1RP - 1594

GW Sampling Report

Date:
March 30, 2012

TETRA TECH

March 30, 2012

Mr. Glenn von Gonten
New Mexico Energy, Minerals, & Natural Resources
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87504

Re: Comprehensive Groundwater Sampling Report for the Celero Energy II, LP, Rock Queen Unit Saltwater Plant #1, Located in Unit Letter D, Section 26, Township 13 South, Range 31 East, Chaves County, New Mexico (NMOCD 1RP#1594).

Mr. Von Gonten:

This report details the results of the groundwater sampling events performed at the Celero Energy II, LP (Celero), Rock Queen Unit Saltwater Plant #1 (Site) for May 2007 through December 2011. The Site is located approximately 21-1/2 miles north of Maljamar, New Mexico. The Site location is shown on Figures 1 and 2.

FACILITY BACKGROUND

Pit Closure

On September 21, 2007, Highlander (Tetra Tech) submitted an Investigation and Characterization work plan (ICP) for an open pit at the Site. The ICP was subsequently approved by the New Mexico Oil Conservation Division (NMOCD).

The Rock Queen Saltwater Plant #1 pit was dewatered and the residual sludge, tank bottom materials, and liner were removed in August 2007. Removed fluids were placed into an existing SWD system or taken for disposal, while the sludge, tank bottom materials, and liner were disposed of at Gandy-Marley, Inc.'s landfill site in Lovington, New Mexico. Upon completion of the removal of the fluids, sludge, and liner, the underlying soils were visually inspected for obvious signs of impact. Approximately 2,200 cubic yards of soil were excavated and transported to Gandy-Marley, Inc. for disposal. The pit was

Tetra Tech
1910 North Big Spring, Midland,TX 79705
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excavated to a point where the subsoil would support a soil boring rig.

On October 12, 2009, a report entitled *Assessment and Closure Report for a Pit located at the Rock Queen Unit Saltwater Plant #1* was submitted to the NMOCD. The report detailed the closure of the former pit along with proposed extension of liner at the facility.

Groundwater Investigation

Between May 2007 and December 2010, Celero installed seven 2-inch monitor wells (MW-1 through MW-7) and one 5-inch recovery well (RW-1) to assess the groundwater quality at the Site. The lithology at the Site was relatively consistent with limestone to approximately 10 to 20 feet bgs and with calcareous with medium to very fine grain sand to a depth of approximately 130 to 165 feet bgs. From approximately 130 feet bgs to the terminus (approximately 150 to 198 feet bgs) the soils were a gray/brown to red clay. See Appendix A for Boring Logs.

During the investigation, groundwater was encountered at depths of approximately 134 to 139 feet bgs. Monitor Well MW-1 was drilled into the surrounding underlying clay to 198 feet bgs and sealed with bentonite back to 145 feet. Afterwards, 40 feet of 0.01 inch slotted screen was installed to from 145 feet to 105 feet bgs. The remaining monitor wells were drilled to depths of 150 to 155 (MW-7) feet bgs and installed with 30 feet of 0.02 inch slotted screen. Recovery well RW-1 was drilled to a depth of 150 feet and installed with 20 feet of 0.035 inch slotted screen. From the top of the screen to the surface of the boring, the wells were completed with blank schedule 40 PVC casing. See Appendix B for monitor well installation diagrams.

During the investigation and subsequent sampling, the only constituents of concern which were detected in the groundwater above New Mexico Water Quality Control Commission (NMWQCC) standards was chlorides, TDS, SO4 and benzene in monitor well MW-1. No Phase Separated Hydrocarbons (PSH) has been measured in any of the onsite monitor wells. See Figure 3 detailing the monitor well locations.

Gauging and Monitor Well Sampling

On May 24, 2007, initial sampling began at the site. During 2010, additional monitor wells were installed and quarterly sampling initiated. During the sampling events, all monitor wells were gauged, purged, and sampled with no PSH measured. Utilizing the water level elevation calculations, groundwater gradient maps were generated for all the sampling events with the exception of May 24, 2007, which lacked sufficient points for development of a gradient map. The hydraulic gradient indicates a southeasterly direction. Groundwater gradient

maps for the sampling events are included as Figures 4 through 10. Gauging data is summarized in Table 1.

During the sampling events, each of the wells was purged utilizing either a submersible pump or by hand bailing and subsequently sampled for BTEX utilizing method SW8021B, chlorides and sulfates utilizing method E 300.0, total dissolved solids (TDS) utilizing method SM2540C and periodically for general chemistry using methods SM2320B, SW6010B, SM4500-H+. The samples were properly preserved and submitted under proper chain-of-custody control to Trace Analysis Inc. of Lubbock, Texas. One sample, MW-1 on January 18, 2011 (0.0116 mg/L) had a result which exceeded the NMWQCC standard of 0.01 milligrams per liter (mg/L) of benzene. The remainder of the samples were below the NMWQCC standards with a majority being at or below detection limits. All the samples collected and analyzed for chlorides were above the NMWQCC standard of 250 mg/L chlorides with samples ranging from 912 mg/L in MW-6 on July 29, 2011 to 174,000 mg/L in MW-1 on April 14, 2011. The general chemistry and BTEX analyses are shown in Tables 2 and 3, respectively. Chloride concentration maps for the sampling events are included as Figures 11 through 17. Copies of the laboratory analyses are enclosed in Appendix C.

During purging activities, it was noted that all seven monitor wells (MW-1 through MW-7) and recovery well RW-1 bail dry.

CONCLUSIONS

1. On May 24, 2007, initial sampling began at the site. During 2010, additional monitor wells were installed and quarterly sampling initiated. During the sampling events, all monitor wells were gauged, purged, and sampled. The samples were preserved, delivered to Trace Analysis, Inc. of Midland, Texas and analyzed for BTEX utilizing method SW8021B, chlorides and sulfates utilizing method E 300.0, total dissolved solids (TDS) utilizing method SM2540C and periodically for general chemistry using methods SM2320B, SW6010B, SM4500-H+.

2. The hydraulic gradient indicates a southeasterly direction.

3. One sample, MW-1 on January 18, 2011 (0.0116 mg/L) had a result which exceeded the NMWQCC standard of 0.01 milligrams per liter (mg/L) of benzene. The remainder of the samples were below the NMWQCC standards with a majority being at or below detection limits.

