1RP-474

Annual Monitor Report

DATE:
2009

April 12, 2010

Samson State BD #4 Reserve Pit
NMOCD Case # 1RP-474-0

2009 Annual Monitoring Report

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

R. T. HICKS CONSULTANTS, LTD.

901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

April 12, 2010

Glenn Von Gonten
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Samson State BD #4 Reserve Pit, T12S, R33E, Section 2, Unit H;
NMOCD Case # 1RP-474-0

Dear Mr. Von Gonten:

Attached is the 2009 Annual Report for the above-referenced site. At the end of this letter are several issues that Samson would like to bring forward to NMOCD in an effort to move toward regulatory site closure.

Brief Summary

- The engineered ET infiltration barrier functions as designed; the chloride flux from the vadose zone to ground water is at or near zero.
- The extent and magnitude of ground water impairment is generally defined
- The average chloride concentration of the plume is changing slightly and down gradient migration is minimal.
- Natural restoration has improved ground water quality of the upper portion of the aquifer, but the source area well (MW-3) remains above ground water standards for TDS and chloride.
- While pumping ground water from MW-3 is beneficial with respect to the removal of contaminant mass, monitoring data suggest meaningful improvement of ground water quality will require long-term pumping.
- In our opinion, there is no reasonable relationship between the economic and social costs and benefits of a ground water restoration strategy that calls for pumping the water and:
    - Treating the water sufficiently to permit use for agriculture or E&P operations
    - Treating the water sufficiently to permit site re-injection
    - Deep well disposal

In 2007, Samson attempted a pump-and-use restoration strategy and found that neither drillers, earthwork contractors nor any water user would accept water pumped from the site in its present condition. We also evaluated the potential of treating the water to remove the contaminants completely at the point of extraction, but because fresh water is available in the immediate area and at locations that are more convenient for commercial or agricultural uses this option was considered not

valid. Finally, we considered the addition of salt to create brine for drilling, but the economics of this solution are not favorable.

In light of this, Samson requests input from NMOCD regarding possible pathways to close the regulatory file. We believe that a 10-acre area (the former pit) is not "a place of withdrawal for present or reasonably foreseeable future use". Although concurrence with this opinion on the part of NMOCD and the surface owner would be required to insure that the site complies with NMOCD Rules.

Some of the questions of concern for Samson include the following:

1. In light of the WQCC decision in the Phelps-Dodge hearing, what data or evaluation would NMOCD require to define the so-called "point of compliance", which some maintain is "a place of withdrawal for present or reasonably foreseeable future use"?
2. Should Samson provide arguments to NMOCD to support a finding that a certain area (e.g. 10 acres around the site) is not a "place of withdrawal for present or reasonably foreseeable future use"?
3. Because the site might become subject to the Abatement Plan requirements, if NMOCD finds that the area is a place of reasonably foreseeable future use, under what circumstances would NMOCD support a petition for alternative abatement standards appropriate?

Samson will continue to monitor ground water in all wells on a quarterly basis until directed otherwise.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall Hicks
Principal

Copy: Hobbs NMOCD office;
Samson Resources
Merchant Cattle Company

April 12, 2010

Samson State BD #4 Reserve Pit
NMOCD Case # 1RP-474-0

2009 Annual Monitoring Report

prepared for:

Samson

R.T. Hicks Consultants, Ltd.

901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Location: T-12-S, R-33-E, Sec 2, Unit H
Latitude: North 33° 18' 35.2"
Longitude: West 103° 34' 39.2"
NMOCD#: 1RP-474-0

1.0 EXECUTIVE SUMMARY

The State BD #4 site, which is operated by Samson Resources Company (Samson), is located approximately 16 miles west of Tatum, New Mexico. Directions to the site are documented in previous submissions. The data presented in this 2009 Annual Monitoring Report permits us to conclude:

- The extent and magnitude of ground water impairment is defined and does not extend beyond the footprint of the former drilling pit on the north, west or south sides.
- Ground water exceeds state standards for chloride and TDS for a distance of about 40 feet east (down gradient) of the former pit.
- The extent of impairment is generally stable and natural dilution and dispersion is reducing the magnitude of impact.
- While pumping ground water from MW-3 from February to July 2007 was beneficial with respect to the removal of contaminant mass, monitoring data suggest meaningful improvement of ground water quality beneath the former drilling pit will require long-term pumping.
- The engineered ET infiltration barrier functions as designed; the chloride flux from the vadose zone to ground water is at or near zero.
- A ground water restoration strategy that calls for using the water in E&P operations or other uses does not create a reasonable relationship between the economic and social costs and benefits.
- Samson requests input from NMOCD regarding possible pathways to close the regulatory file including a decision on the part of NMOCD and the surface owner that a 10-acre area that includes the former pit and production pad is not "a place of withdrawal for present or reasonably foreseeable future use".
- Samson will continue to monitor ground water in all wells on a quarterly basis.

This report is consistent with the commitments and recommendations made in all previous correspondence including the 2008 Annual Ground Water Monitoring Report submitted to the NMOCD on January 22, 2009.

2.0 WORK ELEMENTS PERFORMED

Appendix A presents a table (Table 1) containing results of all historic soil sampling. A table of the historic ground water gauging and laboratory results (Table 2) is also provided in Appendix A. The ground water monitoring laboratory reports and chain-of-custody documents for recent sampling events are included in Appendix B, and Appendix C provides graphs that depict the historic ground water impairment for each monitoring well.

Since November 2008, the site activities at the Samson State BD #4 site included:

- The quarterly ground water sampling of the shallow and deep monitoring wells
- Monitoring of the soil moisture, both background and below the ET Barrier
- The performance of residual drawdown and calculated recovery tests in MW-1, MW-2, MW-4, and MW-4d

3.0 CONCLUSIONS

3.1 ET Barrier Performing as Predicted

Plate 1 is a topographic map of the ET barrier surface which was designed to direct the precipitation runoff toward the less impacted areas of the former pit. Soil moisture monitoring ports and the location of monitoring wells are also plotted on Plate 1. Soil moisture monitoring, as shown on Table 3, demonstrates that the moisture content within the ET Barrier is very low relative to the background values. This result confirms the performance expectations of the ET Barrier.

Table 3. Results of Moisture Port Measurements

Vadose Zone Measurement Date	ET Cover Moisture Ports			Background Cluster Moisture Ports		
	No. 1 West 2.4-foot	No. 2 Center 5-foot	No. 3 East 8-foot	No. 1 West 13.9-foot	No. 2 Center 9.8-foot	No. 3 East 6.5-foot
4/17/07	0	1	1	15	29	18
5/21/07	0	1	1	15	30	20
6/21/07	1	1	1	16	31	22
7/18/07	0	1	1	16	34	22
8/22/07	0	1	1	17	36	23
9/28/07	0	0	1	17	37	22
10/24/07	0	0	1	17	37	21
2/11/08	0	0	0	16	32	17
5/5/08	0	0	1	16	31	18
8/20/08	0	0	1	17	32	18
11/21/08	0	0	0	--	29	16
2/17/09	0	0	0	--	26	14
5/26/09	0	0	1	16	24	14
8/24/09	0	0	1	16	20	12
11/2/09	0	0	1	16	19	11
2/26/10	0	0	1	14	17	9

As discussed below, ground water monitoring results also demonstrate that the chloride concentration of the upper portion of the aquifer beneath and adjacent to the ET cover is stable or declining over time. This observation supports a conclusion that the flux of chloride from the vadose zone to ground water beneath the cover is very low or nil.

3.2 Ground Water Flow Direction is Constant

Hicks Consultants gauged and sampled each of the monitoring wells on a quarterly basis during 2009 and early 2010. Ground water gradient maps (Plates 2A - 2E) indicate essentially no change in the gradient direction and an average gradient slope of 0.0072 ft/ft, which corresponds to the historic gradient for the life of the project.

3.3 Hydraulic Conductivity Increases with Depth

On February 26, 2010, residual drawdown and calculated recovery tests (Theis, 1935) were performed on the shallow (MW-4s) and deep (MW-4d) monitoring wells located on the down gradient edge of the former reserve pit. The methodology and results of these tests are presented in Appendix D. They indicate that the upper portion of the aquifer at this location has a hydraulic conductivity (K) of 3.2 ft/day and the deeper portion of the aquifer has a K of 8.3 ft/day.

Mussharrafieh and Chudnoff (1999) estimated the hydraulic conductivity of the Ogallala Aquifer at the site as 21-40 ft/day. Because this published estimate represents the entire saturated thickness of the Ogallala, which is about 100 feet at the site location (Tillery, 2008), and the Ogallala is often coarser grained at the base and finer grained at the top of the unit (see http://www.npwd.org/new_page_2.htm) the relatively low values of hydraulic conductivity obtained from the recovery tests are within reason.

A calculation of ground water velocity at the site was performed using the measured K values, the average ground water gradient (0.0072 ft/ft), and the estimated porosity (0.25) as follows:

Ground Water Velocity(ft/yr) = Effective Flow Rate(ft/day) x 365(days/yr), where as

Effective Flow Rate(ft/day) = Ground Water Flow Rate (ft/day)/0.25(unitless) and

Ground Water Flow Rate(ft/day) x 0.0072(ft/ft)

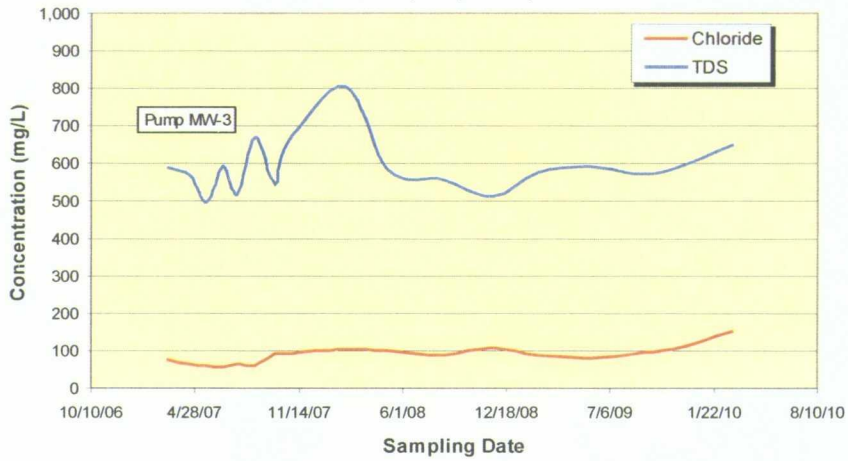
The results indicate that the ground water velocity is 33.6 ft/yr in upper portion of the aquifer and 87.3 ft/yr in the lower portion of the aquifer. This differential in ground water velocity with depth will cause the chloride plume to spread unevenly but dilute more rapidly.

3.4 Pumping & Disposal Is a Marginally Effective Abatement Strategy

A total of 235,000 gallons of impaired ground water (3.7 tons chloride / 6.3 tons TDS) have been removed for disposal from the site to date. No ground water removal has been conducted since July 2007.

Plate 3 depicts the laboratory results for both the shallow and deep zones for the 2009 and early 2010 sampling events. Figure 1 depicts the average chloride and TDS concentrations for all monitoring wells except MW-3 over time. In Figure 1, the width of the text box describing the pumping is equivalent to the duration of the pumping event.

Figure 1
Average Chloride and TDS Results
All Wells (except MW-3)



The data shows that the average site TDS concentration increased independently of the chloride concentration during the year after termination of the pumping operation. The average site TDS concentration then returned to the initial concentration of 500-600 mg/L in mid 2008. Since 2008, the TDS and chloride concentrations have remained stable except for a gradual increase observed in the most recent samples attributable to recently increased salinity in MW-4d (see Appendix C). These results suggest that the removal of saline water from MW-3 has produced no measurable benefit to the overall quality of the ground water relative to natural processes (2007-2010). We conclude that long-term continual pumping at MW-3 would remove additional chloride mass from ground water but is a marginally effective abatement strategy for the site. Because the water from MW-3 will not be used by drilling fluid engineers, cementing companies or other contractors, all water pumped goes to disposal or must be treated prior to use. We do not believe the waste of this resource (disposal) or treatment of the water for subsequent use creates a reasonable relationship between the costs and benefits.

3.5 Chloride Fate and Transport is Dynamic but Contained

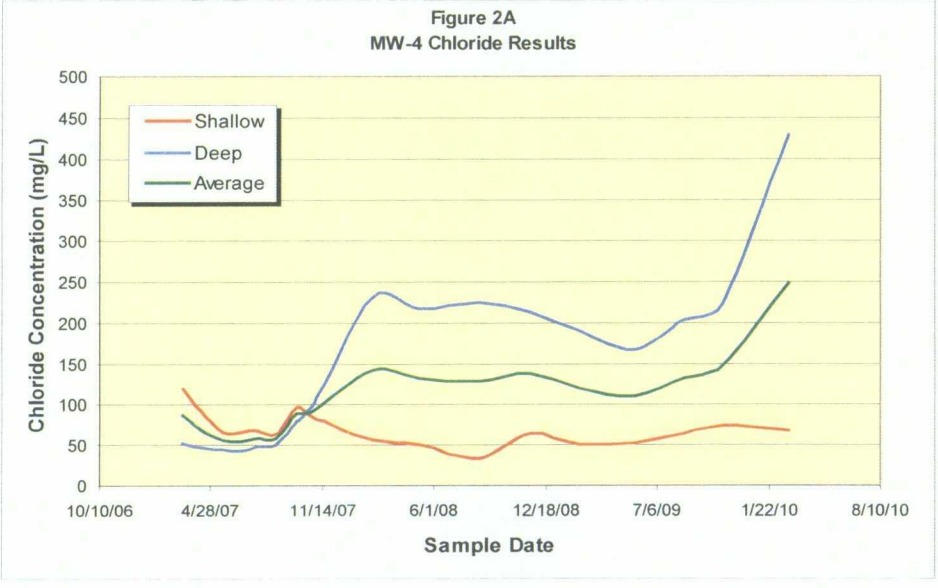
Plate 4 indicates the locations of the soil and ground water monitoring points relative to the original configuration of the reserve pit. Plate 5A shows the site during excavation and 5B shows sampling results of chloride concentrations at a depth of approximately 28 feet below the surface (10 feet above the ground water). Due to the lack of any low-permeability layers between the base of the pit and the water table, seepage from the pit would move vertically downward with little horizontal spreading. Therefore, the area of highest chloride concentrations in ground water due to pit seepage should exist below the area of highest impact defined by the trench soil samples.

A conceptual model that explains the chloride migration from January 2007 to November 2009 across the site is provided in map view (Plate 6A-6D) and cross-section view (Plates 7A-7D). It utilizes the historic laboratory chloride results from the shallow and deep monitoring wells with plume distributions that conform to the ground water velocities determined from the residual drawdown and calculated recovery tests performed in February 2010.

Based on this information, we believe that the primary ground water impact occurred due to saturated flow through the vadose zone below the northwestern edge of the former reserve pit. Pumping from MW-3 removed some of the chloride mass and caused the zone of highest chloride to move south. Over time the higher chloride concentrations (creating slightly denser water) sank lower into the aquifer where it was subject to greater ground water velocities (higher hydraulic conductivity values). At the same time, fresh water (precipitation) from the ET cover run-off was added to the upper portion of the aquifer which diluted the chloride between MW-3 and MW-4.

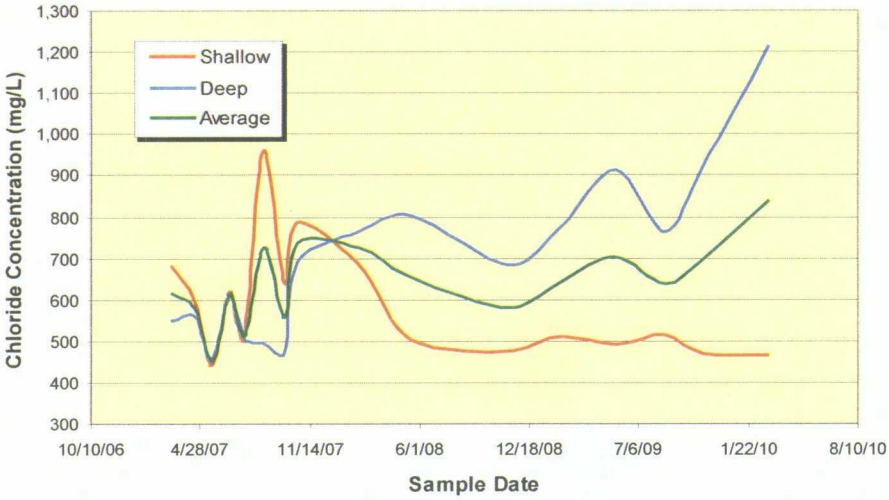
As a result, the chloride (and TDS) concentrations at MW-4 changed from being slightly higher in the shallow zone to being significantly higher in the deep zone over the monitoring period as shown in Figure 2A and 2B below:

Figure 2A
MW-4 Chloride Results



Presently, the chloride and TDS concentration are below the WQCC standards in both of the cross gradient monitoring wells (MW-1 and MW-2). As of the most recent monitoring events the average chloride and TDS concentrations at MW-4s and 4d remain below WQCC standards, however chloride and TDS in samples from MW-4d are slightly above the standards.

Figure 2B
MW-4 TDS Results



From these data, we conclude that an abatement strategy that employs natural restoration supplemented with the fresh water run-off from the ET cover surface is effective but may result in a short-term exceedance of the regulatory standard outside of the footprint of the former drilling pit. Beneath the pit footprint a linear regression analysis of the last two years of ground water data suggests that this area may exceed standards for 10-20 years.

3.6 A Pump-and-Use Abatement Strategy is Problematic

After speaking to several individuals who routinely use water for E&P operations (e.g. mud engineers, well cementing contractors), we conclude that E&P contractors will not use water from the site without treatment. Drilling mud and casing cement demand that one of the primary ingredients, water, is of a known and constant quality. A failure of drilling mud or cement caused by constituents in the ground water from MW-3 is unacceptable.

Additionally, we explored the feasibility of pumping water from MW-3 to tank and adding salt to create saturated brine for drilling. This would involve creating a brine station with the capacity and access suitable for area drilling operations. Costs associated with building the station, transporting salt, and supplying the additional water to satisfy the potential demand are prohibitive relative to benefit.

Treating the water to create a source of stock water provides no benefit since several suitable water wells are already present in the surrounding area to adequately serve this purpose. Treating water produced from MW-3 in the absence of a defined need does not create a reasonable relationship between the social and economic costs and benefits.

3.7 Options for Closing the Regulatory File Are Limited

We have identified two options for closure of the regulatory file. Of these, option No. 1 is the most appropriate for the site, based on future land use and available ground water resources. Once further monitoring has established a completely stable plume, file closure may be pursued based upon:

1. A finding by NMOCD and the surface owner that a 10-acre area at and down gradient of the site is not a place of withdrawal for present or reasonably foreseeable future use, or

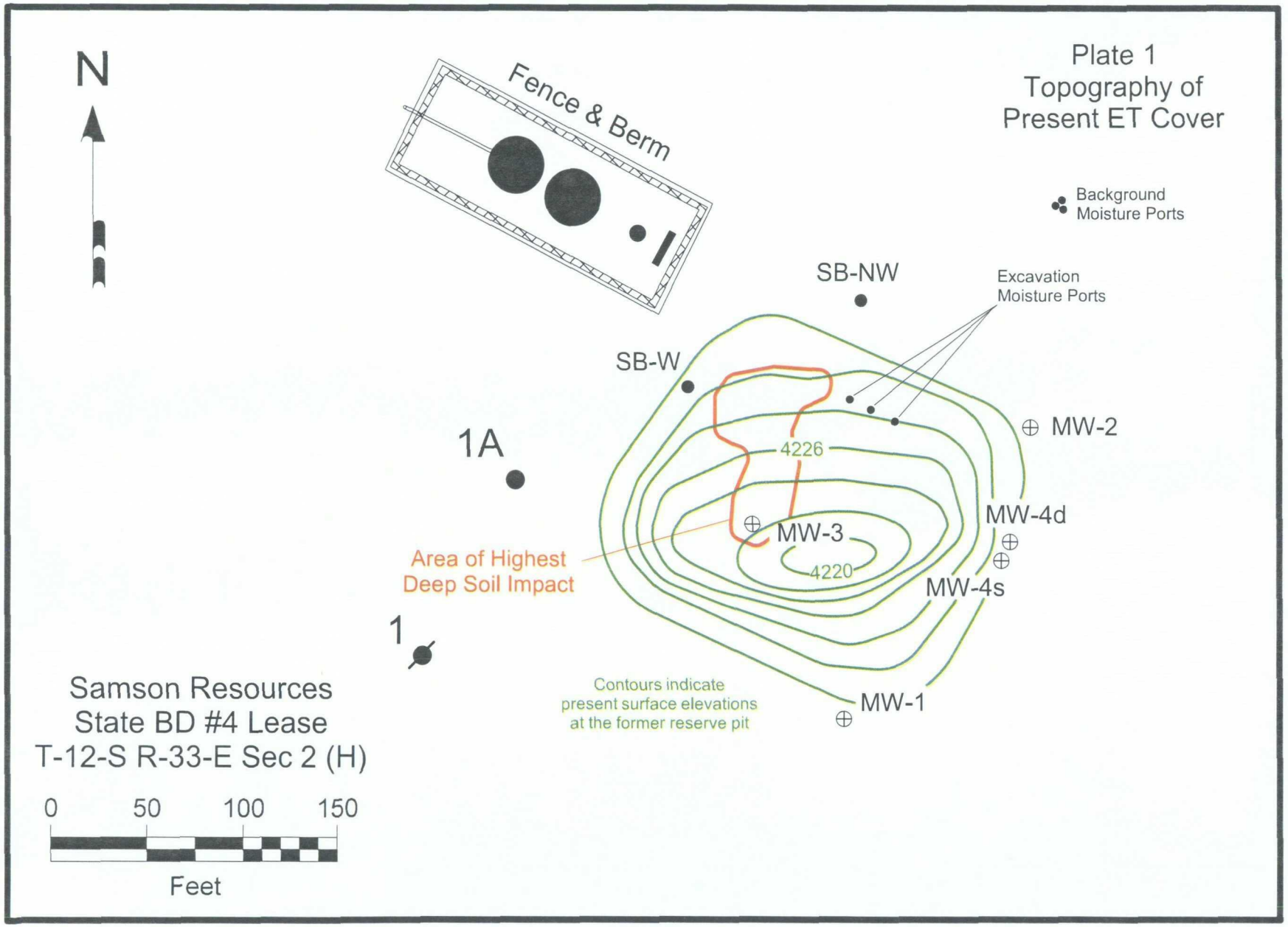
2. A successful petition for alternative abatement standards under Part 30 of NMOCD Rules

