1R - 483

Report/

WORKPLANS

DATE:

12-18-09

Remediation Report

1R-483
Elliott B-9 #1, 4, & 5 Tank Battery

Unit C, Section 9, T22S, R37E
Lea County, New Mexico

LAI Project No. 6-0104-02

December 18, 2009

Prepared for:
John H Hendrix Corporation
110 N Marienfeld, Suite 400
Midland, TX 79701-4461

Prepared by:
William D. Green, PG No. 136
Texas Registered Professional Geologist

Larson & Associates, Inc.
507 North Marienfeld, Suite 200
Midland, Texas 79701

Larson & Associates, Inc.
Environmental Consultants

December 18, 2009

RECEIVED OCD
2009 DEC 18 P 2: 50

Mr. Edward Hansen
State of New Mexico – Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Three OCD Remediation Projects – John H. Hendrix Corporation, Lea County, New Mexico:
No. 1R-483, Elliott B-9 #1,4,&5 Tank Battery, Unit C (NE/4, NW/4), Section 9, T22S, R37E
No. 1R-484, Elliott B-9 #2&3 Tank Battery, Unit D (NW/4, NW/4), Section 9, T22S, R37E
No. 1RP0465, Will Cary #5 Emergency Pit, Unit F (SE/4, NW/4), Section 22, T22S, R37E

Dear Mr. Hansen:

The three enclosed reports are submitted to the State of New Mexico Oil Conservation Division on behalf of John H. Hendrix Corporation by Larson and Associates, Inc., its agent, and present the proposed remedial effort at the referenced sites.

If you have any questions or concerns, please call me at 432.687.0901 to discuss.

Sincerely,

LARSON & ASSOCIATES, INC.

William D. Green, PG No. 136
Texas Licensed Professional Geologist
wgreen@laenvironmental.com

Attachments

CC Ms. Carolyn Haynes – JHHC Midland
Mr. Larry Johnson – OCD District 1

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December 18, 2009

1.0 Executive Summary

This report is submitted to the State of New Mexico Oil Conservation Division (OCD) on behalf of John H. Hendrix Corporation (JHHC) by Larson and Associates, Inc. (LAI), its agent, and presents the proposed remedial efforts at referenced site.

The site is located at Unit C, Section 9, T22S, R37E, Lea County, New Mexico. The site is a former closed production pit, in which surface produced water was disposed. Surface soil has been previously excavated to approximately seven feet below ground surface, and the soil operable unit remediated by installing a 20-mil thick polyethylene liner to prevent the permeation of meteoric water and the vertical migration of *in situ* chlorides. The surface has been returned to productive capacity with 85% to 90% revegetation of range grass and brush. The remedial options for the groundwater operable unit, and a proposed natural attenuation remedy is discussed in this report.

2.0 Responsible Party Contact Information

JHHC's contact for environmental concerns is:

Ms. Carolyn Haynes
John H. Hendrix Corporation
110 N. Marienfeld, Suite 400
Midland, Texas 79701
Office – 432.684.6631, Cell – 575.390.9689
Email – cdoranhaynes@jhhc.org

3.0 Historic Information

The release at this site was identified through the investigation of a closed production pit. The site is located approximately 1.5 miles south of Eunice, New Mexico. Figure 1 presents the site location plotted on a topographic map.

4.0 General Site Characteristics

The Elliott B-9 #1,4,5 site is at latitude N 32° 24' 37.28", longitude W 103° 10' 11.77" (Figure 1). The surface estate is owned by Mr. Charlie Bettis and is used for oil and gas production and occasional livestock grazing.

The surface elevation is approximately 3,420 feet above mean sea level and slopes gently east-southeast. The nearest surface water is more than two miles from the site. Surface soil is comprised of windblown sand with a vegetation cover of shin oak, sand burr grass, and yucca. No water wells were identified within 1,000 feet of the site using the Office of the State Engineer (OSE) Water Right Lookup database.

Several pipelines are either within the release investigation area, or are adjacent to the points of release.

5.0 Geology

The *Geologic Map of New Mexico* (2003) and the *Geologic Atlas of Texas, Hobbs Sheet* indicate the vicinity's surface geology is comprised of Holocene to mid-Pleistocene age, interlaid eolian and piedmont-slope deposits. This material covers the eastern flank of the Pecos River valley. These surficial deposits are primarily derived from reworking the underlying Tertiary-aged Ogallala Formation of the Southern High Plains, which is also comprised of alluvial and eolian deposits with petrocalcic soils. The Ogallala Formation is comprised of fluviatile sand, silt, clay and localized gravel, with indistinct to massive crossbeds. The Ogallala sand is generally fine- to medium-grained quartz, and is known to contain arsenic, barium and other heavy metals in an easily mobilized Van der Waals bonded surficial coating.

Monitor well boring logs indicate a general lithology of an unconsolidated veneer of eolian sand over an eight- to 20-foot thickness of carbonate-indurated sand (caliche). The caliche layer is most like a zone of illuviation where carbonate dust accumulates from surface transportation by meteoric gravity water transitioning to capillary water. Beneath the caliche layer is a thickness of fine-grained reddish-yellow quartz sand. Red-beds were not encountered at 90' below ground surface (bgs), but using data from other investigations in the area, are less than 100 feet bgs. Depth to groundwater is approximately 80 feet bgs, based on monitor wells data (Table 1).

5.1 Regional Structure

The site is located over the north-central portion of the Central Basin Platform, a large elevated block between the Delaware and Midland Basins of southeastern New Mexico and West Texas. Prior to late Mississippian time this region had only mild structural deformation, producing broad shallow depressions and regional arches. Tectonic events associated with the Marathon-Ouachita orogeny in the late Mississippian uplifted the platform and subsequent Pennsylvanian and early Permian deformation compressed and faulted the area. Deformation ceased in the early Permian, as evidenced by high angle faulting that ended during Wolfcampian-aged sedimentation, and the presence of younger strata draped over the preexisting structures. A period of tectonic quiescence followed, during which erosion and gradual subsidence took place. An expanding sea eventually covered the area, depositing several thousand feet of evaporites, carbonates, and shales.

During Triassic time the region underwent slow uplift and erosion followed by down-warping that created a large landlocked basin that was filled with sediments that accumulated in flood plain, deltaic and lacustrine environments. This was followed by another period of erosion during Jurassic time, and a final marine inundation by Cretaceous seas, resulting in the deposition of a basal clastic unit with overlying marine shales and carbonates.

The Laramide Orogeny (when Rocky Mountains were formed) uplifted the area west of the Permian Basin and the Cretaceous sea retreated to the south and east. There has been no significant faulting since Permian time; only gentle regional tilting with some local folding and small scale faulting. Hills (1970) postulated that later normal movement may have occurred by reactivation of existing faults, but that the movement was not sufficient to noticeably displace the overlying Permian strata. Hills (1970) further postulated that late movement along the faults may have created a conduit for fresh water for dissolution of Permian evaporite beds. The faults and fractures in the vicinity of the site do not appear to be active. Tension fractures being somewhat more open may be able to hold water longer and thereby account for the enhanced vegetation and development of erosional features such as playas along fractures. On January 2, 1992, a magnitude 5 earthquake beneath the Drinkard Oilfield (approximately seven miles southeast of the facility) demonstrated that the region is not totally without seismic activity.

5.2 Regional Stratigraphy

Regionally, the Precambrian basement is overlain by marine Cambro-Ordovician platform carbonates and Silurian-Devonian carbonates and shales. These sediments are truncated unconformably by Permian deposits consisting of marine shale, limestone, sandstone, marl, and evaporites. Permian age deposits are unconformably overlain by the Triassic Chinle Group. The Triassic Chinle Group is described as a series of fluvial and lacustrine mudstone, siltstone, sandstone, and silty dolomite strata. Cretaceous sediment strata were deposited as a shallow sea transgressed across the region, and unconformably overlie the Chinle Group. As the shallow sea regressed much of the Cretaceous section was eroded away prior to deposition of the overlying Tertiary Ogallala Formation. The depositional facies of the Ogallala Formation is a series of fluvial valley fills with both valley fills and interfluves overlain by eolian sediments. The Quaternary Blackwater Draw Formation, which overlies the Tertiary Ogallala Formation, consists of windblown sands, silts, and clays.

In the Eunice area, the Ogallala formation consists mainly of unconsolidated to poorly consolidated, very fine to medium-grained sand and gravel, with minor amount of silt and clay up to 30 feet thick under the site. Locally the "c" horizon of the modern soil is called the caprock caliche. The caprock is a hard, erosion resistant, pedogenic calcrete that is typically five to ten feet thick but may exceed 20 feet in some areas. In areas, the caliche is actually forming in, and incorporating, Holocene sediments, and often "Caprock" is a misnomer, as the caprock can be found as a deeper stratum in these areas. The upper-most unit, the Blackwater Draw Formation, consists of reddish brown, very fine to fine grained eolian sand with minor amounts of clay and caliche.

6.0 Site Investigation

Site investigation activities were divided into two logical operations units – soil and groundwater. Previous investigations of both media discussed in the following sections.

6.1 Soil Investigation and Remediation

The initial soil investigation was proposed in February 2006. Revisions were made to the work plan in March 2006, with the OCD approving the investigative activities on March 29, 2006. Ten soil borings were installed primarily to the west of the tank battery on June 28, 2006, with subsequent soil investigations on July 5, 2006, October 4, 2006, and October 30, 2006. Total Petroleum Hydrocarbons (TPH), benzene, and the light-end BTEX constituents were observed in near-surface samples, but quickly attenuated with depth. Chloride distribution attenuated quickly with depth in all borings except BH-14.

BH-14 appears to have been situated within the former production pit. Chloride values in this boring increased to approximately to 6,590 milligrams per kilogram (mg/Kg) at 15 feet bgs, then decrease with depth to approximately 442 mg/Kg at 55 feet bgs, where the chloride concentrations again increase to 1,800 mg/Kg at 60 feet bgs. The soil boring log for BH-14 indicates a lithology change from calicheindurated, silty, very fine sand to weakly cemented, very fine sand just above this concentration spike. It appears the change in lithology and the increase in pore-throat void size increases chloride flocculation and precipitation into this pendular vadose illuviation zone by spreading the hygroscopic water film too thin to entrain salts, except when percolating meteoric water acts as capillary water and coalesces into gravity water recharging the aquifer. In permeable, porous media, gravity-driven contaminant migration tends to have inverted cone morphology without the dispersion observed in areas with low permeability or secondary porosity dominated flow regimes. It is believed the inverted cone model of contaminant migration applies at this site.

On December 17, 2007, the OCD approved the pit closure plan (Appendix A). Between April 2, 2008, and May 2, 2008, soil remediation was conducted at the site. The top two feet of soil was removed from approximately 18,000 square feet of potentially affected land. Additionally, two areas of concern were excavated to about seven feet bgs. These deepened pit excavations are in the middle portion of the remediation area, and were lined with 20-mil polyethylene geotextile to prevent surface water infiltration prior to backfilling. The surface has been returned to productive capacity with 85% to 90% revegetation of range grass and brush.

6.2 Groundwater Investigation

Prior reported groundwater investigation activities consist of the installation of three monitor wells. MW-01 was installed on October 16, 2007 near the southeast (downgradient) corner of the closed pit. Laboratory analytical results indicated impacted water quality exhibiting chloride and total dissolved solids (TDS) concentrations exceeding New Mexico Water Quality Control Commission Domestic Water Supply (DWS) standards.

Hydrocarbons and targeted volatile organic compounds were not detected. MW-02 was installed upgradient of the site on December 3, 2007. This well exhibited chloride and TDS values within the DWS standards.

On June 29, 2009, LAI installed MW-03 in the downgradient direction, with locations concurred upon by the OCD. The downgradient well exhibited chloride and TDS values below DWS standards.

The three monitor wells associated with this site are in a nearly straight line following the apparent groundwater gradient, when compared with a combined site Surfer® plot of this facility, and the nearby Elliot B-9 2&3 facility (Figure 3). Gauging data on September 10, 2009 indicates a slight groundwater mound exists under MW-01. Groundwater elevation is between 3,346.28 feet (MW-01) and 3,345.25 feet (MW-03). Groundwater gradient direction is towards the east-southeast based upon the plot of the two facilities, but may be more southerly than the near linear monitor well configuration suggests. Groundwater gradient slope between the two facilities is approximately 0.00109 ft/ft, consistent with the previous event (June 2009).

Chloride and TDS concentrations exhibited during September 2009 were below DWS standards for MW-02 and MW-03, while MW-01 exhibited 650 milligrams/liter (mg/l, parts per million) chlorides and 1,660 mg/l TDS (Figures 4 & 5, Appendix B). These values are consistent with, although slightly lower than, those values reported from the June monitoring event. Chloride concentrations in the upgradient monitor well (MW-02) and downgradient monitor well (MW-03) have remained relatively stable since monitoring was initiated, at 52 mg/l and 188 mg/l, respectively. Chloride concentrations in the source well, MW-01, increased from October 2007 (1,710 mg/l) to April 2008 (2,070 mg/l). As previously mentioned, geotextile liners were installed in the former pits in April and May 2008. Since that time chloride concentrations in groundwater have steadily declined to 650 mg/l, with further reductions anticipated as gravity water and capillary water draining from beneath the liners decreases.

7.0 Factors Affecting Chlorides in Groundwater Remediation

Chloride migration is controlled by a combination of vadose zone and the aquifer characteristics, as well as Federal, State and local regulations. A complete review of applicable, or relevant and appropriate regulations (ARARs) is not required by the OCD, and is not included in this report. However, a synopsis of pertinent New Mexico regulations are included in support of the decision making process.

7.1 Vadose Zone Characteristics

A few simple principles of soil water and vadose zone morphology must be explained to understand its function in the vertical contaminant transportation.

Soil water is one of three types of water held in the interconnected voids between soil particles: hygroscopic water, capillary water, and gravity water.