4. All the samples collected and analyzed for chlorides were above the NMWQCC standard of 250 mg/L chlorides with samples ranging from 912

mg/L in MW-6 on July 29, 2011 to 174,000 mg/L in MW-1 on April 14, 2011.

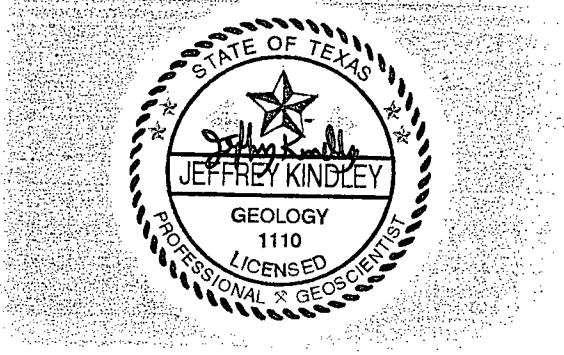
RECOMMENDATIONS

1. Quarterly groundwater monitoring and gauging will be continued throughout the year.

2. Additional monitor wells will be installed in order to further delineate the chloride plume at the site.

3. A remediation system consisting of either a low flow solar/electric pump or a windmill system will be installed in recovery well RW-1. The recovered fluids will be collected in an above ground tank and utilized for possible water flooding purposes in the surrounding oilfield.

If you have any question or comments concerning the assessment or the activities performed at the Site, please call me at (432) 682-4559.



Respectfully submitted,
Tetra Tech, Inc.

Jeffrey Kindley, P.G.
Senior Environmental Geologist

cc: Bruce Woodard – Celero Energy II, LP

FIGURES

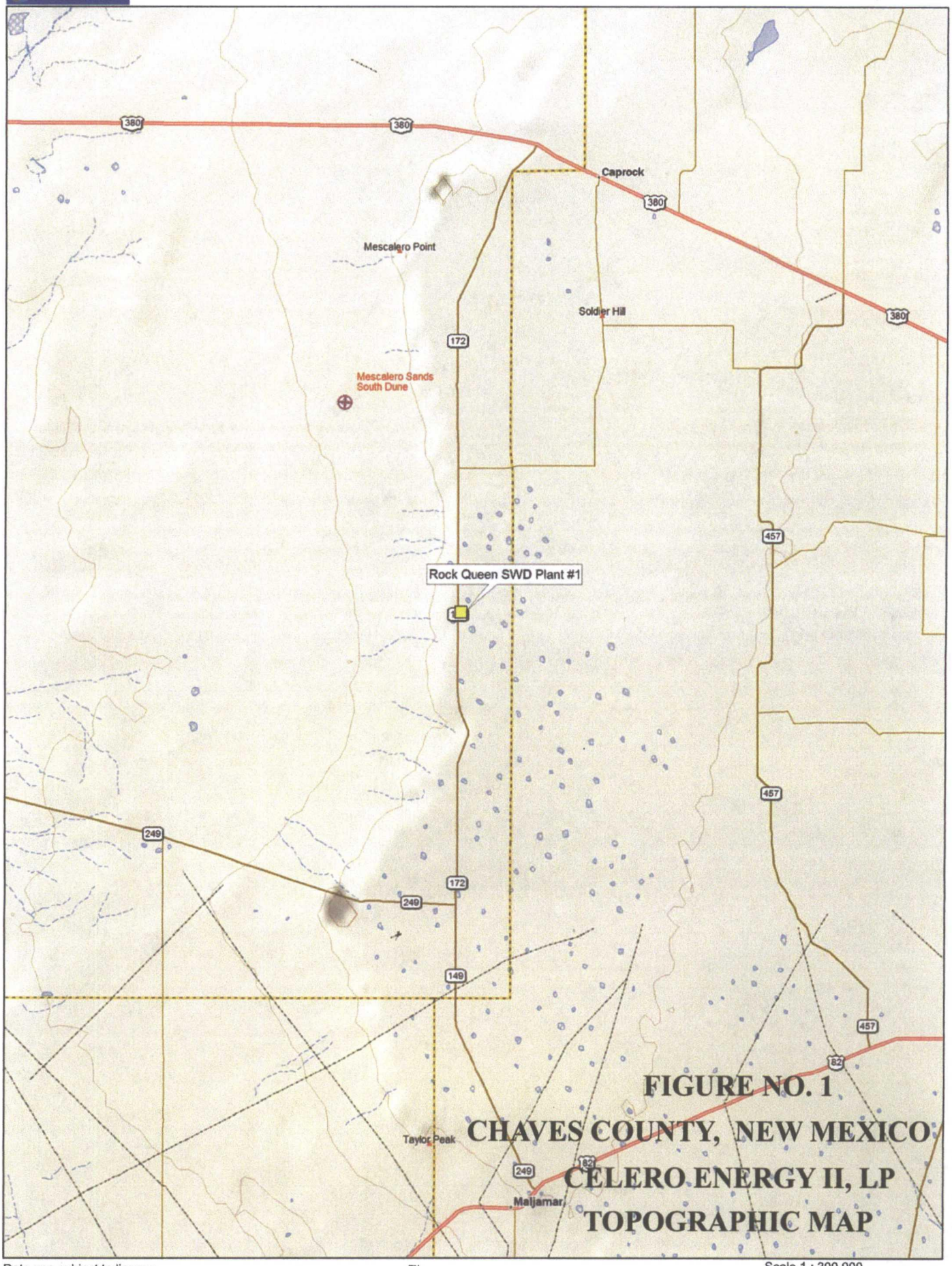


FIGURE NO. 1
CHAVES COUNTY, NEW MEXICO
CELERO ENERGY II, LP
TOPOGRAPHIC MAP

TN

MN (7.7°E)