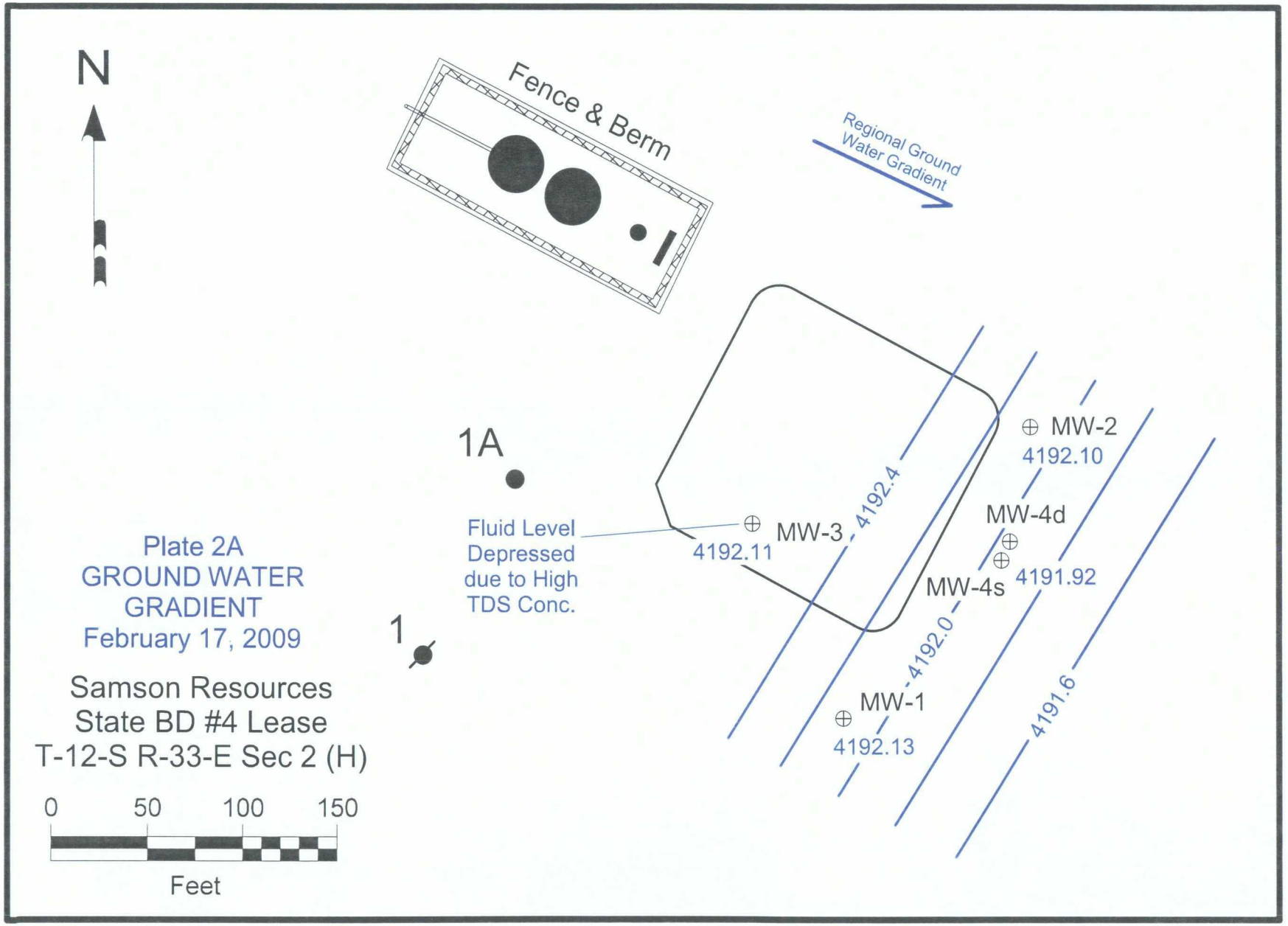
4.0 RECOMMENDATIONS

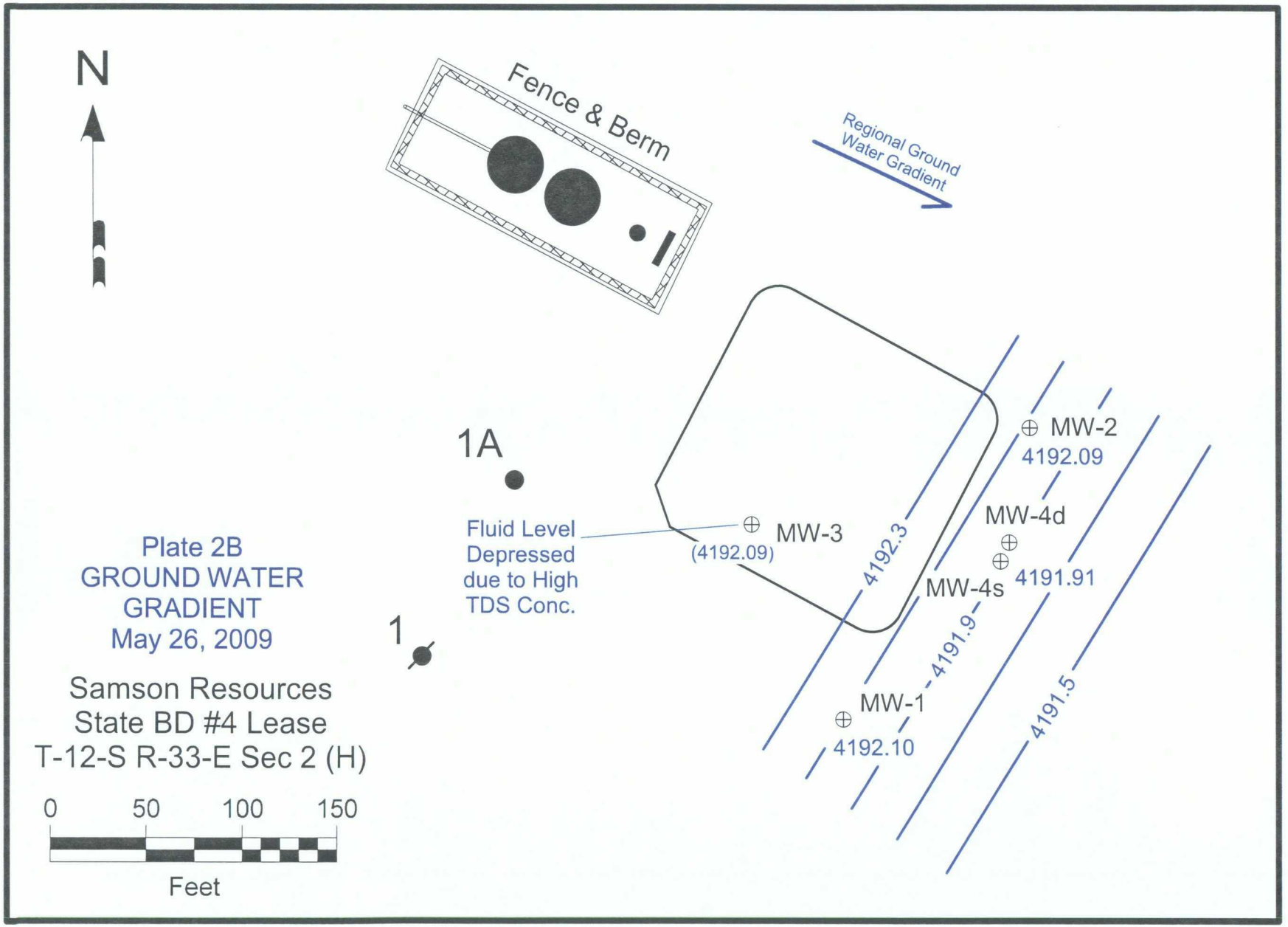
- Continue to collect and analyze ground water samples on quarterly basis for chloride, TDS and field specific conductance from MW-3, MW-4d and MW-4s.
- Obtain a response from NMOCD regarding closure options

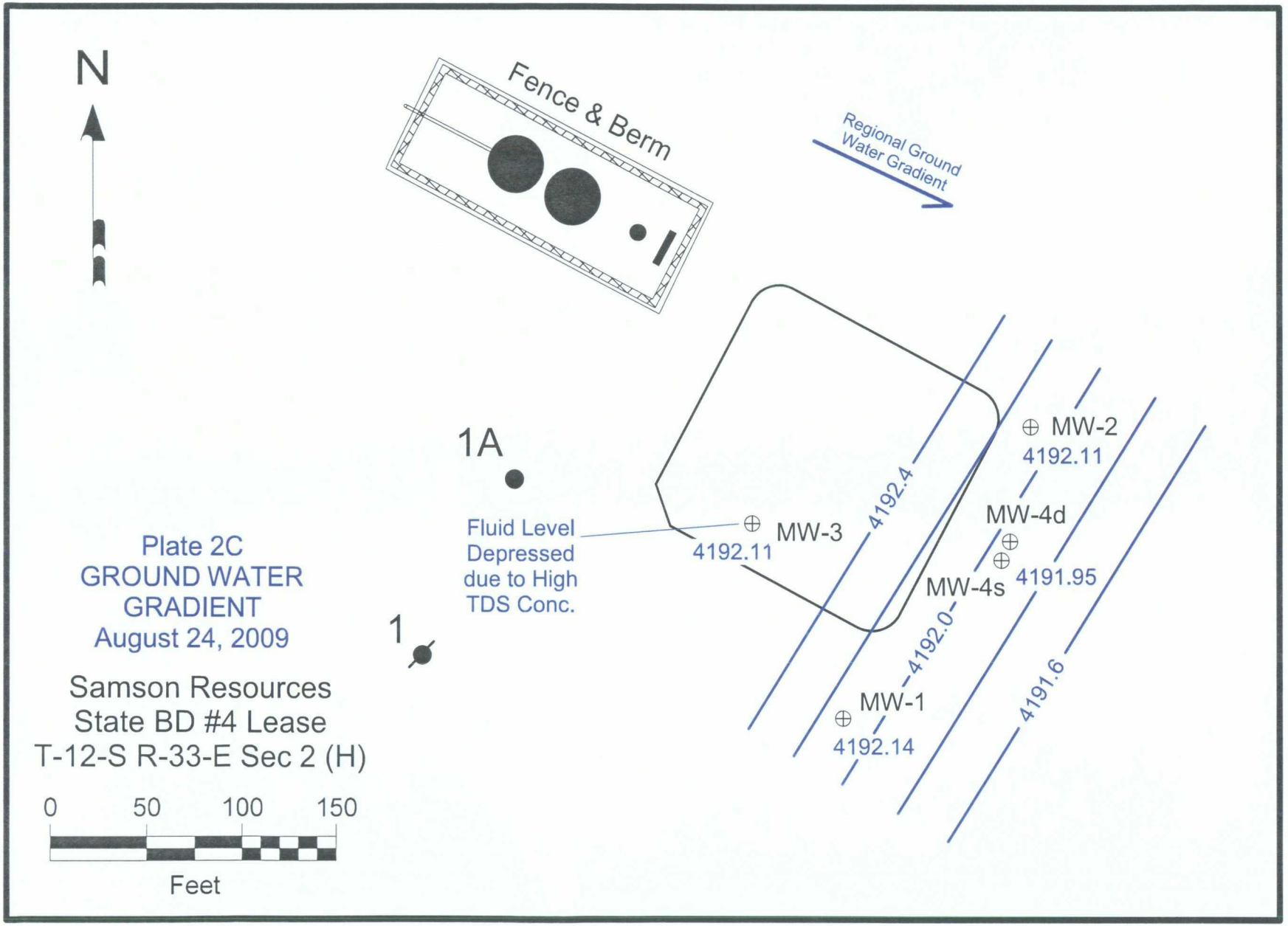
Plates

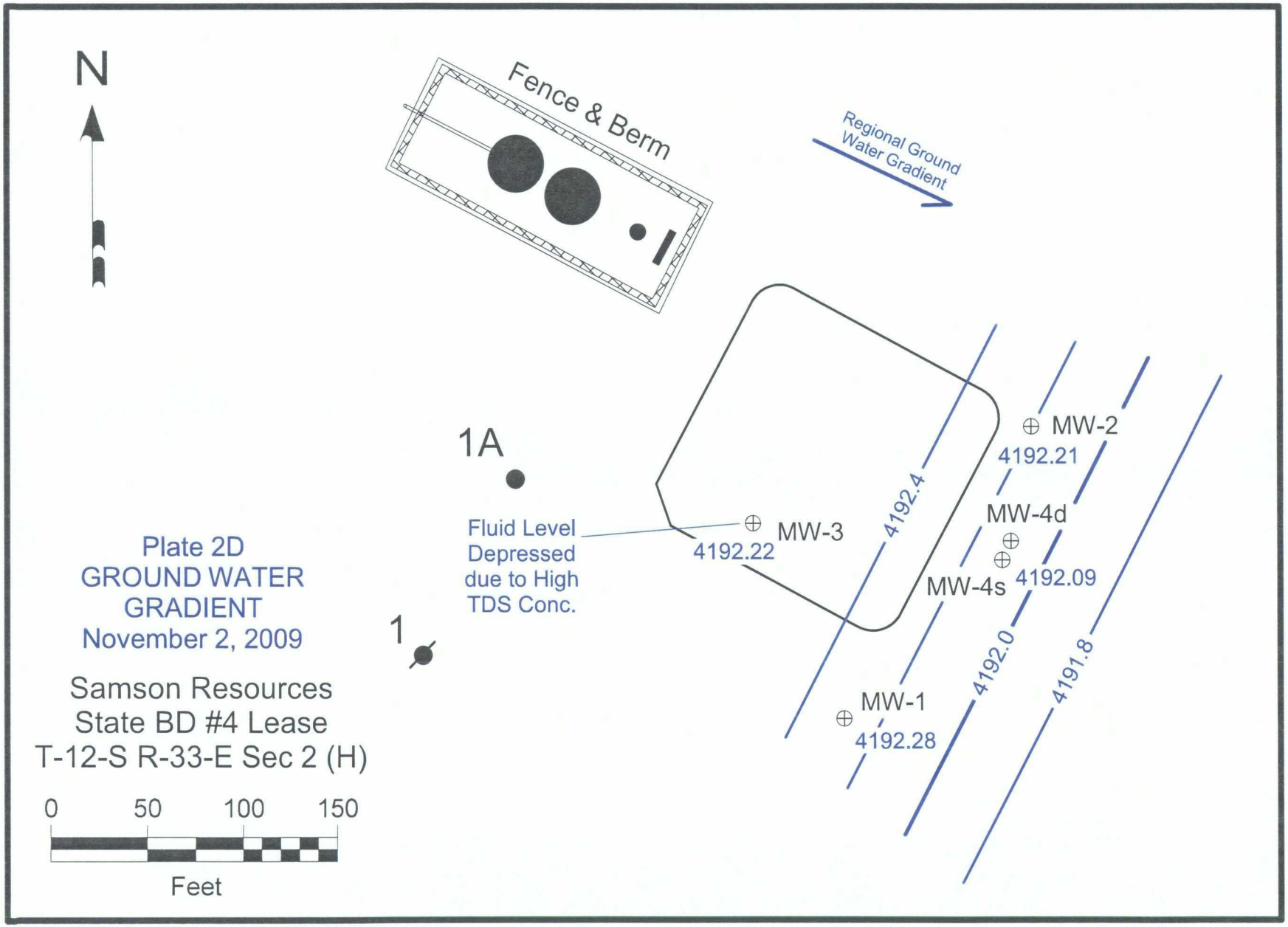
R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

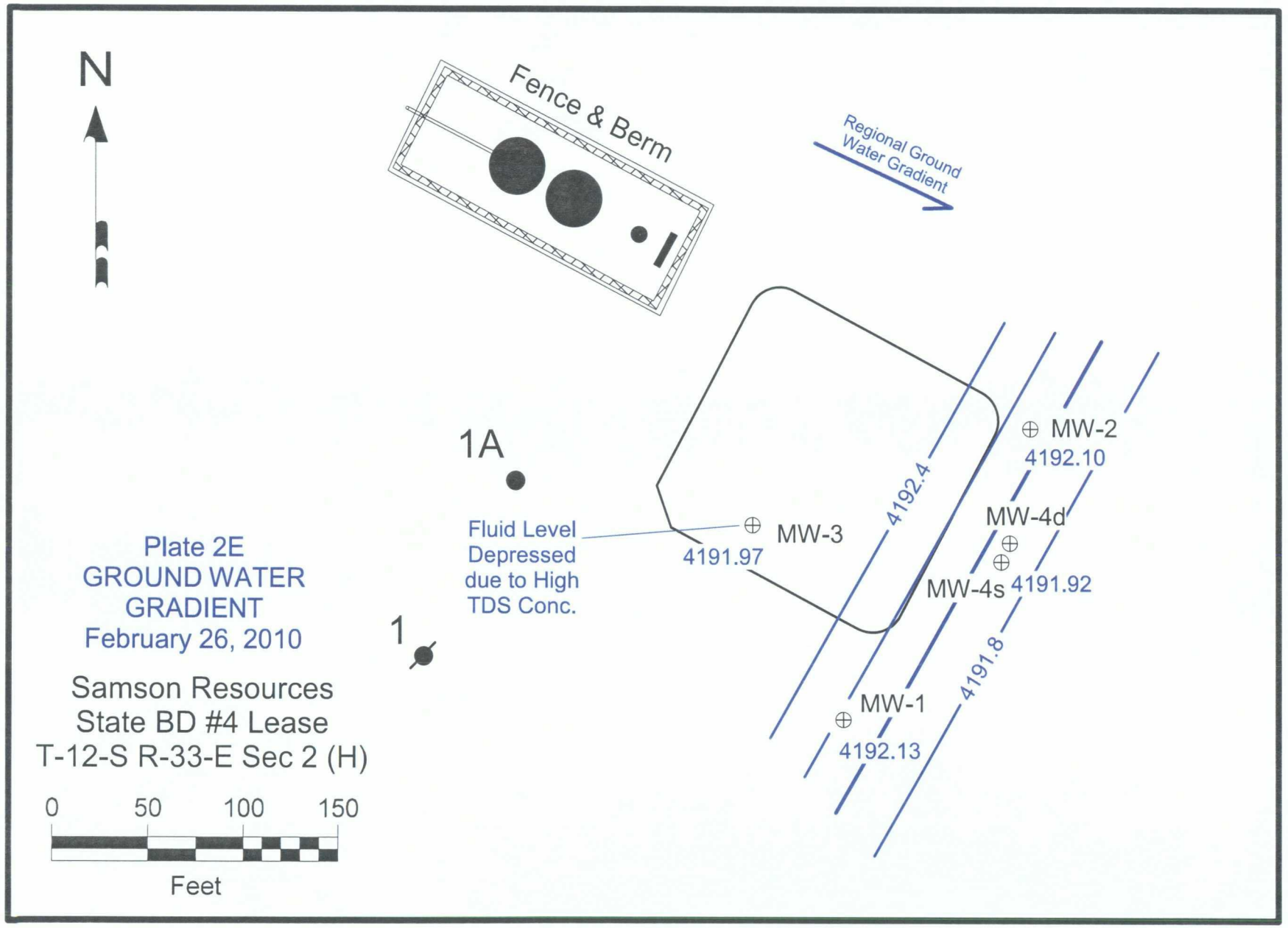

N
Fence & Berm
Plate 1
Topography of
Present ET Cover
Background
Moisture Ports
SB-NW
Excavation
Moisture Ports
SB-W
MW-2
1A
4226
MW-4d
MW-3
Area of Highest
Deep Soil Impact
4220
MW-4s
1
Contours indicate
present surface elevations
at the former reserve pit
MW-1
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet

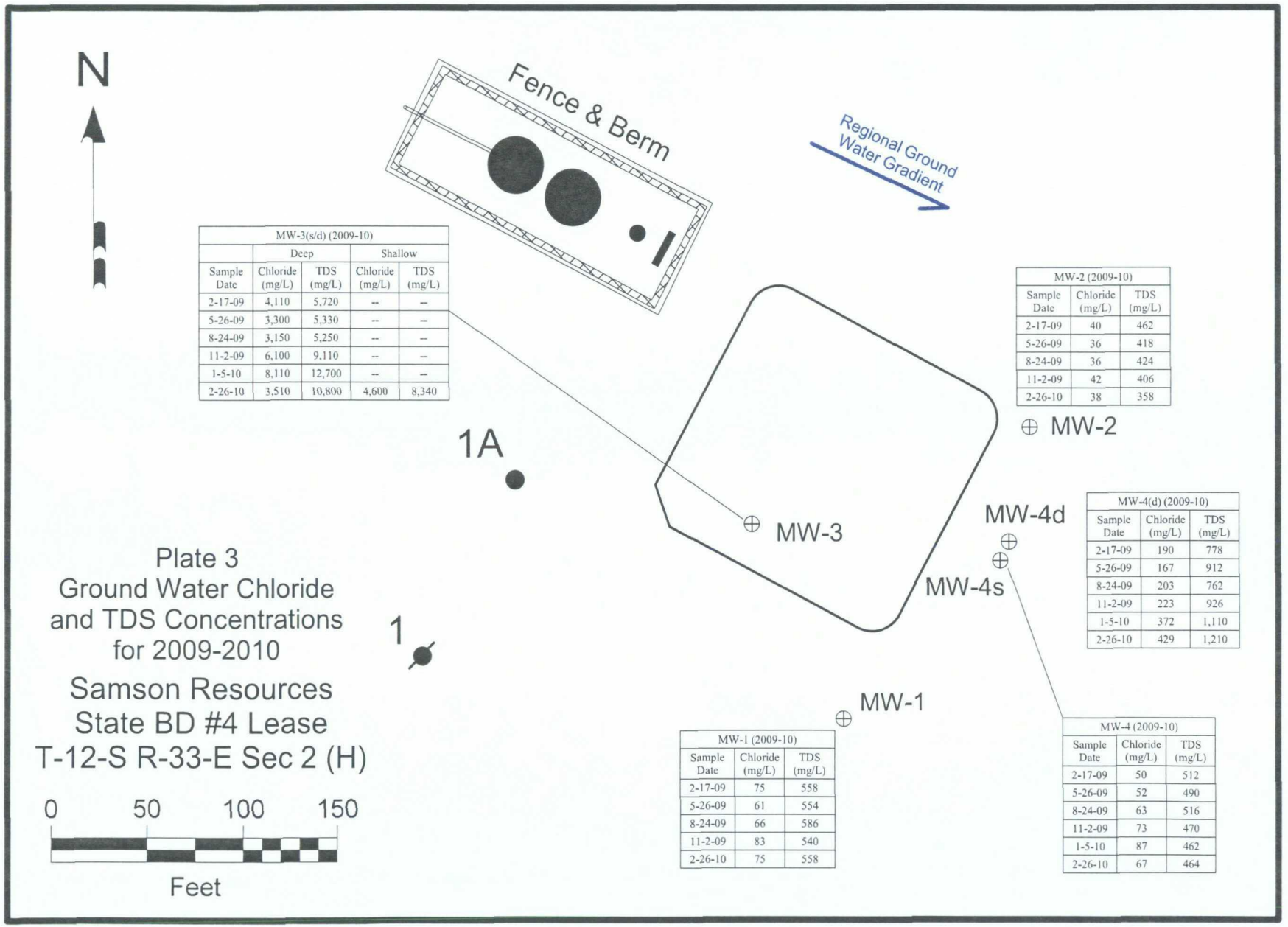

N
Fence & Berm
Regional Ground Water Gradient
1A
1
Fluid Level Depressed due to High TDS Conc.
MW-3
4192.11
MW-2
4192.10
MW-4d
MW-4s
4191.92
MW-1
4192.13
4192.4
4192.0
4191.6
Plate 2A
GROUND WATER GRADIENT
February 17, 2009
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet

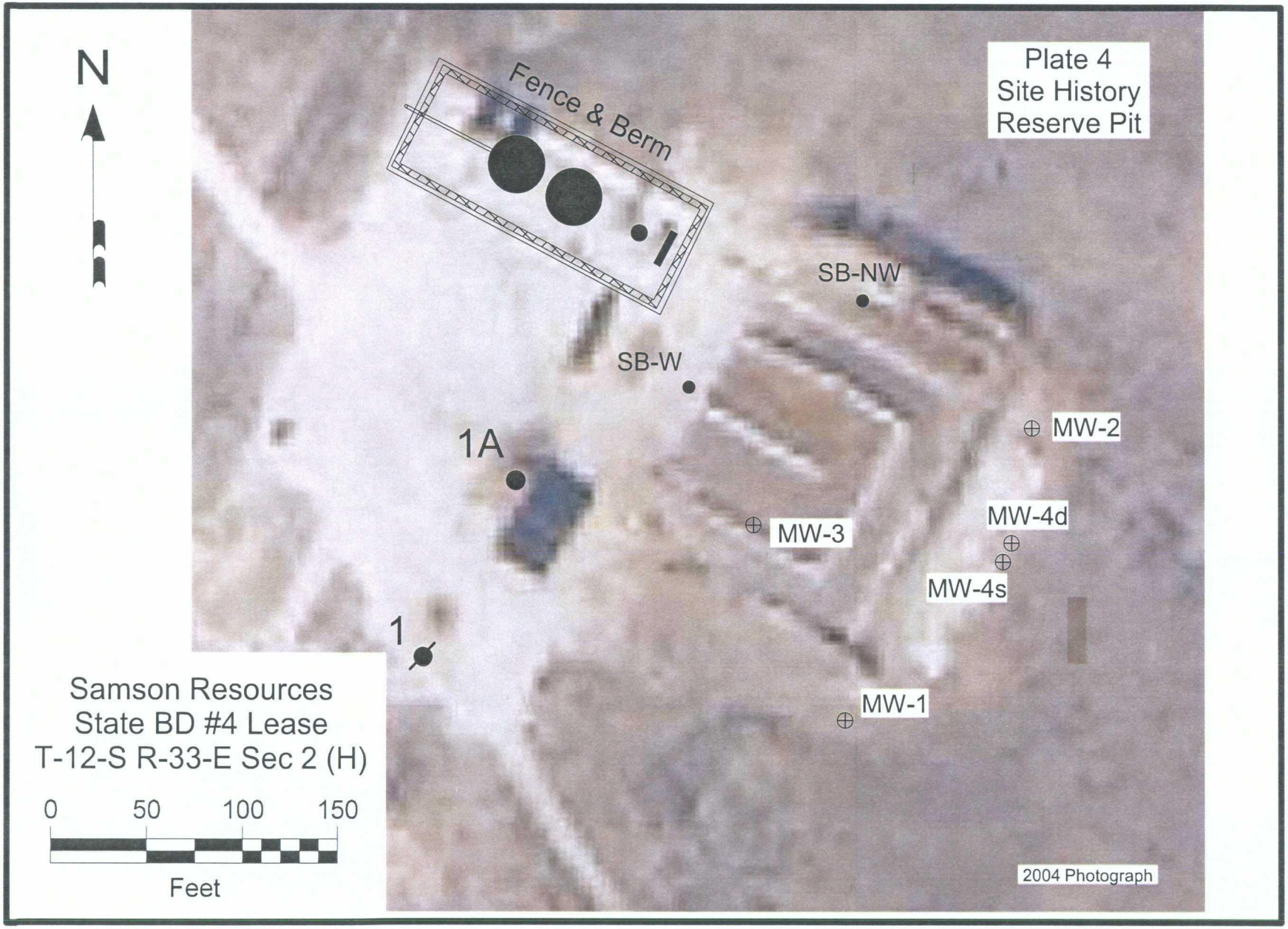

N
Fence & Berm
Regional Ground Water Gradient
1A
Fluid Level Depressed due to High TDS Conc.
MW-3
(4192.09)
MW-2
4192.09
MW-4d
MW-4s
4191.91
4192.3
4191.9
4191.5
MW-1
4192.10
1
Plate 2B
GROUND WATER GRADIENT
May 26, 2009
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet

