1R - 1739

WORKPLANS

DATE:
9-12-08

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

1R1739

1R1739

September 12, 2008

Mr. Ed Hansen
Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505
Via E-Mail

RE: GLADIOLA RELEASE SITE, T 12S R37E SECTION 25 UNIT A,
NMOCD # 1RP-~~1481~~ 1739

Dear Ed:

The attached documents and an electronic version of the same comprise the most salient elements of the file for the above-referenced site. Some miscellaneous e-mails are not included in this submittal due to a hard-drive issue with my old computer. You may wish to contact Larry Johnson for communications that are not included herein.

A time-line of the most important communications from Hicks Consultants (blue highlight) and communications from NMOCD (yellow) are summarized below:

Date	Description of Correspondence and Submittals
6/14/2007	A letter of Violation was sent to Purvis concerning the 6/14/07 inspection of the Gladiola spill site. The letter requested that the site be delineated and contaminated soils removed.
7/17/2007	RTH submitted an email to Larry Johnson requesting and extension of the 7/17/07 deadline.
11/27/2007	Final report sent to Larry Johnson. Recommendations include: 1. Chisel plow the area and mix in hay/straw to improve permeability 2. Grade affected area, create level surface with berms to prevent run-off. 3. Drill water supply well 25-feet down gradient from affected area. 4. Apply water to flush chloride from root zone. 5. Re-seed area based on agricultural properties. 6. Apply water and re-seed as necessary. 7. Release water supply well to land owner.
12/18/2007	Larry Johnson responded to Donnie Brown indicating the submittal of 11/27/07 was denied as as follows: "OCD has reviewed the submittal of a remediation plan dated November 27, 2007 submitted by Hicks Consultants regarding the subject site. This submittal is denied as a full horizontal and vertical delineation is required. Also note that Purvis has been assigned 1RP # 1481 for this site ...."
1/28/08	Submitted response proposal to Larry Johnson concerning the 12/7/07 email. Install 3 soil borings and 1 4-inch monitoring well.
4/2/08	Submitted letter to Larry Johnson that described the revised proposed soil boring characterization of the site after communications with the landowner.
4/25/08	Larry Johnson sent email to Donnie Brown requesting/suggesting contamination removal or system shut down.

5/9/08	Dale Littlejohn sent letter to T. Burris confirming approval to drill soil borings.
8/15/08	Submitted Final Corrective Action Plan to OCD and Burris
8/15/08	Larry Johnson DENIED the 8-15-08 Proposal
8/18/08	Submitted email to Chris Williams to review case prior to hearing
8/25/08	Response from Chris Williams: needs to go through Santa Fe.
9/5/2008	Letter was sent to Daniel Sanchez from RTH
9/9/08	Email sent to Ed Hansen concerning both Purvis sites

We would be pleased to meet with NMOCD technical staff in Santa Fe to discuss

- the site specific evidence developed in the course of our investigation,
- our interpretations of the evidence with respect to the fate and transport of released brine
- our proposal to restore the land surface to environmental conditions prior to the release
- the proposal to protect the property of the landowner through compensation for the temporary loss of the land's productive capacity
- our proposal to monitor the perched water zone below the release
- our analysis of our plan with respect to compliance with the mandates of Rule 116
- a path forward that will result in compliance with NMOCD Rules in the absence of a hearing

Again, I encourage you to contact Mr. Larry Johnson to obtain his perspective on this matter in advance of any meeting of the NMOCD technical staff and the scientists/engineers from Purvis and Hicks Consultants. We look forward to working with you.

Sincerely,

Randall Hicks
R.T. Hicks Consultants, Ltd.

Cc without enclosures
Purvis Operating Company
Ocean Munds-Dry, Holland and Hart
Mr. Tommy Burris
Mr. Larry Johnson, NMOCD

R. T. HICKS CONSULTANTS, LTD.

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

September 5, 2008

Mr. Daniel Sanchez
Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505
Via E-Mail

RE: GLADIOLA RELEASE SITE, T 12S R37E SECTION 25 UNIT A,
NMOCD # 1RP-~~1481~~ 1731

Dear Mr. Sanchez:

Before Chris Williams retired from the District 1 office, he e-mailed me and said that issues associated with the above-referenced site must be resolved in Santa Fe rather than the District Office. The attached communication with Mr. Williams shows that Purvis Operating would prefer to allow NMOCD to fully review the most recent submission rather than move directly to hearing.

We ask for your advice.

1. Shall we submit the reports and other communications originally delivered to the NMOCD Hobbs office to a scientist of your choice within the Environmental Bureau for review and consideration?
2. Shall we schedule a meeting in Santa Fe to present the data and conclusions set forth in our reports in advance of your technical/regulatory review or should such a meeting come after your staff have examined our reports?
3. Shall we request a hearing to appeal the NMOCD rejection of our remediation plan under Rule 116?

We are interested in moving forward with the proposed surface reclamation efforts as soon as possible in order to re-seed the sites at a time recommended by NMSU staff in Artesia. Therefore, we thank you in advance for your attention to this matter.

Sincerely,

Randall Hicks
R.T. Hicks Consultants, Ltd.

cc: Purvis Operating Company
Ocean Munds-Dry, Holland and Hart

Dale Littlejohn

From: Randy Hicks [r@rthicksconsult.com]
Sent: Monday, August 18, 2008 11:19 AM
To: chris.williams@state.nm.us
Cc: 'DONNIE BROWN'; 'Dale Littlejohn'
Subject: Purvis 1RP-1481

Chris:

Prior to requesting a hearing to appeal NMOCD's denial of our proposed corrective action proposal for the Purvis site 1RP-1481, we would like to provide you with an opportunity to respond to our concerns

First a few facts:

1. I received the e-mail transmission of the corrective action proposal from Dale Littlejohn to NMOCD at 2:58 pm on August 15, 2008 (see below)
2. I received the e-mail transmission of NMOCD's denial of the proposal from Larry Johnson at 3:11 pm on that same day
3. NMOCD's denial states: "Attached proposal is herby DENIED. Contamination requires removal"
4. The corrective action proposal is a 7-page letter that includes
   a. Five plates presenting data and lithologic logs from three borings
   b. Peer review of our proposed remedy by Dr. Kerry Sublette of the University of Tulsa and Dr. Robert Flynn of NMSU (Artesia)
   c. References to our previously-submitted HYDRUS modeling of the potential threat to ground water posed by the release
   d. Reference to our analysis of the remedy as it relates to corrective action criteria (e.g. Rule 19) in the NMOCD Rules

Our concerns are simple:

A. Did the 13-minute review of our submission fully consider the data from the newly-installed borings and the relationship of these new data to the November 2008 submission to NMOCD?
B. We can find no support in the NMOCD Rules that "contamination requires removal". Can NMOCD provide a regulatory or statutory reference that supports the rationale for denial in light of the site-specific evidence presented in our submissions?

Implementation of the proposed corrective actions is best performed prior to the next growing season. Therefore, we would appreciate your rapid response so that we may either request a hearing or address NMOCD's specific technical and regulatory concerns in a subsequent submission.

	@ Mark Conder	FW: 1RP-2300N_20080815_170429.pdf - Adobe Reader	Fri 8/15/2008 3:45 PM
	Johnson, Larry, EMNRD	RE: Purvis Operating Gladiola Spill Report NMOCD #1RP-1481	Fri 8/15/2008 3:11 PM
	@ Dale Littlejohn	Purvis Operating Gladiola Spill Report NMOCD #1RP-1481	Fri 8/15/2008 2:58 PM

I will call you later today to get your input on how we should proceed.

Randall Hicks
505-266-5004
505-238-9515 - cell

R. T. HICKS CONSULTANTS, LTD.

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

August 15, 2008

Mr. Larry Johnson
Oil Conservation Division
1625 North French Drive
Hobbs, New Mexico 88240
Via E-Mail and US Mail

RE: GLADIOLA RELEASE SITE, T 12S R37E SECTION 25 UNIT LETTER A, NMOCD # 1RP-~~1481~~ 1739

Mr. Johnson:

On behalf of Purvis Operating (Purvis), R.T. Hicks Consultants, Ltd. (Hicks Consultants) is submitting this corrective action proposal for the above referenced site. The investigations conducted to date demonstrate that neither salt nor hydrocarbons represent a threat to the ground water quality, the environment or public health. However, the landowner may request near surface remediation to return the 0.5-acre spill area to productive quality with respect to pasture.

We have provided this plan to Mr. Burris and propose that we proceed after we resolve any questions or comments first from Mr. Burris then from NMOCD. The most important aspects of our findings and our recommendations are summarized below:

1. A continuous, low-permeability quartzite layer at a depth of about 24 feet below grade supports a saturated soil zone beneath the site.
2. On the south side of the release chloride concentrations of deep soil samples do not exceed 500 mg/kg at depths greater than 10-feet and chloride concentrations do not exceed 1000 mg/kg below the 5-foot depth.
3. On the north side of the release, chloride from the release penetrated the vadose zone to a depth of about 20-feet.
4. Neither analyses nor field observations suggest that the release contained petroleum hydrocarbons.
5. Ground water did not readily flow into the borings, suggesting this perched saturated zone should not be considered "ground water" by the New Mexico statutes.
6. The produced water release at this site is dominated by calcium chloride and therefore did not result in a material loss of soil permeability due to clay swelling associated with the exchange of sodium with calcium in the clay structure.
7. Our communications with agronomists show that over time (years) and without any action on the part of Purvis, the salt in the soil horizon

will migrate below the root zone and vegetation will eventually return to the site.

8. After vegetation returns to the site, the migration of calcium chloride salts will slow.
9. The previously-submitted HYDRUS-1D modeling did not consider the presence of the low-permeability quartzite and assumed a larger chloride load than what is observed. Therefore the previously-submitted model, which predicted no impairment of ground water quality above WQCC Standards, overestimated the potential impact of the release.
10. The previously-submitted evaluation of NMOCD Rules and potential environmental impacts shows that natural restoration plus compensation to the landowner for the temporary loss of productive pasture provides the highest environmental benefit and complies with NMOCD Rules.
11. Purvis has offered to pay the landowner fair compensation to offset the loss of the productive pasture at this 0.5 acre site.
12. If permitted by the landowner and in addition to the proposed compensation, Purvis has elected to proceed with an program to accelerate the re-vegetation of the site by:
    a. Plowing hay into the soil to increase permeability
    b. Re-grading the site to allow for better percolation of precipitation and natural flushing of salt
    c. Monitoring the salinity of the soil at the site to determine the best time to re-seed
    d. Re-seeding the site with a mix of grass and forbs that meets landowner specifications and
    e. Grading the site to eliminate any ponding of precipitation over the subsurface chloride

Location

The Gladiola Site is located 10 miles east of the city of Tatum at T-12-S, R-37-E, Section 25, in Unit A. The surface elevation of the site is approximately 3,872 feet above mean sea level. Plate 1 is a site overview map which depicts the location with respect to area landmarks. A release from the Gladiola SWD pipeline was verified and standing fluid removed on June 10, 2007 and a C-141 form was submitted by Purvis on June 13, 2007.

Previous Submissions

On November 27, 2007 the results of the initial characterization were submitted to the NMOCD. The letter included recommendations to verify the condition of the ground water with respect to chloride by installing a down gradient monitoring well and begin an aggressive in situ restoration of the affected area in order to re-establish vegetation. The NMOCD rejected the proposed corrective actions, without further delineation of the site, in an email dated December 18, 2007.

In response to the NMOCD email, on January 28, 2008, Purvis and Hicks Consultants submitted an amended proposal that added three characterization soil borings to the November 27, 2007 recommendations. The soil boring and monitoring well locations were staked in preparation for a late February 2008 field work schedule, however, the land owner (Mr. Tommy Burrus) requested that the activities be delayed until he had an opportunity to discuss the project with Mr. Purvis and the NMOCD.

Following discussions with Mr. Burrus, Purvis and Hicks Consultants submitted a letter dated April 2, 2008 to the NMOCD which included recommendations for only the characterization soil borings with the option for a down gradient monitoring well if the vertical extent of the chloride-impacted soil could not be determined by the soil borings.

Field Programs

The initial characterization of the near-surface soil was conducted by Hicks Consultants on July 2, 2007. Laboratory samples from the surface to a depth of 3 feet below the surface were submitted to Ward Laboratories, Inc. of Kearney, Nebraska to evaluate the potential for re-vegetation. In addition, the field data was used in the unsaturated zone HYDRUS-1D model to examine the short-term and long-term impact of the release to the soil productivity. A simple ground water mixing model was added to predict the possible future impact to ground water.