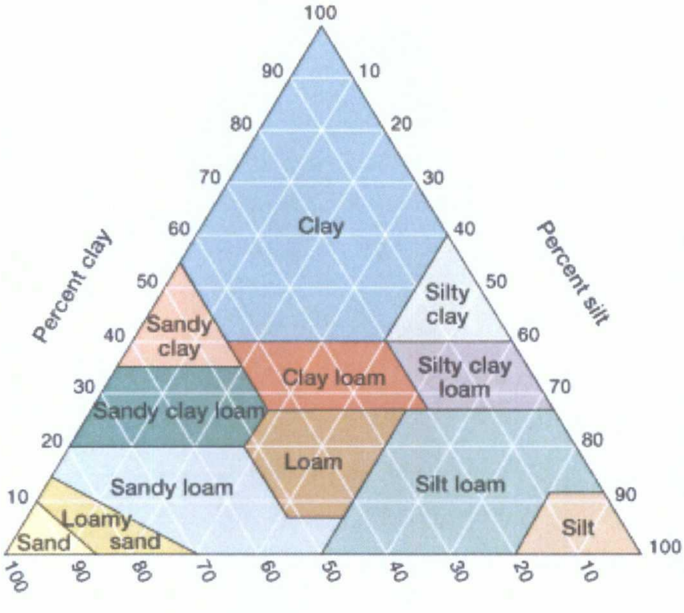
- **Hygroscopic water** is the thin film of water surrounding soil particles and held by Van der Waals attraction. Hygroscopic water is not readily available to plant uptake and may be bound by adhesive forces up to 10,000 bars.
- **Capillary water** is held by cohesive surface tension. This surface tension varies with the chemical composition of the water, and the water can be removed by plant absorption or air drying.
- **Gravity water** is water moving through soil by gravity.

The **vadose zone** is defined as the zone of aeration; that is the unsaturated soils and sediments overlying the saturated zone. The vadose zone can be divided into an upper pendular zone, and lower funicular zone which respond to soil moisture in different ways.

The **pendular** zone is affected by meteoric water percolating into the subsurface. This unit is named for the fluctuating moisture content in response to meteoric events much like a pendulum moves back and forth. In this zone all three types of soil water can be observed in response to recharge events: hygroscopic water between grains, capillary wicking of recharge as a multidirectional wetting front, and gravity water percolating downward.

The **funicular** zone is also called the capillary fringe. In this zone water may move upward under capillary tension some distance from the saturated interface. As gravity water interacts with the capillary water some of the dissolved solids entrained from eluviating material may precipitate into a zone of illuviation. This is one of the processes which creates caliche above the water table. This process is evident in the arid region of southeast New Mexico. Where groundwater potentiometric levels have declined over the millenniums, a caliche horizon may remain as a relic of past conditions.

The proportion of sand, silt, and clay in a soil or sediment – the soil texture – affects the downward migration of water and dissolved constituents. Lithology constrains flow with the size and the interconnection of open pores in the soil or sediment. Clean gravel generally exhibits large, well-connected pore spaces while clay has smaller pores with poorer connectivity but a higher porosity. As a result, the saturated hydraulic conductivity of gravel is higher than the saturated hydraulic conductivity of clay. In the vadose zone the ability of a soil or sediment to transmit chloride depends on how much of the available pore space is filled with water. In a nearly dry soil or sediment, capillary forces hold the water in place, preventing movement. As the moisture content of a soil or sediment increases, more pores become interconnected with water and the soil water pressure increases, also increasing the ability of the unit to transmit water and chloride.



USDA Soil Texture Chart

The site's vadose zone is relatively thick, approximately 80 feet. The primary lithologic soil texture is silty fine sand using the Unified Soil Classification System, which mostly fall into the "sandy loam" category using USDA classification. A caliche layer between 10 and 15 feet thick about ten feet bgs.

Soil moisture content reported from laboratory analyses ranges from 0.7% to 25.3%, with a mean value of 7.7%, a median value of 6%, and a mode value of 1.2%. The low value was reported from a sample retrieved from ~40 feet bgs, while the high value was observed in a sample retrieved from ~5.6 feet bgs.

Geotechnical analyses have not been conducted on the vadose zone strata, but porosity and permeability values can be estimated from published literature values using observed soil textures. Using the values from the *Handbook of Hydrology* (Maidmont, 1993), sandy loam has an effective porosity between 28.3% and 54.1%, with a mean value of 41.2%; the effective porosity is comparable to the specific yield. This same reference lists the residual water content for sandy loam between 2.4% and 10.6%, with a mean value of 4.1% which is similar to laboratory analytical data from the site.

7.2 Aquifer Characteristics

Saturated zone (aquifer) and groundwater movement are generally characterized by the groundwater production features explained by Henry Darcy and other scientists. Values of interest include **Hydraulic Conductivity**, the measure of the ability of fluid to move through the interconnected void spaces of the soil media; **Transmissivity**, the measure of volume at which fluid moves through a unit width of an aquifer under hydraulic gradient; and **Storativity,** the volume of water released from storage per unit decline in hydraulic head in the aquifer, per unit area of the aquifer. Hydraulic conductivity is generally estimated from slug test response, while transmissivity and storativity are calculated from aquifer response to stresses from a pumping test. Since neither test has been performed to provide empirical data for modeling, estimates must be used from literature data.

In the Eunice, NM area, groundwater gradient is relatively flat (0.00109 ft/ft, about six feet per mile), and discharge rates are generally very low. Recovering five gallons per hour (gph) in a 4-inch diameter well is often beyond production capacity in this region. Theis estimated the average porosity of the Ogallala aquifer in Lea County at 35% (1934, p.133). This estimate is within other literature value for the previously discussed range of sandy loam soil. Theis also calculated the hydraulic conductivity in and near Lea County, with an estimate of 2 to 17 feet per day and an average of 8 feet per day. Similarly, Theis calculated the specific yield to average 24%.

7.3 Meteoric Infiltration

Precipitation and evaporation affect the water content of the vadose zone and are a control mechanism for contaminant migration. In arid climates, where rainfall occurs in short-duration thunderstorms between extended dry periods, infiltration is not uniform and occurs primarily after large precipitation events. This results in a vadose zone with relatively low water content, as observed in empirical site data. Theis estimated the net infiltration for the area between ¼ and ½ inch per year. There should not be any recharge at the site mobilizing vadose zone contaminants, as the former pits were excavated and the impermeable geotextile liner would preclude vertical migration.

7.4 Regulatory Requirements

In New Mexico, groundwater extraction must be permitted by the New Mexico Office of the State Engineer (OSE), with the extracted groundwater subjected to beneficial use determination. Based upon experience with other remediation efforts, the removal of groundwater for remediation purposes is not considered a beneficial use by the OSE. Furthermore, if groundwater is extracted, reinjection to flush contaminants would require the issuance of a Discharge Permit from the New Mexico Environmental Division (NMED).

8.0 Remedial Options

Unlike hydrocarbons which can be broken into simpler, and less harmful chemicals, terrestrial microorganisms in groundwater do not digest, transform, or affix chloride compounds. Chloride impacted groundwater is typically addressed in one of three ways: pump and treat, pump and dispose, or natural attenuation. The remedial option choice is greatly affected by the site location infrastructure, the physical/chemical conditions at the location and regulatory requirements.

8.1 Pump and Treat

This method extracts chloride impacted groundwater, *ex situ* treats the entrained water, and re-injects the water into the aquifer to flush residual chlorides. Groundwater restoration requires a treatment system, such as reverse osmosis, fractional distillation, or electrodialysis. Each of these technologies creates an effluent of concentrated salts and removed metals requiring waste stream permitting.

8.1 Pump and Dispose

Although similar to a pump and treat system, this method permanently removes water from the aquifer. Extracted groundwater is routed to a disposal system. In the Eunice oilfield, injection wells would entrain and inject water deep into an oil production zone or into another receiving strata, often liquid depleted salt domes.

8.3 Natural Attenuation

The natural attenuation factors for chlorides consist of dilution and dispersion in the aquifer. This technique depends upon aquifer flow and time to reduce concentrations. This technique works best where chloride concentrations in ground water pose little risk to human health or the environment.

9.0 Remedial Selection

The following site observations or estimations have been identified:

- The vadose zone is approximately 80 feet thick
- There should not be any recharge at the site mobilizing vadose zone contaminants due to geotextile liners
- Depth to groundwater is approximately 80 feet bgs
- Red-beds (the bottom of the saturated zone) most are likely less than 100 feet bgs
- Groundwater gradient is relatively flat at 0.00109 ft/ft, about six ft/mile
- The maximum observed chloride content in groundwater during the most recent event is 650 mg/L
- The maximum observed downgradient chloride content in groundwater event is 188 mg/L
- Soil sample moisture content has a median value of 6%
- Theis estimated an average hydraulic conductivity of 8 ft/day
- Theis calculated the specific yield to average 24%
- Theis estimated the net infiltration for the area between ¼ and ½ inch per year
- The New Mexico OSE requires extracted groundwater meet beneficial use determination

9.1 AMIGO Modeling

The American Petroleum Institute (API) has developed AMIGO software as a screening tool to simulate the chloride concentration in a water table (unconfined) aquifer affected by a surface release of chloride. AMIGO uses the output from HYDRUS-1D simulations in a ground water mixing model to graph chloride concentrations over time. The technical basis for AMIGO is presented in the API Publication 4734, *Modeling Study of Produced Water Release Scenarios* (Hendrickx and others, 2005). This program

is designed to produce two output graphs; one for chloride concentration to depth in the vadose zone, the second for the flux of chlorides from the vadose zone to groundwater over time. AMIGO was designed with climatic data from the Permian Basin/Hobbs area.
Six model runs were conducted with the AMIGO tool (Appendix C). Site specific data from BH-14 was input for the vertical profile, with model defaults for the Lea County area. The variable for the 6 runs were the background chloride concentrations (50 mg/l and 188 mg/l), and the maximum length of chlorides in the release area aligned with groundwater flow direction (5, 10, and 20 feet). It appeared the model is insensitive to these inputs. The model results mimic the limited empirical data, both of which support the removal of the surface source as adequate to abate chlorides leaching to the subsurface and groundwater.

10.0 Conclusions

- Groundwater gradient slope between the two facilities is towards the east-southeast at approximately 0.00109 ft/ft.
- Elliott B-9 #1,4,5 Tank Battery has chloride and TDS concentrations exceeding DWS values in MW-01, 650 mg/l and 1,660 mg/l, respectfully. MW-02 (upgradient) and MW-03 (downgradient) are within DWS values, and have been within DWS values since the initiation of groundwater investigation.
- Chloride concentrations in groundwater have steadily declined to 650 mg/l, with further reductions anticipated as gravity water and capillary water draining from beneath the liners decreases.
- AMIGO computer modeling indicates the removal of the surface source is adequate to abate chlorides leaching to the subsurface.

11.0 Recommendation

Using site data and modeling, LAI recommends monitoring the site to confirm natural attenuation occurs as the vadose zone waters react to the source removal and geotextile capping.

Table 1
Monitor Well Completion and Gauging Summary
John H. Hendrix Corporation
Elliott B-9 Tank Battery #1, #4 and #5 (1R0483)
Unit C (NE/4,NW/4), Section 9, Township 22 South, Range 37 East
Lea County, New Mexico

Well Information									Groundwater Data			
Well ID	Date Drilled	Drilled Depth (bgs)	Well Diameter (inches)	Surface Elevation	Screen Interval (bgs)	Casing Stickup	TOC Elevation	Well Depth from TOC	Date Gauged	Depth to Fluid	Depth to Water	Corrected Water Elevation
MW-1	10/16/2007	90	2	3,424.90	67.03 - 86.34	2.29	3,427.19	90.27	10/16/2007	--	77.97	3,349.22
									4/7/2008	--	81.08	3,346.11
									9/4/2008	--	78.35	3,348.84
									6/3/2009	--	80.90	3,346.29
									6/30/2009	--	80.89	3,346.30
									9/10/2009	--	80.91	3,346.28
MW-2	12/3/2007	91	2	3,423.50	70.50 - 89.81	3.06	3,426.56	92.84	12/4/2007	--	78.79	3,347.77
									4/7/2008	--	81.10	3,345.46
									9/4/2008	--	78.63	3,347.93
									6/3/2009	--	80.87	3,345.69
									6/30/2009	--	80.81	3,345.75
									9/10/2009	--	80.87	3,345.69
MW-3	6/29/2009	89	2	3,424.40	69 - 89	3.14	3,427.54	92.28	6/30/2009	--	82.28	3,345.26
									9/10/2009	--	82.29	3,345.25

Notes
bgs - below ground surface
TOC - top of casing
Wells drilled and constructed by Scarborough Drilling, Inc., Lamesa, Texas, Schedule 40 threaded PVC casing and screen.

Table 2
Water Quality Parameters Summary
John H. Hendrix Corporation
Elliott B-9 Tank Battery #1, #4 and #5 (1R0483)
Unit C (NE/4,NW/4), Section 9, Township 22 South, Range 37 East
Lea County, New Mexico

Water Quality	**Collection Date**	**Alkalinity, Total**	**Chloride**	**Nitrate**	**Sulfate**	**Total Dissolved Solids**
NMWQCC Standard (mg/L)		--	**250**	**10**	**600**	**1000**
MW-01	10/16/2007	215	**1710**	1.83	223	**3,300**
	4/8/2008	200	**2070**	--	214	**3,980**
	9/4/2008	320	**936**	--	141	**2,240**
	6/3/2009	278	**660**	--	130	**1,840**
	9/10/2009	--	**650**	--	--	**1,660**
MW-02	10/16/2007	204	57	--	88	542
	4/8/2008	240	61.7	--	87.2	535
	9/4/2008	260	33.3	--	68.1	438
	6/3/2009	288	56	--	79.0	492
	9/10/2009	--	52	--	--	478
MW-03	6/30/2009	--	188	--	--	875
	9/10/2009	--	188	--	--	889

Notes
Alkalinity analyzed via EPA Method 310.1.
Anions analyzed via EPA Method 300.
TDS analyzed via EPA Method 160.1.
All values reported in Milligrams per liter (mg/L, parts per million).
< - Indicates the value is less than Method Detection Limit (MDL).