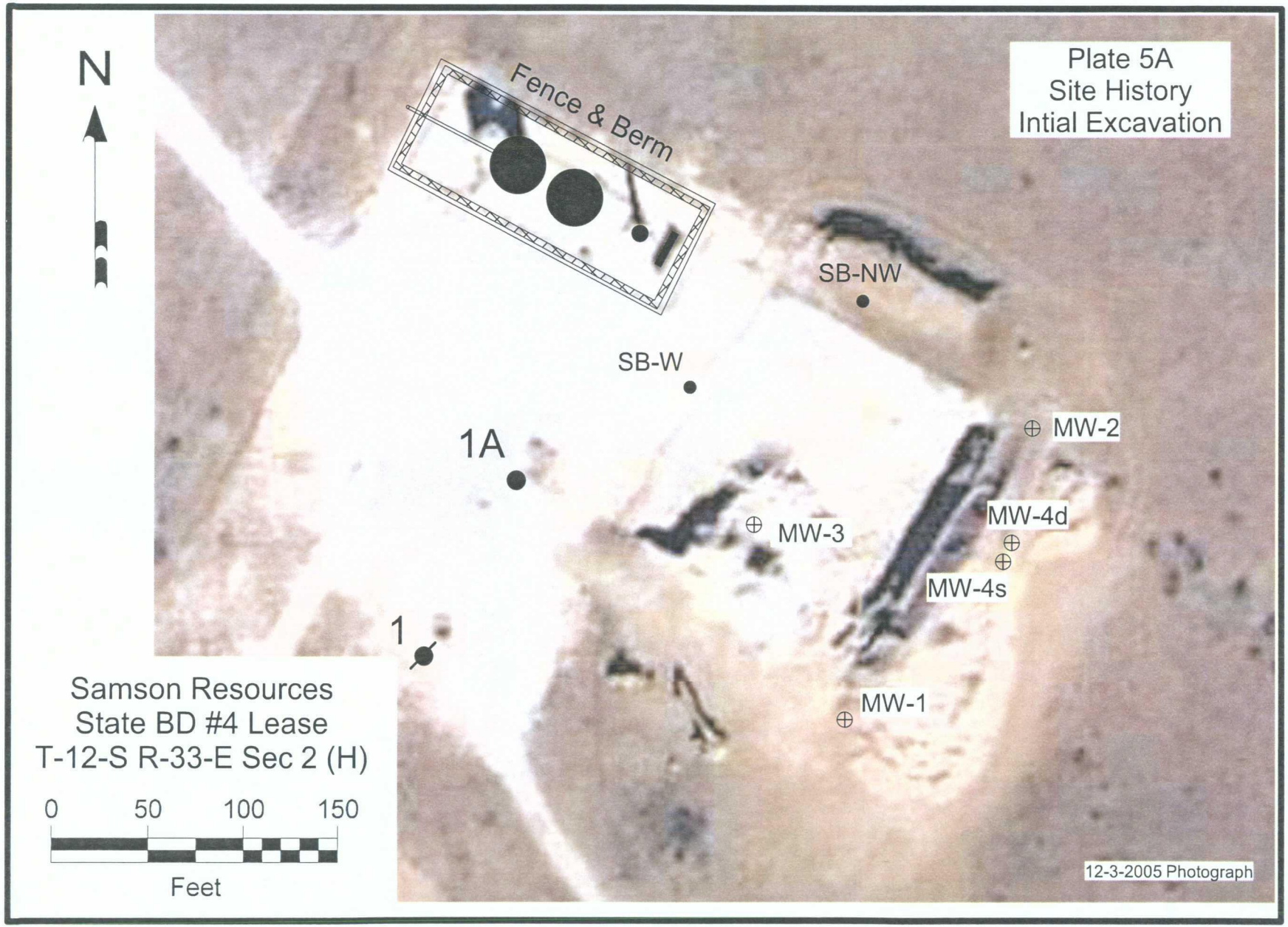

N
Fence & Berm
Regional Ground Water Gradient
1A
Fluid Level Depressed due to High TDS Conc.
MW-3
4192.11
MW-2
4192.11
MW-4d
MW-4s
4191.95
MW-1
4192.14
4192.4
4192.0
4191.6
1
Plate 2C
GROUND WATER GRADIENT
August 24, 2009
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet

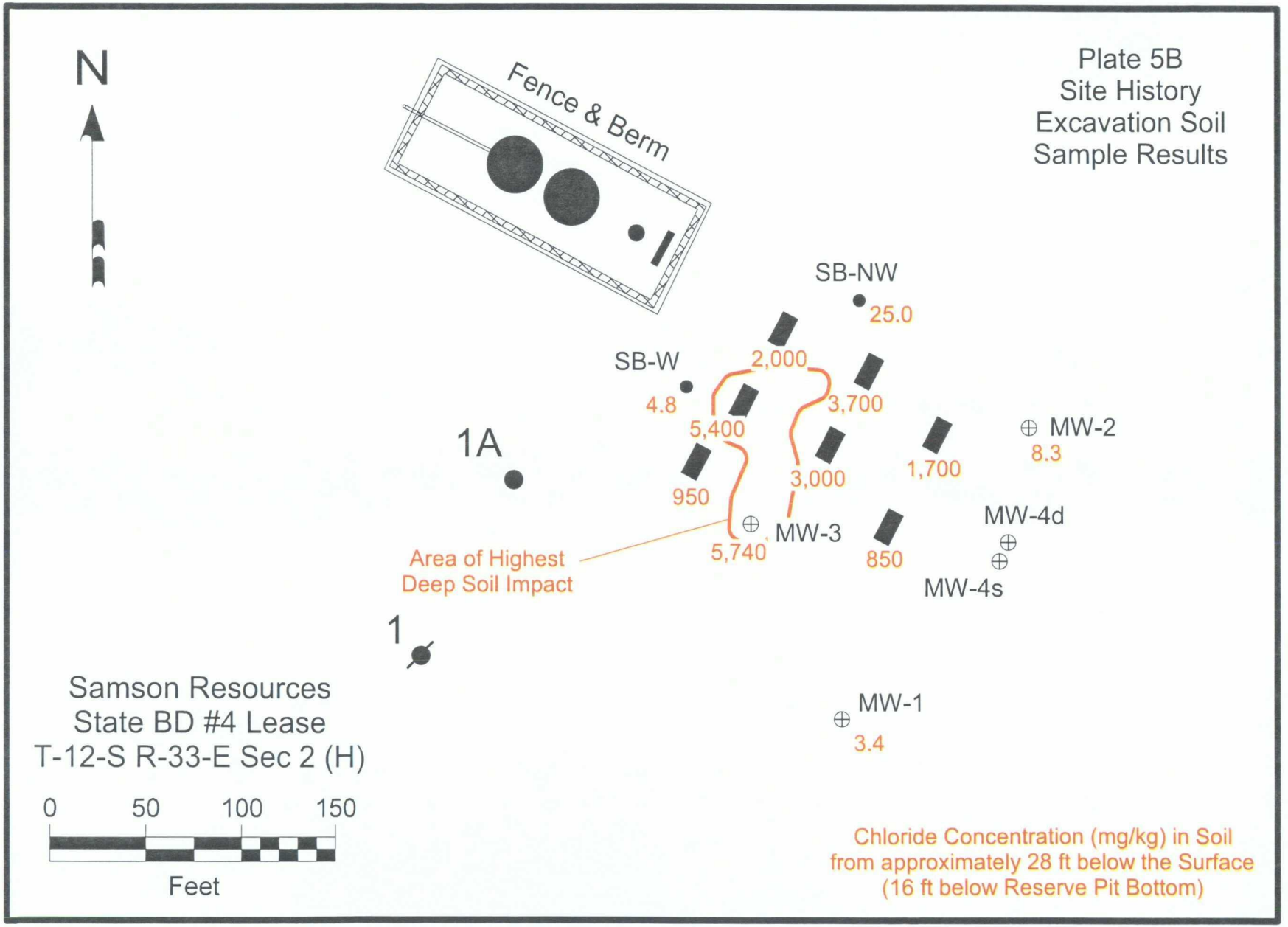

N
Fence & Berm
Regional Ground Water Gradient
1A
Fluid Level Depressed due to High TDS Conc.
MW-3
4192.22
MW-2
4192.21
MW-4d
MW-4s
4192.09
MW-1
4192.28
4192.4
4192.0
4191.8
1
Plate 2D
GROUND WATER GRADIENT
November 2, 2009
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet

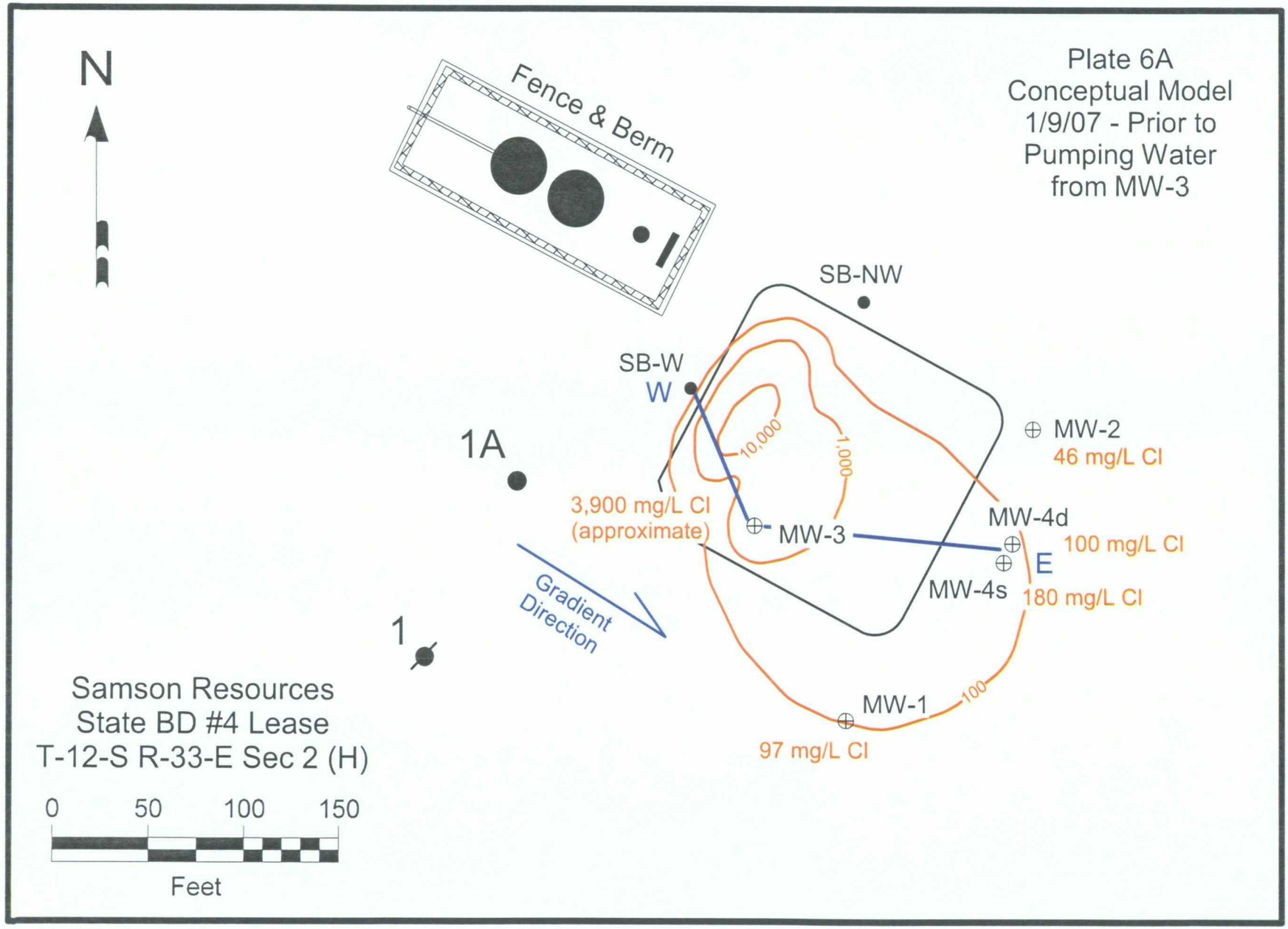

N
Fence & Berm
Regional Ground Water Gradient
1A
Fluid Level Depressed due to High TDS Conc.
MW-3
4191.97
MW-2
4192.10
MW-4d
MW-4s 4191.92
4192.4
4191.8
MW-1
4192.13
1
Plate 2E
GROUND WATER GRADIENT
February 26, 2010
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0 50 100 150
Feet

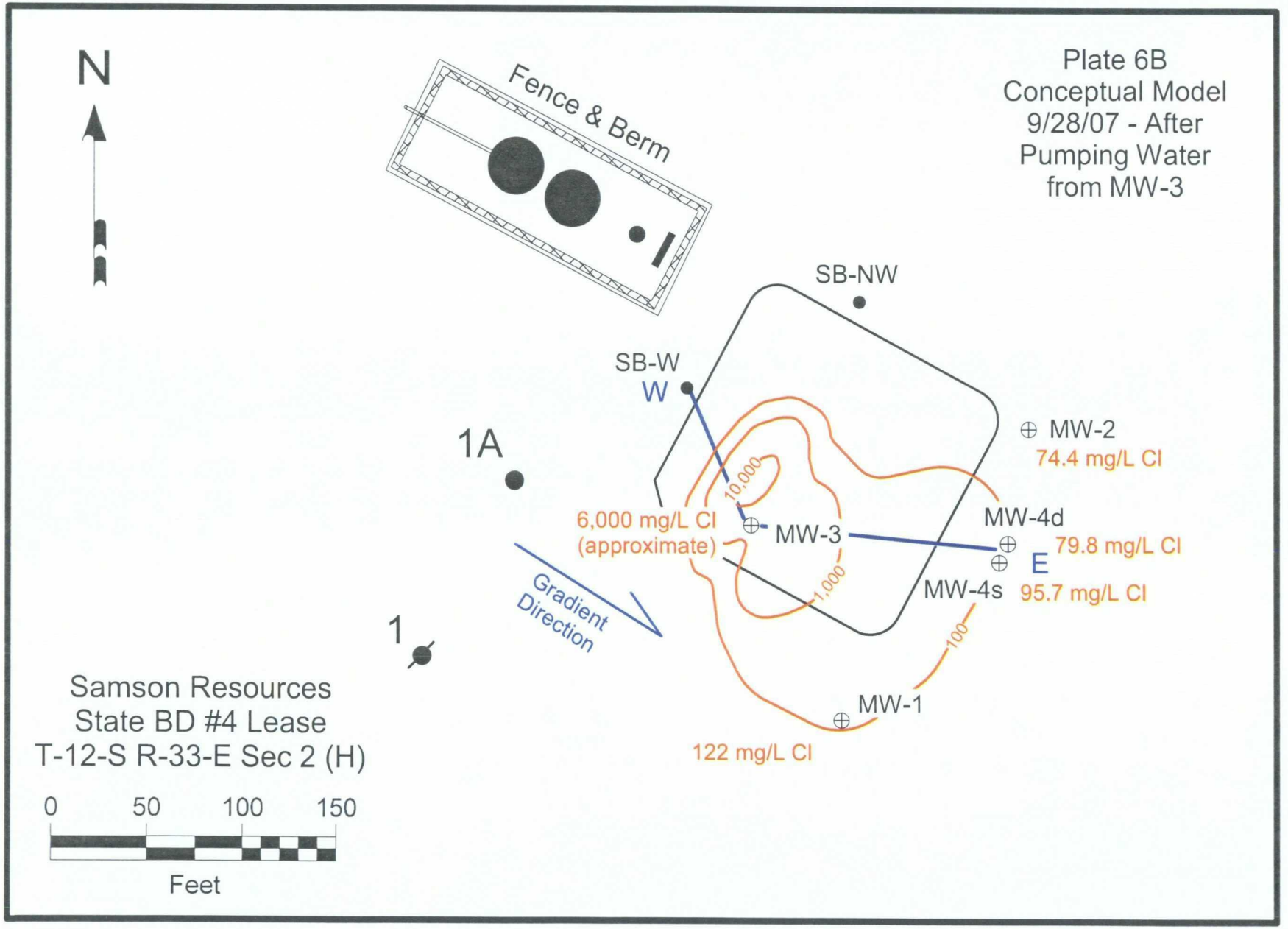

N
Fence & Berm
Regional Ground Water Gradient
MW-3(s/d) (2009-10)
Deep
Shallow
Sample Date
Chloride (mg/L)
TDS (mg/L)
Chloride (mg/L)
TDS (mg/L)
2-17-09 4,110 5,720 -- --
5-26-09 3,300 5,330 -- --
8-24-09 3,150 5,250 -- --
11-2-09 6,100 9,110 -- --
1-5-10 8,110 12,700 -- --
2-26-10 3,510 10,800 4,600 8,340
MW-2 (2009-10)
Sample Date
Chloride (mg/L)
TDS (mg/L)
2-17-09 40 462
5-26-09 36 418
8-24-09 36 424
11-2-09 42 406
2-26-10 38 358
MW-2
1A
MW-3
MW-4d
MW-4s
MW-4(d) (2009-10)
Sample Date
Chloride (mg/L)
TDS (mg/L)
2-17-09 190 778
5-26-09 167 912
8-24-09 203 762
11-2-09 223 926
1-5-10 372 1,110
2-26-10 429 1,210
Plate 3
Ground Water Chloride and TDS Concentrations for 2009-2010
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
1
MW-1
MW-1 (2009-10)
Sample Date
Chloride (mg/L)
TDS (mg/L)
2-17-09 75 558
5-26-09 61 554
8-24-09 66 586
11-2-09 83 540
2-26-10 75 558
MW-4 (2009-10)
Sample Date
Chloride (mg/L)
TDS (mg/L)
2-17-09 50 512
5-26-09 52 490
8-24-09 63 516
11-2-09 73 470
1-5-10 87 462
2-26-10 67 464
0 50 100 150
Feet


N
Fence & Berm
Plate 4
Site History
Reserve Pit
SB-NW
SB-W
1A
MW-2
MW-3
MW-4d
MW-4s
1
MW-1
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet
2004 Photograph


N
Fence & Berm
Plate 5A
Site History
Intial Excavation
SB-NW
SB-W
1A
MW-2
MW-3
MW-4d
MW-4s
1
MW-1
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet
12-3-2005 Photograph


N
Fence & Berm
Plate 5B
Site History
Excavation Soil
Sample Results
SB-NW
25.0
SB-W
4.8
2,000
3,700
5,400
1A
950
3,000
1,700
MW-2
8.3
MW-4d
MW-3
5,740
850
Area of Highest
Deep Soil Impact
MW-4s
1
MW-1
3.4
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet
Chloride Concentration (mg/kg) in Soil
from approximately 28 ft below the Surface
(16 ft below Reserve Pit Bottom)


N
Fence & Berm
Plate 6A
Conceptual Model
1/9/07 - Prior to
Pumping Water
from MW-3
SB-NW
SB-W
W
1A
10,000
1,000
MW-2
46 mg/L Cl
3,900 mg/L Cl
(approximate)
MW-3
MW-4d
100 mg/L Cl
E
MW-4s
180 mg/L Cl
Gradient
Direction
1
MW-1
100
97 mg/L Cl
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet


N
Fence & Berm
Plate 6B
Conceptual Model
9/28/07 - After
Pumping Water
from MW-3
SB-NW
SB-W
W
1A
MW-2
74.4 mg/L Cl
10,000
6,000 mg/L Cl
(approximate)
MW-3
MW-4d
79.8 mg/L Cl
E
MW-4s
95.7 mg/L Cl
1,000
100
Gradient
Direction
1
MW-1
122 mg/L Cl
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet

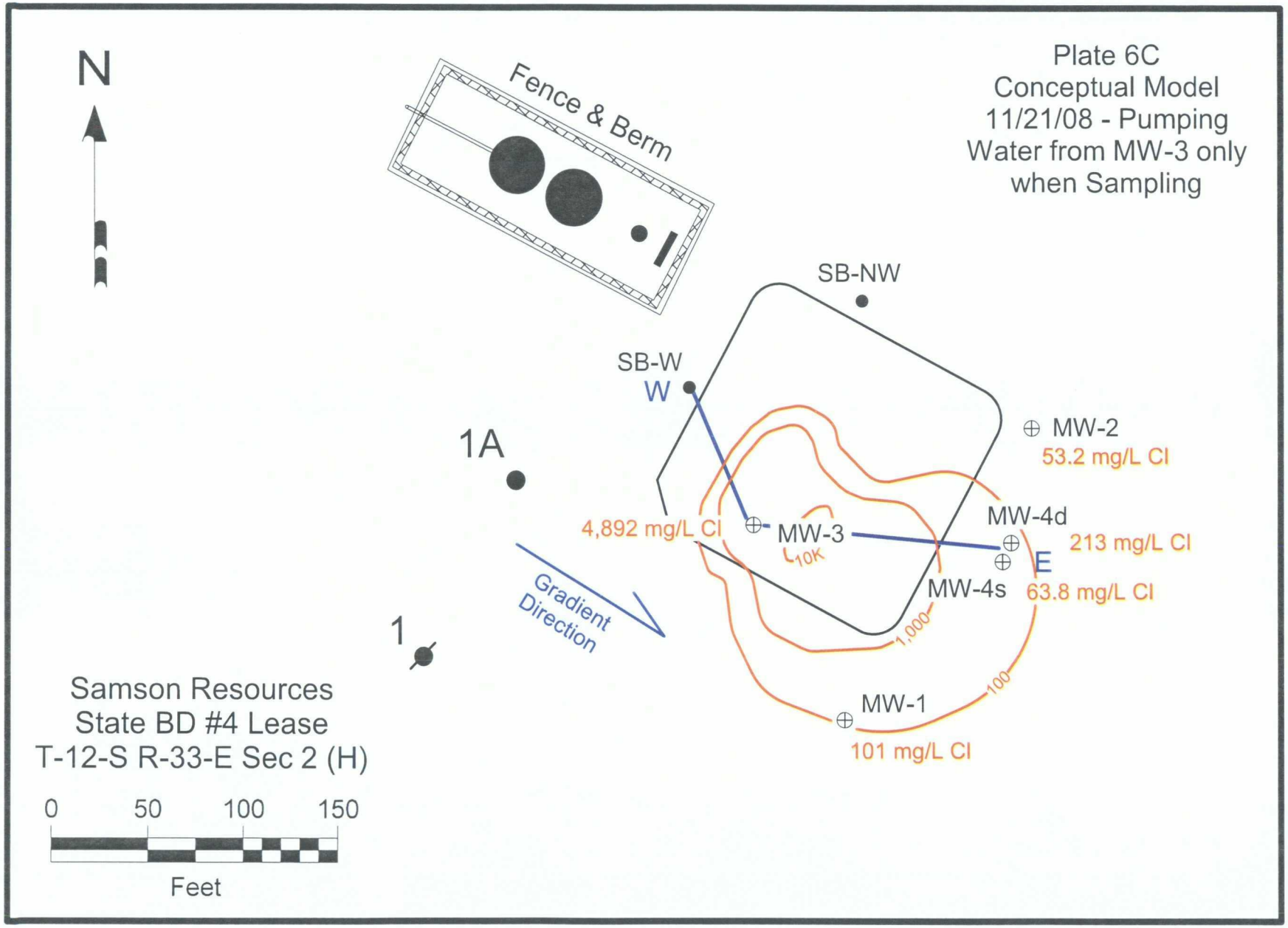


Plate 6C
Conceptual Model
11/21/08 - Pumping
Water from MW-3 only
when Sampling
N
Fence & Berm
SB-NW
SB-W
W
1A
1
MW-2
53.2 mg/L Cl
4,892 mg/L Cl
MW-3
10K
MW-4d
213 mg/L Cl
E
MW-4s
63.8 mg/L Cl
Gradient
Direction
1,000
100
MW-1
101 mg/L Cl
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet

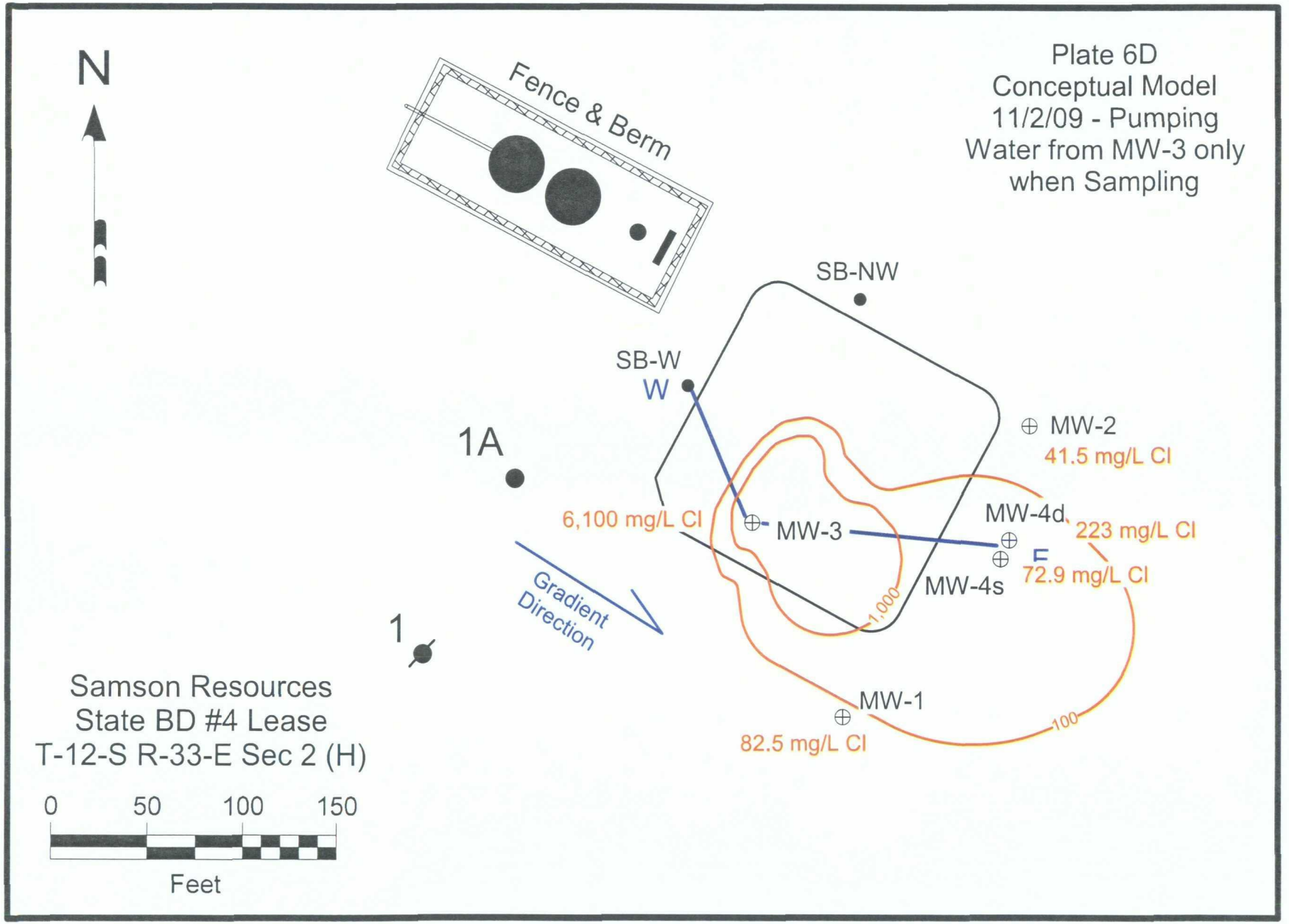


Plate 6D
Conceptual Model
11/2/09 - Pumping
Water from MW-3 only
when Sampling
N
Fence & Berm
SB-NW
SB-W
W
1A
1
MW-2
41.5 mg/L Cl
6,100 mg/L Cl
MW-3
MW-4d
223 mg/L Cl
MW-4s
72.9 mg/L Cl
1,000
Gradient
Direction
MW-1
82.5 mg/L Cl
100
Samson Resources
State BD #4 Lease
T-12-S R-33-E Sec 2 (H)
0
50
100
150
Feet

