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Silver	<0.0050	0.0050		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Sodium	110	10	D2	mg/L	5.0	EPA200.7	5/16/05	5/16/05 17:51	JM	9415
Antimony	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/16/05	KMB	20095/16/05
Arsenic	<0.0040	0.0040		mg/L	1.0	EPA200.9	N/A	5/23/05	KMB	20095/23/2005



License No. AZM133/AZ0133

Client Sample ID:12K-320Collection Date:5/11/2005 3:10:00 PMMatrix:Groundwater

CLIENT:URS CorporationWork Order:0505165Lab ID:0505165-03Project Name:Desert Rock EnergyProject Number:23444264.33202

						Test	Date	Date		
Analyte	Result	PQL	Qual	Units	DF	Code	Prepared	Analyzed	Analys	t Batch ID
Lead	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/18/05	KMB	20095/18/2005
Selenium	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/17/05	KMB	2009_5/17/2005
Thallium	<0.0020	0.0020		mg/L	1.0	EPA200.9	N/A	5/26/05	KMB	200.9_TL-5/26/2005

Confidential and Privileged



CLIENT: Work Order: Project:

0505165

URS Corporation

Desert Rock Energy/23444264.33202

Date:

License No. AZM133/AZ0133

09-Jun-05

QC SUMMARY REPORT

Method Blank

Analyte	Result	DOI	Oval	T Ten ida	DE	Test	Date	Date	A	D-4-1 ID
	Result	PQL	Qual	Units	DF	Code	Prepared	Analyzed	Analyst	Batch ID
Chloride	<2.5	2.5		mg/L	1	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Fluoride	<0.50	0.50		mg/L	1	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Sulfate	<3.0	3.0		mg/L	1	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Nitrate (As N)	<0.50	0.50		mg/L	1	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Nitrate-Nitrite (As N)	<0.50	0.50		mg/L	1	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Total Dissolved Solids	<10	10		mg/L	1	SM 2540 C	N/A	5/16/05	BJK	TDS_DW-5/17/2005
Nitrite (As N)	<0.020	0.020		mg/L	1	SM 4500-NO2 B	N/A	5/13/05 9:49	KMB	NO2_DW-5/13/2005
Alkalinity, Bicarbonate (As CaCO3)	<20	20		mg/L	1	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Carbonate (As CaCO3)	<20	20		mg/L	1	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Hydroxide (As CaCO3)	<20	20		mg/L	1	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Total (As CaCO3)	<20	20		mg/L	1	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Aluminum	<0.10	0.10		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Barium	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Boron	<0.10	0.10		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Calcium	<1.0	1.0		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Chromium	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Cobalt	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Copper	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Iron	<0.10	0.10		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Magnesium	<1.0	1.0		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Nickel	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Potassium	<2.0	2.0		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Silica	<0.43	0.43		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Silver	<0.0050	0.0050		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Sodium	<2.0	2.0		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Cadmium	<0.0030	0.0030		mg/L	1	EPA200.7	5/16/05	5/17/05 10:53	JM	9415
Antimony	<0.0030	0.0030		mg/L	1	EPA200.9	N/A	5/16/05	KMB	20095/16/05
Selenium	<0.0030	0.0030		mg/L	1	EPA200.9	N/A	5/17/05	KMB	2009_5/17/2005
Lead	<0.0030	0.0030		mg/L	1	EPA200.9	N/A	5/18/05	KMB	20095/18/2005
Arsenic	<0.0040	0.0040		mg/L	1	EPA200.9	N/A	5/23/05	KMB	20095/23/2005
Thallium	<0.0020	0.0020		mg/L	1	EPA200.9	N/A	5/26/05	KMB	200.9_TL-5/26/2005

	-		ISWES OCHE						Dat Lice	e: 09 ense No. A	9-Jun-05 ZM133/A	Z0133
CLIENT: Work Order: Project:	050516			444264.33202	2				QC SU	J MMAR Sa	Y REP mple Du	
Analyte	R	esult	PQL	Units	RPD Ref Val	% RPD	RPD Limit	Test Code	Date Prepared	Date Analyzed	Analyst	Qual
Sample ID: 050 Client ID:	05117-03AD	Bat	ch ID:	COND_W-5/13/	2005					•••		<u></u>
1	e 05165-03AD K-320	4260 Bat		µmhos/cm COND_W-5/13/	4280 2005	0%	1	EPA120.1	N/A	5/12/05	SO	
Specific Conductance Sample ID: 050 Client ID:	e 05187-01BD	502.0 Bat		µmhos/cm NO3_W-5/25/20	502.0 005	0%	1	EPA120.1	N/A	5/13/05	SO	
Nitrate-Nitrite (As N) Sample ID: 050 Client ID:	05254-02AD	3.536 Bate	0.50 ch ID:	mg/L NO3_W-5/25/20	3.540 005	0%	8	EPA353.2	N/A	5/25/05	TL	
	05165-03AD K-320	<0.50 Bate	0.50 ch ID:	mg/L PH_W-5/13/200	<0.50 5	0%	8	EPA353.2	N/A	5/25/05	TL	
Temperature °C. pH Sample ID: 050	05165-01AD	21.40 9.306 Bate	N/A N/A ch ID:	 TDS_DW-5/17/2	21.50 9.297 2005	0% 0%	20 20	EPA150.1 EPA150.1	N/A N/A	5/13/05 11:30 5/13/05 11:30	SO SO	
Total Dissolved Solid Sample ID: 050	K-655 is 05165-03AD K-320	154.0 Bate	10 ch ID:	mg/L TURB_W-5/13/2	156.0 2005	1%	14	SM 2540 C	N/A	5/16/05	BJK	
Turbidity		<0.02	0.02	NTU	<0.02	0%	4	EPA180.1	N/A	5/13/05 7:55	SO	

بر من		TRANSWES GEDCHEA							Date: Licen		12-Jun- AZM13	05 3/AZ0133
Work Order:	URS Corp 0505165 Desert Ro	oration ck Energy/234	44264.3	3202					QC SUN Sample			EPORT Duplicate
Analyte		Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: 0505165- Client ID: 12T-633	02A-MSD	Batch ID: IC-5	5/19/2005			Code: E s mg/L	CPA300		Date Analy Date Prepar			00
Chloride Fluoride Sulfate		24.88 4.957 31.04	2.5 0.50 3.0	25.00 5.000 30.00	3.445	100% 99% 92%	80 80 80	113 113 111	25.2 5.016 31.34	1% 1% 1%	6 5 6	
Sample ID: 0505165 Client ID: 12T-633	-02A-MS	Batch ID: IC-5	5/19/2005			Code: H s mg/L	EPA300		Date Analy Date Prepa			00
Chloride Fluoride Sulfate		25.20 5.016 31.34	2.5 0.50 3.0	25.00 5.000 30.00	3.445	101% 100% 93%	80 80 80	113 113 111				
Sample ID: 0505187. Client ID:	-01BS	Batch ID: NO	3_W-5/25/2	2005		Code: ^I s mg/L	EPA353.2		Date Analy Date Prepa			00
Nitrate-Nitrite (As N) Sample ID: 0505254 Client ID:	-02AS	13.86 Batch ID: NO:	1.0 3_W-5/25/2	10.00 2005		104% Code: I s mg/L	90 EPA353.2	110	Date Analy			00
Nitrate-Nitrite (As N)		5.043	0.50	5.000	Omt	101%	90	110	Date Prepa			
Sample ID: 0505165 Client ID: 12T-655		Batch ID: NO	2_DW-5/13	3/2005		Code: ^S s mg/L	SM 4500-N	O2 B	Date Analy Date Prepa			49
Nitrite (As N) Sample ID: 0505165		0.09540 Batch ID: NO	0.020 2_DW-5/13	0.1000			63 SM 4500-N	130 O2 B	0.1 Date Analy			49
Client ID: 12T-655 Nitrite (As N)		0.1000	0.020	0.1000	Umi	s mg/L 100%	63	130	Date Prepa			
Sample ID: 0505094 Client ID:	-01ASD	Batch ID: AL	K_W-5/18/	2005		Code: ^S s mg/L	SM2320 B		Date Analy Date Prepa			00
Alkalinity, Total (As CaCO Sample ID: 0505094		281.0 Batch ID: AL	20 K_W-5/18/	167.0 2005			69 SM2320 B	117	277.1 Date Analy			00
Client ID: Alkalinity, Total (As CaCC	3)	277.1	20	167.0	Unit 135.7	s mg/L 85%	69	117	Date Prepa		n	



CLIENT:

Project:

Work Order:

TRANSWEST GEDCHEM

Desert Rock Energy/23444264.33202

URS Corporation

0505165

Date:

License No. AZM133/AZ0133

12-Jun-05

QC SUMMARY REPORT Sample Matrix Spike

Analyte		Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
	0505165 03C MS			value			EPA200.7		Date Analy			
•	0505165-03C-MS	Batch ID: 94	15				A200.7					10
Client ID:	12K-320				Unit	s mg/L			Date Prepa	red: 3/1	6/03	
Aluminum		12.36	0.10	11.00		112%	70	130				
Barium		1.118	0.010	1.000	0.03648	108%	70	130				
Boron		1.106	0.10	1.000		111%	70	130				
Calcium		29.63	1.0	26.00	1.075	110%	70	130				
Chromium		1.030	0.010	1.000		103%	70	130				
Cobalt		1.109	0.010	1.000		111%	70	130				
Copper		0.9563	0.010	1.000		96%	70	130				
Iron		0.9642	0.10	1.000		96%	70	130				
Magnesium		27.83	1.0	26.00		107%	70	130				
Nickel		1.057	0.010	1.000		106%	70	130				
Silica		29.55	0.43	10.70	18.29	105%	70	130				
Silver		0.08005	0.0050	0.07500		107%	70	130			a waa waa waa waa waa waa waa waa waa w	
Sample ID:	0505165-03C-MSD	Batch ID: 94	15		Test	Code: I	EPA200.7		Date Analy	yzed: 05	5/16/05 15:4	49
Client ID:	12K-320				Unit	s mg/L			Date Prepa	red: 5/1	16/05	
Aluminum		12.88	0.10	11.00		117%	70	130	12.36	4%	12	
Barium		1.153	0.010	1.000	0.03648	112%	70	130	1.118	3%	9	
Boron		1.154	0.10	1.000		115%	70	130	1.106	4%	12	
Calcium		30.69	1.0	26.00	1.075	114%	70	130	29.63	4%	7	
Chromium		1.075	0.010	1.000		108%	70	130	1.03	4%	7	
Cobalt		1.160	0.010	1.000		116%	70	130	1.109	4%	7	
Copper		0.9826	0.010	1.000		98%	70	130	0.9563	3%	8	
Iron		1.018	0.10	1.000		102%	70	130	0.9642	5%	12	
Magnesium		28.82	1.0	26.00		111%		130	27.83	3%	8	
Nickel		1.096	0.010	1.000		110%		130	1.057	4%	7	
Silica		30.72	0.43	10.70	18.29	116%		130	29.55	4%	13	
Silver		0.08189	0.0050	0.07500		109%	70	130	0.08005	2%	15	
Sample ID:	0505119-04B-MS	Batch ID: 94	15		Test	Code: 1	EPA200.7		Date Anal	yzed: 0	5/16/05 16:	36
Client ID:					Unit	s mg/L			Date Prepa	ared: 5/	16/05	
Chromium		1.049	0.010	1.000		105%	70	130				
Sample ID:	0505119-04B-MSD	Batch ID: 94	15		Test	Code:	EPA200.7		Date Anal	yzed: 0	5/16/05 16:	:40
Client ID:					Unit	s mg/L			Date Prepa	ared: 5/	16/05	
Chromium		1.088	0.010	1.000		109%	70	130	1.049	4%	7	
Sample ID:	0505165-03C-MS	Batch ID: 94	15		Test	Code:	EPA200.7		Date Anal	yzed: 0	5/16/05 17:	:55
Client ID:	12K-320		<u> </u>		Uni	s mg/L			Date Prepa	ared: 5/	16/05	
Potassium		27.59	10	25.00		110%	70	130				
Sodium		136.6	10	25.00	113.4	93%	70	130				

		-							Date:	12-Jun	1-05
	⋗╢⋏	TRANSWE GEDCHI	*****						License N	o. AZM1	33/AZ0133
CLIENT:	URS Corp	oration							QC SUMM	ARY F	REPORT
Work Ord		als En anary/22	AAADCA -	22202					Sample Ma	trix Spik	e Duplica
Project:	Desen Ro	ck Energy/23	6444204.		abu	<u> </u>	- -		-		
Analyte		Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD % Ref Val RP		
Sample ID:	0505165-03C-MSD	Batch ID: 94	15		Test	Code: I	EPA200.7		Date Analyzed:	05/16/05 17	:59
Client ID:	12K-320				Unit	s mg/L		-	Date Prepared:	5/16/05	
Potassium		27.93	10	25.00		112%	70	130	27.59 1%	6 13	
Sodium		137.3	10	25.00	113.4	96%	70	130	136.6 19	6 8	
Sample ID:	0505165-03C-MS	Batch ID: 94	15		Test	Code: I	EPA200.7		Date Analyzed:	05/17/05 11	:21
Client ID:	12K-320				Unit	s mg/L			Date Prepared:	5/16/05	
Cadmium		1.103	0.0030	1.000		110%	70	130			
Sample ID:	0505165-03C-MSD	Batch ID: 94	15		Test	Code: 1	EPA200.7		Date Analyzed:	05/17/05 11	:25
Client ID:	12K-320				Unit	s mg/L			Date Prepared:	5/16/05	
Cadmium		1.075	0.0030	1.000		108%	70	130	1.103 3%	6 7	
Sample ID:	0505165-01C-MSD	Batch ID: 20	095/16/05		Test	Code: 1	EPA200.9		Date Analyzed:	05/16/05 00):00
Client ID:						s mg/L			Date Prepared:		
Antimony		0.01310	0.0030	0.01500		87%	70	130	0.01283 29		
Sample ID:	0505165-01C-MS	Batch ID: 20	095/16/05		Test	Code:]	EPA200.9		Date Analyzed:	05/16/05 00):00
Client ID:	12T-655				Unit	s mg/L			Date Prepared:	N/A	
Antimony		0.01283	0.0030	0.01500		86%	70	130			
Sample ID:	0505165-03C-MSD	Batch ID: 20	09_5/17/20	05	Test	Code:]	EPA200.9		Date Analyzed:	05/17/05 00	0:00
Client ID:	12K-320				Unit	s mg/L			Date Prepared:		
Selenium		0.01369	0.0030	0.01500		91%	70	130	0.0129 69	6 17	
Sample ID:	0505165-03C-MS	Batch ID: 20	09 5/17/20	05	Test	Code:	EPA200.9	0	Date Analyzed:	05/17/05 0(0:00
Client ID:		2000				s mg/L			Date Prepared:		
Selenium		0.01290	0.0030	0.01500		86%	70	130	.		
	0505165-03C-MSD	Batch ID: 20			Test		EPA200.9		Date Analyzed:	05/18/05 0/	0:00
Client ID:		Daten ID•	0,0,0,0,00			s mg/L			Date Prepared:		
_ead		0.01384	0.0030	0.01500	0111	92%	70	130	0.01384 09		
Sample ID:	0505165-03C-MS	Batch ID: 20			Test		EPA200.9		Date Analyzed:	05/18/05 0	0:00
Client ID:		2 ID•	/ •			ts mg/L			Date Prepared:		
_ead		0.01384	0.0030	0.01500		92%	70	130	A		
Sample ID:	0505165-03C-MSD	Batch ID: 20	095/23/200)5	Test	Code:	EPA200.9		Date Analyzed:	05/23/05 0	0:00
Client ID:						s mg/L			Date Prepared:		
Arsenic		0.01874	0.0040	0.01500		125%	70	130		% 9	
	0505165-03C-MS	Batch ID: 20			Test		EPA200.9		Date Analyzed:		0:00
sampre ID.		Dawn ID, 20				ts mg/L			Date Prepared:		
Client ID:	12K-320										

12-Jun-05 Date:

		TRANSWE GEDCHI							Date: Licen		12-Jun- AZM1	05 33/AZ0133
CLIENT: Work Order: Project:	URS Corp 0505165 Desert Ro	ooration ck Energy/2:	3444264.3	33202					QC SUN			EPORT atrix Spike
Analyte		Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
-	Sample ID: 0505165-01C-MS Batch ID: 200.9_TL-5/26/2005 Client ID: 12T-655		6/2005	Test Code: EPA200.9 Units mg/L				Date Analy Date Prepa	204.	/26/05 00: A	00	
Thallium		0.01697	0.0020	0.01500		113%	70	130				· · · · · · · · · · · · · · · · · · ·
Sample ID: 050516 Client ID: 12T-65	5-01C-MSD	Batch ID: 20)0.9_TL-5/2	6/2005		Code: s mg/L	EPA200.9		Date Analy Date Prepa	200.	6/26/05 00: A	00
Thallium		0.01714	0.0020	0.01500		114%	70	130	0.01697	1%	16	



0505165

CLIENT:

Work Order:

09-Jun-05 Date:

License No. AZM133/AZ0133

QC SUMMARY REPORT

URS Corporation

Work Order: Project:	0505165 Desert Rock Energy/2	23444264.:	33202					-		В	lank Spike
Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: LCS	Batch ID: I	C-5/19/2005		Test	Code: 1	EPA300		Date Analyz	zed: 05	/19/05 00:	00
				Unit	s: mg/L			Date Prepar			
Chloride	23.40	2.5	25.00		94%	90	110				
Fluoride	4.834	0.50	5.000		97%		110				
Sulfate	28.89	3.0	30.00		96%		110				
Sample ID: LCS	Batch ID: N	NO3_W-5/25	/2005	Test	Code: 1	EPA353.2		Date Analyz	zed: 05	/25/05 00:	.00
				Unit	s: mg/L			Date Prepar			
Nitrate-Nitrite (As N)	5.190	0.50	5.000		104%	90	110				
Sample ID: LCS	Batch ID: N	102_DW-5/1	3/2005	Test	Code: S	SM 4500-N	O2 B	Date Analyz	zed: 05	/13/05 09:	49
				Units	s: mg/L			Date Prepar	ed: N/A	4	
Nitrite (As N)	0.09630	0.020	0.1000		96%	91	112				
Sample ID: LCS	Batch ID: A	LK_W-5/18	/2005	Test	Code: S	SM2320 B		Date Analyz	zed: 05	/18/05 00:	:00
				Unit	s: mg/L			Date Prepar			
Alkalinity, Total (As CaC	03) 166.7	20	167.0		100%	96	103		• .		
Sample ID: LCS-94	15 Batch ID: 9	415		Test	Code: 1	EPA200.7		Date Analyz	zed: 05	/16/05 15:	:21
				Units	s: mg/L			Date Prepar	ed: 5/1	6/05	
Aluminum	11.93	0.10	11.00		108%	85	115				
Barium	1.095	0.010	1.000		110%		115				
Boron	1.062	0.10	1.000		106%	85	115				
Calcium	27.45	1.0	26.00		106%	85	115				
Chromium	1.004	0.010	1.000		100%		115				
Cobalt	1.076	0.010	1.000		108%	85	115				
Copper	0.9450	0.010	1.000		95%		115				
Iron	0.9543	0.10	1.000		95%		115				
Magnesium	26.99	1.0	26.00		104%		115				
Nickel	1.021	0.010	1.000		102%		115				
Potassium	27.08	2.0	25.00		108%		115				
Silica	11.19	0.43	10.70		105%		115				
Silver	0.07838	0.0050	0.07500		105%		115				
Sodium	26.51	2.0	25.00		106%	85	115				



0505165

CLIENT:

Work Order:

Date: 09-Jun-05

License No. AZM133/AZ0133

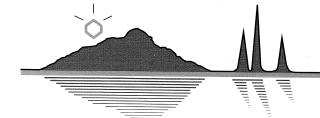
QC SUMMARY REPORT

Project: Desert Rock Energy/23444264.33202

URS Corporation

Blank Spike Duplicate

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: LCSD-9415	Batch ID: 94	15		Test	Code: E	PA200.7		Date Analyzed: 05/16/05 15:24			
				Unit	s: mg/L			Date Prepared: 5/16/05			
Aluminum	12.05	0.10	11.00		110%	85	115	11.93	1%	6	
Barium	1.099	0.010	1.000		110%	85	115	1.095	0%	6	
Boron	1.071	0.10	1.000		107%	85	115	1.062	1%	7	
Calcium	27.80	1.0	26.00		107%	85	115	27.45	1%	7	
Chromium	1.012	0.010	1.000		101%	85	115	1.004	1%	7	
Cobalt	1.082	0.010	1.000		108%	85	115	1.076	1%	7	
Copper	0.9533	0.010	1.000		95%	85	115	0.945	1%	7	
Iron	0.9661	0.10	1.000		97%	85	115	0.9543	1%	8	
Magnesium	27.32	1.0	26.00		105%	85	115	26.99	1%	6	
Nickel	1.036	0.010	1.000		104%	85	115	1.021	1%	7	
Potassium	27.57	2.0	25.00		110%	85	115	27.08	2%	7	
Silica	11.29	0.43	10.70		106%	85	115	11.19	1%	6	
Silver	0.07871	0.0050	0.07500		105%	85	115	0.07838	0%	7	
Sodium	26.51	2.0	25.00		106%	85	115	26.51	0%	7	
Sample ID: LCS-9415	Batch ID: 9415			Test	Code: E	PA200.7		Date Analy	zed: 05	/17/05 10:	56
				Unit	s: mg/L			Date Prepar	ed: 5/1	6/05	
Cadmium	1.059	0.0030	1.000		106%	85	115				
Sample ID: LCSD-9415	Batch ID: 94	15		Test	Code: E	PA200.7		Date Analy	zed: 05	/17/05 11:	00
				Unit	s: mg/L			Date Prepar	red: 5/1	6/05	
Cadmium	1.062	0.0030	1.000		106%	85	115	1.059	0%	7	
Sample ID: LCS	Batch ID: 20	095/16/05		Test	Code: E	PA200.9		Date Analy	zed: 05	/16/05 00:	00
				Units	s: mg/L			Date Prepar	ed: N/A	A	
Antimony	0.01504	0.0030	0.01500		100%	85	115				
Sample ID: LCS	Batch ID: 20	09_5/17/20	05	Test	Code: E	PA200.9		Date Analy	zed: 05	/17/05 00:	00
,				Units	s: mg/L			Date Prepar	ed: N/A	A	
Selenium	0.01634	0.0030	0.01500		109%	85	115				
Sample ID: LCS	Batch ID: 20	095/18/200	5	Test	Code: E	PA200.9		Date Analy	zed: 05	/18/05 00:	00
				Units	s: mg/L			Date Prepar	ed: N/A	A	
Lead	0.01563	0.0030	0.01500		104%	85	115				
Sample ID: LCS	Batch ID: 20	095/23/200	5	Test	Code: E	PA200.9		Date Analy	zed: 05	/23/05 00:	00
				Units	s: mg/L			Date Prepar			
Arsenic	0.01468	0.0040	0.01500		98%	85	115				
Sample ID: LCS	Batch ID: 20	0.9_TL-5/2	6/2005	Test	Code: E	PA200.9		Date Analy	zed: 05	/26/05 00:	00
				Units	s: mg/L			Date Prepar			
Thallium	0.01626	0.0020	0.01500		108%	85	115	<u> </u>			



Transwest Geochem

June 13, 2005

Chris Courtney URS Corporation 7720 N. 16th St. Suite 100 Phoenix, AZ 85020

Re: Desert Rock Energy/23444264.33202 Work Order No.: 0505165

Dear Chris,

Attached is the original Report of Analysis from Radiation Safety Engineering, Inc. (AZ0462) for the samples received on 5/12/2005 11:20:00 AM. The following analysis was performed:

Radiochemical Activity in Water (pCi/L) - Gross Alpha

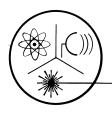
If you have any questions regarding the results, please call me. We appreciate your business and thank you for choosing Transwest Geochem.

Sincerely,

inthem

Carlene McCutcheon Project Manager

ADHS License No. AZM133/AZ0133



Radiation Safety Engineering, Inc.

3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121 Website: www.radsafe.com

(480) 897-9459 FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Transwest Geochem 3725 E. Atlanta Avenue Suite 2 Phoenix, AZ 85040-2960

Sample Received: May 12, 2005 Analysis Completed: May 25, 2005

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method 903.1 (pCi/L)	Radium 228 Activity Method 904 (pCi/L)	Total Radium (pCi/L)
12T-655	9.8 ± 1.5	< 0.3	< 0.4	<0.4
12T-633	12. ± 1.7	< 0.3	< 0.3	<0.3
12K-320	0.9 ± 0.4			

g hut Robert L. Metzger Ph.D., C.H.P.

Arizona Department of Environmental Quality Drinking Water Additional Radiochemical Analysis Report ***Samples To Be Taken At POE Only***

System ID		System Name	· · · · · · · · · · · · · · · · · · ·
05/11/2005	2:00		
Sample Date	Sample Time	Owner/Contact Person	
POE#	C	Owner/Contact Fax Number	
COMPLIANCE	E SAMPLE TYPE		
Reduced	Monitoring	Date Q1 Collected	
Quarterly	· · · ·	Date Q2 Collected	
Composit	te of four quarterly sam	ples Date Q3 Collected	
		Date Q4 Collected	

RADIOCHEMICAL ANALYSIS

>>>To be filled out by laboratory personnel<<<

Analysis Method	MCL	Reporting Limit	Contaminant Name	Cont. Code	Analyses Run Date	Result	Exceed MCL
	15 pCi/L		Adjusted Gross Alpha	4000			
600/00-02		3 pCi/L	Gross Alpha	4002	05/18/2005	9.8±1.5	
7500 - Rn			Radon	4004			
00-07	30 µg/L	(reserved)	Combined Uranium	4006			
			Uranium 234	4007			
			Uranium 235	4008			
			Uranium 238	4009			
	5 pCi/L	1 pCi/L	Combined Radium (226,228)	4010	05/19/2005	<0.4	
903.1		1 pCi/L	Radium 226	4020	05/19/2005	< 0.3	
904.0		1 pCi/L	Radium 228	4030	05/16/2005	< 0.4	
			LABORATORY INF				
Specimen N	Number:	12T-655	_				
Lab ID Nun	nber: AZ	0462 Lab	Name: Radiation Safe	ty Engir	neering, Inc.	,	
Comments:	24813		Aut	horized S	Signature: <u></u>	t2. mit	$\overline{\mathcal{L}}$
Date Public	Water Syste	m Notified:				17	

Arizona Department of Environmental Quality **Drinking Water Additional Radiochemical Analysis Report** ***Samples To Be Taken At POE Only***

System ID System Name 05/11/2005 02:30 Carlene McCutcheon Sample Date Sample Time **Owner/Contact** Person 602-437-0660 POE# **Owner/Contact Fax Number** COMPLIANCE SAMPLE TYPE **Reduced Monitoring** Date Q1 Collected Quarterly Date Q2 Collected Composite of four quarterly samples Date Q3 Collected Date Q4 Collected *****RADIOCHEMICAL ANALYSIS***** >>>To be filled out by laboratory personnel<<< Analysis MCL Reporting Contaminant Cont. Analyses Result Exceed Method Limit Name Code Run Date **MCL** 15 pCi/L Adjusted Gross 4000 Alpha 600/00-02 3 pCi/L Gross Alpha 4002 05/18/2005 $12.\pm 1.7$ 7500 - Rn Radon 4004 00-07 $30 \,\mu g/L$ (reserved) Combined Uranium 4006 Uranium 234 4007 Uranium 235 4008 Uranium 238 4009 **Combined Radium** 5 pCi/L 1 pCi/L 4010 05/19/2005 < 0.3 (226, 228)903.1 1 pCi/LRadium 226 4020 05/19/2005 < 0.3 904.0 1 pCi/L Radium 228 4030 < 0.3 05/19/2005 *****LABORATORY INFORMATION***** >>>To be filled out by laboratory personnel<<< Specimen Number: 12T-633 Lab ID Number: AZ0462 Lab Name: Radiation Safety Engineering, Inc. Apt 2. min Comments: 24814 Authorized Signature: Date Public Water System Notified: DWAR 6: 2003

Arizona Department of Environmental Quality Drinking Water Additional Radiochemical Analysis Report ***Samples To Be Taken At POE Only***

System ID			System Name				
05/11/200	5 03:10)	Carlen	e McCutc	heon		
Sample Dat	te Samp	le Time	Owner/Contac 602-437-066				
POE#			Owner/Contact Fax N	lumber			
COMPLIA	NCE SAMPI	LE TYPE					
Redu	ced Monitori	ng	Date	e Q1 Colle	ected		
Quart	erly		Date	e Q2 Colle	ected		
Comp	oosite of four	quarterly sam	ples Date	e Q3 Colle	ected		
			Date	e Q4 Colle	ected		
			RADIOCHEMICA to be filled out by laborate				
Analysis Method	MCL	Reporting Limit	Contaminant Name	Cont. Code	Analyses Run Date	Result	Exceed MCL
	15 pCi/L		Adjusted Gross Alpha	4000		·	
600/00-02		3 pCi/L	Gross Alpha	4002	05/18/2005	0.9±0.4	
7500 - Rn			Radon	4004	· · · · · · · · · · · · · · · · · · ·		
00-07	30 µg/L	(reserved)	Combined Uranium	4006			
			Uranium 234	4007			
			Uranium 235	4008			
			Uranium 238	4009			
	5 pCi/L	1 pCi/L	Combined Radium (226,228)	4010			
903.1		1 pCi/L	Radium 226	4020			
904.0		1 pCi/L	Radium 228	4030			
			LABORATORY IN				
Specimen N	Jumber:	12K-320	o be filled out by labo	bratory pe	rsonnel		
Lab ID Nur			- Name: Radiation Sa:	fety Engin	eering Inc		
Comments:						t2.mitz	_ _]
Date Public DWAR 6: 2	Water Syste	m Notified:				· · · ····	<u>//</u>

Radiation Safety Engineering, Inc

3245 North Washington Street Chandler, AZ 85225 5/25/2005

	Standards	
Analysis	Ratio of O/E (O/E $\pm 2\sigma$)	Acceptable limits
Alpha	0.99	0.85 - 1.15
Beta	NA	0.85 - 1.15
Uranium	NA	0.85 - 1.15
Radon	NA	0.85 - 1.15
Radium-226	0.95	0.85 - 1.15
Radium-228	1.12	0.85 - 1.15
Strontium	NA	0.85 - 1.15
Tritium	NA	0.85 - 1.15

Quality Assurance Report Work Order: 0505165

Blanks

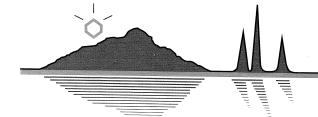
Analysis	Observed	Expected	Acceptable
Alpha	<0.2	< 1.0	< 1.0
Beta	NA	< 3.0	< 3.0
Uranium	NA	< 0.8	< 0.8
Radon	NA	< 150	< 200
Radium-226	<0.5	< 0.7	< 0.9
Radium-228	<0.5	< 0.7	< 0.9
Strontium	NA	< 0.8	< 0.9
Tritium	NA	< 400	< 500

NA Not applicable.

Robert L. Metzger, Ph.D., C.H.P.

CHAIN-OF-CUSTODY Page 1 of 1	: (602) 437-0330 : (602) 437-0660 Project: Desert Rock Energy 23444264.33202	.: (480) 897-9459 :: (480) 892-5446 12-May-05	Collection Date Containers Requested Tests 5/11/2005 2:00:00 PM 1 1 24/81/5 1 5/11/2005 3:10:00 PM 1 1 24/81/5 1 1	can be disposed per your including Method Blank data. including Method Blank data. Received Intact: Custody Seals: Total No. of Containers: te/Time	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
TRANSWEST GEOCHEN	Carlene McCutcheon 3725 E. Atlanta Avenue Suite 2 Phoenix, AZ 85040	Subcontractor: Radiation Safety TEL: 3245 N. Washington Street FAX: Chandler, AZ 85225-1121	Client Sample ID TGI ID Matrix Collection Date 12T-655 01E Drinking Water 5/11/2005 2:00:00 PM 12T-633 02E Drinking Water 5/11/2005 2:30:00 PM 12K-320 03E Drinking Water 5/11/2005 3:10:00 PM	Comments: After analysis, the samples do not need to be returned and standard laboratory practices. Please provide a <u>QC report</u> Da	· / A-H- I.

Relinquished by: _



Transwest Geochem

June 13, 2005

Chris Courtney URS Corporation 7720 N. 16th St. Suite 100 Phoenix, AZ 85020

Re: Desert Rock Energy/23444264.33202 Work Order No.: 0505165

Dear Chris,

Attached is the original Report of Analysis from Aquatic Consulting & Testing, Inc. (AZ0003) for the samples received on 5/12/2005 11:20:00 AM. The following analysis was performed:

Method No. SM 2520 B - Salinity

If you have any questions regarding the results, please call me. We appreciate your business and thank you for choosing Transwest Geochem.

Sincerely,

neCutchem

Carlene McCutcheon Project Manager

ADHS License No. AZM133/AZ0133

AQUATIC CONSULTING & TESTING, INC.

1525 W. University Drive, Suite 106 P.O. Box 1510 Tempe, Arizona 85281 Phone: (480) 921-8044 • FAX: (480) 921-0049

Lic. No. AZ0003

LABORATORY REPORT

Client: Transwest Geochem, Inc. 3725 E. Atlanta Avenue, #2 Phoenix, AZ 85040 Date Submitted: 05/12/05 Date Reported: 06/08/05

Attn: Carlene McCutcheon

RESULTS Client ID: 0505165-01D Sample Type: Groundwater ACT Lab No.: BM05028 Sample Time: 05/11/05 14:00 **Analysis Date** Parameter Start End Unit Method No. Result Conductivity 05/20/05 05/20/05 120.1 255. umho/cm @ 25 C Salinity 05/20/05 05/20/05 SM 2520 B 0.2 ppt Client ID: 0505165-02D Sample Type: Groundwater Sample Time: 05/11/05 14:30 ACT Lab No.: BM05029 **Analysis Date** Parameter Start End Method No. Result Unit Conductivity 05/20/05 05/20/05 120.1 umho/cm @ 25 C 269. Salinity 05/20/05 05/20/05 SM 2520 B 0.2 ppt Client ID: 0505165-03D Sample Type: Groundwater ACT Lab No.: BM05030 Sample Time: 05/11/05 15:10 **Analysis Date** Parameter Start End Method No. Result Unit Conductivity 05/20/05 05/20/05 120.1 492. umho/cm @ 25 C Salinity 05/20/05 05/20/05 SM 2520 B 0.3 ppt

Reviewed by:

Frederick A. Amalfi, Ph. Laboratory Director

QC Report

QC Parameter	Sample Result	Method Blank Result	QCS % Rec	Duplicate Result	Duplicate RPD	Spike Result	Spike % Rec
Batch ID: COND-27765	QC ID: BM0539	0 Samples: BM05	028 BM05029	BM05030			
Conductivity	1130.			1120.	0.889		

CHA	IN-C	F-CL	JST	ODY
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Page 1 of 1

TRANSI	NEST	
GEOC	HEM	
Carlene McCutcheon 3725 E. Atlanta Avenue Suite 2 Phoenix, AZ 85040	TEL: FAX:	(602) 437-0330 (602) 437-0660
Subcontractor: Aquatic Consulting & Testing, Inc 1525 W. University Drive Suite 106 Tempe, AZ 85281	TEL: FAX:	(480) 921-8044 (480) 921-0049

Work Order: 0505165

Project: Desert Rock Energy 23444264.33202

12-May-05

						Requ	lested Tests		
Client Sample ID	TGI ID	Matrix			SUBCONTRACT	PUAS	678		
12T-655	01D		5/11/2005 2:00:00 PM		1	- DMUS	1400	~ 7 0	
12T-633	02D		5/11/2005 2:30:00 PM		1	5	NUSI	DZT ZZ	
12K-320	03D	Groundwater	5/11/2005 3:10:00 PM				DA	405050	
				Y	Salinity				

Comments: After analysis, the samples do not need to be returned and can be disposed per your standard laboratory practices. Please provide a QC report, including Method Blank data.

Sa	mple Receipt	
Temperature:	Ambient / Cold	Ice:
Received Intact:	Yes	Absent Present
Custody Seals:	NA	Wet / Blue
Total No. of Containers:	3	·C.
Total No. of Containers.	ľ	Date/Time

Relinquished by:	Received by:	5.12.05 /608
		- 026

			GEOCH	IEM	Fax				7-033 7-066			Fax			0) 57 0) 57			ų. ⁸		Dat	∍_5/	11/0	<u>15</u>	_ Pa	agei	/of	<u> </u>
Project Manager:	Richard Knox							Bill to:								URS Corp. Attn: Chris Courtney									:		
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FINAL WELL IMPACT REPORT – REVISION NO. 1

DESERT ROCK ENERGY PROJECT FOUR CORNERS AREA, NEW MEXICO

SITHE GLOBAL POWER. LLC.

Prepared by Chris J. Courtney, R.G., P.G. Miller Brooks Environmental, Inc. Job No. 684-0001-0001

October 5, 2006

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LIST OF ACRONYMS

af/yr b	acre-feet per year saturated aquifer thickness
cm/sec	centimeters per second
bgs ft ²	below ground surface
ft^2	feet squared
ft/d	feet per day
ft/ft	feet per foot
ft^2/d	feet squared per day
gpd	gallons per day
gpd/ft	gallons per day per foot
gpd/ft ²	gallons per day per square foot
gpm	gallons per minute
Κ	hydraulic conductivity
K_h/K_v	horizontal to vertical conductivity ratio
NNDWR	Navajo Nation Department of Water Resources
NTUA	Navajo Tribe Utilities Authority
URS	URS Corporation
Sithe	Sithe Global Power, LLC.
Sy	Specific Yield
Ť	Transmissivity
USGS	U.S. Geological Survey

1.0 INTRODUCTION BACKGROUND

Miller Brooks Environmental, Inc. (Miller Brooks) has prepared this report on behalf of Sithe Global Power, LLC (Sithe) for the proposed Desert Rock Power Plant located in the Four Corners Area New Mexico (see Figure 1). This report is based upon a previous study conducted by URS Corporation (URS) in 2005, the results of which are summarized in the report titled *Final Well Impact Report* (2005). This report was prepared to incorporate new geologic and hydrogeologic data within the study area that were not included in the previous study by URS (2005). New data evaluated from the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) OCD Image Database included 31 oil/gas test well logs obtained by the United States Department of the Interior (EMNRD, 2006). The logs were evaluated to more accurately approximate the depth to the top of and thickness of the Morrison Formation, which is the primary water-bearing formation identified for the withdrawal of groundwater for the Desert Rock Power Plant (URS, 2005).

Miller Brooks also assessed and reconstructed the previous groundwater flow model created by URS (2005) to incorporate the new oil/gas test well data. Other revisions to the model included expansion of the model domain, re-layering and re-contouring the model layers, inserting an additional model layer, modifying aquifer input parameters, and simulating two new alternative well field locations per our revised well field placement recommendation memorandum to Sithe (Miller Brooks, 2006). A series of model simulations were then completed to provide more accurate predictions of impacts associated with the withdrawal of groundwater from the proposed water well fields (see Figure 1).

New and/or revised figures, tables and appendices prepared by Miller Brooks and contained within this report include the following:

Figure 1	Site Reference and Well Location Map, Desert Rock Energy Project
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Figure 5	Geologic Cross Section B-B'
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New Appendix

Appendix A Study Area Oil and Gas Test Well Logs, United States Department of the Interior

2.0 STATEMENT OF PURPOSE AND SCOPE

The purpose of this study is to demonstrate that: (1) sufficient groundwater resources appear physically available in the Morrison Formation for the proposed water uses at the proposed Desert Rock Power Plant and (2) to predict the impact, or drawdown, associated with the withdrawal of groundwater from new production wells completed within the Morrison Formation for the life cycle of the plant (40 years). This report describes elements of demand, supply, and impacts associated with the anticipated groundwater withdrawal.

The area evaluated for this study encompasses approximately 1,420 square miles of the San Juan Basin in the northwestern portion of New Mexico, south of Shiprock and Farmington (Figure 1). The average annual water consumption demand of the proposed Desert Rock Power Plant is estimated at 4,950 acre-feet per year (af/yr), or 3,070 gallons per minute (gpm), of continuous flow for a period of 40 consecutive years (Sithe, 2005). The groundwater supply portion of this study includes an evaluation of hydrogeologic conditions to assess the local groundwater resource availability within the Morrison Formation. The impact portion of this study was estimated using the U.S. Geological Survey's (USGS) MODFLOW-96 (Harbaugh and McDonald, 1996), which models groundwater systems in 3-dimension. The MODFLOW-96 code is widely accepted in the hydrogeologic professional community as a valid numerical model to simulate groundwater flow. The graphical interface Groundwater Vistas® (Rumbaugh and Rumbaugh, 1996) was used to generate the drawdown impact contours included in this report. Modifications made by Miller Brooks to the previous groundwater flow model (URS, 2005), as well as the new model drawdown predictions, are also included in this report.

3.0 PROJECTED GROUNDWATER DEMAND

The average water demand for the Desert Rock Energy Project for the first 40 years of operation is calculated to be 4,950 af/yr (equivalent to 3,070 gpm of continuous flow) (Sithe, 2005). This is the volume used in our well impact modeling simulations for the revised well locations, labeled: *Proponent's Preferred Water Well Field B "Location 1,"* and *Proponent's Preferred Water Well Field B "Location 2,"* on the attached Figure 1. Both well field locations were evaluated independently in the revised groundwater flow model and assumed a total of ten new production wells, each pumping at a rate of 307 gpm. This is consistent with the number of wells and flow rate used during the previous modeling analysis (URS, 2005).

4.0 <u>ELEMENTS OF GROUNDWATER SUPPLY</u>

4.1 REGIONAL HYDROGEOLOGIC CONDITIONS

The study area is located in the northwestern portion of the San Juan Basin in Northwestern New Mexico. A map showing the regional geology and major structural features of the San Juan Basin is provided as Figure 2. The San Juan Basin lies on the eastern edge of the Colorado Plateau and extends from northwestern New Mexico into portions of northeastern Arizona along the New Mexico/Arizona border, southwestern Colorado, and the southeastern most corner of Utah. The San Juan Basin is approximately 140 miles wide by 200 miles long, and covers a total area of 21,600 square miles (Dam, et al., 1990) (Figure 2).

The San Juan Basin is a northwest-treading asymmetrical structural depression that formed during the Laramide Orogeny (Late Cretaceous-Early Tertiary) at the eastern edge of the Colorado Plateau. Structural boundaries of the basin consist of large, elongate, domal uplifts; low, marginal platforms; and abrupt monoclines (Kelley, 1951). The most distinctive structural feature in the study area is the Hogback Monocline (see Figure 2), which forms a sharp boundary between the marginal platforms and the central basin. The interior of the basin contains a thick sequence of sedimentary rocks from Cambrian to Tertiary in age, but primarily Pennsylvanian through Tertiary in age. These rocks consist primarily of stacked sequences of sandstone, siltstone, mudstone, limestone, and shale. A generalized stratigraphic sequence of the San Juan Basin is included in Figure 2. These rock sequences dip from the basin margins toward the center of the basin. Older sedimentary rocks outcrop around the basin margins and are successively overlain by younger sedimentary sequences toward the basin center. The maximum stratigraphic thickness of sedimentary rocks in the basin is over 14,000 feet (as recorded in an oil well) at the center of the basin, east of the Hogback Monocline (Fassett and Hinds, 1971).

To illustrate subsurface geology of the project study area, four geologic cross sections are provided as Figures 4 through 7. Cross sections A-A' (Figure 4) (URS, 2005) and B-B' (Figure 5) trend north-south across the project area. Both of these cross sections illustrate the relatively flat subsurface layering of geologic deposits in the project study area. However, as illustrated in the west-east trending cross sections C-C' (Figure 6) and D-D' (Figure 7), the geologic sequences dip steeply downward to the east side of the Hogback Monocline as a result of the structural deformation caused by the monocline.

The primary source of groundwater in the San Juan Basin is derived from wells completed within surficial valley-fill deposits of Quaternary age and sandstones of Tertiary, Cretaceous, Jurassic, and Triassic age (Stone, et al., 1983). Although in less quantities, groundwater is also encountered and has been used historically for uranium mining operations in the San Juan Basin from wells completed in the Morrison Formation and the overlying Dakota Sandstone (Stone, et al., 1983). Groundwater from these two formations also supplies a significant portion of water to drinking water wells in the study area that are owned by the Navajo Nation Department of Water Resources (NNDWR, 2005). Groundwater in sandstone sequences in the San Juan Basin is generally under confined conditions, resulting in an artesian flow from wells completed in these units.