Scale 1 : 300,000

0 1 2 3 4 5 mi

0 2 4 6 8 10 km

1" = 4.73 mi

Data Zoom 9-5

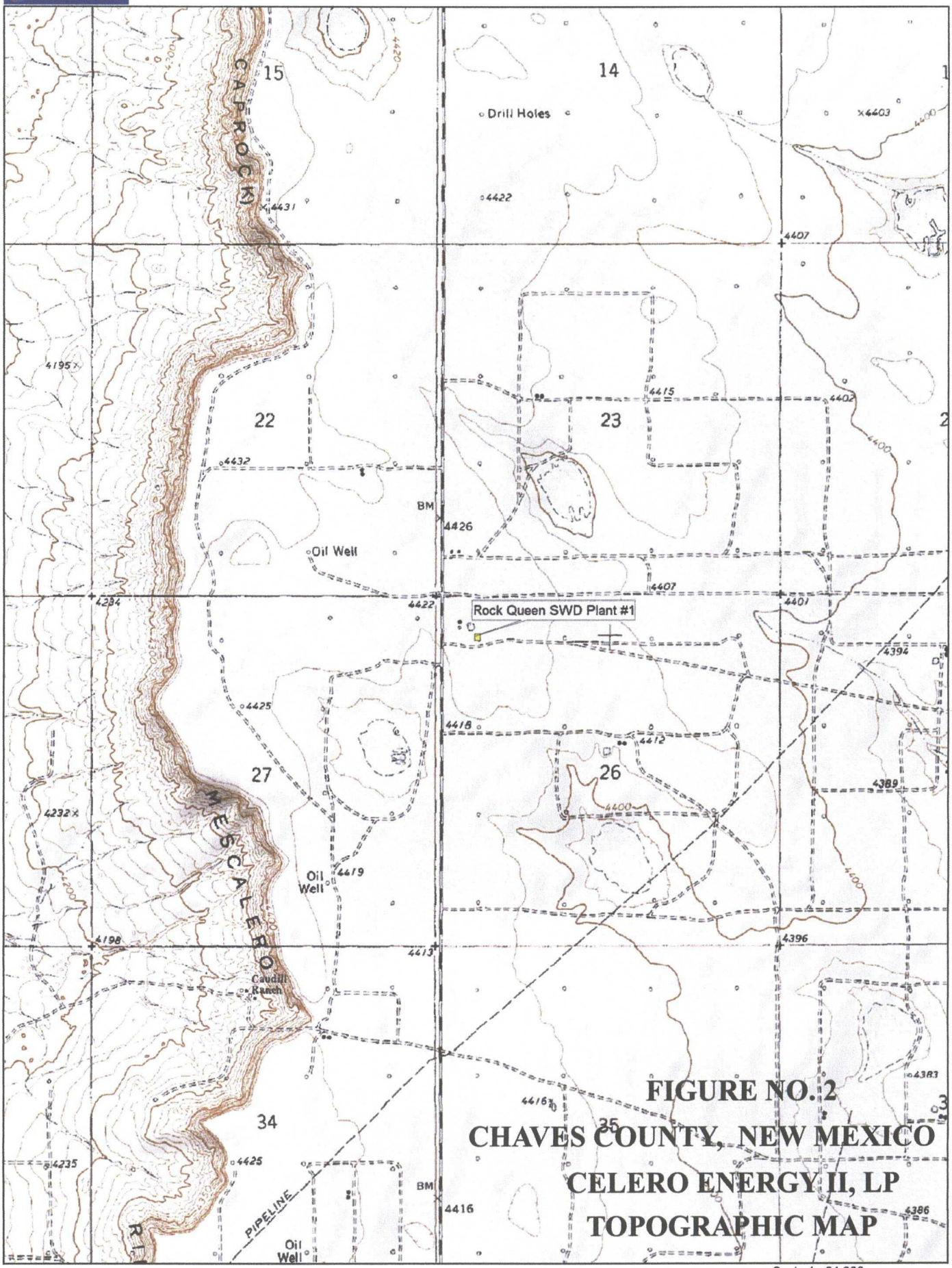


FIGURE NO. 2
CHAVES COUNTY, NEW MEXICO
CELERO ENERGY II, LP
TOPOGRAPHIC MAP

TN

MN (7.7°E)