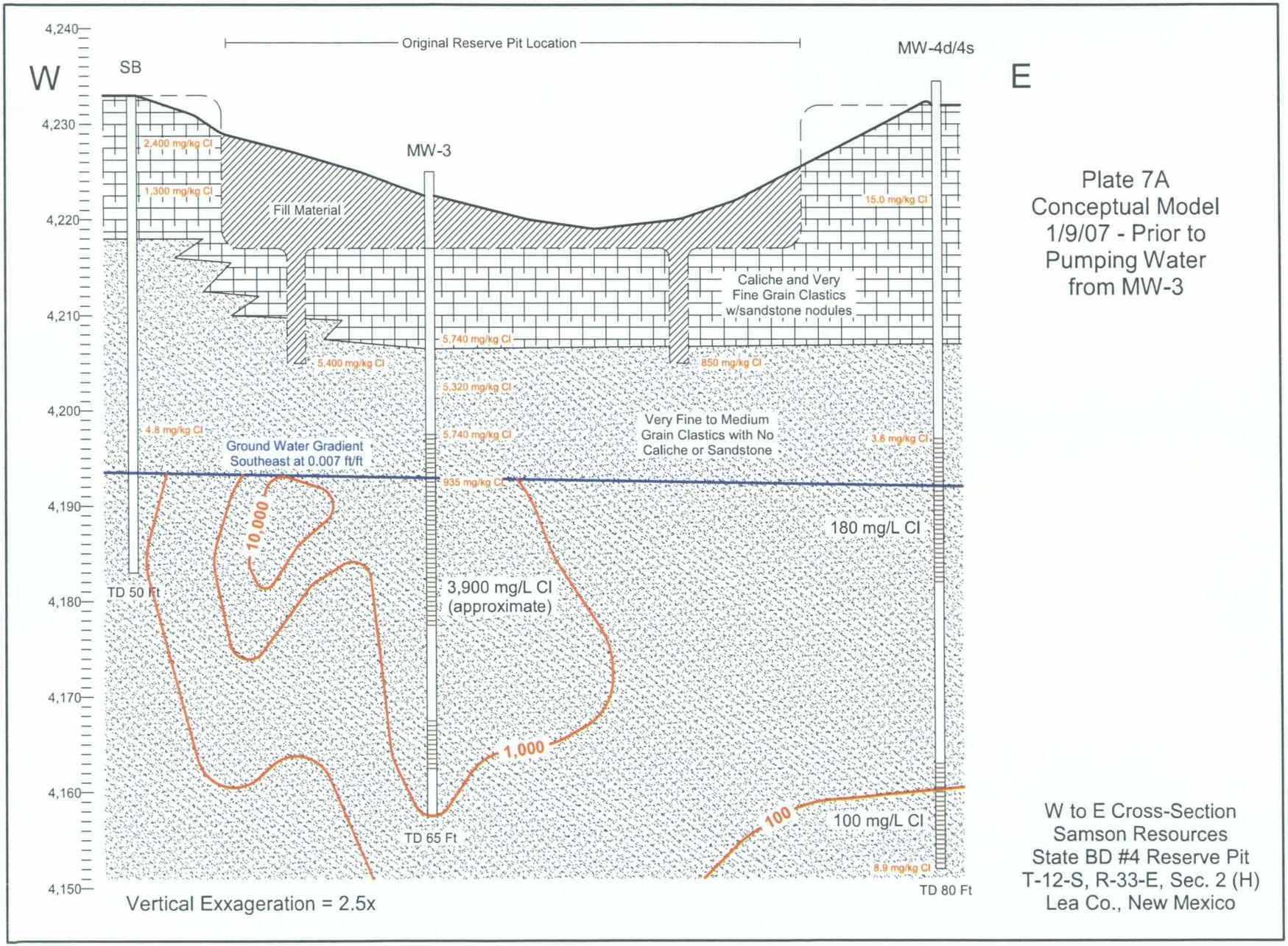


Plate 7A
Conceptual Model
1/9/07 - Prior to
Pumping Water
from MW-3

W to E Cross-Section
Samson Resources
State BD #4 Reserve Pit
T-12-S, R-33-E, Sec. 2 (H)
Lea Co., New Mexico

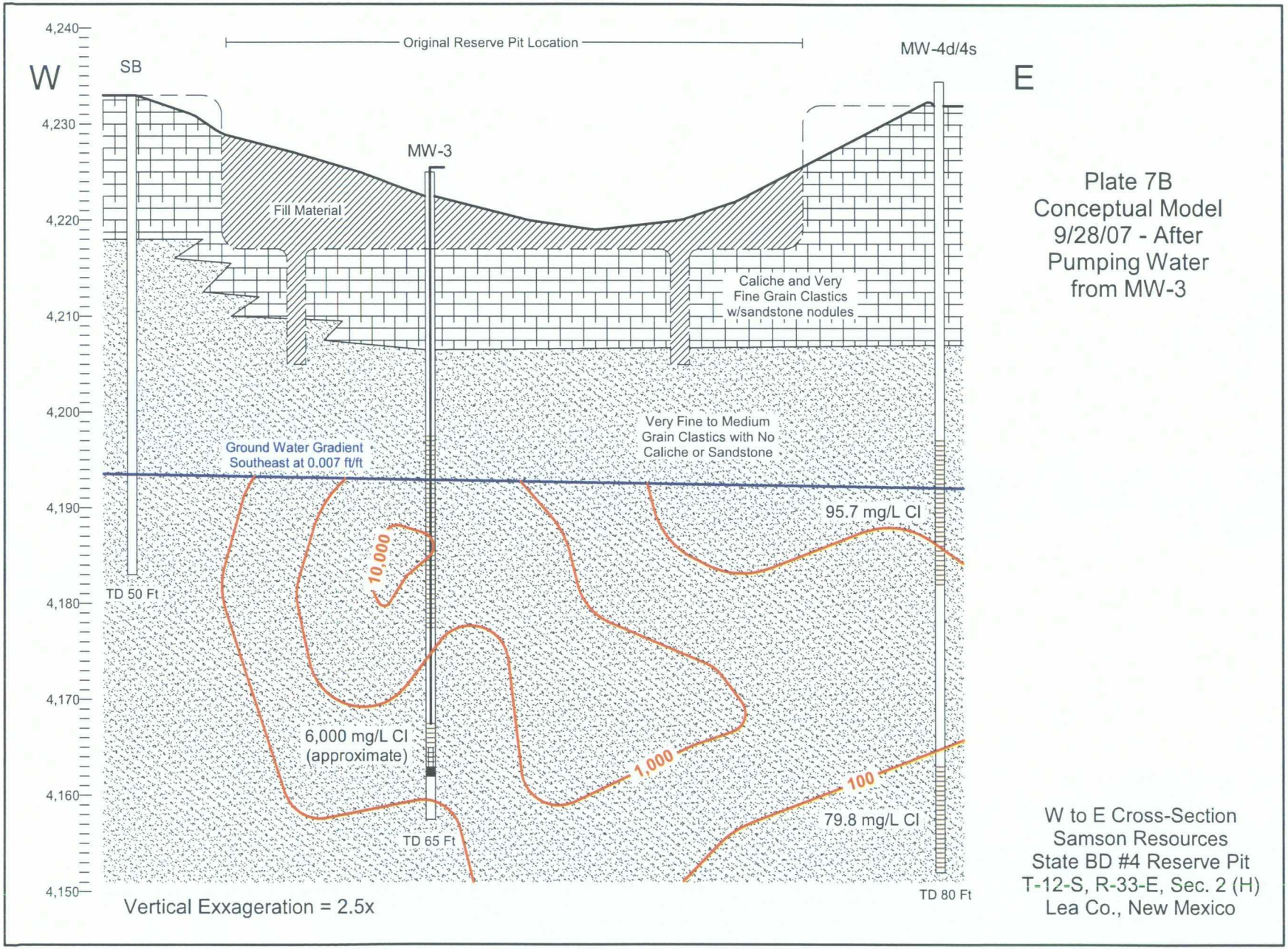


Plate 7B
Conceptual Model
9/28/07 - After
Pumping Water
from MW-3

W to E Cross-Section
Samson Resources
State BD #4 Reserve Pit
T-12-S, R-33-E, Sec. 2 (H)
Lea Co., New Mexico

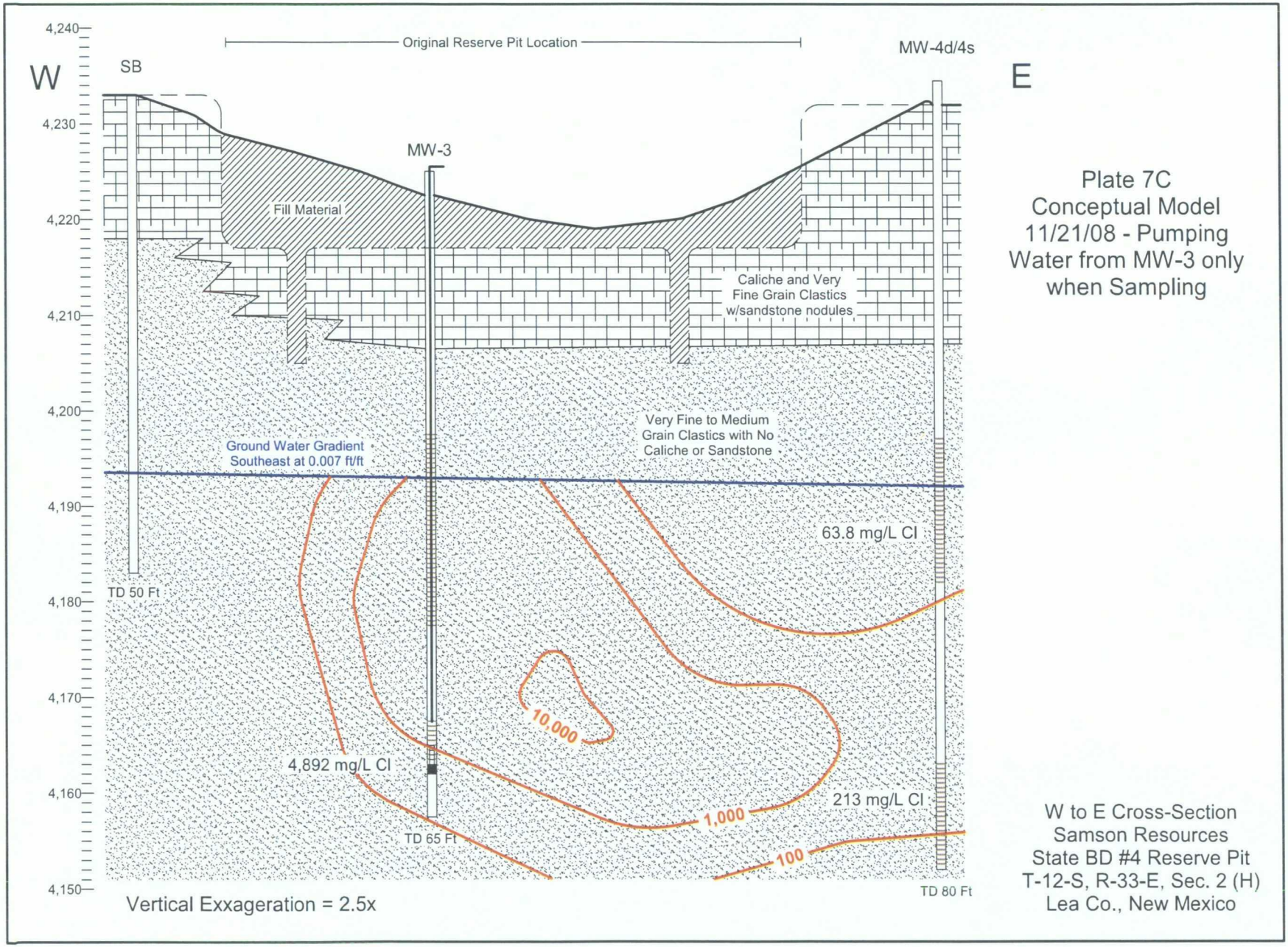


Plate 7C
Conceptual Model
11/21/08 - Pumping Water from MW-3 only when Sampling

W to E Cross-Section
Samson Resources
State BD #4 Reserve Pit
T-12-S, R-33-E, Sec. 2 (H)
Lea Co., New Mexico

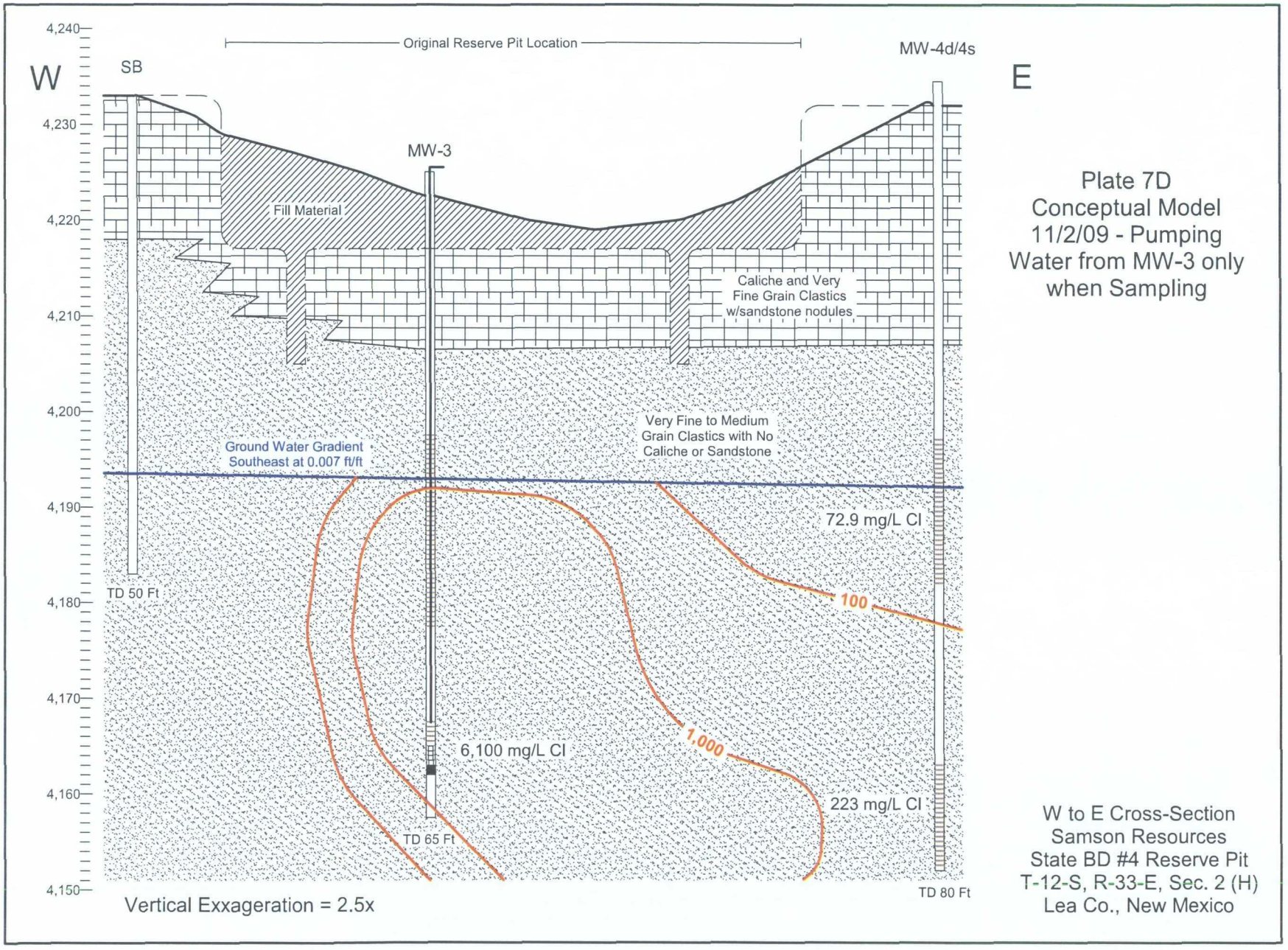


Plate 7D
Conceptual Model
11/2/09 - Pumping
Water from MW-3 only
when Sampling

W to E Cross-Section
Samson Resources
State BD #4 Reserve Pit
T-12-S, R-33-E, Sec. 2 (H)
Lea Co., New Mexico

Appendix A

Tables of Historic Data

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Appendix A - Table 1A
Laboratory Results Summary - Pre-RT Hicks Soil Samples
Results in mg/kg

Sample Location Sample Depth (ft) Sample Date		Pit Comp. 16 ft (bgs) 12/2/05	Pit (max)* 28 ft (bgs) 12/2/05	Applicable Reg. Levels
Benzene		--	--	**0.2**
Toluene		--	--	**0.347**
Ethyl Benzene		--	--	**1.01**
Total Xylenes		--	--	**0.167**
GRO (C_6-C_{10})		--	--	**200**
DRO (>C_{10}-C_{28})		--	--	**200**
Total Alkalinity		208	96	--
Chloride		**4,958**	**6,958**	**1,000**
Carbonate		0	76	--
Bicarbonate		254	40	--
Sulfate		943	298	--
Calcium		128	705	--
Magnesium		78	467	--
Potassium		136	70	--
Sodium		2,928	2,928	--
Bromide		--	--	--

* - Sample taken from area of highest Cl concentration based on HACH kit field screening

Appendix A - Table 1B
Laboratory Results Summary - Excavation & Soil Boring Samples

Sample Location (Surface Elevation)	Sample Date	Depth (ft)	Elevation (ft)		Br (mg/kg)	Chloride (mg/kg)
MW-1 (4233.0)	5/8/06	9	4,224		--	49.4
		19	4,214		--	7.86
		29	4,204		--	3.38
		34	4,199		<0.1	5.02
MW-2 (4230.5)	5/9/06	9	4,222		--	10.0
		19	4,212		--	7.30
		29	4,202		--	8.27
		34	4,197		--	7.77
		39	4,192		0.187	12.0
NE "side" of Pit	7/12/06	28	4,205		<3.0	**3,700**
East "corner" of Pit	7/12/06	28	4,205		<3.0	**1,700**
North "corner" of Pit	7/12/06	28	4,205		<3.0	**2,000**
Center of Pit	7/12/06	28	4,205		<3.0	**3,000**
SE "side" of Pit	7/12/06	28	4,205		<3.0	850
NW "side" of Pit	7/12/06	28	4,205		<3.0	**5,400**
Avg. Clean Stockpile	7/12/06	surface	4,233		--	208
Avg. Dirty Stockpile	7/12/06	surface	4,233		--	**1,768**
East "corner" of Pit	7/12/06	28	4,205		--	950
MW-3 (4222.0)	12/11/06	15	4,207		--	**5,740**
		20	4,202		--	**5,320**
		25	4,197		--	**5,740**
		30	4,192		--	936
MW-4d (4232.0)	1/8/07	10	4,222		--	15.0
		35	4,197		--	3.6
		80	4,152		--	8.9
NW Soil Boring	1/8/07	10	4,224		--	**1,900**
		15	4,219		--	**1,100**
		35	4,199		--	25.0
West Soil Boring	1/9/07	10	4,224		--	**2,400**
		15	4,219		--	**1,300**
		35	4,199		--	4.8

NMOCD Landfarm Closure Standard	**1,000**

Bold **Text** indicate concentration exceeds Regulatory Standards

c:\Samson\State BD-4\BD #4 Project Data

Appendix A - Table 2
Laboratory Results Summary - Groundwater Samples

Monitor Well TOC Elev.	Sample Date	Water Depth	Water Elevation	pH (unitless)	Cond. (uS/cm)	Chloride (mg/L)	TDS (mg/L)	% Cl of TDS
MW-1	5/11/06	41.18	4,192.05	7.41	1.17	--	--	
4,233.23	5/12/06	41.24	4,191.99	7.15	0.88	131	838	16%
	8/2/06	41.22	4,192.01	7.07	0.99	115	648	18%
	10/17/06	41.14	4,192.09					
	12/12/06	41.09	4,192.14					
	1/9/07	41.07	4,192.16			97		
	2/6/07	41.32	4,191.91					
	2/6/07	41.25	4,191.98					
	2/16/07	41.37	4,191.86		0.985			
	3/8/07	41.39	4,191.84			83	620	13%
	3/13/07	41.36	4,191.87		1.025			
	4/17/07	41.13	4,192.10	7.41	0.82	89.6	674	13%
	5/21/07	40.99	4,192.24	7.96	0.79	83.8	630	13%
	6/21/07	41.02	4,192.21	7.52	0.74	76.5	632	12%
	7/18/07	41.05	4,192.18	7.50	0.80	102	650	16%
	8/22/07	40.96	4,192.27	7.26	0.86	88.0	672	13%
	9/28/07	40.94	4,192.29	7.62	0.94	122	606	20%
	10/24/07	41.00	4,192.23	7.75	0.93	117	710	16%
	2/11/08	41.01	4,192.22	7.60	1.00	84.7	1020	8%
	3/13/08	41.01	4,192.22	--	--	--	--	--
	5/5/08	41.03	4,192.20	7.26	1.22	96.3	596	16%
	8/20/08	41.10	4,192.13	7.19	0.96	72.3	568	13%
	11/21/08	41.11	4,192.12	7.14	1.01	101	498	20%
	2/17/09	41.10	4,192.13	7.17	1.14	75.4	558	14%
	5/26/09	41.13	4,192.10	7.43	0.89	60.9	554	11%
	8/24/09	41.09	4,192.14	7.27	0.99	65.5	586	11%
	11/2/09	40.95	4,192.28	7.23	1.00	82.5	540	15%
	2/26/10	41.10	4,192.13	7.19	1.00	74.5	558	13%
MW-2	5/11/06	41.85	4,192.02	7.80	0.81			
4,233.87	5/12/06	41.88	4,191.99	7.50	0.60	44.5	530	8%
	8/2/06	41.88	4,191.99	7.38	0.67	42.2	444	10%
	10/17/06	41.82	4,192.05					
	12/12/06	41.77	4,192.10					
	1/9/07	41.75	4,192.12			46.0		
	2/6/07	41.93	4,191.94					
	2/6/07	41.88	4,191.99					
	2/16/07	41.97	4,191.90		0.924			
	3/8/07	42.03	4,191.84			45	510	9%
	3/13/07	41.99	4,191.88		0.663			
	4/17/07	41.81	4,192.06	7.93	0.65	41.5	436	10%
	5/21/07	41.73	4,192.14	8.31	0.63	38.6	452	9%
	6/21/07	41.73	4,192.14	7.72	0.57	39.7	516	8%
	7/18/07	41.72	4,192.15	8.16	0.56	41.7	388	11%
	8/22/07	41.66	4,192.21	7.60	0.68	40.9	550	7%
	9/28/07	41.65	4,192.22	7.82	0.66	74.4	452	16%
	10/24/07	41.67	4,192.20	7.64	0.73	74.4	430	17%
	2/11/08	41.68	4,192.19	7.56	0.78	39.8	744	5%

Appendix A - Table 2
Laboratory Results Summary - Groundwater Samples

Monitor Well TOC Elev.	Sample Date	Water Depth	Water Elevation	pH (unitless)	Cond. (uS/cm)	Chloride (mg/L)	TDS (mg/L)	% Cl of TDS
	3/13/08	41.68	4,192.19	--	--	--	--	--
	5/5/08	41.68	4,192.19	7.37	0.77	40.1	406	10%
	8/20/08	41.75	4,192.12	7.51	0.71	28.7	440	7%
	11/21/08	41.78	4,192.09	7.40	0.77	53.2	388	14%
	2/17/09	41.77	4,192.10	7.43	0.87	39.7	462	9%
	5/26/09	41.78	4,192.09	7.79	0.66	35.8	418	9%
	8/24/09	41.76	4,192.11	7.63	0.75	35.8	424	8%
	11/2/09	41.66	4,192.21	7.80	0.75	41.5	406	10%
	2/26/10	41.77	4,192.10	7.49	0.74	38.2	358	11%
MW-3 (S)	12/12/06	32.81	4,191.71					
4,224.52	12/18/06	32.82	4,191.70			3,900	5,800	67%
	1/9/07	32.27	4,192.25					
	2/6/07	32.7	4,191.82					
Pump On	2/6/07	44.47	4,180.05			2,500	4,400	57%
	2/16/07	44.45	4,180.07		8.71			
	3/8/07	40.12	4,184.40		10.31	3,400	6,200	55%
	3/13/07	42.41	4,182.11		10.27			
	4/17/07	42	4,182.52	8.08	7.45	2,730	4,520	60%
	5/21/07	41	4,183.52	8.20	8.67	3,340	6,430	52%
	6/21/07	42	4,182.52	7.78	10.24	4,750	7,960	60%
Pump Off	7/18/07	32.48	4,192.04	7.45	10.24	5,730	8,730	66%
	8/22/07	32.22	4,192.30					
	9/28/07	32.24	4,192.28	On August 16, 2007 the pump was moved down to the lower screened interval. The base of the pump is set at a depth of 57 feet (screen at 55 - 60 ft).				
	10/24/07	32.35	4,192.17					
	2/11/08	32.42	4,192.10					
	2/26/10	32.55	4,191.97	7.73	17.33	4,600	8,340	55%
MW-3 (D)	12/18/06	--	--		0.87	2,000	3,700	54%
4,224.52	3/8/07	--	--		10.28	3,500	6,200	56%
	3/13/07	42.41	4,182.11		10.06			
	3/13/08	32.45	4,192.07	--	--	7,730	12,400	62%
	5/5/08	32.50	4,192.02	6.60	19.70	9,680	15,200	64%
	8/20/08	32.42	4,192.10	7.14	12.76	5,300	7,550	70%
	11/21/08	32.42	4,192.10	7.21	10.30	4,892	6,330	77%
	2/17/09	32.41	4,192.11	7.24	12.04	4,110	5,720	72%
	5/26/09	32.43	4,192.09	8.01	10.50	3,300	5,330	62%
	8/24/09	32.41	4,192.11	8.13	10.62	3,150	5,250	60%
	11/2/09	32.30	4,192.22	7.25	17.59	6,100	9,110	67%
	1/5/10	32.40	4,192.12	7.47	>20	8,110	12,700	64%
	2/26/10	32.55	4,191.97	7.80	>20	3,510	10,800	33%
MW-4(S)	1/9/07	--	--			180		
4,233.52	2/6/07	41.73	4,191.79					
	2/6/07	41.80	4,191.72					
	2/16/07	41.84	4,191.68		0.98			
	3/8/07	41.85	4,191.67			120	680	18%
	3/13/07	41.82	4,191.70		0.99			
	4/17/07	41.61	4,191.91	7.78	0.79	84.8	598	14%
	5/21/07	41.50	4,192.02	8.16	0.73	65.7	442	15%