4.2 LOCAL HYDROGEOLOGIC CONDITIONS

Groundwater in the study area is encountered primarily at or near the land surface, under artesian conditions (see Figure 3). Artesian flow from a well occurs when it penetrates an aquifer that is overlain by an impermeable or semi-impermeable unit, such as shale. Under pressure (or confined/semi-confined conditions), that water will rise to the well's *potentiometric surface* without the use of a pump. *Potentiometric surface* is defined as the surface representative of the level to which water will rise in a well cased in the aquifer (Fetter, 1988). Figure 3 provides contours of the potentiometric surface of waters in the Morrison Formation within the study area.

There are three distinct geologic units that supply the majority of groundwater to existing wells completed in the study area (NNDWR, 2005). With increasing depth these include: the Gallup Sandstone, the Dakota Sandstone, and the Morrison Formation. According to NNDWR (2005) records, NNDWR wells located in the study area that are screened within these three geologic units produce the majority of their water from the Morrison Formation (see Figure 1 and Table 4). Within the Morrison Formation, the Westwater Canyon Member (a coarse sequence of sandstone, conglomeritic sandstone, and mudstone) is considered the most productive unit (Stone, et al., 1983) (Dam, et al., 1990).

A revised structural contour map depicting the approximate depth to the top of the Morrison Formation and the approximate thickness of the Morrison Formation are provided as Figures 8 and 9, respectively. The revised maps were generated by incorporating lithologic data from oil/gas test well logs recorded with the United States Department of the Interior (EMNRD, 2006). Copies of those logs are included as Appendix A. Miller Brooks evaluated a total of 31 oil/gas test well logs, 25 of which

encountered and/or recorded penetrating (or being drilled through) the bottom of the Morrison Formation.

Based upon the revised contouring, the depth to the top of the Morrison Formation in the study area is between 1,000 and 6,000 feet below ground surface (bgs) (Figure 8), with a relatively uniform estimated thickness ranging from 850 to 1,050 feet (Figure 9). The depth to the Morrison Formation near the proposed Desert Rock Power Plant increases steeply from west to east as it crosses the western edge of the Hogback Monocline (see Figures 6, 7 and 8).

The Morrison Formation was selected as the target aquifer for this well impact analysis because: (1) it has a relatively higher water-bearing potential than the overlying formations in the study area, and (2) withdrawal of groundwater from the Morrison Formation should minimize drawdown to existing wells in the study area. In addition, groundwater within the Morrison Formation is confined to semiconfined by the overlying Mancos Shale, which has a relatively low permeability. Therefore, impacts to wells completed in geologic units above the Mancos Shale (i.e., in the Gallup Sandstone) should be impacted much less than wells completed in geologic units below the Mancos Shale (i.e., the Dakota Sandstone and the Morrison Formation). However, actual drawdown impacts associated with withdrawing groundwater from the proposed well field for the Desert Rock Power Plant cannot be precisely approximated until a test well has been constructed and appropriately tested.

Recharge to the Morrison Aquifer is derived from precipitation infiltration, streamflow infiltration along outcrop areas, and from downward leakage (Dam, et al., 1990). The revised modeling analysis (as well as the previous model constructed by URS, 2005) takes into account downward leakage from the semi-confining geologic unit above the Morrison sediments (see Section 5.2 for more detail).

4.3 EXISITNG WELLS

Existing wells in the study area are presented in Figure 1. Wells shown include those registered with the New Mexico Office of the State Engineer (2005) (wells in red), wells with records maintained by the NNDWR (2005) (wells in blue), and oil/gas test wells recorded by the United States Department of the Interior and maintained by the New Mexico EMNRD (2006) (wells in green). The logs of the new wells evaluated by Miller Brooks in this revised report (oil/gas test wells) are included for reference in Appendix A. Also depicted on Figure 1 is the relative contribution of Morrison Aquifer-derived groundwater to wells completed in portions of the Morrison Formation (where data are available) for

wells maintained and recorded by the NNDWR. Well inventory tables showing construction and well use information for wells in the study area are included as Tables 1 through 3. Geologic information compiled from logs kept for NNDWR wells and the oil/gas test wells evaluated in this study are included as Tables 4 and 5, respectively.

4.4 AQUIFER CHARACTERISTICS

The transmissivity (T) of an aquifer describes its ability to transmit groundwater to a pumping well. The T value is dependent upon the hydraulic conductivity (K) and the saturated thickness (b) of the aquifer, and is defined by the relationship T = Kb. Transmissivity is expressed in gallons per day per foot (gpd/ft), or square feet per day (ft²/d). Hydraulic conductivity is expressed in units of gallons per day per square foot (gpd/ft²), or feet per day (ft/d).

The most reliable estimates of aquifer transmissivity and hydraulic conductivity are derived from well aquifer test data. In the study area however, aquifer test data are limited. In addition, much of the aquifer test data come from wells that are screened in multiple aquifers and not exclusively the Morrison Formation. Given available historic test data, transmissivity of the Morrison Formation in the study area ranges from 2 to 95 ft²/d. The K values in the Morrison Formation in the study area range from 0.025 to 0.39 ft/d (Stone, et al., 1983; Riser, et al., 1984; Dam, et al., 1990). A map showing the approximate distribution of transmissivity values for the Morrison Aquifer in the study area is presented in Figure 10.

As documented in the previous *Final Well Impact Report* (URS, 2005), to further evaluate T and K values, URS analyzed data from a step test and a 15-hour constant rate aquifer test conducted in September 2002 at the "Sanostee Wash Well." This well is screened in multiple aquifers, which produce water from the Morrison Formation, the Dakota Sandstone, and the Gallup Sandstone (NNDWR, 2005), with its primary water production coming from the Morrison Formation. This well is located just north of the Little River on the Sanostee Chapter, as shown on Figure 7. Our analysis of the recovery test data resulted in a T value of 69 ft²/d, and a K value of 0.345 ft/day (K=T/b) (see Figure 11) (Theis, 1935). Although this well is not screened exclusively in the Morrison Formation, the calculated T and K values fall within the published values obtained from other well test data for wells constructed in the Morrison Aquifer, thus providing a useful comparison.

As shown in Figure 6, the revised aquifer thickness (b) of the Morrison Formation in the study area ranges from 850 feet to just over 1,050 feet, and 950 to 1,050 feet in the Proponent's Preferred Alternative Water Well Field B, "Location 1" and "Location 2" analysis (Stone, et al. 1983; Dam, et al., 1990; NNDWR, 2005) (see Figure 9). As previously discussed in Section 1.0, the approximate thickness of the Morrison Formation for this study was revised by incorporating data from oil/gas test well logs (see Table 3 and Appendix A).

4.5 WATER QUALITY

Data collected from numerous oil/gas test wells throughout the San Juan Basin between 1948 and 1986 (kept in the NWIS and Petroleum Information Corporation's databases) were complied and evaluated by Dam, et al., (1990). The number of samples collected, along with the minimum, maximum, and median value for selected chemical constituents from those wells is provided as Table 5. As can be seen in Table 5, water chemistry (for the constituents listed) in the Morrison Formation is quite variable.

To further evaluate water quality in the Desert Rock Energy Project study area, on May 11, 2005, URS and Sithe personnel collected water quality samples from three wells that are documented as producing water from the Morrison Formation (NNDWR, 2005). Wells sampled included 12K-320, 12T-633, and 12T-655 (see Figure 1). Two of the three wells sampled (12T-633 and 12T-655) are domestic drinking water wells owned and operated by the Navajo Tribe Utilities Authority (NTUA) and are located on the Sanostee Navajo Chapter. The third well sampled (12K-320) is a stock irrigation well owned and maintained by NTUA, located approximately ten miles north of the Sanostee Navajo Chapter (NNDWR, 2005) (see Figure 1). The analytical results from that sampling effort are summarized in Table 4. Copies of all laboratory analytical data are provided in Appendix B. Generally speaking, the water sampled is of good quality. No analytes tested were detected above Federal Primary or Secondary Drinking Water standards, and the water appears to be of acceptable quality (for the constituents tested) for use at the proposed Desert Rock Power Plant.

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5.0 IMPACT ANALYSIS

5.1 MODEL ASSUMPTIONS

The groundwater model code selected for this study was the USGS's MODFLOW-96 (Harbaugh and McDonald, 1996), with the advanced graphical interface Groundwater Vistas® (Rumbaugh and Rumbaugh, 1996). The MODFLOW-96 code is widely accepted in the hydrogeologic professional community as a valid numerical model to simulate groundwater flow in three dimensions. The graphical interface Groundwater Vistas® (Rumbaugh and Rumbaugh, 1996) was used to generate the drawdown impact contours included in this report. To provide a more accurate simulation of subsurface geology, Miller Brooks utilized the computer program Surfer® (Version 8.0) to digitize and import the bottom elevations of Model Layers 1, 2 and 3. Figure 12 provides a model boundary map, and Figures 13 and 14 depict the revised model in cross section (3-dimensional) view.

The following modifications were made to the previous groundwater flow model (URS, 2005) for this revised well impact report.

- The model domain area was moved to the east, to encompass the Proponent's Preferred Alternative Water Well Field B, "Location 1" and "Location 2" (see Figure 12).
- The total model domain area was increased from 144 square miles with a total of 280 columns, 279 rows, and 78,120 model calculation cells, to 384 square miles with a total of 300 columns, 322 rows, and 289,800 model calculation cells (see Figure 12).
- Grid spacing ranged from 247.5 by 165 feet in the simulated well field area to 990 by 660 feet elsewhere. The previous model (URS, 2005) grid spacing ranged from 100 ft² in the simulated well field area to 500 ft² elsewhere.
- One additional model layer was added to the revised model for a total of three model layers. The previous model (URS, 2005) had only two model layers. The layers in the revised model represent the following geologic units:
 - Layer 1 (the upper model layer) represents the Mancos Shale and all other geologic units above it. Because the Mancos Shale is relatively thick in the study area (~ 800 feet) and has a relatively low permeability, modeling the geologic units above it would likely have no appreciable

impact on the drawdown simulations for this study and therefore units above the Mancos Shale were not modeled as separate units. Layer 1 was modeled as a semi-confined layer, unchanged from the previous model (URS, 2005). The bottom of Layer 1 was contoured in the revised model as a variable thickness unit, according to the new cross sections included in this report (see Figures 5 through 7). The bottom of Model Layer 1 was computed by taking the revised approximate depth to the top of the Morrison Formation (see Figure 8) and adding the Model Layer 2 uniform thickness (220 feet) to it (see next two bullet items for more). Figures 13 and 14 show a cross section view of the model layers. The previous model (URS, 2005) set a uniform thickness for Layer 1 at 650 feet and was modeled with a flat bottom.

- Layer 2 represents the Dakota Sandstone, which lies above the Morrison Formation in the model domain area (see Figures 5 through 7). This layer was added to the revised model because the Dakota Sandstone has a much higher permeability than the overlying Mancos Shale and also supplies some groundwater to many of the neighboring NNDWR wells (see Table 4) located west of Highway 491. Therefore, Miller Brooks felt it was prudent to simulate the Dakota Sandstone in the revised model, to more accurately predict drawdown from the proposed well fields. Model Layer 2 was assigned a uniform thickness of 200 feet and is based upon the revised cross sections (Figures 5 through 7).
- Layer 3 (the bottom model layer) represents the Morrison Formation, the target water-bearing unit for this study. The Morrison Formation lies beneath the Mancos Shale and the Dakota Sandstone and ranges in thickness in the model domain area from 950 to 1,050 feet (see Figure 9). The previous model (URS, 2005) set a uniform thickness of 1,000 feet for the Morrison Formation (previously Model Layer 2) (URS, 2005) and modeled it with a flat bottom. In the revised model, Miller Brooks digitized and imported the bottom elevation of Model Layer 3 by taking the revised approximate depth to the top of the Morrison Formation (see Figure 8) and adding it to the approximate thickness of the Morrison Formation (see Figure 9) in the model domain area, to derive a variable bottom elevation of Model Layer 3 (see Figures 13 and 14 for model cross section views).
- → Model Layer 1 The hydraulic conductivity (K) and horizontal to vertical conductivity ratio (K_h/K_v) of 0.0567 ft/day and 10:1 were unchanged from the previous model (URS, 2005). These values were obtained from the most conservative

published values for shale (Spitz and Moreno, 1996), as site-specific values for this unit were unavailable.

- Model Layer 2 The K value and K_h/K_v ratio were set at 0.3225 ft/day and 2:1, respectively. The K value was obtained by taking the average thickness of the Dakota Sandstone unit (200 feet) and dividing it by the average T value in the model domain area (64.5 ft²/day). The average T value and K_h/K_v ratio were obtained from the most conservative published values for a medium- to fine-grained sandstone (Spitz and Moreno, 1996), felt to be most representative of the Dakota Sandstone.
- → Model Layer 3 The distinct K "zones" equaling 0.075 and 0.175 ft/day, were input into the model per the K array shown in Figure 15. The K values were obtained by taking median thickness of the Morrison Formation (1,000 feet) and dividing it by the median T values in the model domain area (75 ft²/day and 125 ft²/day) (see Figure 10 for T array). The K_h/K_v ratio was changed from a 10:1 to 2:1 ratio based upon our reevaluation of published values for a medium to fine grained sandstone (Spitz and Moreno, 1996).
- The storage coefficient for Layers 1 through 3 was set at 0.00011 (unitless). This value represents the median published values from nine wells tested in the Morrison Aquifer (Dam, et al., 1990), and is unchanged from the previous model values for Layers 1 and 2 (URS, 2005).
- The specific yield (Sy) for Model Layers 1, 2 and 3 were set at 0.03, 0.24 and 0.24 (unitless), respectively. The Sy value from the previous model (URS, 2005) was unchanged for Model Layer 1. The Sy value for Model Layer 3 (Layer 2 in the previous model) was changed from 0.2 to 0.24 (unitless). All values were selected from published values for corresponding geologic units (Spitz and Moreno, 1996).
- Two well fields consisting of 10 equally spaced pumping wells, identified as Proponent's Preferred Alternative Water Well Field B, "Location 1" and "Location 2" (see Figure 12) were input into the revised model. The previous model simulated one well field with 10 equally spaced pumping wells located west of Highway 491 and south of Table Mesa (URS, 2005). Well spacing was unchanged at 0.25 mile.
- The simulated wells are screened entirely and exclusively in the Morrison Formation (Model Layer 3 in the revised model, Model Layer 2 in the previous model). This remains unchanged from the previous model (URS, 2005).
- Each simulated well pumps at a continuous rate of 442,080 gallons per day (gpd), or 307 gpm, for a period of 14,600 consecutive days, or 40 years. This equals the total annualized project demand of 4,950 af/yr (Sithe, 2005), or 3,070 gpm. This rate remains unchanged from the previous model (URS, 2005). Each well field ("Location")

1" and "Location 2") was run independently in the revised model to evaluate the impact at both locations separately.

- A specified head boundary was set along the northern and southern model boundaries according to the potentiometric surface contour map compiled for the Morrison Aquifer (Figure 3)¹. This remains unchanged from the previous model (URS, 2005).
- No boundaries were set along the western and eastern model boundaries to allow the model to create its own east-west flow gradient. The previous model (URS, 2005) had set no flow boundaries along the western and eastern model to prevent an east-west gradient influence on the model. The updated boundary condition should allow for a more realistic simulation of groundwater flow in the modeled area.
- The revised model does not simulate recharge from perennial flow along the reach of the Chaco River in the model area, due to a lack of stream flow gauge data. This remains unchanged from the previous model (URS, 2005).

5.2 MODEL PREDICTIONS

Drawdown predictions following 20 years and 40 years of continuous pumping are graphically presented in Figures 16 through 19 for well field "Location 1" and "Location 2." The drawdown predictions for both locations are as follows:

Proponent's Preferred Alternative Water Well Field B, "Location 1"

Based upon the input assumptions presented in Section 5.1, the maximum cumulative 20-year and 40-year impact resulting from the annual projected withdrawal of 4,950 af/yr, or 3,070 gpm, for "Location 1" is predicted to be 1,425 and 1,520 feet, respectively (see Figures 16 and 17). The maximum drawdown predicted occurs at the center of the simulated pumping wells and decreases with distance from the well centers. The model-predicted 50-foot impact radius extends approximately 4.25 and 6.0 miles, respectively, from the center of the simulated well field (see Figures16 and 17). According to available well set data, there are no water production wells located within the model-predicted 50-foot drawdown contour. The model-predicted drawdown presented in Figures 16 and 17

¹ Regional groundwater declines in the Morrison aquifer were not factored into the specified head boundaries due to insufficient water level data in the study area.

Proponent's Preferred Alternative Water Well Field B, "Location 2"

Based upon the input assumptions presented in Section 5.1, the maximum cumulative 20-year and 40-year impact resulting from the annual projected withdrawal of 4,950 af/yr, or 3,070 gpm, for "Location 2" is predicted to be 1,540 and 1,655 feet, respectively (see Figures 18 and 19). The maximum drawdown predicted occurs at the center of the simulated pumping wells and decreases with distance from the well centers. The model-predicted 50-foot impact radius extends approximately 4.0 and 6.1 miles, respectively, from the center of the simulated well field (see Figures18 and 19). According to available well set data, there are no water production wells located within the model-predicted 50-foot drawdown contour. The model-predicted drawdown presented in Figures 18 and 19 represents the decline in the potentiometric surface relative from the land surface.

6.0 <u>CONCLUSIONS</u>

Our conclusions from this revised well impact study are as follows:

 Given the assumptions presented herein, our revised modeling analyses predicts a maximum decline in potentiometric surface of 1,655 feet (at Well Field B, "Location 2") after 40 years of continuous pumping at the Desert Rock Power Plant's estimated demand requirements (4,950 af/yr, or 3,070 gpm).

Because groundwater occurs under confined conditions, resulting in artesian flow from wells, and the depth to the Morrison Formation is approximately 4,500 feet in both of the modeled well field areas (Well Field B, "Location 1" and "Location 2") (Figure 8), a decline in potentiometric surface of 1,655 feet bgs is unlikely to de-water the Morrison Formation.

2. Assuming the modeling simulations are representative of actual subsurface conditions, the results of our modeling analysis would indicate that sufficient local groundwater resources are available from the Morrison Aquifer (at the modeled locations) to meet the projected withdrawal demands for the proposed Desert Rock Power Plant for the next 40 years.

The revised model, consistent with the previous version (URS, 2005), incorporates conservative aquifer parameters, thus representing what we believe should represent a worst-case scenario. Our revised analysis also simulates more realistic subsurface conditions than the previous model (URS, 2005) by contouring the major geologic units in the study area using available oil/gas well test data (see Appendix A), and by simulating more realistic groundwater flow boundary conditions. In addition, the revised model includes the addition of one new model layer (Layer 2, which represents the Dakota Sandstone). This new model layer is of significance because the Dakota Sandstone contributes water production to many of the surrounding NNDWR wells (see Table 5).

3. The revised model predicts that there should be no loss greater than 50 feet in the potentiometric surface to existing water production wells in the study area (wells included in Figure 1) after 40 years of continuous pumping from either one of the simulated well fields at the Desert Rock Power Plant's estimated demand requirements (4,950 af/yr, or 3,070 gpm).

7.0 <u>RECOMMENDATIONS</u>

Based upon the results of this revised well impact study, Miller Brooks makes the following recommendations:

- Due to the limited aquifer test data from wells screened solely in the Morrison Aquifer in the vicinity of the simulated well fields, Miller Brooks recommends drilling and constructing one large-diameter production well and at a minimum, one adjacent smaller diameter monitor well. Testing would include evaluating local lithology (drill cuttings and geophysical logging) to identify the most productive zones (i.e., secondary flow from fracture zones), long-term aquifer production potentials (from aquifer testing data), and zonal water quality of varying formations (from zonal sampling). The preferred location for well test drilling was previously identified as Proponent's Preferred Alternative Water Well Field B, "Location 1" (Miller Brooks, 2006).
- 2. The test data obtained from the drilling and testing of the new production well and monitor well should be used to further refine the modeling analysis. In addition to modifying aquifer parameters, wells may be added, removed, repositioned, or modified (i.e., pump rates, screen interval, etc.) in the model. Predictions from the revised model would be more indicative of potentiometric surface drawdown of the Morrison Aquifer than the previous modeling analysis suggests.
- 3. Water quality data from the current seeps and springs (sampling is currently underway by URS and others) should be compared to available water quality data from the Morrison Formation to determine if there is a geochemical connect or disconnect between spring water and water derived from the Morrison Formation. These data will help determine whether or not there is a hydrologic connection between surface water (seeps and springs) and water derived from the Morrison Formation Formation in the study area.

8.0 <u>REFERENCES</u>

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TABLES

Table 1Well Inventory - Navajo Nation Department of Water ResourcesDesert Rock Energy ProjectNew Mexico

MAP WELL NO.	WELL ID	OPERATOR	USE	FINISH DATE	TOTAL WELL DEPTH (feet)	DEPTH TO WATER (feet bgs)	CASING DIAMETER 1 DEPTH (inches) (ft bgs)	CASING DIAMETER 2 (inches)	DEPTH (ft bgs)	CASING DIAMETER 3 (inches)	DEPTH (ft bgs)	CASING DIAMETER 4 (inches)	DEPTH (ft bgs)	DEPTH INTERVAL (fi bgs)	t WELL CASING	DEPTH INTERVAL (ft bgs)	WELL CASING	DEPTH INTERVAL (f bgs)	t WELL CASING	DEPTH INTERVAL (ft bgs)	WELL CASING	DEPTH INTERVAL (ft bgs)	WELL CASING
12K-300A	12K-300A	UNKNOWN	UNK	Sep-28	2170	N/A	12.50 0-92	10.00	0-503	8.25	0-1270	6.63	0-1693	1492-1529	Screen	1574-1668	Screen	1693-1717	Blank				
12K-309	12K-309	UNKNOWN	UNK	Sep-40	1640	N/A	8.25 0-40	7.00	40-829	5.00	829-1456	4.00	1456-1570	1570-1640	Blank								
12K-320	12K-320	TRIBE O&M	DOM	Aug-60	1992	ART	10.00 0-826	8.62	826-1340	6.62	1332-1400	6.62	1349-1800	1745-1992	Screen								
12K-357	12K-357	TRIBE O&M	LIV	Jul-57	1464	ART	9.63 0-909	13.75	0-60.5					909-1464	Blank								
12R-84	12R-84	TRIBE O&M	DOM	N/A	1430	75	2.00 N/A	8.00	0-1136					1136-1430	Blank								
12T-508	12T-508	TRIBE O&M	DOM	Jul-59	1172	ART	8.63 0-950	10.00	0-212					950-1172	Blank								
12T-511	12T-511	UNKNOWN	LIV	Oct-59	4274	ART	4.50 0-2000							773-779	Screen	903-909	Screen	1680-1686	Screen	1699-1711	Screen	1781-1799	Screen
12T-519	12T-519	TRIBE O&M	LIV	Oct-60	1287	N/A	8.62 0-271	7.50	270-1035					1035-1287	Blank								
12T-520	12T-520	TRIBE O&M	DOM	Feb-61	1850	ART	16.00 0-46	12.00	0-530	9.62	0-1339	7.00	844-1482	1482-1777	Blank								
12T-548	12T-548	TRIBE O&M	LIV	Mar-27	2013	ART	6.62 0-1062	5.19	1062-1733					1733-2013	Blank								
12T-551	12T-551	TRIBE O&M	LIV	Jul-63	7833	ART	9.62 0-1637							1637-1950	Blank								
12T-587	12T-587	NTUA	DOM	Feb-67	1140	N/A	8.62 0-1140							782-821	Screen	840-850	Screen	900-940	Screen	1080-1090	Screen	1114-1128	Screen
12T-618	12T-618	NTUA	DOM	May-05	1440	N/A	8.62 N/A																
12T-618A	12T-618A	TRIBE O&M	LIV	Jan-81	1447	ART	16.00 0-67	12.62	0-742	8.62	790-1447			720-740	Screen	800-940	Screen	1040-1060	Screen	1180-1210	Screen	1250-1320	Screen
12T-620	12T-620	TRIBE O&M	LIV	Sep-77	2034	ART	2.38 0-1200							1200-2034	Blank								
12T-628	12T-628	TRIBE O&M	DOM	Dec-78	2597	ART	8.62 0-109	2.38	109-1827					1827-2597	Blank								
12T-629	12T-629	TRIBE O&M	LIV	Nov-77	2520	ART	2.38 0-1764							1764-2511	Blank								
12T-630	12T-630	TRIBE O&M	LIV	Nov-77	2300	ART	2.38 0-1512							1512-2300	Blank								
12T-632	12T-632	TRIBE O&M	LIV	Oct-77	2518	ART	6.63 0-200	2.00	0-1750					1743-2518	Blank								
12T-633	12T-633	NTUA	MUN	Oct-77	2125	ART	2.38 0-1512	6.62	0-17					1512-2125	Blank								
12T-634	12T-634	TRIBE O&M	DOM	Nov-77	1908	ART	6.62 0-200	2.37	0-1407					1407-1908	Blank								
12T-635	12T-635	TRIBE O&M	LIV	Oct-77	2108	N/A	6.62 0-35	2.37	35-1176					1176-2108	Blank								
12T-640	12T-640	TRIBE O&M	LIV	Dec-77	2349	N/A	2.00 0-1491	6.25	0-120					1491-2349	Blank								
12T-643	12T-643	TRIBE O&M	DOM	Jul-78	1632	N/A	2.37 0-1323	6.60	2-101					1323-1632	Blank								
12T-644	12T-644	TRIBE O&M	LIV	Jul-78	1912	0	2.00 0-1386							1386-1912	Blank								
12T-646	12T-646	TRIBE O&M	UNK	Jul-78	1748	N/A	2.38 0-1281	6.62	0-79					1281-1748	Blank								
12T-647	12T-647	TRIBE O&M	LIV	Aug-78	1912	46	2.37 0-1407	6.88	0-85					1407-1912	Blank								
12T-649	12T-649	TRIBE O&M	LIV	Aug-78	2047	N/A	2.75 0-1595	6.62	0-96					1575-2047	Blank								
12T-651	12T-651	TRIBE O&M	LIV	Aug-78	1691	N/A	6.62 0-96	2.37	96-1281					1281-1691	Blank								
12T-654	12T-654	TRIBE O&M	UNK	Sep-78	1656	0	2.38 0-1302	6.63	0-92					1302-1656	Blank								
12T-703	12T-703	TRIBE O&M	LIV	N/A	1940	N/A	N/A 0-1940							180-460	Screen	830-940	Screen	1140-1400	Screen	1520-1940	Screen		
13K-207	13K-207	TRIBE O&M	LIV	Sep-52	1165	429	6.00 0-885							885-1120	Blank								
13P-522	13P-522	TRIBE O&M	DOM	Aug-73	5250	N/A	20.00 0-100	5.50	0-5000					5000-5250	Blank								
13T-514	13T-514	TRIBE O&M	DOM	Oct-68	1368	263	6.62 0-1337	10.75	0-42					450-460	Screen	484-498	Screen	660-666	Screen	1040-1042	Screen	1337-1368	Blank
BRNHM WSW1	BRNHM WSW1	EPNG	LIV	Aug-73	5250	702	20.00 0-100	5.50	0-5000					5000-5250	Blank								

Data Source: Navajo Nation Department of Water Resource, Water Management Branch Well Database-April 2005

Table adapted from the Final Well Impact Report (URS, 2005)

Abbreviations:	Use Codes:	<u>.</u>
ART = Artesian (flow encountered above ground surface)	DOM	Domestic
ft bgs = feet below ground surface	LIV	Livestock
N/A = Not Available	MUN	Municipal

Table 2 Well Inventory - U.S. Department of the Interior Desert Rock Energy Project, New Mexico

MAP WELL NO.	WELL ID	OPERATO R	USE	TWS	RNG	SEC	Q	Q2	Q3	FINISH DATE	TOTAL WELL DEPTH (ft bgs)	DEPTH TO Morrison (ft bgs)	Thickness of Morrison (ft)
9241	I-149-Ind-9241	N/A	EXP	25N	15W	28				3/23/1955	10020	4540	938
9239	I-149-Ind-9239	N/A	EXP	25N	16W	4				6/12/1957	10100	4703	929
6375	14-20-0603-6375	N/A	EXP	28N	16W	27				9/7/1961	3956	NE	NE
2023	14-20-0603-2203	N/A	EXP	29N	15W	18				11/27/1963	11133	4838	874
512	14-20-603-512	N/A	EXP	26N	19W	30				1/15/1957	7136	910	1062
8103	14-20-0603-8103	N/A	EXP	26N	18W	27				6/5/1974	6355	970	1030
2070	14-20-603-2070	N/A	EXP	26N	17W	11				12/22/1957	4830	4750	UTC
736	14-20-603-736	N/A	EXP	26N	15W	14				11/16/1956	5388	5386	UTC
741	14-20-603-741	N/A	EXP	26N	14W	34				11/23/1962	11282	5938	924
7267	14-20-0603-7267	N/A	EXP	28N	19W	27				7/27/1963	7715	1215	857
1043	14-20-603-1043	N/A	EXP	28N	17W	27				12/21/1956	1690	1677	UTC
6367	14-20-603-6367	N/A	EXP	27N	16W	9				1/17/1962	4737	NE	NE
2203	14-20-603-2203	N/A	EXP	27N	14W	4				11/27/1961	5887	5835	UTC
8461	I-149-Ind-8461	N/A	EXP	28N	17W	34				10/18/1955	1692	1672	UTC
57	I-89-Ind-57	N/A	EXP	27N	17W	3				11/29/1961	7114	1552	1063
58	I-89-Ind-58	N/A	EXP	29N	16W	19				6/16/1958	7036	960	1055
8185	I-149-Ind-8185	N/A	EXP	29N	17W	12				9/15/1954	7215	1088	1047
5035	14-20-603-5035	N/A	EXP	26N	18W	17				12/26/1963	6694	993	952
5019	14-60-603-5019	N/A	EXP	26N	18W	9				6/22/1966	6500	1075	1025
5263	14-20-603-5263	N/A	EXP	26N	16W	36				8/7/1963	4820	4808	UTC
2165	14-20-603-2165	N/A	EXP	24N	17W	1				5/21/1962	4335	4308	UTC
2079	14-20-603-2079	N/A	EXP	27N	15W	12				5/17/1962	5020	NE	NE
6378	14-20-603-6378	N/A	EXP	28N	16W	13				4/16/1964	4360	NE	NE
2013	14-20-603-2013	N/A	EXP	28N	15W	23				7/27/1962	4716	NE	NE
2206	14-20-603-2206	N/A	EXP	28N	14W	22				6/9/1959	5904	5884	UTC
2024	14-20-603-2024	N/A	EXP	29N	16W	23				10/13/1964	4212	4160	UTC
5024	14-20-603-5024	N/A	EXP	29N	17W	31				6/12/1980	7300	1546	1068
2173	14-20-603-2173	N/A	EXP	24N	14W	6				10/14/1957	5311	5243	UTC
6723	I-149-Ind-6723	N/A	EXP	29N	17W	25				8/10/1956	7300	1225	1073
2202	14-20-603-2202	N/A	EXP	24N	17W	5				3/1/1959	3815	NE	NE
744	14-20-603-744	N/A	EXP	25N	14W	3				4/22/1960	5913	5908	UTC

Data Source: New Mexico Energy, Minerals, and Natural Resources Department OCD Image Database, 2006.

Note: Duplicate wells, and wells with no completion date or a completion depth are excluded from this table and the well location map. Table adapted from the Final Well Impact Report (URS, 2005)

Footnotes:

ft bgs = feet below ground surface NE = Not Encountered UTC = Unable to Calculate Use Codes:

EXP Exploration Wells

Table 3Well Inventory - New Mexico Office of the State Engineer
Desert Rock Energy Project, New Mexico

MAP WELL NO.	WELL ID	OPERATOR	USE	TWS	RNG	SEC	Q	Q2	Q3	FINISH DATE	TOTAL WELL DEPTH (ft bgs)	DEPTH TO WATER (ft bgs)
1	SJ 00027	N/A	NOT	29N	15W	1	1	2	3	10/17/1950	1005	ART
17	SJ 00226	N/A	DOM	29N	14W	7	1	1	3	5/20/1977	100	50
19	SJ 00248	N/A	DOM	29N	16W	4	3	4	3	4/23/1977	35	10
21	SJ 00257	N/A	DOM	29N	16W	3	2	2	3	4/25/1978	32	20
22	SJ 00258	N/A	SAN	29N	16W	3	2	2	4	4/26/1978	34	20
23	SJ 00264	N/A	STK	29N	16W	9	0	0		5/2/1977	35	10
24	SJ 00291	N/A	DOM	29N	15W	12	2	1		8/11/1977	0	110
27	SJ 00357	N/A	DOM	29N	16W	4	4	2	2	6/22/1977	45	29
29	SJ 00373	N/A	DOM	29N	16W	4	2	0		6/25/1977	55	30
30	SJ 00376	N/A	DOM	29N	14W	8	4		4	8/19/1977	80	50
31	SJ 00417	N/A	DOM	29N	14W	17	2	3		8/4/1977	38	7
32	SJ 00418	N/A	DOM	29N	14W	17	2	3		8/11/1977	35	7
33	SJ 00437	N/A	DOM	26N	18W	10	2	1	1	8/18/1977	2063	ART
34	SJ 00451	N/A	DOM	29N	14W	7	4	1	3	9/7/1977	39	24
35	SJ 00465	N/A	DOM	26N	18W	35	3	1	-	9/8/1977	2034	ART
37	SJ 00477	N/A	STK	25N	18W	7	2	1		9/16/1977	2125	ART
39	SJ 00521	N/A	STK	29N	17W	21	1	4		11/2/1977	2300	ART
41	SJ 00522	N/A	STK	29N	17W	23	3	1		11/3/1977	2520	ART
46	SJ 00754	N/A	STK	26N	18W	4	3	2	2	7/26/1978	1748	ART
48	SJ 00778	N/A	STK	26N	18W	33	3	1		8/3/1978	1912	ART
49	SJ 00780	N/A	STK	26N	18W	19	3	4	4	8/3/1978	2047	ART
50	SJ 00781	N/A	STK	26N	18W	14	3	1	1	8/7/1978	1728	ART
52	SJ 00782	N/A	STK	25N	18W	17	3	1	1	8/8/1978	1691	ART
54	SJ 00783	N/A	STK	26N	18W	14	3	4	4	8/5/1978	2211	ART
56	SJ 00788	N/A	DOM	29N	14W	8	4	4		5/2/1979	100	70
57	SJ 00793	N/A	STK	26N	18W	5	4	3	2	9/4/1978	1656	ART
59	SJ 00815	N/A	MON	30N	15W	27	4	3	3	10/17/1978	231	ART
60	SJ 00815	N/A	MON	30N	15W	22	3	3	4	10/14/1978	240	ART
71	SJ 00846	N/A	MON	25N	15W	28	2	1		4/11/1979	593	50
72	SJ 00846	N/A	MON	25N	15W	28	2	1		4/26/1979	593	50
73	SJ 00861	N/A	DOM	29N	16W	2	1	2		3/31/1947	21	10
74	SJ 00862	N/A	DOM	29N	16W	2	1	1		2/28/1970	257	25
75	SJ 00863	N/A	DOM	30N	16W	36	3	3		5/31/1945	45	35
76	SJ 00864	N/A	DOM	29N	16W	2	1	2		3/31/1974	21	10
77	SJ 00865	N/A	DOM	29N	16W	2	1	1		8/31/1960	45	30
78	SJ 00866	N/A	IRR	30N	16W	36	3	1		3/31/1974	90	60
79	SJ 00876	N/A	DOM	30N	16W	35	2	4		6/30/1979	77	57
82	SJ 00931	N/A	DOM	29N	15W	4	3	4		4/25/1979	44	22
84	SJ 00944	N/A	DOM	30N	14W	3	1	3		6/6/1979	61	5
85	SJ 00947	N/A	DOM	29N	14W	8	0	0		5/18/1979	370	275
97	SJ 01016	N/A	DOM	29N	15W	11	3	4		7/22/1979	25	4
98	SJ 01034	N/A	DOM		14W	18	2	2	1	11/12/1979	28	16
100	SJ 01136	N/A	DOM	29N	15W	12	2	2		3/26/1980	150	40
102	SJ 01223	N/A	DOM	29N	15W	13	2	4		7/21/1980	30	12
103	SJ 01237	N/A	DOM	29N	15W	6	4		4	8/7/1980	30	14
106	SJ 01259	N/A	DOM	29N	14W	17	1	0		9/9/1980	31	3
107	SJ 01266	N/A	STK	26N	18W	15	3	2		8/25/1980	N/A	N/A
111	SJ 01407	N/A	DOM	29N	14W	6	3	3	3	7/5/1981	70	52
112	SJ 01568	N/A	DOM	29N	14W	7	1	1		5/24/1982	72	30
113	SJ 01569	N/A	SAN	29N	15W	11	1	2		5/27/1982	60	45
117	SJ 01883	N/A	DOM	29N	14W	6	2	3		9/5/1984	75	30
119	SJ 02010	N/A	DOM	29N	15W	11	1	3		11/9/1985	25	9
122	SJ 02036	N/A	DOM	29N	14W	7	4	0		4/22/1986	62	15
123	SJ 02055	N/A	DOM	29N	14W	5	1	1		5/12/1987	150	90
125	SJ 02063	N/A	DOM	29N	15W	11	1	3		6/17/1986	26	ART
126	SJ 02071	N/A	DOM	29N	15W	12	1	1	2	10/30/1986	51	32
129	SJ 02081	N/A	DOM	29N	15W	12	1	1		11/11/1986	42	30
130	SJ 02143	N/A	DOM	29N	14W	17	1	2	4	1/29/1988	36	26

Table 3 Well Inventory - New Mexico Office of the State Engineer Desert Rock Energy Project, New Mexico

MAP WELL NO.	WELL ID	OPERATOR	USE	TWS	RNG	SEC	Q	Q2	Q3	FINISH DATE	TOTAL WELL DEPTH (ft bgs)	DEPTH TO WATER (ft bgs)
131	SJ 02165	N/A	DOM	29N	15W	11	1	1	1	3/5/1988	40	25
136	SJ 02375	N/A	DOM	29N	15W	12	3	2		1/18/1993	38	8
137	SJ 02392	N/A	PUB	30N	16W	35	2	4		8/10/1992	133	ART
138	SJ 02639	N/A	DOM	29N	14W	7	3	3	4	6/14/1995	18	6
141	SJ 02790	N/A	DOM	29N	14W	18	2	2	4	N/A	40	ART
142	SJ 02927	N/A	DOM	29N	14W	6	2	3	2	5/3/1999	150	ART
143	SJ 02976	N/A	DOM	29N	15W	11	3	2	3	1/24/2000	29	8
144	SJ 02999	N/A	DOM	29N	14W	17	1	4	1	8/22/2000	42	28
145	SJ 03012	N/A	DOM	29N	16W	2	1	4	1	6/22/2000	27	12
146	SJ 03015	N/A	DOM	30N	16W	35	4	3	4	6/22/2000	43	17
147	SJ 03074	N/A	DOM	29N	14W	9	1	3	1	N/A	70	ART
148	SJ 03139	N/A	DOM	29N	16W	1	1	4	2	N/A	45	ART
149	SJ 03232	N/A	DOM	30N	16W	35	4	3	2	N/A	40	ART

Data Source: New Mexico Office of the State Engineer, Water Administration and Technical Engineering Resource

System (W.A.T.E.R.S.) GIS Database, updated 3/17/03

Note: Duplicate wells, and wells with no completion date or a completion depth are excluded from this table and the well location map. Table adapted from the Final Well Impact Report (URS, 2005)

Footnotes:

ART = Artesian (flow encountered above ground surface) ft bgs = feet below ground surface N/A = Not Available

Use Codes:

DOM Domestic one household

- IRR Irrigation
- MON Monitoring well
- NOT No use of right or pod
- PUB Construction of public works
- SAN Sanitary in conjuction with a commercial use
- STK Livestock watering

Table 4

Geologic Units Summary for Water Wells Logged by the Navajo Nation Department of Water Resources (Used for Preparing Cross Section A-A')

Desert Rock Energy Project, New Mexico

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
12K-300A	DAKOTA	SANDSTONE	1080	1210	130	S		
1210 000/0	MORRISON	SANDSTONE/SHALE	1210	1717	507	Р	>507	NE
	MANCOS	SHALE	0	662	662	N		
12K-309	GALLUP	SANDSTONE	662	698	36	N		
1210000	MANCOS	SHALE	698	1502	804	N		
	DAKOTA	SANDSTONE/SHALE	1502	NR	??	P	NE	NE
	MANCOS	SHALE	0	460	460	N		
	GALLUP	SANDSTONE	460	540	80	N		
	MANCOS	SHALE	540	1300	760	N		
12K-320	DAKOTA	SANDSTONE/SHALE	1300	1470	170	S		
	BRUSHY BASIN	SANDSTONE/SHALE	1470	1530	60	Р		
	MORRISON	SANDSTONE/SHALE	1530	1985	455	Р		
	BLUFF	SANDSTONE	1985	NR	??	N	>515	NE
12K-357	DAKOTA	SANDSTONE	1370	NR		Р	NE	NE
12R-84	DAKOTA	SANDSTONE	880	1130	250	U		
1211-04	MORRISON	SANDSTONE/SHALE	1130	NR	??	U	UTC	NE
	MANCOS	SHALE	20	100	80	N		
	GALLUP	SANDSTONE	100	185	85	N		
12T-508	MANCOS		185	955	770	N		
	DAKOTA	SANDSTONE	955	1114	159	P		
	BRUSHY BASIN	SANDSTONE/SHALE	1114	NR	??	S	UTC	NE

Table 4

Geologic Units Summary for Water Wells Logged by the Navajo Nation Department of Water Resources (Used for Preparing Cross Section A-A')

Desert Rock Energy Project, New Mexico

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
12T-511	ALLUVIUM	SAND/GRAVEL	0	20	20	N		
	MENEFEE	SANDSTONE/SHALE	20	2006	1986	Р		
	POINT LOOKOUT	SANDSTONE/SHALE	2006	2275	269	Ν		
	MANCOS UPPER	SHALE	2275	3175	900	N		
	GALLUP	SANDSTONE	3175	3382	207	N		
	MANCOS LOWER	SHALE	3382	4112	730	Ν		
	DAKOTA	SANDSTONE/SHALE	4112	NR	??	Ν	NE	NE
12T-519	DAKOTA	SANDSTONE	1025	1255	230	Р		
121 010	MORRISON	SANDSTONE/SHALE	1255	NR	??	S	UTC	NE
	ALLUVIUM	SAND/GRAVEL	0	30	30	N		
	MANCOS UPPER	SHALE	30	248	218	N		
	GALLUP	SANDSTONE	248	330	82	N		
	MANCOS LOWER	SHALE	330	895	565	Ν		
		SHALE	895	1015	120	Ν		
12T-520	DAKOTA	SANDSTONE/SHALE	1015	1180	165	Ν		
	BRUSHY BASIN	MUDSTONE	1180	1342	162	Ν		
	WESTWATER CANYON	SANDSTONE	1342	1485	143	S		
	RECAPTURE	SILTSTONE	1485	1610	125	S		
	SALTWASH	SILTSTONE	1610	1760	150	Р		
	BLUFF	SANDSTONE	1760	1795	35	U		
	SUMMERVILLE	SANDSTONE/SHALE	1795	NR	??	Ν	615	143
	MANCOS	SHALE	710	821	111	N		

Table 4

Geologic Units Summary for Water Wells Logged by the Navajo Nation Department of Water Resources (Used for Preparing Cross Section A-A')

Desert Rock Energy Project, New Mexico

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ⁸
12T-548	DAKOTA	SANDSTONE	821	1024	203	Р		
	MORRISON	SANDSTONE/SHALE	1024	NR	??	P	UTC	NE
12T-551	MANCOS	SHALE	0	1410	1410	Ν		
	DAKOTA	SANDSTONE	1410	1580	170	N		
	BRUSHY BASIN	SANDSTONE/SHALE	1580	1785	205	N		
	WESTWATER CANYON	SANDSTONE	1785	2083	298	Р		
	RECAPTURE	SILTSTONE	2083	NR	??	Ν	>503	298
12T-587	MENEFEE	SANDSTONE/SHALE	0	1052	1052	Р		
121-007	POINT LOOKOUT	SANDSTONE/SHALE	1052	NR	??	S	NE	NE
12T-618A	MENEFEE	SANDSTONE/SHALE	0	1274	1274	S		
	POINT LOOKOUT	SANDSTONE/SHALE	1274	NR	??	Р	NE	NE
	MANCOS	SHALE	5	800	795	N		
12T-620	DAKOTA	SANDSTONE/SHALE	800	1040	240	N		
	BRUSHY BASIN	SANDSTONE/SHALE	1040	1175	135	N		
	WESTWATER CANYON	SANDSTONE	1175	1390	215	P		
	RECAPTURE	SANDSTONE/SHALE	1390	1960	570	S	>920	215

Geologic Units Summary for Water Wells Logged by the Navajo Nation Department of Water Resources (Used for Preparing Cross Section A-A') Desert Rock Energy Project, New Mexico