On May 27, 2008 Hicks Consultants supervised a deep soil sampling program to delineate the vertical extent of the chloride-impacted soil within the spill area. A hollow-stem auger rig was utilized to advance three soil borings to a maximum depth of 29 feet below the ground surface. Plate 2 shows the locations of these borings.

Recovered soil samples were placed in 4-ounce glass jars, sealed with a Teflon-lined lid, immediately chilled to 4° C, and transported to the Xenco Laboratory in Odessa, Texas for analysis of benzene, toluene, ethylbenzene, xylenes, and naphthalene using method SW 8260B (selected samples) and chloride using method EPA 300. Laboratory reports and chain-of-custody documentation are provided in Attachment B.

Characterization Results

Texture of the Vadose Zone Soil

Underlying a 1- to 3-foot thick top soil layer was a soft caliche layer with interbedded silt (10 to 15 feet thick) and a deeper hard caliche layer that included interbedded hard sandstone. Soil samples were recovered at 5-foot intervals for laboratory analysis of hydrocarbons and chloride.

The drilling rig encountered saturated soil in each of the borings at approximately 27 feet below the surface (3,845 ft). Immediately underlying the saturated soil was a very hard sandstone (possibly quartzite) formation which apparently serves

as the lower confining layer for a thin "perched" water zone. The Hicks Consultants field supervisor decided to terminate the each boring prior to fully penetrating the hard zone in an effort to protect the underlying soil and ground water from the elevated chloride concentrations above. Free water samples could not be recovered from the "perched" zone through the open bore holes however saturated soil samples were taken for laboratory analysis. Each soil boring was plugged with hydrated bentonite and cuttings. Attachment A provides soil lithology logs, which include the laboratory chloride and hydrocarbon results.

Chemistry of the Vadose Zone Soil

The adjacent table presents the analytical results of the soil sampling program conducted in June 2007 (also provided in earlier submittals). The results indicated that the native vegetation would not grow within the spill area without the reduction the salt (chloride) concentrations in the root zone.

Sample Location	Composite Soil Samples		
Depth (ft)	0 to 8"	8" to 24"	24" to Cal.
Sample Date	7/2/07	7/2/07	7/2/07
Saturation (%)	45	48	47
Saturated Paste pH	6.9	7.3	7.7
Extract EC (mmho/cm)	**23.5**	**13.9**	**11.9**
HCO_3 (ppm)	40	40	0
Cl (ppm)	10,200	5,740	4,740
Ca (ppm)	1,987	757	649
Mg (ppm)	541	426	306
Na (ppm)	550	310	321
Sodium Adsorption Ration	2.8	2.2	2.6
Calculated TDS	18,800	11,120	9,520
Calculated ESP (%)	**2.8**	**1.9**	**2.5**

Soil Boring	Sample Depth	Chloride (mg/kg)
SB-1	0-1'	2,190
	5'	231
	10'	17.9
	15'	59.4
	20'	75.8
	25'	174
	29'	184
SB-2	0-1'	3,810
	5'	438
	10'	678
	15'	445
	20'	120
	25'	99.4
	29'	249
SB-3	0-1'	901
	5'	2,780
	10'	1,660
	15'	1,940
	20'	974
	25'	341

The results of the deep soil sampling conducted in May 2008 are depicted on the adjacent table and on Plate 2. All of the hydrocarbon sample results were below the method detection concentration and are therefore not included on the table. Samples from soil borings SB-1 and SB-2, both located south of the pipeline, contain chloride concentrations above 2,000 mg/kg in the surface soil (0 to 1.0 ft). SB-1 contains chloride concentrations below 500 from five feet below the surface to the total depth of the boring. Only one sample from SB-2 in this same depth interval exceeds 500 mg/kg chloride.

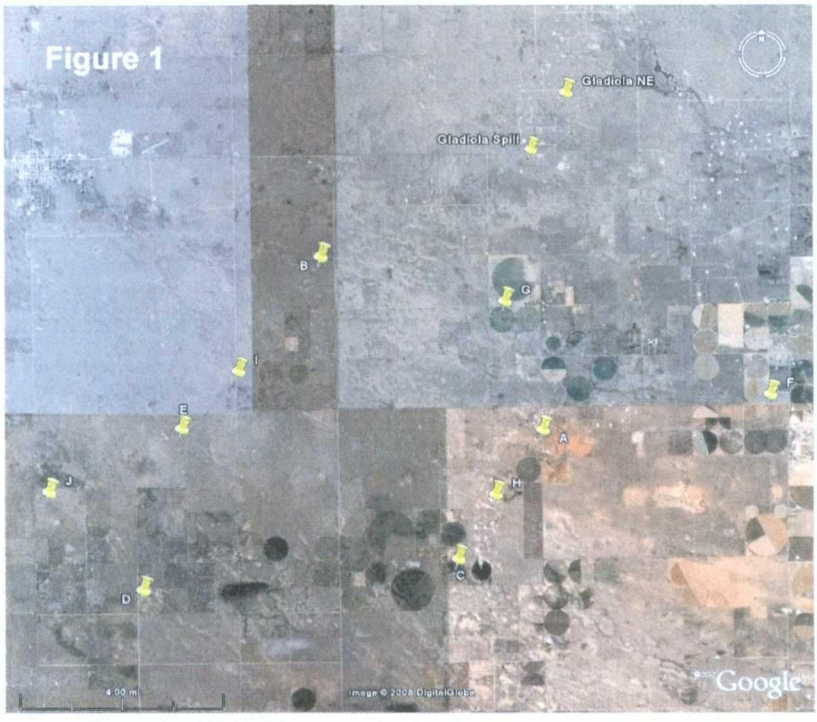
Soil boring SB-3 is located on the north side of the pipeline and contains the highest chloride concentration at the 5-foot depth with decreasing concentrations to the total depth of the boring. These results were re-verified by the laboratory because they did not appear consistent with the other two boring sample results.

It should be noted that a significant deference exists between in the chloride concentrations from the 5-point composite surface soil sample taken in June 2007 (10,200 ppm) and the average of the surface soil samples taken from the three borings in May 2008 (2,300 mg/kg). While these samples were recovered using different methods and the analyses were performed by different laboratories, the dramatic decrease in the concentration over the 11-month period strongly suggests that the remediation of the surface soil has already begun due to the natural precipitation that has occurred during this time.

Depth to Ground Water

Because a ground water monitoring well was not installed at the site, the public records were examined in an effort to verify that the saturated soil zone encountered by the borings was not the uppermost portion of the shallow aquifer, which is used primarily for area livestock and irrigation.

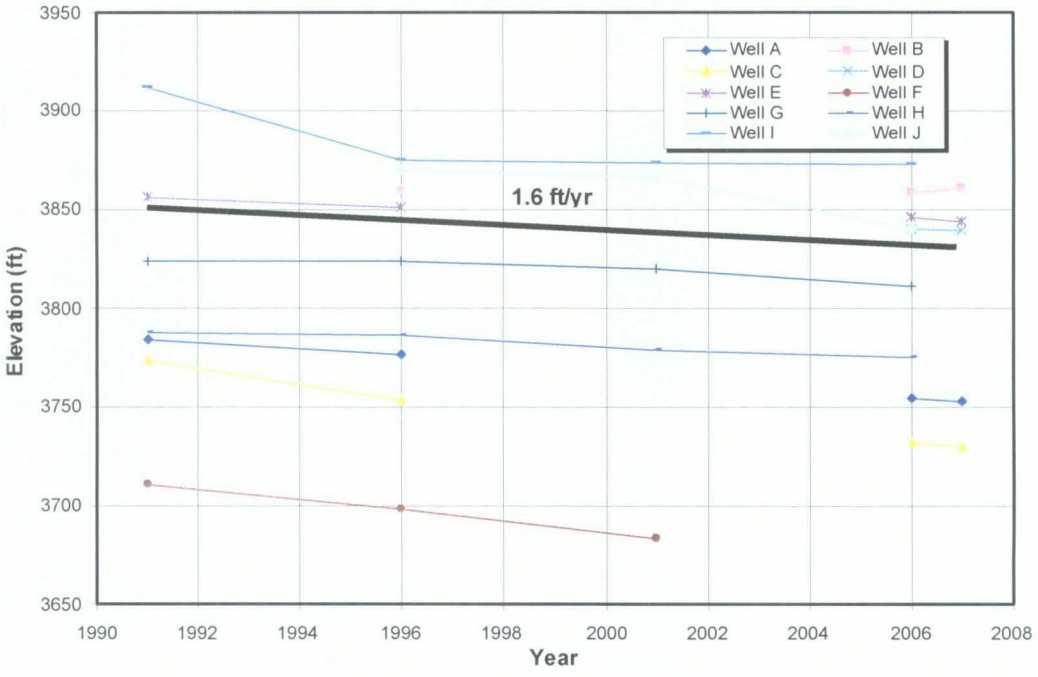
Hicks Consultants reviewed the available records and determined that the most complete potentiometric data was from measurements taken in 1991 and to a much lesser extent in 1996. Regional potentiometric surface maps from 1991 and 1996 are provided in Plate 3A and 3B respectively. They indicate that the ground water elevation at the Gladiola site was approximately 3,840 feet in 1991 and 3,835 in 1996.



An estimate of the current ground water elevation was made using ten area water wells for which potentiometric data is available from at lease three measurement events between 1991 and 2007. These water wells, as shown on Figure 1, are located south of the Gladiola spill site. Figure 2 is a graph of the historic water elevations from each of these wells. The average annual rate of decrease in water level per year from each of the wells was determined to be from 0 to 2.9 ft/yr. The average for all of the wells (1.6 ft/yr) was applied to the estimates made from the 1991 and 1996 potentiometric maps for the Gladiola site and it was determined that the current ground water elevation at the site should be approximately 3,814 to 3,817 feet.

Since the estimated current ground water elevation is approximately 30 feet below the saturated zone encountered during the installation of the soil borings at the Gladiola site (55-feet below ground surface), we conclude that the saturated soil horizon at 24-feet below surface is not part of the shallow aquifer but is a "perched" zone.

Figure 2
Ground Water Elevation Decline
1991 to 2007 (actual data)



Proposed Remedy

By copy of this letter to Mr. Tommy Burrus, Purvis is stating that they will compensate the land owner $2,500 for the temporary loss of the productive capacity of the land impacted by this spill.

In addition, if approved by the landowner, Purvis will perform the corrective actions listed below which have been reviewed and endorsed (see Attachment C) by Dr. Robert Flynn of NMSU and Dr. Kerry Sublette of the University of Tulsa.

1. Grade the site during plowing to prevent run-off and ensure uniform flushing by natural rainfall. Additionally, rotted hay will be added during the plowing to enhance the soil permeability. Because the sodium absorption ratio (SAR) and exchangeable sodium percentage (ESP) are low, it is not desirable to apply gypsum or other calcium additives to the soil. While re-vegetation of the site could be accelerated by flushing the soil with fresh water, the transport volume necessary to make a significant impact (approximately 1.8 large (200 bbl) transport trucks per 1-inch of coverage) is not justified.

2. Install a 2-inch monitoring well at the down slope (eastern) edge of the treatment area which will be completed with five feet of screen to a depth not to exceed 29 feet such that the water from the "perched" zone can be monitored to determine the effect from treatment area. Plate 4 depicts the project area and location of the monitoring well.

3. Following the initial project start-up additional plowing of the site, installation of jute netting, and the installation of fencing may be required during the treatment period to insure penetration of the fresh water, protection from wind erosion, and prevent the grazing of any new vegetation by livestock or small animals.

Project Monitoring and Reporting
Purvis and Hicks Consultants propose that the following monitoring and reporting schedule be adopted in order to provide verification of the success for the selected remedy:

Baseline Conditions – Following the initial plowing operation a 5-point composite soil sample will be recovered from the surface for laboratory salinity evaluation. A water sample will be recovered from the monitoring well for analysis of chloride. Start-up operations will be documented with photographs.

Treatment and Post-Treatment Monitoring – Local weather conditions will be monitored on a weekly basis using internet sources. Quarterly monitoring well water samples will be recovered for chloride analysis and quarterly composite soil samples will be recovered for salinity evaluation.

When the electrical conductivity (EC) in the root zone soil decreases to <4.0 mmho/cm then the area will be re-seeded with native vegetation or a mixture selected by the land owner. If requested by the land owner the area may be re-seeded at a point prior to the achievement of the EC goal with more salt-tolerant species. Following re-seeding the monitoring will continue on an annual basis and the progress of the remedy will be documented photographically.