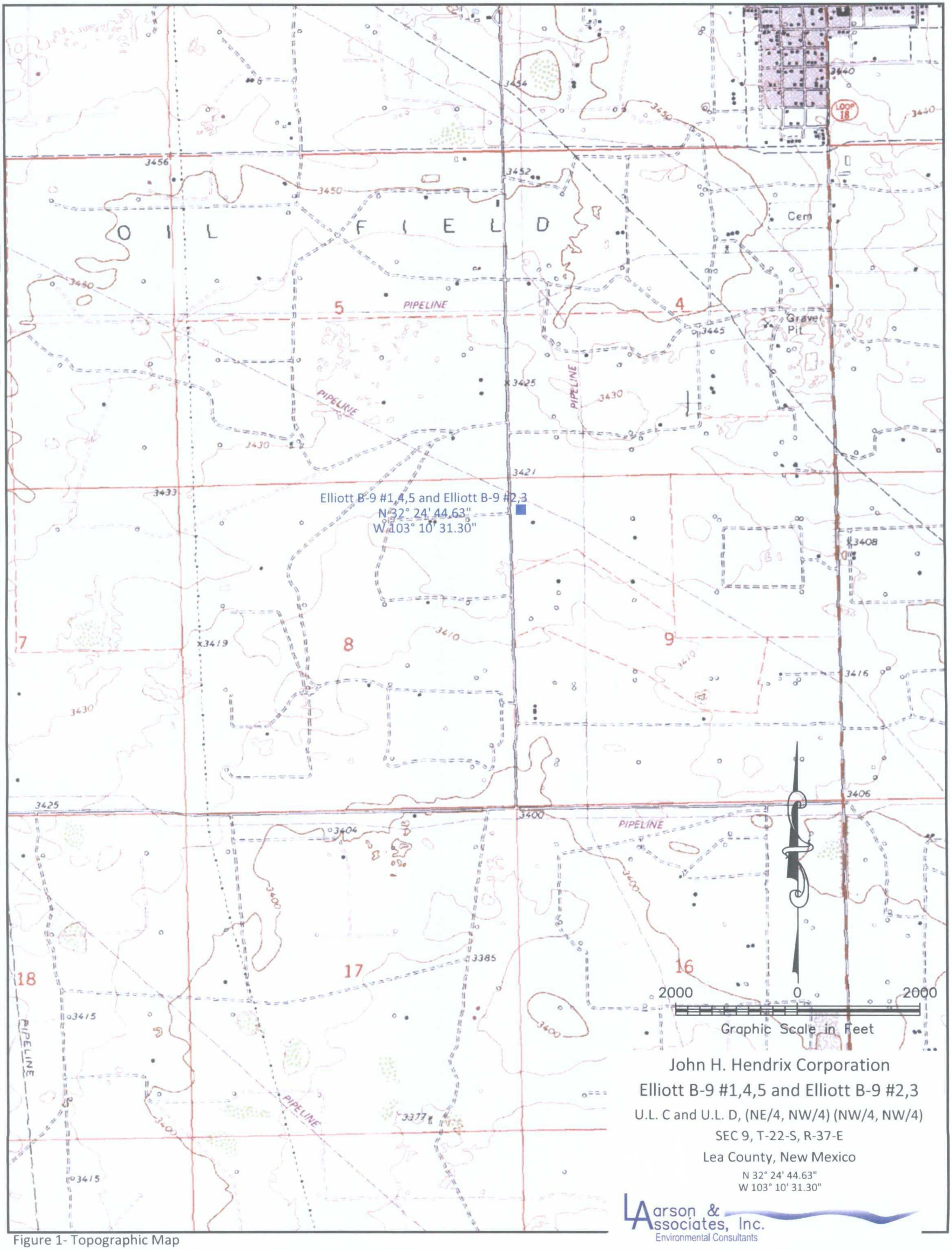


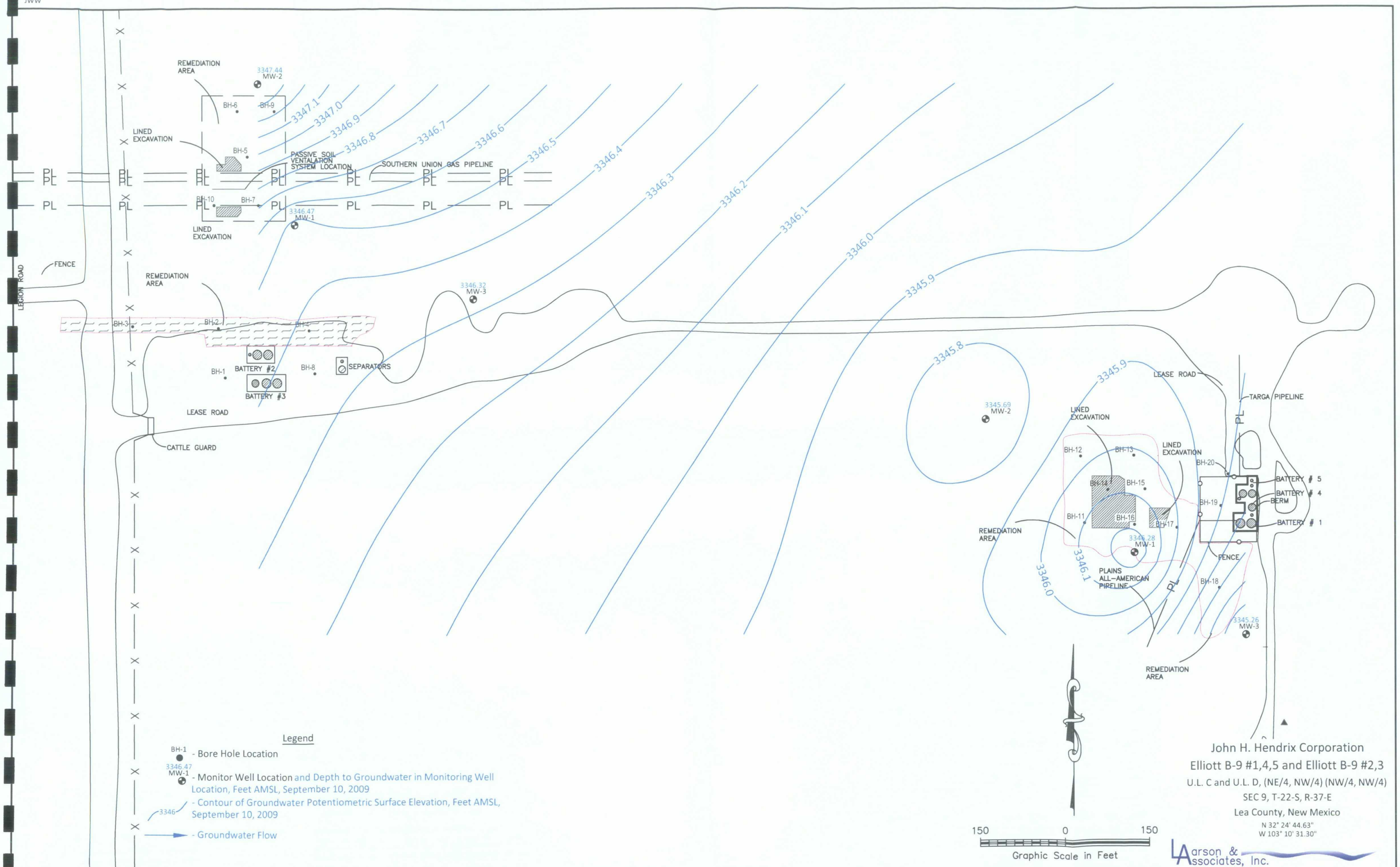
Figure 1- Topographic Map

JWW

John H. Hendrix Corporation
Elliott B-9 #1,4,5 and Elliott B-9 #2,3
U.L. C and U.L. D, (NE/4, NW/4) (NW/4, NW/4)
SEC 9, T-22-S, R-37-E
Lea County, New Mexico
N 32° 24' 44.63"
W 103° 10' 31.30"

Larson & Associates, Inc.
Environmental Consultants

Figure 2 - Aerial Photograph



John H. Hendrix Corporation
Elliott B-9 #1,4,5 and Elliott B-9 #2,3
U.L. C and U.L. D, (NE/4, NW/4) (NW/4, NW/4)
SEC 9, T-22-S, R-37-E
Lea County, New Mexico
N 32° 24' 44.63"
W 103° 10' 31.30"

Larson & Associates, Inc.
Environmental Consultants

Figure 3- Groundwater Potentiometric Map, September 10, 2009

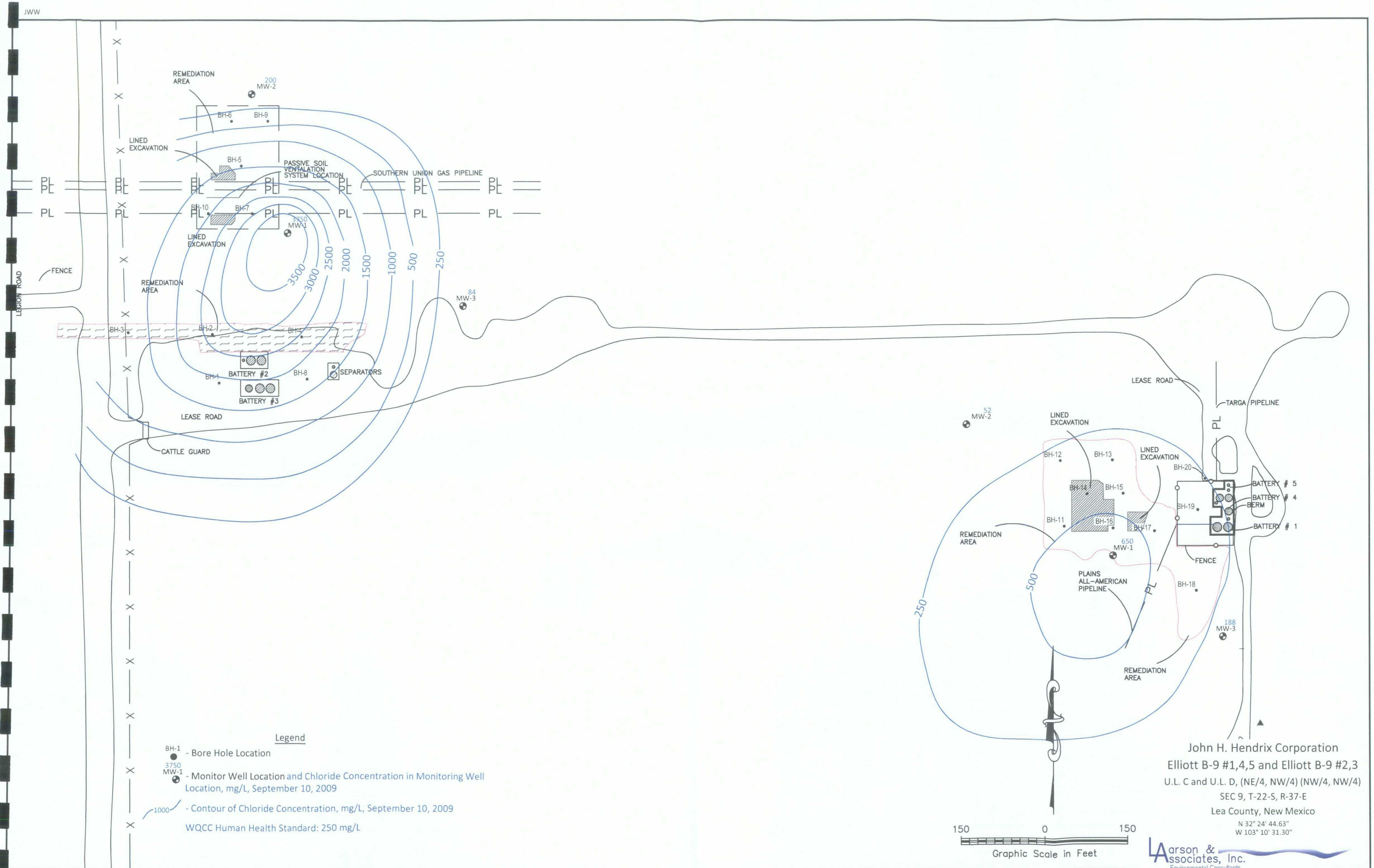
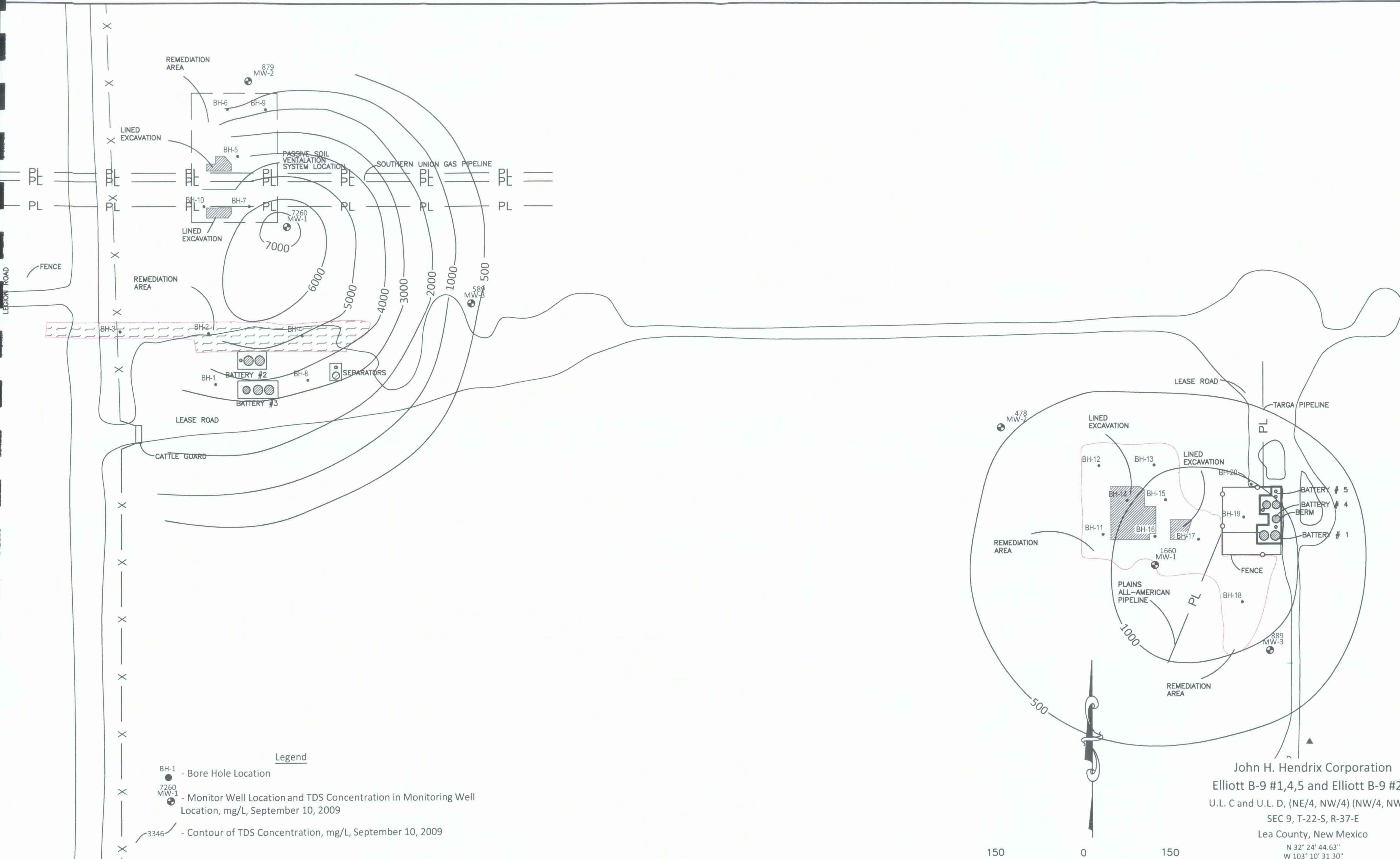