Thickness of Thickness of Morrison Westwater Contribution to Depth to Top Depth to Bottom Formation Canyon Member Well **Common Formation** of unit of unit **Unit Thickness** (feet)^B Well No. Name Lithology (ft bgs) (feet) **Production**^A (feet)^B (ft bgs) MANCOS UPPER SHALE 0 615 N 615 GALLUP SANDSTONE/SHALE 615 785 170 N SHALE MANCOS LOWER 785 1460 675 N 12T-628 DAKOTA SANDSTONE/SHALE 1460 145 N 1605 SANDSTONE/SHALE 205 N BRUSHY BASIN 1605 1810 SANDSTONE 340 P 1810 WESTWATER CANYON 2150 RECAPTURE SANDSTONE/SHALE 2150 NR ?? S >545 340 MANCOS UPPER SHALE 460 460 N 0 GALLUP SANDSTONE/SHALE 460 720 260 N SHALE MANCOS LOWER 720 1290 570 N 12T-629 DAKOTA SANDSTONE/SHALE 1290 1508 218 N **BRUSHY BASIN** SANDSTONE/SHALE 1508 1710 202 S WESTWATER CANYON SANDSTONE 1710 1928 218 P SANDSTONE/SHALE RECAPTURE 1928 NR ?? S >420 218

Geologic Units Summary for Water Wells Logged by the Navajo Nation Department of Water Resources (Used for Preparing Cross Section A-A')

Desert Rock Energy Project, New Mexico

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	MANCOS UPPER	SHALE	0	250	250	N		
	GALLUP	SANDSTONE/SHALE	250	470	220	N		
	MANCOS LOWER	SHALE	470	1070	600	N		
	ДАКОТА	SANDSTONE	1070	1330	260	N		
12T-630	BRUSHY BASIN	SANDSTONE/SHALE	1330	1478	148	N		
	WESTWATER CANYON	SANDSTONE	1478	1745	267	S		
	RECAPTURE	SANDSTONE/SHALE	1745	2124	379	S		
	SALTWASH	SANDSTONE/SHALE	2124	2222	98	S		
	BLUFF	SANDSTONE	2222	NR	??	S	>892	267
	MANCOS UPPER	SHALE	0	418	418	N		
	GALLUP	SANDSTONE	418	570	152	N		
	MANCOS LOWER	SHALE	570	1370	800	N		
12T-632	DAKOTA	SANDSTONE	1370	1546	176	N		
121 002	BRUSHY BASIN	SANDSTONE/SHALE	1546	1890	344	S		
	WESTWATER CANYON	SANDSTONE	1890	2100	210	Р		
	RECAPTURE	SANDSTONE/SHALE	2100	2443	343	S		
	BLUFF	SANDSTONE	2443	NR	??	U	>897	210

Geologic Units Summary for Water Wells Logged by the Navajo Nation Department of Water Resources (Used for Preparing Cross Section A-A')

Desert Rock Energy Project, New Mexico

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	GALLUP	SANDSTONE	0	59	59	N		
	MANCOS LOWER	SHALE	59	895	836	N		
	DAKOTA	SANDSTONE	895	1080	185	N		
12T-633	BRUSHY BASIN	SANDSTONE/SHALE	1080	1270	190	S		
	WESTWATER CANYON	SANDSTONE	1270	1547	277	Р		
	RECAPTURE	SANDSTONE/SHALE	1547	1930	383	S		
	BLUFF	SANDSTONE	1930	NR	??	S	>850	277
	MANCOS LOWER	SHALE	375	918	543	N		
	DAKOTA	SANDSTONE	918	1030	112	N		
12T-634	BRUSHY BASIN	SANDSTONE/SHALE	1030	1375	345	N		
	WESTWATER CANYON	SANDSTONE	1375	1525	150	Р		
	RECAPTURE	SANDSTONE/SHALE	1525	NR	??	S	>495	150

Geologic Units Summary for Water Wells Logged by the Navajo Nation Department of Water Resources (Used for Preparing Cross Section A-A')

Desert Rock Energy Project, New Mexico

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
	GALLUP	SANDSTONE	335	440	105	N		
	MANCOS LOWER	SHALE	440	905	465	N		
	DAKOTA	SANDSTONE/SHALE	905	1085	180	N		
12T-635	BRUSHY BASIN	SANDSTONE/SHALE	1085	1350	265	S		
	WESTWATER CANYON	SANDSTONE	1350	1670	320	Р		
	RECAPTURE	SANDSTONE/SHALE	1670	1955	285	S		
	SUMMERVILLE	SANDSTONE/SHALE	1955	NR	??	S	870	320
12T-640	MORRISON	SANDSTONE/SHALE	1487	NR	??	Р	UTC	NE
	MANCOS LOWER	SHALE	0	840	840	N		
12T-643	DAKOTA	SANDSTONE	840	1040	200	N		
121-040	MORRISON	SANDSTONE/SHALE	1065	NR	??	Р		
	WESTWATER CANYON	SANDSTONE	1345	1618	273	Р	>553	273
12T-647	MORRISON	SANDSTONE/SHALE	1323	NR	??	Р	UTC	NE
	MANCOS	SHALE	0	230	230	N		
	GALLUP	SANDSTONE	230	450	220	N		
12T-649	MANCOS LOWER	SHALE	450	1134	684	N		
	DAKOTA	SANDSTONE	1134	1354	220	N		
	MORRISON	SANDSTONE/SHALE	1354	NR	??	Р	υтс	NE

Geologic Units Summary for Water Wells Logged by the Navajo Nation Department of Water Resources (Used for Preparing Cross Section A-A') Desert Rock Energy Project, New Mexico

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B	Thickness of Westwater Canyon Member (feet) ^B
12T-651	MORRISON	SANDSTONE/SHALE	1060	1691	631	P	UTC	NE

Data Source: Navajo Nation Department of Water Resource, Water Management Branch Well Database-April 2005

Table adapted from the Final Well Impact Report (URS, 2005)

Abbreviations:	Footnotes:
NR = Not Recorded	^A Contribution to Well Production: P = Primary; S = Secondary; N = None
ft bgs = feet below ground surface	^B Thickness of Morrison Formation: NE = Formation Not Encountered; UTC = Unable to calculate

^CThickness of Westwater Canyon Membern: NE = Member Not Encountered; UTC = Unable to calculate

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B
	LEWIS	SHALE	0	100	100	N	
	CLIFFHOUSE	SANDSTONE	100	540	440	N	
	MENEFEE	SANDSTONE/SHALE	540	2348	1808	N	
	POINT LOOKOUT	SANDSTONE	2348	2518	170	N	
	MANCOS	SHALE	2518	3520	1002	N	
	GALLUP	SANDSTONE	3520	3885	365	N	
	SANASTEE	SANDSTONE/SHALE	3885	3962	77	N	
	LOWER MANCOS	SHALE	3962	4220	258	N	
	GREENHORN	LIMESTONE	4220	4282	62	N	
	GRANEROS	SHALE	4282	4320	38	N	
	DAKOTA	SANDSTONE	4320	4540	220	S	
9241	MORRISON	SANDSTONE/SHALE	4540	5478	938	P	
JZ4 I	TODILITO	LIMESTONE	5478	5496	18	N	
	ENTRADA	SANDSTONE	5496	5600	104	N	
	CHINLE	SHALE	5600	6717	1117	N	
	SHINARUMP	CONGLOMERATE	6717	6870	153	N	
	MOENKOPI		6870	7045	175	N	
	DECHELLY	SANDSTONE	7045	7585	540	N	
	CUTLER		7585	8750	1165	N	
	RICE		8750	8950	200	N	
	HERMOSA		8950	9625	675	N	
	MOLAS		9625	9686	61	N	
	LEADVILLE	LIMESTONE	9686	9776	90	N	
	ELBERT		9776	10020	244	N	938

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B
	FRUITLAND	SHALE	0	??	??	N	
	PICTURED CLIFFS	SANDSTONE	??	??	??	N	
	CLIFFHOUSE	SANDSTONE	??	??	??	N	
	MENEFEE	SANDSTONE/SHALE	??	2517	??	N	
	POINT LOOKOUT	SANDSTONE	2517	2667	150	N	
	MANCOS	SHALE	2667	4367	1700	N	
	GREENHORN	LIMESTONE	4367	4470	103	N	
	DAKOTA	SANDSTONE	4470	4703	233	S	
	MORRISON	SANDSTONE/SHALE	4703	5632	929	P	
9239	TODILITO	LIMESTONE	5632	5650	18	N	
3233	ENTRADA	SANDSTONE	5650	5820	170	N	
	WINGATE	SANDSTONE	5820	6280	460	N	
	CHINLE	SHALE	6180	7064	884	N	
	SHINARUMP		7064	7162	98	N	
	MOENKOPI		7162	7180	18	N	
	DECHELLY	SANDSTONE	7180	7663	483	N	
	CUTLER		7663	8860	1197	N	
	HERMOSA		8860	9846	986	N	
	MOLAS		9846	9990	144	N	
	LEADVILLE	LIMESTONE	9990	10100	110	N	929
		SHALE	0	493	493	N	
	MESA VERDE GROUP	SANDSTONE/SHALE	493	2522	2029	N	
6375	MANCOS	SHALE	2522	3626	1104	N	
	GALLUP	SANDSTONE/SHALE	3626	3785	159	N	
	SANASTEE	SANDSTONE	3785	> 3956	>171	N	NE

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness o Morrison Formation (feet) ^B
	MENEFEE	SANDSTONE/SHALE	1522	2510	988	N	
	POINT LOOKOUT	SANDSTONE	2510	2858	348	N	
	MANCOS	SHALE	2858	3787	929	N	
	GALLUP	SANDSTONE	3787	4192	405	N	
	SANASTEE		4192	4666	474	N	
	DAKOTA	SANDSTONE	4666	4838	172	S	
	MORRISON	SANDSTONE/SHALE	4838	5712	874	P	
	SUMMERVILLE		5712	5825	113	N	
	ENTRADA	SANDSTONE	5825	5953	128	N	
	WINGATE	SANDSTONE	5953	6270	317	N	
2023	CHINLE	SHALE	6270	7153	883	N	
2020	MOENKOPI		7153	7304	151	N	
	DECHELLY	SANDSTONE	7304	7740	436	N	
	ORGAN ROCK		7740	9058	1318	N	
	HERMOSA		9058	9810	752	N	
	PARADOX		9810	10640	830	N	
	MOLAS		10640	10750	110	N	
	LEADVILLE	LIMESTONE	10750	10904	154	N	
	OURAY	LIMESTONE	10904	10946	42	N	
	ELBERT		10946	11060	114	N	
	MCCRACKEN		11060	11133	73	N	
	GRANITE WASH		11133	??	??	N	8

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B
	DAKOTA	SANDSTONE	748	910	162	S	Ĩ
	MORRISON	SANDSTONE/SHALE	910	1992	1082	P	
	TODILITO	LIMESTONE	1992	2018	26	N	
	ENTRADA	SANDSTONE	2018	2754	736	N	
512	CHINLE	SHALE	2754	3772	1018	N	
	COCONINO	SANDSTONE	3772	5560	1788	N	
	HERMOSA		5560	6409	849	N	
	MOLAS		6409	6463	54	N	
	LEADVILLE	LIMESTONE	6463	6762	299	N	1082
	DAKOTA	SANDSTONE	748	970	222	S	
	MORRISON	SANDSTONE/SHALE	970	2000	1030	P	
	TODILITO	LIMESTONE	2000	2021	21	N	
	ENTRADA	SANDSTONE	2021	??	??	N	
	DECHELLY	SANDSTONE	3673	4293	620	N	
8103	ORGAN ROCK		4293	5450	1157	N	
	HONAKER TRAIL		5450	5897	447	N	
	ISMAY		5897	6007	110	N	
	DESERT CREEK		6007	6103	96	N	
	АКАН		6103	6178	75	N	
	BARKER CREEK		6178	??	??	N	1030

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B
	MESA VERDE GROUP	SANDSTONE/SHALE	0	2672	2672	N	
	UPPER MANCOS	SHALE	2672	3601	929	N	
	GALLUP	SANDSTONE	3601	3800	199	N	
	MIDDLE MANCOS	SHALE	3800	4021	221	N	
2070	SANASTEE	SANDSTONE/SHALE	4021	4061	40	N	
2010	LOWER MANCOS	SHALE	4061	4433	372	N	
	GREENHORN	LIMESTONE	4433	4490	57	N	
	GRANEROS	SHALE	4490	4532	42	N	
	DAKOTA	SANDSTONE	4532	4750	218	S	
	MORRISON	SANDSTONE/SHALE	4750	> 4830	> 80	P	> 80
	PICTURED CLIFFS	SANDSTONE	704	820	116	N	
	LEWIS	SHALE	820	1000	180	N	
	CLIFFHOUSE/MENEFEE	SANDSTONE/SHALE	1000	3180	2180	N	
	POINT LOOKOUT	SANDSTONE	3180	3330	150	N	
736	MANCOS	SHALE	3330	4264	934	N	
	GALLUP	SANDSTONE	4264	4658	394	N	
	SANASTEE	SANDSTONE/SHALE	4658	5122	464	N	
	DAKOTA	SANDSTONE	5122	5385	263	S	
	MORRISON	SANDSTONE/SHALE	5386	5388	>2	P	>2

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B
	POINT LOOKOUT	SANDSTONE	3678	3818	140	N	
	MANCOS	SHALE	3818	4758	940	N	
	GALLUP	SANDSTONE	4758	5178	420	N	
	SANASTEE	SANDSTONE/SHALE	5178	5560	382	N	
	GREENHORN	LIMESTONE	5560	5614	54	N	
	GRANEROS	SHALE	5614	5646	32	N	
	DAKOTA	SANDSTONE	5646	5938	292	S	
	MORRISON	SANDSTONE/SHALE	5938	6862	924	P	
	TODILITO	LIMESTONE	6862	6890	28	N	
741	ENTRADA	SANDSTONE	6890	7018	128	N	
	CHINLE	SHALE	7018	8034	1016	N	
	SHINARUMP	CONGLOMERATE	8034	8068	34	N	
	MOENKOPI		8068	8274	206	N	
	DECHELLY	SANDSTONE	8274	8613	339	N	
	CEDAR MESA		8613	9848	1235	N	
	HERMOSA		9848	11055	1207	N	
	MOLAS		11055	11136	81	Ν	
	LEADVILLE	LIMESTONE	11136	11250	114	N	
	IGNACIO	QUARTZITE	11250	??	??	Ν	924

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B
	UPPER MANCOS	SHALE	0	200	200	N	
	GALLUP	SANDSTONE	200	??	??	N	
	LOWER MANCOS	SHALE	??	952	??	N	
	GREENHORN	LIMESTONE	952	1020	68	N	
	GRANEROS	SHALE	1020	1068	48	N	
	DAKOTA	SANDSTONE	1068	1215	147	S	
	MORRISON	SANDSTONE/SHALE	1215	2072	857	P	
	SUMMERVILLE		2072	2270	198	N	
	TODILITO	LIMESTONE	2270	2287	17	N	
7267	ENTRADA	SANDSTONE	2287	??	??	N	
1201	CHINLE	SHALE	??	3696	??	N	
	MOSS BACK		3696	3731	35	N	
	SHINARUMP	CONGLOMERATE	3731	3948	217	N	
	DECHELLY	SANDSTONE	3948	4443	495	N	
	ORGAN ROCK		4443	5742	1299	N	
	HERMOSA		5742	6471	729	N	
	PARADOX		6471	6973	502	N	
	MOLAS		6973	7096	123	N	
	LEADVILLE	LIMESTONE	7096	7292	196	N	
	ELBERT		7292	??	??	N	857
	MANCOS	SHALE	0	645	645	N	
	GALLUP	SANDSTONE	645	995	350	N	
1043	SONASTEE	SANDSTONE/SHALE	995	1360	365	N	
1043	GREENHORN	LIMESTONE	1360	1475	115	N	
	DAKOTA	SANDSTONE	1475	1677	202	S	
	MORRISON	SANDSTONE/SHALE	1677	>1690	>13	Р	>13

Well No.	Common Formation Name	Lithology	Depth to Top of unit (ft bgs)	Depth to Bottom of unit (ft bgs)	Unit Thickness (feet)	Contribution to Well Production ^A	Thickness of Morrison Formation (feet) ^B
	UNDESIGNATED		0	780	780	N	
	CHACRA		780	1125	345	N	
	CLIFF HOUSE	SANDSTONE	1125	1348	223	N	
	MENEFEE	SHALE	1348	2555	1207	N	
	POINT LOOKOUT	SANDSTONE	2555	2736	181	N	
6367	MANCOS	SHALE	2736	3622	886	N	
0007	GALLUP	SANDSTONE	3622	3810	188	N	
	BISTI SAND	SAND	3810	4132	322	N	
	SANASTEE	SANDSTONE/SHALE	4132	4518	386	N	
	GREENHORN	LIMESTONE	4518	4578	60	N	
	GRANEROS	SHALE	4578	4617	39	N	
	DAKOTA	SANDSTONE	4617	4737	>120	S	NE
	PICTURED CLIFFS	SANDSTONE	1020	1270	250	N	
	LEWIS	SHALE	1270	1859	589	N	
	CLIFF HOUSE	SANDSTONE	1859	??	??	N	
2203	MENEFEE	SHALE	??	3575	??	N	
2203	POINT LOOKOUT	SANDSTONE	3575	3835	260	N	
	MANCOS	SHALE	3835	5648	1813	N	
	DAKOTA	SANDSTONE	5648	5835	187	S	
	MORRISON	SANDSTONE/SHALE	5835	>5887	>52	P	>52

Data Source: U.S. Department of Interior Oil/Gast Test wells, New Mexico EMNRD OCD Image Database, 2006

Abbreviations:

Footnotes:

NR = Not Recorded

^AContribution to Well Production: P = Primary; S = Secondary; N = None^BThickness of Morrison Formation: NE = Formation Not Encountered

ft bgs = feet below ground surface

General Water Chemistry of Groundwater Produced from the Morrison Formation in the San Juan Basin Desert Rock Energy Project, New Mexico

Sample ID	Number of Samples	Minimum	Maximum	Medium
Specific Conductance (us/cm)	52	300	6000	876
pH (standard units)	42	6.6	9.4	8.2
Temperature (degrees Celcius)	39	6	76	23
Calcium	56	0.8	550	14
Magnesium	53	0.1	62	3.7
Sodium	57	43	1,400	140
Potassium	56	0.1	24	2
Alkalinity (total as calcium carbonate)	56	10	670	200
Sulfate	52	6	3,200	160
Chloride	57	1.1	1,200	8.9
Flouride	50	0.2	7.7	0.6
Dissolved Solids (sun of constituents)	52	116	5,000	614
Nitrate (as nitrogen)	21	0.1	4.5	0.4
Arsenic	19	0.01	0.21	0.02
Iron	41	0.03	20	0.6
Manganese	21	0.01	19	0.1
Selenium	17	0.01	0.02	0.01
Radium-226	17	0.07	110	0.62

Explanation:

us/cm = microsiemens per centimeter at 25 degrees Celcius

Dissolved constituents are reported in milligrams per liter unless noted otherwise

Radium-226 is reported in picocuries per liter

Water Quality Data from Sanostee Tribe Water Wells Sampled on May 11, 2005 Desert Rock Energy Project, New Mexico

General Chemistry

Sample ID	рН	Temperature (° C)	TDS (mg/L)	Turbidity (NTU)	Conductivity (µmhos/cm)	Nitrite (mg/L)	Nitrate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)
12K-655	8.1	21.8	160	< 0.02	270	< 0.020	< 0.50	4.5	< 0.50	6.6
12K-633	9	21.5	170	< 0.02	280	< 0.020	< 0.50	< 2.5	< 0.50	3.4
12K-320	9.3	21.5	300	< 0.02	500	< 0.020	< 0.50	4.5	< 0.50	52

Metals

Sample ID	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Calcium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)
12K-655	< 0.10	< 0.0030	< 0.0040	0.14	< 0.10	< 0.0030	20	< 0.010	< 0.010	0.29
12K-633	< 0.10	< 0.0030	< 0.0040	0.014	< 0.10	< 0.0030	1.3	< 0.010	< 0.010	< 0.010
12K-320	< 0.10	< 0.0030	< 0.0040	0.036	< 0.10	< 0.0030	1.1	< 0.010	< 0.010	< 0.010

Radiochemical Activity

Sample ID	Gross Alpha Activity Method 600 / 00-02 (pCi/L)	Radium 226 Activity Method 903.1 (pCi/L)	Radium 228 Activity Method 904 (pCi/L)	Total Radium (pCi/L)
12K-655	9.8 +/- 1.5	< 0.3	< 0.4	< 0.4
12K-633	12. +/- 1.7	< 0.3	< 0.3	< 0.3
12K-320	0.9 +/- 0.4			

Table adapted from the Final Well Impact Report (URS, 2005)

Explanation:

TDS = Total Dissolved Solids

< = below laboratory reporting limits

mg/L = milligrams per Liter

µmhos/cm = micromhos per centimeter

Water Quality Data from Sanostee Tribe Water Wells Sampled on May 11, 2005 Desert Rock Energy Project, New Mexico

General Chemistry (continued)

Sample ID		Alkalinity	(mg/L)	
	Bicarbonate	Carbonate	Hydroxide	Total
12K-655	140	< 20	< 20	140
12K-633	89	50	< 20	140
12K-320	100	97	< 20	200

Metals (continued)

Sample ID	lron (mg/L)	Lead (mg/L)	Magnesium (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Silica (mg/L)	Silver (mg/L)	Sodium (mg/L)	Thallium (mg/L)
12K-655	< 0.10	0.0095	4	< 0.010	2.8	< 0.0030	19	< 0.0050	34	< 0.0020
12K-633	< 0.10	< 0.0030	< 1.0	< 0.010	< 2.0	< 0.0030	16	< 0.0050	68	< 0.0020
12K-320	< 0.10	< 0.0030	< 1.0	< 0.010	< 2.0	< 0.0030	18	< 0.0050	110	< 0.0020

Table 8 Groundwater Modeling Input Data for Revised and Original Models Desert Rock Energy Project, New Mexico

Layer	Geologic Unit	Thickness (ft)	Notes	K (ft/day)	Kh/KV ratio	Storage coeff.	SY (I)
1	Mancos Shale	variable	Leaky upper aquitard	0.0567	10 to 1	0.00011	0.03
2	Dakota Sandstone	200	aquifer	0.3225	2 to 1	0.00011	0.24
3	Sandstone (Morrison Fm)	1000	aquifer	K1 = 0.075, K2 = 0.125	2 to 1	0.00011	0.24
# Wells	Pump Rate (gpm)	Time pumping (days)	Well Spacing	Screen Interval			
10	307	7300 (stress period 1)	1/4 mile	All of layer 3			
	total = 3070	14600 (stress period 2)		1000 feet			
Head Boundary (type)	gradient						
Specified Head	0.0014 ft/ft						
Model area	# columns	# rows	# cells	min cell size	max cell size		
24x16 miles	300	322	96600 per layer	247.5 x 165 ft	990 x 660 ft		

Original Model Input (URS 2005)

Layer	Geologic Unit	Thickness (ft)	Notes	K (ft/day)	Kh/KV ratio	Storage coeff.	SY (I)
Layer			NOLES	K (IVUAY)		coen.	31 (i)
1	Mancos Shale	650	Leaky upper aquitard	0.0567	10 to 1	0.00011	0.03
	Sandstone						
2	(Morrison Fm)	1000	aquifer	0.2	10 to 1	0.00011	0.2
# Wells	Pump Rate (gpm)	Time pumping (days)	Well Spacing	Screen Interval			
10	307	14600	1/4 mile	All of layer 2			
Head Boundary (type)	gradient						
Specified Head	0.0038 ft/ft						
Model area	# columns	# rows	# cells	min cell size	max cell size		
12X12 miles	280	279	78120	100 X 100 feet	500 X 500 ft		

APPENIDX A

STUDY AREA OIL AND GAS TEST WELLS, UNITED STATES DEPARTMENT OF THE INTERIOR

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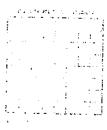
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UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

Allertos	Window	Rock,	Arizona
Tribe	Nava jo		
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LESSEE'S MONTHLY REPORT OF OPERATIONS State New Mexico County San Juan Preid Wildcat

Agent's Address P. O. Box 1611	Company THE PURE OIL COMPANY
Casper, Wyoming	Company THE PURE OIL COMPANY Signed
Phone 234-1565	Agent's title District Office Manager

TED. AND	т₩₽.	BAN G E	WELL ND.	Days Prded.	Barreis of Oil	Gravity	Cu. ft. of Gas (in thousands)	Gallons of Gasoline Recovered	Bbls, water (If none, so state)	REHARK IF defiling, depth; if she dete and result of tes content of	S it dawn, cause; it for ascallae res
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	\ .				Summervill	le	5,712' (-		Ouray		4 (-5561)
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COAFIDENTIAL UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

Alloct	e Window Rock, Ariz.
	Navajo
Lassa	7, 14-20-603-2023

LESSEE'S MONTHLY REPORT OF OPERATIONS

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kona			234-	1565	جود وحرور وقادموه ورود والمروحة مد		Ag	ent's title	District	Office Manager
VE. ANC	тур,	BAND 2	WELL NG.	Days Prdcd.	Barrels of Oil	Gravity	Cu. ft. of Gas (in thousands)	Gallons of Gasoline Recovered	Bbls. water (If none, so state)	REMARKS (Fdniling, depth) if shut down, cause; deto and result of text for gespling content of gas
SW : 18 rajo T	29N ract		l ell	-0 No- 1	0		0		None	Drilled 5,808' to 10,073'. DST NO. 2 - 9984' - 10,073' Ismay Section of Paradox. Tool open
					drilling ISI 36/30 40/30 min DST NO. 3	fluid minu utes; - 10	no gas, r tes; IF 22/ Bottom hol 181'-10,21	ic oil. 5 minute 1e temp. 6' - Par	Pressure: s; FF 27, 240°. Di adox. To	30 minutes. Opened with a very weak Recovered 764' of 1 H & FH 4879; 30 minutes; FSI rilled to 10,216'. ool opened with weak roughout test. Tool
					open a to 1,071' of (high pre FH 4876; Bottom ho 10,284' - a very we	tal o dril ssure ISI 4 le ter 10,3 ak blo	f 95 minute ling fluid but low vo 73/30 min. mp. 230. I 71' - Parad w. Recove	s, 90 mi of which lume gas FSI 495 rilled t lox. Too red 60'	nutes tes 900' was pocket) 30 min. 5 10,371 1 open 30 of drill	ting. Recovered highly gas cut Pressures: IH 49 IF 215; FF 430; DST NO. 4 - D minutes. Opened w ing fluid. Pressure 112/30 min.; FH 499
	EP 2	3 19	ED 103		Bottom ho SAMPLE TO Summervil Todilto Entrada	le ter PS:	5,712" (- 5,815" (- 5,825" (-	Drilled 369) 472) 482)	to 10,589	5 - INCOMPLÉTE.
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UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

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LOCATE WELL CORRECTLY							

Sole 011 6 thefining Company Avajo Tribe of Indians "D" Bo, 1

WELL HUSTORY

This well was drilled to a total depth of 7136" and plugged and abandened as a dry hole on January 6, 1957.

Set 13-3/d* easing at 406' w/SM seeks neat essent. Second diroulated.

1' light green sandy limestane, tight His 14' marcon, green, and red fine grained sandstone, fair perceity, looks wat, no taste, odor or show.

Set 9-5/8* easing at 2700' w/900 sacks Si gel and 100 sasks neat occent. Cement direulated. Drilled to 6182' and sharted tasting.

Core No. 2 from 6182 to 6194.5 - recovered 12.5' white, fine grained hard calcareous sundatone. He bisible perceity. Sectioned simpoints of blooding oil. Thin somes of stain, odor and fluorepetities along frestures and badding planes between 6184 - 6186. Good ofor, stain and fluerescence in bottom 1-1/2". Very slightly bleeding oil & gas along fractures. Ges may be 1 sector

DET #1 from 6172 to 6195 w/1* TO & 3/4" BC. TO 36 minutes. Opened w/mask blow - died in 7 minutes. Br-passed beel - reopened tool - faw bubbles and died. Accovered 10' very slight odl out mud. IN & FM 3480#. Hin. & Max. FF 30#. HUP after 30 minutes - 30#. Test satisfactor

Gure He. 3 from 6195 to 6222 - recovered 101 - 31 white dolomites fine grained sondstone w/slight stain, oder and finoreseases; 7' gray fine erystalline hard dissite, no shows.

Gere He. 4 from 6221 to 6227 - recovered 6' - 1' gray, hard, finely orystelline dolomite; 2' dark gray soft shale; 3' hard green shale w/patches of tan linestone.

097 #2 from 6192 to 6227 w/Johnston Lool & 14 TG & 3/44 BG. TO 30 min. Yery week blue for 8 minutes & det died. Dr 3495#, FH 3500#, min. & mar. FP 70#. BUP 70# after % min. Resovered 10: very slightly oil & gas out drig. mud. Test satisfactory.

DET #3 6815 to 6329 w/Reinston tool & 1" WG & 3/4" BG. TO 30 min. Very week blow, then died in 23 win. IN 3300#, FH 3300#, min. & max YP 210#. BEP 210# after 30 min. Recovered 32' very slightly all & gas dut mud. Dottom hels temp. 1720. Test sutisfactory.

- Come Ma. 5 from 6504 to 6514 - renovered 104 - 44 gray modium erystalline lightetone w/manarous fractures filled w/red shale, eastered patches of red shale; 6' gray medium crystalline livestone and red shale, shout 50% red shale in patches, looks broosisted, but all fractures filled w/wed shale. Gaslarge salaits lined is wag.

ter # 4 from 6484 to 6514 w/1" TO & 3/4" BG. TO 55 min. Weak blow for 45 min. & died. D: 34807, PM 34708, min. PP 508, max PP 708. BU after 30 min. 708. Test satisfactory.

Core So. 6 from 6593 to 6614 - recovered 21 - 17' margon and green vary shale; 4' gray-green medium crystallion dolonite w/a fue small patches of black and green shale.

Core No. 7 from 6614 to 6644 - recovered 29' - 3' gray-green medium to corsely srystalling dolomite; 6' light gray, very finely crystalline colomite, for tight fractures; 4' light gray coursely crystalline dolomite, for tight fractures; 5' gray, finely crystalline, sendy dolomite; 2' gray dense colomite; 6' green and marcon dolomitic shale; 2' gray-green dense delouite.

Core No. 5 from 6644 to 6693 - recovered 38". - 13" marcon shale w/streaks of gray-green sholey dolomits, few fractures 20 to 30 degree dips; 4" gray-green breeslated sandy dolomite red Shale in frasheres; 17' gray-green sandy finaly orystalline dolowite, locally breediated. One wag and numerous tractures in lower part, few gas bubbles; 3' red shale and very soudy dolouite - 30 to 30 degree dipas 1' white shelky sandy linestone badly ground up by core bhi. DOT #5 from 6650 to 6693 w/Johnston tool, 1" TO & 3/4" NG. TO 30 min. Opened w/wery weak blow for 6 min. & died. IH & FM 3640F. Hin. & Max PP OF. HUP OF after 30 min. Res. 7' drig. mud. Test satisfactory.

Ran dipacter survey and velocity survey at 7032'.

Core #9 from 7116 to 7136 - recovered 20' - dark green chlorite gasies (metamorphic rock). Huserous tight fractures filled w/saloite.

Ban 25, Ganta Ray, Neutron & Marolog surveys.

Received verbal approval to plug and a bandom 1-1-57. Set plugs as follows: From 68:0 to 6720 w/75 sks. most out., from 6520 to 6350 w/100 sks mat., from 5650 to 5550 w/75 sks and., from 3800 to 3700 w/75 sks. and., from 2800 to 2650 w/100 sks. out.

Set top plug at 25" to surface w/10 sacks next semant.

Well plugged and abandoned.

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Exclusion .

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WELL CO	MPLETION C	R RECOM	PLETI	ON REPORT	AND LOO	G *	6. IF INDIAL	N, ALLOT	T D GE T
1s. TYPE OF WEL	L: OIL WELL	X WELL	DR	T Other			7. UNIT AGE	ELMENT	NAME
b. TYPE OF COMI				_					
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3. ADDRESS OF OPER	ATOB	Attentio	11 1	T. B1138	·····		-	. 6	
	2100, Denv						10. FIELD A	ND FOOL,	OE WILD
4. LOCATION OF WEL At surface	L (Report location c	learly and in acco	ordance	with any State req	uiremente)*		Tocit		
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At top prod. inte	erval reported below	660 '	FSL	<u>& 1980'</u>	FEL, Sec.	27	Sec.	27 1	r26N-
At total depth		-							
			14. PER	MIT NG.	DATE ISSUED		12. COUNTY PARISH San J		13. ST.
15. DATE SPUDDED	16. DATE T.D. REACI	-			18. ELEVATIONS (D		RT, GE, ETC.)*	19. EL	LEV. CASIN
3-18-74	4-6-74	4-	18-7	4 IF MULTIPLE COM		22	ROTARY TOO	1.8	5610 CABLE
6355'		26'		HOW MANY		LED BY	Surface	B	-
24. PRODUCING INTER			OTTON, I	NAME (MD AND TWO) *	<u> </u>		25.	WAS DIRI
Barker Cre	ek Top 61								N
28. TYPE ELECTRIC A	Bottom ND OTHER LOGS BUN	TD						27. WAI	B WELL C
IRS, BHC-S	Sonic-GR								Y
28.			~~~~	D (Report all stri	• •			· · · · ·	
CASINO SIZE	WEIGHT, LB./FT.	DEPTH SET (ו (חאב						
				HOLE SIZE		ENTING	HECORD		AMOUNT
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INSTRUCTIONS

General: This form is designed for submitting a complete and correct well completion report and log on all types of lands and leases to either a Federal agency or a State agency, or both, pursuant to applicable Federal and/or State laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office. See instructions on items 22 and 24, and 33, below regarding separate reports for separate completions.

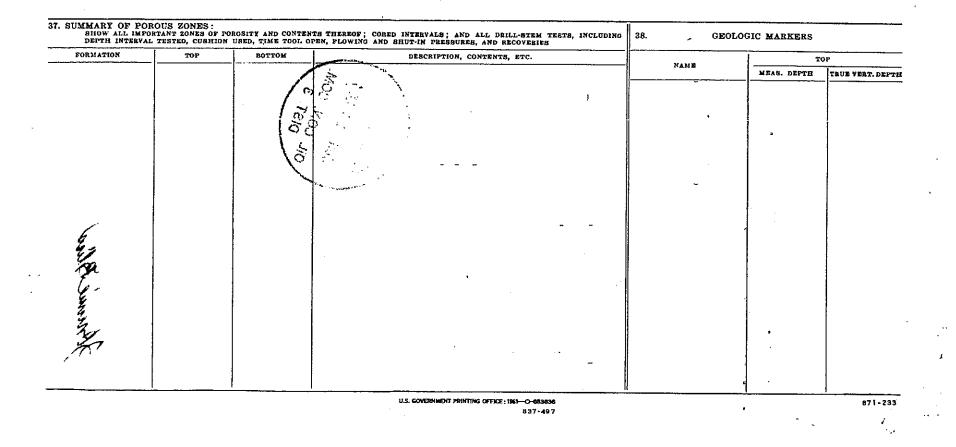
If not filed prior to the time this summary record is submitted, copies of all currently available logs (drillers, geologists, sample and core analysis, all types electric, etc.), formation and pressure tests, and directional surveys, should be attached hereto, to the extent required by applicable Federal and/or State laws and regulations. All attachments should be listed on this form, see item 35.

of them 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 18: Indicate which elevation is used as reference (where not otherwise shown) for depth measurements given in other spaces on this form and in any attachments.

items 22 and 24: If this well is completed for separate production from more than one interval zone (multiple completion), so state in item 22, and in item 24 show the producing interval, or intervals, top(s), bottom(s) and name(s) (if any) for only the interval reported in item 33. Submit a separate report (page) on this form, adequately identified, for each additional interval to be separately produced, showing the additional data pertinent to such interval.

Hem 29: "Sacks Cement": Attached supplemental records for this well should show the details of any multiple stage cementing and the location of the cementing tool. Hem 33: Submit a separate completion report on this form for each interval to be separately produced. (See instruction for items 22 and 24 above.)



. 6

MAVAJO TRIBE "AR" NO. 6

WELL COMPLETION HISTORY

- 4-13-74 Ran tubing and bit, tagged cament at 6326' PBTD. Pulled tubing and bit, ran packer. Perforated Barker Creek interval 6288-92' 2 JSPF through tubing with magnet stand off gun.
- 4-14-74 Spotted acid across perfs 6288-92*, let soak 1 hr with packer set at 6247'. Acidized with 700 gal 15% WE HCl acid, maximum pressure 2600# © 3 BPM, minimum pressure 1500# © 1 BPM. ISIP 1000#, 5 minutes SI - zero. Swab tested.
- 4-16-74 Perforated thru tubing with magnetic stand off gun 2 JSPF Barker Creek intervals 6214-17, 6234-46 & 6250-61'.
- 4-17-74 Set packer at 6121°. Ran 500 gal unibead TDA plug and spotted 300 gal 15% ME HCl acid across perfs 6214-92°. Acidized with 4000 gal 28% ME HCl acid in 3 stages using 2 - 400 gal TDA plugs. Maximum rate 12 BPM © 4000 psi, minimum rate 10 BPM © 3400 psi. ISIP 900%, 5 minutes SI - sero. Swab tested.
- 4-18-74 Tubing pressure 250% after 14 hrs SI. Ran swab 3 times and well started flowing. Flowed 150 BFO 4 157 BLW in 10 hrs.
- 4-27-74 IP: Flowed 24 hrs. 107 BO & 110 BW, GOR 790, TP 265 psi. 18/64" choke. Gravity 45.0 @ 60*.

ELECTER DOG TOPS

Honaker Trail	5450°
\$70.1" ANT Ising	5897 '
2000' 10 Desprt Creek	6007 '
2021 JUN CORAN	6103 '
3073 CON 3Batker Creek	6178'

D. 770

No DSTS were taken

CORE

Core	No.	1	Barker	Creek	6195-6236'	Cut 41'	Recovered	41*
Core	No.	2	Barker	Czeek	6236-6296'	Cut 60'	Recovered	

4867

Dakota Morrison Todilto Entrada DeChelly Organ Rock S .OM "SA" MELET OLIVIA

VELL COMPLETION MISTORY

- 4-13-74 Ran tubing and bit, tagged cement at 6326' PBTD. Puble? tubing and bit, ran packer. Perforated Barker Greek intervi-6283-92' 2 JSPF through tubing with magnet stand off gun.
- 4-14-74 Spotted acid across parts (288-22', let soak i ar with packer set at 6247'. Acidized with 700 gel 15% ME MCL acid, maximum pressure 2600% > 3 3PM, minimum pressure 1500% with 3PM. 13(F 1000%, 5 minutes SI - zero. Swab tested.
 - s-11-74 Perforated thru tubing with magnetic stand off gun 2 JSPF Barker Creek intervola 6214-17, 6254-46 & 6250-611.
- 4-27-74 Set packer at 5121'. Ran 500 gal unibead TDA plag and spotted 300 gal 15% ME HCl acid across perfs 6214-32'. Acidized with 4000 gal 26% ME HCl acid in 3 stages using 2 - 400 pal 7% pluga. Maximum rate 12 BPM @ 4000 psi, Anirum rate 15 BPM p 3400 psi. ISID 9005, 5 minutes SI - zero. Swap tested.
 - 2-)3-74 Tubing pressure 250- after 14 hrs SI. Ran swab 3 times and well started flowing. Flowed 350 BFO & 157 BMM in 15 hrs.
 - 4-27-74 IP: Miowad 24 hrs. 307 BO & 310 PW, GOR 753, TF 265 ast. 18/64° choke. Gravity 45.0 2 60°.

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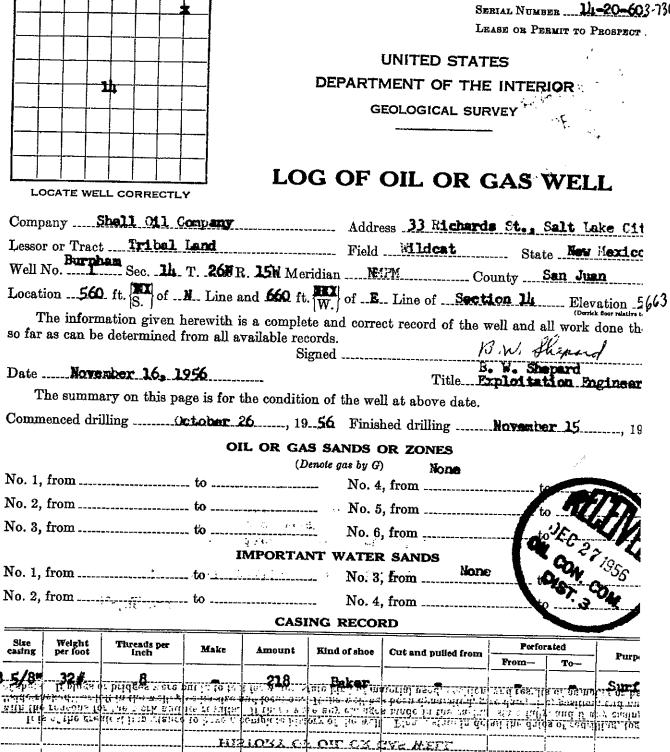
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Form 9-880

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Budget Bureau No. 42-R355.4. Approval expires 12-31-60.

U. S. LAND OFFICE MINION Re



MUDDING AND CEMENTING RECORD

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	se fl	anable gas to a	urfact. Order seemed to change after 20 in.
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			oll or water- INF 3552, THP 3598-, INF 37.5-
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	20.00 C	salt water for	reminder of test, Closed tool for 90 Min.
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Budget Bureau No. 42-R355.4. Approval expires 12-31-60.

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# MUDDING AND CEMENTING RECORD

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			IOOTING R			
Size	Shell used	Explosive used	Quantity	Date	Depth shot	Depth cleaned out
*******						
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The p	roduction for th	e first 24 hours wa	s b	arrels of	fluid of which	: % was oil;%
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If gas	well, cu. ft. per	24 hours	Gallo			ft. of gas
		r sq. in			- /	6

### **EMPLOYEES**

....., Driller

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...., Driller

# FORMATION RECORD

110     150     150     150     150       150     220     70     State       270     350     110     Sand       330     6.70     70     Date       400     4.70     160     Intele       400     860     230     Gand       50     67.     110     Date       57.     1630     350     Shale       57.     1630     350     Shale       590     1440     50     Shale       1030     1300     350     Shale       1440     50     Shale     Shale       1440     140     50     Shale       1440     140     50     Shale       1440     140     35     Shale       1560     1610     35     Sand       1650     1650     35     Sand       1650     1650     160     Date       1650     1650     1677     Yorrison       1677     70rrison     1677 </th <th>FROM</th> <th>TO</th> <th>TOTAL FEET</th> <th></th> <th>FORMATION</th> <th>r</th> <th></th>	FROM	TO	TOTAL FEET		FORMATION	r	
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U. S. LAND OFFICE
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GEOLOGICAL SURVEY

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Lessor or Tract J.S. Seat1.9. 19 Well No	Serperation Address Box 457, Fermington, New Merico Field Hogdack-Pennylvanlan, New Maxico M. Meridian Mathews County San, Juan, 
Date	TitleField-Superintendent

The summary on this page is for the condition of the well at above date.

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OIL OR GAS SANDS OR ZONES (Denote gas by G) No. 2, from ..... 6530 ..... to .... 6570.0. No. 5, from ...... to ...... to IMPORTANT WATER SANDS No. 1, from ...... to ...... No. 3, from ..... No. 2, from ...... to ...... No. 4, from ..... . to CASING RECORD Weight per feat Threads per larts Perforated Nise nading Make Lmeunt Mind of shoe | Cut and pulled from Purpess From---To-13-3/2-35/6-111p Joint 9-9/6 32:3 611 7-15 611 811 297--in**to** burfaes... Guide Guide Internetiat diste CTAL 1558 Liner 1.7 MUDDING AND CEMENTING RECORD Sice Amount of mud used Where set Number sanks of coment Method used Mud gravity 250 SACKY 1211100 ton 2 - Ing 625 Sacky fallibarton 2 - Ing 475 sacky fallibarton 2 - Ing 210 weeks fallibarton 2 - Ing PLUCS AND ADAPTERS 2117 **柒**游 5613 :::5 7035 Heaving plug-Material ..... Adapters-Material..... Size .... SHOOTING RECORD Size Shelt used Esploides Gerd Quantity Bats Depth shat Depth desard sui "Connected well to V. .. Freed SI Minas "light flant, Shiprock, Few Merico, on Vanuary 27, 1958, to complete testing of well wills furnishing supply of feeling-bracks motoral gas to complete. TOOLS USED 

Rock pressure, lis. per sq. in. 400 ("http://www.sc.)