Scale 1 : 24,000

0 600 1200 1800 2400 3000 ft

0 200 400 600 800 1000 m

1" = 2,000.0 ft

Data Zoom 14-0

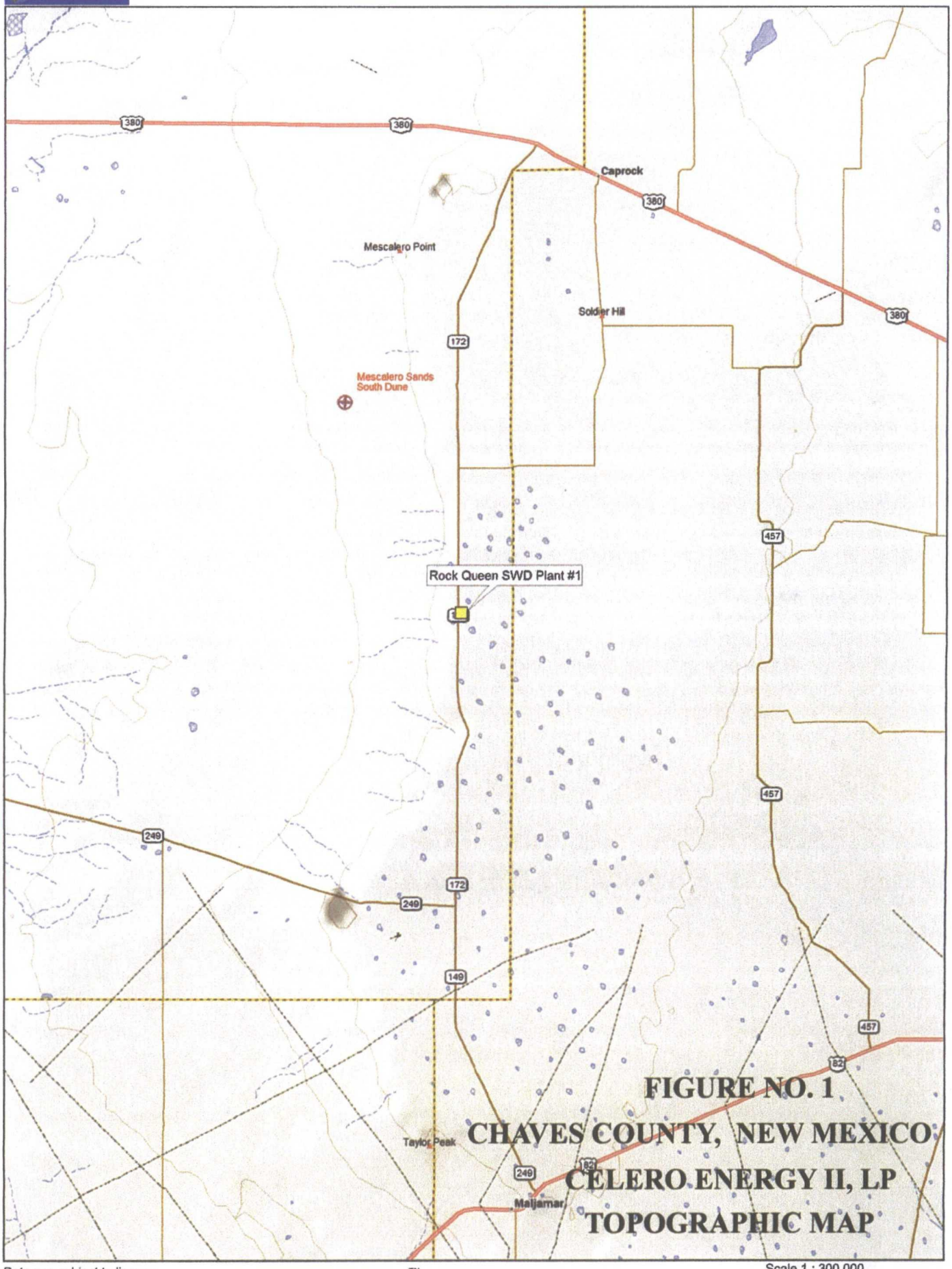


FIGURE NO. 1

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY II, LP

TOPOGRAPHIC MAP

TN
MN (7.7°E)

Scale 1 : 300,000
1" = 4.73 mi
Data Zoom 9-5

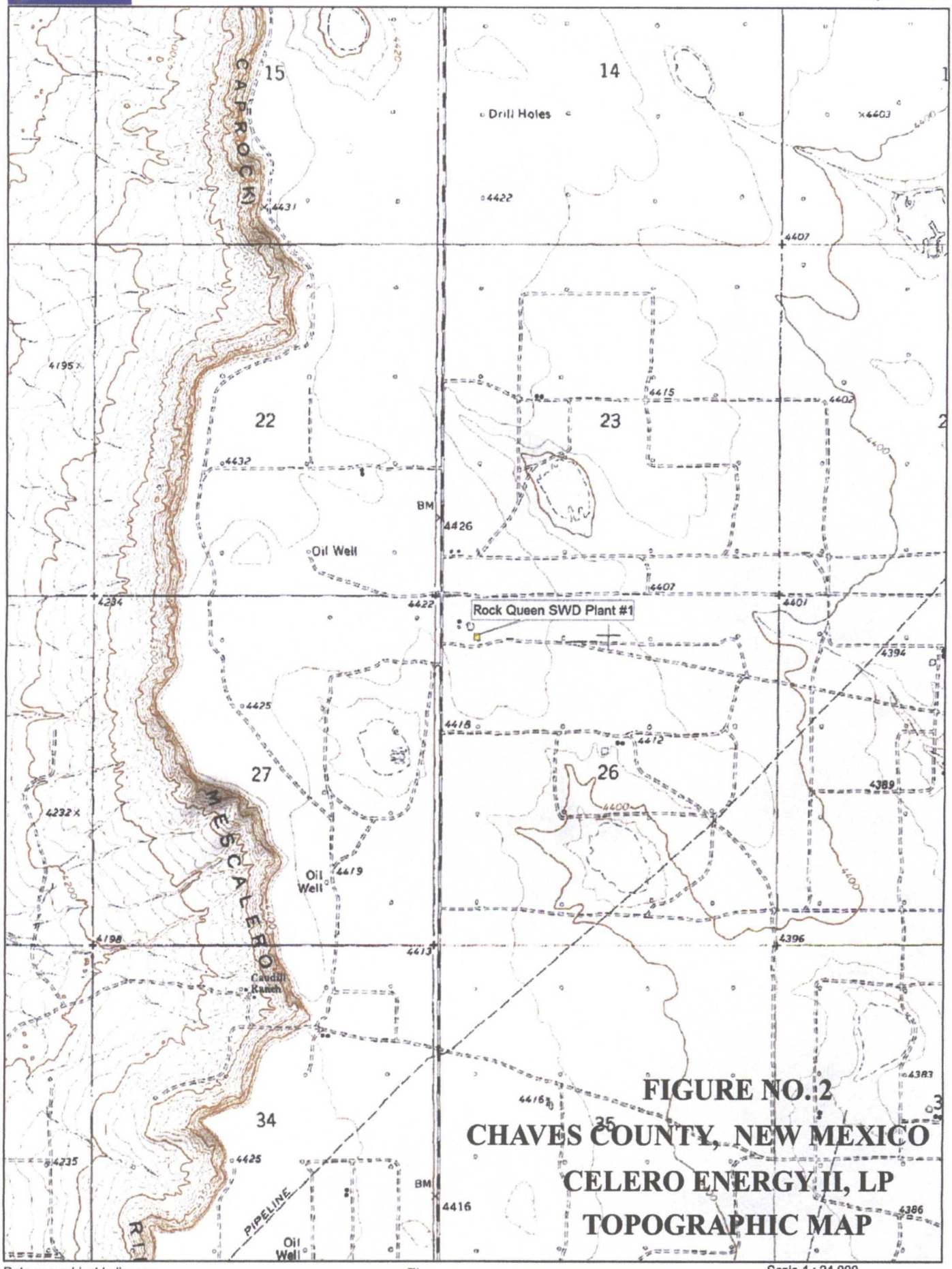


FIGURE NO. 2
CHAVES COUNTY, NEW MEXICO
CELERO ENERGY II, LP
TOPOGRAPHIC MAP

TN

MN (7.7°E)

Scale 1 : 24,000

0 600 1200 1800 2400 3000 ft

0 200 400 600 800 1000 m

1" = 2,000.0 ft

Data Zoom 14-0

MW–6

MW–2

FORMER PIT

MW–7

MW–3

RW–1

MW–1

ROCK QUEEN
INJ. WELL #1

MW–4

MW–5

SCALE: 1" = 150'