Reporting – Hicks Consultants will submit monitoring reports to the land owner and the NMOCD on a quarterly to annual basis until the vegetation is re-established or it is determined that the remedy has failed to achieve the desired results. Recommendations for additional treatment of the area will be provided with each monitoring report as necessary.

Please contact me if you have any questions or require additional information.

Sincerely,

Dale T. Littlejohn

Dale Littlejohn
R.T. Hicks Consultants, Ltd.

cc: Purvis Operating Company
Mr. Tommy Burrus

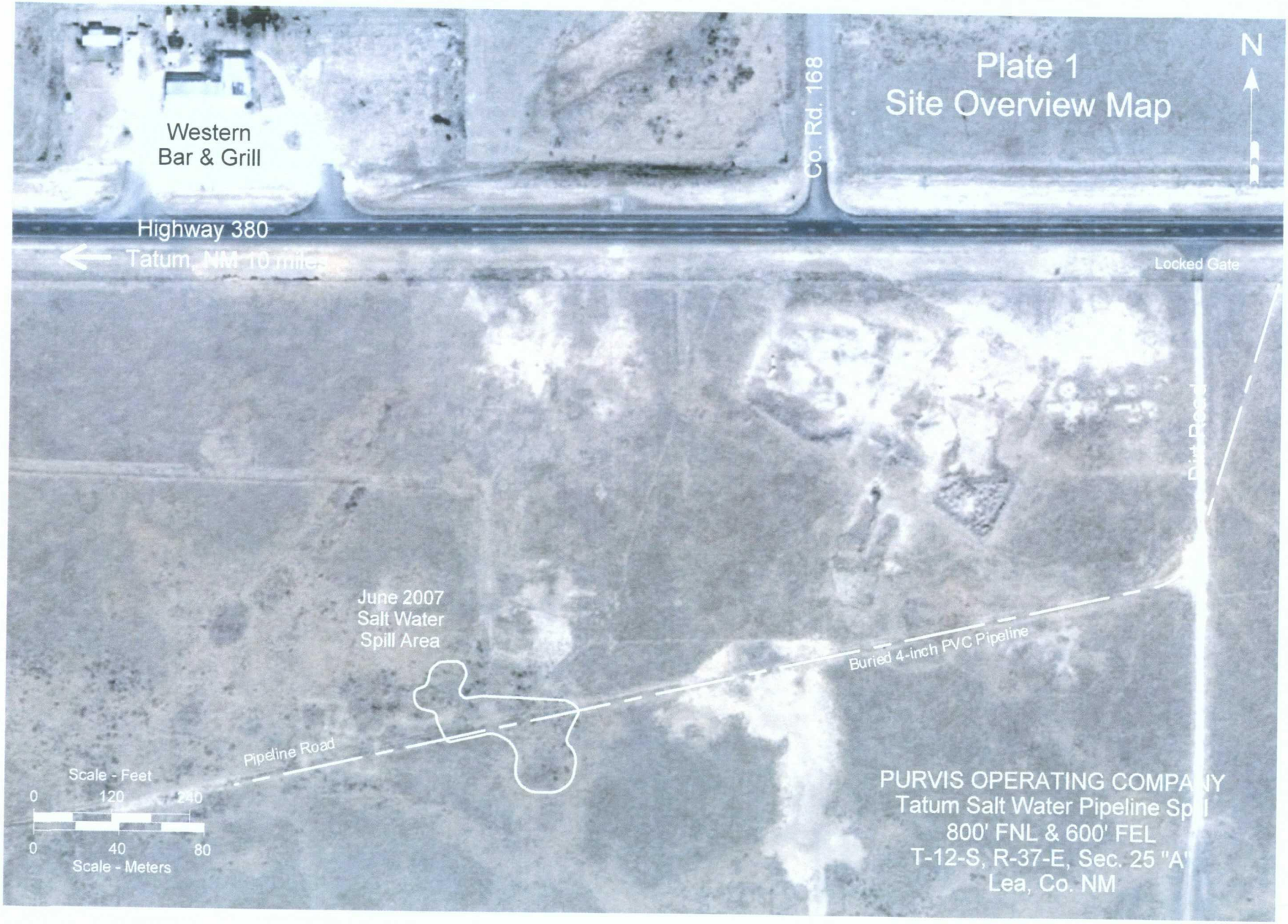
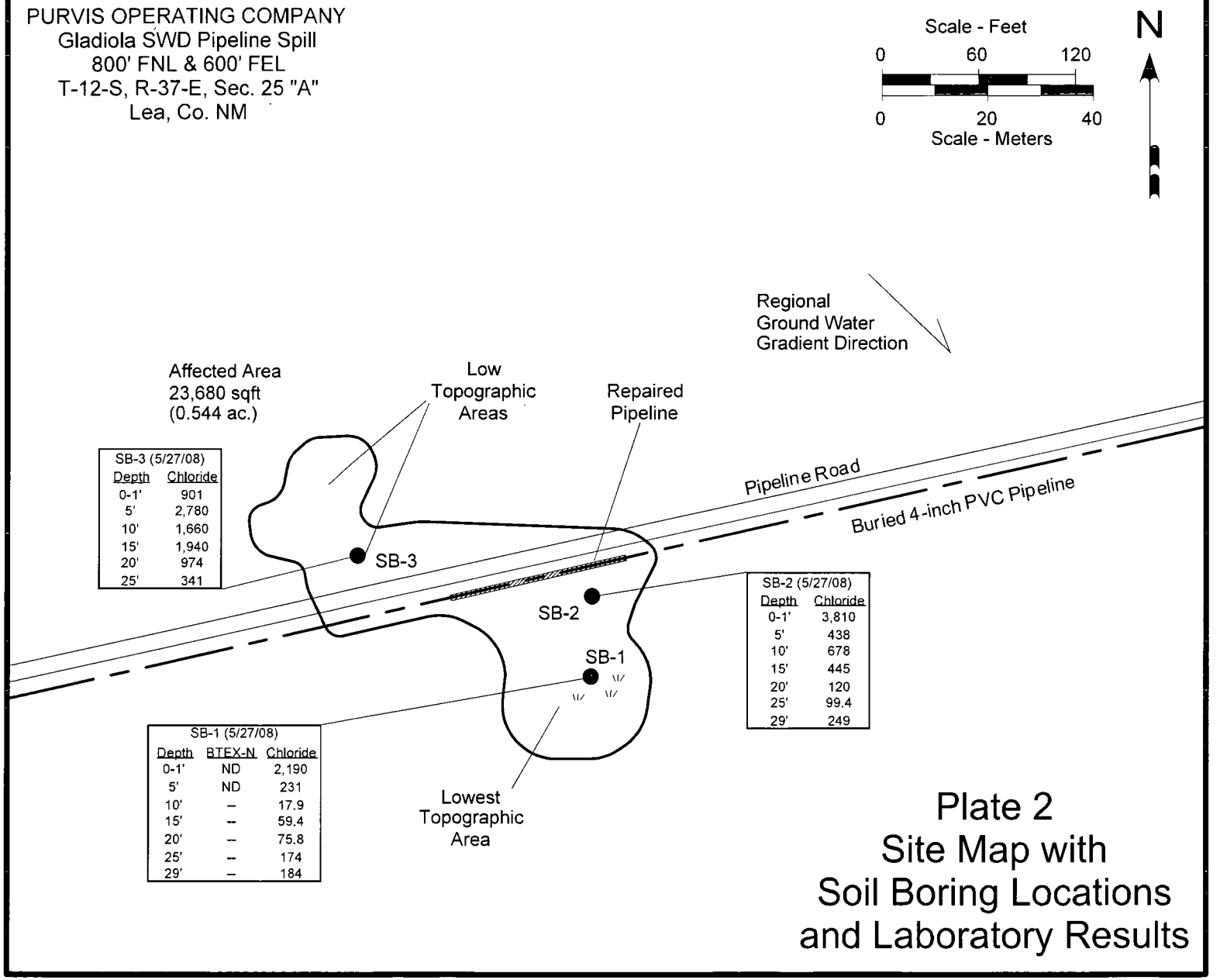


Plate 1
Site Overview Map
N
Western
Bar & Grill
Co. Rd. 168
Highway 380
Tatum, NM 10 miles
Locked Gate
June 2007
Salt Water
Spill Area
Buried 4-inch PVC Pipeline
Pipeline Road
Scale - Feet
0
120
240
0
40
80
Scale - Meters
PURVIS OPERATING COMPANY
Tatum Salt Water Pipeline Spill
800' FNL & 600' FEL
T-12-S, R-37-E, Sec. 25 "A"
Lea, Co. NM

PURVIS OPERATING COMPANY
Gladiola SWD Pipeline Spill
800' FNL & 600' FEL
T-12-S, R-37-E, Sec. 25 "A"
Lea, Co. NM



SB-3 (5/27/08)

Depth	Chloride
0-1'	901
5'	2,780
10'	1,660
15'	1,940
20'	974
25'	341

SB-2 (5/27/08)

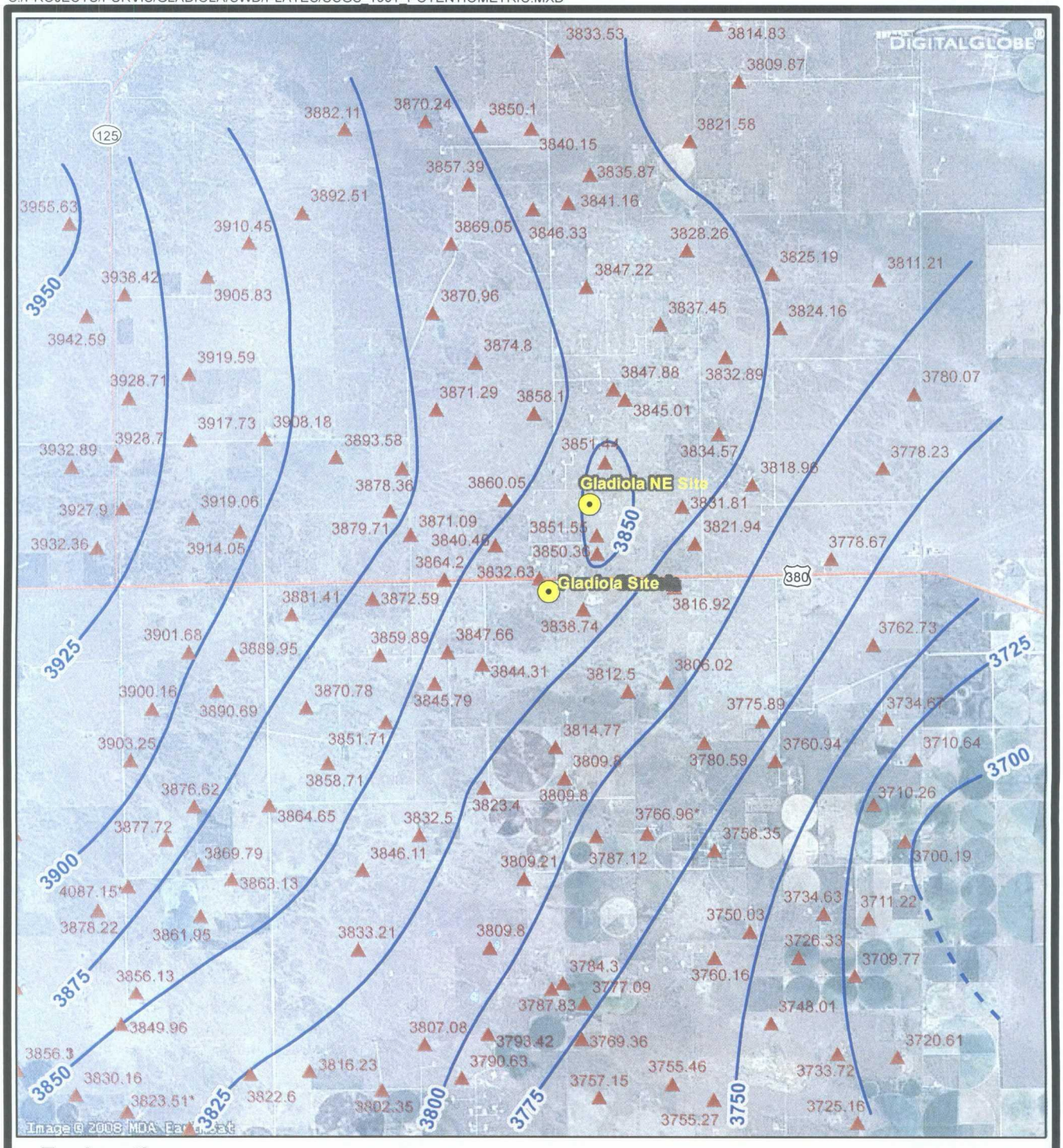
Depth	Chloride
0-1'	3,810
5'	438
10'	678
15'	445
20'	120
25'	99.4
29'	249