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FORMATION RECORD-Continued

#### HISTORY OF OIL OR CAS WELL

USG Section 19 Well No. 17 was spudded on September 20, 1957, and on September 21, 1957, 13-3/8" casing was set at 251 feet with 125 sacks of \$5 gel and followed by 125 sacks of cement. After waiting on coment for 24 hours, casing and water shut-off were tested with ... 500 pounds pressure for thirty minutes, which held with no drop in pressure.

9-5/8" easing was set at 2157' with 500 sacks 45 gel cement and followed by 125 sacks neat commut. After waiting on commut for thirty-six hours, easing and water shut-off were tested with 1000 pounds pressure for thirty minutes which held with no drop in pressure.

7" casing was landed at 5613' and commented with 400 sacks 6% gel cement and followed by 75 sacks must comment. After waiting on comment for 72 hours, 7" casing was tested with 1100 pounds for thirty minutes, which held with no drop in pressure.

A 5" 15 pound liner was run with Baash-Ross pack-off type liner hanger and set at 5486-7035' with 210 sacks of sement. After waiting on sement, casing was tested with 1100 pounds pressure for thirky minutes, which held with no drop in pressure.

Perforated with four shots per foot 6530-6570 and 6643-6659. Spotted acid over perforations and set packer at 6490'. Acidized with 1500 gallons 15% regular acid. Breakdown pressure 1250 psi, treating pressure 1500 psi, injection rate 2 barrels per minute. Tested 6450 MCFPD, 32 BOPH, 17 BMPH. Set packer at 6459' and squeesed both sets perforations with 150 sacks comput. Re-squeezed with 150 sacks comput to 4400 pci. Drilled solid ement to 6663 and cleaned out to plug bask depth 6700'. Re-Perforated with four shots per foot 6643-6659'. Spotted and set packer at 6612. And ised with 500 gallons 15% anid. Breakdown pressure 2900 pai, treating pressure 1600 pei, injection rate two barrels per minute. Tested 2620 MCFPD, 60 BARRELS oll per hear, no water. Re-perforated with A shots per foot 6530-6570. Set retrievable bridge plug 6620'. Spotted and set packer at 6472'. Addised with 1000 gallens 15% anid. Breakdown pressure 1700 pd., treating pressure 1900 pei, injection rate 3-1/2 barrels per minute. Tested 5100 HCFPD, 25 barrels oil per hour, 3-1/2 barrels water per hour. Set magnesium bridge plug 6620 and packer at 6510 and spacesed some with 200 sacks essent to 4500 pst. Drilled solid cement 6517-6610. Re-perforated with two shots per fost 6530-6570. Spotted acid and set packer at 6506'. Acidized with 500 gallons 15% regular. Breakdown pressure 3000 psi, treating pressure 1700 pei, injection rate two barrels per minute. Tested 2910 MCFPD, 1-1/2 barrels oil per hour, 1/3 barrels water per hour. Perforated four shots per foot 6396-6426'. Set retrievable bridge plug 6470'. Spotted and set packer 6374'. Acidised with 1000 gallons 15% regular. Breakdown pressure 2000 pd, treating pressure 1600 psi, injection rate 2-1/3 barrels per minute. Tested 8050 HCFPD, 4-1/3 barrels oil per hour, I barrel water per hour. Drilled coment and magnesium bridge plug and cleaned out to plug back depth. Set Baker Model B preduction packer at 6619' with 2-3/8" tubing landed at 6619" and side door choke nipple above packer. Installed side door choke and flo ed thru tubing to test some 6643-6659. Tested 797 HCFPD, 14 barrels oil per hour, 2 barrels water per hour. Closed casing pressure steady at 2400 pd indicating packer holding. Adidized some with 500 gallons 15% regular and tested 2980 NCPPD, 69 barrels oil per hour, no water. Closed casing pressure steady at 2400 showing effective separation of upper sones from lower sone. Commested well to pipeline to test upper sones 6396-6426 and 6530-6570. Tested well into pipeline 3400 MCFPD, 98 barrels oil per day, 50 barrels water per day and completed as condensate-producing gas well January 30, 1958. Blanked off lewer of-bearing zone 6643-6659 and equipped well to produce upper perforations 6396-6426 and 6530-6570 through tubing string to supply helium-bearing gas to U. S. Bureau of Mines

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U. S. G. S. FORM 9-330

LOG OF OIL OR GAS WELL

NAVAJO TRIBAL WELL NO. 1

#### HISTORY OF OIL OR GAS WELL

Well was spudded April 11, 1954, and drilled to total depth of 7215'. Sixteen drill stem tests were run covering all possible productive zones. No commercial shows of oil or gas were encountered. Casing was run as follows: 13-3/8" casing set at 300' with 125 sacks cement plus 8% gel plus 200 sacks neat cement; 7" casing set at 6382' with 50 sacks cement plus 6% gel plus 50 cubic feet strata-crete plus 50 sacks neat Cement. Drill stem tests were run as follows: DST #1, 875-925' Dakota, recovered 435' drilling mid and 360' water cut mud. DST #2, 933-986' Dakota, recovered 830' heavily sulphur cut drilling mud. DST #3, 2165-2190' Entrada, failed. DST #4, 2165-2190', recovered 210' drilling mud and 900' fresh water. DST #5, 3780-3798' Shina-rump, recovered 5' slightly gas cut drilling mud. DST #6, 5628-5655' Pennsylvanian, recovered 30' drilling mud. DST #7, 5754-5865' Pennsylvanian, recovered 15' drilling mud. DST #8, 6382-6409' Pennsylvanian, failed. DST #9, 6382-6409', recovered 45' slightly gas cut mud. DST #10, 6382-6460' Pennsylvanian, recovered 160' slightly gas cut mud. DST #11, 6530-6593' Pennsylvanian, failed. DST #12, 6532-6593' recovered 50' drilling mud. DST #13, 6588-6661' Pennsylvanian, flowed gas at rate of 60 MCFPD and recovered 90' slightly gas cut mud, 90' heavily gas cut mud, and 90' heavily salt water and gas cut mud. DST #14, 6715-6770' Pennsylvanian, recovered 6' slightly gas cut drilling mud. DST #15, 6770-6897' Pennsylvanian, flowed slat water at rate of 30 barrels per hour with slight show of distillate; gas volume was too small to measure and was non-inflammable. DST #16, 7164-7215' Mississippian, flowed salt water at rate of 13 barrels per hour. Well was plugged back from total depth to 6650' with cement and the interval 6600-6650' acidized with 5000 gallons 15% acid. Following this treatment well flowed at rate 2280 MCFPD low BTU gas, 4 barrels distillate per day and 74 barrels salt water per day. Well was plugged back to 6570' with cement and interval 6382-6570' was acidized with 5000 gallons 15% acid. Following this treatment the well swabbed 6 barrels of salt water per hour with no shows of oil or gas.

Well was permanently plugged and abandoned as follows:

- 1) plugged hole with solid cement from 7215-6570'.
- 2) spotted 50 sacks cement plug on bottom.
- 3) 7" casing was shot off at 3964' but unable to pull casing, 7" casing was shot free at 2200' and 2200' of 7" casing was recovered.
- 4) plugged with solid cement from 4100-3800'.
- 5) shot off 9-5/8" casing at 400' and 400' of 9-5/8" casing was recovered.
- 6) plugged hole with solid cement from 450-250' and spotted a 10-sack cement plug at surface in 13-3/8" casing, August 23, 1954.
- 7) hole filled with 12pound mud at following intervals: from top of cement in bottom of hole to 4100', 3800-450', and from 250' to bottom of 10-sack surface plug.
- 8) erected 4' pipe marker and restored ground level to original contours as per regulations.

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Form 9-381 b (April 1952)	(SUBMIT IN TRIPLICATE) UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY	Budget Bureau No. 42-R360.4. Approval expires 12-31-50. Indian Agency <b>BAVD 39</b> <b>Tribel</b> Allottee Lease No. <b>16-20-503-5035</b>	
BI	SUNDRY NOTICES AND REPORTS O	N WELLS	,

	Navajo Tribal "N"	Fa	mington, Her Marico December 31, 19 62	
	(INDICATE ABOVE BY CHECK MARK		JRE OF REPORT, NOTICE, OR OTHER DATA)	
			U. S. GEOLOGICAE CONTACT ON THE OF HEROTON, NEW MEXICO	
	NOTICE OF INTENTION TO ABANDON WELL		U. S. GEOLOGICAL SURVEY	
1	NOTICE OF INTENTION TO FULL OR ALTER CASING.			
	NOTICE OF INTENTION TO SHOOT OR ACIDIZE		SUBSEQUENT REPORT OF ABANDONMENT 14N	
,	NOTICE OF INTENTION TO REDRILL OR REPAIR WELL		SUBSEQUENT REPORT OF REDRILLING OR REPAIR	<b>_</b>
	NOTICE OF INTENTION TO TEST WATER SHUT-OFF		SUBSEQUENT REPORT OF ALTERING CASTIG	
	NOTICE OF INTENTION TO CHANGE PLANS		SUBSEQUENT REPORT OF SHOOTING OR ACIDZING	)
	NOTICE OF INTENTION TO DRILL	1	SUBSEQUENT REPORT OF WATER SHUT-OFF	

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	and Sec. No.)	(Twp.)	(Range)	(M	ridian)	
			Sen Joan		New No.	
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he elevatio	n of the derric	k floor above	sea level is	ft. <b>(Te</b>	be repor	ted Jeteroits: 3
			DETAILS OF W	ORK		
iate names of a	and expected depths	to objective sands ing points	; show sizes, weights, and , and all other important	lengths of prop proposed work	osed casings; ind	icate mudding jobs, cement-
ie propos	e to drill?	the Navajo	Tribal "N" No	. 1	Geri Ma	sissingian test
	ng program					
67. 29783	SLT	1753 (B.40), <b>1877</b>	TERMARTES			
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Attai L. O. Speer, Jr.

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U. S. GDVERNMENT PAINTING OFFICE 16-84375-6

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### NEW MEXICO OIL CONSERVATION COMMISSION Wall Location and Associate Dedication Pla

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Well Location and Acreage Dedication Plat	
SECTION A.	Date December 31, 1962
Operator Pan American Petroleum Corporation Lease Navajo Tr	
Well No. 1 Unit Letter M Section 17 Township 26 No	rth Range 18 West NMPM
Located 790 . Feet From South Line 790	Feet From West Line
County San Juan G. L. Elevation To report lateredicated	-
Name of Producing Formation Mississippian . Pool	Wildcat
1. Is the Operator the only owner' in the dedicated acreage outlined on the plat b	elow? Yes X No
2. If the answer to question One is "No," have the interests of all the owners I	been consolidated by communitization
agreement or otherwise? Yes No	
	•••••••••••••••••••••••••••••••••••••••
3. If the answer to question Two is "No," list all the owners and their respectiv	re interests <del>below.</del>
OWNER	LANDOFFEL
	RELEVED
	JAN 3 1963
····· , . ,,	CAN COM.
SECTION B.	3
	and the second second second second second second second second second second second second second second second
	This is to certify that the informa- tion in Section A above is true and
	complete to the best of my knowl-
	edge and belief.
	Pan American Petroleum ^C orp.
	LL I (CRATOR)
	F. H. Hollingsworth
	REFRESENTATIVE)
	Box 480, Farmington, New Mex.
	Augenses
Navajo Tribal Contract	This is to certify that the well loca-
No. 14-20-603-5035	tion shown on the plat in Section B was pletted from field notes of ac-
	tual surveys made by me or under
	my supervision and that the same is true and correct to the best of
	my knowledge and belief.
	Date Surveyed Dec. 21, 1962 Four States Engineering Co.
	FARMINGTON, NEW MEXICO
19 ⁰	
	REGISTERED ENGINEER OR
	LAND SURVEYOR
0 330 660 990 1320 1650 1980 2310 2640 2000 1500 1000 500 0	Certificate No. 3602

		LN61	J RIDU			
Form 9-331 C Jill (May 1963)	DEPARTMENT	ED STATES	SUBMIT IN TR (Other instruc reverse si	tions on	• Form approv Budget Burea	eđ. u No. 42-R1425
Cu	DELVICE		RIUR		5. LEASE DEBIGNATION	AND SEBIAL NO.
		GICAL SURVEY		ACV	6. IF INDIAN, ALLOTTE	E OR TRIBE NAME
	N FOR PERMIT I	O DRILL, DEE	PEN, OR PLUG B		Navajo - Cont	rect #14-20-603
18. TYPE OF WORK		DEEPEN 🗌	PLUG BAC	ск 🗆	7. UNIT AGREEMENT	5019
b. TYPE OF WELL	AS OTHER		SINGLE MULTIP		S. FARM OR LEASE NA	ME 1
2. NAME OF OPERATOR	<u></u>		CHAN	<b>ICE</b>	TARON AND I	Neve jo
MOBIL OIL C	ORPORATION		CHAP		S WELL NO.	
3. ADDRESS OF OPERATOR	<b>^</b>	. 0	OK	<i>U</i> .	IC FIALD AND POOL,	OR WILDCAT
A TOOLING OF WELL (R	652, Casper Wy	In accordance with any	y State requirem sts. 7		PEUNSYI	Valen D
At surface 000 E	ast of West 11D	9 7 000. NOLT	n of south line S	3ec. 9,	IL. SEC., T., E., M., OR AND SUBYLY OF A	BLK.
T26N, R10W, At proposed prod. zon	San Juan County	, New Mexico			SW SW	
	AND DIBECTION FROM NEAR	PAT TOWN OF POST OF	105*		12. COUNTY OR PARISE	1 13. STATE
14. DISTANCE IN MILES	AND DIRECTION FROM WEAR				San Juan	New Mexico
15. DISTANCE FROM PROPO	J8ED*	16.	NO. OF ACRES IN LEASE		OF ACRES ASSIGNED HIS WELL	
LOCATION TO NEARES PROPERTY OS LEASE I	LINE, FT.	560'	2240		60	
(Also to nearest drip 18. DISTANCE FROM PROF	OSED LOCATION*	19.	PROPOSED DEPTH	20. ROTA	BY OR CABLE TOOLS	<u></u>
TO NEAREST WELL, D or applied for, on th	RILLING, COMPLETED, IS LEASE, FT.		6500 '	1	otary	
21. ELEVATIONS (Show wh		5150		-	22. APPROX. DATE W	OBE WILL START*
		CR. 595	) 		6-22-66	
23.		ROPOSED CASING A	ND CEMENTING PROGRA	AM		
SIZE OF HOLE	BIZE OF CASING	WEIGHT PER BOOT	SETTING DEPTH	1	QUANTITY OF CEME	NT
17"	13-3/8"		1001		50 sacks	
10-3/4"	8-5/8"		1600'	ļ	00 sacks	
7-7/8"	5-1/2"		6500'		j00 sacks	
a test of t		formation in t	Ll to an estimate the Tocito Dome 1 as. Proposed los	deld.	One 60' Core	

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The man beaches					
sonic-caliper	from cag shoe	to T.D.	Estimated formation	1 topa:	
	Gallup Sand	י0	Dechelly	3750'	CEIVEN
	Mancos	150'	Cutler	4300'	STITIC \
	Dakota	850'	Hermose	55001	LUL.
	Morrison	1075'	5th Shale	63451	1 1 1966
	Entrada	5100 i	"E" Zoce	63551	JUN 1 7 1966
	Wingate	22001	"F" Zone	6415	JUNI IS COM.
	Chinle	2750'	T.D.	6 <b>500 '</b>	DIST. 3
	Shinerump	3450'			
	Moenkopi	3510'			

IN ABOVE SPACE DESCRIBE PROPOSED PROGRAM : If proposal is to deepen or plug back, give data on present productive zone and proposed new productive zone. If proposal is to drill or deepen directionally, give pertinent data on subsurface locations and measured and true vertical depths. Give blowout preventer program, if any.

24. Original Signed By BIGNED M. McLaughlin 1n	TITLE Producing Hanager	DATE 6/13/66
(This space for Federal or State office use)		
PERMIT NO.	APPROVAL DATE	<u> </u>
APPROVED BY	SUPERVISOR DIST. #3	DATE JUN 17 1966

*See Instructions On Reverse Side

#### Instructions

General: This form is designed for submitting proposals to perform certain well operations, as indicated, on all types of lands and leases for appropriate action by either a Federal or a State agency, or both, pursuant to applicable Federal and/or State laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 1: If the proposal is to redrill to the same reservoir at a different subsurface location or to a new reservoir, use this form with appropriate notations. Consult applicable State or Federal regulations concerning subsequent work proposals or reports on the well.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 14: Needed only when location of well cannot readily be found by road from the land or lease description. A plat, or plats, separate or on this reverse side, show-ing the roads to, and the surveyed location of, the well, and any other required information, should be furnished when required by Federal or State agency offices. Items 15 and 18: If well is to be, or has been directionally drilled, give distances for subsurface location of hole in any present or objective production zone.

Item 22: Consult applicable Federal or State regulations, or appropriate officials, concerning approval of the proposal before operations are started.

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 1		YEEO		$\sim$		
		NEW MEXICO OF	IL CONSERVATION C	CATION	NGE	Form C+102 Supersedes C+ Effective 1-1-6
Operator .		All distances must be	e from the outer boundaries			
	1 011 200000	Corporation	Legee Navajo, No. 14-20-603		Well N	o, 1
Unit Letter	Section	Township	Range	County		<del>_</del>
Actual Footage Lo	9 Fation of Wells	26 North	18 West	San Ji	18 <b>n</b>	
660	feet from the	South line and	660 (*	et from the W9:	st line	
Ground Lyvel Elev. 5750	Producing F	ormation PRUNSYL.	Bool	and Dome	Dedicated Acre	ndet
	acreage dedi	cated to the subject w			160	Acres
3. If more th dated by a		different ownership is unitization, force-pool	ing.etc?		ests of all owners	been consoli
L_] Yes	No If	answer is "yes;" type o	of consolidation			
If answer	is "no," list the	owners and tract desc	criptions which have a	actually been co	neolidated (Iles	verse sile -
					unational (Che ic	ACINE NING O
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#### United States

DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

Allow	ee Navajo Tribe
Tribe	<u>Nava jo</u>
Losse	No. 14-20-603-537

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# LESSEE'S MONTHLY REPORT OF OPERATIONS

	State]	Yew N	lexic	0	. County	San Jua	n	Field	Wildcat		
	The	fol <mark>low</mark>	i <b>n</b> g is	a cor	toct top	wrt of operatio	ons and	production (	(isoluding dri	lling and	producies wells) for
	month of	·	July	, , , , , , , , , , , , , , , , , , , ,	**** *********	ې دې غورې و و و و و و و و و و و و و و و و و و	6	3		*******	<b></b>
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	NCS. AND	7WP.	2411 3 E	WELL HD.	Days Prdcd.	Earrels of Oil	Grait	Cu. it. of Ga	(s) Gallons of Gasoline Recovered	Bbis, water (If none, so state)	REITARKS If drilling, dopth If shut down, a deta and result of test for gasa content of nea
NW N Sec₃	-	26N	16W	1	-0-	-0-	-	-()	-	None	Location: 990'
	jo Trac	t 3,	Wel	L No.	1			7 1			and 990' FWL. Elevations: GR KB 5428'. Spud
		D <b>ril</b>	led	12-1	h" ho	le to 183*	and :	eamed to	13-3/2"	Set 7 1	7:00 P.M. 7-16- s. of 9-5/8" OD
		casi	ng at	<b>t 18</b> 8	). H	alliburton	cemer	ited with	125 sax r	egular Ne	sat cement with
		cium	chl	bride	i. Ci	rculated c	iment	to surfac	ce. Plug	down at 9	2:30 A.M. 7-17-6
		711 711	nea l	co 31 Core	102". No 2	Core No.	4 = 31 6228	02 -3042	• Cut and	l recover	red 60'. Drille ttempted DST No
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	:	DIOW	, de	crea	ied to	zero in 4	5 min	ites. No	gas. Rec	pvered 3	0' of drilling
		Pres	sure	8: ]	CH & F	H 2446; 15	minut	e ICI 160	); IF 9. F.	F 15: 15	minute FCI 102:
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			10	🤉 sax	i regu	lar cement	in to	p of surf	ace casing	z. Left	10.1# mud betwe
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				kota			1,5861	(+ 843)		 	DIST. 3
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No runs or sales of oil; No M. cu. it. of gas s

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SW/4 Sec. and	Bec. No.)	(Twp.)	R17W (Range)	NMPM (Meridian)	(w) Iew Mexico
SW/4 Se (4 Bec. and Wildca (Field	sc. 1 Bed. No.) at	124N (Twp.) San Ju	R17W (Range) an County anty or Subdivision)	NMPM (Meridian)	<b></b>
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DETAILS OF WORK - Continued

DST #2 Dakota - 4166' to 4208'. SI 15 minutes, open 60 minutes, SI 60 minutes. Recovered 120' of slightly gas cut mud. IHH 2313 FHH 2298, ISI 2115, FSI 2024, IF 59, FF 80.

DST #3 Dakota - 4167' to 4260'. SI 15 minutes, open 2 1/2 hours, SI 60 minutes. Recovered 230' of 8.9# to 9.3#/gal. water cut dri ling mud. IHH 2313, FHH 2298, ISI 2100, IF 59, FF 133, FSI 1977.

Commercial production was not encountered. Spotted 70 sack cemen plug from TD to 4110'. Spotted 36 sack cement plug from 3785' t 3660'.

Turned well over to Navajo Indian Agency for completion in the Gallup as a water supply well.

Ran 97 joints of 5 1/2" O.D., 14/ and 174, J-55 casing w/Baker Model "A" open hole pack-off shoe, metal petal basket, baffel col & four centralizers. Landed casing @ 3131' KB and cemented w/240 sacks cement w/4% gel followed w/100 sacks regular cement. WOC.

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so far as	s can be	ation given b determined f	rom all av	ailable rec Si	ords. Ung	t record of the iter signed DOZIER. JR. Engliah Title			
$\mathrm{The}$	e summa	ry on this pa	ge is for t	he conditio	on of the wel	l at above date.			- <u> </u>
Commer	nced dril	ling Ka	<del>y-17</del>	, 19	62. Finish	ed drilling	<del>Xay</del> 30		, 19 <b>.62.</b> -
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Size casing	Weight per foot	Threads per Inch	Make	Amount	Kind of shoe	Cut and pulled from	From-	To-	Purpose
8-5/3	32 of 1			St. 561			n <del>tida (n. 1</del>		Sur Lace
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			MUDD	ING AND	CEMENTI	ING RECORD			

Size casing	Where set	Number sacks of cement	Method used	Mud gravity	Amount of mud used
8-5/8	329	250	Tisplacement		-

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Heaving plug-	Material		ND ADAPT		th set
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<b>r</b> /			ING RECOP		
Size Si	hell used E	xplosive used Qu	antity Dat	e Depth shot	Bepth cleaned out
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			LS USED		
Rotary tools we	re used from	feet to	fe	et, and from	feet to
Cable tools were	used from	0 feet to	• 50 <b>2</b> 0	et, and from	feet to
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UNITED STATES									
DEPARTMENT OF THE INTERIOR									
GEOLOGICAL SURVEY									

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# LESSEE'S MONTHLY REPORT OF OPERATIONS

State	IGN I	ext.c	0	County	, <u>San Ju</u>	an	Field	W1]	dcat		••
The	follow	ing is	<b>a</b> cori	rect sep	ort of operati	ons and	production (i	ncluding dr.	illing and p	producing wells) for th	đ
month of	f	]	Marc	1		19.61	1				_
Agent's	Addres	58	P. 0.	Box	1611		. Ca	1100110	The Pure	Oil Company	-
			Caspe	er, Wy	rowing		Si	gned	K.C	Devis	-
Phone			234-1	1565	المراجع وود ووجو الشروعي والشروعي		Ag	- aut's title	District	Office Manager	-
<del></del>	i İ	1			<u>}</u>	1		Gallons of	Inble meter	REITARKS	z
4 of 4	1WP.	8AH 0 C	₩6LL #0,	Days Prdcd.	Barrels of Oi	Gravity	in thousands	Gasoline Recovered	(If none, so state)	REI LARKS If drilling, depthy if shut down, cause deto and result of toot for gesoline content of ges	4
ne ne	28N	16W	1	-0-	-0-		location	660' F	NL and 6	60' FEL. L&S	-
Sec. 13	7						elevation	vs: GR 5	417'; KB	5428'. Spudded	
Pure-Si	in Na	vajo	Tra	t 9,	Well No. 1		3-22-64.	Drilled	to 252"	Set 7 its. of	
							9-5/8" OI	) 36# J-5	5 casing	line pipe at	
	[						248" - Ce	mented w	ith 200 i	sax regular coment	
				•			with 2% c	alcium c	hloride.	Good returns.	
	ł			1	1					to 4,292'. Drill	sd
	Į									mpleted 3-29-64.	
	[					1	Ran elect	tric loga			
				1			LOG TOPS	<b>B</b>			
							Chacra		7601	(+4668)	
							Cliff Hou	188	1,4361	(+3992)	
				-	1		Pt. Look	nit.	2,5321	(+2896)	
							Mancos		2,842'	(+2586)	
							Upper Ga	Цlup	3,785'	(+1643)	_
			Ì	1	· -		Upper Gal	llup Sand	3,9821	-3,990' (+1446-+14	38
		]					Lower Gal	llup	4,085	(+1343)	
		<b>]</b> .					Sanastee		4,235	(+4668) (+3992) (+2896) (+2586) (+1643) 3,990' (+1146-+14 (+1343) (+1193)	
						1	Well P &	A 3-29-6	u as fol:	lows:	
	1			Plug	5 No. 1 - 4	290	- 4,190' -	100' -	30 sax r(	egular cement	
				Ping	z no. 2 - 4	100101	- 3,990	- 50' -	30 sax n	egular cement	
			1	Ping	5 No. 3 - 2	1900	- 2,800 -	100' -	h0 sax r	egular cement	
				Plug	5 No. 4 -	010	- 710 -	- 100' -	30 sax r	gular coment	
		1	4	PLUE		20	- 01 -	28 -	10 sax r	gular cement dry hole marker	
	1			Leit			n cement j	nnge• T	pstalled	dry note marker	
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Form 9	-330		• ••	· .	2 a - 1 - 2	E Carl Marcal Na	get Bureau No. roval expires 12- vajo Tri	be	
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				LO	G OF (	DIL OR G	AS W	VEL	F.
LOC	CATE WEL	L CORRECTLY				_	- •		
Compa	iny	The Pure Oi	1 Comp	any	Addre	ss P. O. Box	<u>1611, Ca</u>	sper,	Wyoming
						Wildcat			
Well N	ío. <u>1</u>	Sec. 13 7	r. 28n. r	<b>16W</b> Mer	ridian M	PM Cot	unty <b>San</b>	Juan	
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CONFLICTION AND TESTING Ferforsted Dakota, 5645-5862: w/2 bullets end 2 jets/f- treated w/500 gals sud sold, Fractured w/35,000 gallets ends 2 jets/f- treated w/500 gals sud sold, After recovering 778 bbls load water 1h 5 days, seabled and flowed 80 bbls lead water for 12 hrs, witcht mount of gas fellowing mab-Casing pressive jubits and threat the sound of correction bulldup) to 3754 milet receive the second state of the sound of the sound of the Squeezed parts 5848-5862; w/25 pr gammet. 2

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Core No. 6, 57461-5805', recovered 59' silvetone and said, no shows. Core-New 7, 58061-58331, weighted 26.51 shy siltstens and sig no should not all Core No. 6, 54331-5678', recovered b?' sh, ed and songlamerately no shows.

Care No. 4, 57081-57101 recovered 2' siltations

Cara Bo. S. START-STAR's recovered 35! meals no show

COLO DETINI MAIN -classes of the number of the state 

2' sand way average Core No. 21-50881-526214 mecovared 371 shale

1.4

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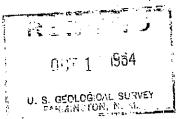
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	UNITED ST RTMENT OF TH GEOLOGICAL S	IE INTE	(O RIOR	MIT IN TI ther instru reverse s	ctions on Ide)	5. LEASE DESIGNATION AND SERIAL NO. 14-20-603-2024
APPLICATION FOR	PERMIT TO DRIL	L, DEEP	EN, OR	PLUGE	<u>ACK</u>	6. IF INDIAN, ALLOTTEE OR TRIBE NAME
b. TYPE OF WELL	DEEP	en 🗆	PL	UG BAG	ск 🗀	Navajo 7. UNIT AGREEMENT NAME
WELL CAS WELL	OTHER			MULTIP	¹⁰	S. FARM OR LEASE NAME
2. NAME OF OFERATOR Zohler and Danne	berg					Navajo 2024 9. WELL NO.
219 Patterson Bu: 4. LOCATION OF WELL (Report location At surface 1980' FNL x 990'	ilding - Den n clearly and in accordan FEL Sec.23-2	ver, Co ce with any S 29N-16V	olorado State requireme	80202 nts.*)	2	#1 10. FIBLD AND FOOL, OR WILDCAT Wild.cat 11. SEC. T. R. M. OR BLK.
At proposed prod. zone	-	-	,			AND SURVEY OR AREA
same						Sec.23-29N-16W,NMPM
14. DISTANCE IN MILES AND DIRECTIO <u>5 miles west of Fi</u> 16. DISTANCE FROM PROPURED*						12. COUNTY OR PARISH 13. STATE San Juan New Mexico
LOCATION TO NEAREST PROPERTY OR LEASEST (Also to nearest drlg. unit line, if	(any) 990'	16. NO	. OF ACRES IN 2560	LEASE	17. NO. 0 TO TH	F ACRES ASSIGNED IIS WELL 40
18. DISTANCE FROM PROPOSED LOCATIO TO NEAREST WELL, DEILLING, COMJ OR APPLIED FOR, ON THIS LEASE, FT.	none		OFCSED DEFTH	ιp)		tary
21. ELEVATIONE (Show whether DF. RT. 5340 GR 23.	GB, etc.)					22. APPROX. DATE WORK WILL START. October 13, 1964
<i>4</i> 3.	PROPOSED C	ASING AND	CEMENTING	PROGRAM	¥	
SIZE OF HOLE SIZE OF	CASING WEIGHT H	ZE FOOT	SETTING D	EPTH		QUANTITY OF CEMENT
		······				

It is intended to drill a 4100' Gallup Sanastee test in the following manner: Drill 11" hole to 150' and cement 8-5/8" casing with 70 sax. Drill 7-7/8" hole to total depth with mud. If commercial production is encountered, cement  $4-\frac{1}{2}$ " casing and fluid frac with chemicals. Put well on production.



IN ABOVE SPACE DESCRIBE PROFOSED PROGRAM : If proposal is to deepen or plug back, give data on present productive zone and proposed new productive preventer program, if any.

810	MIAMI OIL PRODUCERS,	INC.	Downoheme	Zoller and	DATE 10-12-64
ľ')	his space for Federal or State office use)	0			
PE	RM IT NO		APPROVAL DATE		
	PROVED BY			ر ۲ <u>۲</u>	
					OCT 15:964
		*See Instructio	ns On Reverse Sid	e	311- 1. 1. 1. A.

Instructions

General: This form is designed for submitting proposals to perform certain well operations, as indicated, on all types of lands and leases for appropriate action by either a Federal or a State agency, or both, pursuant to applicable Federal and/or State laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 1: If the proposal is to redrill to the same reservoir at a different subsurface location or to a new reservoir, use this form with appropriate notations. Consult applicable State or Federal regulations concerning subsequent work proposals or reports on the well.

Item 4: if there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific fustructions.

Item 14: Needed only when location of well cannot readily be found by road from the land or lease description. A plat, or plats, separate or on this reverse side, show-ing the roads to, and the surveyed location of, the well, and any other required information, should be furnished when required by Federal or State agency offices.

Items 15 and 18: If well is to be, or has been directionally drilled, give distances for subsurface location of hole in any present or objective production zone. Item 22: Cousult applicable Federal or State regulations, or appropriate officials, concerning approval of the proposal before operations are started.

X U.S. GOVERNMENT PRINTING OFFICE : 183-0-711-396

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Form C-128 (6-57)

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## NEW MEXICO OIL CONSERVATION COMMISSION

## Well Location and Acreage Dedication Plat

		•		Data	Octobe	r 12,	1964
ection A. ZOLLER AND DANNEBERG							
	XXXXX	Letse.	Navajo	14-20-	-603-20	24	
ell NoUnit LetterH_Secti	oa <u>23</u>		Township	29 NORT	H_Range	16 WEST	NMPN
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Is the Operator the only owner in the dedicate	a acreage		I LES Plat de	10 8.			
Yes No If the answer to question one is "no", has	ve the sate	ests of a	ll tue owner	rs been co	nsolidated	by commu	nitiz eti (
agreement or otherwise? Yes No	· • • • • • • • • • • • • • • •	If answ	wer is "yes"	, Type of	Consolide	stion.	
If the answer to question two is "no", list	all the own	ers and th	neir taspecii Lan	ve interes d Descrip	is below: tion		•
Owner						A IR	
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otion B.	Note: A						٦
his is to certify that the information	1		i €		ļ		
Section A above is true and complete	1		I	1	ļ		
the best of my knowledge and belief.	r	-	,	<u>†</u> ~ − ı−			
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DITER AND DANNEBERG	11		) 	↓'_			-
IAMI ØIL (PROBYCERS, INC.			t				
(Representative)	'	ł	1			990'	
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made by me or under my supervision and that the same are true and correct to the best of my knowledge and belief.

(Seal)

Farmington, New Mexico

September 17, 1964 Date Surveyed. Begistered Professional Engineer and for Land Surveyor James P. Leese, N. Mex. Reg. No. 1463

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November 18, 1994:	runnes the both int. To ensure on water.
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#### Pit Reford

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10	7-†78°		( <b>)))</b> )	行行です。	

### B-Ion Tormation Tops

Lewis - Surface	Terre Gallup	_	40001(613年9)
Mess Verde - 750'(+4507)	diel michael	-	4160151(412972) 41601(41187)
Foint Lookout 2-161(-2851)	1921 - C. H.		42601(+1187)
Mancos - 27421(+1605)	12.0/		4,21,21

#### Discussion

The Miami Cil Producers, Inc. Movalo 2024 /7 found 22' of sand in the Gallup with 12' of concentry prom 4101-12'. Average perosity was 115 with water conturation sveraging 70%. Log analysis indicated high water contraction which is typical of the South Waterflow orea. Based on the penults of the drillstem test it was decided to man pipe.

A detailed couly with reconverdations for additional drilling has already been submitted on the aven.

Hovens 1. Cenned; Geologist November 4, 1954

(Rev. 5-63)			STA	TES	• • • • • • • • • • • • • • • • • • •	HIT I)	I DUPLI.	£•	1	Form	approved. Bureau No.
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14. TYPE OF WELL								••••••••••••••••••••••••••••••••••••••	Navaj		
L TYPE OF COMP		EE ELI WELLL			Other			•	1.		17 NAME
	OTER L EN	PACK			Otheri		<b>`</b>		8. FARM 0	A LEASE	NAMB
2. NAME OF OPERATO Vista	Resources	, Inc.			í tru				Navaj	<u>o Tr</u>	<u>act 20-</u>
8. ADDRESS OF OPERA		I. N.E. Suit	te R	A1'huoi	Lerane	NM.	871.22.	•		<b>3 -</b> 3	1
4. LOCATION OF WELL									ſ		DL, OK WILDC
At surface 660		80' FEL Sec	ction	31, T	29 N -					. R., M.,	OK BLOCK AN
At top prod. inter	rval reported be	elow Sar	n Juan	Coun	ty, NM	•				-	T 29 N
At total depth	Same as	Above							Jec.	51,	1 23 11-1
-	Same as	Above		EMIT NO.			ISSUED		12. COUNTY		13. #TA
				. Schr		5,	/17/78		San_Ju	an	NM
		REACHED 17. DAT			•		•	•	IT. GR. ETC.}*	19.	ELET. CASIN
3/1/80   20. TOTAL DEPTH, MD A	<u>4/5/80</u> TVD   21. PLU	10, BACK T.D., MD &	<u>6/12/3</u> 579   23	. IT MEL	TIPLE COMPL	<u>5179</u>	23. INTE		ROTART TO		5179 CABLE 1
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7195-7	'197 Par	adox (Penn.	.)					×. / / /			No
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25. CABINO BIZZ	WEIGHT. LB.				ort all string	7s eet i		ENTING	<u></u>		•
13 3/8"	48		< <u>B</u>	17	1/2"	-		- <del>.</del>			ANOUNT I
9 5/8"	36	2569'	KB	12	1/4"	-	Circul Circul	ated ated			<u>None</u>
7"	26 & 23	6499'	КВ	8	3/4"	75	sx Cl	<u>B + 2</u>	2% CC		None
29.	<u> </u>	LINER RECORD				<u> </u>	30.		UBING REC	2080	
	TOP (MD)	BOTTON (MD)	BACKS C	ENEXT ^e	BCREEN (1	4D)	30. BIZE		CHING REC		PACKER ST
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31. PERFORATION RECO	RD (Interval, e	te and number)	 		1						
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General: This form is designed for submitting a complete and correct well completion report and log on all types of lands and leases to either a Federal agency or a State agency, or both, pursuant to applicable Federal and/or State laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are abown below or will be issued by, or may be obtained from, the local Federal and/or State office. See instructions on items 22 and 24, and 33, below regarding separate reports for separate completions. If not fled prior to the time this summary record is submitted, copies of all currently available logs (drillers, geologists, sample and core analysis, all types electric, etc.), forma-tion and pressure tests, and directional surveys, abould be attached hereto, to the extent required by applicable Federal and/or State laws and regulations. All attachments about de liste are un applicable. State required bereto, to the extent required by applicable Federal and/or State laws and regulations. All attachments about de liste are un applicable. State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State attact there are unapplicable.

or Federal office for specific instructions. Ham 18: Indicate which elevation is used as reference (where not otherwise shown) for depth measurements given in other spaces on this form and in any attachments. Items 22 and 24: If this well is completed for separate production from more than one interval work (page) on this form and in any attachments. Items 22 and 24: If this well is completed for separate production from more than one interval work (page), so state in item 22, and in item 24 show the producing interval, or intervala, top(s), bottom(s) and name(s) (if any) for only the interval reported in item 33. Submit a separate report (page) on this form, adequately identified, interval, we interval to be apparately produced, abowing the additional data periment to such interval. Item 25: "Socia Cement": Attached supplemental records for this well show the details of any multiple stage cementing and the location of the cementing tool. Item 33: Submit a separate completion report on this form for each interval to be separately produced. (See instruction for items 22 and 24 above.)

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648 670 930 3170 4139 4302 4558 4558 4600 4938 4995 5029	670 930 3170 4139 4302 4558 4600 4938 4995 5029 5243	548 22 260 2240 969 163 256 42 338 57 94 214	LEVIS S SINAYER S WAT UPPER S GALLUP MED MED MED	HALE, SHALE, CAND, HALE, SHALE, CAN DE - SAND, CREV, EA WEY, IMTERCEN ANOOS - SHALE, C - SAND, LITE CRE CRAINEO, WATER MANOOS - SHALE, E - SILT, CREV, MOOS - SHALE, D - LIWY, SHALE - CHALE, DARK O SAND, LITE SREY CRAINES TA M.	FINE-WED DR., WAYER WE EDN, DREV FINE-MED DR., DID W/BREV SHALE REV V. WHITE; FINE- WEY DARE DREV MARD, TITE ARE DREV, MARD, SPLIN-
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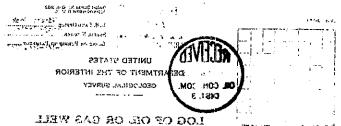
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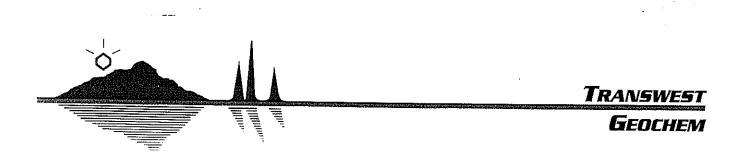
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Size casing	Where set	Number sacks of cement	Method used	Mud gravity	Amount of mud used
8-5/8					
			*********	*****	

Hogwing plug		PLUGS AND ADAPTERS Length						
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## **APPENDIX B**

## LABORATORY ANALYTICAL DATA FOR SAMPLES COLLECTED FROM SANOSTEE TRIBE WELLS ON MAY 11, 2005



June 13, 2005

Chris Courtney URS Corporation 7720 N. 16th St. Suite 100 Phoenix, AZ 85020

RE: Desert Rock Energy/23444264.33202

Work Order No.: 0505165

Dear Chris,

Transwest Geochem, Inc. received 3 samples on 5/12/2005 11:20:00 AM for the analyses presented in the following report.

The Case Narrative of this report addresses any Quality Control and/or Quality Assurance issues associated with this Work Order.

If you have any questions regarding these test results, please feel free to call us at (602) 437-0330.

Sincerely,

of ochem

Carlene McCutcheon Project Manager

ADHS License No. AZM133/AZ0133

## TRANSWEST

Client:URS CorporationWork Order:0505165Project Name:Desert Rock EnergyProject Number:23444264.33202

**GEOCHEM** Date Printed: 13-Jun-05

**Case Narrative** 

All method blanks, laboratory spikes, and/or matrix spikes met quality control objectives for the parameters associated with this Work Order except as detailed below or on the Data Qualifier page of this report. Data Qualifiers used in this report are in accordance with ADEQ Arizona Data Qualifiers, Revision 2.0 11/26/2003.

Data qualifiers ("flags") contained within this analytical report have been issued to explain a quality control deficiency, and do not affect the quality (validity) of the data unless noted otherwise in the case narrative.

	TRANSWEDT GEOCHEM	Date Printed 09-Jun-05 License No. AZM133/AZ0133
CLIENT:	URS Corporation	Case Narrative
Project Name:	Desert Rock Energy	
<b>Project Number:</b>	23444264.33202	Data Qualifiers
Work Order:	0505165	
Date Received:	12-May-05	

One or more of the following data qualifiers may be associated with your analytical and/or quality control data.

H3 Sample was received and analyzed past holding time.

D2 Sample required dilution due to high concentration of target analyte.