0 150'

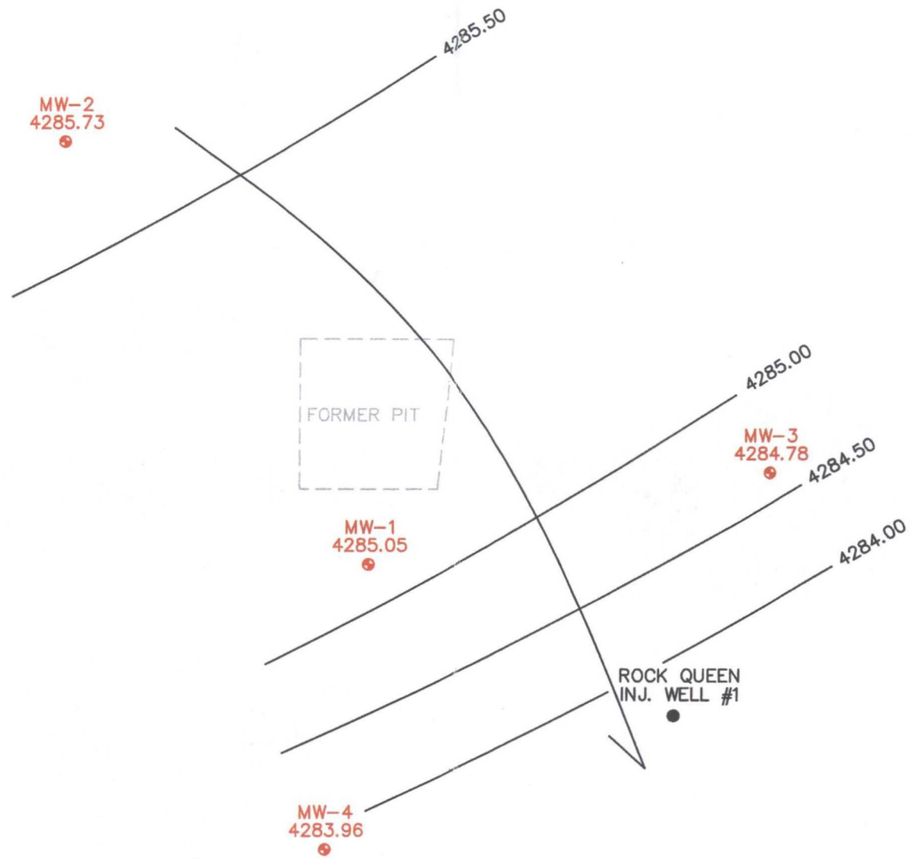
DATE: 04/12/2011
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 3

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
SITE MAP

TETRA TECH, INC.
MIDLAND, TEXAS



C.I. = .50'

SCALE: 1" = 150'

0 150'

DATE: 11/24/2009

DWN. BY: IM

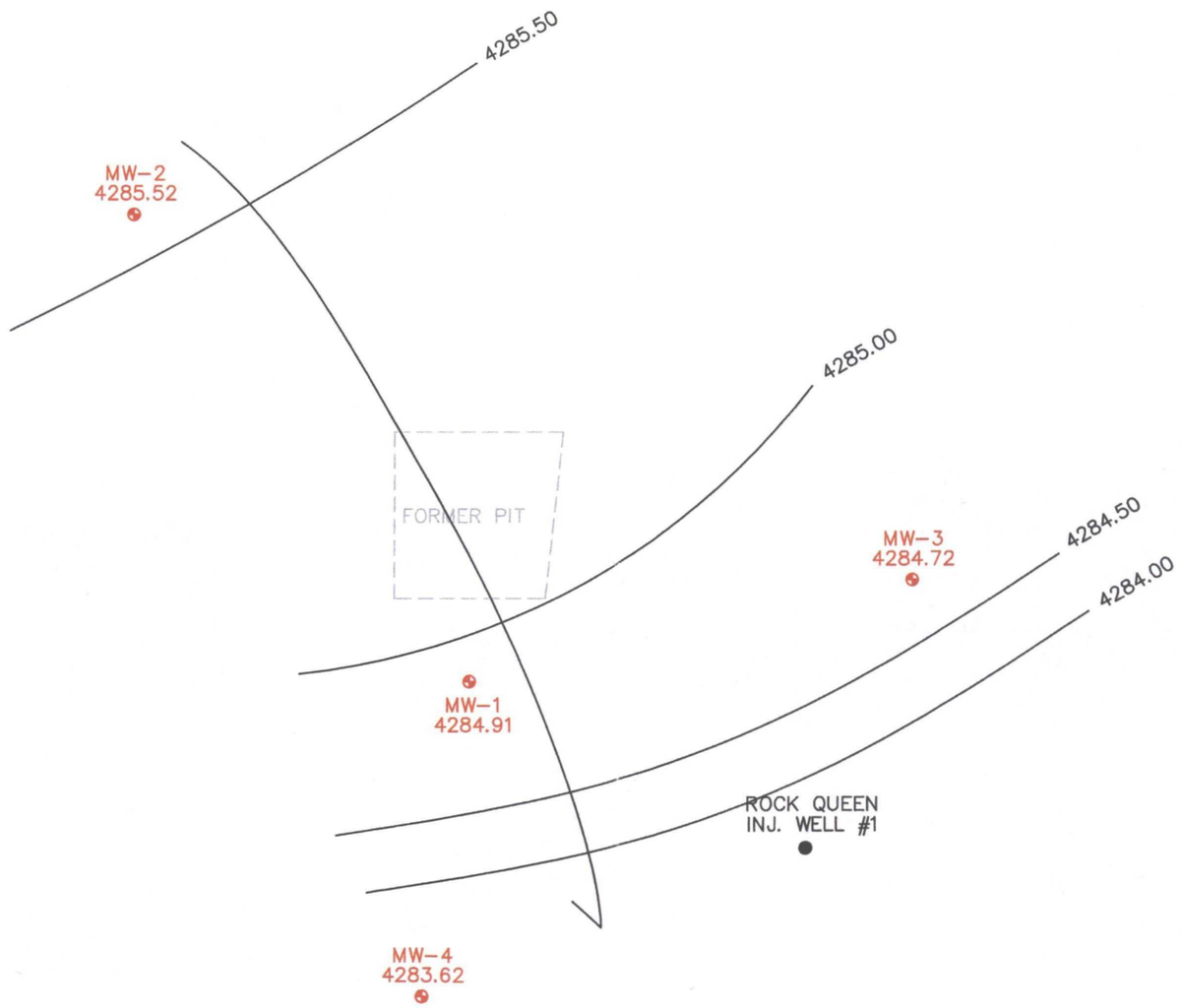
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 4