Figure 4- Chloride Concentration Map, September 10, 2009



Legend

- BH-1 ● - Bore Hole Location
- 7260 MW-1 - Monitor Well Location and TDS Concentration in Monitoring Well Location, mg/L, September 10, 2009
- 3346 - Contour of TDS Concentration, mg/L, September 10, 2009

150 0 150

Graphic Scale in Feet

John H. Hendrix Corporation

Elliott B-9 #1,4,5 and Elliott B-9 #2,3

U.L. C and U.L. D, (NE/4, NW/4) (NW/4, NW/4)

SEC 9, T-22-S, R-37-E

Lea County, New Mexico

N 32° 24' 44.63"
W 103° 10' 31.30"

Larson & Associates, Inc.
Environmental Consultants

JWW

Figure 5- TDS Concentration Map, September 10, 2009

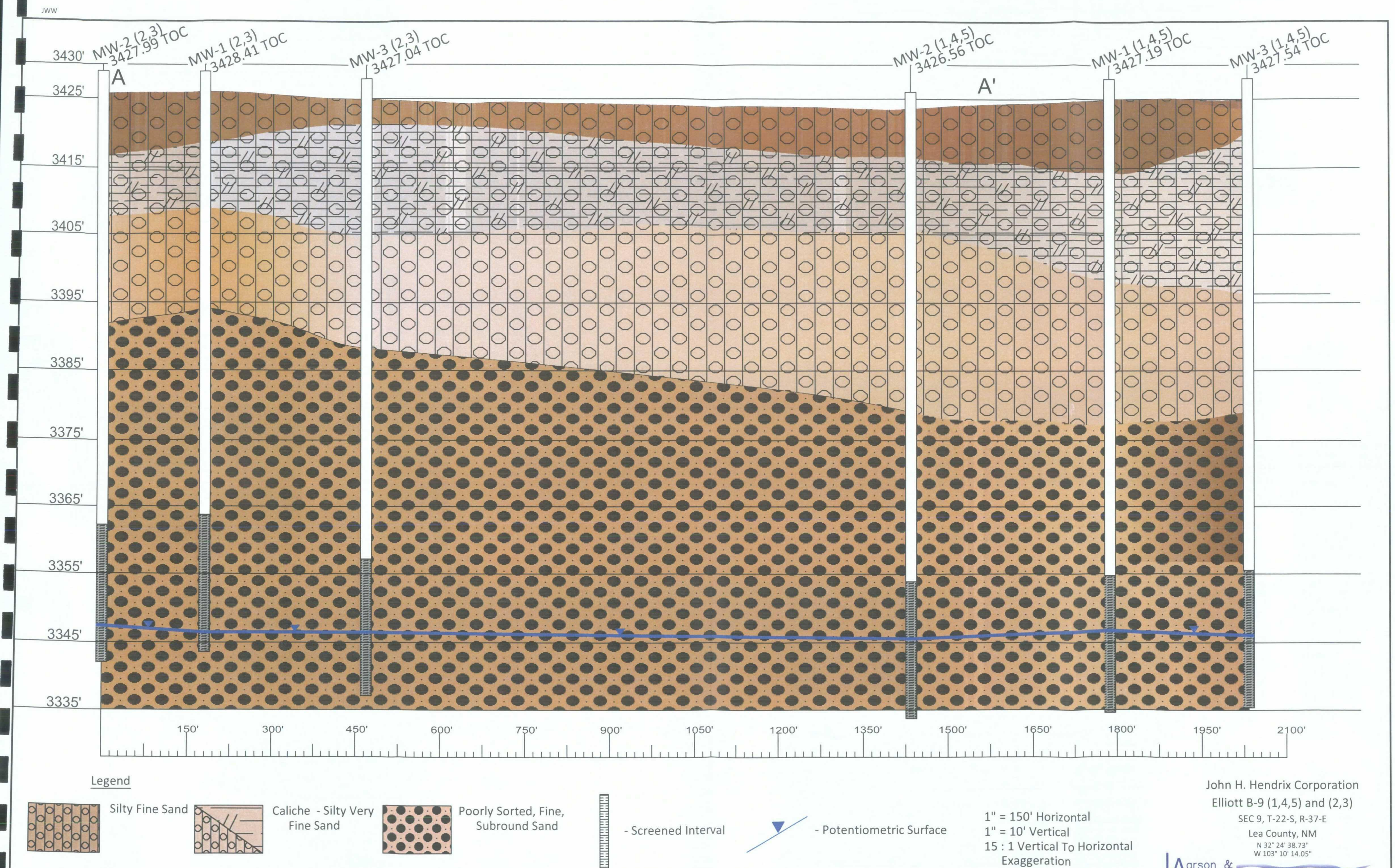


Figure 6 - Cross Section

Sent: Monday, December 17, 2007 4:13 PM
To: Mark Larson
Subject: John Hindrex 1R0483 and 1R0484 Elliot

Dear Mark,

Sorry for the delay, I was out sick with the flu. Pursuant to our meeting last week OCD hereby approves the pit closure plans as described in the meeting. Groundwater monitoring and possible remediation will continue as discussed.

Please be advised that OCD approval of this plan does not relieve the owner/operator of responsibility should their operations fail to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, OCD approval does not relieve the owner/operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Wayne Price-Environmental Bureau Chief
Oil Conservation Division
1220 S. Saint Francis
Santa Fe, NM 87505
E-mail wayne.price@state.nm.us
Tele: 505-476-3490
Fax: 505-476-3462

CARDINAL LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
LARSON & ASSOCIATES, INC.
ATTN: MICHELLE GREEN
507 N. MARIEFELD, SUITE 200
MIDLAND, TX 79701

Receiving Date: 06/03/09
Reporting Date: 06/10/09
Project Number: 6-0104-02
Project Name: ELLIOTT B-9 #1, 4 & 5
Project Location: NOT GIVEN

Sampling Date: 06/03/09
Sample Type: GROUND WATER
Sample Condition: COOL & INTACT @ 4°C
Sample Received By: ML
Analyzed By: AB/HM

LAB NO.	SAMPLE ID	Cl^- (mg/L)	SO_4 (mg/L)	TDS (mg/L)	CO_3 (mg/L)	HCO_3 (mg/L)
Analysis Date:		06/05/09	06/09/09	06/08/09	06/09/09	06/09/09
H17548-1	MW-1	660	130	1,840	0	278
H17548-2	MW-2	56	79.0	492	0	288
Quality Control		490	42.7	NR	NR	988
True Value QC		500	40.0	NR	NR	1000
% Recovery		98.0	107	NR	NR	98.8
Relative Percent Difference		< 0.1	3.0	4.1	NR	1.2
METHOD: Standard Methods, EPA		4500-Cl⁻B	375.4	160.1	310.1	310.1

Chemist

Date 06/10/09

H17548 Larson & Associates

CARDINAL LABORATORIES

2111 Beechwood, Abilene, TX 79603 (325) 673-7001 Fax (325) 673-7020
101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page____ of ____

Company Name: Larson + Assoc.	**BILL TO**
Project Manager: Michelle Green	P.O. #:
Address: 507 N. Marienfeld #200	Company: JHHC
City: Midland State: TX Zip: 79701	Attn: Carolyn Haynes
Phone #: 687-0901 Fax #:	Address:
Project #: 6-0104-02 Project Owner:	City:
Project Name: Elliott B-9 #1, 4+5	State: Zip:
Project Location:	Phone #:
Sampler Name:	Fax #:

ANALYSIS REQUEST

Lab I.D. (FOR LAB USE ONLY)	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	MATRIX: WASTEWATER	MATRIX: SOIL	MATRIX: OIL	MATRIX: SLUDGE	MATRIX: OTHER :	PRESERV.: ACID/BASE:	PRESERV.: ICE / COOL	PRESERV.: OTHER :	SAMPLING: DATE	SAMPLING: TIME	Anions - chloride + TDS
H17548-1	MW-1		1	1							1		6-3	1405	✓
-2	MW-2		1	1							1		6-3	1343	✓

Sampler Relinquished: [signature]	Date: 6-3-08 Time: 3:25	Received By: [signature]	Phone Result: ☐ Yes ☐ No Add'l Phone #:
Relinquished By:	Date: Time:	Received By:	Fax Result: ☐ Yes ☐ No Add'l Fax #:
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Temp. 4°C	Sample Condition Cool ☑ Yes ☐ No; Intact ☑ Yes ☐ No	CHECKED BY: (Initials) [initials]

REMARKS:

† Cardinal cannot accept verbal changes. Please fax written changes to 325-673-7020.

CARDINAL
LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

July 3, 2009

Michelle Green
Larson & Associates, Inc.
507 North Marienfeld, Suite 202
Midland, TX 79701

Re: Elliot B-9 Battery 1, 4, & 5

Enclosed are the results of analyses for sample number H17723, received by the laboratory on 06/30/09 at 2:20 pm.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene
Laboratory Director

CARDINAL LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
LARSON & ASSOCIATES, INC.
ATTN: MICHELLE GREEN
507 N. MARIENFELD, SUITE 202
MIDLAND, TX 79701

Receiving Date: 06/30/09
Reporting Date: 07/02/09
Project Number: 6-0104-02
Project Name: ELLIOTT B-9 BATTERY 1, 4 & 5
Project Location: ELLIOT B-9 BATTERY 1, 4, & 5

Sampling Date: 06/30/09
Sample Type: GROUND WATER
Sample Condition: COOL & INTACT @ 6°C
Sample Received By: ML
Analyzed By: HM

LAB NO.	SAMPLE ID	Cl^- (mg/L)	TDS (mg/L)
Analysis Date:		07/01/09	07/01/09
H17723-1	MW-3	188	875
Quality Control		500	NR
True Value QC		500	NR
% Recovery		100	NR
Relative Percent Difference		< 0.1	<0.1
METHOD: Standard Methods, EPA		4500-Cl⁻B	160.1

Chemist ____________ Date 07/13/09

H17723 Larson & Associates

CARDINAL LABORATORIES
101 East Marland, Hobbs, NM 88240
(575) 393-2326 Fax (575) 393-2476

Company Name: Larson + Associates	**BILL TO**
Project Manager: Michelle Green	P.O. #:
Address: 507 N Marienfeld #202	Company: JAHC
City: Midland State: TX Zip: 79701	Attn: Carolyn Haynes
Phone #: 432-687-0901 Fax #:	Address:
Project #: 6-0104-02 Project Owner:	City:
Project Name: Elliott B9 Battery 1,4 + 5	State: Zip:
Project Location: Elliott B-9 Battery 1, 4, + 5	Phone #:
Sampler Name: Don McGinnis	Fax #:

Lab I.D. (FOR LAB USE ONLY)	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	Chloride	TDS
H17723-1	MW-3		1	X							✓		6-30-09	1315	X	X

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Sampler Relinquished: [signature]	Date: 6-30-09 Time: 1420	Received By: [signature]	Phone Result: ☐ No Add'l Phone #:
Relinquished By:	Date: Time:	Received By:	Fax Result: ☐ No Add'l Fax #:
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Temp. 6°C	Sample Condition Cool ☑ Yes ☐ No Intact ☑ Yes ☐ No	CHECKED BY: (Initials) [initials]
REMARKS:			

† Cardinal cannot accept verbal changes. Please fax written changes to 575-393-2476.