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		Geochem

CLIENT:

**Project Name:** 

Project Number: 23444264.33202

**URS** Corporation

Desert Rock Energy

Date Printed12-Jun-05License No.AZM133/AZ0133

**∼**,

# Work Order Sample Summary

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Client Sample ID	Lab Sample ID	Test Code	Collection Date
12T-655	0505165-01A	EPA120.1	5/11/2005 2:00:00 PM
		EPA150.1	5/11/2005 2:00:00 PM
		EPA180,1	5/11/2005 2:00:00 PM
		EPA300	5/11/2005 2:00:00 PM
		SM 2540 C	5/11/2005 2:00:00 PM
		SM 4500-NO2 B	5/11/2005 2:00:00 PM
		SM2320 B	5/11/2005 2:00:00 PM
	0505165-01B	EPA353.2	5/11/2005 2:00:00 PM
	0505165-01C	EPA200.7	5/11/2005 2:00:00 PM
		EPA200.9	5/11/2005 2:00:00 PM
	0505165-01D		5/11/2005 2:00:00 PM
	0505165-01E		5/11/2005 2:00:00 PM
		EPA901,1	5/11/2005 2:00:00 PM
12T-633	0505165-02A	EPA120.1	5/11/2005 2:30:00 PM
		EPA150.1	5/11/2005 2:30:00 PM
		EPA180.1	5/11/2005 2:30:00 PM
		EPA300	5/11/2005 2:30:00 PM
		SM 2540 C	5/11/2005 2:30:00 PM
		SM 4500-NO2 B	5/11/2005 2:30:00 PM
		SM2320 B	5/11/2005 2:30:00 PM
	0505165-02B	EPA353.2	5/11/2005 2:30:00 PM
	0505165-02C	EPA200.7	5/11/2005 2:30:00 PM
		EPA200.9	5/11/2005 2:30:00 PM
	0505165-02D		5/11/2005 2:30:00 PM
	0505165-02E		5/11/2005 2:30:00 PM
		EPA901.1	5/11/2005 2:30:00 PM
12K-320	0505165-03A	EPA120.1	5/11/2005 3:10:00 PM
		EPA150.1	5/11/2005 3:10:00 PM
		EPA180.1	5/11/2005 3:10:00 PM
		EPA300	5/11/2005 3:10:00 PM
		SM 2540 C	5/11/2005 3:10:00 PM
		SM 4500-NO2 B	5/11/2005 3:10:00 PM
		SM2320 B	5/11/2005 3:10:00 PM
	0505165-03B	EPA353.2	5/11/2005 3:10:00 PM

1 of 2

CLIENT: Project Name: Project Number: Work Order: Date Received:	URS Corporation Desert Rock Energy 23444264.33202 0505165 12-May-05		Work Order Sample Summary			
Client Sample ID		Lab Sample ID	Test Code	Collection Date		
12K-320		0505165-03C	EPA200.7	5/11/2005 3:10:00 PM		
			EPA200.9	5/11/2005 3:10:00 PM		
		0505165-03D		5/11/2005 3:10:00 PM		
		0505165-03E		5/11/2005 3:10:00 PM		

	TRANSWEST GEOCHEM	Date Printed 09-Jun-05 License No. AZM133/AZ0133				
CLIENT: Project Name: Project Number: Work Order: Date Received:	URS Corporation Desert Rock Energy 23444264.33202 0505165 12-May-05	Definitions				
Analytical Spike (	distilled, digested, or extracted and if the MS has failed. It is used to it	get analyte added to a sample after it has been is ready for analysis. The AS is generally performed adicate interference that arises from sample as opposed to interference that is innate to the matrix.				
Continuing Curve Verification (CCV	7) intervals during an analysis. The C	rve check. This is a standard analyzed at specified CCV verifies the stability and accuracy of the ic CCV recovery acceptance criteria for each method.				
Dilution Factor (I	DF) The DF is an indication of how mu	ch a sample had to be diluted in order to quantitate it licated in the reported sample result. The sample PQL				
Internal Standard	chemical composition but is unique	r to the organic compound of interest in terms of in that it is rare in the environment. The same ry sample for some organic methods.				
Laboratory Contro Sample (LCS)	ol The LCS is also referred to as a bla of a target analyte (from the same s of deionized water or other appropriate	The LCS is also referred to as a blank spike. The LCS is an addition of a known amount of a target analyte (from the same source as calibration standards or spikes) to an aliquot of deionized water or other appropriate clean matrix. The LCS is processed through the entire method procedure in the same manner as samples.				
Matrix Spike (MS		of a target analyte added to a sample. The MS is processed				
Method Blank (M	B) The MB is an aliquot of deionized to be free of the analyte in question or analysis procedure and is used to	water or other appropriate clean matrix that is thought . The MB is processed through the entire extraction o indicate contamination in the lab.				
Method Detection Limit (MDL)	The MDL is the lowest level of det	ection of which a method is capable.				
Practical Quantita Limit (PQL)		ch Transwest Geochem can detect an analyte in lence. The PQL will increase as the DF increases. the MDL.				
Relative Percent Difference (RPD)	The RPD is a measure of precision the same sample). It is calculated u its associated duplicate result.	cision (the ability to obtain the same result on re-analysis of lated using the result of a sample, MS, LCS, or LCSV and				
Secondary Source Sample (LCSV)	same type of standard as a calibrati	s a second source laboratory control sample. It is the pration or spiking standard but is obtained from a different tion of the primary standard quality, method performance,				
Surrogate	chemical composition but is unique surrogates are used, they are added	t to the organic compound of interest in terms of que in that it is rare in the environment. When led to every sample, blank and standard. Surrogate of extraction and/or analytical success.				
Trip Blank (TB)	The TB travels from the lab, to the	ater preserved in the same manner as the samples. field, and then back to the lab with the samples from cation of contamination introduced during sample				

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CLIENT:	URS Corporation
CLIENT: Project Name:	URS Corporation Desert Rock Energy

12-May-05

19 9 · Michill Shipmon

Work Order:

Date Received:

Date Printed 09-Jun-05 License No. AZM133/AZ0133

## References

Transwest Geochem, Inc. uses the methods outlined in the following references:

Code of Federal Regulations, 40CFR, Part 136, Appendix A, 1998.

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

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

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, Revised August 1993.

Methods for the Determination of Metals in Environmental Samples, Supplement 1: EPA/600/R-94/111, Revised May 1994.

Methods for the Determination of Organic Compounds in Drinking Water, EPA/600/4-88/039, Revised July, 1991; EPA-600/4-90/020, Supplement I, July 1990; EPA-600/R-92/129; Supplement II, August 1992; EPA-600/R-95/131, Supplement III, August 1995.

Hach, Water Analysis Handbook, 3rd Edition, 1997.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition, 1986 including Update I, July 1992; Update IIA, August 1993; Update II; September 1994; Update IIB, January 1995; Update III, December 1996

Bureau of Laboratory Services, State of Arizona Department of Health Services Method 418.1AZ: TPH in Soil, September 1994.

Bureau of Laboratory Services, State of Arizona Department of Health Services Method 8015AZ.R1, September 1998. (Comment: C6-C10 GRO reported by this method is not to be used in compliance situations)

ASTM MethodD4982, Annual Book of ASTM Standards, Volumes 11.01 and 11.02, 1995

The Determination of Polychlorinated Biphenyls in Transformer Fluid and Waste Oils, EPA-600 4-81-045, September 1982.

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Lab ID: 0505165-0	)1					Matrix	: Ground	water		
Project Name: Desert Ro	ck Energy									
Project Number: 23444264.										
						Test	Date	Date		
Analyte	Result	PQL	Qual	Units	DF	Code	Prepared	Analyzed	Analys	t Batch ID
						ED4408.4	MIN	54355		
Specific Conductance	270	1.0		µmhos/cm	1.0	EPA120.1	N/A	5/13/05	SO (	COND_W-5/13/2005
рН	8.1	N/A	H3	-	1.0	EPA150.1	N/A	5/13/05 11:30	so	PH_W-5/13/2005
Temperature °C.	21.8	N/A			1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Turbidity	<0.02	0.02		NTU	1.0	EPA180.1	N/A	5/13/05 7:55	SO	TURB_W-5/13/2005
Chloride	4.5	2.5		mg/L	1.0	EPA300	N/A	5/19/05	TL	10-5/19/2005
Fluoride	<0.50	0.50		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Sulfate	6.6	3.0		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Nilrale (As N)	<0.50	0.50		mg/L	1.0	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Total Dissolved Solids	160	10		mg/L	1.0	SM 2540 C	N/A	5/16/05	BJK	TDS_DW-5/17/2005
Nitrite (As N)	<0.020	0.020		mg/L	1.0	SM 4500-NO2 B	N/A	5/13/05 9:49	КМВ	NO2_DW-5/13/2005
Alkalinity, Bicarbonate (As C	140	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Carbonate (As CaCO3)	<20	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Hydroxide (As CaCO3)	<20	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Total (As CaCO3)	140	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Atuminum	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Barium	0.14	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Boron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Cadmium	<0.0030	0.0030		mg/L	1.0	EPA200.7	5/16/05	5/17/05 11:11	JM	9415
Calcium	20	1.0		mg/L	1.0	EPA200,7	5/16/05	5/16/05 15:35	JM	9415
Chromium	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Cobalt	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Copper	0.29	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Iron	<0,10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Magnesium	4.0	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JМ	9415
Nickel	<0.010	0.010		mgA.	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Potassium	2.8	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Silica	19	0.43		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Silver	<0.0050	0.0050		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Sodium	34	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:35	JM	9415
Antimony	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/16/05	KMB	20095/16/05
Arsenic	<0.0040	0.0040		mg/L	1.0	EPA200.9	N/A	5/23/05	KMB	20095/23/2005

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Ż	AL TI	tanswe Geoch			Date Printed 12-Jun-05 License No. AZM133/AZ0133								
CLIENT:	URS Corporation				Client	Sample D	<b>D:</b> 12T-65:	5					
Work Order:	0505165				Coll	ection Dat	te: 5/11/20	05 2:00:00	PM	,			
Lab ID:	0505165-01					Matri	ix: Ground	water					
Project Name:	Desert Rock Energ	у											
Project Number	: 23444264.33202												
						Test	Date	Date					
Analyte	Rest	ılt PQL	Qual	Units	DF	Code	Prepared	Analyzed	Analyst	Batch ID			
Lead	0.00	95 0.0030		mg/L	1.0	EPA200.9	N/A	5/18/05	KMB	20095/18/2005			

mg/L,

mg/L

EPA200.9

EPA200.9

1.0

1.0

5/17/05

5/26/05

KMB

KMB

N/A

N/A

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Selenium

Thalium

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£

<0.0030

<0.0020

0.0030

0.0020

Confidential	and	Privileged
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2009_5/17/2005

200.9_TL-5/26/2005

- Alt		VSWES OCHE				Da	te Printec	12-Jun-05	)	
AND IN	4.¥1		17			Lie	cense No.	AZM133/	/AZ013	3
CLIENT: URS Corp	oration				Clien	t Sample ID	: 12T-633	3		
Work Order: 0505165					Col	lection Date	: 5/11/20	05 2:30:00 1	PM	ł
Lab ID: 0505165-0	)2						: Ground			
Project Name: Desert Ro										
Project Number: 23444264										
r roject Rumber, 20444204.	.JJ202							<u> </u>		·····
Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analys	t Batch ID
Specific Conductance	280	1.0		µmhos/cm	1.0	EPA120.1	N/A	5/13/05	SO	COND_W-5/13/200
рН	9.0	N/A	H3	-	1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Temperature °C.	21.5	N/A			1,0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Turbidity	<0.02	0.02		NŤU	1.0	EPA180.1	N/A	5/13/05 7:55	SO	TURB_W-5/13/2005
Turbicity	N0.02	0.02		MU	1.0	EF X 100, 1		010001.00	30	1010010-00102003
Chloride	<2.5	2.5		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Fluoride	<0.50	0,50		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Sulfate	3.4	3.0		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Nitrate (As N)	<0.50	0.50		mg/L	1.0	EPA353.2	N/A	5/25/05	ΤL	NO3_W-5/25/2005
Total Dissolved Solids	170	10		mg/L	1.0	SM 2540 C	N/A	5/16/05	BJK	TDS_DW-5/17/200
Nitrite (As N)	<0.020	0.020		mg/L	1.0	SM 4500-NO2 B	N/A	5/13/05 9:49	KMB	NO2_DW-5/13/200
Alkalinity, Bicarbonate (As C	89	20		mg/L	1.0	SM2320 B	N/A	5/18/05	кмв	ALK_W-5/18/2005
Alkalinity, Carbonate (As Ca	50	20		mg/L	1.0	SM2320 B	N/A	5/18/05	КМВ	ALK_W-5/18/2005
Alkalinity, Hydroxide (As CaCO3)	<20	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Total (As CaCO3)	140	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Aluminum	<0,10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Barium	0.014	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Boron	<0.10	0.10		mg/L	1.0	EPA200,7	5/16/05	5/16/05 15:39	JM	9415
Cadmium	<0.0030	0.0030		mg/L	1.0	EPA200.7	5/16/05	5/17/05 11:14	JM	9415
Calcium	1.3	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Chromium	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Cobali	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Copper	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
iron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Magnesium	<1.0	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Vickel	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Potassium	<2.0	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Silica	16	0.43		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:39	JM	9415
Silver	<0.0050	0.0050		mg/L	1.0	EPA200,7	5/16/05	5/16/05 15:39	JM	9415
Sodium	68	2.0		mg/L	1.0	EPA200,7	5/16/05	5/16/05 15:39	JM	9415
Antimony	<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/16/05	КМВ	20095/16/05
Arsenic	<0.0040	0.0040		mg/L	1.0	EPA200.9	N/A	5/23/05	KMB	20095/23/2005

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- X			NSWES GEOCHEN	<del></del>			-	ate Printec icense No.	I 12-Jun-03 AZM133		3
CLIENT:	URS Corporatio	n				Client	Sample D	D: 12T-633	3		
Work Order:	0505165					Coll	ection Dat	te: 5/11/20	05 2:30:001	PM	•
Lab ID:	0505165-02						Matri	x: Ground	water		
Project Name:	Desert Rock En	ergy									
<b>Project Number</b>	: 23444264.3320	2									
Analyte	R	esult	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analys	st Batch ID
Lead	<(	0.0030	0,0030		mg/L	1.0	EPA200.9	N/A	5/18/05	KMB	20095/18/2005
Selenium	<(	0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/17/05	KMB	2009_5/17/2005
Thallium	<(	0.0020	0.0020		mg/L	1.0	EPA200.9	N/A	5/26/05	KMB	200.9_TL-5/26/2005

- Au		vswes Eoche					ite Printeo cense No.	1 12-Jun-04 AZM133		3
CLIENT: URS Corp	oration				Clien	t Sample ID	: 12K-32	0		
Work Order: 0505165	oration.					lection Date			РМ	
Lab ID: 0505165-(	13				ÇU		: Ground		. 1	
						1714(11)	. Orouna	Wator		
Project Name: Desert Ro	•.									
Project Number: 23444264	.33202									
Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analy	st Batch ID
Specific Conductance	500	1.0		µmhos/cm	1.0	EPA120.1	N/A	5/13/05	so	COND_W-5/13/2005
		<b>b</b> #14	110			FD4450.4	4174	514005 44.00	••	
pH Tommometume 80	9.3	N/A	H3		1.0	EPA150,1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Temperature °C.	21.5	N/A			1.0	EPA150.1	N/A	5/13/05 11:30	SO	PH_W-5/13/2005
Turbidity	<0.02	0.02		NTU	1.0	EPA180.1	N/A	5/13/05 7:55	SO	TURB_W-5/13/2005
Chloride	4.5	2.5		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Fluoride	<0.50	0.50		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Sulfate	52	3.0		mg/L	1.0	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Nitrate (As N)	<0.50	0.50		mg/L	1.0	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Total Dissolved Solids	300	10		mg/L	1.0	SM 2540 C	N/A	5/16/05	BJK	TDS_DW-5/17/2005
Nilrite (As N)	<0.020	0.020		mg/L	1.0	SM 4500-NO2 B	N/A	5/13/05 9:49	кмв	NO2_DW-5/13/2005
Alkalinity, Bicarbonate (As C	100	20		1	1.0	SM2320 B	N/A	5/18/05	1410	
Alkalinity, Carbonate (As Ca	97	20		ng/L ng/L	1.0	SM2320 B	NA	5/18/05	KMB KMB	ALK_W-5/18/2005 ALK_W-5/18/2005
Alkalinity, Hydroxide (As CaCO3)	<20	20 20		mg/∟ mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Total (As CaCO3)	200	20		mg/L	1.0	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
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Aluminum	<0.10	0.10		mgA.	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Barium	0.036	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Boron	<0.10	0.10		mg/L	1.0	EPA200,7	5/16/05	5/16/05 15:42	JM	9415
Cadmium	<0.0030	0.0030		mg/L	1.0	EPA200.7	5/16/05	5/17/05 11:18	JM	9415
Calcium	1.1	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Chromium	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Cobalt	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Copper	<0.010	0.010		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
ron	<0.10	0.10		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Magnesium	<1.0	1.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Nickel	<0.010	0.010		mg/L	1.0	EPA200,7	5/16/05	5/16/05 15:42	JM	9415
Potassium	<2.0	2.0		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Silica	18	0.43		mg/L	1.0	EPA200.7	5/16/05	5/16/05 15:42	JM	9415
Silver Sodium	<0.0050 110	0.0050 10	D2	mg/L mg/L	1.0 5.0	EPA200.7 EPA200.7	5/16/05 5/16/05	5/16/05 15:42 5/16/05 17:51	JM JM	9415 9415
Antimony	<0.0030	0.0030		mg/L	1.0	EPA200,9	N/A	5/16/05	KMB	20095/16/05
Arsenic	<0.0040	0.0040		mg/L	1.0	EPA200,9	N/A	5/23/05	KMB	20095/23/2005

	<u>∽</u> ĄĮĄ	******	NSWES EOCHEA				-	ate Printec icense No.	1 12-Jun-05 AZM133		
CLIENT:	URS Corporati	ion				Client	Sample II	D: 12K-32	)		····
Work Order:	0505165					Coll	ection Dat	e: 5/11/20	05 3:10:00	PM	÷
Lab ID:	0505165-03						Matri	x: Ground	water		
Project Name:	Desert Rock E	nergy									
<b>Project Number</b>	: 23444264.332	02									
			,,,,	*****			Test	Date	Date		
Analyte	]	Result	PQL	Qual	Units	DF	Code	Prepared	Analyzed	Analyst	Batch ID
Lead		<0.0030	0.0030		mg/L	1.0	EPA200.9	N/A	5/18/05	КМВ	20095/18/2005
Selenium		<0.0030	0,0030		mg/L	1.0	EPA200.9	N/A	5/17/05	KMB	2009_5/17/2005

mg/L.

1.0

EPA200.9

N/A

5/26/05

KMB

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Thailium

<0.0020

0.0020

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200.9_TL-5/26/2005

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an Gelekener	D.	<b>Geochem</b>	

URS Corporation

Date: 09-Jun-05

License No. AZM133/AZ0133

Method Blank

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### QC SUMMARY REPORT

Work Order:0505165Project:Desert Rock Energy

CLIENT:

Desert Rock Energy/23444264.33202

Analyte	Result	PQL	Qual	Units	DF	Test Code	Date Prepared	Date Analyzed	Analyst	Batch ID
Chloride	<2.5	2.5		mg/L	1	EPA300	N/A	5/19/05	TL.	IC-5/19/2005
Fluoride	<0.50	0.50		mg/L	1	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Sulfate	<3.0	3.0		mg/L	1	EPA300	N/A	5/19/05	TL	IC-5/19/2005
Nitrate (As N)	<0.50	0.50		mg/L	1	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Nitrate-Nitrite (As N)	<0.50	0.50		mg/L	1	EPA353.2	N/A	5/25/05	TL	NO3_W-5/25/2005
Total Dissolved Solids	<10	10		mg/L	1	SM 2540 C	N/A	5/16/05	BJK	TDS DW-5/17/2005
Nitrite (As N)	<0.020	0.020		mg/L	1	SM 4500-NO2 B	N/A	5/13/05 9:49	KMB	NO2_DW-5/13/2005
Alkalinity, Bicarbonate (As CaCO3)	<20	20		mg/L	1	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Carbonate (As CaCO3)	<20	20		mg/L	1	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkalinity, Hydroxide (As CaCO3)	<20	20		mg/L	1	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Alkatinity, Total (As CaCO3)	<20	20		mg/L	1	SM2320 B	N/A	5/18/05	KMB	ALK_W-5/18/2005
Aluminum	<0.10	0.10		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Barium	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Boron	<0.10	0.10		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Calcium	<1.0	1.0		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Chromium	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Cobalt	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Copper	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
iron	<0.10	0.10		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Magnesium	<1.0	1.0		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Nickel	<0.010	0.010		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Potassium	<2.0	2.0		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Silica	<0.43	0.43		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Silver	<0.0050	0.0050		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Sodium	<2.0	2.0		mg/L	1	EPA200.7	5/16/05	5/16/05 15:17	JM	9415
Cadmium	<0.0030	0.0030		mg/L	1	EPA200.7	5/16/05	5/17/05 10:53	JM	9415
Antimony	<0.0030	0.0030		mg/L	1	EPA200.9	N/A	5/16/05	КМВ	20095/16/05
Selenium	<0.0030	0.0030		mg/L	1	EPA200.9	N/A	5/17/05	КМВ	2009_5/17/2005
Lead	<0.0030	0.0030		mg/L	1	EPA200.9	N/A	5/18/05	КМВ	20095/18/2005
Arsenic	<0.0040	0.0040		mg/L	1	EPA200.9	N/A	5/23/05	KMB	20095/23/2005
Thallium	<0.0020	0.0020		mg/L	1	EPA200.9	N/A	5/26/05	KMB	200.9_TL-5/26/2005

	<u>H</u>		<b>IVSIVE</b> IVSIVE						Dat Lic	te: 0! ense No. A	9-Jun-05 ZM133/A	Z0133
CLIENT:		orporat	ion						OC SI	JMMAR	VREP	ÓRT
Work Order:	050516	-							QUN			
Project:	Desert	Rock E	nergy/23	444264.33	202					ba	mple Du	pricate
Analyte	R	lesult	PQL	Units	RPD Ref Val	% RPD	RPD Limit	Test Code	Date Prepared	Date Analyzed	Analyst	Qual
Sample ID: 0505 Client ID:	117-03AD	В	atch ID:	COND_W-5/	/13/2005							<u></u>
Specific Conductance		4260	1.0	µmhos/cm	4280	0%		EPA120.1	N/A	5/12/05	SO	
Sample ID: 0505 Client ID: 12K-	165-03AD 320	В	atch ID:	COND_W-5/	/13/2005				<u> </u>			
Specific Conductance		502.0	1,0	µmhos/cm	502.0	0%	1	EPA120.1	N/A	5/13/05	SO	
Sample ID: 0505 Client ID:	187-01BD	В	atch ID:	NO3_W-5/25	5/2005							
Nitrate-Nitrite (As N)		3.536	0.50	mg/L	3.540	0%	8	EPA353.2	N/A	5/25/05	TL	
Sample ID: 0505: Client ID:	254-02AD	B	atch ID:	NO3_W-5/25	5/2005							
Nitrate-Nitrite (As N)		<0.50	0.50	mg/L	<0.50	0%	8	EPA353.2	N/A	5/25/05	TL	
Sample ID: 0505 Client ID: 12K-	165-03AD 320	B	atch ID:	PH_W-5/13/2	2005	·						
Temperature °C.		21.40	N/A		21.50	0%	20	EPA150.1	N/A	5/13/05 11:30	\$0	
pН		9.306	N/A		9.297	0%	20	EPA150.1	N/A	5/13/05 11:30	SO	
Sample ID: 0505: Client ID: 12K-	165-01AD 655	B	atch ID:	TDS_DW-5/I	17/2005						./	<u> </u>
Total Dissolved Solids		154.0	10	mg/L	156.0	1%	14	SM 2540 C	N/A	5/16/05	BJK	
Sample ID: 0505 Client ID: 12K-	165-03AD 320	B	atch ID:	TURB_W-5/	13/2005			···· , , , , , , , , , , , , , , , , ,				
Turbidity		<0.02	0.02	NTU	<0.02	0%	4	EPA180.1	N/A	5/13/05 7:55	so	

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0505165

URS Corporation

Desert Rock Energy/23444264.33202

CLIENT:

**Project:** 

Work Order:

# Date: 12-Jun-05 License No. AZM133/AZ0133

#### QC SUMMARY REPORT

Sample Matrix Spike Duplicate

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: 0505165-02A-MSD	Batch ID: IC		Vuluo		Code; I			Date Analy			
Client ID: 12T-633					s mg/L			Date Prepa			
Chloride	24.88	2.5	25.00		100%	80	113	25.2	1%	6	
Fluoride	4.957	0.50	5.000		99%	80	113	5.016	1%	5	
Sulfate	31.04	3.0	30.00	3.445	92%	80	111	31.34	1%	6	
Sample ID: 0505165-02A-MS	Batch ID: IC	-5/19/2005		Test	Code: I	EPA300		Date Analy	zed: 05	/19/05 00:	00
Client ID: 12T-633				Unit	s mg/L			Date Prepa	red: N//	ł	
Chloride	25.20	2.5	25,00		101%	80	113				
Fluoride	5.016	0.50	5.000		100%	80	113				
Sulfate	31.34	3.0	30,00	3.445	93%	80	111				
Sample ID: 0505187-01BS	Batch ID: NO	03_W-5/25/	2005	Test	Code: I	EPA353.2		Date Analy	/zed: 05	/25/05 00:	00
Client ID:				Unit	s mg/L			Date Prepa	red: N/A	4	
Nitrate-Nitrile (As N)	13.86	1.0	10.00	3.492	104%	90	110				
Sample ID: 0505254-02AS	Batch ID: NO	03_W-5/25/	2005	Test	Code: I	EPA353.2		Date Analy	/zed: 05	/25/05 00:	00
Client ID:				Unit	s mg/L			Date Prepa	red: N/A	4	
Nitrate-Nitrite (As N)	5,043	0.50	5.000		101%	90	110				
Sample ID: 0505165-01A-MSD	Batch ID: NO	D2_DW-5/1	3/2005	Test	Code: S	SM 4500-N	O2 B	Date Analy	/zed: 05	/13/05 09:	49
Client ID: 12T-655				Unit	s mg/L			Date Prepa	red: N/a	4	7
Nitrite (As N)	0.09540	0.020	0.1000		95%	63	130	0.1	5%	6	
Sample ID: 0505165-01A-MS	Batch ID: NO	DW-5/1	3/2005	Test	Code: S	SM 4500-N	O2 B	Date Analy	/zed: 05	/13/05 09:	49
Client ID: 12T-655				Unit	s mg/L			Date Prepa	red: N/.	4	
Nitrite (As N)	0.1000	0.020	0.1000		100%	63	130				
Sample ID: 0505094-01ASD	Batch ID: AI	.K_W-5/18/	2005	Test	Code: 8	SM2320 B		Date Analy	/zed: 05	/18/05 00:	00
Client ID:				Unit	s mg/L			Date Prepa	red: N/	4	
Alkalinity, Total (As CaCO3)	281.0	20	167.0	135.7	87%	69	117	277.1	1%	3	
Sample ID: 0505094-01AS	Batch ID; AI	.K_W-5/18/	2005	Test	Code: 8	SM2320 B		Date Analy	zed: 05	/18/05 00	00
Client ID:				Unit	s mg/L			Date Prepa	red: N/	A	
Alkalinity, Total (As CaCO3)	277.1	20	167.0	135,7	85%	69	117				

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All Contractions	TRANSWEST
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## License No. AZM133/AZ0133

Date:

## QC SUMMARY REPORT

Work Order: Project:

CLIENT:

URS Corporation 0505165

Desert Rock Energy/23444264.33202

Sample Matrix Spike

12-Jun-05

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD % RPD Ref Val RPD Limit Qual
Sample ID: 0505165-03C-MS	Batch ID: 94				Code: E		2000	Date Analyzed: 05/16/05 15:46
Client ID: 12K-320	201021 127				s mg/L			Date Prepared: 5/16/05
Aluminum	40.00	0.10	11.00		-		400	
Barium	12.36 1.118	0.10 0.010	11.00 1.000	0.03648	112% 108%	70 70	130 130	
Boron	1.106	0.010	1,000	0.03040	111%	70	130	
Calcium	29,63	1.0	26,00	1.075	110%	70	130	
Chromium	1.030	0.010	1.000	1.015	103%	70	130	
Cobail	1.109	0.010	1.000		111%	70	130	
Copper	0,9563	0.010	1.000		96%	70	130	
Iron	0.9642	0.10	1.000		96%	70	130	
Magnesium	27.83	1.0	26.00		107%	70	130	
Nickel	1.057	0.010	1.000		106%	70	130	
Sílica	29.55	0.43	10.70	18.29	105%	70	130	
Silver	0.08005	0.0050	0.07500		107%	70	130	
Sample ID: 0505165-03C-MSD	Batch ID: 94	115		Test	Code: I	PA200.7		Date Analyzed: 05/16/05 15:49
Client ID: 12K-320				Unit	s mg/L			Date Prepared: 5/16/05
Aluminum	12.88	0.10	11.00		117%	70	130	12.36 4% 12
Barium	1.153	0.010	1.000	0.03648	112%	70	130	1.118 3% 9
Boron	1.154	0.10	1.000		115%	70	130	1.106 4% 12
Calcium	30.69	1.0	26.00	1.075	114%	70	130	29.63 4% 7
Chromium	1.075	0.010	1,000		108%	70	130	1.03 4% 7 🧭
Cobalt	1.160	0.010	1.000		116%	70	130	1.109 4% 7
Copper	0.9826	0.010	1.000		98%	70	130	0.9563 3% 8
Iron	1.018	0.10	1.000		102%	70	130	0.9642 5% 12
Magnesium	28.82	1.0	26.00		111%	70	130	27.83 3% 8
Nickel	1.096	0.010	1.000		110%	70	130	1.057 4% 7
Silica	30.72	0.43	10.70	18.29	116%	70	130	29.55 4% 13
Silver	0.08189	0.0050	0.07500		109%	70	130	0.08005 2% 15
Sample ID: 0505119-04B-MS	Batch ID: 94	115		Test	Code: I	PA200.7		Date Analyzed: 05/16/05 16:36
Client ID:				Unit	s mg/L			Date Prepared: 5/16/05
Chromium	1.049	0.010	1.000		105%	70	130	
Sample ID: 0505119-04B-MSD	Batch ID: 94	415		Test	Code: I	EPA200.7		Date Analyzed: 05/16/05 16:40
Client ID:				Unit	s mg/L			Date Prepared: 5/16/05
Chromium	1.088	0.010	1.000		109%	70	130	1.049 4% 7
Sample ID: 0505165-03C-MS	Batch ID: 94	115		Test	Code: I	EPA200.7		Date Analyzed: 05/16/05 17:55
Client ID: 12K-320				Unit	s mg/L			Date Prepared: 5/16/05
Potassium	27.59	10	25.00		110%	70	130	
Sodium	136.6	10	25.00	113.4	93%	70	130	

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CLIENT:	URS Con	oration							OC SUI	MMA	RYR	EPÓRT
Work Ord									-			Duplicate
Project:	Desert Ro	ck Energy/2	3444264.	33202					Sampte	5 IVIALI	ix opixe	Dupitoate
Analyte		Result	PQL	SPK value	SPK. Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID:	0505165-03C-MSD	Batch ID: 94	115		Test	Code: 1	EPA200.7		Date Anal	yzed: 0	5/16/05 17:5	9
Client ID:	12K-320				Unit	s mg/L			Date Prepa	red: 5/	16/05	
Potassium Sodium		27.93 137.3	10 10	25.00 25.00	113.4	112% 96%		130 130	27.59 136.6	1% 1%	13 8	
Sample ID:	0505165-03C-MS	Batch ID: 94	115		Test	Code:	EPA200.7		Date Anal	yzed: 0	5/17/05 11:2	.1
Client ID:	12K-320				Unit	s mg/L			Date Prepa			
Cadmium		1.103	0.0030	1.000	- Win and	110%	70	130				
Sample ID:	0505165-03C-MSD	Batch ID: 94	15		Test	Code:	EPA200,7		Date Anal	vzed: 0	5/17/05 11:2	
Client ID:	12K-320				Unit	s mg/L			Date Prepa			
Cadmium		1.075	0.0030	1.000		108%	70	130	1.103	3%	7	
Sample ID:	0505165-01C-MSD	Batch ID: 20	095/16/05		Test	Code: 1	EPA200.9		Date Analy	vzed: 0	5/16/05 00:0	0
Client ID:	12T-655					s mg/L			Date Prepa			
Antimony		0.01310	0.0030	0.01500		87%	70	130	0.01283	2%	14	
Sample ID:	0505165-01C-MS	Batch ID: 20	095/16/05		Test		EPA200.9		Date Analy			0
Client ID:						s mg/L			Date Prepa			
Antimony		0.01283	0.0030	0.01500		86%	70	130				
Sample ID:	0505165-03C-MSD	Batch ID: 20	09 5/17/20		Test		EPA200.9		Date Analy	uzad• 0	5/17/05 00-0	10
Client ID:			-			s mg/L			Date Prepa			1
Selenium		0.01369	0.0030	0.01500		91%	70	130	0.0129	6%	17	
Sample ID:	0505165-03C-MS	Batch ID: 20			Test		EPA200.9	100	Date Analy			<u>ا</u>
Client ID:						s mg/L			Date Prepa			
Selenium		0.01290	0.0030	0.01500		86%	70	130	~p-			
Sample ID:	0505165-03C-MSD	Batch ID: 20			Test		EPA200.9		Date Anal	vzed: 0	5/18/05 00:0	
Client ID:						s mg/L			Date Prepa			
Lead	····	0.01384	0.0030	0.01500		92%	70	130	0.01384	0%	13	
	0505165-03C-MS	Batch ID: 20			Test		EPA200.9		Date Anal			10
Client ID:						s mg/L			Date Prepa			
Lead		0.01384	0.0030	0.01500		92%	70	130	· · · · · ·			
Sample ID:	0505165-03C-MSD	Batch ID: 20			Test		EPA200.9		Date Anal	vzed: 0	5/23/05 00:0	90
Client ID:						s mg/L			Date Prepa			
Arsenic		0.01874	0.0040	0.01500		125%	70	130	0.01855	1%	9	
Sample ID:	0505165-03C-MS	Batch ID: 20		· · · ·	Test		EPA200.9		Date Anal			)0
Client ID:						s mg/L			Date Prepa			
Arsenic		0.01855	0.0040	0.01500		124%	70	130	<b>r</b> -	-		

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CLIENT:	URS Corp	poration			****				QC SUN	има	RVR	EPORT
Work Order:	0505165								20.00			
Project:	Desert Ro	ck Energy/2	3444264.3	33202						San	nple M	atrix Spike
				SPK.	SPK	%	Low	High	RPD	%	RPD	
Analyte		Result	PQL	value	Ref Val	Rec	Limit	Limit	Ref Val	RPD	Limit	Qual
Sample ID: 05051	65-01C-MS	Batch ID: 20	0.9_TL-5/26	5/2005	Test	Code:	EPA200.9		Date Analy	zed: 05	/26/05 00:	00
Client ID: 12T-6	55				Unit	s mg/L			Date Prepar	red: N/A	4	
Thallium		0.01697	0.0020	0.01500		113%	70	130				<u></u>
Sample ID: 05051	65-01C-MSD	Batch ID: 20	0.9_TL-5/26	5/2005	Test	Code:	EPA200.9		Date Analy	zed: 05	/26/05 00:	00
Client ID: 12T-6	55				Unit	s mg/L			Date Prepar	red; N/	A.	
Thallium		0.01714	0.0020	0.01500		114%	70	130	0.01697	1%	16	······································

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0505165

URS Corporation

CLIENT:

Work Order:

#### Date: 09-Jun-05 License No. AZM133/AZ0133

## QC SUMMARY REPORT

Blank Spike

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Project:	Desert Rock Energy/2	3444264.:	33202							В	lank Spike
Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: LCS	Batch ID: IC	C-5/19/2005		Test	Code:	EPA300		Date Analyz	ed: 05	/19/05 00	:00
				Unit	s: mg/L			Date Prepare	ed: N/.	A	
Chloride	23.40	2.5	25.00		94%	90	110				
Fluoride	4,834	0.50	5.000		97%	90	110				
Sulfate	28.89	3.0	30.00		96%	90	110				
Sample ID: LCS	Batch ID: N	O3_W-5/25/	/2005	Test	Code:	EPA353.2		Date Analyz	red: 05	/25/05 00	.00
•••				Units	s: mg/L			Date Prepare	ed: N/.	A	
Nitrate-Nitrite (As N)	5.190	0.50	5.000		104%	90	110				
Sample ID: LCS	Batch ID: N	02_DW-5/1	3/2005	Test	Code: \$	SM 4500-N	02 B	Date Analyz	red: 05	/13/05 09	:49
				Units	s: mg/L			Date Prepare	ed: N/.	A	
Nitrite (As N)	0.09630	0.020	0.1000		96%	91	112				
Sample ID: LCS	Batch ID: A	LK_W-5/18	/2005	Test	Code: S	M2320 B		Date Analyz	xed; 05	/18/05 00	:00
				Units	s; mg/L			Date Prepare			
Alkalinity, Total (As CaC	03) 166.7	20	167.0		100%	96	103				
Sample ID: LCS-94	15 Batch ID: 94	15		Test	Code: 1	EPA200.7		Date Analyz	xed: 05	/16/05 15:	21
				Units	; mg/L			Date Prepare	ed: 5/1	6/05	
Aluminum	11.93	0.10	11.00		108%	85	115				
Barium	1.095	0.010	1.000		110%	85	115				
Вогол	1.062	0.10	1.000		106%	85	115				
Calcium	27.45	1.0	26.00		106%	85	115				
Chromium	1.004	0.010	1.000		100%	85	115				
Cobalt	1.076	0.010	1.000		108%	85	115				
Copper	0.9450	0.010	1.000		95%	85	115				
Iron	0.9543	0.10	1.000		95%	85	115				
Magnesium	26.99	1.0	26.00		104%	85	115				
Nickel	1.021	0.010	1.000		102%	85	115				
Potassium	27.08	2.0	25.00		108%	85	115				
Silica	11.19	0.43	10.70		105%	85	115				
Silver	0.07838	0.0050	0.07500		105%	85	115				
Sodium	26.51	2.0	25.00		106%	85	115				



#### Date: 09-Jun-05 License No. AZM133/AZ0133

## QC SUMMARY REPORT

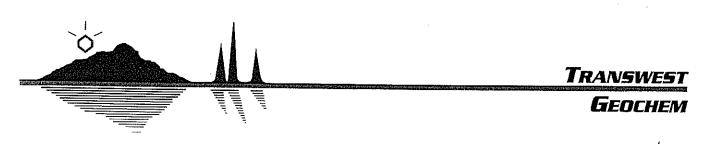
**URS** Corporation Work Order: 0505165 **Project:** 

CLIENT:

Desert Rock Energy/23444264.33202

Blank Spike Duplicate

Analyte	Result	PQL	SPK value	SPK Ref Val	% Rec	Low Limit	High Limit	RPD Ref Val	% RPD	RPD Limit	Qual
Sample ID: LCSD-9415	Batch ID: 94	Batch ID: 9415		Test	Test Code: EPA200.7			Date Analyzed: 05/16/05 15:24			
				Unit	Units: mg/L			Date Prepar	ed: 5/1	6/05	
Aluminum	12.05	0.10	11.00		110%	85	115	11.93	1%	6	**
Barium	1.099	0.010	1.000		110%	85	115	1.095	0%	6	
Boron	1.071	0.10	1.000		107%	85	115	1.062	1%	7	
Calcium	27.80	1.0	26.00		107%	85	115	27.45	1%	7	
Chromium	1.012	0.010	1.000		101%	85	115	1.004	1%	7	
Cobalt	1.082	0.010	1.000		108%	85	115	1.076	1%	7	
Copper	0.9533	0.010	1.000		95%	85	115	0,945	1%	7	
Iron	0.9661	0.10	1.000		97%	85	115	0.9543	1%	8	
Magnesium	27.32	1.0	26.00		105%	85	115	26.99	1%	6	
Nickel	1.036	0.010	1.000		104%	85	115	1.021	1%	7	
Potassium	27.57	2.0	25.00		110%	85	115	27.08	2%	7	
Sílica	11.29	0.43	10.70		106%	85	115	11.19	1%	, 6	
Silver	0.07871	0.0050	0.07500		105%	85	115	0.07838	0%	7	
Sodium	26.51	2.0	25.00		106%	85	115	26.51	0%	7	
Sample ID: LCS-9415	Batch ID: 94	15		Test	Code: E	PA200.7		Date Analy:		/17/05 10:	56
				Units	; mg/L			Date Prepar			
Cadmium	1.059	0.0030	1.000		106%	85	115			·	
Sample ID: LCSD-9415	Batch ID: 94	15		Test	Code: E	PA200.7		Date Analy:	zed: 05	/17/05 11;	00 /
				Units	; mg/L			Date Prepar	ed: 5/1	6/05	
Cadmium	1.062	0.0030	1.000		106%	85	115	1.059	0%	7	
Sample ID: LCS	Batch ID: 20	095/16/05		Test	Code: E	PA200.9		Date Analy:	zed: 05	/16/05 00;	00
				Units	; mg/L			Date Prepar	ed: N//	4	
Antimony	0.01504	0.0030	0.01500		100%	85	115				<u>_</u> _
Sample ID: LCS	Batch ID: 20	09_5/17/20	05	Test	Code: E	PA200.9		Date Analy:	zed: 05	/17/05 00:	00
				Units	: mg/L			Date Prepar			
Selenium	0.01634	0.0030	0.01500		109%	85	115				
Sample ID: LCS	Batch ID: 20	095/18/200	5	Test	Code: E	PA200.9		Date Analy:	zed: 05	/18/05 00:	00
				Units	; mg/L			Date Prepar	ed: N/A	ł	
ead	0.01563	0.0030	0.01500		104%	85	115				
Sample ID: LCS	Batch ID: 20	095/23/200	5	Test	Code; E	PA200.9		Date Analy:	zed: 05	/23/05 00:	00
				Units	; mg/L			Date Prepar	ed: N/A	4	
Arsenic	0.01468	0.0040	0.01500		98%	85	115				
Sample ID: LCS	Batch ID: 20	0.9_TL-5/2	6/2005	Test	Code: E	PA200.9		Date Analyz	zed; 05	/26/05 00:	00
				Units	: mg/L			Date Prepar	ed: N/A	4	
Thallium	0.01626	0.0020	0.01500		108%	85	115			····	



June 13, 2005

Chris Courtney URS Corporation 7720 N. 16th St. Suite 100 Phoenix, AZ 85020

Re: Desert Rock Energy/23444264.33202 Work Order No.: 0505165

Dear Chris,

Attached is the original Report of Analysis from Radiation Safety Engineering, Inc. (AZ0462) for the samples received on 5/12/2005 11:20:00 AM. The following analysis was performed:

Radiochemical Activity in Water (pCi/L) - Gross Alpha

If you have any questions regarding the results, please call me. We appreciate your business and thank you for choosing Transwest Geochem.

Sincerely,

, Achen

Carlene McCutcheon Project Manager

ADHS License No. AZM133/AZ0133



## **Radiation Safety Engineering, Inc.**

3245 N. WASHINGTON ST. · CHANDLER, ARIZONA 85225-1121 Website: www.radsafe.com

(480) 897-9459 FAX (480) 892-5446

#### Radiochemical Activity in Water (pCi/L)

Transwest Geochem 3725 E. Atlanta Avenue Suite 2 Phoenix, AZ 85040-2960

Sample Received: May 12, 2005 Analysis Completed: May 25, 2005

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method 903.1 (pCi/L)	Radium 228 Activity Method 904 (pCi/L)	Total Radium (pCi/L)
12T-655	$9.8 \pm 1.5$	< 0.3	< 0.4	<0.4
12T-633	12. ± 1.7	< 0.3	< 0.3	<0.3
12K-320	0.9 ± 0.4			

Robert L. Metzger A.D., C.H.P.

#### Arizona Department of Environmental Quality Drinking Water Additional Radiochemical Analysis Report ***Samples To Be Taken At POE Only***

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System ID	S	system Name	
05/11/2005	2:00	Carlene McCutcheon	
Sample Date	Sample Time	Owner/Contact Person	—
POE#	Owr	ner/Contact Fax Number	
COMPLIANCI	E SAMPLE TYPE		
Reduced	Monitoring	Date Q1 Collected	
Quarterly	,	Date Q2 Collected	
Composi	te of four quarterly sample	s Date Q3 Collected	
		Date Q4 Collected	

***RADIOCHEMICAL ANALYSIS***

>>>To be filled out by laboratory personnel<<<

Analysis Method	MCL	Reporting Limit	Contaminant Name	Cont. Code	Analyses Run Date	Result	Exceed MCL
	15 pCi/L		Adjusted Gross Alpha	4000		entervedet ut	·····
600/00-02		3 pCi/L	Gross Alpha	4002	05/18/2005	9.8±1.5	
7500 - Rn			Radon	4004			
00-07	30 µg/L	(reserved)	Combined Uranium	4006	,, .		
			Uranium 234	4007			
			Uranium 235	4008		- <u>/-/t</u> .	
	-		Uranium 238	4009			_
	5 pCi/L	l pCi/L	Combined Radium (226,228)	4010	05/19/2005	<0.4	
903.1		1 pCi/L	Radium 226	4020	05/19/2005	< 0.3	
904.0	-	1 pCi/L	Radium 228	4030	05/16/2005	< 0.4	_
			LABORATORY INF o be filled out by labor			·····	
Specimen N	Number:	12T-655	_				
Lab ID Nur	nber: AZ	.0462 Lab	Name: Radiation Safe	ty Engin	eering, Inc.		
Comments:	24813		Aut	horized S	Signature: <u>36</u>	t 2. mil	$\sum$
Date Public	Water Syste	m Notified:		;	-,	17	

#### Arizona Department of Environmental Quality Drinking Water Additional Radiochemical Analysis Report ***Samples To Be Taken At POE Only***

-

System ID			System Name				
05/11/200	02:30	0	Carlene	McCutc	heon		,
Sample Da	te Samp	le Time	Owner/Contact	Person	1101 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
			602-437-0660				
POE#			Owner/Contact Fax Nu	umber			
COMPLIA	NCE SAMP	LE TYPE					
Redu	ced Monitori	ing	Date	Q1 Colle	ected		I
🔲 Quart	erly		Date	Q2 Colle	ected		
Comp	posite of four	quarterly san	nples Date	Q3 Colle	ected	·	
				Q4 Colle			
			*RADIOCHEMICAI				
		///1	o be filled out by labor	ratory pe	rsonnel<<<		
Analysis Method	MCL	Reporting Limit	Contaminant Name	Cont. Code	Analyses Run Date	Result	Exceed MCL
	15 pCi/L		Adjusted Gross Alpha	4000		<u></u>	
600/00-02		3 pCi/L	Gross Alpha	4002	05/18/2005	12.±1.7	
7500 - Rn			Radon	4004			<b>—</b> .*
00-07	30 μg/L	(reserved)	Combined Uranium	4006		·····	
<u></u>			Uranium 234	4007			
			Uranium 235	4008	· · · · · · · · · · · · · · · · · · ·		
			Uranium 238	4009			
·	5 pCi/L	l pCi/L	Combined Radium (226,228)	4010	05/19/2005	<0.3	
903.1		l pCi/L	Radium 226	4020	05/19/2005	< 0.3	
904.0		1 pCi/L	Radium 228	4030	05/19/2005	< 0.3	
			LABORATORY INF to be filled out by labor				
Specimen N	lumber:	12T-633		atory po			
Lab ID Nun	nber: AZ	0462 Lab	- Name: Radiation Safe	ty Engin	eering, Inc.		
Comments:	24814					ht 2. mil	7
Date Public	Water Syste	m Notified:					j <b>~~</b>

DWAR 6: 2003

#### Arizona Department of Environmental Quality Drinking Water Additional Radiochemical Analysis Report ***Samples To Be Taken At POE Only***

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	•v						
System ID			System Name				,
05/11/200	05 03:1	0	Carlene	McCutcl	heon		
Sample Da	te Sam _f	ole Time	Owner/Contact 602-437-0660				
POE#			Owner/Contact Fax Ni	ımber			
COMPLIA	NCE SAMP	LE TYPE					
<b>F</b> armery	ced Monitor		Date	Q1 Colle	cted		
		0		Q2 Colle			
	-	r quarterly san		Q2 Colle			
		i quartoriy san	-	-	·		
		**:	*RADIOCHEMICAI	Q4 Colle			
			o be filled out by labor				
Analysis Method	MCL	Reporting Limit	Contaminant Name	Cont. Code	Analyses Run Date	Result	Exceed MCL
	15 pCi/L		Adjusted Gross Alpha	4000			
600/00-02	•	3 pCi/L	Gross Alpha	4002	05/18/2005	0.9±0.4	
7500 - Rn	•		Radon	4004			<u> </u>
00-07	30 μg/L	(reserved)	Combined Uranium	4006			_
			Uranium 234	4007			
	_		Uranium 235	4008	······································		
			Uranium 238	4009			
	5 pCi/L	l pCi/L	Combined Radium (226,228)	4010			•••••
903.1		1 pCi/L	Radium 226	4020			
904.0		1 pCi/L	Radium 228	4030		······································	
			LABORATORY INF				—
Specimen N	Jumber	12K-320	o be filled out by labor	atory per	rsonnel <<<		
Lab ID Nur	-		- Name: Radiation Safe	ty Engin	eering Inc		
Comments:			· · · · · · · · · · · · · · · · · · ·			7	
	Water Syste	em Notified:			<u> </u>	t 2. July	∧

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#### Radiation Safety Engineering, Inc 3245 North Washington Street Chandler, AZ 85225 5/25/2005

Quality Assurance Report Work Order: 0505165

	Standards	
Analysis	Ratio of O/E $(O/E \pm 2\sigma)$	Acceptable limits
Alpha	0.99	0.85 - 1.15
Beta	NA	0.85 - 1.15
Uranium	NA	0.85 - 1.15
Radon	NA	0.85 - 1.15
Radium-226	0.95	0.85 ~ 1.15
Radium-228	1.12	0.85 - 1.15
Strontium	NA	0.85 - 1.15
Tritium	NA	0.85 - 1.15

Standards

······································		Blanks	
Analysis	Observed	Expected	Acceptable
Alpha	<0.2	< 1.0	< 1.0
Beta	NA	< 3.0	< 3.0
Uranium	NA	< 0.8	< 0.8
Radon	NA	< 150	< 200
Radium-226	<0.5	< 0.7	< 0.9
Radium-228	<0.5	< 0.7	< 0.9
Strontium	NA	< 0.8	< 0.9
Tritium	NA	< 400	< 500

NA Not applicable.