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
GROUNDWATER GRADIENT MAP
11/24/09

TETRA TECH, INC.
MIDLAND, TEXAS



SCALE: 1" = 150'

C.I. = .50' 0 150'

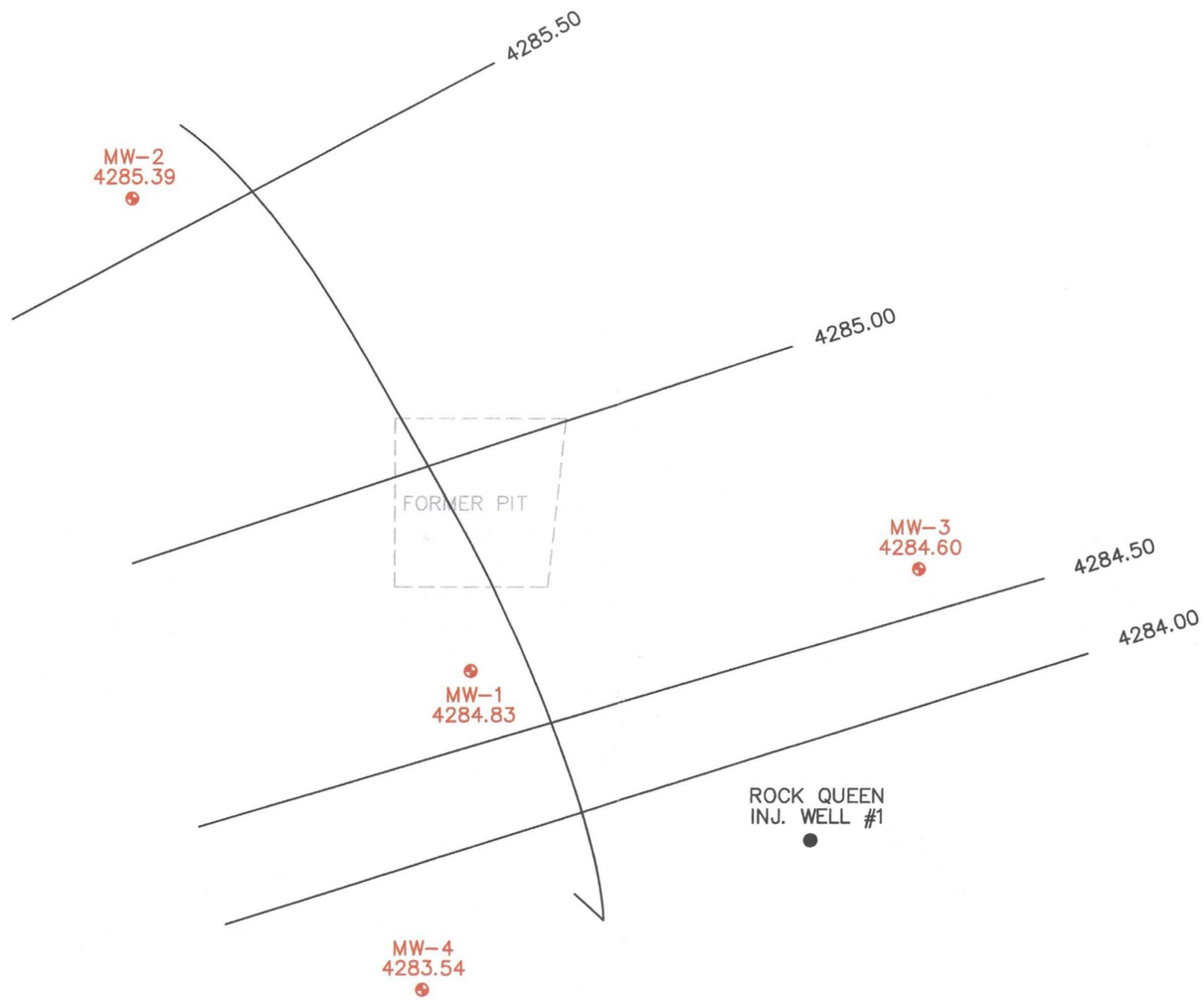
DATE: 07/13/2010
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 5

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
GROUNDWATER GRADIENT MAP
07/13/10

TETRA TECH, INC.
MIDLAND, TEXAS



SCALE: 1" = 150'

C.I. = .50'

0 150'

DATE: 10/11/2010

DWN. BY: IM

FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 6

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
GROUNDWATER GRADIENT MAP
10/11/2010

TETRA TECH, INC.
MIDLAND, TEXAS

MW–6
4285.95

MW–2
4285.43

MW–3
4285.01

MW–7
4283.76

RW–1
4285.72

MW–1
4284.80

ROCK QUEEN
INJ. WELL #1

MW–4
4283.51

MW–5
4281.49

FORMER PIT

4285.50
4285.00
4284.50
4284.00
4283.50
4283.00
4282.50
4282.00

C.I. = .05'

SCALE: 1" = 150'
0 150'

FIGURE NO. 7

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
GROUNDWATER GRADIENT MAP
01/17/2011

TETRA TECH, INC.
MIDLAND, TEXAS

DATE: 01/17/2011
DWN. BY: IM
FILE: c:\CELERO\3134\R Q UNIT SWD PLNT 1

MW-6
4285.76

MW-2
4285.34

4285.50

4285.00

4284.50

4284.00

MW-7
4283.73

4283.50

MW-3
4285.04

4283.00

4282.50

4282.00

4281.50

FORMER PIT

RW-1
4285.34

MW-1
4284.66

ROCK QUEEN
INJ. WELL #1

MW-4
4283.37

MW-5
4281.44

C.I. = .05'

SCALE: 1" = 150'

0 150'

FIGURE NO. 8

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
GROUNDWATER GRADIENT MAP
04/12/2011