#24

CARDINAL
LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

September 14, 2009

Michelle Green
Larson & Associates, Inc.
507 North Marienfeld, Suite 202
Midland, TX 79701

Re: Elliot B-9 #1, 4 & 5

Enclosed are the results of analyses for sample number H18218, received by the laboratory on 09/10/09 at 1:04 pm.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accredited though the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.2	Regulated VOCs (V2, V3)

Accreditation applies to public drinking water matrices.

Total Number of Pages of Report: 3 (includes Chain of Custody)

Sincerely,

Celey D. Keene
Laboratory Director

CARDINAL LABORATORIES

PHONE (575) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR
LARSON & ASSOCIATES, INC.
ATTN: MICHELLE GREEN
507 N. MARIENFELD, SUITE 202
MIDLAND, TX 79701

Receiving Date: 09/10/09
Reporting Date: 09/13/09
Project Number: 6-0104-02
Project Name: ELLIOTT B-9 #1, 4 & 5
Project Location: NEW MEXICO

Sampling Date: 09/10/09
Sample Type: GROUND WATER
Sample Condition: COOL & INTACT @ 1.5°C
Sample Received By: ML
Analyzed By: HM

LAB NO.	SAMPLE ID	Cl^- (mg/L)	TDS (mg/L)
Analysis Date:		09/11/09	09/11/09
H18218-1	MW-1	650	1,660
H18218-2	MW-2	52	478
H18218-3	MW-3	188	889
Quality Control		500	NR
True Value QC		500	NR
% Recovery		100	NR
Relative Percent Difference		< 0.1	1.3
METHOD: Standard Methods, EPA		4500-Cl⁻B	160.1

Chemist (signature)

Date 09/14/09

H18218 Larson & Associates

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

CARDINAL LABORATORIES
2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240
(325) 673-7001 Fax (325) 673-7020 (505) 393-2326 Fax (505) 393-2476

Company Name: Larson + Associates, Inc		**BILL TO**	
Project Manager: Michelle Green		P.O. #:	
Address: 507 N. Marienfeld Suite 200		Company: JHHC	
City: Midland	State: TX Zip: 79701	Attn:	
Phone #: 432-687-0901	Fax #:	Address:	
Project #: 6-0104-02	Project Owner:	City:	
Project Name: Elliot B-9 #1,4+5		State:	Zip:
Project Location: New Mexico		Phone #:	
Sampler Name: Roger Brooks		Fax #:	

ANALYSIS REQUEST

Lab I.D. (FOR LAB USE ONLY)	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	MATRIX: WASTEWATER	MATRIX: SOIL	MATRIX: OIL	MATRIX: SLUDGE	MATRIX: OTHER:	PRESERV: ACID/BASE:	PRESERV: ICE / COOL	PRESERV: OTHER:	SAMPLING: DATE	SAMPLING: TIME	Chloride (E300)	TDS
H18218-1	MW-1		2	X							X		9-10-09	11:00	X	X
-2	MW-2		2	X							X		9-10-09	11:30	X	X
-3	MW-3		2	X							X		9-10-09	10:30	X	X

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising whether based in contract or tort, shall be limited to the amount paid by the client for the analyses. All claims including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within 30 days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

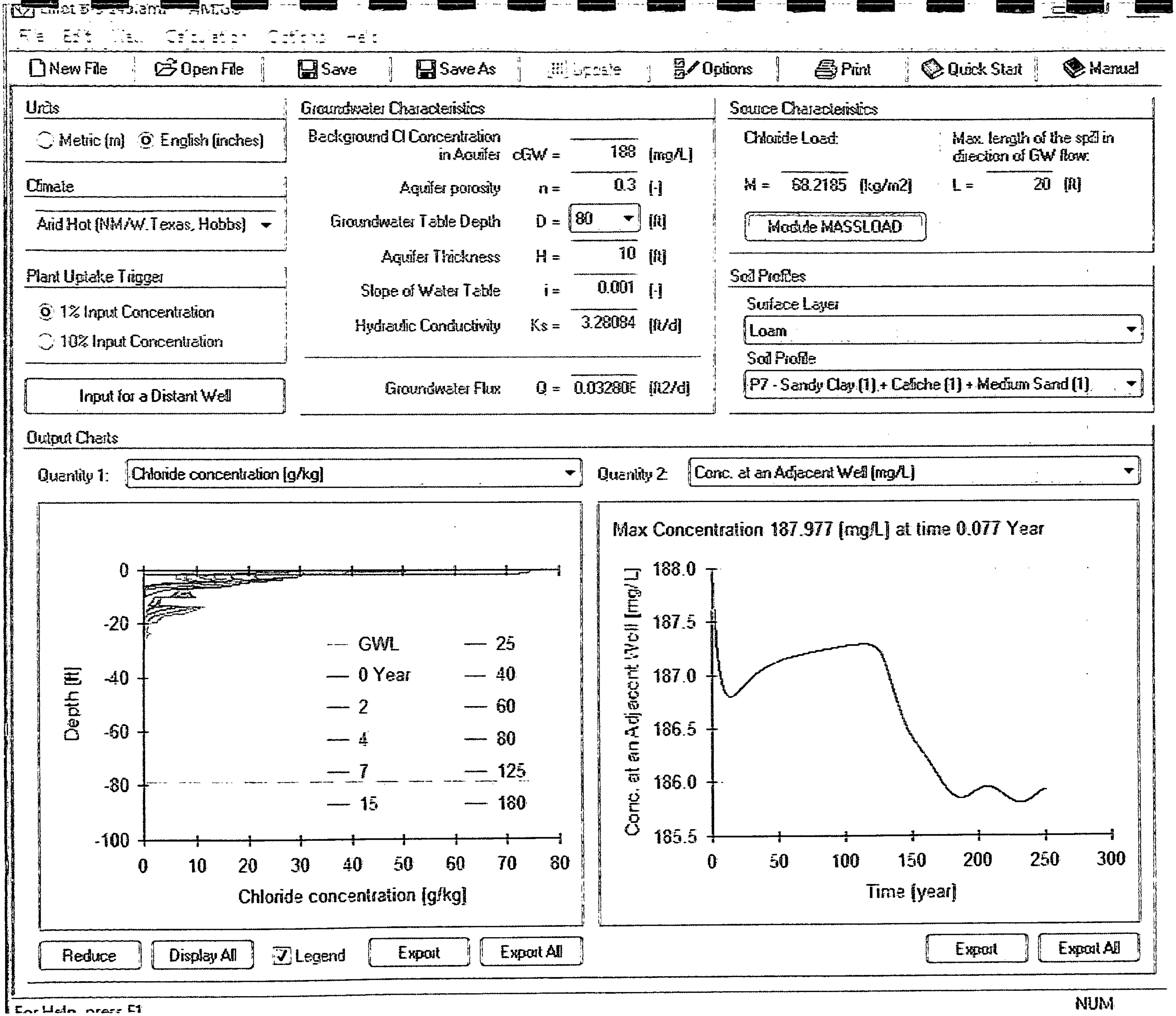
Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% per annum from the original date of invoice, and all costs of collections, including attorney's fees.

Sampler Relinquished: Roger Brooks	Date: 9-10-09 Time: 13:04	Received By: [signature]	Phone Result: ☐ Yes ☐ No Add'l Phone #:
Relinquished By:	Date: Time:	Received By:	Fax Result: ☐ Yes ☐ No Add'l Fax #:
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Temp. 1.5C	Sample Condition: Cool ☑ Yes ☐ No; Intact ☑ Yes ☐ No	CHECKED BY: (Initials) MCAB

REMARKS: Larson Contact: Michelle Green 432-687-0901

† Cardinal cannot accept verbal changes. Please fax written changes to 325-673-7020.

#26


File Edit View Calculation Options Help
New File
Open File
Save
Save As
Update
Options
Print
Quick Start
Manual
Units
Metric (m)
English (inches)
Climate
Arid Hot (NM/W.Texas, Hobbs)
Plant Uptake Trigger
1% Input Concentration
10% Input Concentration
Input for a Distant Well
Groundwater Characteristics
Background Cl Concentration in Aquifer cGW = 188 [mg/L]
Aquifer porosity n = 0.3 [-]
Groundwater Table Depth D = 80 [ft]
Aquifer Thickness H = 10 [ft]
Slope of Water Table i = 0.001 [-]
Hydraulic Conductivity Ks = 3.28084 [ft/d]
Groundwater Flux Q = 0.03280E [ft2/d]
Source Characteristics
Chloride Load:
M = 68.2185 [kg/m2]
Max. length of the spill in direction of GW flow:
L = 20 [ft]
Module MASSLOAD
Soil Profiles
Surface Layer
Loam
Soil Profile
P7 - Sandy Clay (1) + Caliche (1) + Medium Sand (1)
Output Charts
Quantity 1: Chloride concentration [g/kg]
Quantity 2: Conc. at an Adjacent Well [mg/L]
Depth [ft]
0
-20
-40
-60
-80
-100
0 10 20 30 40 50 60 70 80
Chloride concentration [g/kg]
GWL
0 Year
2
4
7
15
25
40
60
80
125
180
Max Concentration 187.977 [mg/L] at time 0.077 Year
Conc. at an Adjacent Well [mg/L]
188.0
187.5
187.0
186.5
186.0
185.5
0 50 100 150 200 250 300
Time [year]
Reduce
Display All
Legend
Export
Export All
Export
Export All
For Help, press F1
NUM

MASS[redacted]AD - Use[redacted] Inputs from Bo[redacted]ngs Data

Moist Bulk Density

( ) User provided moist bulk density rho_m [kg/m^3]

(•) Calculated moist bulk density rho_m : 1432 [kg/m^3]

Dry bulk density rho : 1420 [kg/m^3]

Vol. Water Content Theta_V : 0.012 [-]

Moist bulk density used in calculation : 1432 [kg/m^3]

Depth to Water

Depth to Water : 77 Feet

Borehole Weights

Boring No.	Proportional Area Weights PAW [-]	Chl. Load of each Borehole L [kg/m^2]	Equal Area Weights EAW [-]	PAW*L
1	0.000	68.219	1.0	0.000
2	0.000	0.000	0.0	0.000
3	0.000	0.000	0.0	0.000
4	0.000	0.000	0.0	0.000
5	0.000	0.000	0.0	0.000
6	0.000	0.000	0.0	0.000
7	0.000	0.000	0.0	0.000
8	0.000	0.000	0.0	0.000
9	0.000	0.000	0.0	0.000
10	0.000	0.000	0.0	0.000
Sum	0.000	68.219	1.0	0.000

Clear Table | Set Options for All Borings

Output - Chloride Load

Update | Total Chloride Load : 68.2185 [kg/m^2]

Soil Samples from a Borehole

Boring No.: 1 | Units: Feet | Sample Type: Interval

Sample No.	Top of Sample [ft]	Bottom of Sample [ft]	Average Depth [ft]	Chloride Conc. [mg/kg]	Chloride Load [kg/m^2]
1	0.000	2.000	1.000	813.000	0.355
2	5.000	6.000	5.500	2630.000	3.381
3	10.000	11.000	10.500	5290.000	8.642
4	15.000	16.000	15.500	6590.000	12.963
5	20.000	21.000	20.500	5320.000	12.996
6	25.000	26.000	25.500	2980.000	9.057
7	30.000	31.000	30.500	2230.000	5.685
8	35.000	36.000	35.500	1700.000	4.288
9	40.000	41.000	40.500	1600.000	3.601
10	45.000	46.000	45.500	799.000	2.618
11	50.000	51.000	50.500	1400.000	2.400
12	55.000	56.000	55.500	442.000	2.010
13	0.000	0.000	0.000	0.000	0.223
14	0.000	0.000	0.000	0.000	0.000
15	0.000	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.000
17	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.000
19	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000
21	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000
27	0.000	0.000	0.000	0.000	0.000
28	0.000	0.000	0.000	0.000	0.000
29	0.000	0.000	0.000	0.000	0.000
30	0.000	0.000	0.000	0.000	0.000

Clear Table | Chloride Load for Boring 1 : 68.2185 [kg/m^2]

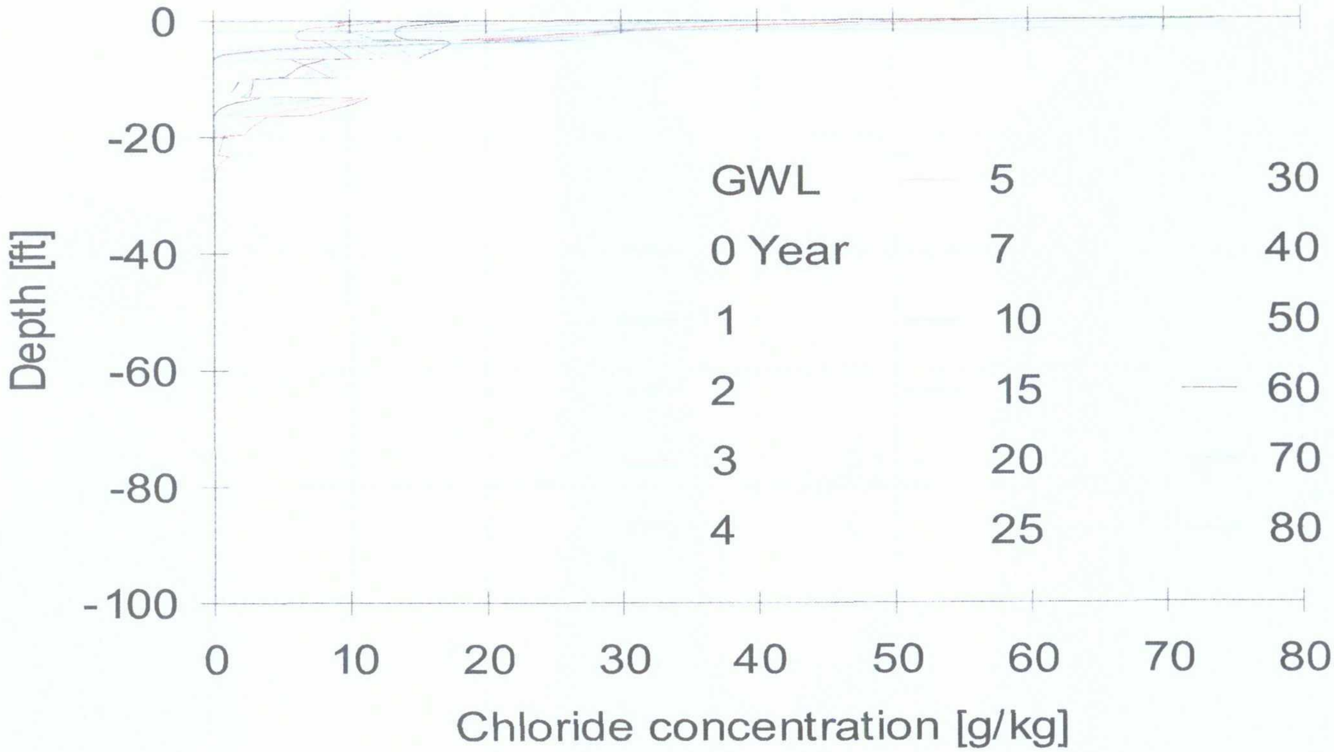
OK | Cancel

Project: Elliot B-9 145.ami
Path: C:\Program Files\API\AMIGO\Projects\Elliot B-9 145.ami
Date: 10/23/2009
Units: English (inches)
Climate: Arid Hot (NM/W.Texas, Hobbs)
Plant Uptake Trigger: 1% Input Concentration