Robert L. Metzger, Ph.D., C.H.P.

CHAIN-OF-CUSTODY	Work Order: 0505165 Project: Desert Rock Energy 23444264.33202	12-May-05	Requested Tests           I         24,615           I         24,615           I         2,4815	rr your Blank data. Blank data. Received Intact: Sample Receipt Received Intact: Ambient / Cold Ice: Received Intact: Ambient / Cold Ice: Received Intact: Ambient / Cold Ice: Received by: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers: Containers
TRANSWEST GEOCHEM	TEL: (602) 437-0330 FAX: (602) 437-0660	TEL: (480) 897-9459 FAX: (480) 892-5446	Matrix     Collection Date     Containers       Drinking Water     5/11/2005     2:00:00       Drinking Water     5/11/2005     2:30:00       Prinking Water     5/11/2005     3:10:00	Comments: After analysis, the samples do not need to be returned and can be disposed per your standard laboratory practices. Please provide a QC report, including Method Blank data.
	Carlene McCutcheon 3725 E. Atlanta Avenue Suite 2 Phoenix, AZ 85040	Subcontractor: Radiation Safety 3245 N. Washington Street Chandler, AZ 85225-1121	Client Sample ID TGI ID 127-655 01E 12K-320 03E	Comments: After analysis, the sam standard laboratory pr

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June 13, 2005

Chris Courtney URS Corporation 7720 N. 16th St. Suite 100 Phoenix, AZ 85020

Re: Desert Rock Energy/23444264.33202 Work Order No.: 0505165

Dear Chris,

Attached is the original Report of Analysis from Aquatic Consulting & Testing, Inc. (AZ0003) for the samples received on 5/12/2005 11:20:00 AM. The following analysis was performed:

Method No. SM 2520 B - Salinity

If you have any questions regarding the results, please call me. We appreciate your business and thank you for choosing Transwest Geochem.

Sincerely,

NeCutchem Carlene McCutcheon

Project Manager

ADHS License No. AZM133/AZ0133



## AQUATIC CONSULTING & TESTING, INC.

1525 W. University Drive, Suite 106 P.O. Box 1510 Tempe, Arizona 85281 Phone: (480) 921-8044 • FAX: (480) 921-0049

Lic. No. AZ0003

#### LABORATORY REPORT

Client: Transwest Geochem, Inc. 3725 E. Atlanta Avenue, #2 Phoenix, AZ 85040 Date Submitted: 05/12/05 Date Reported: 06/08/05

Attn: Carlene McCutcheon

	R	ESULTS				
Client ID: 0505165-01D ACT Lab No.: BM05028	Sample Type: Groundwater Sample Time: 05/11/05 14:00					
	Analys					
Parameter	_Start_	End	Method No.	<u>Result</u>	<u>Unit</u>	
Conductivity	05/20/05	05/20/05	120.1	255.	umho/cm @ 25 C	
Salinity	05/20/05	05/20/05	SM 2520 B	0.2	ppt	
Client ID: 0505165-02D ACT Lab No.: BM05029			Sample Type: Grou Sample Time: 05/11			
	Analys		•			
Parameter	_Start	End	Method No.	Result	Unit	
Conductivity	05/20/05	05/20/05	120.1	269.	umho/cm @ 25 C	
Salinity	05/20/05	05/20/05	SM 2520 B	0.2	ppt	
Client ID: 0505165-03D ACT Lab No.: BM05030			ample Type: Grou ample Time: 05/11			
	Analys	is Date				
<u>Parameter</u>	Start	End	Method No.	Result	Unit	
Conductivity	05/20/05	05/20/05	120.1	492.	umho/cm @ 25 C	
Salinity	05/20/05	05/20/05	SM 2520 B	0.3	ppt	

Reviewed by:

Frederick A. Amalfi, Ph.Q Laboratory Director

## QC Report

QC Parameter		Sample Result	Method Blank Result	QCS % Rec	Duplicate Result	Duplicate RPD	Spike Result	Spike % Rec
Batch ID: COND-27765	QC ID:	BM05390	) Samples: BM050	028 BM05029	BM05030	<u></u>		
Conductivity		1130.			1120.	0.889		

Page 1 of 1

Deur	TRANSWEST GEOCHEM	CHAIN-UP	CHAIN-OF-CUSTODY	Page 1 of 1
Carlene McCutcheon 3725 E. Atlanta Avenue Suite 2 Phoenix, AZ 85040	TEL: (602) 437-0330 FAX: (602) 437-0660	Work Order: 0505165 Project: Desert R	k Order: 0505165 Project: Desert Rock Energy 23444264.33202	3202
Subcontractor: Aquatic Consulting & Testing, Inc 1525 W. University Drive Suite 106 Tempe, AZ 85281	TEL: (480) 921-8044 FAX: (480) 921-0049			12-May-05
Client Sample IDTGI IDMatrix12T-65501DGroundwater12T-63302DGroundwater12K-32003DGroundwater	Collection Date         Container           5/11/2005         2:00:00 PM         1           5/11/2005         3:10:00 PM         1	S SUBCONTRACT 1 1 1 1 1 1 1 1 1 1 1 1 1	Requested Tests 05028 13M05029 13M05030	
·				
tts: After analysis, the samples do standard laboratory practices.	Comments: After analysis, the samples do not need to be returned and can be disposed per your standard laboratory practices. Please provide a QC report, including Method Blank data.		Sample ReceiptTemperature:Sample ReceiptReceived Intact:YesCustody Seals:NATotal No. of Containers:3	
Relinquished by: Add Add	purma Shelof heio8	B Received by:	4	Date/Time 5-12-05 160B

	γ, , ,		
Chain of Custody       TGI Work Order No: 0205/0 5       Date 5/11/01	-is Courtwoy Suith 100 480 - 371-1415	K Ma Kad Chem K Ma Kad Chem K Ma Kad Si Se HS	5/12/05 1/20 Revised: 7/2/004
Train Date	Corp. Attn: Chris Corp. 16th Sheel, S. mit 1 2 25 100 Fax: 14	HG, WAW	(Print Name)
3860 S. Palo Verde Rd., Ste. 301 Tucson, Arizona 85714 Phone: (520) 573-1061 - Fax: (520) 573-1063	Bil to::::::::::::::::::::::::::::::::::::	P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P	
3725 E. Atlanta Ave., Ste 2 Phoenix, Arizona 85040 Phone: (602) 437-0330 Faxtor (602) 437-0660		Sómi-Volatila Organics GOMS (625/8270)	Received by: (Signature)
TRANSWEST GEOCHEM		Cr. Frifay Cr. 33202 Date NiA Absent Resent Date Sampled Sampled Lab ID Sfit do 15: 10 3 5 511/05 14: 30 2 511/05 15: 10 3 5	Aris Courthey Fedex Courthey
	anger. Richerd ne. 5,7, 604	Drycr Ro Sample Rec Ves N Ves N CW CW	Relinquished by: (Signature) CALC Fedus White copy to TGI, Yellow copy for final report, Pink copy to sampler
	Project Manage Client Name: Address: City. State ZIP: Phone: Prone:	Project Number Project Number Temperature: Received Intact Custody Seals: Total No. of Co Sample Identif	Mittee cop

February 5, 2007

Ms. Jennifer Pyne URS Corporation 7720 N 16th Street, Suite 100 Phoenix, AZ 85020

#### Re: Final Well Impact Report – Revision No. 2 Desert Rock Energy Project, Four Corners Area, New Mexico Miller Brooks Project Number 684-0001-0003

Dear Ms. Pyne:

Miller Brooks Environmental, Inc. (Miller Brooks) has prepared this letter report on behalf of Sithe Global Power, LLC (Sithe) for the proposed Desert Rock Power Plant located in the Four Corners Area, New Mexico (see Figure 1). This report is based upon a previous study conducted by URS Corporation (URS) in 2005 (URS, 2005) and a revised study conducted by Miller Brooks in 2006 (Miller Brooks, 2006). This report was prepared to incorporate additional revisions to the groundwater model requested by the U.S. Environmental Protection Agency (EPA) in a letter to URS dated November 16, 2006 (EPA, 2006) and comments made during a meeting held in Farmington, New Mexico on November 29, 2006. This report presents the model input revisions and resulting drawdown impacts related to those comments. The project background, hydrogeology, and aquifer characteristics used in this modeling study can be found in the previous well impact report (Miller Brooks 2006).

New tables and figures prepared by Miller Brooks and contained within this report include the following:

Table 1Groundwater Modeling Input Data

Figure 1	North Well Field 20-Year Impact
Figure 2	North Well Field 40-Year Impact
Figure 3	South Well Field 20-Year Impact
Figure 4	South Well Field 40-Year Impact
Figure 5	Both Well Fields 20-Year Impact
Figure 6	Both Well Fields 40-Year Impact

#### Model Assumptions

The groundwater model code selected for this study is the U.S. Geological Survey's MODFLOW-96 (Harbaugh and McDonald, 1996), with the advanced graphical interface Groundwater Vistas® (Rumbaugh and Rumbaugh, 1996), which is consistent with the original model (URS 2005) and the first revision (Miller Brooks 2006). The

MODFLOW-96 code is widely accepted in the hydrogeologic professional community as a valid numerical model to simulate groundwater flow in three dimensions. The graphical interface Groundwater Vistas® was used to generate the drawdown impact contours included in this report. To provide a more accurate simulation of subsurface geology, Miller Brooks utilized the computer program Surfer® (Version 8.0) to digitize and import the bottom elevations of Model Layers 1, 2 and 3. Figure 1 provides a model boundary map.

The following summarizes the input parameters used in this modeling study. Table 1 provides details on the model input parameters for the original, first and second (current) revisions.

- 1.) The model domain area was increased from 384 square miles to 784 square miles to mitigate boundary on the drawdown contours and to incorporate the requested 10-foot drawdown contour.
- 2.) The model was expanded two miles in both north and south directions and six miles in both east and west directions (see Figure 1).
- 3.) The total model grid was increased from 300 columns, 322 rows, and 289,800 model cells to a total of 374 columns, 436 rows and 489,192 model calculation cells. The maximum and minimum grid spacing remained unchanged and ranged from 247.5 by 165 feet in the simulated well field area to 990 by 660 feet at the model boundaries.
- 4.) The bottom of Layer 1 was recontoured as a variable thickness unit, to extend the layer to the new model boundaries. Layer 1 (the upper model layer) represents the Mancos Shale and all other geologic units above it. Layer 1 was modeled as a semi-confined layer, unchanged from the previous model revision (Miller Brooks, 2006).
- 5.) The bottom of Layer 2 was recontoured using Surfer®. Layer 2 represents the Dakota Sandstone, which lies above the Morrison Formation in the model domain area. Layer 2 remained a uniform thickness of 200 feet, consistent with the previous model revision (Miller Brooks, 2006).
- 6.) The previous model revision (Miller Brooks, 2006) set a uniform thickness of 1,000 feet for the Morrison Formation (Layer 3) variable elevation (based upon the contour map) (Miller Brooks, 2006). Per EPA's request (EPA 2006), Miller Brooks reduced Layer 3 to a uniform thickness of 600 feet. The bottom elevation of Layer 3 was recontoured by taking the approximate depth to the top of the Morrison Formation and adding it to the revised approximate thickness of the Morrison Formation in the model domain area, to derive a variable bottom elevation that would also extend to the new model boundaries. *Note: Layer 3 (the bottom model layer) represents the Morrison Formation (the target water-bearing unit for this study). The Morrison Formation lies beneath the Mancos Shale and the Dakota Sandstone and ranges in thickness in the model domain area from 950 to 1,050 feet.*

- 7.) Model Layer 1 The hydraulic conductivity (K) and horizontal-to-vertical conductivity ratio ( $K_h/K_v$ ) of 0.0567 feet per day (ft/day) and 10:1 were unchanged from the previous model (Miller Brooks, 2006).
- 8.) Model Layer 2 The K value remained unchanged at 0.3225 ft/day, but the  $K_h/K_v$  ratio was changed from 2:1 to 10:1 based upon our reevaluation of published values for a medium- to fine-grained sandstone (Spitz and Moreno, 1996) and comments provided by EPA (EPA, 2006).
- 9.) Model Layer 3 The distinct K "zones" 0.075 and 0.175 ft/day remained unchanged from the previous model and were input into the model to extend to the new model boundaries. The K values were obtained by taking the median thickness of the Morrison Formation (1,000 feet) and dividing it by the median transmissivity (T) values in the model domain area (75 ft²/day and 125 ft²/day). The K_h/K_v ratio was changed from a 10:1 to a 2:1 ratio based upon our reevaluation of published values for a medium- to fine-grained sandstone (Spitz and Moreno, 1996) and comments provided by EPA (EPA, 2006).
- 10.) The storage coefficient for all Model Layers was set at 0.00011 (unitless). This value represents the median published values from nine wells tested in the Morrison Aquifer (Dam, et al., 1990) and is unchanged from the previous model revisions (Miller Brooks, 2006).
- 11.) The specific yield (Sy) for Model Layers 1, 2 and 3 was set at 0.03, 0.15, and 0.15 (unitless), respectively. The Sy value from the previous model revision (Miller Brooks, 2006) was unchanged for Model Layer 1. The Sy value for Model Layers 2 and 3 was changed from 0.24 to 0.15 (unitless) based on more conservative estimates and comments provided by EPA (EPA, 2006).
- 12.) The two well fields consisting of ten equally spaced pumping wells (identified as Proponent's Preferred Alternative Water Well Field B, "Location 1" and "Location 2") (see Figure 1) remained unchanged from the previous model revision. Well spacing was unchanged at 1/4 mile.
- 13.) The simulated wells remained screened entirely and exclusively in the Morrison Formation (Model Layer 3). Based upon the revised thickness of Layer 3 per EPA comments (EPA, 2006), the total screened interval in each pumping well was changes from 1,000 feet (Miller Brooks, 2006) to 600 feet.
- 14.) Each simulated well pumps at a continuous rate of 442,080 gallons per day (gpd), or 307 gallons per minute (gpm), for a period of 14,600 consecutive days, or 40 years. This equals the total annualized project demand of 4,950 af/yr (Sithe, 2005), or 3,070 gpm. This rate remains unchanged from the previous model (Miller Brooks, 2006). Each well field ("Location 1" and "Location 2") was run independently in the previous model to evaluate the impact at both locations separately. The same two runs were conducted in this revision in addition to a third run in

which all 20 wells at both well fields were pumped at half the total rate (153.5 gpm) of a single well field configuration, resulting in the total demand of 3,070 gpm.

- 15.) A specified head boundary was set along the northern and southern model boundaries according to the potentiometric surface contour map compiled for the Morrison Aquifer. This remains unchanged from the previous model (Miller Brooks, 2006), with the exception that Miller Brooks had to extrapolate the constant head boundaries in all directions to accommodate the extended model boundaries (based upon the potentiometric surface map) (Miller Brooks, 2006).
- 16.) No boundaries were set along the western and eastern model boundaries to allow the model to create its own east-west flow gradient. This remains unchanged from the previous model revision (Miller Brooks, 2006).
- 17.) No recharge is simulated from perennial flow along the reach of the Chaco River due to a lack of stream flow gauge data. This remains unchanged from the previous model revision (Miller Brooks, 2006).

#### **Model Predictions**

Drawdown predictions following 20 years and 40 years of continuous pumping are graphically presented in Figures 1 through 6 for the South well field "Location 2", North well field "Location 1", and the dual North and South well field configuration. The drawdown predictions are as follows:

#### Proponent's Preferred Alternative Water Well Field B, North Well Field "Location 2"

Based upon the input assumptions presented herein, the maximum cumulative 20-year and 40-year impact resulting from the annual projected withdrawal of 4,950 af/yr, or 3,070 gpm, for "Location 2" is predicted to be 1,885 and 2,010 feet, respectively (see Figures 1 and 2). The maximum drawdown predicted occurs at the center of the simulated pumping wells and decreases with distance from the well centers. The model-predicted, 10-foot impact radius extends approximately 7.2 and 9.8 miles for the 20- and 40-year predictions, respectively, from the center of the simulated well field (see Figures 1 and 2). According to available well set data, there are no water production wells located within the model-predicted, 10-foot drawdown contour for either the 20- or 40-year predictions. Please note that the model-predicted drawdown presented in Figures 1 and 2 represents the decline in the potentiometric surface relative from the land surface.

#### Proponent's Preferred Alternative Water Well Field B, South Well Field "Location 1"

Based upon the input assumptions presented herein, the maximum cumulative 20-year and 40-year impact resulting from the annual projected withdrawal of 4,950 af/yr, or 3,070 gpm, for "Location 1" is predicted to be 1,920 and 2,020 feet, respectively (see Figures 3 and 4). The maximum drawdown predicted occurs at the center of the simulated pumping wells and decreases with distance from the well centers. The model-predicted, 10-foot impact radius extends approximately 7.5 and 10.1 miles, respectively,

from the center of the simulated well field (see Figures 3 and 4). According to available well set data, there are no water production wells located within the model-predicted, 10-foot drawdown contour for either the 20- or 40-year predictions. The 40-year predicted, 10-foot drawdown contour overlaps two monitoring wells (wells 71 and 72; see Figure 4) registered with the New Mexico Office of the State Engineer. According to its well records, these are oil/gas test wells, not water production wells. The model-predicted drawdown presented in Figures 3 and 4 represents the decline in the potentiometric surface, relative from the land surface.

## Proponent's Preferred Alternative Water Well Field B, Both Well Fields "Location 1" and "Location 2"

Based upon the input assumptions presented herein, the maximum cumulative 20-year and 40-year impact resulting from the annual projected withdrawal of 4,950 af/yr, or 3,070 gpm, for "Location 2" is predicted to be 960 and 1,020 feet, respectively (see Figures 5 and 6). The maximum drawdown predicted occurs at the center of the simulated pumping wells and decreases with distance from the well centers. The modelpredicted, 10-foot impact radius extends approximately 7.0 miles from "Location 1" and 6.0 miles from "Location 2" after 20 years, and 8.0 miles from "Location 1" and 9.0 miles from "Location 2" after 40 years from the center of the simulated well fields (see Figures 5 and 6). According to available well set data, there are no water production wells located within the model-predicted, 10-foot drawdown contour for either the 20- or 40-year predictions. Please note that the model-predicted drawdown presented in Figures 5 and 6 represents the decline in the potentiometric surface relative from the land surface.

#### Conclusions

Our conclusions from this revised well impact study are as follows:

- Given the assumptions presented herein, our revised modeling analyses predicts a maximum decline in potentiometric surface of 2,020 feet (at Well Field B, "Location 2", see Figure 4) after 40 years of continuous pumping at the Desert Rock Power Plant's estimated demand requirements (4,950 af/yr, or 3,070 gpm). Because groundwater generally occurs under confined conditions within the study area (Dam, et. al, 1990), resulting in artesian flow from wells, and the depth to the Morrison Formation is approximately 4,500 feet in both of the modeled well field areas (Well Field B, "Location 1" and "Location 2"), a decline in potentiometric surface of 2,020 feet below ground surface is unlikely to de-water the Morrison Formation. Assuming the modeling simulations are representative of actual subsurface conditions, the results of this revised modeling analysis tends to suggest that sufficient local groundwater resources are available from the Morrison Aquifer (at the modeled locations) to meet the projected withdrawal demands for the proposed Desert Rock Power Plant for the next 40 years.
- This revised model, consistent with the previous version (Miller Brooks, 2006), incorporates conservative aquifer parameters, thus representing what

we believe should represent a worst-case scenario. It also incorporates and addresses comments on the previous model revision by EPA (EPA, 2006). This revised model predicts that there should be no loss greater than 10 feet in the potentiometric surface to existing water production wells in the study area after 40 years of continuous pumping from either one or both of the simulated well fields at the Desert Rock Power Plant's estimated demand requirements (4,950 af/yr or 3,070 gpm) (see Figures 1 through 6).

#### Recommendations

Based upon the results of this revised well impact study, Miller Brooks makes the following recommendations:

- 1. Miller Brooks recommends incorporating geologic and hydrogeologic data (as applicable) from the new test wells currently being drilled at the project site into the revised model to better access drawdown impacts.
- 2. In addition to modifying aquifer parameters, wells may be added, removed, repositioned, or modified (i.e., pump rates, screen interval, etc.) in the model to assist the selected contractor with optimal well placements. This will help mitigate drawdown impacts associated with the new wells. Predictions from the revised model would be more indicative of potentiometric surface drawdown of the Morrison Aquifer than the previous modeling analyses have suggested.

#### References

- Dam, W. L., Kernodle, J. M., Leavings, G. W., and Craig, S. D., 1990, Hydrogeology of the Morrison Formation in the San Juan Structural Basin, New Mexico, Colorado, Arizona, and Utah; U.S. Geological Survey Water Resources Hydrologic Investigations Atlas HA-720-J, Sheets 1 and 2.
- Harbaugh, A. W. and McDonald, M.G., 1996, Users Documentation for MODFLOW-96 and Update to the U.S. Geological Survey Modular Finite Difference Ground-water Flow Model; Open File Report 96-485.
- Miller Brooks Environmental, Inc., 2006, Final Well Impact Report; Desert Rock Energy Project, Four Corners Area, New Mexico, Prepared for Sithe Global Power, LLC, October 5, 2006.
- Rumbaugh, J. and D. Rumbaugh, 1996. Guide to using Ground Water Vistas; 209 p.
- Spitz, K. and Moreno, J., 1996, A Practical Guide to Groundwater and Solute Transport Modeling; John Wiley & Sons, New York.
- URS Corporation, 2005, Final Well Impact Report, Desert Rock Energy Project, Four Corners Area, New Mexico, September 23, 2005.
- U.S. Environmental Protection Agency, 2006, EPA Comments on the Desert Rock Energy Project PDEIS, 11/13/06

Please feel free to contact myself or Stephen Flora at 602-728-0577 with any questions or concerns regarding this report.

Sincerely,

Chris Courtney, RG Associate Hydrogeologist

Stephen Flora, GIT Project Hydrogeologist

Attachments	Table 1 – Groundwater Modeling Input Data
	Figure 1 – North Well Field – 20 Year Impact
	Figure 2 – North Well Field – 40 Year Impact
	Figure 3 – South Well Field – 20 Year Impact
	Figure 4 – South Well Field – 40 Year Impact
	Figure 5 – Both Well Fields – 20 Year Impact
	Figure 6 – Both Well Fields – 40 Year Impact

cc: MBE Project Number 684-0001-0003

# Table 1 Groundwater Modeling Input Data

Desert Rock Energy Project, New Mexico

Current Revision Model Input Desert Rock Energy Project, New Mexico							
Layers	Geologic Unit	Thickness (ft)	Notes	K (ft/day)	Kh/KV ratio	Storage coeff.	SY (I)
1	Mancos Shale	variable	Leaky upper aquitard	0.0567	10 to 1	0.00011	0.03
2	Dakota Sandstone	200	aquifer	0.3225	10 to 1	0.00011	0.15
3	Sandstone (Morrison Fm)	600	aquifer	K1 = 0.075, K2 = 0.125	10 to 1	0.00011	0.15
# Wells	Pump Rate (gpm)	Time pumping (days)	Well Spacing	Screen Interval	Model Run		
10 north well field	307/well 3070 total	7,300/14,600	1/4 mile	All of layer 3 600 feet	1		
10 south well field	307/well 3070 total	7,300/14,600	1/4 mile	All of layer 3 600 feet	2		
20 (10 each well field)	153.5/well 3070 total	7,300/14,600	1/4 mile	All of layer 3 600 feet	3		
Head Boundary (type)	Hydrualic gradient						
Specified Head	0.0041 ft/ft						
Model area	# columns	# rows	# cells	min cell size	max cell size		
28x28 miles	374	436	163,064 per layer	247.5 x 165 ft	990 x 660 ft		
784 square miles			489,192 total				

#### First Revision Model Input (Miller Brooks 2006)

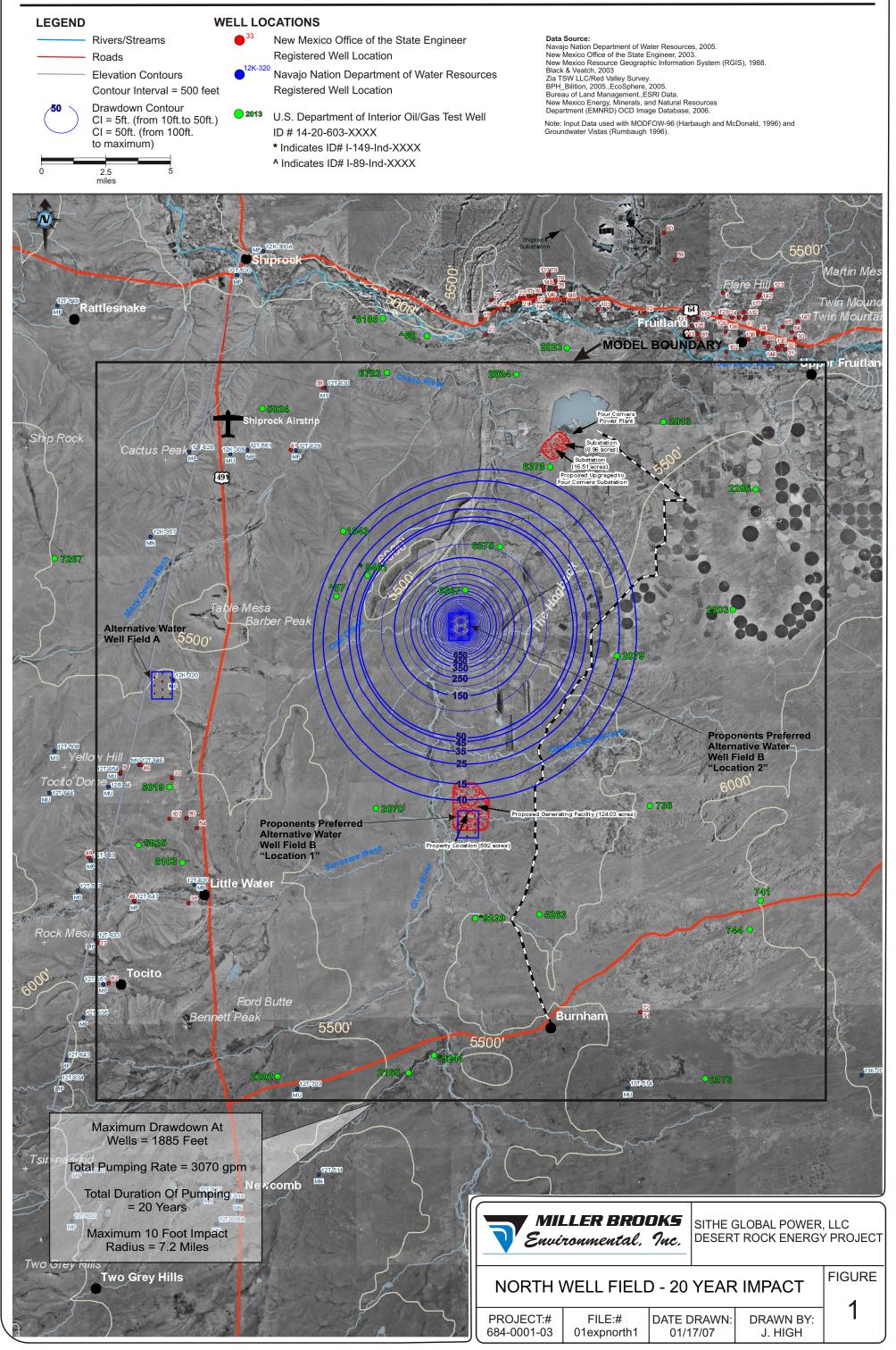
Layer	Geologic Unit	Thickness (ft)	Notes	K (ft/day)		Storage coeff.	SY (I)
1	Mancos Shale	variable	Leaky upper aquitard	0.0567	10 to 1	0.00011	0.03
2	Dakota Sandstone	200	aquifer	0.3225	2 to 1	0.00011	0.24
3	Sandstone (Morrison Fm)		aquifer	K1 = 0.075, K2 = 0.125	2 to 1	0.00011	0.24
# Wells	Pump Rate (gpm)	Time pumping (days)	Well Spacing	Screen Interval			
10	307	7300 (stress period 1)	1/4 mile	All of layer 3			
	total = 3070	14600 (stress period 2)		1000 feet			
Head Boundary (type)	gradient						
Specified Head	0.0048 ft/ft						
Model area	# columns	# rows	# cells	min cell size	max cell size		
24x16 miles	300	322	96600 per layer	247.5 x 165 ft	990 x 660 ft		

#### Original Model Input (URS 2005)

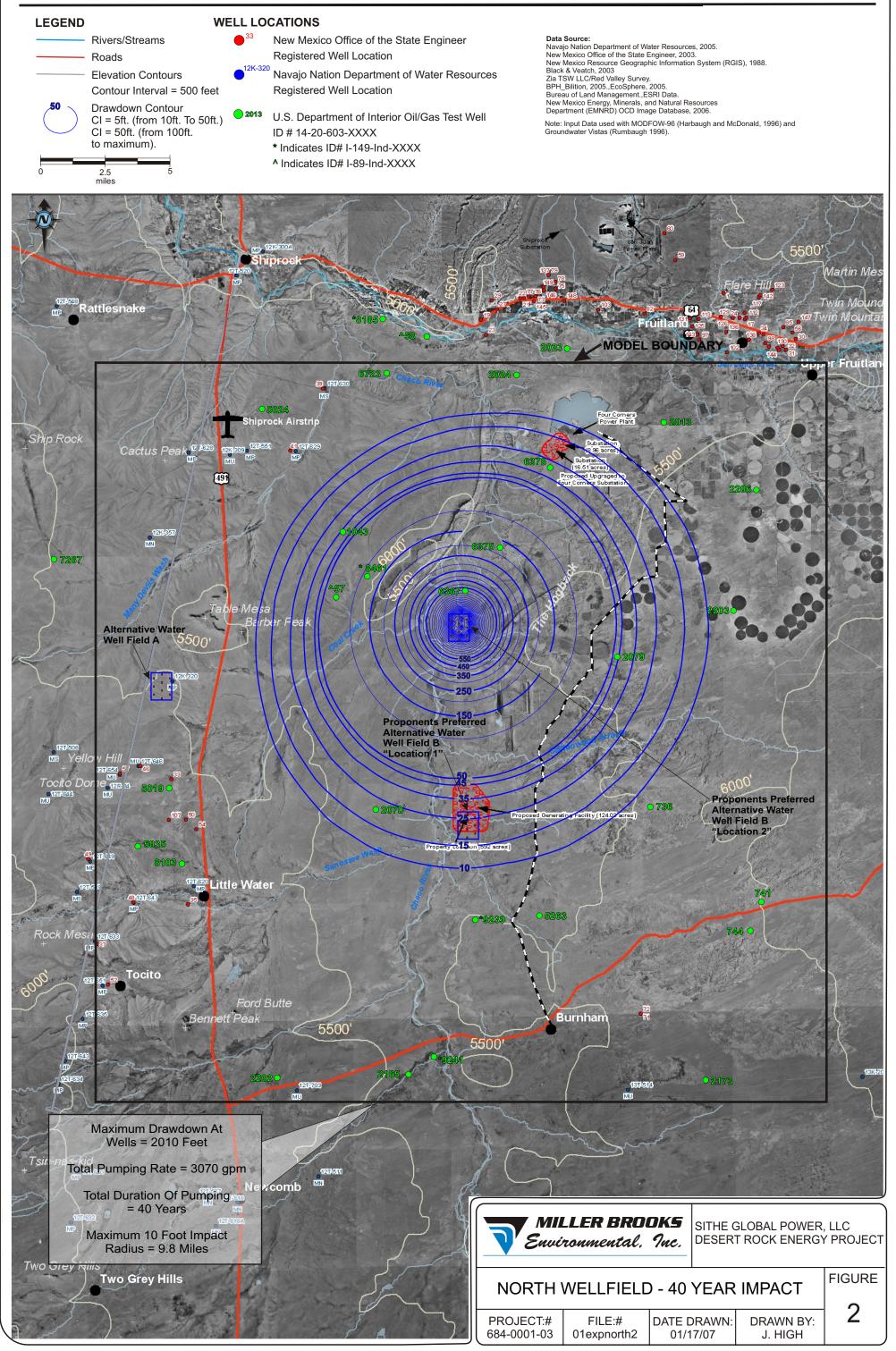
Layer	Geologic Unit	Thickness (ft)	Notes	K (ft/day)	Kh/KV ratio	Storage coeff.	SY (I)
1	Mancos Shale	650	Leaky upper aquitard	0.0567	10 to 1	0.00011	0.03
2	Sandstone (Morrison Fm)		aquifer	0.2	10 to 1	0.00011	0.2
# Wells	Pump Rate (gpm)	Time pumping (days)		Screen Interval		·	·
10	307	14600	1/4 mile	All of layer 2			
Head Boundary (type)	gradient						
Specified Head	0.0038 ft/ft						
Model area	# columns	# rows	# cells	min cell size	max cell size		
12X12 miles	280	279	78120	100 X 100 feet	500 X 500 ft		



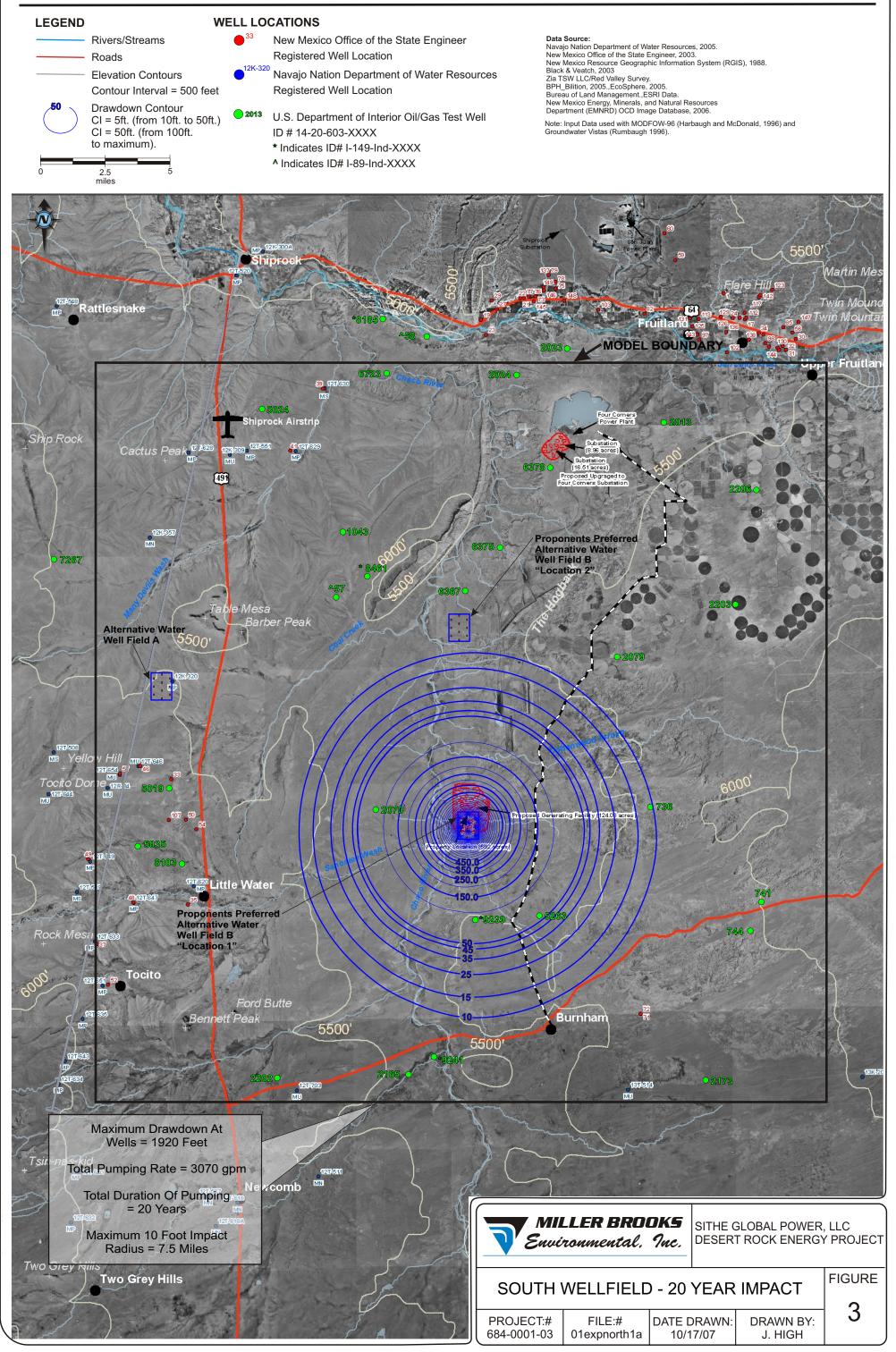
## SITHE GLOBAL POWER, LLC - DESERT ROCK ENERGY PROJECT



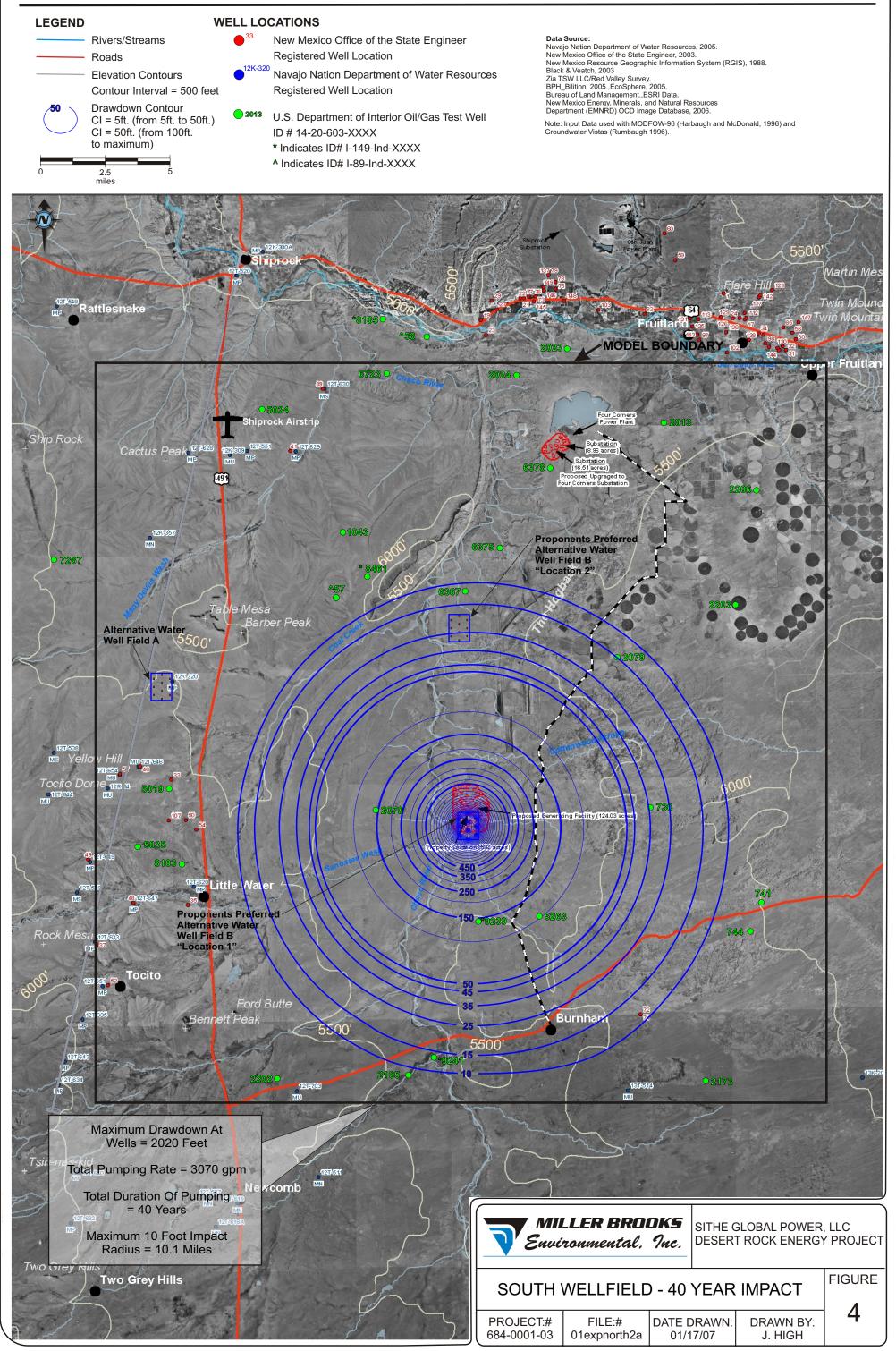
## SITHE GLOBAL POWER, LLC - DESERT ROCK ENERGY PROJECT