SB-1 (5/27/08)

Depth	BTEX-N	Chloride
0-1'	ND	2,190
5'	ND	231
10'	--	17.9
15'	--	59.4
20'	--	75.8
25'	--	174
29'	--	184

Plate 2
Site Map with Soil Boring Locations and Laboratory Results

S:/PROJECTS/PURVIS/GLADIOLA/SWD/PLATES/USGS_1991_POTENTIOMETRIC.MXD



Explanation

Potentiometric Surface (feet msl)

Equipotential line

Equipotential line (inferred)

Purvis Gladiola Site

USGS Gauging Station showing 1991 ground water elevation (feet msl)

Notes:
* station not used in potentiometric surface calculation

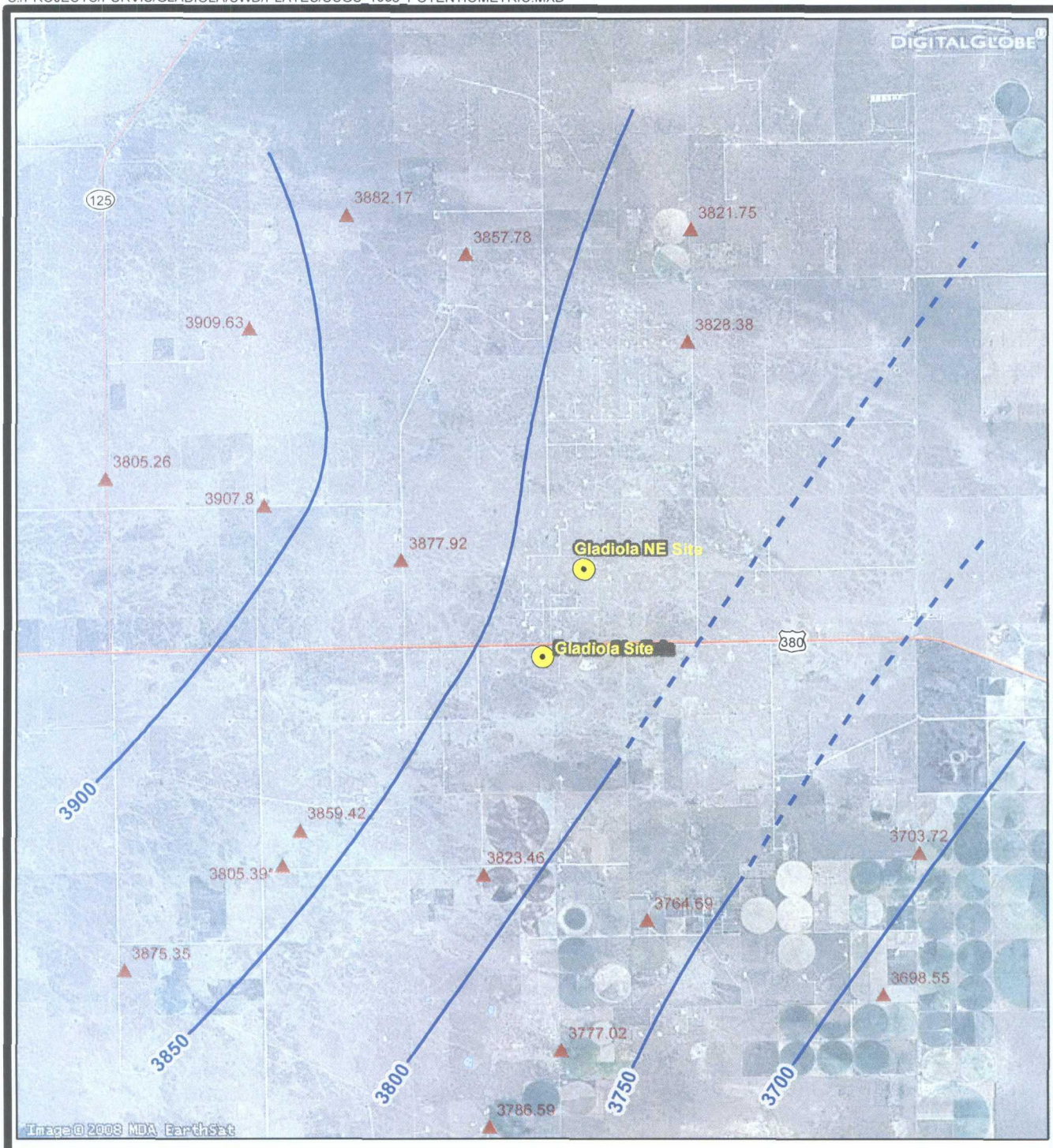
N W E S

0 1 2 Miles

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	1991 Potentiometric Surface	Plate 3A
	Purvis - Galdiola SWD	June 2008

6/13/2008

S:/PROJECTS/PURVIS/GLADIOLA/SWD/PLATES/USGS_1996_POTENTIOMETRIC.MXD



Explanation

Potentiometric Surface (feet msl)

Equipotential line

Equipotential line (inferred)

Purvis Gladiola Site

USGS Gauging Station showing 1996 *ground water* elevation (feet msl)

Notes:
* station not used in potentiometric surface calculation

N
W E
S

0 1 2
Miles

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	1996 Potentiometric Surface	Plate 3B
	Purvis - Galdiola SWD	June 2008

6/13/2008

PURVIS OPERATING COMPANY
Gladiola SWD Pipeline Spill
800' FNL & 600' FEL
T-12-S, R-37-E, Sec. 25 "A"
Lea, Co. NM

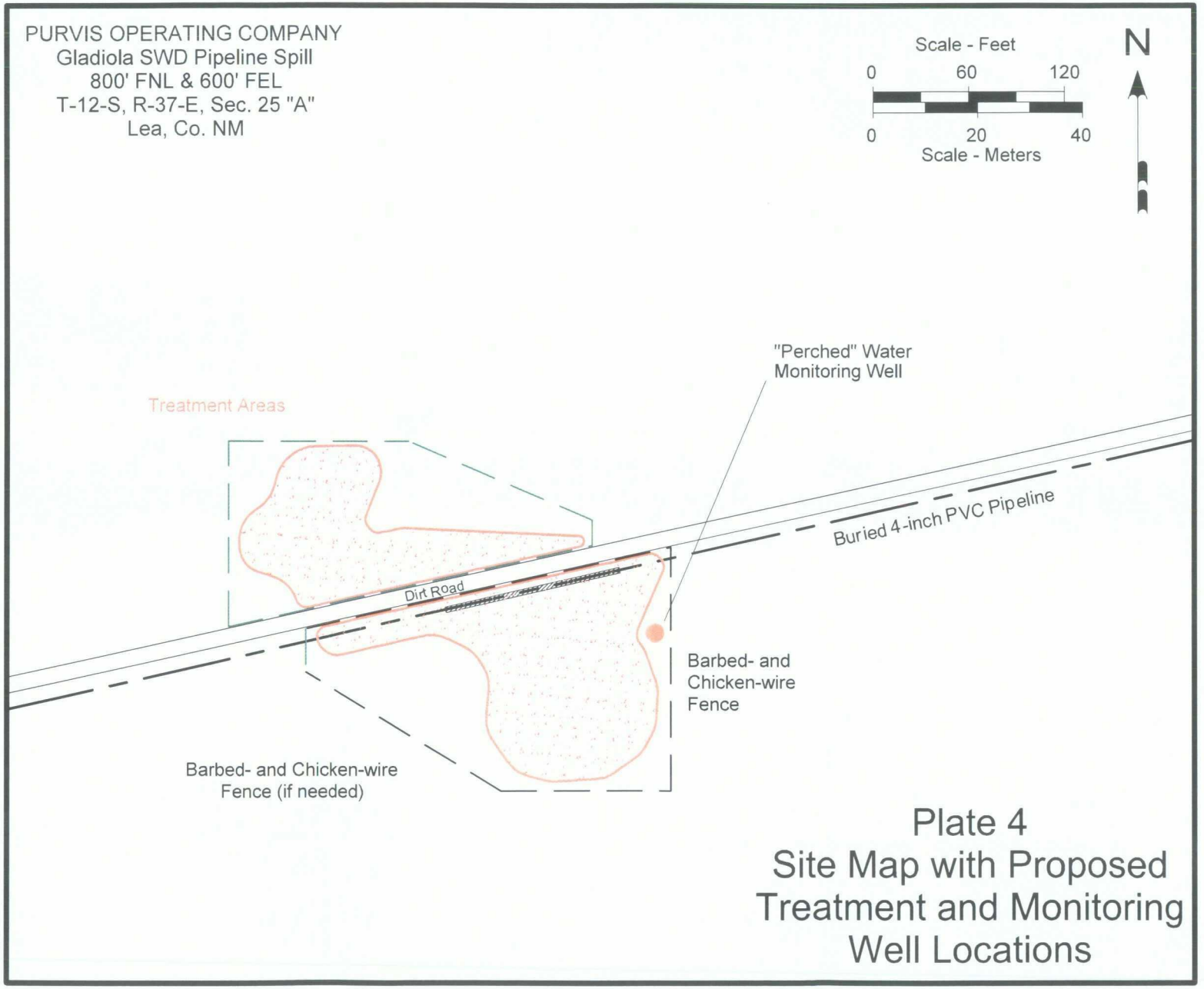


Plate 4
Site Map with Proposed Treatment and Monitoring Well Locations

ATTACHMENT A

Lithology Logs from Soil Borings (Vertical Delineation)
Conducted by RTH in May 2008

LITHOLOGIC LOG (Soil Boring)

R T Hicks Consultants Ltd

P O Box 7624
Midland, TX 79708
(432) 528-3878

BORING NO.: SB-1
SITE ID: Gladiola Pipeline Spill
SURFACE ELEVATION: 3872 MSL
CONTRACTOR: Atkins Engineering
DRILLING METHOD: Hollow-Stem
INSTALLATION DATE: 5/27/08
WELL PLACEMENT: Lowest (topo) Area
COMMENTS: Lat. 33° 15' 16.5" North, Long. 103° 08' 48.0" West

TOTAL DEPTH: 29 Ft
CLIENT: Purvis Operating
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-12-S, R-37-E, Sec. 25 (A)
FIELD REP.: Dale Littlejohn
FILE NAME: \Lithlogs (5-08)

Completion	Lithology	SAMPLE DATA PHOTO	DEPTH	Type	BTEX	Cl (Lab)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE, SORTING, ROUNDING, CONSOL., DIST. DEATURES
Bentonite and Cuttings / No Casing			0-1	Cutting	ND	2,190		SILTY CLAY Dark reddish brown (top soil).
			5	Cutting	ND	231	5	SILTY CALICHE Light tan to brown, soft drilling.
			10	Cutting	--	17.9	10	
			15	Cutting	--	59.4	15	SANDSTONE White to grayish white, cemented, interbedded with white caiche, hard drilling.
			20	Cutting	--	75.8	20	SILTY CALICHE Light brown, soft drilling.
			25	Cutting	--	174	25	CALICHE Light brown with some silt, very hard drilling, moist soil at 24 ft. Did not fully penetrate hard zone.
								Standing water at 29 feet (could not sample)
TD = 29 Feet			29	Cutting	--	184		

LITHOLOGIC LOG (Soil Boring)

R T Hicks Consultants Ltd

P O Box 7624
Midland, TX 79708
(432) 528-3878

BORING NO.:	SB-2	TOTAL DEPTH:	29.0 Ft
SITE ID:	Gladiola Pipeline Spill	CLIENT:	Purvis Operating
SURFACE ELEVATION:	3872 MSL	COUNTY:	Lea County
CONTRACTOR:	Atkins Engineering	STATE:	New Mexico
DRILLING METHOD:	Hollow-Stem	LOCATION:	T-12-S, R-37-E, Sec. 25 (A)
INSTALLATION DATE:	5/27/08	FIELD REP.:	Dale Littlejohn
WELL PLACEMENT:	Location of Hand Auger A	FILE NAME:	\Lithlogs (5-08)
COMMENTS:	Lat. 33° 15' 17.0" North, Long. 103° 08' 48.0" West		

Completion	Lithology	SAMPLE DATA PHOTO	DEPTH	Type	BTEX	Cl (Lab)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE, SORTING, ROUNDING, CONSOL., DIST. DEATURES
Bentonite and Cuttings / No Casing			0-1	Cutting	--	3,810		CLAY Dark reddish brown (top soil).
			5	Cutting	--	438	5	SILTY CALICHE Brown to tan, soft drilling except for very hard layer at 7 to 8 ft.
			10	Cutting	--	678	10	
			15	Cutting	--	445	15	
								SANDSTONE Gray, cemented, hard drilling.
			20	Cutting	--	120	20	CALICHE Light brown to tan, with some silt and interbedded hard sandstone layers.
			25	Cutting	--	99.4	25	
TD = 29.0 Feet			29	Cutting	--	249		Moist soil at 28 ft, saturated at 29 ft with standing water 1/2 hour after drilling.