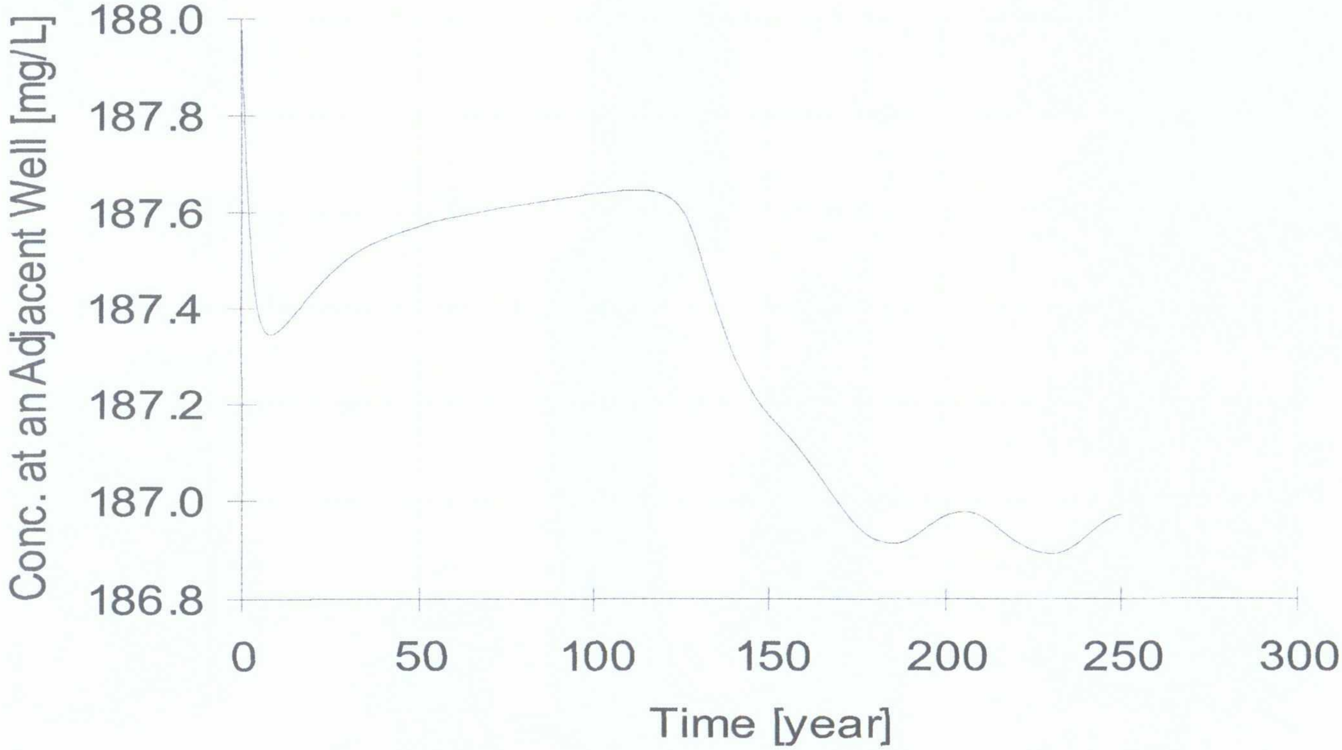
Groundwater Characteristics
Background Cl Concentration in Aquifer: 188 [mg/L]
Aquifer porosity: 0.3 [-]
Groundwater Table Depth: 80 [ft]
Aquifer Thickness: 10 [ft]
Slope of Water Table: 0.001 [-]
Hydraulic Conductivity: 3.28084 [ft/d]
Groundwater Flux: 0.0328084 [ft2/d]

Source Characteristics
Chloride Load:: 68.2185 [kg/m2]
Max. length of the spill in direction of GW flow:: 10 [ft]

Soil Profiles
Surface Layer: Loam
Soil Profile: P7 - Sandy Clay (1) + Caliche (1) + Medium Sand (1)



Max Concentration 187.977 [mg/L] at time 0.077 Year



Run 2 WDG 10/23/09

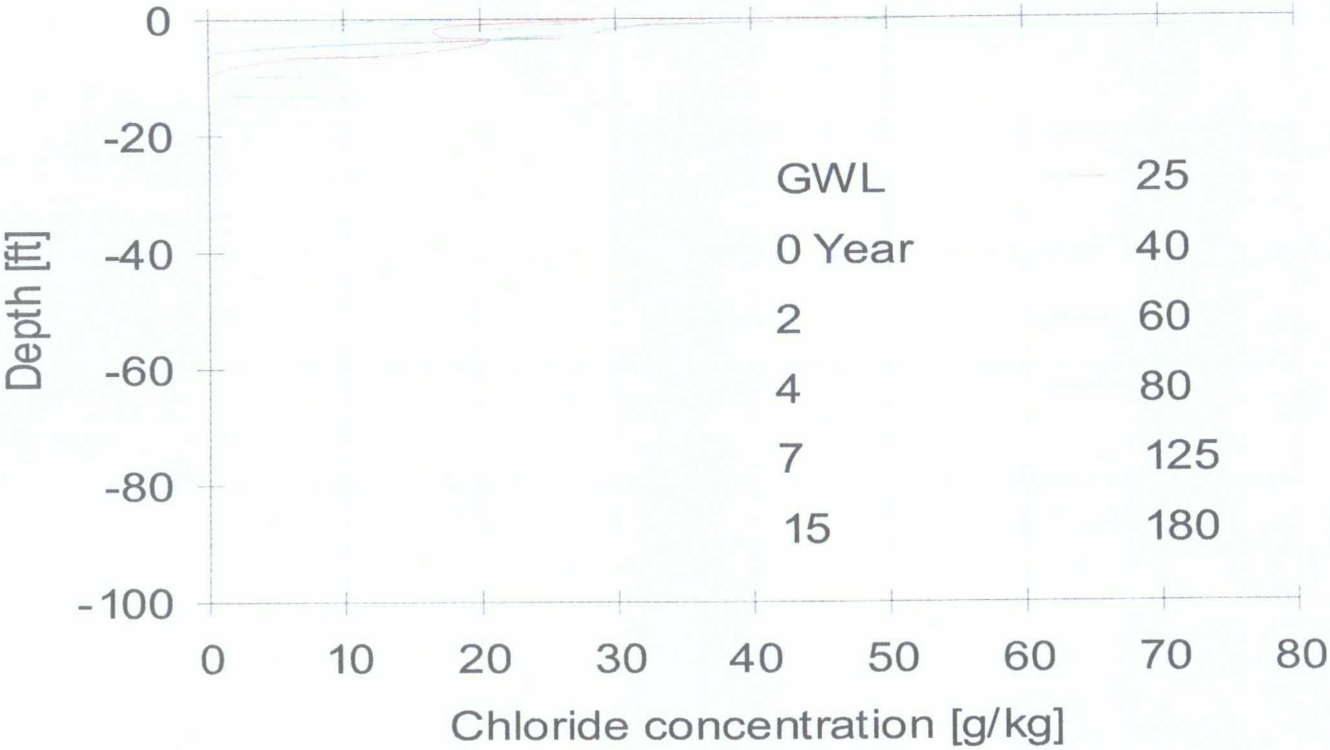
Project: Elliot B-9 145.ami
Path: C:\Program Files\API\AMIGO\Projects\Elliot B-9 145.ami
Date: 10/23/2009
Units: English (inches)
Climate: Arid Hot (NM/W.Texas, Hobbs)
Plant Uptake Trigger: 1% Input Concentration

Groundwater Characteristics
Background Cl Concentration in Aquifer: 188 [mg/L]
Aquifer porosity: 0.3 [-]
Groundwater Table Depth: 80 [ft]
Aquifer Thickness: 10 [ft]
Slope of Water Table: 0.001 [-]
Hydraulic Conductivity: 3.28084 [ft/d]
Groundwater Flux: 0.0328084 [ft2/d]

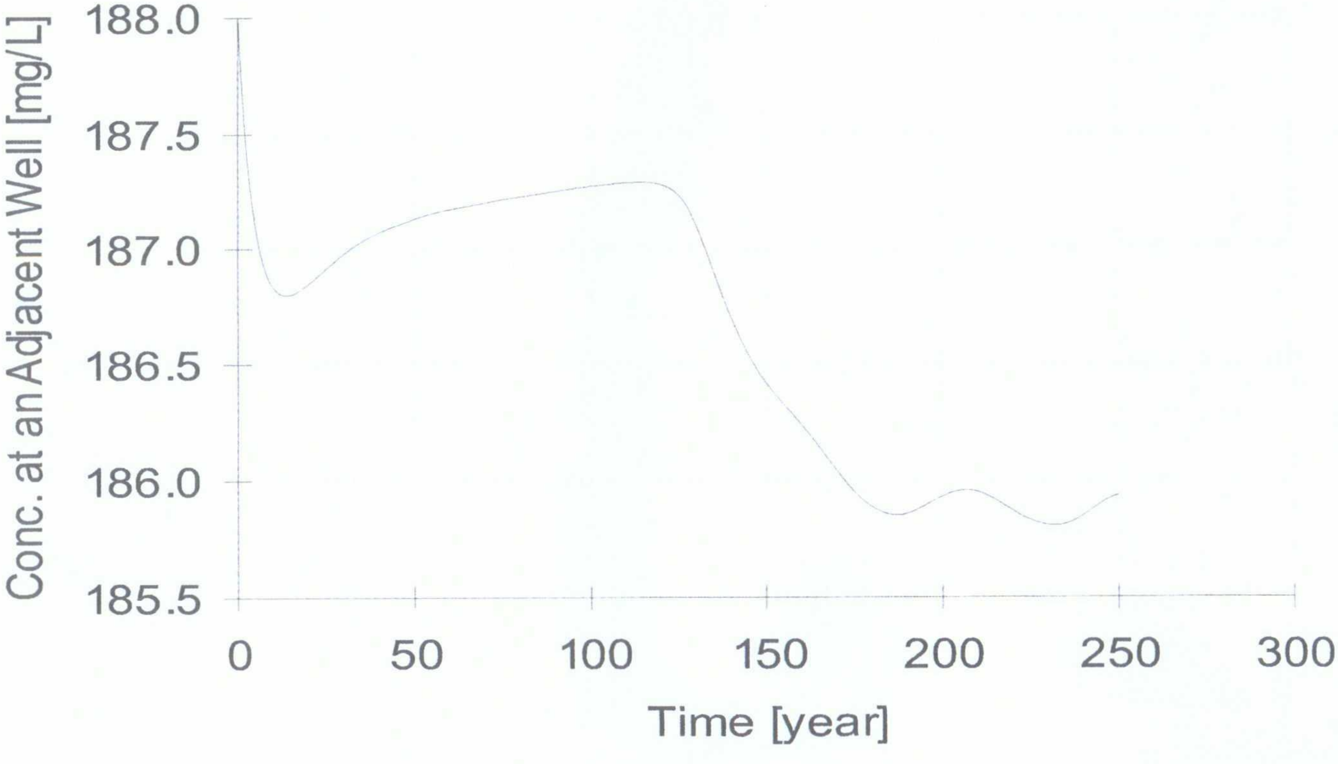
Source Characteristics
Chloride Load:: 68.2185 [kg/m2]
Max. length of the spill in direction of GW flow:: 20 [ft]

Soil Profiles
Surface Layer: Loam
Soil Profile: P7 - Sandy Clay (1) + Caliche (1) + Medium Sand (1)