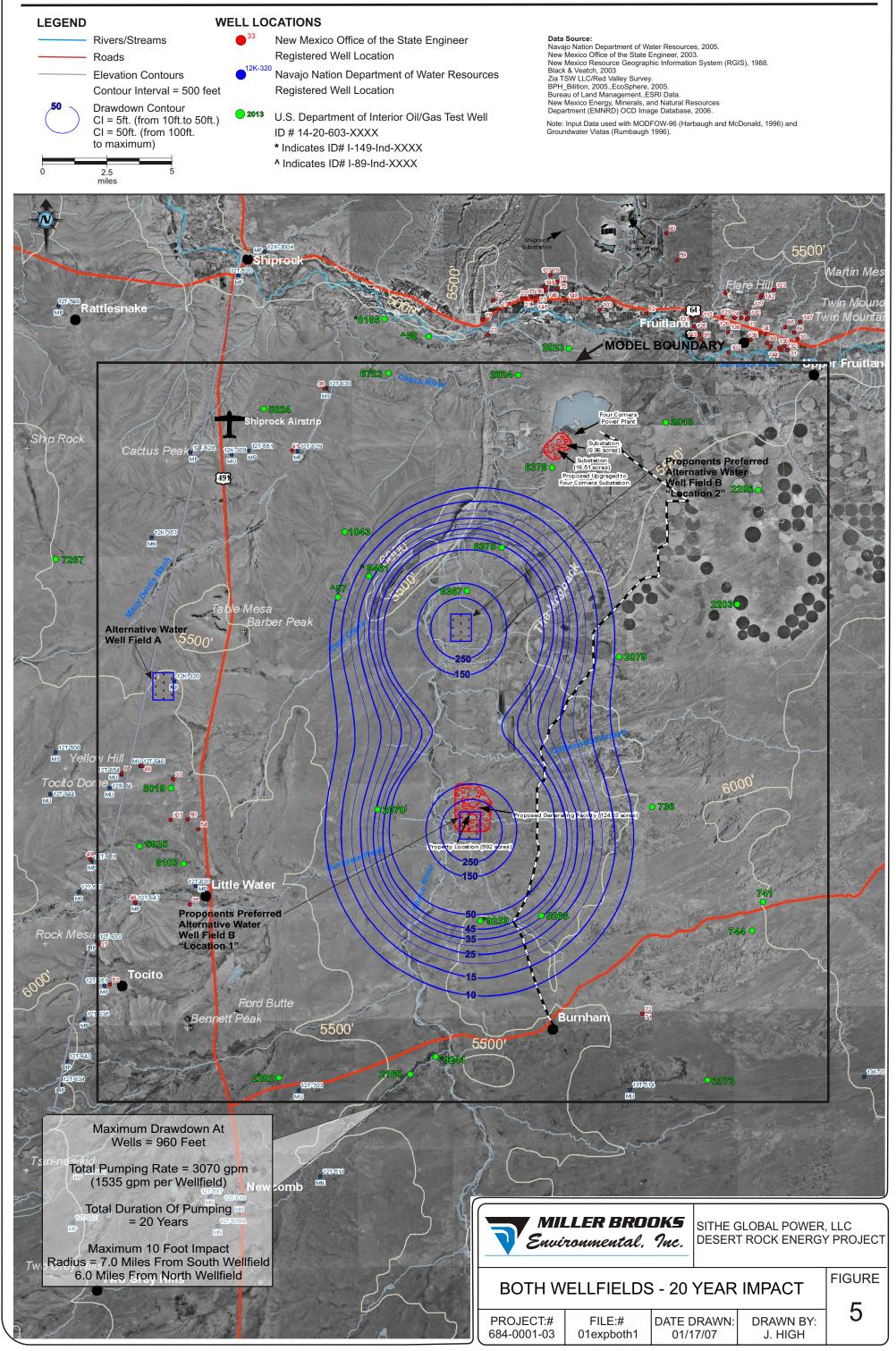
## SITHE GLOBAL POWER, LLC - DESERT ROCK ENERGY PROJECT



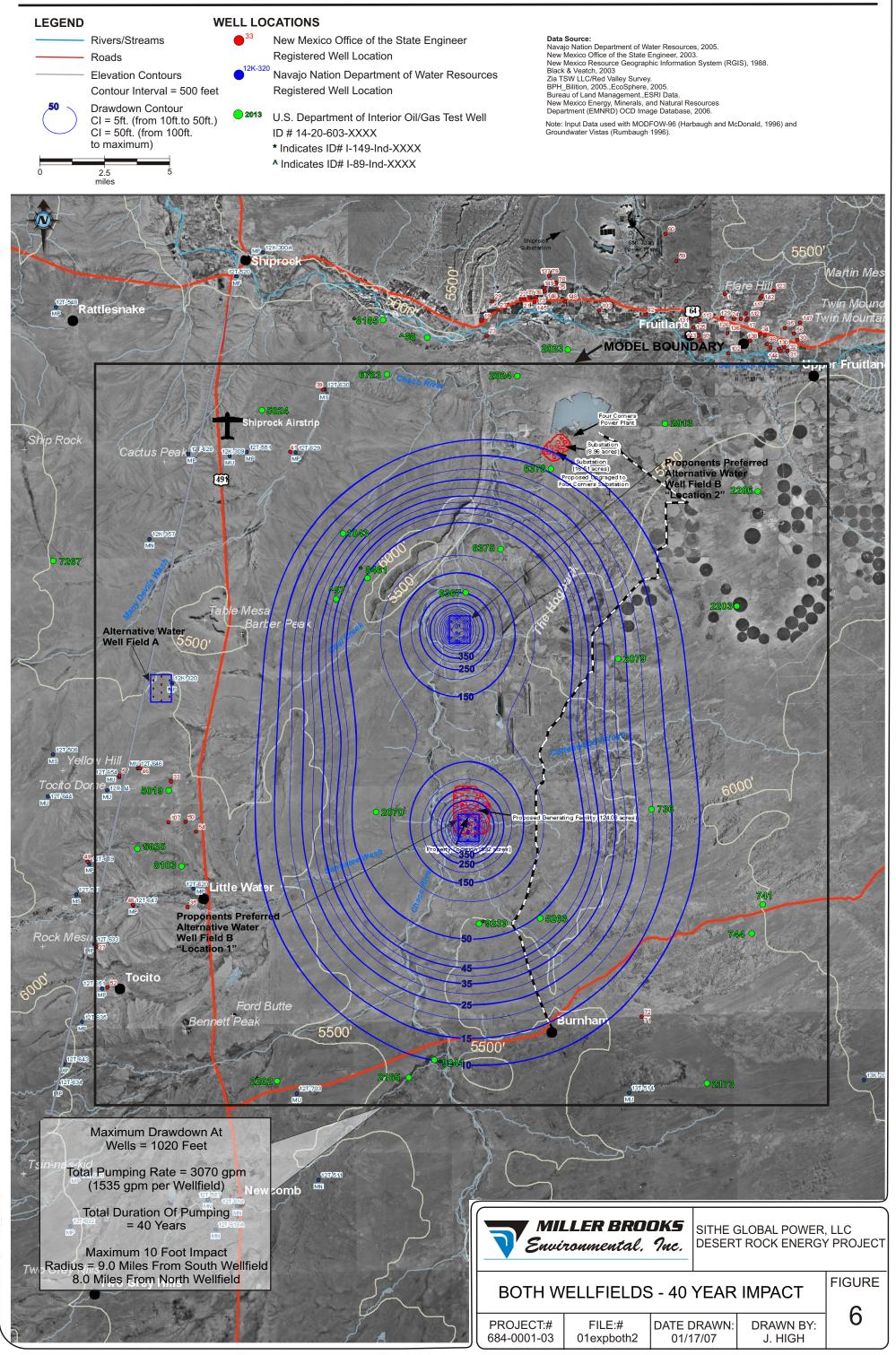
# SITHE GLOBAL POWER, LLC - DESERT ROCK ENERGY PROJECT



# SITHE GLOBAL POWER, LLC - DESERT ROCK ENERGY PROJECT



# SITHE GLOBAL POWER, LLC - DESERT ROCK ENERGY PROJECT



January 30, 2007

Ms. Jennifer Pyne URS Corporation 7720 N 16th Street, Suite 100 Phoenix, AZ 85020

# Re: Water Quality Comparison Report – A Comparison of 2006 Burnham Chapter Water Well Data to Historical Morrison Formation Water Well Data Desert Rock Energy Project, New Mexico

Miller Brooks Environmental, Inc. Project #0684-0001-0001

Dear Ms. Pyne:

Miller Brooks Environmental, Inc. (Miller Brooks) has prepared this report for URS Corporation (URS), per Sub-Task 5 of "Work Order No. 2" from URS dated August 31, 2006. This report presents the analytical results for water samples collected by Ecosphere Environmental Services (Ecosphere) in Farmington, New Mexico on November 1st, 7th, and 22nd, 2006 at six artesian wells located on Burnham Chapter land adjacent to the proposed Desert Rock Power Plant in the Four Corners Area, New Mexico. This report also compares that data to historical water quality data from samples collected in wells reported to have historically withdrawn groundwater from the Morrison Formation located in the Upper San Juan Basin (Dam et. al, 1990) in the vicinity of the Desert Rock project site (the study area).

# **PROJECT BACKGROUND**

The study area (see Figure 1) is located in the northwestern portion of New Mexico, southeast of Shiprock and due south of Farmington. The proposed water supply for the Desert Rock Power Plant is from new production wells proposed for future construction. The proposed wells will be designed to withdraw groundwater exclusively from the Morrison Formation to mitigate drawdown in Navajo Nation water supply wells and seeps and springs which derive most, if not all, of their water supply for an upper confined aquifer (above the Morrison Formation). The locations of the six artesian wells sampled by Ecosphere used for comparison in this report are shown on Figure 1. Site descriptions, GPS locations and Ecosphere's field notes are included in Appendix 1.

The purpose of this report is to compare water chemistry from the six artesian wells sampled by Ecosphere to historical groundwater chemistry from samples collected in wells reported to have produced water from the Morrison Formation. The comparison is intended to draw a similarity or dissimilarity in the two water sources with respect to their geochemical "footprints." Although not part of this evaluation, the "footprint" could be evaluated to determine the degree of hydrologic "connectivity" between seeps- and springs-derived water and Morrison Formation-derived water. This information could be helpful in relating drawdown at the proposed well field(s) for the proposed Desert Rock Power Plant as it relates to potential drawdown of artesian wells in the study area.

Since there are few documented wells constructed and currently producing groundwater exclusively from the Morrison Formation in the study area (Miller Brooks, 2006), this report compares the artesian well data to historical water quality data for groundwater samples collected in wells reported to have withdrawn groundwater from the Morrison Formation (Dam, et. al, 1990). The historical data are a compilation of wells sampled between 1948 and 1986 (Dam, et. al, 1990) located within and outside of the study area but within the same geologic province (the Upper San Juan Basin). Due to a lack of well construction records, we cannot conclusively confirm if the Morrison Formation well data set used in this report represents groundwater produced exclusively from the Morrison Formation.

# WATER QUALITY RESULTS

The water quality data presented in the report are discussed in the following four sections:

- General Chemistry
- Major Anions
- Major Cations
- Other Metals

For ease of reference, samples colleted by Ecosphere on November 1st, 7th, and 22nd, 2006 from the six artesian wells (Figure 1) will be referred tot as the "artesian wells." Samples collected from wells completed in the Morrison Formation (Dam, et. al., 1990) will be referred to as the "Morrison Formation wells." Table 1 provides a summary of the water quality data referenced in this report. The laboratory analytical reports from Green Analytical Laboratories, Inc. for the six artesian wells sampled are included as Appendix 2.

This report compares the median values of concentrations (for the selected constituents) of the Morrison Formation well data set to the average values of the artesian well data set, presented in Table 1 as a "coefficient of variation" (in percent). In addition, we have prepared stiff plots of each artesian well sampled (Figure 2) and a comparative stiff plot using the median concentrations from the Morrison Formation well data set (Figure 3) and the average values from the artesian well data set. These stiff plots are intended to graphically demonstrate the similarity or dissimilarity in geochemistry of the two water sources.

# **General Chemistry**

# Specific Conductance (SC) and Total Dissolved Solids (TDS):

The average concentration of SC and TDS from the artesian wells sampled is 3,558 microsiemens per centimeter ( $\mu$ s/cm) and 2,489 milligrams per liter (mg/L), respectively (Table 1). The median concentration of SC and TDS from the Morrison Formation wells is 876  $\mu$ s/cm and 614 mg/L, respectively. The calculated coefficient of variation in SC and TDS from the two water sources is 86 and 85 percent, respectively. The highest SC and TDS concentrations from the artesian wells sampled were at "well 01," with a concentration of 7,510  $\mu$ s/cm and 6,100 mg/L, respectively.

# <u>Fluoride</u>:

The average concentration of Fluoride from the artesian wells sampled is 2.07 mg/L (Table 1). The median concentration of Fluoride from the Morrison wells is 0.6 mg/L (Table 1). The calculated coefficient of variation in Fluoride from the two water sources is 78 percent.

# <u>Nitrate:</u>

The average concentration of Nitrate from the artesian wells sampled is 0.78 mg/L. The median concentration of Nitrate from the Morrison wells is 0.4 mg/L (Table 1). The calculated coefficient of variation in Nitrate from the two water sources is 45 percent.

# <u>рН:</u>

The average pH value from the artesian wells sampled is 8.21 (Table 1). The median pH value from the Morrison wells is 8.2 (Table 1). The calculated coefficient of variation in pH from the two water sources is less than one percent.

# General Chemistry Summary

The two water sources have an average coefficient of variation for the general chemistry constituents presented of 59 percent (Table 1). The high discrepancy in the coefficient of variation for SC, TDS and nitrate would suggest that the two water sources have different geochemical "footprints" with regard to the general chemistry constituents presented in this report.

# **Major Anions**

# <u>Alkalinity:</u>

The average concentration for Alkalinity (CaCO₃) from the artesian wells sampled is 335 mg/L. The median concentration for Alkalinity from the Morrison wells is 200 mg/L (Table 1). The calculated coefficient of variation in Alkalinity from the two water sources is 36 percent.

# <u>Sulfate:</u>

The average concentration for Sulfate from the artesian wells sampled is 1,498 mg/L. The median concentration for Sulfate from the Morrison wells is 160 mg/L (Table 1). The calculated coefficient of variation in Sulfate from the two water sources is 114 percent. The highest Sulfate concentration from the artesian wells sampled is at "well 01," with a concentration of 3,900 mg/L.

# Chloride:

The average concentration for Chloride from the artesian wells sampled is 56 mg/L. The median concentration for Chloride from the Morrison wells is 8.9 mg/L (Table 1). The calculated coefficient of variation in Chloride from the two water sources is 103 percent.

### Major Anion Summary

The two water sources have an average coefficient of variation for the major anions presented of 84 percent (Table 1). The two water sources have a relatively low coefficient of variation for Alkalinity but a much higher coefficient of variation for Sulfate and Chloride. The major anion results indicate that the Morrison wells are Carbonate-dominated waters (due to high Alkalinity (CaCO₃) concentrations, with lesser concentrations of Sulfate and Chloride), while the artesian wells are Sulfate-dominated waters (with higher Sulfate concentrations, as described above). This would suggest that the two water sources have different geochemical "footprints" with regard to the major anions presented in this report.

# Major Cations

# <u>Sodium:</u>

The average concentration of Sodium from the artesian wells sampled is 659 mg/L. The median concentration for Sodium from the Morrison wells is 140 mg/L (Table 1). The calculated coefficient of variation in Sodium from the two water sources is 92 percent.

# Calcium:

The average concentration of Calcium from the artesian wells sampled is 99 mg/L. The median concentration of Calcium from the Morrison wells is 14 mg/L (Table 1). The calculated coefficient of variation in Calcium from the two water sources is 106 percent.

# <u>Magnesium:</u>

The average concentration of Magnesium from the artesian wells sampled is less than 15 mg/L. The median concentration of Magnesium from the Morrison wells is 3.7 mg/L (Table 1). The coefficient of variation in Magnesium from the two water sources is 85 percent.

# Potassium:

The average concentration of Potassium from the artesian wells sampled is 3.92 mg/L. The median concentration for Potassium from the Morrison wells is 2 mg/L (Table 1). The calculated coefficient of variation in Potassium from the two water sources is 46 percent.

# Major Cations Summary

The two water sources have an average coefficient of variation for the major cations presented of 82 percent (Table 1). The two water sources have a relatively high coefficient of variation in concentrations of the major cations compared, suggesting that the two water sources have different geochemical "footprints" with regards to major cations. However, it should also be noted that both water sources are Sodium-dominated with respect to the major cations compared in this report (both have relatively high Sodium concentrations, with lesser concentrations of Calcium, Magnesium, and Potassium, as described above).

# **Other Metals**

<u>Arsenic:</u>

The average concentration of Arsenic from the artesian wells sampled is 0.0008 mg/L. The median concentration for Arsenic from the Morrison wells is 0.02 mg/L (Table 1). The calculated coefficient of variation in Arsenic from the two water sources is 131 percent.

# <u>Manganese:</u>

The average concentration of Manganese from the artesian wells sampled is 0.0047 mg/L. The median concentration of Manganese from the Morrison wells is 0.1 mg/L (Table 1). The calculated coefficient of variation in Manganese from the two water sources is 50 percent.

# Iron:

The average concentration of Iron from the artesian wells sampled is 0.07 mg/L. The median concentration of Iron from the Morrison wells is 0.6 mg/L (Table 1). The calculated coefficient of variation in Iron from the two water sources is 112 percent.

# Other Metals Summary

The two water sources have an average coefficient of variation for the other metals presented of 98 percent (Table 1). This would suggest that the two water sources have different geochemical "footprints" with regard to the other metals presented in this report.

# CONCLUSIONS

The artesian wells have higher concentrations of the major cations, major anions, SC, and TDS than the Morrison wells (see Table 1). The waters sampled from the artesian wells are Sodium Sulfate dominated, with relatively high concentrations of SC and TDS. In comparision, Morrison Formation wells are Sodium Carbonate dominated, with much lower concentrations of SC and TDS than the artesian wells sampled. The *average coefficient of variation* between the concentrations for those constituents presented herein for the artesian wells and the Morrison Formation Wells is 81 percent (Table 1). The stiff plots comparison (Figure 3) illustrates the relatively high dissimilarity in the ionic strengths of the two water sources. Based upon the data presented herein, the two water sources have distinct and dissimilar geochemical "footprints."

### REFERENCES

Dam, W.L., Kernodle, J.M., Leavings, G.W., and Craig, S.D., 1990, Hydrogeology of the Morrison Formation in the San Juan Structural Basin, New Mexico, Colorado, Arizona, and Utah; U. S. Geological Survey Water Resources Hydrologic Investigations Atlas HA-720-J, Sheets 1 and 2.

Miller Brooks Environmental Inc., 2006, Final Well Impact Report – Revision No. 1, Desert Rock Energy Project Four Corners Area, New Mexico, Sithe Global Power L.L.C.; October 5

If you have any questions or concerns, please do not hesitate to contact us at (602) 728-0577.

Sincerely, *Miller Brooks Environmental, Inc.* 

Chris J. Courtney, RG, PG Office Manager/Associate Hydrogeologist

Stephen P. Flora, GIT Project Hydrogeologist

Attachments: Table 1 – General Water Chemistry of Groundwater Produced from the Morrison Formation in the San Juan Basin
Figure 1 – Desert Rock Energy Project – Burnham Chapter Well Monitoring Locations
Figure 2 – Stiff Diagrams – Burnham Artesian Wells
Figure 3 – Stiff Diagrams – Historical Morrison Wells vs. Burnham Artesian Wells
Appendix 1 – Ecosphere Artesian Well Site Descriptions and Field Notes
Appendix 2 – Laboratory Analytical Results, Green Analytical Laboratories, Inc.

cc: Miller Brooks Project File 684-0001-01

V:\URS\Desert Rock Energy\684-0001-0001\Burnham Chapter Sampling\Seeps and Springs Report\Burnham Water Quality Report Final (1-30-07).doc

# Table 1 General Water Chemistry of Groundwater Produced from the Morrison Formation in the San Juan Basin Desert Rock Energy Project, New Mexico

Water Quality Data from 1948-1986 (Dam et. al, 1990)			Burnham Water Well Analytical Results, 2006						Coefficient			
Parameter	# of samples	Minimum	Maximum	Median	01	02	03	04	05	06	Average	of Variation
GENERAL CHEMISTRY												
Specific Conductance (us/cm)	52	300	6,000	876	7,510	1,740	3,640	1,960	2,920	3,580	3,558	86%
Fluoride	50	0.2	7.7	0.6	0.9	2.4	2.6	0.5	2.7	3.3	2.07	78%
Nitrate (as nitrogen)	21	0.1	4.5	0.4	0.04	2.29	0.7	0.27	1.16	0.21	0.78	45%
Dissolved Solids (TDS)	52	116	5,000	614	6,100	915	2,130	1,220	2,000	2,570	2,489	85%
pH (standard units)	42	6.6	9.4	8.2	7.58	8.2	8.78	8.6	7.97	8.15	8.21	0%
General Chemistry - Average Coefficient of Variation										59%		
			I	MAJOR A	NIONS	1	1					
Alkalinity (as CaCO3)	56	10	670	200	396	262	604	284	304	158	335	36%
Sulfate	52	6	3,200	160	3,900	600	1,040	660	1,240	1,550	1,498	114%
Chloride	57	1.1	1,200	8.9	89	19	172	23	17	16	56	103%
							Ма	ajor Anions	- Average	Coefficien	t of Variation	84%
				MAJOR C	ATIONS	r						
Calcium	56	0.8	550	14	396	43.3	5.2	11.8	59.1	78.5	99	106%
Magnesium	53	0.1	62	3.7	60.5	4.9	2.9	3	7	11.7	15	85%
Sodium	57	43	1,400	140	1,310	317	763	388	528	647	659	92%
Potassium	56	0.1	24	2	9.4	2.7	3.6	2.6	3.7	1.5	3.92	46%
							Ма	jor Cations	- Average	Coefficien	t of Variation	82%
			1	OTHER N	IETALS							
Arsenic	19	0.01	0.21	0.02	0.0012	0.0007	0.0005	< 0.0005	0.0007	< 0.0005	0.0008	131%
Iron	41	0.03	20	0.6	< 0.05	< 0.05	< 0.05	0.06	<0.05	0.08	0.07	112%
Manganese	21	0.01	19	0.1	0.2747	0.0017	0.0039	0.0021	0.0012	0.0023	0.0477	50%
Other Metals - Average Coefficient of Variation 98%										<b>98%</b>		

Average Coefficient of Variation for all Constituents 81%

#### Explanation:

us/cm = microsiemens per centimeter at 25 degrees Celsius Dissolved constituents are reported in milligrams per liter unless noted otherwise Radium-226 is reported in Pico curies per liter < = not detected above the laboratory's lower detection limit (LDL)



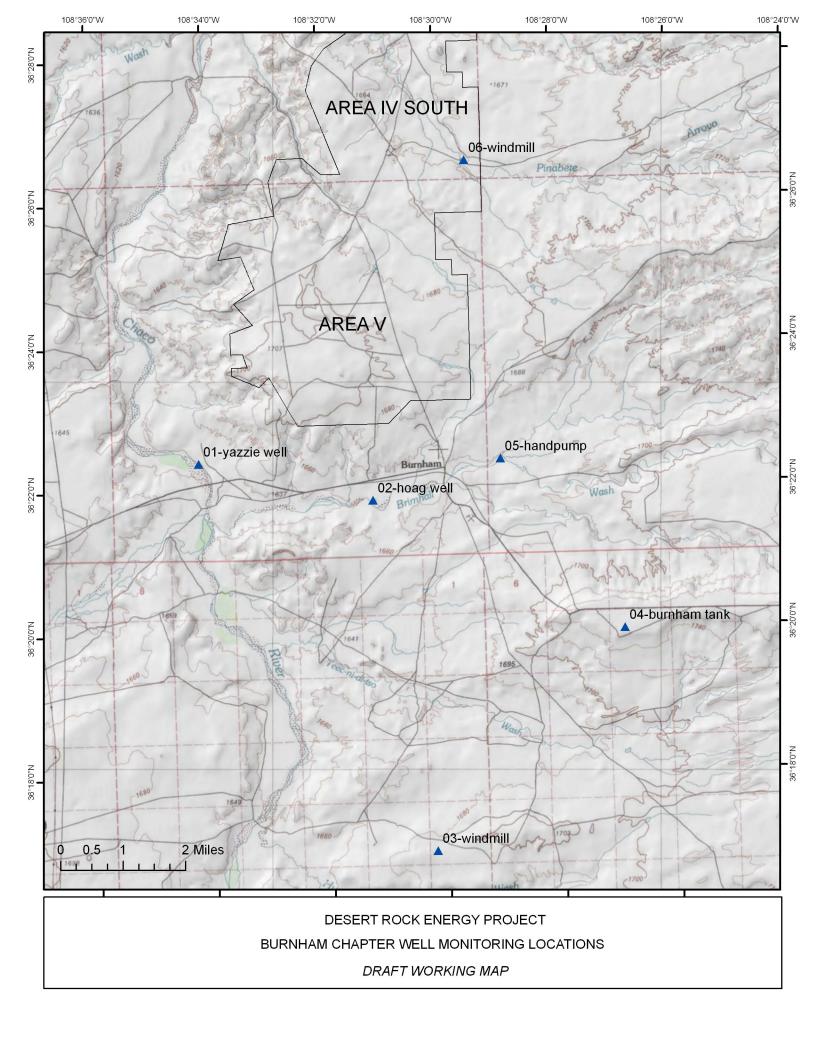
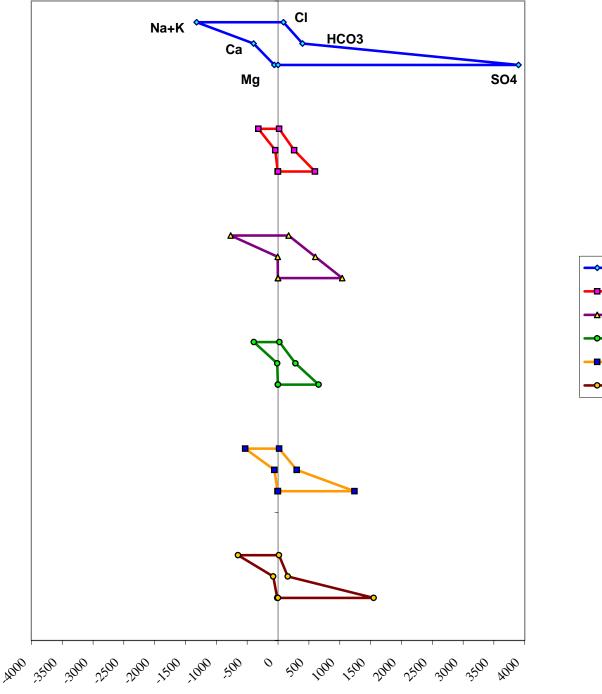


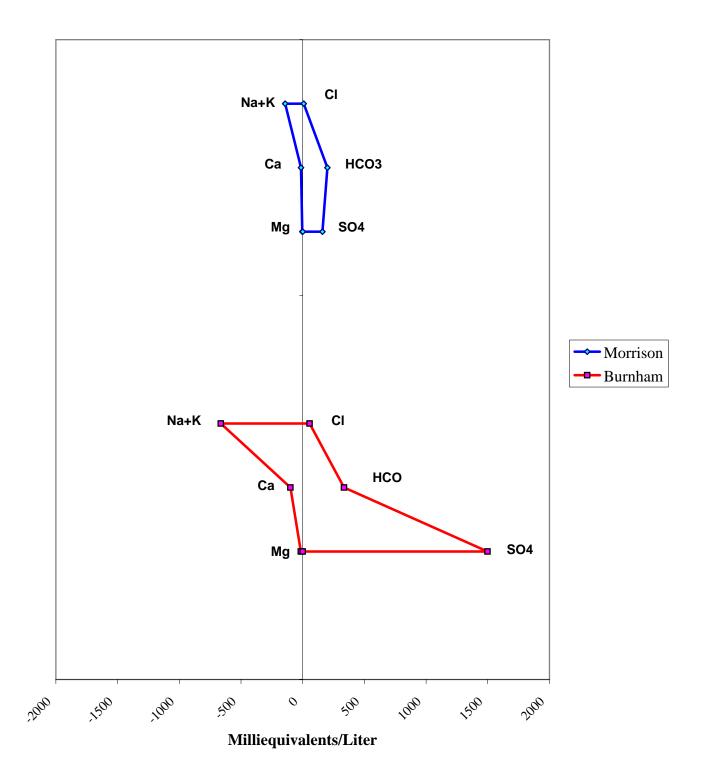
Figure 2 - Stiff Diagrams Burnham Wells, Springs, and Seeps November 2006 Desert Rock, New Mexico



-01 -02 -03 -04 -05 -06

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Figure 3 - Stiff Diagrams Historical Morrison Wells vs Burnham Artesian Wells Desert Rock, New Mexico



#### **Ecosphere Burnham Chapter Artesian Well Monitoring Field Notes**

#### Site 1: Yazzie Well

**Physical Setting:** Site is located on shallow south sloped flood plain of Chaco Wash drainage. The side high bank is next to the well. Recent rainfall is documented as sheet flow silt that drains directly into the well from the northwest from an old eroded two-track dirt road. The deposited silt is alkaline as indicated by the precipitated white salts coming off the drying deposited soils. Two home sites are located 1000-1500 feet to N and NW.

**Plant Community:** Vegetation plant community includes saltcedar, rubber rabbitbrush, spreading rabbitbrush, Drummond's goldenweed and alkali saccaton plant community. Sandy alluvial deposited soils. **Existing Well Facilities:** Well site is fenced off with an existing low concrete well structure covered by a wooden frame, metal tank and bathtub for water trough. The well provides water for livestock.

#### Site 2: Hoag Well

**Physical Setting:** The fenced off well is located north of Brimhall Wash drainage, on the north flood plains. The well provides water for livestock. Home sites are located 400 feet north of the well.

**Plant Community:** Plant community consists of scattered saltcedar, rubber rabbitbrush, and alkali saccaton. The area surrounding the site is heavily grazed.

**Existing Well Facilities:** On the location in the fenced site are metal water trough, meatl tank, concrete spring housing, and hand water pump

#### Site 3: Windmill 3

**Physical Setting:** The site located on a regional high area surrounded by nearly barren badlands to the north and to the south is an extensive sand sheet. Access is from a two-track dirt road along the north region of the site.

**Plant Community:** Plant community type consists of sparse shadscale, Bigelow's rabbitbrush, alkali saccaton and sand dropseed. Silty sand soils are eolian deposited.

**Existing Well Facilities:** The location has 2 metal water troughs, windmill with solar panel, 2 large metal holding tanks and 2 taller, smaller volume metal tank elevated several feet above the ground.

#### Site 4: Burnham Chapter Well

**Physical Setting:** The well is located on a large open level area 1000 feet south of a major dirt road. Home sites are located 1000 feet to the southwest. This includes a sheep corral 500 feet to the south of the tanks. A dirt road from the north is access to the site, the road continues southwest to the home sites.

**Plant Community:** Grassland plant community includes alkali saccaton, sand dropseed, galleta and purple threeawn. The site is heavily grazed.

**Existing Well Facilities:** On the location are 2 large metal holding tanks including 3 tall elevated metal tanks. A water trough and concrete well housing is located 500 feet to the north.

#### Site 5: Hand Pump Well 1

**Physical Setting:** The well is located south of Brimhall Wash on the flood plain, about 1.5 miles east of the Chapter House. Brimhall Wash drainage is 400 feet to the north.

**Plant Community:** Vegetation cover type consists of scattered saltcedar, four-winged saltbush, greasewood, rubber rabbitbrush, broom snakeweed, and alkali saccaton.

Existing Well Facilities: On the location are concrete well housing, hand pump, and 2 small water troughs.

#### Site 6: Pinabete Wash Windmill

**Physical Setting:** Windmill is located in a low bowl shaped area surrounded by sand sheet and minor dunes. To the west is Pinabete Wash drainage floodplain and sandy channel. A fenced off grazing section is located 150 feet east of the windmill.

**Plant Community:** Vegetation cover type includes scattered rubber rabbitbrush, saltcedar and alkali saccaton. Soils are sandy in composition and of eolian and alluvial depositional origin.

Existing Facilities: Active metal windmill, tall metal storage tank and metal water trough.

**Ecosphere Burnham Chapter Artesian Well GPS locations** 

		Max H					Update			Unfilt	<b>F</b> :14
Well Name		_		Rcvr_Type	GPS Date	GPS Time	Sta	Feat Name	Datafile		r⊪_ Pos
			Postprocessed				_010		Datame	_103	1 03
01-yazzie well	4.4	1.6	Code	GeoXT	11/1/2006 0:00	10:34:11am	New	Point_ge	R110109A.cor	6	6
			Postprocessed				-				
02-hoag well	2.5	1.29	Code	GeoXT	11/1/2006 0:00	11:44:31am	New	Point_ge	R110109A.cor	5	5
			Postprocessed								
03-windmill	3.29	1.7	Code	GeoXT	11/1/2006 0:00	12:39:11pm	New	Point_ge	R110109A.cor	5	5
	F 00	2.00	Postprocessed	OssYT	44/7/0000 0-00	00-00-04	Nam	Deint ne			
04-burnham tank	5.09	3.09	Code Postprocessed	GeoXT	11/7/2006 0:00	03:23:31pm	INEW	Point_ge	R110714A.cor	2	2
05-handpump	5.9	54	Code	GeoXT	11/7/2006 0:00	04-00-16pm	New	Point_ge	R110714A.cor	4	4
	0.0	0.4	Postprocessed	000/1	11/1/2000 0.00	04.00.10pm	1101	rom <u>g</u> e			
06-windmill	2	1.1	Code	GeoXT	11/22/2006 0:00	10:11:21am	New	Point_ge	R112209A.cor	4	4
							0.4.4	r		Deint	
Well Name		GPS_ Week	GPS Second	GPS_Height	Vort Proc	Horz Prec	Std_ Dev	Northing	Easting	Point ID	
		VVEEK	GFS_Second	GFS_neight	Ven_Fiec		Dev	Northing	Lasting		
01-yazzie well	Generic	1399	322465	1621.17	1.4	0.6	0.37	4028074.87	718028.42	2	
02-hoag well	Generic	1399	326685	1644.29	0.8	0.5	0.23	4027149.95	722527.27	3	
03-windmill	Generic	1399	329965	1694.67	0.9	0.6	0.18	4018115.02	724204.96	4	
04-burnham tank	Generic	1400	253425	1756.77	1.3	1	0.28	4023893.25	729024.51	6	$\left  - \right $
05-handpump	Generic	1400	255630	1660.04	0.8	1.7	0.51	4028239.15	725808.82	2 7	
06-windmill	Generic	1402	321095	1655.79	0.5	0.4	0.19	4035933.24	724857.8	8 1	

GPS Waypoint	Well ID	<b>GPS</b> Coordinates	Use
		(12 S)	
1	Windmill #1	0724477	Livestock
		4027345	(access sample
			through storage
			tank)
2	Unknown	0722622	None, locked
		4033116	
3	Unknown	0728681	None, open
		4024348	
4	<b>Burnham Chapter</b>	0728660	Chapter House,
		4024348	residential,
			livestock
10	Handpump Well	0724180*	livestock
	#1	4018120*	
	Handpump Well	Within site of #1	livestock
	#2		
7	Windmill #2	0726930	Out of service
		4020855	
9	Windmill #3	0724186	Livestock
		4018125	
11	Hoag Well	0722536	Livestock
		4027140	
12	Yazzie Well	0718024	Livestock
		4028085	
13	Unknown Well	0717827	None, locked
		4028215	
14	Closed Well	0723429	None, cemented
		4039274	

# Burnham Chapter Seeps, Springs, and Wells Survey 10/18/2006

*wells are approximately 1/2 mile north and east from coordinates

# Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

GAL I.D.: 611-015-01 Date Received: 11/02/06 **Ecosphere Environmental** 2257 Main Ave, Patio Level Date Reported: 12/07/06 QC Batches: Durango, CO 81301 Attention: Tyler Scheid **PROJECT NAME: Desert Rock Burnham PROJECT NUMBER:** Sample Date: 11/01/06 SAMPLE I.D.: 01-Yazzie Sample Matrix: Water

# Laboratory Report

#### REPORT UNITS PARAMETER METHOD LIMIT RESULT DIL Alkalinity, Total 1 2320B 10 396 mg/L 1 Alkalinity, Bicarbonate 2320B 10 396 mg/L Alkalinity, Carbonate 2320B 10 <10 1 mg/L 1 Alkalinity, Hydroxide 2320B 10 <10 mg/L 0.0005 0.0012 Arsenic 200.8 1 mg/L Calcium 200.7 0.5 396 1 mg/L 1 Chloride 4500CL 10 89 mg/L 1 7510 uS/cm Conductivity 2510B 1.0 Fluoride 4500F C 0.2 0.9 1 mg/L Iron 200.7 0.05 < 0.05 1 mg/L Magnesium 200.7 0.5 60.5 1 mg/L 0.0005 0.2747 mg/L Manganese 200.8 1 Nitrate/Nitrite as N 353.3 0.02 0.04 1 mg/L NA SU pН 150.1 NA 7.58 Potassium 200.7 0.5 9.4 1 mg/L Sodium 200.7 0.5 1310 1 mg/L Sulfate 4500SO4 10 3900 1 mg/L TDS 2540C 10 6100 1 mg/L Hardness Calc 10 1240 1 mg/L

PROJECT NAME:	Desert Rock Burnham
PROJECT NUMBER:	
SAMPLE I.D.:	01- Yazzie

Sample Date:	11/01/06
Sample Matrix:	Water

# **RESULTS**

		REPORT				
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS	
					GAL I.D.:	611-015-02
0					Date Received:	11/02/06
0					Date Reported:	01/00/00
0					QC Batches:	
Attention: Tyler Sc	cheid					
PROJECT NAME:	0					
PROJECT NUMBER	<u>.</u>				Sample Date:	11/01/06
SAMPLE I.D.:	02- Hoa	9			Sample Matrix:	0

# Laboratory Report

		REPORT			
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS
Alkalinity, Total	2320B	10	262	1	mg/L
Alkalinity, Bicarbonate	2320B	10	234	1	mg/L
Alkalinity, Carbonate	2320B	10	28	1	mg/L
Alkalinity, Hydroxide	2320B	10	<10	1	mg/L
Arsenic	200.8	0.0005	0.0007	1	mg/L
Calcium	200.7	0.5	43.3	1	mg/L
Chloride	4500CL	10	19	1	mg/L
Conductivity	2510B	1.0	1740	1	uS/cm
Fluoride	4500F C	0.2	2.4	1	mg/L
Iron	200.7	0.05	<0.05	1	mg/L
Magnesium	200.7	0.5	4.9	1	mg/L
Manganese	200.8	0.0005	0.0017	1	mg/L
Nitrate/Nitrite as N	353.3	0.02	2.29	1	mg/L
pН	150.1	NA	8.20	NA	SU
Potassium	200.7	0.5	2.7	1	mg/L
Sodium	200.7	0.5	317	1	mg/L
Sulfate	4500SO4	10	600	1	mg/L
TDS	2540C	10	915	1	mg/L
Hardness	Calc	10	128	1	mg/L

PROJECT NAME:	Desert Rock Burnham
PROJECT NUMBER:	
SAMPLE I.D.:	01- Yazzie

# **RESULTS**

		REPORT				
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS	
					GAL I.D.:	611-015-03
0					Date Received:	11/02/06
0					Date Reported:	01/00/00
0					QC Batches:	
Attention: Tyler Sc	cheid					
PROJECT NAME:	0					
PROJECT NUMBER	<u>R:</u>				Sample Date:	11/01/06
SAMPLE I.D.:	03- Wind	lmill 3			Sample Matrix:	0

# Laboratory Report

		REPORT			
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS
Alkalinity, Total	2320B	10	604	1	mg/L
Alkalinity, Bicarbonate	2320B	10	444	1	mg/L
Alkalinity, Carbonate	2320B	10	160	1	mg/L
Alkalinity, Hydroxide	2320B	10	<10	1	mg/L
Arsenic	200.8	0.0005	0.0005	1	mg/L
Calcium	200.7	0.5	5.2	1	mg/L
Chloride	4500CL	10	172	1	mg/L
Conductivity	2510B	1.0	3640	1	uS/cm
Fluoride	4500F C	0.2	2.6	1	mg/L
Iron	200.7	0.05	<0.05	1	mg/L
Magnesium	200.7	0.5	2.9	1	mg/L
Manganese	200.8	0.0005	0.0039	1	mg/L
Nitrate/Nitrite as N	353.3	0.02	0.70	1	mg/L
рН	150.1	NA	8.78	NA	SU
Potassium	200.7	0.5	3.6	1	mg/L
Sodium	200.7	0.5	763	1	mg/L
Sulfate	4500SO4	10	1040	1	mg/L
TDS	2540C	10	2130	1	mg/L
Hardness	Calc	10	25	1	mg/L

PROJECT NAME:	Desert Rock Burnham
PROJECT NUMBER:	
SAMPLE I.D.:	01- Yazzie

# **RESULTS**

		REPORT				
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS	
					GAL I.D.:	611-058-01
0					Date Received:	11/09/06
0					Date Reported:	01/00/00
0					QC Batches:	
Attention: Tyler Sc	heid					
PROJECT NAME:	0					
PROJECT NUMBER	<u>!:</u>				Sample Date:	11/07/06
SAMPLE I.D.:	04- Burn	nam			Sample Matrix:	0

# Laboratory Report

		REPORT			
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS
Alkalinity, Total	2320B	10	284	1	mg/L
Alkalinity, Bicarbonate	2320B	10	208	1	mg/L
Alkalinity, Carbonate	2320B	10	76	1	mg/L
Alkalinity, Hydroxide	2320B	10	<10	1	mg/L
Arsenic	200.8	0.0005	<0.0005	1	mg/L
Calcium	200.7	0.5	11.8	1	mg/L
Chloride	4500CL	10	23	1	mg/L
Conductivity	2510B	1.0	1960	1	uS/cm
Fluoride	4500F C	0.2	0.5	1	mg/L
Iron	200.7	0.05	0.06	1	mg/L
Magnesium	200.7	0.5	3.0	1	mg/L
Manganese	200.8	0.0005	0.0021	1	mg/L
Nitrate/Nitrite as N	353.3	0.02	0.27	1	mg/L
рН	150.1	NA	8.60	NA	SU
Potassium	200.7	0.5	2.6	1	mg/L
Sodium	200.7	0.5	388	1	mg/L
Sulfate	4500SO4	10	660	1	mg/L
TDS	2540C	10	1220	1	mg/L
Hardness	Calc	10	42	1	mg/L

PROJECT NAME:	Desert Rock Burnham
PROJECT NUMBER:	
SAMPLE I.D.:	01- Yazzie

Sample Date:	11/01/06
Sample Matrix:	Water

# **RESULTS**

		REPORT				
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS	
					GAL I.D.:	611-058-02
0					Date Received:	11/09/06
0					Date Reported:	01/00/00
0					QC Batches:	
Attention: Tyler Sc	cheid					
PROJECT NAME:	0					
PROJECT NUMBER	<u> </u>				Sample Date:	11/07/06
SAMPLE I.D.:	05- Hand	lpump			Sample Matrix:	0

# Laboratory Report

# **RESULTS**

#### REPORT PARAMETER METHOD LIMIT RESULT DIL UNITS Alkalinity, Total 2320B 10 304 1 mg/L Alkalinity, Bicarbonate 304 1 2320B 10 mg/L Alkalinity, Carbonate mg/L 2320B 10 <10 1 Alkalinity, Hydroxide <10 mg/L 2320B 10 1 mg/L Arsenic 200.8 0.0005 0.0007 1 Calcium 200.7 0.5 59.1 1 mg/L Chloride 4500CL 10 1 mg/L 17 2510B 2920 uS/cm Conductivity 1.0 1 Fluoride 4500F C 0.2 2.7 1 mg/L Iron 200.7 0.05 mg/L < 0.05 1 Magnesium 200.7 0.5 7.0 1 mg/L Manganese 200.8 0.0005 0.0012 1 mg/L Nitrate/Nitrite as N 353.3 0.02 1.16 1 mg/L NA SU pН 150.1 NA 7.97 Potassium 200.7 0.5 3.7 1 mg/L Sodium 200.7 0.5 528 1 mg/L Sulfate 4500SO4 10 1240 1 mg/L TDS 2540C 10 2000 1 mg/L Hardness Calc 10 176 1 mg/L

John Green, Laboratory Manager

PROJECT NAME:	Desert Rock Burnham
PROJECT NUMBER:	
SAMPLE I.D.:	01- Yazzie

Sample Date:	11/01/06
Sample Matrix:	Water

# **RESULTS**

<u></u>		REPORT				
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS	
					GAL I.D.:	611-124-01
#REF!					Date Received:	11/28/06
#REF!					Date Reported:	#REF!
#REF!					QC Batches:	
Attention: Tyler Sc	heid					
PROJECT NAME:	#REF!					
PROJECT NUMBER	<u>.</u>				Sample Date:	11/22/06
SAMPLE I.D.:	06 - Win	dmill			Sample Matrix:	#REF!