Appendix A - Table 2
Laboratory Results Summary - Groundwater Samples

Monitor Well TOC Elev.	Sample Date	Water Depth	Water Elevation	pH (unitless)	Cond. (uS/cm)	Chloride (mg/L)	TDS (mg/L)	% Cl of TDS
	6/21/07	41.51	4,192.01	7.79	0.65	65.8	618	11%
	7/18/07	41.54	4,191.98	7.81	0.68	67.5	514	13%
	8/22/07	41.44	4,192.08	7.46	0.78	64.0	960	7%
	9/28/07	41.43	4,192.09	7.89	0.77	95.7	640	15%
	10/24/07	41.48	4,192.04	7.97	0.84	85.1	786	11%
	2/11/08	41.50	4,192.02	7.44	0.90	55.2	688	8%
	3/13/08	41.50	4,192.02	--	--	--	--	--
	5/5/08	41.51	4,192.01	7.35	0.86	49.5	514	10%
	8/20/08	41.58	4,191.94	7.35	0.77	32.5	476	7%
	11/21/08	41.60	4,191.92	7.23	0.83	63.8	478	13%
	2/17/09	41.60	4,191.92	7.26	0.97	50.1	512	10%
	5/26/09	41.61	4,191.91	7.62	0.75	52.2	490	11%
	8/24/09	41.57	4,191.95	7.45	0.87	63.2	516	12%
	11/2/09	41.43	4,192.09	7.43	0.88	72.9	470	16%
	1/5/10	41.53	4,191.99	7.41	0.88	87.4	462	19%
	2/26/10	41.60	4,191.92	7.39	0.89	67.0	464	14%
MW-4(D)	1/9/07	--	--			100		
4,233.38	2/6/07	41.61	4,191.77					
	2/6/07	41.53	4,191.85					
	2/16/07	41.64	4,191.74		0.95			
	3/8/07	41.65	4,191.73			52.0	550	9%
	3/13/07	41.63	4,191.75		0.78			
	4/17/07	41.42	4,191.96	7.87	0.70	45.7	562	8%
	5/21/07	41.32	4,192.06	8.33	0.69	44.8	458	10%
	6/21/07	41.33	4,192.05	7.72	0.61	42.4	610	7%
	7/18/07	41.34	4,192.04	7.93	0.62	48.2	508	9%
	8/22/07	41.26	4,192.12	7.53	0.74	50.4	494	10%
	9/28/07	41.24	4,192.14	7.79	0.75	79.8	474	17%
	10/24/07	41.29	4,192.09	7.94	0.87	95.7	690	14%
	2/11/08	41.30	4,192.08	7.42	1.31	231	764	30%
	3/13/08	41.32	4,192.06	--	--	--	--	--
	5/5/08	41.32	4,192.06	7.26	1.22	217	804	27%
	8/20/08	41.39	4,191.99	7.33	1.16	225	736	31%
	11/21/08	41.41	4,191.97	7.22	1.25	213	682	31%
	2/17/09	41.40	4,191.98	7.22	1.48	190	778	24%
	5/26/09	41.42	4,191.96	7.50	1.12	167	912	18%
	8/24/09	41.39	4,191.99	7.35	1.35	203	762	27%
	11/2/09	41.25	4,192.13	7.35	1.35	223	926	24%
	1/5/10	41.35	4,192.03	7.27	1.82	372	1110	34%
	2/26/10	41.41	4,191.97	7.22	2.02	429	1210	35%

c:\Samson\State BD-4\BD #4 Project Data

Appendix B

Laboratory Reports

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Analytical Report 325220

for

R.T. Hicks Consultants, LTD

Project Manager: Dale Littlejohn

Samson State BD No. 4

L-126-0209

19-FEB-09

12600 West I-20 East Odessa, Texas 79765

Texas certification numbers:
Houston, TX T104704215-08B-TX - Odessa/Midland, TX T104704400-08-TX

Florida certification numbers:
Houston, TX E871002 - Miami, FL E86678 - Tampa, FL E86675
Norcross(Atlanta), GA E87429

South Carolina certification numbers:
Norcross(Atlanta), GA 98015

North Carolina certification numbers:
Norcross(Atlanta), GA 483

Houston - Dallas - San Antonio - Tampa - Miami - Latin America
Midland - Corpus Christi - Atlanta

19-FEB-09

Project Manager: **Dale Littlejohn**
R.T. Hicks Consultants, LTD
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Reference: XENCO Report No: **325220**
Samson State BD No. 4
Project Address: Lea Co., NM

Dale Littlejohn:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 325220. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 325220 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron, II
Odessa Laboratory Manager

Sample Cross Reference 325220

R.T. Hicks Consultants, LTD, Albuquerque, NM

Samson State BD No. 4

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
MW-1	W	Feb-17-09 09:55		325220-001
MW-2	W	Feb-17-09 08:46		325220-002
MW-3	W	Feb-17-09 10:10		325220-003
MW-4 (D)	W	Feb-17-09 09:30		325220-004
MW-4 (S)	W	Feb-17-09 09:23		325220-005

Certificate of Analysis Summary 325220

R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Samson State BD No. 4

Project Id: L-126-0209
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: Tue Feb-17-09 03:30 pm
Report Date: 19-FEB-09
Project Manager: Brent Barron, II

Analysis Requested												
	Lab Id:	325220-001		325220-002		325220-003		325220-004		325220-005		
	Field Id:	MW-1		MW-2		MW-3		MW-4 (D)		MW-4 (S)		
	Depth:											
	Matrix:	WATER		WATER		WATER		WATER		WATER		
	Sampled:	Feb-17-09 09:55		Feb-17-09 08:46		Feb-17-09 10:10		Feb-17-09 09:30		Feb-17-09 09:23		
Anions by EPA 300	***Extracted:***											
	Analyzed:	Feb-19-09 01:00		Feb-19-09 01:00		Feb-19-09 01:00		Feb-19-09 01:00		Feb-19-09 01:00		
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	
Chloride		75.4	5.00	39.7	5.00	4110	100	190	5.00	50.1	5.00	
TDS by SM2540C	***Extracted:***											
	Analyzed:	Feb-18-09 15:41		Feb-18-09 15:41		Feb-18-09 15:41		Feb-18-09 15:41		Feb-18-09 15:41		
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	
Total dissolved solids		558	5.00	462	5.00	5720	5.00	778	5.00	512	5.00	

Brent Barron
Odessa Laboratory Director

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

* Outside XENCO's scope of NELAC Accreditation.

Blank Spike Recovery

Project Name: Samson State BD No. 4

Work Order #: 325220 **Project ID:** L-126-0209

Lab Batch #: 750052 **Sample:** 750052-1-BKS **Matrix:** Water

Date Analyzed: 02/19/2009 **Date Prepared:** 02/19/2009 **Analyst:** LATCOR

Reporting Units: mg/L **Batch #:** 1

Anions by EPA 300	BLANK /BLANK SPIKE RECOVERY STUDY					
Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Chloride	ND	10.0	10.3	103	90-110	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Form 3 - MS Recoveries

Project Name: Samson State BD No. 4

Work Order #: 325220
Lab Batch #: 750052
Date Analyzed: 02/19/2009
QC- Sample ID: 325202-001 S
Reporting Units: mg/L

Date Prepared: 02/19/2009
Batch #: 1

Project ID: L-126-0209
Analyst: LATCOR
Matrix: Water

Inorganic Anions by EPA 300	MATRIX / MATRIX SPIKE RECOVERY STUDY					
Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
Chloride	66.6	100	173	106	80-120	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

Sample Duplicate Recovery

Project Name: Samson State BD No. 4

Work Order #: 325220

Lab Batch #: 750052 **Project ID:** L-126-0209

Date Analyzed: 02/19/2009 **Date Prepared:** 02/19/2009 **Analyst:** LATCOR

QC- Sample ID: 325202-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

Anions by EPA 300	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	66.6	64.9	3	20	

Lab Batch #: 750117

Date Analyzed: 02/18/2009 **Date Prepared:** 02/18/2009 **Analyst:** WRU

QC- Sample ID: 325202-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

TDS by SM2540C	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Total dissolved solids	760	812	7	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Dale Littlejohn
Company Name: RT Hicks Consultants Ltd
Company Address: P.O. Box 7624
City/State/Zip: Midland, Texas 79708
Telephone No: (432) 528-3878
Fax No: (432) 689-4578 (Fax)
Sampler Signature: Dale Littlejohn

Project Name: Samson State BD No. 4
Project #: L-126-0209
Project Loc: Lea Co., NM
PO #:

LAB # 325220 (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	Water	Chloride	Total Dissolved Solids	Standard TAT
01	MW-1	2/17/09	0955	1	X	X	X	X	X
02	MW-2	''	0846	1	X	X	X	X	X
03	MW-3	''	1010	1	X	X	X	X	X
04	MW-4(D)	''	0930	1	X	X	X	X	X
05	MW-4(S)	''	0923	1	X	X	X	X	X

Other columns printed on the form, all empty: Preservative: HNO_3, HCl, NaOH, H_2SO_4, None, Other (Specify); Matrix: Sludge, Soil, Other (specify); Analyze For (TCLP / TOTAL): TPH: 418.1 8015M 1005 1006, Cations (Ca, Mg, Na, K), Anions (Cl, SO4, CO3, HCO3), SAR / ESP / CEC, Metals: As Ag Ba Cd Cr Pb Hg Se, Volatiles, Semivolatiles, BTEX 8021B/5030 or BTEX 8260, RCI, N.O.R.M., Bromide; RUSH TAT (Pre-Schedule).

Special Instructions: Send Invoice to RT Hicks Consult. 901 Rio Grande Blvd. NW, Suite F-142. Albuquerque, NM 87104; Send results to Dale Littlejohn at the adress above.

Sample Containers Intact? (Y) N
Temperature Upon Receipt: 4.0
Laboratory Comments: 11 poly w/labels no seals

Relinquished by:	Date	Time	Received by:	Date	Time
Dale Littlejohn	2/17/09	1530			
Relinquished by:	Date	Time	Received by ELOT: Andrea Ferm	2.17.09	15:30

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: RT Hicks

Date/ Time: 2-17-09 1536

Lab ID # : 325220

Initials: CL

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	Yes	No	4.0 °C	
#2	Shipping container in good condition?	Yes	No		
#3	Custody Seals intact on shipping container/ cooler?	Yes	No	Not Present	
#4	Custody Seals intact on sample bottles/ container?	Yes	No	Not Present	
#5	Chain of Custody present?	Yes	No		
#6	Sample instructions complete of Chain of Custody?	Yes	No		
#7	Chain of Custody signed when relinquished/ received?	Yes	No		
#8	Chain of Custody agrees with sample label(s)?	Yes	No	ID written on Cont./ Lid	
#9	Container label(s) legible and intact?	Yes	No	Not Applicable	
#10	Sample matrix/ properties agree with Chain of Custody?	Yes	No		
#11	Containers supplied by ELOT?	Yes	No		
#12	Samples in proper container/ bottle?	Yes	No	See Below	
#13	Samples properly preserved?	Yes	No	See Below	
#14	Sample bottles intact?	Yes	No		
#15	Preservations documented on Chain of Custody?	Yes	No		
#16	Containers documented on Chain of Custody?	Yes	No		
#17	Sufficient sample amount for indicated test(s)?	Yes	No	See Below	
#18	All samples received within sufficient hold time?	Yes	No	See Below	
#19	Subcontract of sample(s)?	Yes	No	Not Applicable	
#20	VOC samples have zero headspace?	Yes	No	Not Applicable	

Variance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken: _____

Check all that Apply:

- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

Analytical Report 333727

for

R.T. Hicks Consultants, LTD

Project Manager: Dale Littlejohn

Samson State BD No. 4

L-126-0509

10-JUN-09

12600 West I-20 East Odessa, Texas 79765

Texas certification numbers:
Houston, TX T104704215-08B-TX - Odessa/Midland, TX T104704400-08-TX
Corpus Christi, TX T104704370-08-TX - Dallas, TX T104704295-08-TX

Florida certification numbers:
Houston, TX E871002 - Miami, FL E86678 - Tampa, FL E86675
Miramar, FL E86349
Norcross(Atlanta), GA E87429

South Carolina certification numbers:
Norcross(Atlanta), GA 98015

North Carolina certification numbers:
Norcross(Atlanta), GA 483

Houston - Dallas - San Antonio - Tampa - Miami - Latin America
Midland - Corpus Christi - Atlanta

10-JUN-09

Project Manager: **Dale Littlejohn**
R.T. Hicks Consultants, LTD
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Reference: XENCO Report No: **333727**
Samson State BD No. 4
Project Address: Lea Co., NM

Dale Littlejohn:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 333727. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 333727 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron, II
Odessa Laboratory Manager

Sample Cross Reference 333727

R.T. Hicks Consultants, LTD, Albuquerque, NM

Samson State BD No. 4

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
MW-1	W	May-26-09 15:32		333727-001
MW-2	W	May-26-09 14:25		333727-002
MW-3	W	May-26-09 15:55		333727-003
MW-4 (S)	W	May-26-09 15:06		333727-004
MW-4 (D)	W	May-26-09 15:03		333727-005

CASE NARRATIVE

XENCO Laboratories

Client Name: R.T. Hicks Consultants, LTD

Project Name: Samson State BD No. 4

Project ID: *L-126-0509* | *Report Date:* *10-JUN-09*

Work Order Number: *333727* | *Date Received:* *05/27/2009*

Sample receipt non conformances and Comments:

Samples MW-4(D) (Chain of custody line item 4) and MW-4 (S) (Chain of custody line item 5) were incorrectly labled by the techs in sample receiving. This was noticed by the client and brought to our attention. The laboratory ids have been corrected, however MW-4(D) has now been assigned sample ID 333727-005 and MW-4 (S) has been assigned sample ID 333727-004. A corrective action has been issued in this case.

Sample receipt Non Conformances and Comments per Sample:

None

Analytical Non Conformances and Comments:

Batch: LBA-760251 Inorganic Anions by EPA 300
None

Batch: LBA-760281 TDS by SM2540C
None

Certificate of Analysis Summary 333727

R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Samson State BD No. 4

Project Id: L-126-0509
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: Wed May-27-09 08:42 am
Report Date: 10-JUN-09
Project Manager: Brent Barron, II

Analysis Requested											
	Lab Id:	333727-001		333727-002		333727-003		333727-004		333727-005	
	Field Id:	MW-1		MW-2		MW-3		MW-4 (S)		MW-4 (D)	
	Depth:										
	Matrix:	WATER		WATER		WATER		WATER		WATER	
	Sampled:	May-26-09 15:32		May-26-09 14:25		May-26-09 15:55		May-26-09 15:06		May-26-09 15:03	
Anions by EPA 300	*Extracted:*										
	Analyzed:	May-27-09 13:50		May-27-09 13:50		May-27-09 13:50		May-27-09 13:50		May-27-09 13:50	
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL
Chloride *		60.9	5.00	35.8	5.00	3300	100	52.2	5.00	167	5.00
TDS by SM2540C	*Extracted:*										
	Analyzed:	May-27-09 16:00		May-27-09 16:00		May-27-09 16:00		May-27-09 16:00		May-27-09 16:00	
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL
Total dissolved solids		554	5.00	418	5.00	5330	5.00	490	5.00	912	5.00

Brent Barron
Odessa Laboratory Director

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

BRL Below Reporting Limit.

RL Reporting Limit

* Outside XENCO's scope of NELAC Accreditation.

Blank Spike Recovery

Project Name: Samson State BD No. 4

Work Order #: 333727 **Project ID:** L-126-0509

Lab Batch #: 760251 **Sample:** 760251-1-BKS **Matrix:** Water

Date Analyzed: 05/27/2009 **Date Prepared:** 05/27/2009 **Analyst:** LATCOR

Reporting Units: mg/L **Batch #:** 1

Anions by EPA 300 Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
		BLANK /BLANK SPIKE RECOVERY STUDY				
Chloride	ND	10.0	9.68	97	90-110	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

BS / BSD Recoveries

Project Name: Samson State BD No. 4

Work Order #: 333727
Analyst: WRU
Lab Batch ID: 760281
Sample: 760281-1-BKS
Batch #: 1
Units: mg/L

Project ID: L-126-0509
Date Prepared: 05/27/2009
Date Analyzed: 05/27/2009
Matrix: Water

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

TDS by SM2540C Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Total dissolved solids	ND	1000	924	92	1000	972	97	5	80-120	30	

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Form 3 - MS Recoveries

Project Name: Samson State BD No. 4

Work Order #: 333727
Lab Batch #: 760251
Date Analyzed: 05/27/2009
QC- Sample ID: 333690-001 S
Reporting Units: mg/L

Project ID: L-126-0509
Date Prepared: 05/27/2009
Analyst: LATCOR
Batch #: 1
Matrix: Water

Inorganic Anions by EPA 300	MATRIX / MATRIX SPIKE RECOVERY STUDY					
Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
Chloride	52.0	100	150	98	80-120	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

BRL - Below Reporting Limit

Sample Duplicate Recovery

Project Name: Samson State BD No. 4

Work Order #: 333727

Lab Batch #: 760251 **Project ID:** L-126-0509

Date Analyzed: 05/27/2009 **Date Prepared:** 05/27/2009 **Analyst:** LATCOR

QC- Sample ID: 333690-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

Anions by EPA 300	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	52.0	52.7	1	20	

Lab Batch #: 760281

Date Analyzed: 05/27/2009 **Date Prepared:** 05/27/2009 **Analyst:** WRU

QC- Sample ID: 333727-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

TDS by SM2540C	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Total dissolved solids	554	564	2	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

Xenco Laboratories

12600 West I-20 East
Odessa, Texas 79765
Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Dale Littlejohn
Company Name: RT Hicks Consultants Ltd
Company Address: P.O. Box 7624
City/State/Zip: Midland, Texas 79708
Telephone No: (432) 528-3878
Fax No: (432) 689-4578 (Fax)
Sampler Signature: Dale Littlejohn

Project Name: Samson State BD No. 4
Project #: L-126-0509
Project Loc: Lea Co., NM
PO #:

LAB # (lab use only) 533723	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	HNO3	HCl	NaOH	H2SO4	None	Other (Specify)	Matrix: Water	Sludge	Soil	Other (specify)	Analyze For: TPH 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Chlorides	Bromide	Total Dissolved Solids		RUSH TAT (Pre-Schedule)	Standard TAT
01	MW-1	5/28/09	1532	1	X							X														X		X			X
02	MW-2	5/28/09	1425	1	X							X														X		X			X
03	MW-3	5/28/09	1555	1	X							X														X		X			X
04	MW-4(D)	5/26/09	1503	1	X							X														X		X			X
05	MW-4(S)	5/26/09	1506	1	X							X														X		X			X

Special Instructions: Send invoice to RT Hicks Consult. 901 Rio Grande Blvd. NW, Suite F-142, Albuquerque, NM 87104; Send results to Dale Littlejohn at the address above.

Relinquished by:	Date	Time	Received by:	Date	Time
Dale Littlejohn	5/29/09	8:42			
Relinquished by:	Date	Time	Received by ELOT: [signature]	5/29/09	8:42

Sample Containers Intact? Y N
Temperature Upon Receipt:
Laboratory Comments:

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: RT Hicks

Date/ Time: 5.27.09 8.42

Lab ID #: 333727

Initials: AL

Sample Receipt Checklist

				Client Initials
#1 Temperature of container/ cooler?	(Yes)	No	/ °C	
#2 Shipping container in good condition?	(Yes)	No		
#3 Custody Seals intact on shipping container/ cooler?	Yes	No	(Not Present)	
#4 Custody Seals intact on sample bottles/ container?	Yes	No	(Not Present)	
#5 Chain of Custody present?	(Yes)	No		
#6 Sample instructions complete of Chain of Custody?	(Yes)	No		
#7 Chain of Custody signed when relinquished/ received?	(Yes)	No		
#8 Chain of Custody agrees with sample label(s)?	(Yes)	No	ID written on Cont./ Lid	
#9 Container label(s) legible and intact?	(Yes)	No	Not Applicable	
#10 Sample matrix/ properties agree with Chain of Custody?	(Yes)	No		
#11 Containers supplied by ELOT?	(Yes)	No		
#12 Samples in proper container/ bottle?	(Yes)	No	See Below	
#13 Samples properly preserved?	(Yes)	No	See Below	
#14 Sample bottles intact?	(Yes)	No		
#15 Preservations documented on Chain of Custody?	(Yes)	No		
#16 Containers documented on Chain of Custody?	(Yes)	No		
#17 Sufficient sample amount for indicated test(s)?	(Yes)	No	See Below	
#18 All samples received within sufficient hold time?	(Yes)	No	See Below	
#19 Subcontract of sample(s)?	Yes	No	(Not Applicable)	
#20 VOC samples have zero headspace?	Yes	No	(Not Applicable)	

Variance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken: _____

Check all that Apply:

- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

Analytical Report 342171

for

R.T. Hicks Consultants, LTD

Project Manager: Dale Littlejohn

Samson State BD No. 4

L-126-0809

27-AUG-09

12600 West I-20 East Odessa, Texas 79765

Xenco-Houston (EPA Lab code: TX00122):
Texas (T104704215-08-TX), Arizona (AZ0738), Arkansas (08-039-0), Connecticut (PH-0102), Florida (E871002)
Illinois (002082), Indiana (C-TX-02), Iowa (392), Kansas (E-10380), Kentucky (45), Louisiana (03054)
New Hampshire (297408), New Jersey (TX007), New York (11763), Oklahoma (9218), Pennsylvania (68-03610)
Rhode Island (LAO00308), USDA (S-44102)

Xenco-Atlanta (EPA Lab Code: GA00046):
Florida (E87428), North Carolina (483), South Carolina (98015), Utah (AALII), West Virginia (362), Kentucky (85)
Louisiana (04176), USDA (P330-07-00105)

Xenco-Miami (EPA Lab code: FL01152): Florida (E86678), Maryland (330)
Xenco-Tampa Mobile (EPA Lab code: FL01212): Florida (E84900)
Xenco-Odessa (EPA Lab code: TX00158): Texas (T104704400-08-TX)
Xenco-Dallas (EPA Lab code: TX01468): Texas (T104704295-08-TX)
Xenco-Corpus Christi (EPA Lab code: TX02613): Texas (T104704370-08-TX)
Xenco-Boca Raton (EPA Lab Code: FL00449): Florida(E86240),
South Carolina(96031001), Louisiana(04154), Georgia(917)

27-AUG-09

Project Manager: **Dale Littlejohn**
R.T. Hicks Consultants, LTD
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Reference: XENCO Report No: **342171**
Samson State BD No. 4
Project Address: Lea Co., NM

Dale Littlejohn:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 342171. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 342171 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron, II
Odessa Laboratory Manager

Sample Cross Reference 342171

R.T. Hicks Consultants, LTD, Albuquerque, NM

Samson State BD No. 4

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
MW-1	W	Aug-24-09 11:17		342171-001
MW-2	W	Aug-24-09 10:08		342171-002
MW-3	W	Aug-24-09 11:33		342171-003
MW-4 (D)	W	Aug-24-09 10:45		342171-004
MW-4 (S)	W	Aug-24-09 10:50		342171-005

CASE NARRATIVE

Client Name: R.T. Hicks Consultants, LTD
Project Name: Samson State BD No. 4

Project ID: L-126-0809
Work Order Number: 342171

Report Date: 27-AUG-09
Date Received: 08/25/2009

Sample receipt non conformances and Comments:

None

Sample receipt Non Conformances and Comments per Sample:

None

Analytical Non Conformances and Comments:

Batch: LBA-769775 Inorganic Anions by EPA 300
None

Batch: LBA-769958 TDS by SM2540C
None

Certificate of Analysis Summary 342171

R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Samson State BD No. 4

Project Id: L-126-0809
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: Tue Aug-25-09 10:00 am
Report Date: 27-AUG-09
Project Manager: Brent Barron, II

Analysis Requested												
	Lab Id:	342171-001		342171-002		342171-003		342171-004		342171-005		
	Field Id:	MW-1		MW-2		MW-3		MW-4 (D)		MW-4 (S)		
	Depth:											
	Matrix:	WATER		WATER		WATER		WATER		WATER		
	Sampled:	Aug-24-09 11:17		Aug-24-09 10:08		Aug-24-09 11:33		Aug-24-09 10:45		Aug-24-09 10:50		
TDS by SM2540C	*Extracted:*											
	Analyzed:	Aug-25-09 16:30		Aug-25-09 16:30		Aug-25-09 16:30		Aug-25-09 16:30		Aug-25-09 16:30		
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	
Total dissolved solids		586	5.00	424	5.00	5250	5.00	762	5.00	516	5.00	

Brent Barron, II
Odessa Laboratory Manager

Certificate of Analysis Summary 342171

R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Samson State BD No. 4

Project Id: L-126-0809
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: Tue Aug-25-09 10:00 am
Report Date: 27-AUG-09
Project Manager: Brent Barron, II

Analysis Requested	*Lab Id:*	342171-001		342171-002		342171-003		342171-004		342171-005	
	Field Id:	MW-1		MW-2		MW-3		MW-4 (D)		MW-4 (S)	
	Depth:										
	Matrix:	WATER		WATER		WATER		WATER		WATER	
	Sampled:	Aug-24-09 11:17		Aug-24-09 10:08		Aug-24-09 11:33		Aug-24-09 10:45		Aug-24-09 10:50	
Anions by EPA 300	*Extracted:*										
	Analyzed:	Aug-25-09 12:59		Aug-25-09 12:59		Aug-25-09 12:59		Aug-25-09 12:59		Aug-25-09 12:59	
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL
Chloride		65.5	5.00	35.8	5.00	3150	50.0	203	5.00	63.2	5.00

Brent Barron, II
Odessa Laboratory Manager

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

BRL Below Reporting Limit.