LITHOLOGIC LOG (Soil Boring)

R T Hicks Consultants Ltd

P O Box 7624
Midland, TX 79708
(432) 528-3878

BORING NO.: SB-3
SITE ID: Gladiola Pipeline Spill
SURFACE ELEVATION: 3872 MSL
CONTRACTOR: Atkins Engineering
DRILLING METHOD: Hollow-Stem
INSTALLATION DATE: 5/27/08
WELL PLACEMENT: Location of Hand Auger D
COMMENTS: Lat. 33° 15' 17.3" North, Long. 103° 08' 50.0" West

TOTAL DEPTH: 26.0 Ft
CLIENT: Purvis Operating
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-12-S, R-37-E, Sec. 25 (A)
FIELD REP.: Dale Littlejohn
FILE NAME: \Lithlogs (5-08)

Completion	Lithology	SAMPLE DATA PHOTO	DEPTH	Type	BTEX	Cl (Lab)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE, SORTING, ROUNDING, CONSOL., DIST. DEATURES
Bentonite and Cuttings / No Casing			0	Cutting	--	901		CLAY Dark reddish brown, (top soil).
			5	Cutting	--	2,780	5	SILTY CALICHE Light brown to tan, soft drilling.
			10	Cutting	--	1,660	10	
			15	Cutting	--	1,940	15	CALICHE Grayish white, with some silt and interbedded hard sandstone layers.
			20	Cutting	--	974	20	
			25	Cutting	--	341	25	Very moist soil at 26 ft

TD = 26.0 Feet

ATTACHMENT B

Laboratory Reports and Chain-of-Custody Documentation From May 2008 Characterization

Analytical Report 304637

for

R.T. Hicks Consultants, LTD

Project Manager: Dale Littlejohn

Gladiola Spill

L-141-0508

04-JUN-08

12600 West I-20 East Odessa, Texas 79765

Texas certification numbers:
Houston, TX T104704215

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 - Austin - Tampa - Miami - Latin America
Midland - Corpus Christi - Atlanta

04-JUN-08

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

Reference: XENCO Report No: **304637**
Gladiola Spill
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 304637. 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. 304637 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 304637

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

Gladiola Spill

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
SB-1 (0-1)	S	May-27-08 09:15		304637-001
SB-1 (5')	S	May-27-08 09:20		304637-002
SB-1 (10')	S	May-27-08 09:25		304637-003
SB-1 (15')	S	May-27-08 09:30		304637-004
SB-1 (20')	S	May-27-08 09:35		304637-005
SB-1 (25')	S	May-27-08 09:40		304637-006
SB-1 (29')	S	May-27-08 09:45		304637-007
SB-2 (0-1')	S	May-27-08 10:30		304637-008
SB-2 (5')	S	May-27-08 10:35		304637-009
SB-2 (10')	S	May-27-08 10:40		304637-010
SB-2 (15')	S	May-27-08 10:55		304637-011
SB-2 (20')	S	May-27-08 11:00		304637-012
SB-2 (25')	S	May-27-08 11:05		304637-013
SB-2 (29')	S	May-27-08 11:10		304637-014
SB-3 (0-1')	S	May-27-08 11:55		304637-015
SB-3 (5')	S	May-27-08 12:00		304637-016
SB-3 (10')	S	May-27-08 12:05		304637-017
SB-3 (15')	S	May-27-08 12:10		304637-018
SB-3 (20')	S	May-27-08 12:15		304637-019
SB-3 (25')	S	May-27-08 12:20		304637-020

Certificate of Analysis Summary 304637
R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Gladiola Spill

Project Id: L-141-0508
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: May-28-08 09:18 am
Report Date: 04-JUN-08
Project Manager: Brent Barron, II

Analysis Requested	*Lab Id:*	304637-001		304637-002		304637-003		304637-004	
	Field Id:	SB-1 (0-1)		SB-1 (5')		SB-1 (10')		SB-1 (15')	
	Depth:								
	Matrix:	SOIL		SOIL		SOIL		SOIL	
	Sampled:	May-27-08 09:15		May-27-08 09:20		May-27-08 09:25		May-27-08 09:30	
BTEX by SW 8260B	*Extracted:*	Jun-04-08 10:10		Jun-04-08 10:25					
	Analyzed:	Jun-04-08 12:21		Jun-04-08 12:44					
	Units/RL:	mg/kg	RL	mg/kg	RL				
Benzene		ND	0.0061	ND	0.0046				
Toluene		ND	0.0061	ND	0.0046				
Ethylbenzene		ND	0.0061	ND	0.0046				
m,p-Xylenes		ND	0.0123	ND	0.0092				
o-Xylene		ND	0.0061	ND	0.0046				
Naphthalene		ND	0.061	ND	0.046				
Total BTEX		ND		ND					
Total Xylenes		ND		ND					
Inorganic Anions by EPA 300	*Extracted:*								
	Analyzed:	May-28-08 14:38		May-28-08 14:38		May-28-08 14:38		May-28-08 14:38	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		2190	29.5	231	10.6	17.9	5.00	59.4	10.0
Percent Moisture	*Extracted:*								
	Analyzed:	May-28-08 17:00		May-28-08 17:00					
	Units/RL:	%	RL	%	RL				
Percent Moisture		15.2	1.00	5.92	1.00				

Brent Barron
Odessa Laboratory Director

Certificate of Analysis Summary 304637
R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Gladiola Spill

Project Id: L-141-0508
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: May-28-08 09:18 am
Report Date: 04-JUN-08
Project Manager: Brent Barron, II

Analysis Requested	*Lab Id:*	304637-005		304637-006		304637-007		304637-008	
	Field Id:	SB-1 (20')		SB-1 (25')		SB-1 (29')		SB-2 (0-1')	
	Depth:								
	Matrix:	SOIL		SOIL		SOIL		SOIL	
	Sampled:	May-27-08 09:35		May-27-08 09:40		May-27-08 09:45		May-27-08 10:30	
Inorganic Anions by EPA 300	*Extracted:*								
	Analyzed:	May-28-08 14:38		May-28-08 14:38		May-28-08 14:38		May-28-08 14:38	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		75.8	10.0	174	5.00	184	10.0	3810	50.0

Brent Barron
Odessa Laboratory Director

Certificate of Analysis Summary 304637
R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Gladiola Spill

Project Id: L-141-0508
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: May-28-08 09:18 am
Report Date: 04-JUN-08
Project Manager: Brent Barron, II

Analysis Requested	*Lab Id:*	304637-009		304637-010		304637-011		304637-012	
	Field Id:	SB-2 (5')		SB-2 (10')		SB-2 (15')		SB-2 (20')	
	Depth:								
	Matrix:	SOIL		SOIL		SOIL		SOIL	
	Sampled:	May-27-08 10:35		May-27-08 10:40		May-27-08 10:55		May-27-08 11:00	
Inorganic Anions by EPA 300	*Extracted:*								
	Analyzed:	May-28-08 14:38		May-28-08 14:38		May-28-08 14:38		May-28-08 14:38	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		438	10.0	678	5.00	445	10.0	120	5.00

Brent Barron
Odessa Laboratory Director

Certificate of Analysis Summary 304637
R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Gladiola Spill

Project Id: L-141-0508 **Date Received in Lab:** May-28-08 09:18 am
Contact: Dale Littlejohn **Report Date:** 04-JUN-08
Project Location: Lea Co., NM **Project Manager:** Brent Barron, II

Analysis Requested													
	Lab Id:	304637-013		304637-014		304637-015		304637-016	
	Field Id:	SB-2 (25')		SB-2 (29')		SB-3 (0-1')		SB-3 (5')	
	Depth:								
	Matrix:	SOIL		SOIL		SOIL		SOIL	
	Sampled:	May-27-08 11:05		May-27-08 11:10		May-27-08 11:55		May-27-08 12:00	
Inorganic Anions by EPA 300	***Extracted:***								
	Analyzed:	May-28-08 14:38		May-28-08 14:38		May-28-08 14:38		May-28-08 14:38	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		99.4	5.00	249	5.00	901	10.0	2780	25.0

Brent Barron
Odessa Laboratory Director

Certificate of Analysis Summary 304637
R.T. Hicks Consultants, LTD, Albuquerque, NM

Project Name: Gladiola Spill

Project Id: L-141-0508
Contact: Dale Littlejohn
Project Location: Lea Co., NM

Date Received in Lab: May-28-08 09:18 am
Report Date: 04-JUN-08
Project Manager: Brent Barron, II

Analysis Requested	*Lab Id:*	304637-017		304637-018		304637-019		304637-020	
	Field Id:	SB-3 (10')		SB-3 (15')		SB-3 (20')		SB-3 (25')	
	Depth:								
	Matrix:	SOIL		SOIL		SOIL		SOIL	
	Sampled:	May-27-08 12:05		May-27-08 12:10		May-27-08 12:15		May-27-08 12:20	
Inorganic Anions by EPA 300	*Extracted:*								
	Analyzed:	May-28-08 14:38		May-28-08 14:38		May-28-08 21:35		May-28-08 21:35	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		1660	20.0	1940	20.0	974	10.0	341	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(PQL) and above the SQL(MDL).

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.

* Outside XENCO'S scope of NELAC Accreditation

Form 2 - Surrogate Recoveries

Project Name: Gladiola Spill

Work Order #: 304637 **Project ID:** L-141-0508

Lab Batch #: 724402 **Sample:** 304637-001 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0521	0.0500	104	74-121	
Dibromofluoromethane	0.0548	0.0500	110	80-120	
1,2-Dichloroethane-D4	0.0505	0.0500	101	80-120	
Toluene-D8	0.0512	0.0500	102	81-117	

Lab Batch #: 724402 **Sample:** 304637-001 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0483	0.0500	97	74-121	
Dibromofluoromethane	0.0518	0.0500	104	80-120	
1,2-Dichloroethane-D4	0.0516	0.0500	103	80-120	
Toluene-D8	0.0509	0.0500	102	81-117	

Lab Batch #: 724402 **Sample:** 304637-001 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0493	0.0500	99	74-121	
Dibromofluoromethane	0.0515	0.0500	103	80-120	
1,2-Dichloroethane-D4	0.0521	0.0500	104	80-120	
Toluene-D8	0.0504	0.0500	101	81-117	

Lab Batch #: 724402 **Sample:** 304637-002 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0514	0.0500	103	74-121	
Dibromofluoromethane	0.0556	0.0500	111	80-120	
1,2-Dichloroethane-D4	0.0521	0.0500	104	80-120	
Toluene-D8	0.0505	0.0500	101	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis

*** Poor recoveries due to dilution

Surrogate Recovery [D] = 100 * A / B

All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Gladiola Spill

Work Order #: 304637 **Project ID:** L-141-0508

Lab Batch #: 724402 **Sample:** 510050-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0491	0.0500	98	74-121	
Dibromofluoromethane	0.0470	0.0500	94	80-120	
1,2-Dichloroethane-D4	0.0476	0.0500	95	80-120	
Toluene-D8	0.0500	0.0500	100	81-117	

Lab Batch #: 724402 **Sample:** 510050-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0512	0.0500	102	74-121	
Dibromofluoromethane	0.0545	0.0500	109	80-120	
1,2-Dichloroethane-D4	0.0494	0.0500	99	80-120	
Toluene-D8	0.0512	0.0500	102	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis

*** Poor recoveries due to dilution

Surrogate Recovery [D] = 100 * A / B

All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: Gladiola Spill

Work Order #: 304637 **Project ID:** L-141-0508

Lab Batch #: 724402 **Sample:** 510050-1-BKS **Matrix:** Solid
Date Analyzed: 06/04/2008 **Date Prepared:** 06/04/2008 **Analyst:** BRS
Reporting Units: mg/kg **Batch #:** 1