TETRA TECH, INC.
MIDLAND, TEXAS

DATE: 04/12/2011
DWN. BY: IM
FILE: G:\CELERO\3134\R Q UNIT SWD PLNT 1

MW–6
4,284.86

MW–2
4,284.35

FORMER PIT

RW–1
4,284.44

MW–1
4,284.58

MW–3
4,283.97

MW–7
4,282.78

ROCK QUEEN
INJ. WELL #1

MW–4
4,282.58

MW–5
4,280.50

4,284.00

4,283.00

4,282.00

4,281.00

C.I. = 1'

SCALE: 1" = 150'

0 150'

DATE: 7/28/2011
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 9

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
GROUNDWATER GRADIENT MAP
GAUGED ON 7/28/2011

TETRA TECH, INC.
MIDLAND, TEXAS

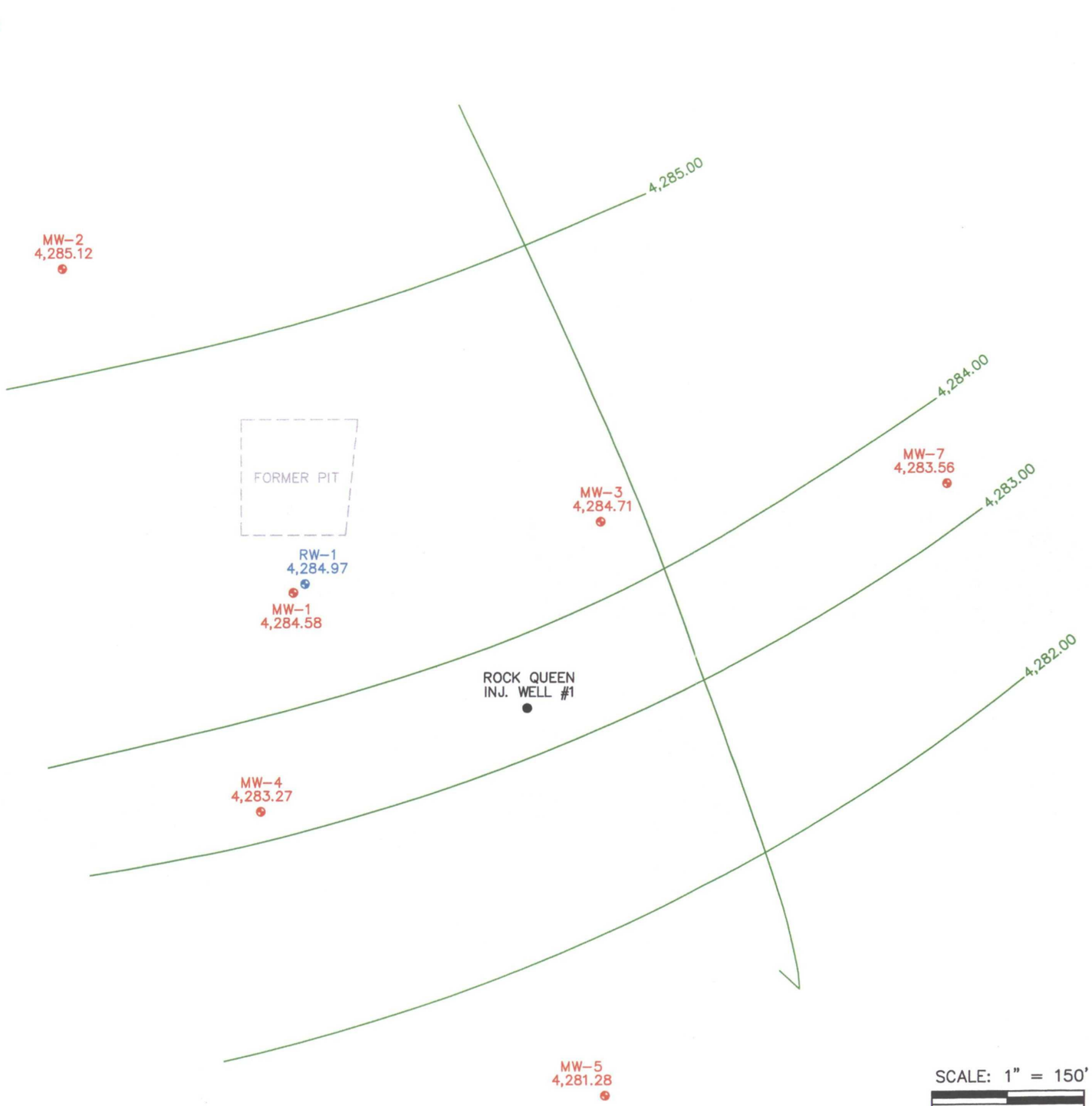


FIGURE NO. 10

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
GROUNDWATER GRADIENT MAP
GAUGED ON 10/24/2011

TETRA TECH, INC.
MIDLAND, TEXAS

DATE: 10/24/2011
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

MW–2
19,900

FORMER PIT

MW–3
59,500

MW–1
139,000

ROCK QUEEN
INJ. WELL #1

MW–4
9,360

RESULTS IN mg/L

SCALE: 150'
0 150'

DATE: 11/24/2009
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 11

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
CHLORIDE CONCENTRATION MAP
SAMPLED ON 11/24/2009

TETRA TECH, INC.
MIDLAND, TEXAS

MW–6

MW–2

FORMER PIT

MW–3

MW–7

RW–1

MW–1

ROCK QUEEN
INJ. WELL #1

MW–4

MW–5

SCALE: 1" = 150'

0 150'

DATE: 04/12/2011

DWN. BY: IM

FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 3

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
SITE MAP

TETRA TECH, INC.
MIDLAND, TEXAS

MW–2
43,200

FORMER PIT

MW–3
73,200

MW–1
155,000

ROCK QUEEN
INJ. WELL #1

MW–4
85,800

RESULTS IN mg/L

SCALE: 150'
0 150'

DATE: 07/13/2010
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 12

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
CHLORIDE CONCENTRATION MAP
SAMPLED ON 07/13/2010

TETRA TECH, INC.
MIDLAND, TEXAS

MW–2
51,800

FORMER PIT

MW–3
85,500

MW–1
130,000

ROCK QUEEN
INJ. WELL #1

MW–4
93,200

RESULTS IN mg/L

SCALE: 150'
0 150'