RL Reporting Limit

* Outside XENCO's scope of NELAC Accreditation.

Blank Spike Recovery

Project Name: Samson State BD No. 4

Work Order #: 342171 **Project ID:** L-126-0809

Lab Batch #: 769775 **Sample:** 769775-1-BKS **Matrix:** Water

Date Analyzed: 08/25/2009 **Date Prepared:** 08/25/2009 **Analyst:** LATCOR

Reporting Units: mg/L **Batch #:** 1

	BLANK /BLANK SPIKE RECOVERY STUDY					
Anions by EPA 300 **Analytes**	**Blank Result [A]**	**Spike Added [B]**	**Blank Spike Result [C]**	**Blank Spike %R [D]**	**Control Limits %R**	**Flags**
Chloride	ND	10.0	9.33	93	80-120	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

BS / BSD Recoveries

Project Name: Samson State BD No. 4

Work Order #: 342171
Analyst: WRU
Lab Batch ID: 769958
Sample: 769958-1-BKS
Batch #: 1
Units: mg/L

Date Prepared: 08/25/2009
Project ID: L-126-0809
Date Analyzed: 08/25/2009
Matrix: Water

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

TDS by SM2540C Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Total dissolved solids	ND	1000	932	93	1000	936	94	0	80-120	30	

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Form 3 - MS Recoveries

Project Name: Samson State BD No. 4

Work Order #: 342171
Lab Batch #: 769775
Project ID: L-126-0809
Date Analyzed: 08/25/2009
Date Prepared: 08/25/2009
Analyst: LATCOR
QC- Sample ID: 342088-001 S
Batch #: 1
Matrix: Water
Reporting Units: mg/L

Inorganic Anions by EPA 300	MATRIX / MATRIX SPIKE RECOVERY STUDY					
Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
Chloride	139	100	230	91	80-120	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

BRL - Below Reporting Limit

Sample Duplicate Recovery

Project Name: Samson State BD No. 4

Work Order #: 342171

Lab Batch #: 769775 **Project ID:** L-126-0809

Date Analyzed: 08/25/2009 **Date Prepared:** 08/25/2009 **Analyst:** LATCOR

QC- Sample ID: 342088-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

Anions by EPA 300	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	139	142	2	20	

Lab Batch #: 769958

Date Analyzed: 08/25/2009 **Date Prepared:** 08/25/2009 **Analyst:** WRU

QC- Sample ID: 342171-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

TDS by SM2540C	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Total dissolved solids	586	576	2	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

Xenco Laboratories

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Dale Littlejohn

Company Name: RT Hicks Consultants Ltd

Company Address: P.O. Box 7624

City/State/Zip: Midland, Texas 79708

Telephone No: (432) 528-3878

Fax No: (432) 689-4578 (Fax)

Sampler Signature: Dale Littlejohn

Project Name: Samson State BD No. 4

Project #: L-126-0809

Project Loc: Lea Co., NM

PO #:

LAB # 342771 (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Ice	HNO3	HCl	NaOH	H2SO4	None	Other (Specify)	Water	Sludge	Soil	Other (specify)	TPH 418.1 / 8015M 1005 / 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Chloride	Bromide	Total Dissolved Solids		RUSH TAT (Pre-Schedule)	Standard TAT
01	MW-1	8/24/09	1117	1	X							X														X		X			X
02	MW-2	8/24/09	1008	1	X							X														X		X			X
03	MW-3	8/24/09	1133	1	X							X														X		X			X
04	MW-4(D)	8/24/09	1045	1	X							X														X		X			X
05	MW-4(S)	8/24/09	1050	1	X							X														X		X			X

Analyze For: TCLP / TOTAL

Special Instructions: Send Invoice to RT Hicks Consult, 901 Rio Grande Blvd, NW, Suite F-142, Albuquerque, NM 87104; Send results to Dale Littlejohn at the adress above.

Sample Containers Intact? Y
Temperature Upon Receipt: 3.1
Laboratory Comments:

Relinquished by	Date	Time	Received by	Date	Time
Dale Littlejohn	8/25/09	1000			
			Received by ELOT: Andrea [illegible]	8-25-09	10:00

11.2

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: R.T. Hicks

Date/ Time: 8.25.09 10:00

Lab ID #: 342171

Initials: AL

Sample Receipt Checklist

				Client Initials
#1 Temperature of container/ cooler?	Yes	No	3 °C	
#2 Shipping container in good condition?	Yes	No		
#3 Custody Seals intact on shipping container/ cooler?	Yes	No	Not Present	
#4 Custody Seals intact on sample bottles/ container?	Yes	No	Not Present	
#5 Chain of Custody present?	Yes	No		
#6 Sample Instructions complete of Chain of Custody?	Yes	No		
#7 Chain of Custody signed when relinquished/ received?	Yes	No		
#8 Chain of Custody agrees with sample label(s)?	Yes	No	ID written on Cont./ Lid	
#9 Container label(s) legible and intact?	Yes	No	Not Applicable	
#10 Sample matrix/ properties agree with Chain of Custody?	Yes	No		
#11 Containers supplied by ELOT?	Yes	No		
#12 Samples in proper container/ bottle?	Yes	No	See Below	
#13 Samples properly preserved?	Yes	No	See Below	
#14 Sample bottles intact?	Yes	No		
#15 Preservations documented on Chain of Custody?	Yes	No		
#16 Containers documented on Chain of Custody?	Yes	No		
#17 Sufficient sample amount for indicated test(s)?	Yes	No	See Below	
#18 All samples received within sufficient hold time?	Yes	No	See Below	
#19 Subcontract of sample(s)?	Yes	No	Not Applicable	
#20 VOC samples have zero headspace?	Yes	No	Not Applicable	

Variance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken: _____

Check all that Apply:

- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

Analytical Report 350773

for

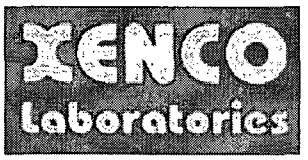
R.T. Hicks Consultants, LTD

Project Manager: Dale Littlejohn

Samson State BD No. 4

L-126-1109

16-NOV-09



12600 West I-20 East Odessa, Texas 79765

Xenco-Houston (EPA Lab code: TX00122):
Texas (T104704215-08-TX), Arizona (AZ0738), Arkansas (08-039-0), Connecticut (PH-0102), Florida (E871002)
Illinois (002082), Indiana (C-TX-02), Iowa (392), Kansas (E-10380), Kentucky (45), Louisiana (03054)
New Hampshire (297408), New Jersey (TX007), New York (11763), Oklahoma (9218), Pennsylvania (68-03610)
Rhode Island (LAO00308), USDA (S-44102)

Xenco-Atlanta (EPA Lab Code: GA00046):
Florida (E87428), North Carolina (483), South Carolina (98015), Utah (AALI1), West Virginia (362), Kentucky (85)
Louisiana (04176), USDA (P330-07-00105)

Xenco-Miami (EPA Lab code: FL01152): Florida (E86678), Maryland (330)
Xenco-Tampa Mobile (EPA Lab code: FL01212): Florida (E84900)
Xenco-Odessa (EPA Lab code: TX00158): Texas (T104704400-08-TX)
Xenco-Dallas (EPA Lab code: TX01468): Texas (T104704295-08-TX)
Xenco-Corpus Christi (EPA Lab code: TX02613): Texas (T104704370-08-TX)
Xenco-Boca Raton (EPA Lab Code: FL00449): Florida(E86240),
South Carolina(96031001), Louisiana(04154), Georgia(917)

16-NOV-09

Project Manager: **Dale Littlejohn**
R.T. Hicks Consultants, LTD
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Reference: XENCO Report No: **350773**
Samson State BD No. 4
Project Address: Lea Co., NM

Dale Littlejohn:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 350773. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 350773 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron, II
Odessa Laboratory Manager

Sample Cross Reference 350773

R.T. Hicks Consultants, LTD, Albuquerque, NM

Samson State BD No. 4

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
MW-1	W	Nov-02-09 15:33		350773-001
MW-2	W	Nov-02-09 14:23		350773-002
MW-3	W	Nov-02-09 15:53		350773-003
MW-4 (D)	W	Nov-02-09 14:55		350773-004
MW-4 (S)	W	Nov-02-09 15:07		350773-005

CASE NARRATIVE

Client Name: R.T. Hicks Consultants, LTD
Project Name: Samson State BD No. 4

Project ID: L-126-1109
Work Order Number: 350773

Report Date: 16-NOV-09
Date Received: 11/03/2009

Sample receipt non conformances and Comments:

None

Sample receipt Non Conformances and Comments per Sample:

None

Analytical Non Conformances and Comments:

Batch: LBA-780328 Anions by E300
None

Batch: LBA-780417 TDS by SM2540C
None

Certificate of Analysis Summary 350773

R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Samson State BD No. 4

Project Id: L-126-1109
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: Tue Nov-03-09 04:03 pm
Report Date: 16-NOV-09
Project Manager: Brent Barron, II

Analysis Requested	*Lab Id:*	350773-001		350773-002		350773-003		350773-004		350773-005	
	Field Id:	MW-1		MW-2		MW-3		MW-4 (D)		MW-4 (S)	
	Depth:										
	Matrix:	WATER		WATER		WATER		WATER		WATER	
	Sampled:	Nov-02-09 15:33		Nov-02-09 14:23		Nov-02-09 15:53		Nov-02-09 14:55		Nov-02-09 15:07	
Anions by E300	*Extracted:*										
	Analyzed:	Nov-04-09 22:36		Nov-04-09 22:36		Nov-04-09 22:36		Nov-04-09 22:36		Nov-04-09 22:36	
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL
Chloride		82.5	5.00	41.5	5.00	6100	100	223	5.00	72.9	5.00
TDS by SM2540C	*Extracted:*										
	Analyzed:	Nov-04-09 15:42		Nov-04-09 15:42		Nov-04-09 15:42		Nov-04-09 15:42		Nov-04-09 15:42	
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL
Total dissolved solids		540	5.00	406	5.00	9110	5.00	926	5.00	470	5.00

Brent Barron, II
Odessa Laboratory Manager

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

BRL Below Reporting Limit.

RL Reporting Limit

* Outside XENCO's scope of NELAC Accreditation.

Blank Spike Recovery

Project Name: Samson State BD No. 4

Work Order #: 350773 **Project ID:** L-126-1109

Lab Batch #: 780328 **Sample:** 780328-1-BKS **Matrix:** Water

Date Analyzed: 11/04/2009 **Date Prepared:** 11/04/2009 **Analyst:** LATCOR

Reporting Units: mg/L **Batch #:** 1

BLANK /BLANK SPIKE RECOVERY STUDY

Anions by E300 Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Chloride	ND	10.0	10.5	105	90-110	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

BS / BSD Recoveries

Project Name: Samson State BD No. 4

Work Order #: 350773 **Project ID:** L-126-1109

Analyst: WRU **Date Prepared:** 11/04/2009 **Date Analyzed:** 11/04/2009

Lab Batch ID: 780417 **Sample:** 780417-1-BKS **Batch #:** 1 **Matrix:** Water

Units: mg/L

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

TDS by SM2540C Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Total dissolved solids	ND	1000	900	90	1000	914	91	2	80-120	30	

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Form 3 - MS Recoveries

Project Name: Samson State BD No. 4

Work Order #: 350773
Lab Batch #: 780328
Project ID: L-126-1109
Date Analyzed: 11/04/2009
Date Prepared: 11/04/2009
Analyst: LATCOR
QC- Sample ID: 350773-001 S
Batch #: 1
Matrix: Water
Reporting Units: mg/L

Inorganic Anions by EPA 300	MATRIX / MATRIX SPIKE RECOVERY STUDY					
Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
Chloride	82.5	100	183	101	90-110	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

BRL - Below Reporting Limit

Sample Duplicate Recovery

Project Name: Samson State BD No. 4

Work Order #: 350773

Lab Batch #: 780328 **Project ID:** L-126-1109

Date Analyzed: 11/04/2009 **Date Prepared:** 11/04/2009 **Analyst:** LATCOR

QC- Sample ID: 350773-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

Anions by E300 Analyte	SAMPLE / SAMPLE DUPLICATE RECOVERY				
	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	82.5	75.7	9	20	

Lab Batch #: 780417

Date Analyzed: 11/04/2009 **Date Prepared:** 11/04/2009 **Analyst:** WRU

QC- Sample ID: 350773-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

TDS by SM2540C Analyte	SAMPLE / SAMPLE DUPLICATE RECOVERY				
	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Total dissolved solids	540	584	8	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

Xenco Laboratories

12600 West I-20 East
Odessa, Texas 79765
Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Dale Littlejohn
Company Name: RT Hicks Consultants Ltd
Company Address: P.O. Box 7624
City/State/Zip: Midland, Texas 79708
Telephone No: (432) 528-3878
Fax No: (432) 689-4578 (Fax)
Sampler Signature: Dale Littlejohn

Project Name: Samson State BD No. 4
Project #: L-126-1109
Project Loc: Lea Co., NM
PO #:

LAB # 350773 (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Matrix: Water	Sludge	Soil	Other (specify)	Analyze For: TCLP: TPH: 418.1 8015M 1005 1006	TOTAL: TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Chloride	Bromide	Total Dissolved Solids		RUSH TAT (Pre-Schedule)	Standard TAT
-01	MW-1	11/2/09	1533	1	X							X															X		X			X
-02	MW-2	11/2/09	1423	1	X							X															X		X			X
-03	MW-3	11/2/09	1553	1	X							X															X		X			X
-04	MW-4(D)	11/2/09	1455	1	X							X															X		X			X
-05	MW-4(S)	11/2/09	1507	1	X							X															X		X			X

Special Instructions: Send Invoice to RT Hicks Consult. 901 Rio Grande Blvd. NW, Suite F-142, Albuquerque, NM 87104; Send results to Dale Littlejohn at the adress above.

Sample Containers Intact? (Y) N
Temperature Upon Receipt: .1
Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Dale Littlejohn	11/3/09	1603			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
			Andrea Sam	11.3.09	16:03

w/labels no seals

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: R.T. Hicks

Date/ Time: 11.3.09 16:03

Lab ID # : 350773

Initials: AL

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	(Yes)	No	0.1 °C	
#2	Shipping container in good condition?	(Yes)	No		
#3	Custody Seals intact on shipping container/ cooler?	Yes	No	(Not Present)	
#4	Custody Seals intact on sample bottles/ container?	Yes	No	(Not Present)	
#5	Chain of Custody present?	(Yes)	No		
#6	Sample instructions complete of Chain of Custody?	(Yes)	No		
#7	Chain of Custody signed when relinquished/ received?	(Yes)	No		
#8	Chain of Custody agrees with sample label(s)?	(Yes)	No	ID written on Cont./ Lid	
#9	Container label(s) legible and intact?	(Yes)	No	Not Applicable	
#10	Sample matrix/ properties agree with Chain of Custody?	(Yes)	No		
#11	Containers supplied by ELOT?	(Yes)	No		
#12	Samples in proper container/ bottle?	(Yes)	No	See Below	
#13	Samples properly preserved?	(Yes)	No	See Below	
#14	Sample bottles intact?	(Yes)	No		
#15	Preservations documented on Chain of Custody?	(Yes)	No		
#16	Containers documented on Chain of Custody?	(Yes)	No		
#17	Sufficient sample amount for indicated test(s)?	(Yes)	No	See Below	
#18	All samples received within sufficient hold time?	(Yes)	No	See Below	
#19	Subcontract of sample(s)?	Yes	No	(Not Applicable)	
#20	VOC samples have zero headspace?	Yes	No	(Not Applicable)	

Variance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken:

Check all that Apply:

- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

Analytical Report 357607

for

RT Hicks Consultants Ltd. (Midland)

Project Manager: Dale Littlejohn

Samson State BD No. 4

L-126-0110

11-JAN-10

12600 West I-20 East Odessa, Texas 79765

Xenco-Houston (EPA Lab code: TX00122):
Texas (T104704215-08-TX), Arizona (AZ0738), Arkansas (08-039-0), Connecticut (PH-0102), Florida (E871002)
Illinois (002082), Indiana (C-TX-02), Iowa (392), Kansas (E-10380), Kentucky (45), Louisiana (03054)
New Hampshire (297408), New Jersey (TX007), New York (11763), Oklahoma (9218), Pennsylvania (68-03610)
Rhode Island (LAO00308), USDA (S-44102)

Xenco-Atlanta (EPA Lab Code: GA00046):
Florida (E87429), North Carolina (483), South Carolina (98015), Utah (AALI1), West Virginia (362), Kentucky (85)
Louisiana (04176), USDA (P330-07-00105)

Xenco-Miami (EPA Lab code: FL01152): Florida (E86678), Maryland (330)
Xenco-Tampa Mobile (EPA Lab code: FL01212): Florida (E84900)
Xenco-Odessa (EPA Lab code: TX00158): Texas (T104704400-08-TX)
Xenco-Dallas (EPA Lab code: TX01468): Texas (T104704295-08-TX)
Xenco-Corpus Christi (EPA Lab code: TX02613): Texas (T104704370-08-TX)
Xenco-Boca Raton (EPA Lab Code: FL00449): Florida(E86240),
South Carolina(96031001), Louisiana(04154), Georgia(917)

11-JAN-10

Project Manager: **Dale Littlejohn**
RT Hicks Consultants Ltd. (Midland)
P.O. Box 7624

Midland, TX 79708

Reference: XENCO Report No: **357607**
Samson State BD No. 4
Project Address: Lea Co., NM

Dale Littlejohn:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 357607. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 357607 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron, II
Odessa Laboratory Manager

Sample Cross Reference 357607

RT Hicks Consultants Ltd. (Midland), Midland, TX

Samson State BD No. 4

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
MW-3	W	Jan-05-10 14:30		357607-001
MW-4 s	W	Jan-05-10 13:42		357607-002
MW-4 d	W	Jan-05-10 14:24		357607-003

CASE NARRATIVE

Client Name: RT Hicks Consultants Ltd. (Midland)
Project Name: Samson State BD No. 4

Project ID: *L-126-0110* *Report Date:* *11-JAN-10*
Work Order Number: *357607* *Date Received:* *01/06/2010*

Sample receipt non conformances and Comments:

None

Sample receipt Non Conformances and Comments per Sample:

None

Analytical Non Conformances and Comments:

Batch: LBA-788426 Inorganic Anions by EPA 300
None

Batch: LBA-788826 TDS by SM2540C
None

Certificate of Analysis Summary 357607

RT Hicks Consultants Ltd. (Midland), Midland, TX

Project Name: Samson State BD No. 4

Project Id: L-126-0110
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: Wed Jan-06-10 10:07 am
Report Date: 11-JAN-10
Project Manager: Brent Barron, II

Analysis Requested											
	Lab Id:	357607-001		357607-002		357607-003					
	Field Id:	MW-3		MW-4 s		MW-4 d					
	Depth:										
	Matrix:	WATER		WATER		WATER					
	Sampled:	Jan-05-10 14:30		Jan-05-10 13:42		Jan-05-10 14:24					
Anions by E300	*Extracted:*										
	Analyzed:	Jan-06-10 17:14		Jan-06-10 17:14		Jan-06-10 17:14					
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL				
Chloride		8110	250	87.4	5.00	372	5.00				
TDS by SM2540C	*Extracted:*										
	Analyzed:	Jan-08-10 12:40		Jan-08-10 12:40		Jan-08-10 12:40					
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL				
Total dissolved solids		12700	5.00	462	5.00	1110	5.00				

Brent Barron, II
Odessa Laboratory Manager

Final Ver. 1.000

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

BRL Below Reporting Limit.

RL Reporting Limit

* Outside XENCO's scope of NELAC Accreditation.

Blank Spike Recovery

Project Name: Samson State BD No. 4

Work Order #: 357607 **Project ID:** L-126-0110

Lab Batch #: 788426 **Sample:** 788426-1-BKS **Matrix:** Water

Date Analyzed: 01/06/2010 **Date Prepared:** 01/06/2010 **Analyst:** LATCOR

Reporting Units: mg/L **Batch #:** 1

	BLANK /BLANK SPIKE RECOVERY STUDY					
Anions by E300 **Analytes**	**Blank Result [A]**	**Spike Added [B]**	**Blank Spike Result [C]**	**Blank Spike %R [D]**	**Control Limits %R**	**Flags**
Chloride	ND	11.0	11.2	102	90-110	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

BS / BSD Recoveries

Project Name: Samson State BD No. 4

Work Order #: 357607
Analyst: WRU
Lab Batch ID: 788826
Sample: 788826-1-BKS
Batch #: 1
Units: mg/L

Date Prepared: 01/08/2010
Project ID: L-126-0110
Date Analyzed: 01/08/2010
Matrix: Water

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

TDS by SM2540C Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Total dissolved solids	ND	1000	962	96	1000	952	95	1	80-120	30	

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Form 3 - MS Recoveries

Project Name: Samson State BD No. 4

Work Order #: 357607
Lab Batch #: 788426
Project ID: L-126-0110
Date Analyzed: 01/06/2010
Date Prepared: 01/06/2010
Analyst: LATCOR
QC- Sample ID: 357607-002 S
Batch #: 1
Matrix: Water
Reporting Units: mg/L

Inorganic Anions by EPA 300	MATRIX / MATRIX SPIKE RECOVERY STUDY					
Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
Chloride	87.4	100	189	102	90-110	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

BRL - Below Reporting Limit

Sample Duplicate Recovery

Project Name: Samson State BD No. 4

Work Order #: 357607

Lab Batch #: 788426 **Project ID:** L-126-0110

Date Analyzed: 01/06/2010 **Date Prepared:** 01/06/2010 **Analyst:** LATCOR

QC- Sample ID: 357607-002 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

Anions by E300 Analyte	SAMPLE / SAMPLE DUPLICATE RECOVERY				
	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	87.4	83.7	4	20	

Lab Batch #: 788826

Date Analyzed: 01/08/2010 **Date Prepared:** 01/08/2010 **Analyst:** WRU

QC- Sample ID: 357606-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

TDS by SM2540C Analyte	SAMPLE / SAMPLE DUPLICATE RECOVERY				
	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Total dissolved solids	10300	9690	6	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

Xenco Laboratories

12600 West I-20 East
Odessa, Texas 79765
Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Dale Littlejohn
Company Name: RT Hicks Consultants Ltd
Company Address: P.O. Box 7624
City/State/Zip: Midland, Texas 79708
Telephone No: (432) 528-3878
Fax No: (432) 689-4578 (Fax)
Sampler Signature: Dale Littlejohn

Project Name: Samson State BD No. 4
Project #: L-126-0110
Project Loc: Lea Co., NM
PO #:

LAB # 357607 (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice (Lab)	Preservative: HNO_3	Preservative: HCl	Preservative: NaOH	Preservative: H_2SO_4	Preservative: None	Preservative: Other (Specify)	Matrix: Water	Matrix: Sludge	Matrix: Soil	Matrix: Other (specify)	Analyze For: TCLP: TPH: 418.1 8015M 1005 1006	TCLP: Cations (Ca, Mg, Na, K)	TCLP: Anions (Cl, SO4, CO3, HCO3)	TCLP: SAR / ESP / CEC	TCLP: Metals: As Ag Ba Cd Cr Pb Hg Se	TCLP: Volatiles	TCLP: Semivolatiles	TCLP: BTEX 8021B/5030 or BTEX 8260	TOTAL: RCI	TOTAL: N.O.R.M.	TOTAL: Chloride	TOTAL: Bromide	TOTAL: Total Dissolved Solids		RUSH TAT (Pre-Schedule)	Standard TAT
01	MW-3	1/5/10	1430	1	X							X														X		X			X
02	MW-4s	1/5/10	1342	1	X							X														X		X			X
03	MW-4d	1/5/10	1424	1	X							X														X		X			X

Special Instructions: Send Invoice to RT Hicks Consult. 901 Rio Grande Blvd. NW, Suite F-142, Albuquerque, NM 87104; Send results to Dale Littlejohn at the adress above.