BTEX by SW 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
		BLANK /BLANK SPIKE RECOVERY STUDY				
Benzene	ND	0.1000	0.0958	96	66-142	
Toluene	ND	0.1000	0.0954	95	59-139	
Ethylbenzene	ND	0.1000	0.1019	102	75-125	
m,p-Xylenes	ND	0.2000	0.2018	101	75-125	
o-Xylene	ND	0.1000	0.1085	109	75-125	
Naphthalene	ND	0.100	0.098	98	70-130	

Lab Batch #: 723814 **Sample:** 723814-1-BKS **Matrix:** Solid
Date Analyzed: 05/28/2008 **Date Prepared:** 05/28/2008 **Analyst:** IRO
Reporting Units: mg/kg **Batch #:** 1

Inorganic 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	9.46	95	75-125	

Lab Batch #: 723817 **Sample:** 723817-1-BKS **Matrix:** Solid
Date Analyzed: 05/28/2008 **Date Prepared:** 05/28/2008 **Analyst:** IRO
Reporting Units: mg/kg **Batch #:** 1

Inorganic 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	9.91	99	75-125	

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

Form 3 - MS Recoveries

Project Name: Gladiola Spill

Work Order #: 304637

Lab Batch #: 723814 **Project ID:** L-141-0508

Date Analyzed: 05/28/2008 **Date Prepared:** 05/28/2008 **Analyst:** IRO

QC- Sample ID: 304634-001 S **Batch #:** 1 **Matrix:** Soil

Reporting Units: mg/kg

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	200	341	101	75-125	

Lab Batch #: 723817

Date Analyzed: 05/28/2008 **Date Prepared:** 05/28/2008 **Analyst:** IRO

QC- Sample ID: 304637-019 S **Batch #:** 1 **Matrix:** Soil

Reporting Units: mg/kg

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	974	200	1180	103	75-125	

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

Form 3 - MS / MSD Recoveries

Project Name: Gladiola Spill

Work Order # : 304637 **Project ID:** L-141-0508

Lab Batch ID: 724402 **QC- Sample ID:** 304637-001 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 06/04/2008 **Date Prepared:** 06/04/2008 **Analyst:** BRS

Reporting Units: mg/kg

BTEX by SW 8260B Analytes	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
	Parent Sample Result [A]	Spike Added [B]	Spiked Sample Result [C]	Spiked Sample %R [D]	Spike Added [E]	Duplicate Spiked Sample Result [F]	Spiked Dup. %R [G]	RPD %	Control Limits %R	Control Limits %RPD	Flag
Benzene	ND	0.6774	0.6224	92	0.5953	0.5446	91	1	66-142	25	
Toluene	ND	0.6774	0.6286	93	0.5953	0.5402	91	2	59-139	25	
Ethylbenzene	ND	0.6774	0.6603	97	0.5953	0.5719	96	1	75-125	25	
m,p-Xylenes	ND	1.355	1.297	96	1.191	1.133	95	1	75-125	25	
o-Xylene	ND	0.6774	0.7013	104	0.5953	0.6086	102	2	75-125	25	
Naphthalene	ND	0.677	0.639	94	0.595	0.651	109	15	70-130	25	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

Relative Percent Difference RPD = 200*(D-G)/(D+G)

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Sample Duplicate Recovery

Project Name: Gladiola Spill

Work Order #: 304637

Lab Batch #: 723814 **Project ID:** L-141-0508
Date Analyzed: 05/28/2008 **Date Prepared:** 05/28/2008 **Analyst:** IRO
QC- Sample ID: 304634-001 D **Batch #:** 1 **Matrix:** Soil
Reporting Units: mg/kg

Inorganic Anions by EPA 300	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	139	143	3	20	

Lab Batch #: 723817
Date Analyzed: 05/28/2008 **Date Prepared:** 05/28/2008 **Analyst:** IRO
QC- Sample ID: 304637-019 D **Batch #:** 1 **Matrix:** Soil
Reporting Units: mg/kg

Inorganic Anions by EPA 300	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	974	977	0	20	

Lab Batch #: 723811
Date Analyzed: 05/28/2008 **Date Prepared:** 05/28/2008 **Analyst:** JLG
QC- Sample ID: 304633-001 D **Batch #:** 1 **Matrix:** Soil
Reporting Units: %

Percent Moisture	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Percent Moisture	ND	ND	NC	20	

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

Environmental Lab of Texas

12500 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: Gladiola Spill
Project #: L-141-0508
Project Loc: Lea Co., NM
PO #:

LAB # (lab use only) 346031	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	TCLP Metals: As Ag Ba Cd Cr Pb Hg Se	TCLP Volatiles	TCLP Semivolatiles	BTEX 8021B + Naphthalene	RCI	N.O.R.M.	Chloride	Bromide	Total Dissolved Solids	RUSH TAT (Pre-Schedule)	Standard TAT
01	SB-1 (0-1')	5/27/08	0915	1	X									X									X			X				X
02	SB-1 (5')	5/27/08	0920	1	X									X									X			X				X
03	SB-1 (10')	5/27/08	0925	1	X									X												X				X
04	SB-1 (15')	5/27/08	0930	1	X									X												X				X
05	SB-1 (20')	5/27/08	0935	1	X									X												X				X
06	SB-1 (25')	5/27/08	0940	1	X									X												X				X
07	SB-1 (29')	5/27/08	0945	1	X									X												X				X
08	SB-2 (0-1')	5/27/08	1030	1	X									X												X				X
09	SB-2 (5')	5/27/08	1035	1	X									X												X				X
10	SB-2 (10')	5/27/08	1040	1	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: -1.5
Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Dale Littlejohn	5/28/08	0910			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
			Andrea Lam	5/28/08	918

402 ywm

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: Gladiola Spill
Project #: L-141-0508
Project Loc: Lea Co., NM
PO #:

Page 2 of 2

LAB # (lab use only) 304637	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: 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
11	SB-2 (15')	5/27/08	1055	1	X									X												X				X
12	SB-2 (20')	5/27/08	1100	1	X									X												X				X
13	SB-2 (25')	5/27/08	1105	1	X									X												X				X
14	SB-2 (29')	5/27/08	1110	1	X									X												X				X
15	SB-3 (0-1')	5/27/08	1155	1	X									X												X				X
16	SB-3 (5')	5/27/08	1200	1	X									X												X				X
17	SB-3 (10')	5/27/08	1205	1	X									X												X				X
18	SB-3 (15')	5/27/08	1210	1	X									X												X				X
19	SB-3 (20')	5/27/08	1215	1	X									X												X				X
20	SB-3 (25')	5/27/08	1220	1	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: -1.5
Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Dale Littlejohn	5/28/08	0918			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
			Andrea Lam	5/28/08	9:18

4 oz glass

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: R.T. Hicks

Date/ Time: 5.28.08 9:18

Lab ID #: 304637

Initials: AL

Sample Receipt Checklist

				Client Initials
#1 Temperature of container/ cooler?	Yes	No	-1.5 °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

ATTACHMENT C

Review of Proposed Remedy:
Robert P. Flynn, Ph. D., New Mexico State University
and Kerry Sublette Ph. D., University of Tulsa

Dale Littlejohn

From: Dale Littlejohn [dale@rthicksconsult.com]

Sent: Friday, July 25, 2008 11:34 AM

To: 'Donnie Brown'; 'Sublette, Kerry'; Robert Flynn (rflynn@nmsu.edu); Randy Hicks (Randy Hicks)

Subject: Brine Spill in New Mexico

Gentleman,

The attached document is a proposal to remediate a brine water spill near Tatum, New Mexico. As discussed to some extent earlier, either with myself or Randy Hicks, we (and our client) would greatly appreciate your professional input for this project, particularly with respect to the proposed remedy. With you permission, we would like to include your comments, either as a response to this email or some other format of your preference, as an attachment to the final report to the NMOCD.

Please contact myself or Randy Hicks if you have any questions or require additional information. We look forward to hearing from you.

Thanks,

Dale T Littlejohn, PG
R T Hicks Consultants Ltd
(432) 528-3878 (office)
(432) 689-4578 (fax)

Dale Littlejohn

From: Robert Paul Flynn [rflynn@nmsu.edu]
Sent: Friday, August 01, 2008 7:47 AM
To: dale@rthicksconsult.com
Subject: Gladiola Report

The report looked good. I suspect it will be some time before the soil ec will drop to below 4 mmhos/cm.
Weeds will be a concern during this reclamation phase. There are a few warm-season grass species that have adequate salt tolerance that should be included in the establishment phase before the soil reaches 4 mmhos/cm. With any "luck" these species could help keep weedy species to a minimum.

-Robert Flynn

Robert P. Flynn, Ph.D.
Associate Professor, Ext. Plant Sci.
NMSU Agricultural Science Center
67 E. Four Dinkus Rd.
Artesia, NM 88210
575-748-1228 office, 575-748-1229 fax

Dale Littlejohn

From: Sublette, Kerry [kerry-sublette@utulsa.edu]
Sent: Tuesday, August 12, 2008 2:21 PM
To: Dale Littlejohn
Subject: RE: Gladiola and NE Gladiola Reports

Dale,

I have reviewed the proposed remediation plan for the Gladiola Release site dated July 25, 2008. I agree with the remediation plan described here with the possible exception of a need for further hay addition in the second year.

Kerry Sublette

R. T. HICKS CONSULTANTS, LTD.

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

April 2, 2008

Mr. Larry Johnson
Oil Conservation Division
1625 North French Drive
Hobbs, New Mexico 88240
Via E-Mail and US Mail

RE: Gladiola Release Site T 12S R37E Section 25 Unit Letter A
NMOCD # 1RP-1481

Mr. Johnson:

Since the submission of our January 28, 2008 letter, R T Hicks Consultants and Purvis Operating have communicated with the land owner, Mr. Tommy Burrus, in an effort to secure access permission and solicit his input regarding the proposed corrective actions. As a result of these discussions we are scheduling a drill rig to begin implementation of the following revised work elements of the selected remedy. Before early-May we plan to:

I. Collect soil samples at 2.5-foot intervals (from below the caliche to the ground water depth) at three locations within the area of the spill:
   a. One boring within the lowest topographic area of the spill, which is the location of hand auger boring B on Plate 1
   b. One boring at a high topographic area near the release site, near location A on Plate 1
   c. One boring within the low topographic feature, which is the location of hand auger location D on Plate 1

II. Evaluate chloride mass in the vadose zone
   a. Use field evaluation methods to determine the chloride concentrations in the soil during the drilling operations and
   b. submit representative samples to the laboratory for verification of field chloride results and gravimetric soil moisture

III. Install a 2-inch monitoring well immediately southeast of the spill area if the following conditions are **not** met in one or more of the soil borings:
   a. The occurrence of five consecutive samples that exhibit decreasing concentrations with depth and the deepest sample containing less than 500 ppm chloride or
   b. The occurrence of three consecutive samples that exhibit concentrations of less than 500 ppm chloride

IV. Employ the data collected from the boring program in a revised simulation of chloride transport and submit the results of the simulation and field program to NMOCD in a brief report.

Restoration of the surface soil to enable re-vegetation of native species is contingent on ongoing negotiations with the land owner and the results of the simulation modeling.

We look forward to working with you to bring this site into full compliance with NMOCD Rules.

Sincerely,

Dale T. Littlejohn

Dale Littlejohn
R.T. Hicks Consultants, Ltd.

cc: Purvis Operating Company
Mr. Tommy Burrus

R. T. HICKS CONSULTANTS, LTD.

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

January 28 2008

Mr. Larry Johnson
Oil Conservation Division
1625 North French Drive
Hobbs, New Mexico 88240
Via E-Mail and US Mail

RE: Gladiola Release Site T 12S R37E Section 25 Unit Letter A
NMOCD # 1RP-1481

Mr. Johnson:

In response to your December 18, 2007 email to Purvis Operating, we are scheduling a drill rig to begin implementation of the following work elements of the selected remedy. Before early-February we plan to:

I. Collect soil samples at 2.5-foot intervals (from below the caliche to the ground water depth) at three locations within the area of the spill:
   a. One boring within the lowest topographic area of the spill, which is the location of hand auger boring B on Plate 1
   b. One boring at a high topographic area near the release site, near location A on Plate 1
   c. One boring within the low topographic feature, which is the location of hand auger location D on Plate 1

II. Evaluate
   a. submit soil samples in the laboratory for chloride and
   b. 2-4 samples for gravimetric soil moisture (laboratory)

III. Install the proposed 4-inch monitoring/water well southeast of sample B (see Plate 1 and Plate 2) and collect samples from the upper vadose zone in this area that is unaffected by the release to aid in the characterization of the site. Following installation the monitoring well will be developed and sampled to determine concentrations of chloride and TDS. Development and purged water will be discharged to the ground unless conductivity measurements indicate elevated chlorides.