Run 2 WDG 10/23/09



Max Concentration 187.977 [mg/L] at time 0.077 Year

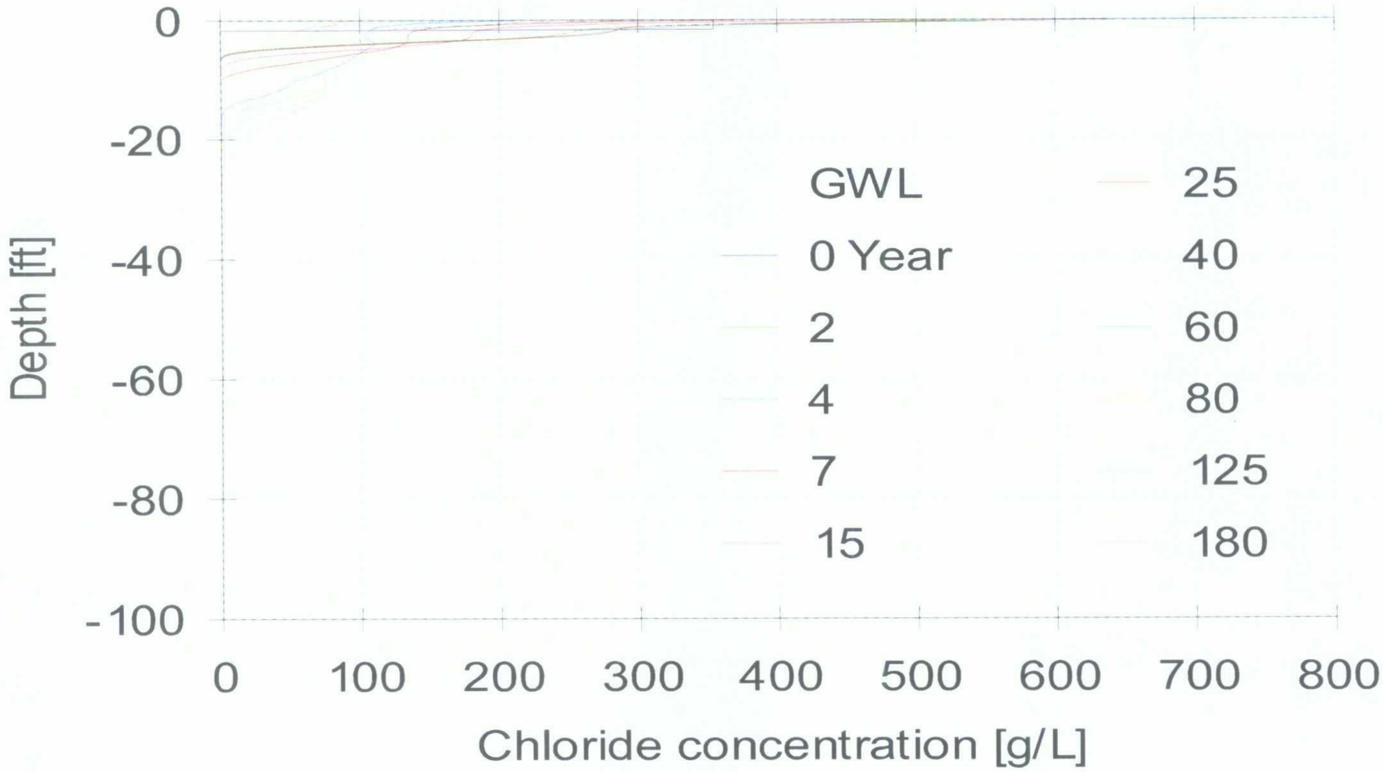


Project: Elliot B-9 145.ami
Path: C:\Program Files\API\AMIGO\Projects\Elliot B-9 145.ami
Date: 11/2/2009
Units: English (inches)
Climate: Arid Hot (NM/W.Texas, Hobbs)
Plant Uptake Trigger: 1% Input Concentration

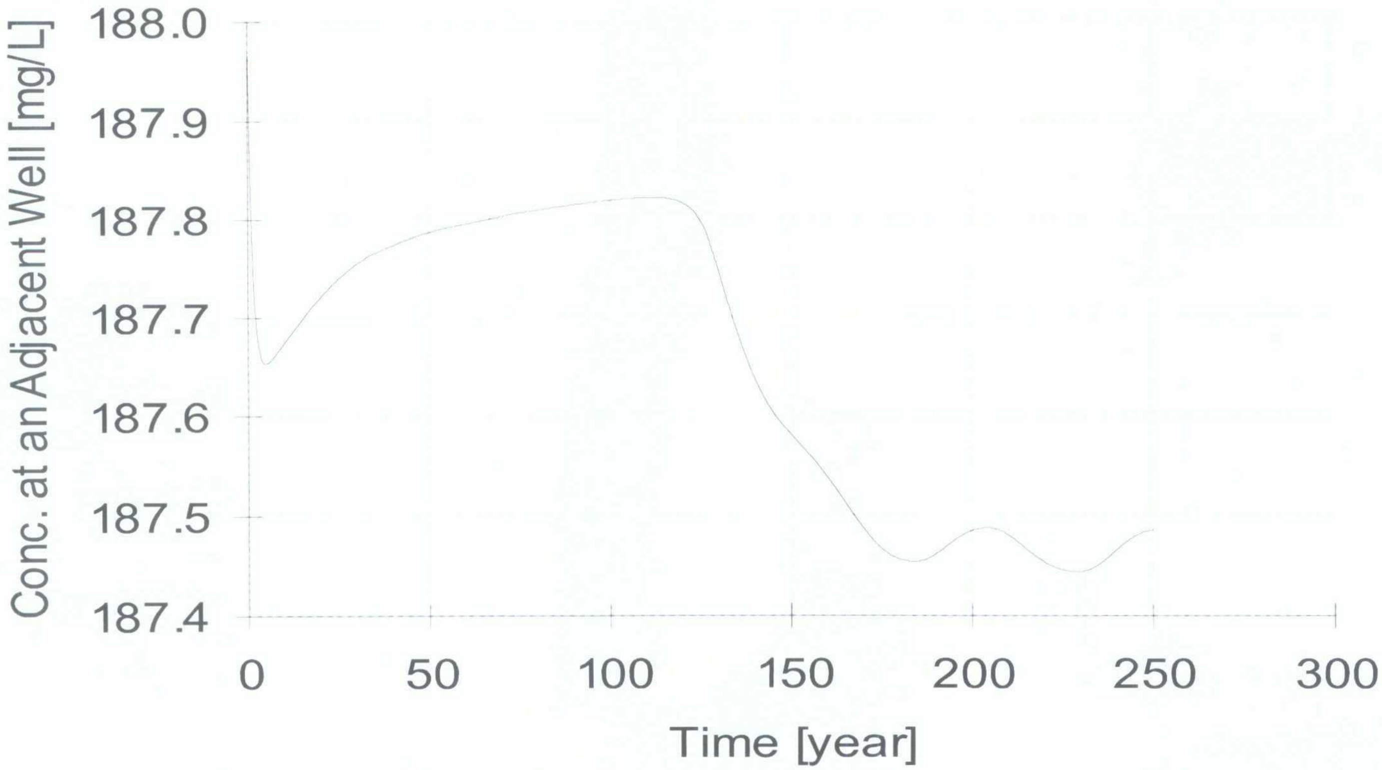
Groundwater Characteristics
Background Cl Concentration in Aquifer: 188 [mg/L]
Aquifer porosity: 0.3 [-]
Groundwater Table Depth: 80 [ft]
Aquifer Thickness: 10 [ft]
Slope of Water Table: 0.001 [-]
Hydraulic Conductivity: 3.28084 [ft/d]
Groundwater Flux: 0.0328084 [ft2/d]

Source Characteristics
Chloride Load:: 68.2185 [kg/m2]
Max. length of the spill in direction of GW flow:: 5 [ft]

Soil Profiles
Surface Layer: Loam
Soil Profile: P7 - Sandy Clay (1) + Caliche (1) + Medium Sand (1)



Max Concentration 187.977 [mg/L] at time 0.077 Year

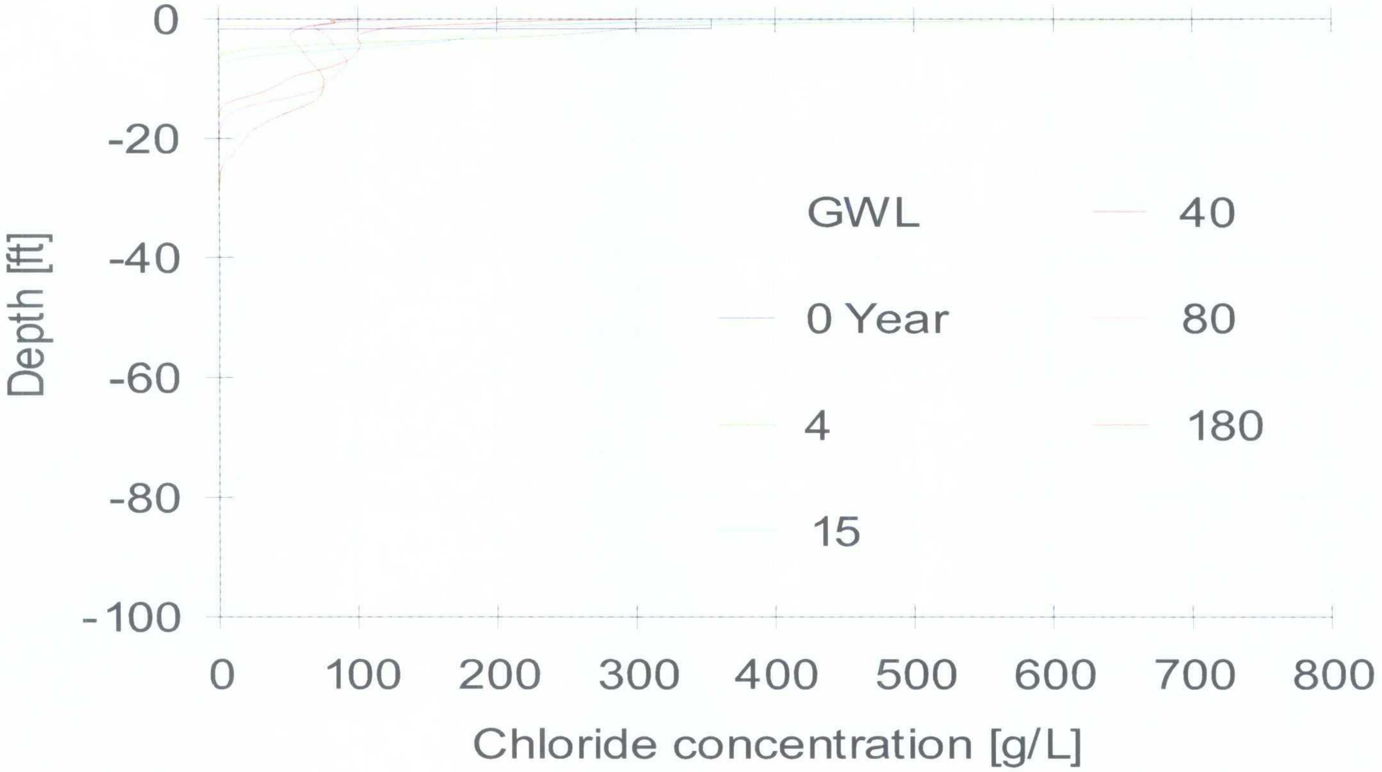


Project: Elliot B-9 145.ami
Path: C:\Program Files\API\AMIGO\Projects\Elliot B-9 145.ami
Date: 11/2/2009
Units: English (inches)
Climate: Arid Hot (NM/W.Texas, Hobbs)
Plant Uptake Trigger: 1% Input Concentration

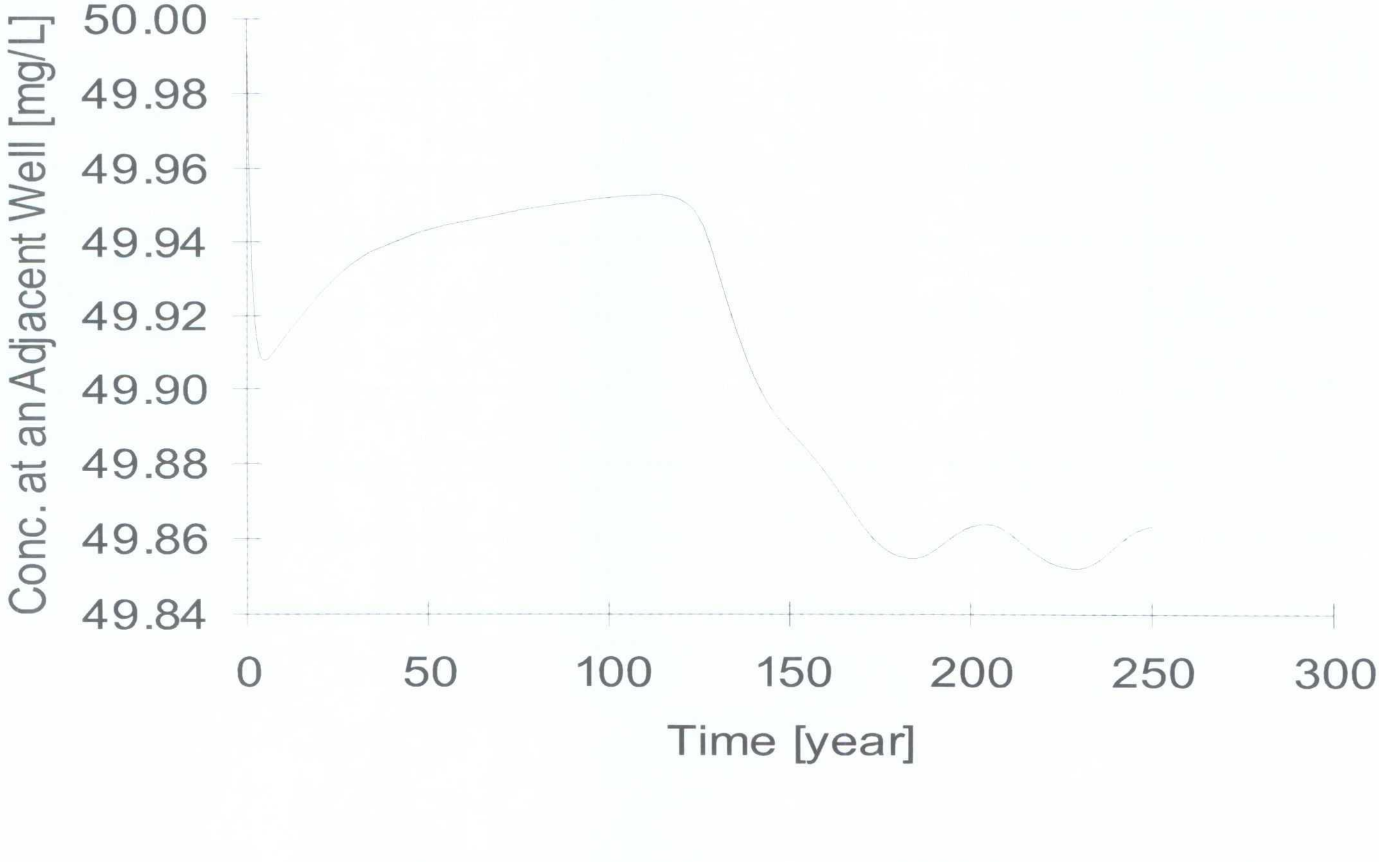
Groundwater Characteristics
Background Cl Concentration in Aquifer: 50 [mg/L]
Aquifer porosity: 0.3 [-]
Groundwater Table Depth: 80 [ft]
Aquifer Thickness: 10 [ft]
Slope of Water Table: 0.001 [-]
Hydraulic Conductivity: 3.28084 [ft/d]
Groundwater Flux: 0.0328084 [ft2/d]