# Laboratory Report

		REPORT			
PARAMETER	METHOD	LIMIT	RESULT	DIL	UNITS
Alkalinity, Total	2320B	10	158	1	mg/L
Alkalinity, Bicarbonate	2320B	10	142	1	mg/L
Alkalinity, Carbonate	2320B	10	16	1	mg/L
Alkalinity, Hydroxide	2320B	10	<10	1	mg/L
Arsenic	200.8	0.0005	<0.0005	1	mg/L
Calcium	200.7	0.5	78.5	1	mg/L
Chloride	4500CL	10	16	1	mg/L
Conductivity	2510B	1.0	3580	1	uS/cm
Fluoride	4500F C	0.2	3.3	1	mg/L
Iron	200.7	0.05	0.08	1	mg/L
Magnesium	200.7	0.5	11.7	1	mg/L
Manganese	200.8	0.0005	0.0023	1	mg/L
Nitrate/Nitrite as N	353.3	0.02	0.21	1	mg/L
рН	150.1	NA	8.15	NA	SU
Potassium	200.7	0.5	1.5	1	mg/L
Sodium	200.7	0.5	647	1	mg/L
Sulfate	4500SO4	10	1550	1	mg/L
TDS	2540C	10	2570	1	mg/L
Hardness	Calc	10	244	1	mg/L

January 31, 2007

Ms. Jennifer Pyne URS Corporation 7720 N. 16th Street, Suite 100 Phoenix, AZ 85020

# Re: Water Quality Comparison Report – A Comparison of 2006 Sanostee Chapter Water Well Data to Historical Morrison Formation Water Well Data Desert Rock Energy Project, New Mexico

Miller Brooks Environmental, Inc. Project #0684-0001-0001

Dear Ms. Pyne:

Miller Brooks Environmental, Inc. (Miller Brooks) has prepared this report for URS Corporation (URS), per Sub-Task 5 of "Work Order No. 2" from URS dated August 31, 2006. This report presents the analytical results for water samples collected by Ecosphere Environmental Services (Ecosphere) in Farmington, New Mexico on September 6, 2006 at six artesian wells located on Sanostee Chapter land adjacent to the proposed Desert Rock Power Plant in the Four Corners Area, New Mexico. This report also compares that data to historical water quality data from samples collected in wells reported to have historically withdrawn groundwater from the Morrison Formation located in the Upper San Juan Basin (Dam, et. al, 1990) in the vicinity of the Desert Rock project site (the study area).

# **PROJECT BACKGROUND**

The study area (see Figure 1) is located in the northwestern portion of New Mexico, southeast of Shiprock and due south of Farmington. The proposed water supply for the Desert Rock Power Plant is from new production wells proposed for future construction. The proposed wells will be designed to withdraw groundwater exclusively from the Morrison Formation to mitigate drawdown in Navajo Nation water supply wells and seeps and springs which derive most, if not all, of their water supply for an upper confined aquifer (above the Morrison Formation). The locations of the six artesian wells sampled by Ecosphere used for comparison in this report are shown on Figure 1. Site descriptions, GPS locations and Ecosphere's field notes are included in Appendix 1.

The purpose of this report is to compare water chemistry from the six artesian wells sampled by Ecosphere to historical groundwater chemistry from samples collected in wells reported to have produced water from the Morrison Formation. The comparison is intended to draw a similarity or dissimilarity in the two water sources with respect to their geochemical "footprints." Although not part of this evaluation, the "footprint" could be evaluated to determine the degree of hydrologic "connectivity" between seeps- and springs-derived water and Morrison Formation-derived water. This information could be helpful in relating drawdown at the proposed well field(s) for the proposed Desert Rock Power Plant as it relates to potential drawdown of artesian wells in the study area.

Since there are few documented wells constructed and currently producing groundwater exclusively from the Morrison Formation in the study area (Miller Brooks, 2006), this report compares the artesian well data to historical water quality data for groundwater samples collected in wells reported to have withdrawn groundwater from the Morrison Formation (Dam, et. al, 1990). The historical data are a compilation of wells sampled between 1948 and 1986 (Dam, et. al, 1990) located within and outside of the study area but within the same geologic province (the Upper San Juan Basin). Due to a lack of well construction records, we cannot conclusively confirm if the Morrison Formation well data set used in this report represents groundwater produced exclusively from the Morrison Formation.

# WATER QUALITY RESULTS

The water quality data presented in the report is discussed in the following four sections:

- General Chemistry
- Major Anions
- Major Cations
- Other Metals

For ease of reference, samples colleted by Ecosphere on September 6, 2006 from the six artesian wells (Figure 1) will be referred in this report as the "artesian wells." Samples collected from wells completed in the Morrison Formation (Dam. et. al., 1990) will be referred to as the "Morrison Formation wells." Table 1 provides a summary of the water quality data referenced in this report. The laboratory analytical reports from Green Analytical Laboratories, Inc. for the six artesian wells sampled are included as Appendix 2.

This report compares the median values of concentrations (for the selected constituents) of the Morrison Formation well data set to the average values of the artesian well data set, presented in Table 1 as a "coefficient of variation" (in percent). In addition, we have prepared stiff plots of each artesian well sampled (Figure 2) and a comparative stiff plot using the median concentrations from the Morrison Formation well data set (Figure 3) and the average values from the artesian well data set. These stiff plots are intended to graphically demonstrate the similarity or dissimilarity in geochemistry of the two water sources.

# **General Chemistry**

# Specific Conductance (SC) and Total Dissolved Solids (TDS):

The average concentration of SC and TDS from the artesian wells sampled is 479 microsiemens per centimeter ( $\mu$ s/cm) and 233 milligrams per liter (mg/L), respectively (Table 1). The median concentration of SC and TDS from the Morrison Formation wells is 876  $\mu$ s/cm and 614 mg/L, respectively. The calculated coefficient of variation in SC and TDS from the two water sources is 41 and 644 percent, respectively.

# <u>Fluoride</u>:

The average concentration of Fluoride from the artesian wells sampled is 0.4 mg/L (Table 1). The median concentration of Fluoride from the Morrison wells is 0.6 mg/L (Table 1). The calculated coefficient of variation in Fluoride from the two water sources is 31 percent.

# <u>Nitrate:</u>

The average concentration of Nitrate from the artesian wells sampled is 0.02 mg/L. The median concentration of Nitrate from the Morrison wells is 0.4 mg/L (Table 1). The calculated coefficient of variation in Nitrate from the two water sources is 128 percent.

# <u>рН:</u>

The average pH value from the artesian wells sampled is 9.5 (Table 1). The median pH value from the Morrison wells is 8.2 (Table 1). The calculated coefficient of variation in pH from the two water sources is 10 percent.

# General Chemistry Summary

The two water sources have an average coefficient of variation for the general chemistry constituents presented of 55 percent (Table 1). The high discrepancy in the coefficient of variation for nitrate and TDS could suggest that the two water sources have different geochemical "footprints" with regard to the general chemistry constituents presented in this report.

# **Major Anions**

### <u>Alkalinity:</u>

The average concentration for Alkalinity (CaCO₃) from the artesian wells sampled is 214 mg/L. The median concentration for Alkalinity from the Morrison wells is 200 mg/L (Table 1). The calculated coefficient of variation in Alkalinity from the two water sources is 5 percent.

# <u>Sulfate:</u>

The average concentration for Sulfate from the artesian wells sampled is 27 mg/L. The median concentration for Sulfate from the Morrison wells is 160 mg/L (Table 1). The calculated coefficient of variation in Sulfate from the two water sources is 101 percent.

### Chloride:

The average concentration for Chloride from the artesian wells sampled is 10 mg/L. The median concentration for Chloride from the Morrison wells is 8.9 mg/L (Table 1). The calculated coefficient of variation in Chloride from the two water sources is 8 percent.

# Major Anion Summary

The two water sources have an average coefficient of variation for the major anions presented of 38 percent (Table 1). The two water sources have a relatively low coefficient of variation for Alkalinity and Chloride, but a much higher coefficient of variation Sulfate. The major anions discussed above indicate that both water sources are Carbonate-dominated waters (due to high Alkalinity (CaCO₃). There is no conclusive evidence in the anion data presented to suggest a similarity or dissimilarity in the two water sources.

# Major Cations

# Sodium:

The average concentration of Sodium from the artesian wells sampled is 113 mg/L. The median concentration for Sodium from the Morrison wells is 140 mg/L (Table 1). The calculated coefficient of variation in Sodium from the two water sources is 15 percent.

# Calcium:

The average concentration of Calcium from the artesian wells sampled is 1 mg/L. The median concentration of Calcium from the Morrison wells is 14 mg/L (Table 1). The calculated coefficient of variation in Calcium from the two water sources is 123 percent.

### <u>Magnesium:</u>

The average concentration of Magnesium from the artesian wells sampled is less than 0.5 mg/L. The median concentration of Magnesium from the Morrison wells is 3.7 mg/L (Table 1). The coefficient of variation in Magnesium from the two water sources is 108 percent.

### <u>Potassium:</u>

The average concentration of Potassium from the artesian wells sampled is 0.53 mg/L. The median concentration for Potassium from the Morrison wells is 2 mg/L (Table 1). The calculated coefficient of variation in Potassium from the two water sources is 82 percent.

### Major Cations Summary

The two water sources have an average coefficient of variation for the major cations presented of 82 percent (Table 1). The two water sources have a relatively high coefficient of variation in concentrations of the major cations compared with the exception of sodium, suggesting that the two water sources have different geochemical "footprints" with regards to major cations. However, it should also be noted that both water sources are Sodium-dominated with respect to the major cations compared in this report (both have relatively high Sodium concentrations, with lesser concentrations of Calcium, Magnesium and Potassium, as described above).

# **Other Metals**

### Arsenic:

The average concentration of Arsenic from the artesian wells sampled is 0.0048 mg/L. The median concentration for Arsenic from the Morrison wells is 0.02 mg/L (Table 1). The calculated coefficient of variation in Arsenic from the two water sources is 87 percent.

### <u>Manganese:</u>

The average concentration of Manganese from the artesian wells sampled is 0.0006 mg/L. The median concentration of Manganese from the Morrison wells is 0.1 mg/L (Table 1). The calculated coefficient of variation in Manganese from the two water sources is 140 percent.

### Iron:

The average concentration of Iron from the artesian wells sampled is 0.052 mg/L. T he median concentration of Iron from the Morrison wells is 0.6 mg/L (Table 1). The calculated coefficient of variation in Iron from the two water sources is 119 percent.

### Other Metals Summary

The two water sources have an average coefficient of variation for the other metals presented of 115 percent (Table 1). In addition, the ionic strengths of the three metals presented are substantially higher in the Morrison Formation wells. This would suggest that the two water sources have different geochemical "footprints" with regard to the other metals presented in this report.

# CONCLUSIONS

The *average coefficient of variation* between the concentrations for the constituents presented herein for the artesian wells and the Morrison Formation wells is 73 percent (Table 1). Generally speaking, the artesian wells have lower concentrations of general chemistry parameters, major cations, sulfate, and other metals than the Morrison wells and relatively similar concentrations of Alkalinity (CaCO₃) and Chloride (see Table 1). Both water sources are Sodium Sulfate dominated as illustrated in the stiff plot comparison (Figure 3). However, Figure 3 also illustrates a relatively significant discrepancy in ionic strength with regards to Sulfate. The geochemical comparisons presented in this report do not conclusively indicate a similarity or dissimilarity with respect to the geochemical "footprints" of either water source.

### REFERENCES

Dam, W.L., Kernodle, J.M., Leavings, G.W., and Craig, S.D., 1990, Hydrogeology of the Morrison Formation in the San Juan Structural Basin, New Mexico, Colorado, Arizona, and Utah; U. S. Geological Survey Water Resources Hydrologic Investigations Atlas HA-720-J, Sheets 1 and 2.

Miller Brooks Environmental Inc., 2006, Final Well Impact Report – Revision No. 1, Desert Rock Energy Project Four Corners Area, New Mexico, Sithe Global Power L.L.C.; October 5

If you have any questions or concerns, please do not hesitate to contact us at (602) 728-0577.

Sincerely, *Miller Brooks Environmental, Inc.* 

Chris J. Courtney, RG, PG Office Manager/Associate Hydrogeologist

Stephen P. Flora, GIT Project Hydrogeologist

Attachments: Table 1 – Chemistry Comparison -Groundwater Produced from the Morrison Formation in the San Juan Basin vs. Sanostee Chapter Seeps and Springs Water
 Figure 1 – Desert Rock Energy Project – Sanostee Chapter Well Monitoring Locations
 Figure 2 – Stiff Diagrams Sanostee Artesian Wells
 Figure 3 – Stiff Diagrams Historical Morrison Wells vs. Sanostee Artesian Wells
 Appendix 1 – Ecosphere Artesian Well Site Descriptions and Field Notes
 Appendix 2 – Laboratory Analytical Results, Green Analytical Laboratories, Inc.

cc: Miller Brooks Project #0684-0001-0001

V:\URS\Desert Rock Energy\684-0001-0001\Sanostee Chapter Sampling\Seeps and Springs Report\Sanostee Water Quality Report Final (1-30-07).doc

Table 1

#### Chemistry Comparison -Groundwater Produced from the Morrison Formation in the San Juan Basin vs. Sanostee Chapter Seeps and Springs Desert Rock Energy Project, New Mexico

Water Quality Data from 1948-1986 (Dam et. al, 1990)			Sanostee Water Well Analytical Results, 2006									
Parameter	# of samples	Minimum	Maximum	Median	01	02	03	04	05	06	Average	Coefficient of Variation
				GENERAL C	HEMISTRY					-	-	-
Specific Conductance (us/cm)	52	300	6000	876	537	406	494	450	441	545	479	41%
Fluoride	50	0.2	7.7	0.6	1	0.3	0.2	0.3	0.2	0.3	0.4	31%
Nitrate (as nitrogen)	21	0.1	4.5	0.4	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.02	128%
Dissolved Solids (TDS)	52	116	5,000	614	255	205	210	220	220	285	233	64%
pH (standard units)	42	6.6	9.4	8.2	9.41	9.5	9.4	9.5	9.5	9.5	9.5	10%
							General	Chemistry	- Average	Coefficien	t of Variation	55%
				MAJOR A	NIONS							
Alkalinity (as CaCO3)	56	10	670	200	226	187	238	214	214	202	214	5%
Sulfate	52	6	3,200	160	50	16	< 10	< 10	< 10	63	27	101%
Chloride	57	1.1	1,200	8.9	< 10	< 10	< 10	< 10	< 10	< 10	10	8%
							Ма	ijor Anions	- Average	Coefficien	t of Variation	38%
				MAJOR C	ATIONS		1	1	1			
Calcium	56	0.8	550	14	0.8	0.8	2	0.5	0.6	1	1	123%
Magnesium	53	0.1	62	3.7	< 0.5	<0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5	108%
Sodium	57	43	1,400	140	133	101	115	103	102	121	113	15%
Potassium	56	0.1	24	2	0.5	< 0.5	0.7	0.5	< 0.5	< 0.5	0.53	82%
	Major Cations - Average Coefficient of Variation 82%								82%			
				OTHER N	IETALS		1	1	1			
Arsenic	19	0.01	0.21	0.02	0.0005	0.0052	0.0114	0.0027	0.0045	0.0044	0.0048	87%
Iron	41	0.03	20	0.6	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	0.052	119%
Manganese	21	0.01	19	0.1	0.0005	0.0005	0.001	0.0006	0.0005	< 0.0005	0.0006	140%
							0	ther Metals	- Average	Coefficien	t of Variation	115%

Average Coefficient of Variation for all Constituents 73%

#### Explanation:

us/cm = microsiemens per centimeter at 25 degrees Celsius Dissolved constituents are reported in milligrams per liter unless noted otherwise Radium-226 is reported in Pico curies per liter < = not detected above the laboratory's lower detection limit (LDL)



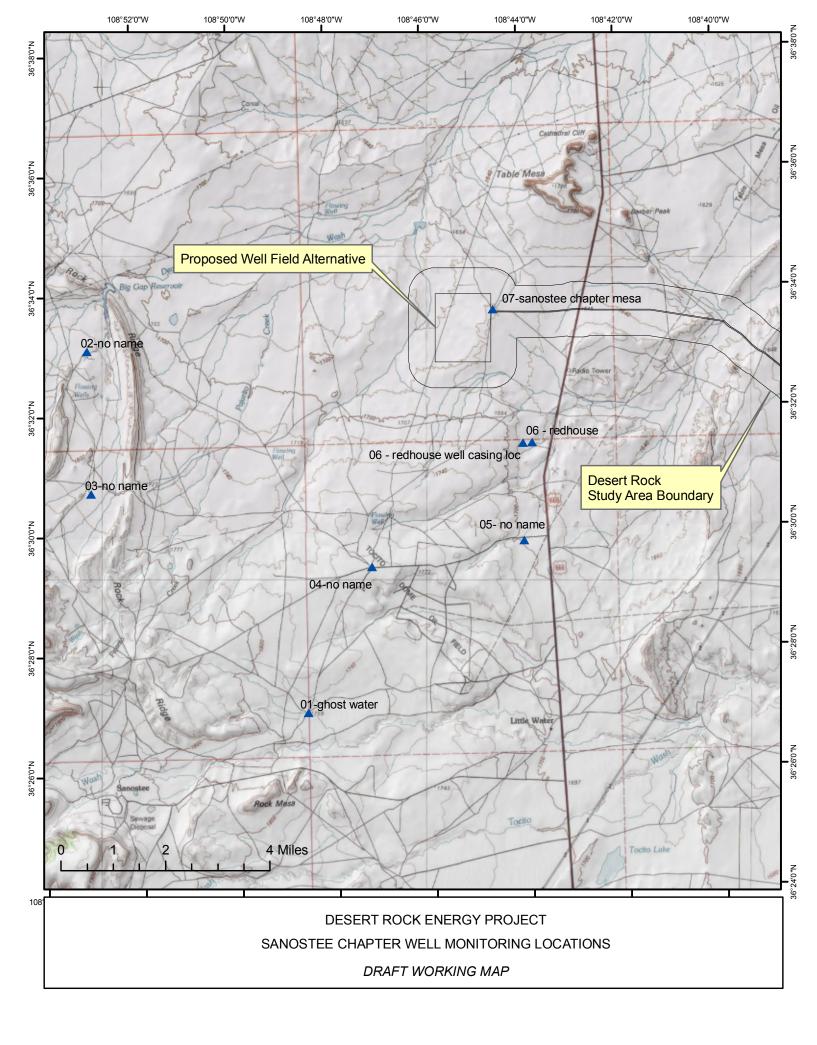
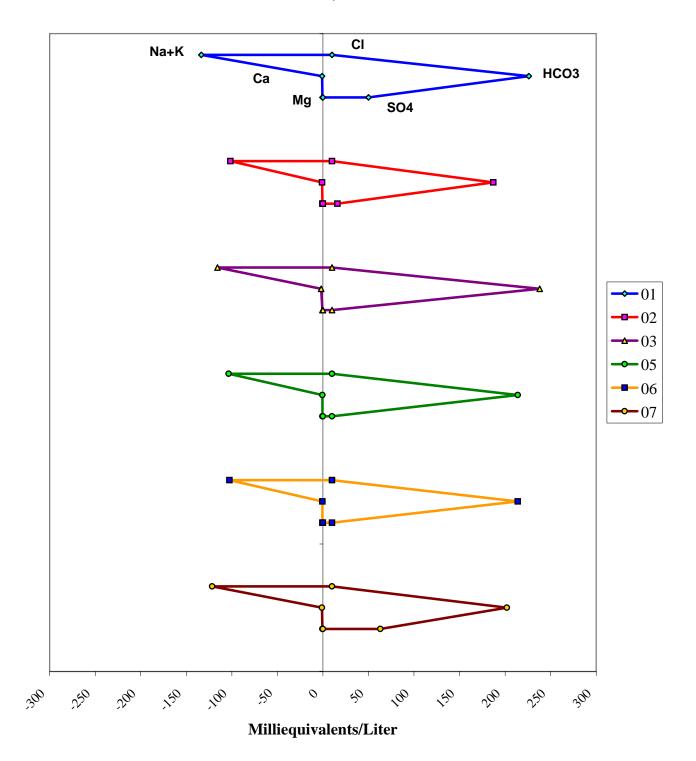


Figure 2 - Stiff Diagrams Sanostee Wells, Springs, and Seeps September 2006 Desert Rock, New Mexico



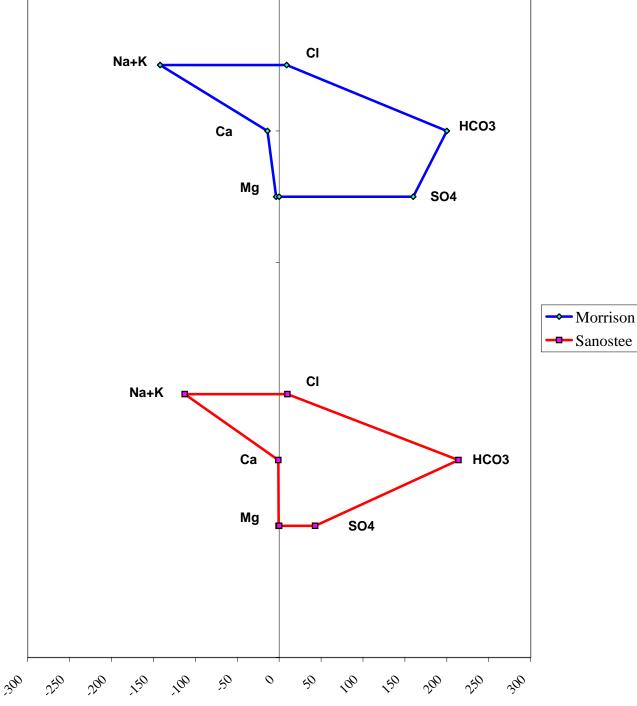


Figure 3 - Stiff Diagrams Historical Morrison Wells vs. Sanostee Artestian Wells Desert Rock, New Mexico

Milliequivalents/Liter

FID_	Comment	Max_PDOP	Max_HDOP Corr_Type	Rcvr_Type	GPS_Date	GPS_Time	Update_Sta	GPS_Height	Vert_Prec	Horz_Prec Std_Dev	Northing	Easting	Point_ID
	01-ghost water	1.89	1.2 Postprocessed Code	GeoXT	9/6/2006 0:00	11:39:41am	New	1758.63	0.6	0.5 8.50E-05	4036084.33	696303.61	1
	02-no name	2.09	1.1 Postprocessed Code	GeoXT	9/6/2006 0:00	12:45:01pm	New	1751.29	0.6	0.4 1.56E-04	4047215.11	689464.51	2
	03-no name	2.2	1.29 Postprocessed Code	GeoXT	9/6/2006 0:00	01:21:51pm	New	1810.22	0.7	0.5 4.87E-04	4042817.26	689600.24	3
	04-no name	3.79	2.59 Postprocessed Code	GeoXT	9/6/2006 0:00	01:59:11pm	New	1790.44	0.9	0.8 1.61E-04	4040587.84	698255.12	4
	05- no name	3.5	1.6 Postprocessed Code	GeoXT	9/6/2006 0:00	02:22:36pm	New	1699.63	1	0.5 2.85E-04	4041420.55	702950.47	5
	06 - redhouse	3.29	1.39 Postprocessed Code	GeoXT	9/6/2006 0:00	02:56:36pm	New	1668.73	1	0.5 2.26E-04	4044437.6	703189.76	6
	06 - redhouse well casing loc	5	1.5 Postprocessed Code	GeoXT	9/6/2006 0:00	03:03:36pm	New	1671.75	1.6	0.5 5.20E-05	4044415.35	702910.94	7
	07-sanostee chapter mesa	3.7	2 Postprocessed Code	GeoXT	9/6/2006 0:00	03:37:21pm	New	1683.32	1	0.7 3.35E-04	4048543.61	701980.12	8

Site	Conductivity (mS/cm)	Temp (deg C) Note
01-ghost water	515	22.4 Artesian well. Open flow, no shut off. Trough runs to pond. Runs year round. Capped in the 1940's or 1950's. Known to taste of metallic substance.
02-no name	374	21.9 Hand pump/artesian well. Trough runs to dry pond. 12/8/15, 10/9/68 engraved on brass monument. Concrete bunker water tank of unknown storage capacity.
03-no name	452	22.3 Artesian well. Shut off valve engaged. Valve opened and allowed to flow for 5 minutes before sampled. Metal trough. Windmill 3T382 150 feet away.
04-no name	1828	34.3 Windmill pump/artesian well. Concrete trough. Not flowing, windmill locked. Water trickling at casing. Field measure taken inside of casing slot, no sample taken.
05-no name	406	26.7 Artesian well. Open flow, no shut off. Trough runs to pond/wetland. Runs year round. Known for good potability and livestock watering.
06-redhouse	397	28.7 Artesian well. Well piped to shut off valve at Redhouse residence. Drilled to approx 1400 feet in 1979 - info from onsite resident. Steady flow year round with pressure
07-sanostee chapter mesa	503	28.0 Artesian well. Open flow, no shut off. Trough runs to pond/wetland. Runs year round. 12/5/?2, 7/?/65 engraved on monument at casing.

ure to power large lawn sprinkler. Sample taken from hose outlet.

# **Ecosphere Artesian Well Site Descriptions**

Site 01: Ghost Water Well (Chii dii toh)

**Physical Setting:** Site is located on shallow southeast sloped swale. The site is an area with several dirt roads that intersect. The site is disturbed with limited vegetation.

**Plant Community:** Surrounding plant community is sparsely scattered four-winged saltbush, greasewood and alkali saccaton plant community. Disturbed areas have weedy plant species represented by summer cypress, false buffalograss, prostrate knotweed and Russian thistle.

**Existing Well Facilities:** Perennial artesian well with existing concrete well structure, 2 metal troughs and 2 overflow ponds nearby. The well provides water for livestock and small mammals. Navajo families that live in the region use the well for limited domestic use.

#### Site 02: Big Gap Well

**Physical Setting:** The well is located between the Hogback monoclinal ridge to the east and lateral extensive benches and mesas that surround the eastern foothills of Beautiful Mountain to the west. On site setting is characterized by a shallow east slope swale. Two large Chinese elm located to the east of the well, provides shade for livestock.

**Plant Community:** Three distinct plant community types occur within the spring location. The northwestern section is dominated by shadscale, New Mexico matted saltbush, broom snakeweed and alkali saccaton. The southeastern region is dominated by greasewood and limited alkali saccaton. A narrow riparian community exists next to the well housing the community consists of spikerush, aster and broadleaf plantain.

**Existing Well Facilities:** On the location are 2 metal water troughs, concrete spring housing, hand water pump and a large overflow pond to the southeast.

Site 03: Well # T382

**Physical Setting:** The site setting is characterized by a shallow southeast sloped swale in a broad open region. The site shows signs of sheetflow during excessive rainfall.

**Plant Community:** Plant community type within the spring location consists of sparse four-winged saltbush, alkali saccaton and Russian thistle.

**Existing Well Facilities:** The location has 2 metal water troughs, windmill, 1 large metal holding tank and 1 taller, smaller volume metal tank elevated several feet above the ground. This tank is utilized for domestic water.

Site 04: Well # 20

**Physical Setting:** The well is located next to a major dirt road intersection. A homesite is located 500-700 feet to the north.

**Plant Community:** Plant community nearby includes scattered four-winged saltbush, broom snakeweed, Greene's rabbitbrush and alkali saccaton.

**Existing Well Facilities:** On the location are a windmill and metal elevated metal with a concrete water trough. The elevated tank is used for domestic water.

Site 05: No name or number

**Physical Setting:** The well is located on a shallow east sloped swale.

**Plant Community:** Vegetation cover type consists of four-winged saltbush, Bigelow's rabbitbrush, broom snakeweed, alkali saccaton and galleta. A narrow riparian community extends to the northeast.

Existing Well Facilities: On the location are water troughs, well, and overflow pond.

Site 06: No well number or name

**Physical Setting:** The well is located next to an existing lawn surrounded by trees. The actual well is located approximately 1500 feet to the west. The water is piped down to near several homesites located in the immediate vicinity.

**Plant Community:** The vegetation cover consists of lawn grasses, weedy forbs, and Navajo willows. **Existing Well Facilities:** On the location is a faucet, sprinkler, lawn and shade trees.

Site 07: No number or name.

**Physical Setting:** The well is located on the north side of a major dirt road. The site is on top of an elevated region with gentle slopes away from the well to the north, northeast and south.

**Plant Community:** The region surrounding the well is covered by salt desert scrub of matted saltbush, Castle Valley saltbush and sparse galleta. The region northeast of the site is and extended wetland with two large circular wetlands that occupy a large region before the large overflow pond to the northeast. The riparian vegetation cover includes spikerush, wirerush, rabbitfoot grass, alkali saccaton, scratchgrass and water speedwell.

**Existing Well Facilities:** On the location are wellhead, water trough, plus an extensive wetland to the northeast and a large overflow pond to the northeast.

#### Ecosphere Artesian Well GPS locations

FID_	Comment	Max_PDOP	Max_HDOP	Corr_Type	Rcvr_Type	GPS_Date	GPS_Time	Update_Sta
	01-ghost water	1.89	1.2	Postprocessed Code	GeoXT	9/6/2006 0:00	11:39:41am	New
	02-no name	2.09	1.1	Postprocessed Code	GeoXT	9/6/2006 0:00	12:45:01pm	New
	03-no name	2.2	1.29	Postprocessed Code	GeoXT	9/6/2006 0:00	01:21:51pm	New
	04-no name	3.79	2.59	Postprocessed Code	GeoXT	9/6/2006 0:00	01:59:11pm	New
	05- no name	3.5	1.6	Postprocessed Code	GeoXT	9/6/2006 0:00	02:22:36pm	New
	06 - redhouse	3.29	1.39	Postprocessed Code	GeoXT	9/6/2006 0:00		New
	06 - redhouse well casing loc	5	1.5	Postprocessed Code	GeoXT	9/6/2006 0:00	03:03:36pm	New
	07-sanostee chapter mesa	3.7	2	Postprocessed Code	GeoXT	9/6/2006 0:00	03:37:21pm	New
FID_	Comment	GPS_Height	Vert_Prec	Horz_Prec	Std_Dev	Northing	Easting	Point_ID
	01-ghost water	1758.63			8.50E-05	4036084.33	696303.61	1
	02-no name	1751.29	0.6	0.4	1.56E-04	4047215.11	689464.51	2
	03-no name	1810.22	0.7	0.5	4.87E-04	4042817.26	689600.24	3
	04-no name	1790.44	0.9	0.8	1.61E-04	4040587.84	698255.12	4
	05- no name	1699.63	1	0.5	2.85E-04	4041420.55	702950.47	5
	06 - redhouse	1668.73	1	0.5	2.26E-04	4044437.6	703189.76	6
	06 - redhouse well casing loc	1671.75	1.6	0.5	5.20E-05	4044415.35	702910.94	7
	07-sanostee chapter mesa	1683.32	1	0.7	3.35E-04	4048543.61	701980.12	8

### Ecosphere Artestian Well Field Notes

Site	Conductivity (mS/cm)	Temp (deg C)	Note
			Artesian well. Open flow, no shut off. Trough runs to pond. Runs year round.
01-ghost water	515	22.4	Capped in the 1940's or 1950's. Known to taste of metallic substance.
			Hand pump/artesian well. Trough runs to dry pond. 12/8/15, 10/9/68 engraved on brass monument. Concrete bunker water tank of unknown storage
02-no name	374	21.9	capacity.
03-no name	452	22.3	Artesian well. Shut off valve engaged. Valve opened and allowed to flow for 5 minutes before sampled. Metal trough. Windmill 3T382 150 feet away.
			Windmill pump/artesian well. Concrete trough. Not flowing, windmill locked. Water trickling at casing. Field measure taken inside of casing slot, no sample
04-no name	1828	34.3	taken.
05-no name	406	26.7	Artesian well. Open flow, no shut off. Trough runs to pond/wetland. Runs year round. Known for good potability and livestock watering.
06-redhouse	397	28.7	Artesian well. Well piped to shut off valve at Redhouse residence. Drilled to approx 1400 feet in 1979 - info from onsite resident. Steady flow year round with pressure to power large lawn sprinkler. Sample taken from hose outlet.
07-sanostee chapter mesa	503		Artesian well. Open flow, no shut off. Trough runs to pond/wetland. Runs year round. 12/5/?2, 7/?/65 engraved on monument at casing.



GAL ID No.:

609-037,01-06

September 29, 2006

Ecosphere Environmental 2257 Main Ave Durango, CO 81301 Attention:

Project Name: Project Number: Date Received: 09/08/06

This is to transmit the attached analytical report. The analytical data and information contained therein was generated using specified or selected methods contained in references, such as Standard Methods for the Examination of Water and Wastewater, 18th & 19th editions, and Methods for Determination of Organic Compounds in Drinking Water, EPA-600/4-79-020.

Samples were received by Green Analytical Laboratories, Inc. in good condition on 09/08/06.

If you should have any questions or comments regarding this report, please do not hesitate to call.

Sincerely,

Dellis Sufett

Fol² John Green Laboratory Director

Enclosure

75 SUTTLE STREET, DURANGO, COLORADO 81303 TELEPHONE (970) 247-4220 FAX (970) 247-4227

p.3

Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

Ecosphere Environmen 2257 Main Ave Durango, CO 81301 Attention:	tal	GAL I.D.: Date Received: Date Reported: QC Batches:	609-037-01 09/08/06 09/29/06
PROJECT NAME:	Desert Rock Monitoring		
PROJECT NUMBER:		Sample Date:	09/06/06
SAMPLE I.D.:	01 - Ghost Water	Sample Matrix:	Water
		Units:	mg/L

# Metals

#### REPORT LIMIT METHOD RESULT DILUTION PARAMETER 200.8 0.0005 0.0005 Arsenic 1 200.7 0.5 0.8 1 Calcium 200.7 0.05 < 0.05 1 Iron 0.5 <0.5 1 200.7 Magnesium 0.0005 0.0005 1 200.8 Manganese 0.5 0.5 Potassium 200.7 1 Sodium 200.7 0.5 133 1 Calc <10 1 Hardness

Fon: John Green, Laboratory Director

p.4

Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

		GAL I.D.:	609-037-01
Ecosphere Environmen	Date Received:	09/08/06	
2257 Main Ave	Date Reported:	09/29/06	
Durango, CO 81301 Attention:	QC Batches:		
PROJECT NAME: Desert Rock Monitoring PROJECT NUMBER:		Sample Date:	09/06/06
SAMPLE I.D.:	01 - Ghost Water	Sample Matrix:	Water

## Wet Chemistry

#### RESULTS REPORT DATE PARAMETER METHOD LIMIT RESULT UNITS ANALYZED ANALYST Alkalinity as CaCO3 10 226 2320B mg/L 10 Chloride 4500CL <10 mg/L Conductivity 2510B 1.0 537 uS/cm Fluoride 4500F C 0.2 1.0 mg/L Nitrate/Nitrite as N 353.3 0.02 < 0.02 mg/L NA 9.41 su pН 150.1 Sulfate 4500SO4 10 50 mg/L TDS 2540C 10 255 mg/L

for: John Green, Laboratory Manager

Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

Ecosphere Environmental 2257 Main Ave Durango, CO 81301 Attention: 

PROJECT NAME:	Desert Rock Monitoring
PROJECT NUMBER:	
SAMPLE I.D.:	02

Sample Date:	09/06/06
Sample Matrix:	Water
Units:	mg/L

### **Metals**

### RESULTS

		REPORT		
PARAMETER	METHOD	LIMIT	RESULT	DILUTION
Arsenic	200.8	0.0005	0.0052	1
Calcium	200.7	0.5	0.8	1
Iron	200.7	0.05	<0.05	1
Magnesium	200.7	0.5	<0.5	1
Manganese	200.8	0.0005	0.0005	1
Potassium	200.7	0.5	<0.5	1
Sodium	200.7	0.5	101	1
Hardness	Calc		<10	1

For: John Geen, Laboratory Director

10/04/2006 WED 07:41 [TX/RX NO 8223] 2005

Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

GAL I.D.: 609-037-02 **Ecosphere Environmental** Date Received: 09/08/06 2257 Main Ave Date Reported: 09/29/06 Durango, CO 81301 QC Batches: Attention: **Desert Rock Monitoring PROJECT NAME:** PROJECT NUMBER: Sample Date: 09/06/06 02 SAMPLE I.D.: Sample Matrix: Water

## Wet Chemistry

RESULTS				
		REPORT		DATE
PARAMETER	METHOD	LIMIT	RESULT	UNITS ANALYZED ANALYST
Alkalinity as CaCO3	2320B	10	187	mg/L
Chloride	4500CL	10	<10	mg/L
Conductivity	2510B	1.0	406	uS/cm
Fluoride	4500F C	0.2	0.3	mg/L
Nitrate/Nitrite as N	353.3	0.02	<0.02	mg/L
рН	150.1	NA	9.5	SU
Sulfate	4500SO4	10	16	mg/L
TDS	2540C	10	205	mg/L

COP - John Green Laboratory Manager

p.7

Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

Ecosphere Environmental 2257 Main Ave Durango, CO 81301 Attention: 
 GAL I.D.:
 609-037-03

 Date Received:
 09/08/06

 Date Reported:
 09/29/06

 QC Batches:
 09/29/06

PROJECT NAME:	Desert Rock Monitoring
PROJECT NUMBER:	
SAMPLE I.D.:	03

Sample Date:	09/06/06
Sample Matrix:	Water
Units:	mg/L

## Metals

#### RESULTS REPORT LIMIT RESULT DILUTION METHOD PARAMETER 0.0005 1 0.0114 Arsenic 200.8 1 200.7 0.5 2.0 Calcium 0.06 1 0.05 200.7 Iron < 0.5 1 0.5 200.7 Magnesium 0.0010 1 0.0005 Manganese 200.8 0.5 0.7 1 200.7 Potassium 1 115 200.7 0.5 Sodium 1 <10 Calc Hardness

For .: John Green, Laboratory Director

Ecosphere Environmental

**Desert Rock Monitoring** 

9703827259

p.8

Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

**Ecosphere Environmental** 2257 Main Ave Durango, CO 81301 Attention:

03

GAL I.D.:	609-037-03
Date Received:	09/08/06
Date Reported:	09/29/06
QC Batches:	

Sample Date: Sample Matrix:

09/06/06 Water

## Wet Chemistry

#### RESULTS

**PROJECT NAME: PROJECT NUMBER:** 

SAMPLE I.D.:

	REPORT			DATE		
PARAMETER	METHOD	LIMIT	RESULT	UNITS ANALYZED ANALYST		
Alkalinity as CaCO3	2320B	10	238	mg/L		
Chloride	4500CL	10	<10	mg/L		
Conductivity	2510B	1.0	494	uS/cm		
Fluoride	4500F C	0.2	0.2	mg/L		
Nitrate/Nitrite as N	353.3	0.02	<0.02	mg/L		
рН	150.1	NA	9.40	SU		
Sulfate	4500SO4	10	<10	mg/L		
TDS	2540C	10	210	mg/L		

For John Green Laboratory Manager

10/04/2006 WED 07:41 [TX/RX NO 8223] 2008

p.9

Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

Ecosphere Environme 2257 Main Ave Durango, CO 81301 Attention:	ntal	GAL I.D.: Date Received: Date Reported: QC Batches:	<b>609-037-04</b> 09/08/06 09/29/06
<u>PROJECT NAME:</u> <u>PROJECT NUMBER:</u> SAMPLE I.D.:	Desert Rock Monitoring 05	Sample Date: Sample Matrix: Units:	09/06/06 Water mg/L

## Metals

		REPORT			
PARAMETER	METHOD	LIMIT	RESULT	DILUTION	
Arsenic	200.8	0.0005	0.0027	1	
Calcium	200.7	0.5	0.5	1	
Iron	200.7	0.05	<0.05	1	
Magnesium	200.7	0.5	<0.5	1	
Manganese	200.8	0.0005	0.0006	1	
Potassium	200.7	0.5	0.5	1	
Sodium	200.7	0.5	103	1	
Hardness	Calc		<10	1	

Fort John Green, Laboratory Director

Ecosphere Environmental 2257 Main Ave Durango, CO 81301 Attention: 
 GAL I.D.:
 609-037-04

 Date Received:
 09/08/06

 Date Reported:
 09/29/06

 QC Batches:
 09/29/06

PROJECT NAME:	Desert Rock Monitoring	
PROJECT NUMBER:		Sa
SAMPLE I.D.:	05	Sa

### Sample Date: 09/06/06 Sample Matrix: Water

# Wet Chemistry

<u>RESULTS</u>				
		REPORT		DATE
PARAMETER	METHOD	LIMIT	RESULT	UNITS ANALYZED ANALYST
Alkalinity as CaCO3	2320B	10	214	mg/L
Chloride	4500CL	10	<10	mg/L
Conductivity	2510B	1.0	450	uS/cm
Fluoride	4500F C	0.2	0.3	mg/L
Nitrate/Nitrite as N	353.3	0.02	<0.02	mg/L
рН	150.1	NA	9.50	SU
Sulfate	4500SO4	10	<10	mg/L
TDS	2540C	10	220	mg/L

for: John Greek, Laboratory Manager

Ecosphere Environment 2257 Main Ave	al	GAL I.D.: Date Received: Date Reported:	<b>609-037-05</b> 09/08/06 09/29/06
Durango, CO 81301 Attention:		QC Batches:	
PROJECT NAME: PROJECT NUMBER:	Desert Rock Monitoring	Sample Date:	09/06/06
SAMPLE I.D.:	06 - Residence	Sample Matrix: Units:	Water mg/L

## Metals

#### **RESULTS** REPORT PARAMETER METHOD LIMIT RESULT DILUTION 0.0005 Arsenic 200.8 0.0045 1 Calcium 200.7 0.5 0.6 1 200.7 0.05 < 0.05 1 Iron Magnesium 200.7 0.5 < 0.5 1 Manganese 200.8 0.0005 0.0005 1 Potassium 200.7 0.5 < 0.5 1 200.7 Sodium 0.5 102 1 Hardness <10 Calc 1

Pro: John Green, Laboratory Director

GAL I.D.: 609-037-05 **Ecosphere Environmental** Date Received: 09/08/06 2257 Main Ave Date Reported: 09/29/06 Durango, CO 81301 QC Batches: Attention: PROJECT NAME: Desert Rock Monitoring PROJECT NUMBER: Sample Date: 09/06/06 06 - Residence SAMPLE I.D.: Sample Matrix: Water

## Wet Chemistry

<u>RESULTS</u>				
		REPORT		DATE
PARAMETER	METHOD	LIMIT	RESULT	UNITS ANALYZED ANALYST
Alkalinity as CaCO3	2320B	10	214	mg/L
Chloride	4500CL	10	<10	mg/L
Conductivity	2510B	1.0	441	uS/cm
Fluoride	4500F C	0.2	0.2	mg/L
Nitrate/Nitrite as N	353.3	0.02	<0.02	mg/L
рН	150.1	NA	9.50	SU
Sulfate	4500SO4	10	<10	mg/L
TDS	2540C	10	220	mg/L

Ful: John Green, Laboratory Manager

Ecosphere Environmen	tal	GAL I.D.: Date Received:	<b>609-037-06</b> 09/08/06
2257 Main Ave Durango, CO 81301 Attention:		Date Reported: QC Batches:	09/29/06
PROJECT NAME:	Desert Rock Monitoring		
PROJECT NUMBER: SAMPLE I.D.:	07	Sample Date: Sample Matrix:	09/06/06 Water
		Units:	mg/L

### **Metals**

#### REPORT PARAMETER METHOD LIMIT RESULT DILUTION 200.8 0.0005 Arsenic 0.0044 1 Calcium 200.7 0.5 1.0 1 Iron 200.7 0.05 < 0.05 1 Magnesium 200.7 0.5 < 0.5 1 Manganese 0.0005 <0.0005 200.8 1 Potassium 200.7 0.5 < 0.5 1 Sodium 200.7 0.5 121 1 Hardness Calc <10 1

John Green, Laboratory Director fue

Green Analytical Laboratories, Inc. 75 Suttle Street Durango, CO 81303

Ecosphere Environmental 2257 Main Ave Durango, CO 81301 Attention: 
 GAL I.D.:
 609-037-06

 Date Received:
 09/08/06

 Date Reported:
 09/29/06

 QC Batches:
 09/29/06

 PROJECT NAME:
 Desert Rock Monitoring

 PROJECT NUMBER:
 07

Sample Date:	09/
Sample Matrix:	W

09/06/06 Water

## Wet Chemistry

		REPORT		DATE
PARAMETER	METHOD	LIMIT	RESULT	UNITS ANALYZED ANALYST
Alkalinity as CaCO3	2320B	10	202	mg/L
Chloride	4500CL	10	<10	mg/L
Conductivity	2510B	1.0	545	uS/cm
Fluoride	4500F C	0.2	0.3	mg/L
Nitrate/Nitrite as N	353.3	0.02	<0.02	mg/L
рН	150.1	NA	9.50	SU
Sulfate	4500SO4	10	63	mg/L
TDS	2540C	10	285	mg/L

For John Creen Laboratory Manager

Relinquished by:	LF	)		Date: C	ilyla	~86	Time	*  ( ;	4	Recei	ved b	y:	<u> </u>	5.	<u>II</u> :	2	pif	J	4	Date I	-08-06	Time: ///// Time:	] ,
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Sample ID	Date	Time	Collected by: (Init.)	م Matrix Type From Table 1	No. of Containers	Sample Filtered ? Y/N	Unpreserved (Ice Only)	HNO3	HCL	H2SO4	NAOH	Other (Specify)	per qu									omments	
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	Colle	ction	1	Miscell	aneous			Pres	serv	ative	(s)												
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Lab Name: Green Anal	ytical Labor	atories, Inc.	(9	70) 24 ⁻	7-4220	FA	X (9	970) 2	247-	4227	,	T			Ana	lyses	Req	uired					
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