IV. Employ the data collected from the boring program in a revised simulation of chloride transport and submit the results of the simulation and field program to NMOCD in a brief report.

By late March, Purvis plans to plow the site and improve soil permeability through the addition of straw, as outlined in the November 2007 submission. Purvis will also re-grade the site and begin adding water from the supply well (generally after precipitation events) to flush the chloride from the soil horizon prior to the frost-free growing season and continue the proposed surface rehabilitation program.

Finally, we attach a copy of our e-mail requesting an extension of time to submit the remediation plan. In the future when we do not obtain a response from NMOCD, we will re-submit or update the request. We do appreciate your rapid review of the November 27 submission and we look forward to working with you to bring this site into full compliance with NMOCD Rules.

Sincerely,

Dale T. Littlejohn

Dale Littlejohn
R.T. Hicks Consultants, Ltd.

cc: Purvis Operating Company

PURVIS OPERATING COMPANY
Gladiola SWD Pipeline Spill
800' FNL & 600' FEL
T-12-S, R-37-E, Sec. 25 "A"
Lea, Co. NM

LITHOLOGY:
0 - 1.0 ft: Silty Clay, dark brown, with some (<10%) fine grain, poorly sorted, sub angular sand
Below 1 ft (where present): Sand, orange-brown with some (5%) silt, fine-medium grain, poorly sorted, sub rounded.
Below Soil (1 - 3 ft): Caliche, white, very hard

Pipeline set in trench within caliche at approx. 3.5 feet

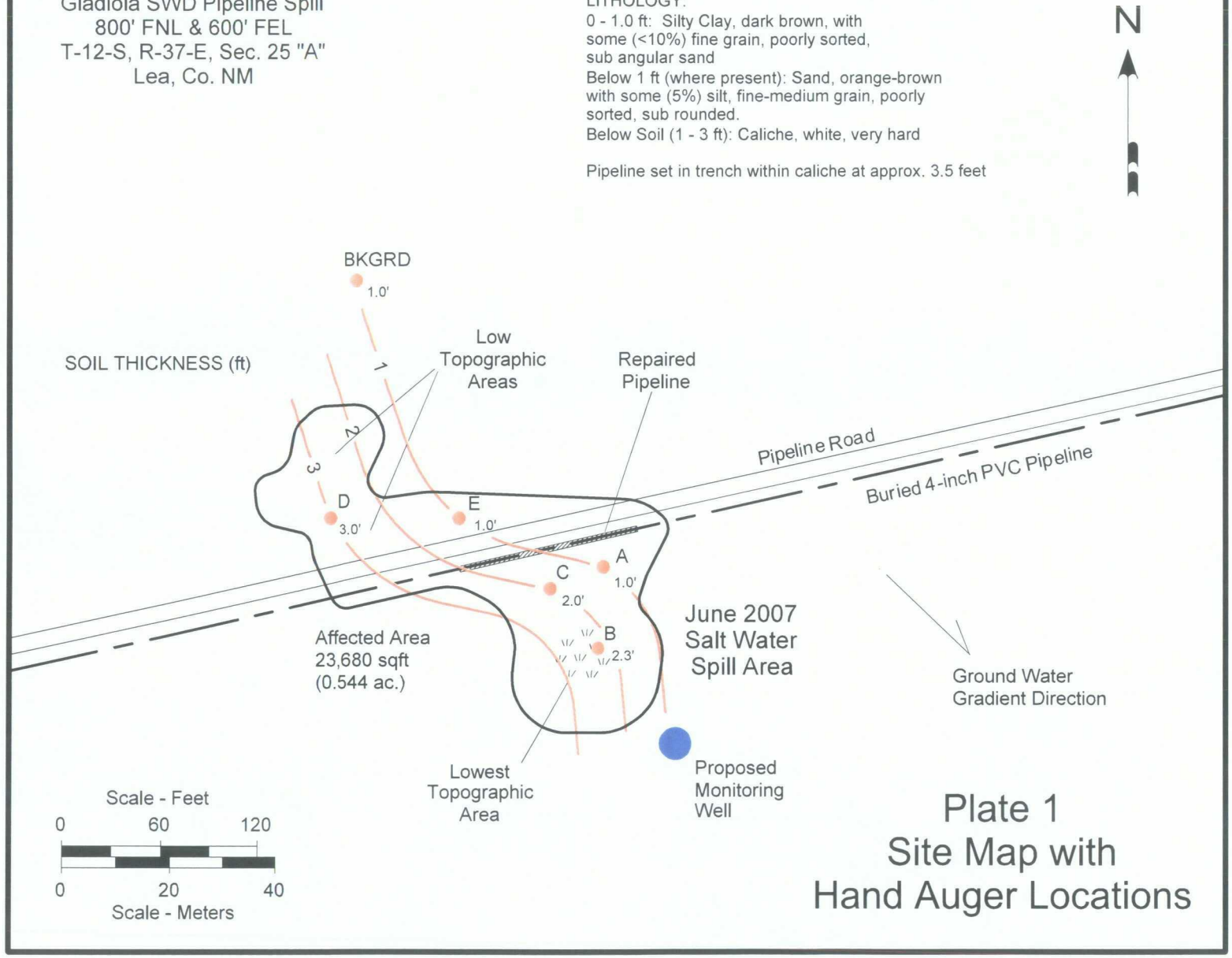


Plate 1
Site Map with Hand Auger Locations

R. T. HICKS CONSULTANTS, LTD.

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

November 27, 2007

Mr. Larry Johnson
New Mexico Energy, Minerals, & Natural Resources
Oil Conservation Division
1625 North French Drive
Hobbs, New Mexico 88240
Via E-Mail and US Mail

RE: **INVESTIGATION & CHARACTERIZATION RESULTS and REMEDIATION PLAN**
Gladiola SWD
T 12S R37E Section 25 Unit Letter A

Dear Mr. Johnson:

Purvis Operating Company (Purvis) has retained R.T. Hicks Consultants, Ltd. (Hicks Consultants) to address potential environmental concerns at the above-referenced site. The release site is approximately 10 miles east of Tatum, NM as shown on the attached Site Location and Topographic Map (Plate 1). Land in the site area is primarily utilized for cattle ranching and crude oil production (north of the site).

Proposed Action

Purvis proposes the following Corrective Action:

A. Use a chisel plow in the area affected by the release to mix hay/straw into the soil to improve the permeability and improve the soil.
B. Grade the affected area, creating a level surface with berms (if necessary) to prevent run-off of precipitation.
C. Drill a water supply well about 25 feet down gradient of the affected area.
D. From December to February, apply controlled amounts of water obtained from the water supply well to the affected area in order to flush salt from the root zone and into the upper vadose zone.
E. In March, determine the agricultural properties of the soil and re-seed the area with native species that will tolerate the salinity of the rehabilitated soil horizon
F. From March to June, apply water to the re-seeded area as necessary
G. No later than December 2008, release the water supply well to the landowner. However, subject to Purvis Operating Co. use of the well at any time during the future to water, other spills and/or any other use of such well for any need related to Purvis' operations of our pipelines on this property

Background

Purvis discovered an accidental discharge at the above-mentioned site on June 10, 2007, however due to a locked gate and the removal of the Purvis lock, the spill site could not be accessed until June 13, 2007. The NMOCD was notified and a C-141 form was submitted following the initial inspection. The volume of the release is unknown but is probably more than 50 barrels (bbls) and the size of the affected area is 0.54 acres. Plate 2 is a Site Overview Map and Plate 3 is a detailed Site Map showing the

surface area impacted by the release, the location of hand auger holes, a description of the surface soil, and contours indicating the depth to bedrock (caliche). The figures below are photographs of the site taken on June 22, 2007.

Low area south of pipeline (View to SW)

Low area to northwest (View to NW)

Road next to pipeline (View to West)

Spill area (View to South)

Characterization Program

We have conducted the following investigation/characterization activities:

- On June 22, 2007 Dale Littlejohn of Hicks Consultants visited the site, staked locations for sampling and met with Purvis representatives to coordinate the characterization of the site.
- On July 2, 2007, Mr. Littlejohn collected samples with a hand auger for a salinity/sodium evaluation in order to determine the best method for re-vegetation and provide data for the prediction of risks to the groundwater. Soil samples were sent to Ward Laboratories of Kearney, Nebraska for analysis. (Appendix A presents the laboratory results of the characterization program)
- Data from the field program was used in the unsaturated zone HYDRUS-1D model to evaluate the short-term and long-term impact of the release to soil productivity. A simple ground water mixing model was added in order to predict the possible future impact to the ground water (see Appendix B for information on this simulation modeling)

Characterization Results and Conclusions

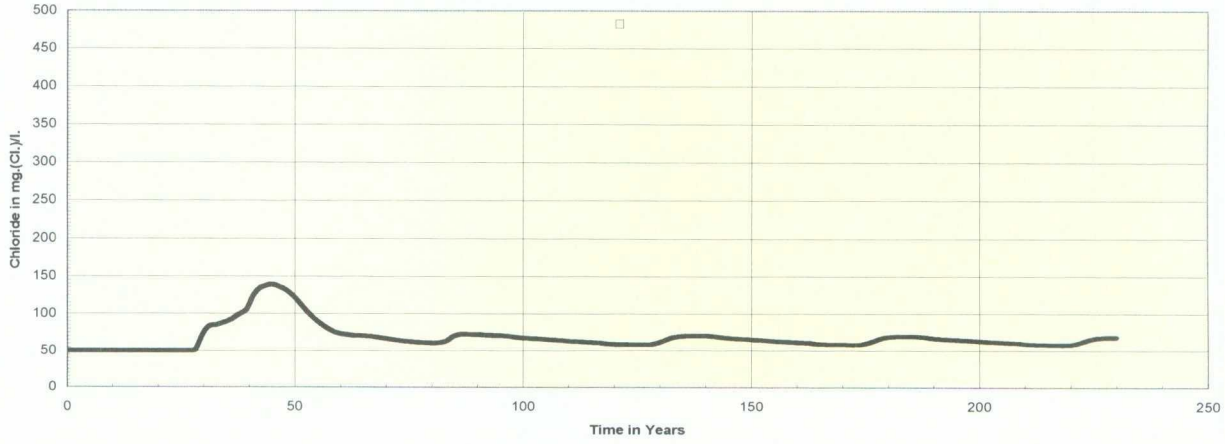
Plate 4 indicates the depths from which the composite soil samples were recovered. Table 1 provides a summary of the laboratory results for the spill area and background soil samples along with some guidelines concerning plant growth limitations. The results indicate that while the soil contains elevated chloride, which will prevent the near-term natural recovery of the native vegetation, the soil structure (permeability) has not been damaged by excess sodium.

The simulations presented in Appendix B permit the following conclusions:

1. Ground water beneath the site will not exceed New Mexico ground water standards at a place of reasonably foreseeable future use

   The predictions presented in the attached report indicate that salt from the spill migrates into the aquifer and becomes dispersed and diluted within the upper 40-feet of the saturated zone. Hicks Consultants can provide NMOCD with several case studies that document the fact that impact to fresh water from brine releases disperse rapidly throughout the upper 40-feet (or more) of the aquifer. Figure 3 of the attached modeling appendix is reproduced below.

Figure 3: Predicted Chloride Concentration in the Aquifer at the Gladiola Site
0% of the Chloride Load Assumed Removed Initially.
Vegetation is re-established at Year 40.
Chloride distributed throughout upper 40-feet of aquifer.



2. Removal or effective sequestration of 45% of the chloride mass in the shallow soil minimizes the potential impact to ground water.

   If the HYDRUS predictions assume that chloride molecules are restricted to the uppermost 10-feet of the aquifer, fresh water will exceed the WQCC Standards. NMOCD generally suggests that consultants use only the uppermost 10-feet of the aquifer in their simulations. Hicks Consultants agrees with NMOCD that such a suggestion is valid for hydrocarbon releases (which are often confined to the upper portion of an aquifer) but the 10-foot restriction cannot be arbitrarily applied to a brine release, such as this site.