DATE: 10/11/2010
DWN. BY: IM
FILE: C:\CELERO\J134\R Q UNIT SWD PLNT 1

FIGURE NO. 13

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
CHLORIDE CONCENTRATION MAP
SAMPLED ON 10/11/2010

TETRA TECH, INC.
MIDLAND, TEXAS

MW–6
3,010

MW–2
66,600

FORMER PIT

MW–3
85,200

MW–7
35,700

RW–1
NS

MW–1
132,000

ROCK QUEEN
INJ. WELL #1

MW–4
93,200

MW–5
32,400

RESULTS IN mg/L
NS – NOT SAMPLED

SCALE: 150'
0 150'

DATE: 1/18/11
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 14

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
CHLORIDE CONCENTRATION MAP
SAMPLED ON 1/18/11

TETRA TECH, INC.
MIDLAND, TEXAS

MW–6
1,320

MW–2
99,700

FORMER PIT

MW–3
118,000

MW–7
61,500

RW–1
NS

MW–1
174,000

ROCK QUEEN
INJ. WELL #1

MW–4
102,000

MW–5
20,000

RESULTS IN mg/L
NS – NOT SAMPLED

SCALE: 150'
0 150'

DATE: 4/14/2011
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 15

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
CHLORIDE CONCENTRATION MAP
SAMPLED ON 4/14/2011

TETRA TECH, INC.
MIDLAND, TEXAS

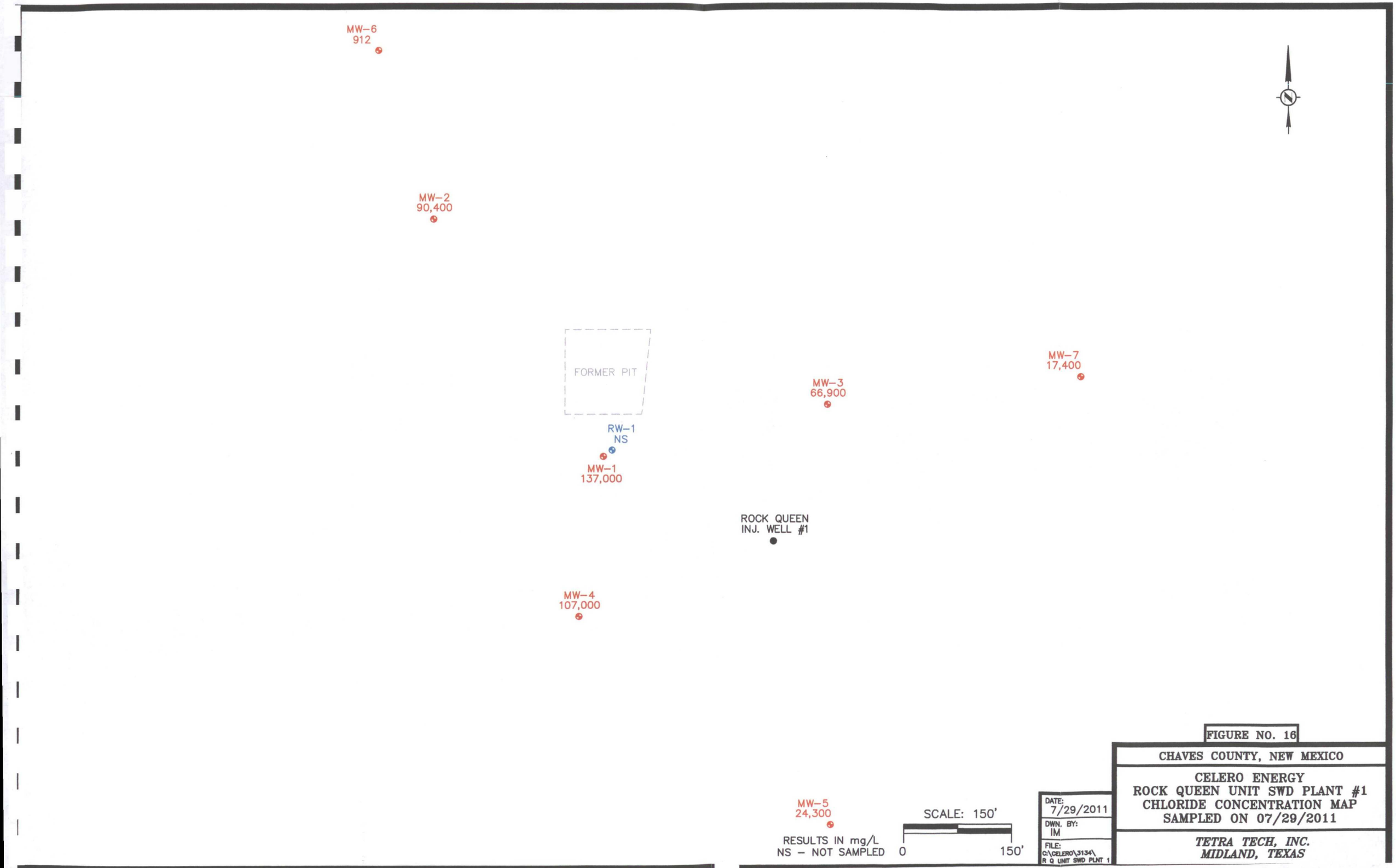


FIGURE NO. 16

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
CHLORIDE CONCENTRATION MAP
SAMPLED ON 07/29/2011

TETRA TECH, INC.
MIDLAND, TEXAS

MW–6
1,110

MW–2
80,300

FORMER PIT

MW–3
123,000

MW–7
49,000

RW–1
NS

MW–1
143,000

ROCK QUEEN
INJ. WELL #1

MW–4
124,000

MW–5
6,360

RESULTS IN mg/L
NS – NOT SAMPLED

SCALE: 150'
0 150'

DATE: 10/27/2011
DWN. BY: IM
FILE: C:\CELERO\3134\R Q UNIT SWD PLNT 1

FIGURE NO. 17

CHAVES COUNTY, NEW MEXICO

CELERO ENERGY
ROCK QUEEN UNIT SWD PLANT #1
CHLORIDE CONCENTRATION MAP
SAMPLED ON 10/27/2011

TETRA TECH, INC.
MIDLAND, TEXAS