Source Characteristics
Chloride Load:: 68.2185 [kg/m2]
Max. length of the spill in direction of GW flow:: 5 [ft]

Soil Profiles
Surface Layer: Loam
Soil Profile: P7 - Sandy Clay (1) + Caliche (1) + Medium Sand (1)



Max Concentration 49.994 [mg/L] at time 0.077 Year

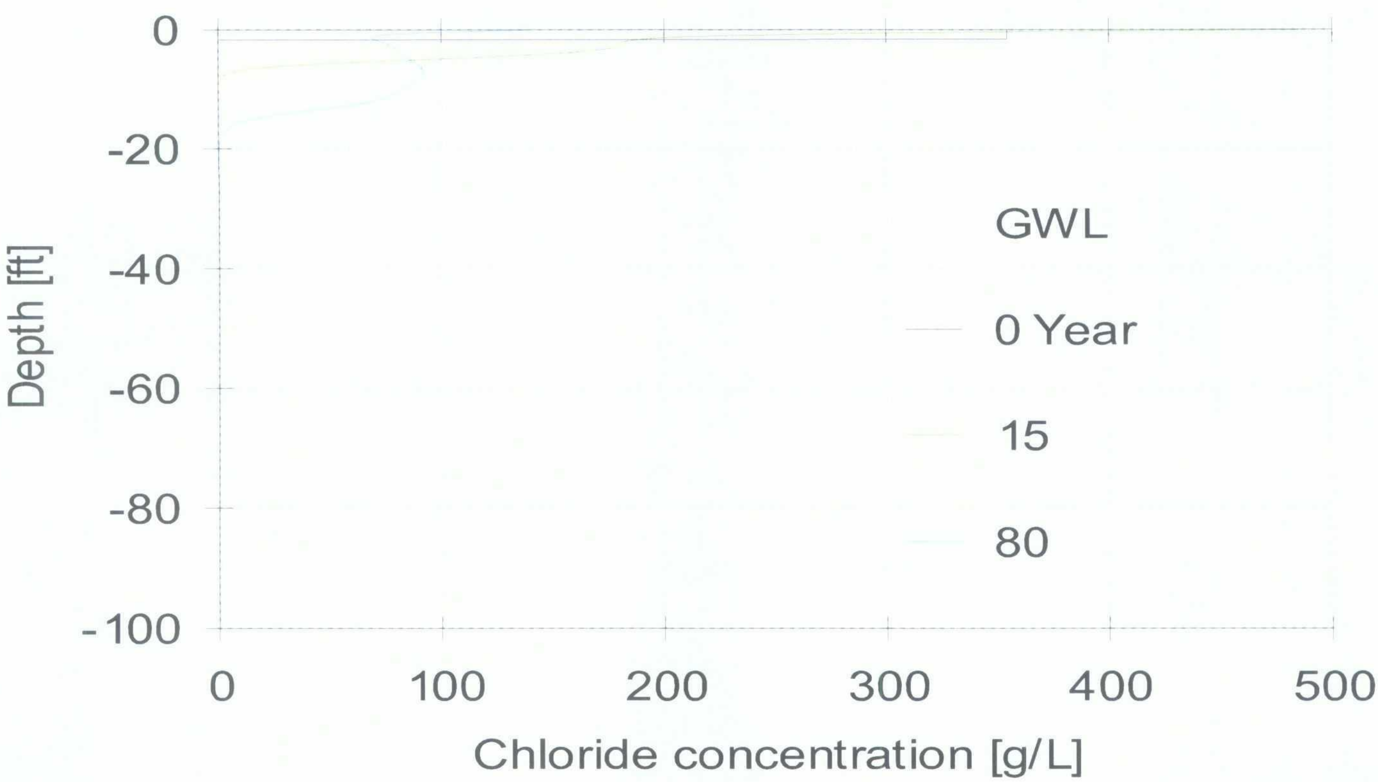


Project: Elliot B-9 145.ami
Path: C:\Program Files\API\AMIGO\Projects\Elliot B-9 145.ami
Date: 11/2/2009
Units: English (inches)
Climate: Arid Hot (NM/W.Texas, Hobbs)
Plant Uptake Trigger: 1% Input Concentration

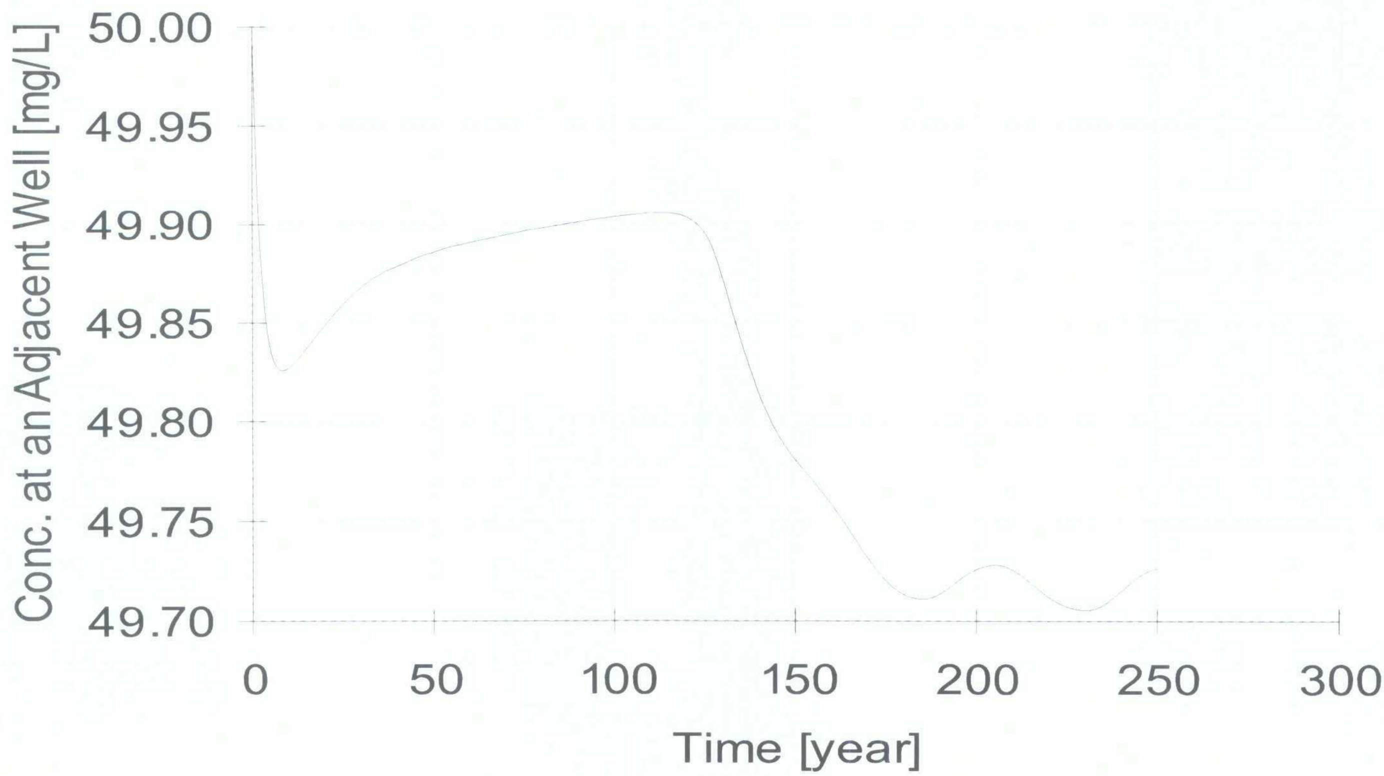
Groundwater Characteristics
Background Cl Concentration in Aquifer: 50 [mg/L]
Aquifer porosity: 0.3 [-]
Groundwater Table Depth: 80 [ft]
Aquifer Thickness: 10 [ft]
Slope of Water Table: 0.001 [-]
Hydraulic Conductivity: 3.28084 [ft/d]
Groundwater Flux: 0.0328084 [ft2/d]

Source Characteristics
Chloride Load:: 68.2185 [kg/m2]
Max. length of the spill in direction of GW flow:: 10 [ft]

Soil Profiles
Surface Layer: Loam
Soil Profile: P7 - Sandy Clay (1) + Caliche (1) + Medium Sand (1)



Max Concentration 49.994 [mg/L] at time 0.077 Year

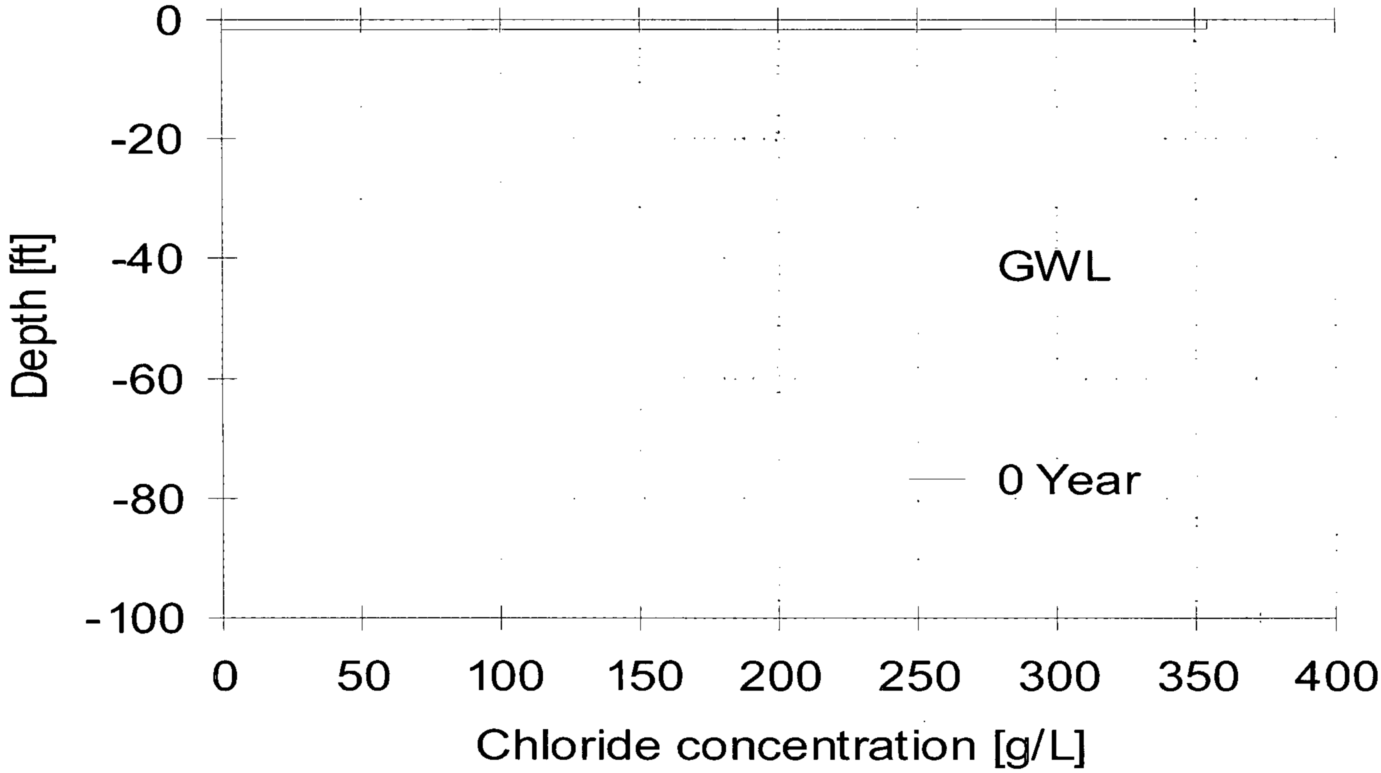


Project: Elliot B-9 145.ami
Path: C:\Program Files\API\AMIGO\Projects\Elliot B-9 145.ami
Date: 11/2/2009
Units: English (inches)
Climate: Arid Hot (NM/W.Texas, Hobbs)
Plant Uptake Trigger: 1% Input Concentration

Groundwater Characteristics
Background Cl Concentration in Aquifer: 50 [mg/L]
Aquifer porosity: 0.3 [-]
Groundwater Table Depth: 80 [ft]
Aquifer Thickness: 10 [ft]
Slope of Water Table: 0.001 [-]
Hydraulic Conductivity: 3.28084 [ft/d]
Groundwater Flux: 0.0328084 [ft2/d]

Source Characteristics
Chloride Load:: 68.2185 [kg/m2]
Max. length of the spill in direction of GW flow:: 20 [ft]

Soil Profiles
Surface Layer: Loam
Soil Profile: P7 - Sandy Clay (1) + Caliche (1) + Medium Sand (1)



Max Concentration 49.994 [mg/L] at time 0.077 Year