Sample Containers Intact? (Y) N
Temperature Upon Receipt: 1.1
Laboratory Comments: ID written on container

Relinquished by:	Date	Time	Received by:	Date	Time
Dale Littlejohn	1/6/10	1007			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
			Andrea Sam	1-6-10	10:07

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: RT Hicks

Date/ Time: 1.6.10 10:07

Lab ID #: 357607

Initials: AL

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	(Yes)	No	1.1 °C	
#2	Shipping container in good condition?	(Yes)	No		
#3	Custody Seals intact on shipping container/ cooler?	Yes	No	(Not Present)	
#4	Custody Seals intact on sample bottles/ container?	Yes	No	(Not Present)	
#5	Chain of Custody present?	(Yes)	No		
#6	Sample instructions complete of Chain of Custody?	(Yes)	No		
#7	Chain of Custody signed when relinquished/ received?	(Yes)	No		
#8	Chain of Custody agrees with sample label(s)?	Yes	No	(ID written on Cont./ Lid)	
#9	Container label(s) legible and intact?	Yes	No	(Not Applicable)	
#10	Sample matrix/ properties agree with Chain of Custody?	(Yes)	No		
#11	Containers supplied by ELOT?	(Yes)	No		
#12	Samples in proper container/ bottle?	(Yes)	No	See Below	
#13	Samples properly preserved?	(Yes)	No	See Below	
#14	Sample bottles intact?	(Yes)	No		
#15	Preservations documented on Chain of Custody?	(Yes)	No		
#16	Containers documented on Chain of Custody?	(Yes)	No		
#17	Sufficient sample amount for indicated test(s)?	(Yes)	No	See Below	
#18	All samples received within sufficient hold time?	(Yes)	No	See Below	
#19	Subcontract of sample(s)?	Yes	No	(Not Applicable)	
#20	VOC samples have zero headspace?	Yes	No	(Not Applicable)	

Variance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken: _____

Check all that Apply:

- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

Analytical Report 363834

for

R.T. Hicks Consultants, LTD

Project Manager: Dale Littlejohn

Samson State BD No. 4

L-126-0210

16-MAR-10

12600 West I-20 East Odessa, Texas 79765

Xenco-Houston (EPA Lab code: TX00122):
Texas (T104704215-TX), Arizona (AZ0738), Arkansas (08-039-0), Connecticut (PH-0102), Florida (E871002)
Illinois (002082), Indiana (C-TX-02), Iowa (392), Kansas (E-10380), Kentucky (45), Louisiana (03054)
New Hampshire (297408), New Jersey (TX007), New York (11763), Oklahoma (9218), Pennsylvania (68-03610)
Rhode Island (LAO00312), USDA (S-44102)

Xenco-Atlanta (EPA Lab Code: GA00046):
Florida (E87429), North Carolina (483), South Carolina (98015), Utah (AALI1), West Virginia (362), Kentucky (85)
Louisiana (04176), USDA (P330-07-00105)

Xenco-Miami (EPA Lab code: FL01152): Florida (E86678), Maryland (330)
Xenco-Tampa Mobile (EPA Lab code: FL01212): Florida (E84900)
Xenco-Odessa (EPA Lab code: TX00158): Texas (T104704400-TX)
Xenco-Dallas (EPA Lab code: TX01468): Texas (T104704295-TX)
Xenco-Corpus Christi (EPA Lab code: TX02613): Texas (T104704370)
Xenco-Boca Raton (EPA Lab Code: FL00449):
Florida(E86240),South Carolina(96031001), Louisiana(04154), Georgia(917)
North Carolina(444), Texas(T104704468-TX), Illinois(002295)

16-MAR-10

Project Manager: **Dale Littlejohn**
R.T. Hicks Consultants, LTD
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

Reference: XENCO Report No: **363834**
Samson State BD No. 4
Project Address: Lea Co., NM

Dale Littlejohn:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 363834. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 363834 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron, II
Odessa Laboratory Manager

Sample Cross Reference 363834

R.T. Hicks Consultants, LTD, Albuquerque, NM

Samson State BD No. 4

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
MW-1	W	Feb-26-10 11:41		363834-001
MW-2	W	Feb-26-10 12:49		363834-002
MW-4 D	W	Feb-26-10 09:32		363834-003
MW-4 S	W	Feb-26-10 10:26		363834-004
MW-3 D	W	Feb-26-10 14:05		363834-005
MW-3 S	W	Feb-26-10 14:00		363834-006

CASE NARRATIVE

Client Name: R.T. Hicks Consultants, LTD
Project Name: Samson State BD No. 4

Project ID: *L-126-0210*
Work Order Number: *363834*

Report Date: *16-MAR-10*
Date Received: *03/01/2010*

Sample receipt non conformances and Comments:

None

Sample receipt Non Conformances and Comments per Sample:

None

Analytical Non Conformances and Comments:

Batch: LBA-796498 Inorganic Anions by EPA 300
None

Batch: LBA-796873 TDS by SM2540C
None

Certificate of Analysis Summary 363834

R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Samson State BD No. 4

Project Id: L-126-0210
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: Mon Mar-01-10 11:15 am
Report Date: 16-MAR-10
Project Manager: Brent Barron, II

Analysis Requested													
	Lab Id:	363834-001		363834-002		363834-003		363834-004		363834-005		363834-006	
	Field Id:	MW-1		MW-2		MW-4 D		MW-4 S		MW-3 D		MW-3 S	
	Depth:												
	Matrix:	WATER		WATER		WATER		WATER		WATER		WATER	
	Sampled:	Feb-26-10 11:41		Feb-26-10 12:49		Feb-26-10 09:32		Feb-26-10 10:26		Feb-26-10 14:05		Feb-26-10 14:00	
Anions by E300	*Extracted:*												
	Analyzed:	Mar-15-10 15:05		Mar-15-10 15:05		Mar-15-10 15:05		Mar-15-10 15:05		Mar-15-10 15:05		Mar-15-10 15:05	
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL
Chloride		74.5	5.00	38.2	5.00	429	5.00	67.0	5.00	3510	250	4600	100
TDS by SM2540C	*Extracted:*												
	Analyzed:	Mar-03-10 14:50		Mar-03-10 14:50		Mar-03-10 14:50		Mar-03-10 14:50		Mar-03-10 14:50		Mar-03-10 14:50	
	Units/RL:	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL	mg/L	RL
Total dissolved solids		558	5.00	358	5.00	1210	5.00	464	5.00	10800	5.00	8340	5.00

Brent Barron, II
Odessa Laboratory Manager

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL and above the SQL.

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

JN A combination of the "N" and the "J" qualifier. The analysis indicates that the analyte is "tentatively identified" and the associated numerical value may not be consistent with the amount actually present in the environmental sample.

BRL Below Reporting Limit.

RL Reporting Limit

* Outside XENCO's scope of NELAC Accreditation.

Blank Spike Recovery

Project Name: Samson State BD No. 4

Work Order #: 363834 **Project ID:** L-126-0210

Lab Batch #: 796498 **Sample:** 796498-1-BKS **Matrix:** Water

Date Analyzed: 03/03/2010 **Date Prepared:** 03/03/2010 **Analyst:** LATCOR

Reporting Units: mg/L **Batch #:** 1

Anions by E300 Analytes	Blank Result [A]	BLANK /BLANK SPIKE RECOVERY STUDY Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
Chloride	ND	8.00	7.05	88	90-110	L

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

BS / BSD Recoveries

Project Name: Samson State BD No. 4

Work Order #: 363834
Analyst: WRU
Lab Batch ID: 796873
Sample: 796873-1-BKS
Batch #: 1
Units: mg/L

Date Prepared: 03/03/2010
Project ID: L-126-0210
Date Analyzed: 03/03/2010
Matrix: Water

BLANK /BLANK SPIKE / BLANK SPIKE DUPLICATE RECOVERY STUDY

TDS by SM2540C Analytes	Blank Sample Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Spike Added [E]	Blank Spike Duplicate Result [F]	Blk. Spk Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Total dissolved solids	ND	1000	888	89	1000	906	91	2	80-120	30	

Relative Percent Difference RPD = 200*|(C-F)/(C+F)|
Blank Spike Recovery [D] = 100*(C)/[B]
Blank Spike Duplicate Recovery [G] = 100*(F)/[E]
All results are based on MDL and Validated for QC Purposes

Form 3 - MS Recoveries

Project Name: Samson State BD No. 4

Work Order #: 363834
Lab Batch #: 796498
Project ID: L-126-0210
Date Analyzed: 03/03/2010
Date Prepared: 03/03/2010
Analyst: LATCOR
QC- Sample ID: 363833-001 S
Batch #: 1
Matrix: Water
Reporting Units: mg/L

Inorganic Anions by EPA 300	MATRIX / MATRIX SPIKE RECOVERY STUDY					
Analytes	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	%R [D]	Control Limits %R	Flag
Chloride	2570	1000	3610	104	90-110	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

BRL - Below Reporting Limit

Sample Duplicate Recovery

Project Name: Samson State BD No. 4

Work Order #: 363834

Lab Batch #: 796498 **Project ID:** L-126-0210

Date Analyzed: 03/03/2010 **Date Prepared:** 03/03/2010 **Analyst:** LATCOR

QC- Sample ID: 363833-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

Anions by E300 Analyte	SAMPLE / SAMPLE DUPLICATE RECOVERY				
	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	2570	2490	3	20	

Lab Batch #: 796873

Date Analyzed: 03/03/2010 **Date Prepared:** 03/03/2010 **Analyst:** WRU

QC- Sample ID: 363833-001 D **Batch #:** 1 **Matrix:** Water

Reporting Units: mg/L

TDS by SM2540C Analyte	SAMPLE / SAMPLE DUPLICATE RECOVERY				
	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Total dissolved solids	7120	7830	9	30	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.
BRL - Below Reporting Limit

Xenco Laboratories

12600 West I-20 East
Odessa, Texas 79765

Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Dale Littlejohn
Company Name RT Hicks Consultants Ltd
Company Address: P.O. Box 7624
City/State/Zip: Midland, Texas 79708
Telephone No: (432) 528-3878 **Fax No:** (432) 689-4578 (Fax)
Sampler Signature: Dale Littlejohn

Project Name: Samson State BD No. 4
Project #: L-126-0210
Project Loc: Lea Co., NM
PO #:

363834 LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Matrix: Water	Sludge	Soil	Other (specify):	Analyze For (TCLP: / TOTAL:): TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030 or BTEX 8260	RCI	N.O.R.M.	Chloride	Bromide	Total Dissolved Solids		RUSH TAT (Pre-Schedule)	Standard TAT
-01	MW-1	2/26/10	1141	1	X							X														X		X			X
-02	MW-2	2/26/10	1249	1	X							X														X		X			X
-03	MW-4d	2/26/10	0932	1	X							X														X		X			X
-04	MW-4s	2/26/10	1026	1	X							X														X		X			X
-05	MW-3d	2/26/10	1405	1	X							X														X		X			X
-06	MW-3s	2/26/10	1400	1	X							X														X		X			X

Special Instructions: Send Invoice to RT Hicks Consult. 901 Rio Grande Blvd. NW, Suite F-142, Albuquerque, NM 87104; Send results to Dale Littlejohn at the adress above.

Relinquished by:	Date	Time	Received by:	Date	Time
Dale Littlejohn	3/1/10	1115			
Relinquished by:	Date	Time	Received by ELOT: Andrea Lam	3.1.10	11:15

Sample Containers Intact? (Y) N
Temperature Upon Receipt: 2.1
Laboratory Comments:
1 Don Lid | 1 L poly

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: R.T. Hicks

Date/ Time: 3.1.10 11:15

Lab ID #: 363884

Initials: AL

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	(Yes)	No	2.1 °C	
#2	Shipping container in good condition?	(Yes)	No		
#3	Custody Seals intact on shipping container/ cooler?	Yes	No	(Not Present)	
#4	Custody Seals intact on sample bottles/ container?	Yes	No	(Not Present)	
#5	Chain of Custody present?	(Yes)	No		
#6	Sample instructions complete of Chain of Custody?	(Yes)	No		
#7	Chain of Custody signed when relinquished/ received?	(Yes)	No		
#8	Chain of Custody agrees with sample label(s)?	Yes	No	(ID written on Cont./ Lid)	
#9	Container label(s) legible and intact?	Yes	No	(Not Applicable)	
#10	Sample matrix/ properties agree with Chain of Custody?	(Yes)	No		
#11	Containers supplied by ELOT?	(Yes)	No		
#12	Samples in proper container/ bottle?	(Yes)	No	See Below	
#13	Samples properly preserved?	(Yes)	No	See Below	
#14	Sample bottles intact?	(Yes)	No		
#15	Preservations documented on Chain of Custody?	(Yes)	No		
#16	Containers documented on Chain of Custody?	(Yes)	No		
#17	Sufficient sample amount for indicated test(s)?	(Yes)	No	See Below	
#18	All samples received within sufficient hold time?	(Yes)	No	See Below	
#19	Subcontract of sample(s)?	Yes	No	(Not Applicable)	
#20	VOC samples have zero headspace?	Yes	No	(Not Applicable)	

Variance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken: _____

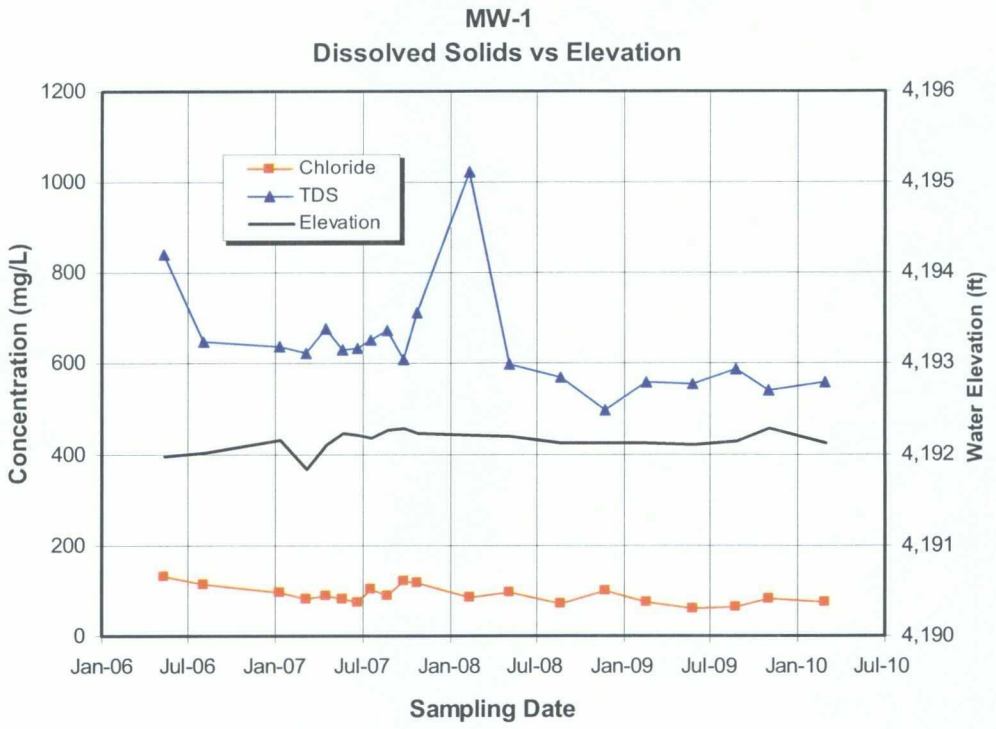
Check all that Apply:

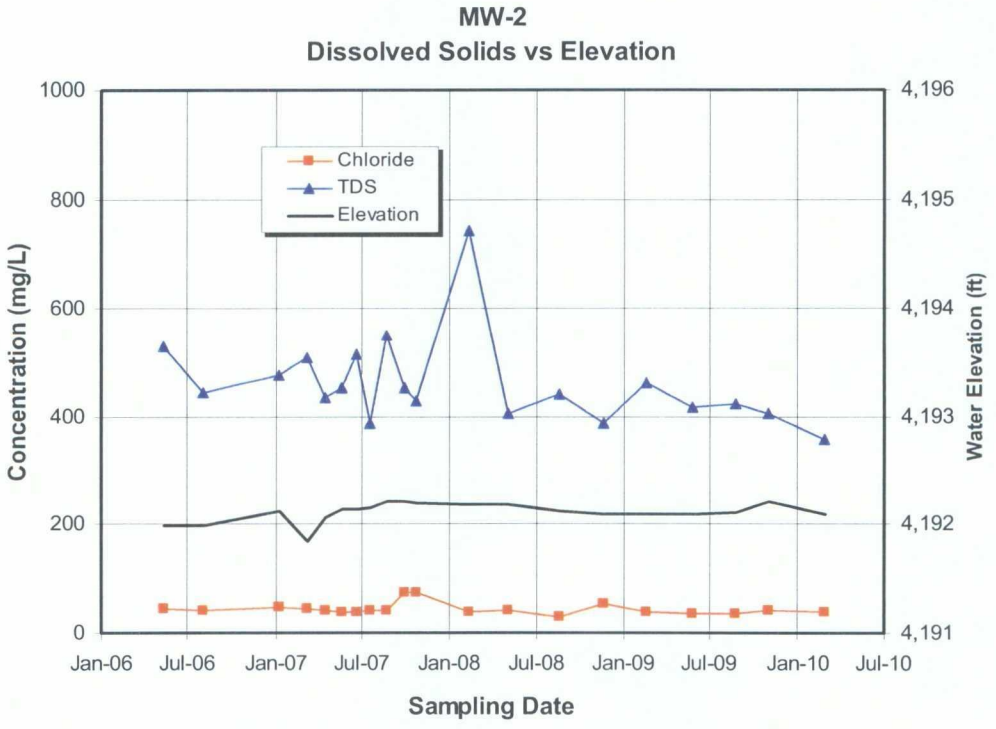
- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

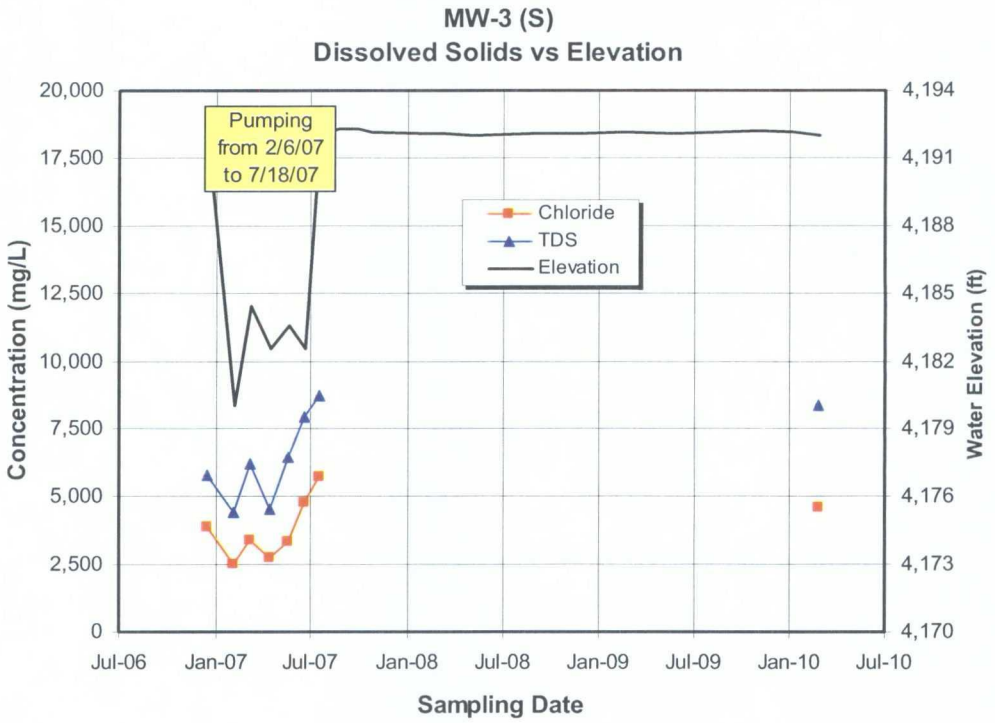
Appendix C

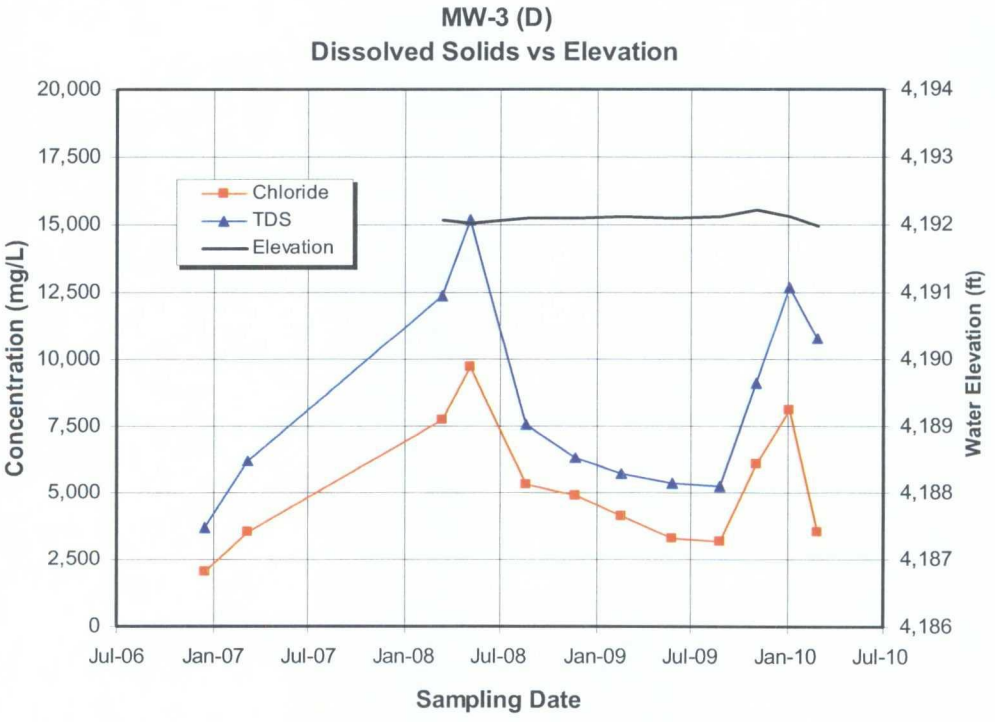
Graphs - Historic Ground Water Data

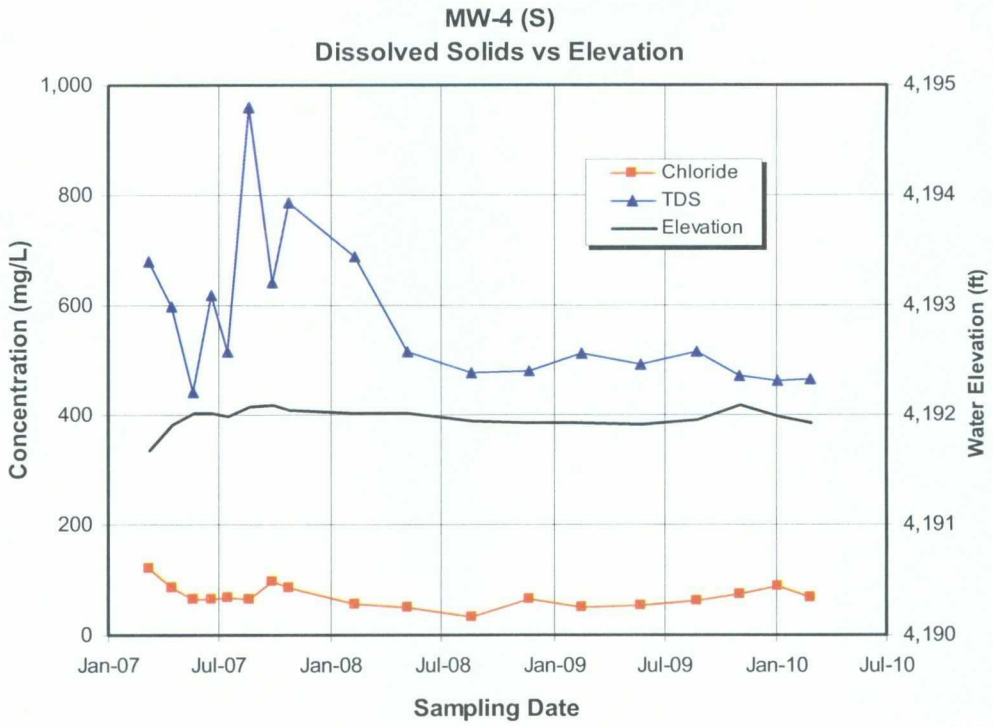
R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142
Albuquerque, NM 87104

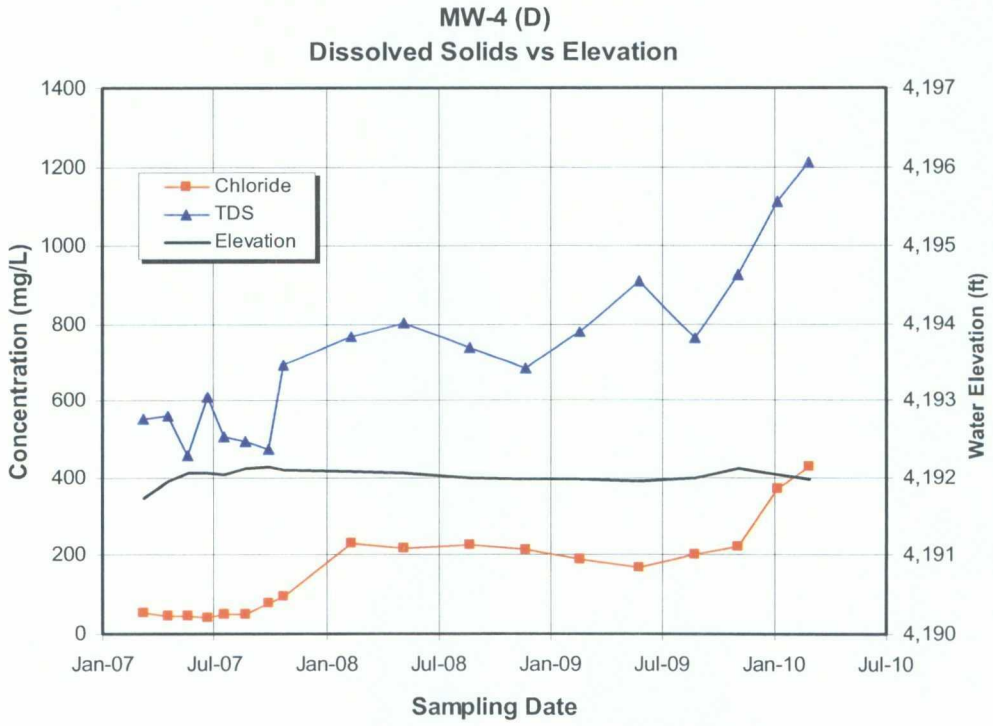

MW-1
Dissolved Solids vs Elevation
Chloride
TDS
Elevation
Concentration (mg/L)
Water Elevation (ft)
Sampling Date
0
200
400
600
800
1000
1200
4,190
4,191
4,192
4,193
4,194
4,195
4,196
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10


MW-2
Dissolved Solids vs Elevation
Chloride
TDS
Elevation
Concentration (mg/L)
Water Elevation (ft)
Sampling Date
0
200
400
600
800
1000
4,191
4,192
4,193
4,194
4,195
4,196
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10


MW-3 (S)
Dissolved Solids vs Elevation
Pumping from 2/6/07 to 7/18/07
Chloride
TDS
Elevation
Concentration (mg/L)
Water Elevation (ft)
20,000
17,500
15,000
12,500
10,000
7,500
5,000
2,500
0
4,194
4,191
4,188
4,185
4,182
4,179
4,176
4,173
4,170
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Sampling Date


MW-3 (D)
Dissolved Solids vs Elevation
Chloride
TDS
Elevation
Concentration (mg/L)
Water Elevation (ft)
20,000
17,500
15,000
12,500
10,000
7,500
5,000
2,500
0
4,194
4,193
4,192
4,191
4,190
4,189
4,188
4,187
4,186
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Sampling Date


MW-4 (S)
Dissolved Solids vs Elevation
Concentration (mg/L)
Water Elevation (ft)
Chloride
TDS
Elevation
1,000
800
600
400
200
0
4,195
4,194
4,193
4,192
4,191
4,190
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Sampling Date


MW-4 (D)
Dissolved Solids vs Elevation
Concentration (mg/L)
Water Elevation (ft)
Chloride
TDS
Elevation
1400
1200
1000
800
600
400
200
0
4,197
4,196
4,195
4,194
4,193
4,192
4,191
4,190
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09
Jul-09
Jan-10
Jul-10
Sampling Date

Appendix D

Methodology for Draw Down Tests

R.T. Hicks Consultants, Ltd.
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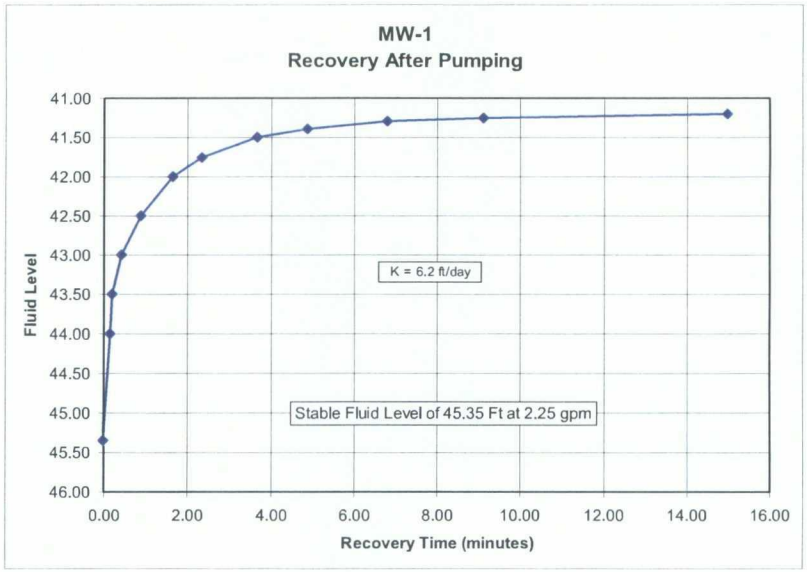
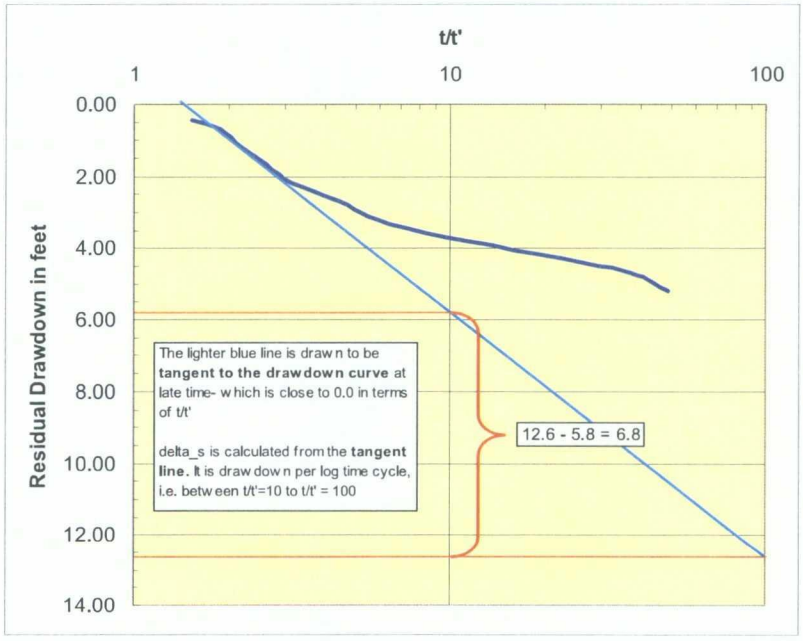
Albuquerque, NM 87104

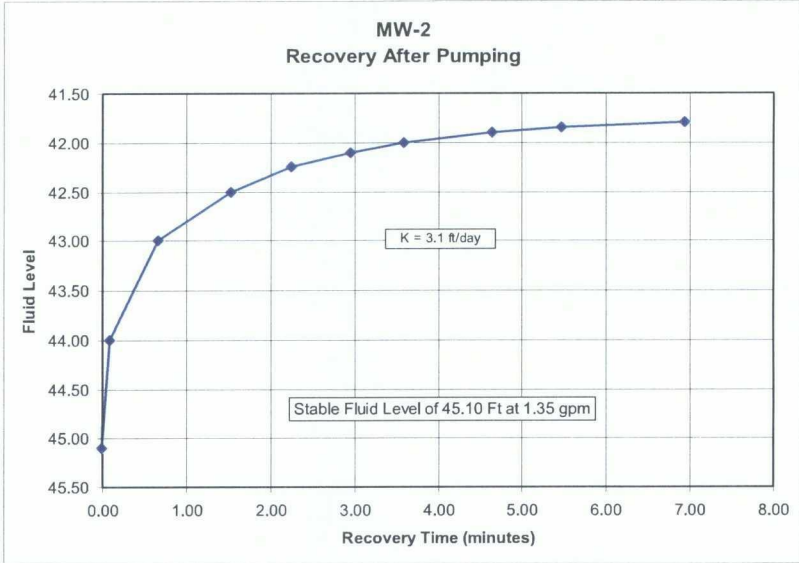


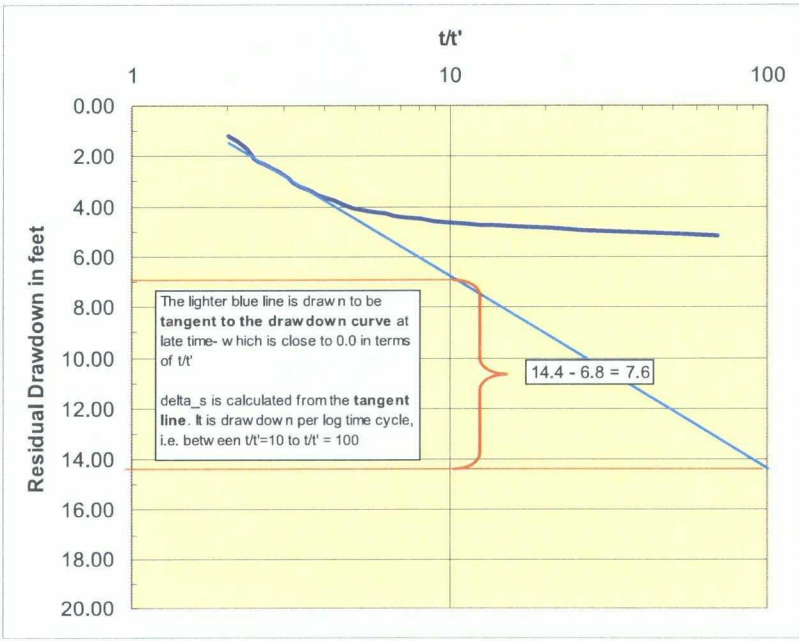


					delta_s is calculated from graph	
Input	Pumping Rate	2.25	[gal/min]	Input	6.8	[feet]

T = (264*Q)/delta_s delta_s is residual drawdown in feet per log time cycle (Page 256, Groundwater and Wells)

Output	T =	87.35294	[feet^2/day]
Input	Aquifer thickness	14.1	[feet]
Output	Resultant K	6.195244	[feet/day]

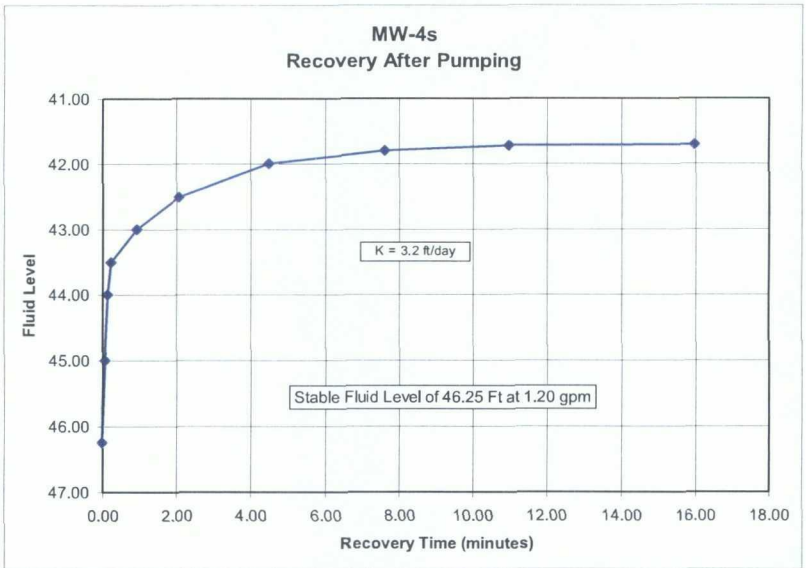


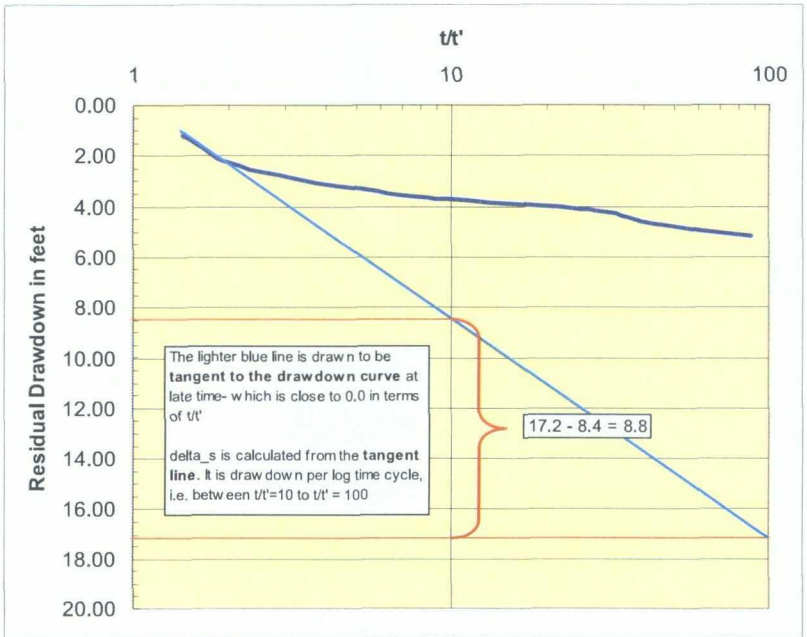


				delta_s is calculated from graph	
Input	Pumping Rate	1.35	[gal/min]	Input	7.6 [feet]

T = (264*Q)/delta_s **delta_s is residual drawdown in feet per log time cycle (Page 256, Groundwater and Wells)**

Output	T =	46.89474	[feet^2/day]
Input	Aquifer thickness	15.2	[feet]
Output	Resultant K	3.08518	[feet/day]

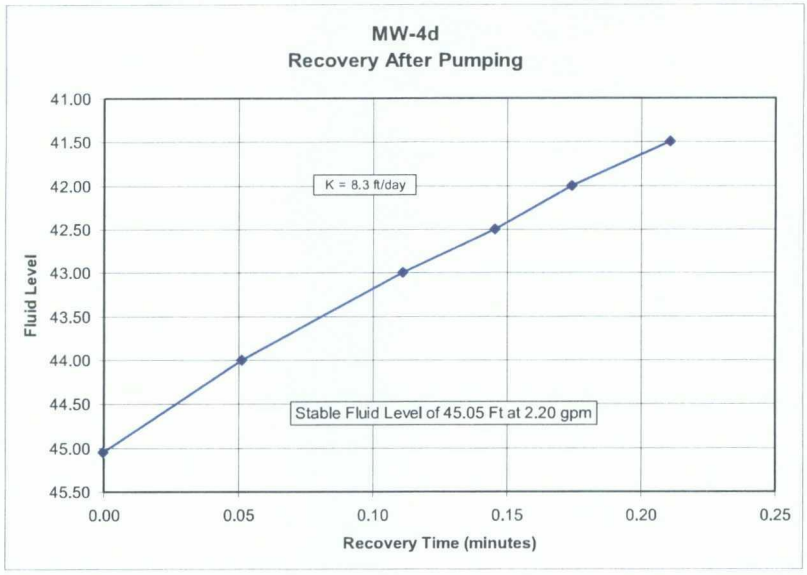


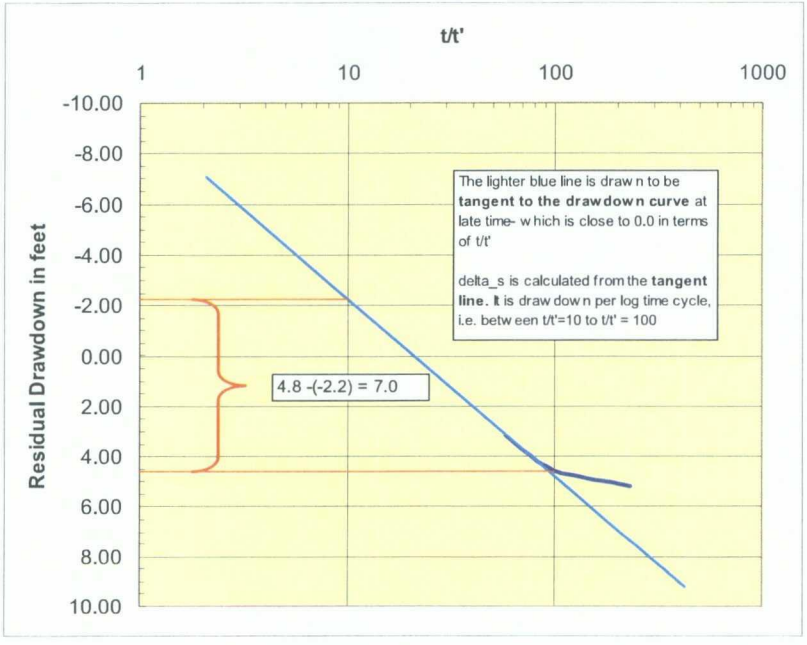


				delta_s is calculated from graph	
Input	Pumping Rate	1.20	[gal/min]	Input	8.8 [feet]

T = (264*Q)/delta_s delta_s is residual drawdown in feet per log time cycle (Page 256, Groundwater and Wells)

Output	T =	36	[feet^2/day]
Input	Aquifer thickness	11.4	[feet]
Output	Resultant K	3.157895	[feet/day]





					delta_s is calculated from graph	
Input	Pumping Rate	2.20	[gal/min]	Input	7	[feet]

T = (264*Q)/delta_s delta_s is residual drawdown in feet per log time cycle (Page 256, Groundwater and Wells)

Output	T =	82.97143	[feet^2/day]
Input	Aquifer thickness	10	[feet]
Output	Resultant K	8.297143	[feet/day]

13 Recovery tests

When the pump is shut down after a pumping test, the water levels in the well and the piezometers will start to rise. This rise in water levels is known as residual drawdown, s'. It is expressed as the difference between the original water level before the start of pumping and the water level measured at a time t' after the cessation of pumping. Figure 13.1 shows the change in water level with time during and after a pumping test.

It is always good practice to measure the residual drawdowns during the recovery period. Recovery-test measurements allow the transmissivity of the aquifer to be calculated, thereby providing an independent check on the results of the pumping test, although costing very little in comparison with the pumping test.

Residual drawdown data are more reliable than pumping test data because recovery occurs at a constant rate, whereas a constant discharge during pumping is often difficult to achieve in the field.

The analysis of a recovery test is based on the principle of superposition, which was discussed in Chapter 6. Applying this principle, we assume that, after the pump has been shut down, the well continues to be pumped at the same discharge as before, and that an imaginary recharge, equal to the discharge, is injected into the well. The recharge and the discharge thus cancel each other, resulting in an idle well as is required for the recovery period. For any of the well-flow equations presented in the previous chapters, a corresponding 'recovery equation' can be formulated.

The Theis recovery method (Section 13.1.1) is widely used for the analysis of recovery tests. Strictly speaking, this method is only valid for confined aquifers which are fully penetrated by a well that is pumped at a constant rate. Nevertheless, if additional limiting conditions are satisfied, the Theis method can also be used for leaky aquifers (Section 13.1.2) and unconfined aquifers (Section 13.1.3), and aquifers that are only partially penetrated by a well (Section 13.1.4).

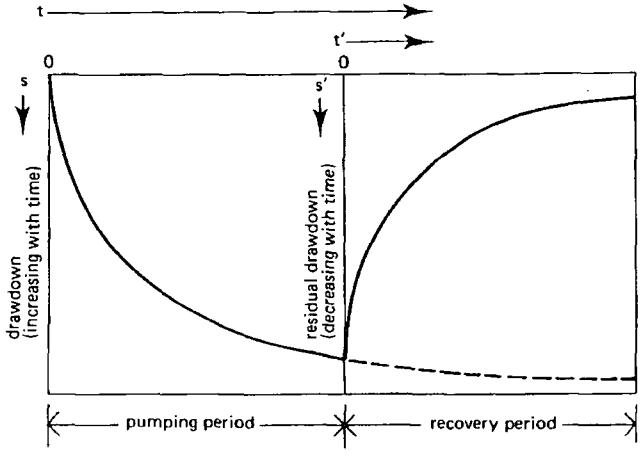


Figure 13.1 Time drawdown and residual drawdown

If the recovery test is conducted in a free-flowing well, the Theis recovery method can also be used (Section 13.2).

If the discharge rate of the pumping test was variable, the Birsoy-Summer recovery method (Section 13.3.1) can be used.

13.1 Recovery tests after constant-discharge tests

13.1.1 Confined aquifers, Theis's recovery method

According to Theis (1935), the residual drawdown after a pumping test with a constant discharge is

$$s' = \frac{Q}{4\pi KD}\{W(u) - W(u')\} \tag{13.1}$$

where

$$u = \frac{r^2S}{4KDt} \text{ and } u' = \frac{r^2S'}{4KDt'}$$

When u and u′ are sufficiently small (see Section 3.2.2 for the approximation of W(u) for $u < 0.01$), Equation 13.1 can be approximated by

$$s' = \frac{Q}{4\pi KD}\left(\ln\frac{4KDt}{r^2S} - \ln\frac{4KDt'}{r^2S'}\right) \tag{13.2}$$

where

- s' = residual drawdown in m
- r = distance in m from well to piezometer
- KD = transmissivity of the aquifer in m^2/d
- S' = storativity during recovery, dimensionless
- S = storativity during pumping, dimensionless
- t = time in days since the start of pumping
- t' = time in days since the cessation of pumping
- Q = rate of recharge = rate of discharge in m^3/d

When S and S′ are constant and equal and KD is constant, Equation 13.2 can also be written as

$$s' = \frac{2.30Q}{4\pi KD}\log\frac{t}{t'} \tag{13.3}$$

A plot of s′ versus t/t′ on semi-log paper (t/t′ on logarithmic scale) will yield a straight line. The slope of the line is

$$\Delta s' = \frac{2.30Q}{4\pi KD} \tag{13.4}$$

where $\Delta s'$ is the residual drawdown difference per log cycle of t/t′.

The Theis recovery method is applicable if the following assumptions and conditions are met:
- The assumptions listed at the beginning of Chapter 3, adjusted for recovery tests.

The following conditions are added:
- The flow to the well is in an unsteady state;
- $u < 0.01$, i.e. pumping time $t_p > (25\,r^2S)/KD$
- $u' < 0.01$, i.e. $t' > (25\,r^2S)/KD$, see also Section 3.2.2.

Procedure 13.1
- For each observed value of s', calculate the corresponding value of t/t';
- For one of the piezometers, plot s' versus t/t' on semi-log paper (t/t' on the logarithmic scale);
- Fit a straight line through the plotted points;
- Determine the slope of the straight line, i.e. the residual drawdown difference $\Delta s'$ per log cycle of t/t';
- Substitute the known values of Q and $\Delta s'$ into Equation 13.4 and calculate KD.

Remark
- When S and S′ are constant, but unequal, the straight line through the plotted points intercepts the time axis where $s' = 0$ at a point $t/t' = (t/t')_o$. At this point, Equation 13.2 becomes

$$0 = \frac{2.30Q}{4\pi KD}\left[\log\left(\frac{t}{t'}\right)_o - \log\frac{S}{S'}\right]$$

Because $2.30\,Q/4\pi KD \neq 0$, it follows that $\log (t/t')_o - \log (S/S') = 0$. Hence $(t/t')_o = S/S'$, which determines the relative change of S.

13.1.2 Leaky aquifers, Theis's recovery method

After a constant-discharge test in a leaky aquifer, Hantush (1964), disregarding any storage effects in the confining aquitard, expresses the residual drawdown s' at a distance r from the well as

$$s' = \frac{Q}{4\pi KD}\{W(u,r/L) - W(u',r/L)\} \qquad (13.5)$$

Taking this equation as his basis and using a digital computer, Vandenberg (1975) devised a least-squares method to determine KD, S, and L. For more information on this method, we refer the reader to the original literature.

If the pumping and recovery times are long, leakage through the confining aquitards will affect the water levels. If the times are short, i.e. if $t_p + t' \leq (L^2S)/20KD$ or $t_p + t' \leq cS/20$, the Theis recovery method (Section 13.1.1) can be used, but only the leaky aquifer's transmissivity can be determined (Uffink 1982; see also Hantush 1964).

13.1.3 Unconfined aquifers, Theis's recovery method

An unconfined aquifer's delayed watertable response to pumping (Chapter 5) is fully reversible according to Neuman's theory of delayed watertable response, because hysteresis effects do not play any part in this theory. Neuman (1975) showed that the Theis recovery method (Section 13.1.1) is applicable in unconfined aquifers, but only for late-time recovery data. At late time, the effects of elastic storage, which set in after pumping stopped, have dissipated. The residual drawdown data will then fall on a straight line in the semi-log s′ versus t/t′ plot used in the Theis recovery method.

13.1.4 Partially penetrating wells, Theis's recovery method

The Theis recovery method (Section 13.1.1) can also be used if the well is only partially penetrating. For long pumping times in such a well, i.e. $t_p > (D^2S)/2KD$, the semi-log plot of s versus t yields a straight line with a slope identical to that of a completely penetrating well (Hantush 1961b). Thus, if the straight line portion of the recovery curve is long enough, i.e. if both t_p and t′ are greater than $(10\ D^2S)/KD$, the Theis recovery method can be applied (Uffink 1982).

13.2 Recovery tests after constant-drawdown tests

If the recovery test follows a constant-drawdown test instead of a constant-discharge test, the Theis recovery method (Section 13.1.1) can be applied, provided that the discharge at the moment before the pump is shut down is used in Equation 13.4 (Rushton and Rathod 1980).

13.3 Recovery tests after variable-discharge tests

13.3.1 Confined aquifers, Birsoy-Summers's recovery method

To analyze the residual drawdown data after a pumping test with step-wise or intermittently changing discharge rates, Birsoy and Summers (1980) proposed the following expression

$$\frac{s'}{Q_n} = \frac{2.30}{4\pi KD} \log\left\{\beta_{t(n)}\left(\frac{t-t_n}{t-t'_n}\right)\right\} \qquad (13.6)$$

where

s' = residual drawdown at $t > t'_n$
Q_n = constant discharge during the last (= n-th) pumping period
t_n = time at which the n-th pumping period started
$t-t_n$ = time since the n-th pumping period started
t'_n = time at which the n-th pumping period ended
$t-t'_n$ = time since the n-th pumping period ended
$\beta_{t(n)}$ is defined according to Equation 12.2

A semi-log plot of s'/Q_n versus the corresponding adjusted time of recovery: $\beta_{t(n)}(t-t_n/t-t'_n)$ yields a straight line. The slope of the straight line $\Delta(s'/Q_n)$ is equal to $2.30/4\pi KD$, from which the transmissivity can be determined.

The Birsoy-Summers recovery method can be used if the following assumptions and conditions are met:

- The assumptions listed at the beginning of Chapter 3, as adjusted for recovery tests, with the exception of the fifth assumption, which is replaced by:
  - Prior to the recovery test, the aquifer is pumped at a variable discharge rate.

The following conditions are added:

- The flow to the well is in an unsteady state;
- $u < 0.01$ $\quad [u = r^2S/4KD\{\beta_{t(n)}(t_p-t_n)\}]$, see also Section 3.2.2;
- $u' < 0.01$ $\quad [u' = r^2S/4KD\{\beta_{t(n)}(t-t_n/t-t'_n)\}]$.

Procedure 13.2

- For a single piezometer, calculate the adjusted time of recovery, $\beta_{t(n)}(t-t_n/t-t'_n)$, by applying Equation 12.2 for the calculation of $\beta_{t(n)}$, and by using all the observed values of the discharge rate and the appropriate values of time;
- On semi-log paper, plot the observed specific residual drawdown s'/Q_n versus the corresponding values of $[\beta_{t(n)}(t-t_n/t-t'_n)]$ (the adjusted time of recovery on the logarithmic scale);
- Draw a straight line through the plotted points;
- Determine the slope of the straight line, $\Delta(s'/Q_n)$, which is the difference of s'/Q_n per log cycle of adjusted time of recovery;
- Calculate KD from $\Delta(s'/Q_n) = 2.30/4\pi KD$.

Remark

- See Section 12.1 for simplified expressions of $\beta_{t(n)}(t-t_n)$ which can be introduced into the expression for the adjusted time of recovery.