When we simulated the impact to a 10-foot thick aquifer beneath the Gladiola spill site, we found that removal or sequestration of 45% of the chloride mass mitigated the potential impact to less than WQCC Standards. Similarly, sequestration or removal of 45% of the chloride mass would minimize the impact to the upper 40 feet of the underlying Ogallala Aquifer.

3. Removal of 45% of the chloride mass may have been possible if Purvis was permitted immediate access to the release site.

We cannot conclude with reasonable certainty that denial of access to the spill site prevented emergency removal of 45% of the released brine (using vacuum trucks to remove the liquid). However, we can conclude that the delay of the response

- increased the severity of the environmental impact of the release and
- may create a need for a corrective action if NMOCD assumes that chloride behaves like hydrocarbons and is confined to the uppermost 10-feet of an aquifer.

4. NMOCD Rules require a mitigation effort of the ground surface (the environment and private property).

We do not believe that fresh water will exceed WQCC Standards at a place of reasonably foreseeable future use due to the release at this site. The release does not pose a risk to public health or human safety. The spill has affected the environment and private property.

Evaluation of Alternatives

We used field data, laboratory analyses, site conditions, the results of the simulations, and the advice of an agronomist associated with NMSU to evaluate the following corrective action alternatives:

1. Dig-haul-dispose of the upper 2-feet of soil and replacement of the excavated chloride-impacted soil with imported clean soil.
2. Remove the upper 1-foot of impacted soil, use fresh water to flush residual chloride to below the root zone, grade the site to prevent ponding of precipitation, and re-establish vegetation.
3. Grade the site to facilitate addition of fresh water and leaching of chloride from the soil, then re-grade the site and re-vegetate.
4. Leave the uppermost sandy-loam soil in place; allow natural flushing and natural re-vegetation of the site.

Appendix C presents the ranking of these alternatives and shows that leaching chloride and re-vegetation (alternative 3) provides the highest degree of protection of fresh water, the environment, public health, safety and property, while satisfying the NMOCD recommendation of employing a 10-foot thick mixing zone to predict compliance with ground water protection standards. Alternative 3 does not require extensive excavation and does not expose the responsible party to potential landfill liabilities. However, the remedy providing the greatest benefit with the least impact is Alternative 4. If NMOCD agrees that salt impacts disperse rapidly through the upper 40-feet of an aquifer, Alternative 4 is the best remedy for this site.

Who is the Responsible Party?

Purvis bears responsibility for the impact to rangeland vegetation and the resultant temporary loss of the productive capacity of the ½ acre of affected land. The proposed remedy will return the range to it original productive capacity with a short time. Releasing the proposed water supply well to the landowner (subject to the continuing use of the well by Purvis) provides ample compensation for the temporary damage to range caused by the release subject to continuing use of such well by Purvis.

If NMOCD concurs that a 40-foot mixing zone is appropriate for brine releases and/or the proposed water supply well is the place of reasonably foreseeable future use, then assigning responsibility for potential impairment of ground water is not necessary.

If NMOCD mandates use of a 10-foot mixing zone to determine if fresh water may be impaired above WQCC Standards at this site, then the landowner who denied immediate access to the site must bear some or all of the responsibility for any NMOCD-required ground water protection measure.

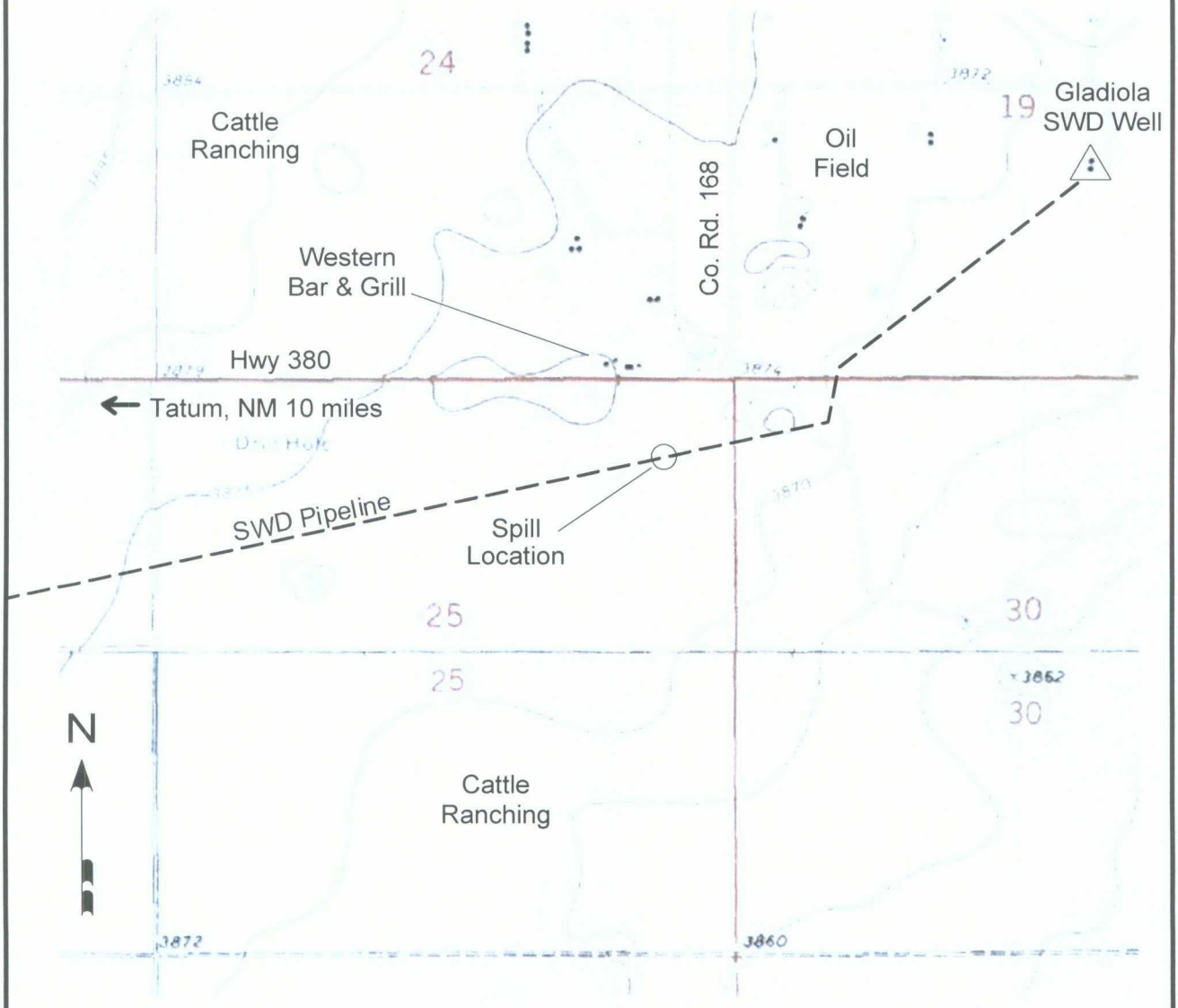
Please contact me if you have any questions or require additional information. Once the liabilities for this release have been formally assigned, Hicks Consultants will be glad to present these results and correction action alternatives to all interested parties.

Sincerely,

Randall Hicks
R.T. Hicks Consultants, Ltd.

Copy: Purvis Operating

Purvis Operating Co., Tatum Salt Water Pipeline Spill
800' FNL & 600' FEL T-12-S, R-37-E, Sec. 25 "A",Lea, Co. NM



Scale - Feet
0 1000 2000
0 0.20 0.40
Scale - Miles

Plate 1
Site Location and Topographic Map


Plate 2
Site Overview Map
N
Western
Bar & Grill
Co. Rd. 168
Highway 380
Tatum, NM 10 miles
Locked Gate
June 2007
Salt Water
Spill Area
Buried 4-inch PVC Pipeline
Pipeline Road
Scale - Feet
0
120
240
0
40
80
Scale - Meters
PURVIS OPERATING COMPANY
Tatum Salt Water Pipeline Spill
800' FNL & 600' FEL
T-12-S, R-37-E, Sec. 25 "A"
Lea, Co. NM

PURVIS OPERATING COMPANY
Gladiola SWD Pipeline Spill
800' FNL & 600' FEL
T-12-S, R-37-E, Sec. 25 "A"
Lea, Co. NM

LITHOLOGY:
0 - 1.0 ft: Silty Clay, dark brown, with some (<10%) fine grain, poorly sorted, sub angular sand
Below 1 ft (where present): Sand, orange-brown with some (5%) silt, fine-medium grain, poorly sorted, sub rounded.
Below Soil (1 - 3 ft): Caliche, white, very hard

Pipeline set in trench within caliche at approx. 3.5 feet

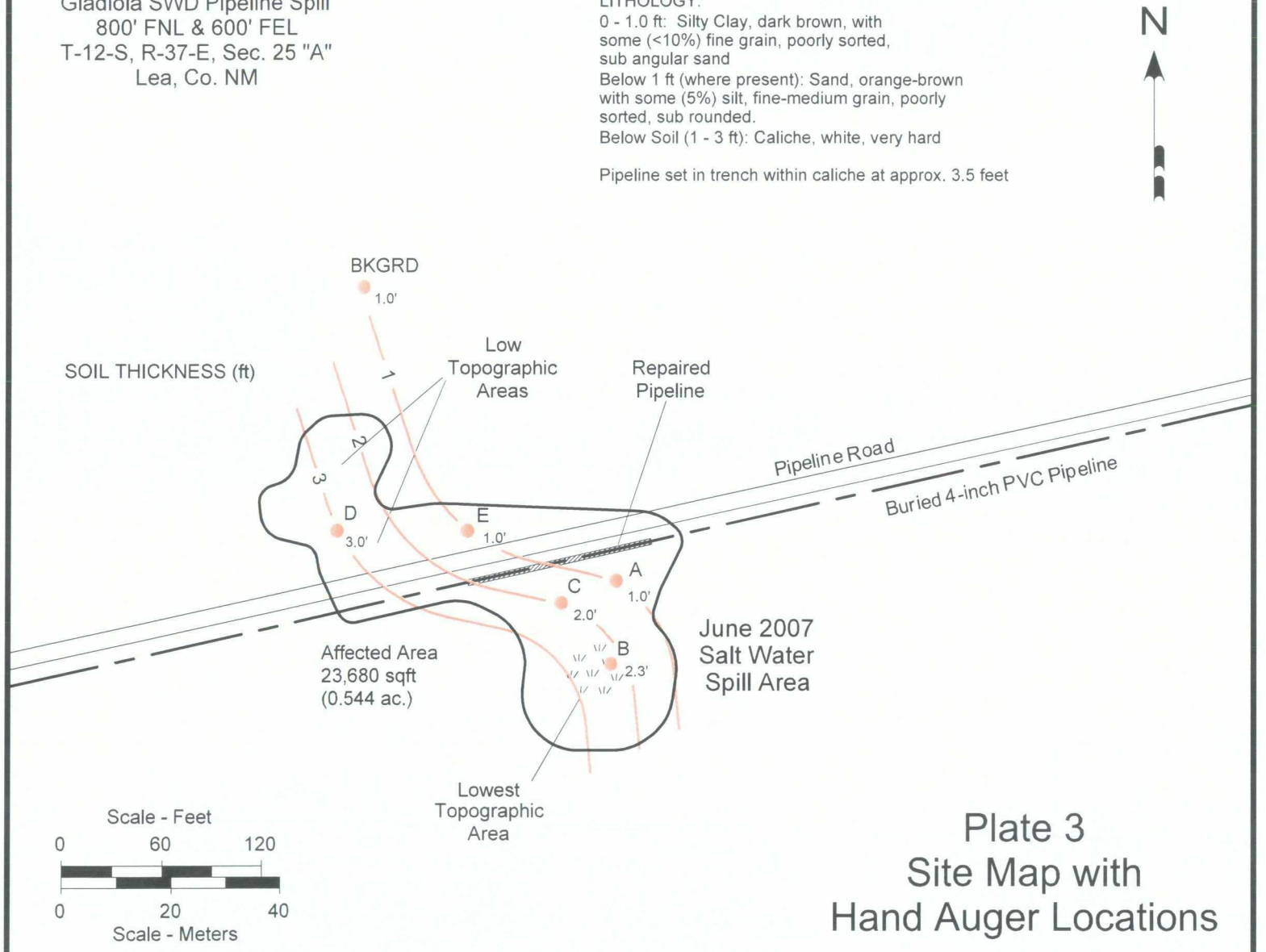


Plate 3
Site Map with Hand Auger Locations

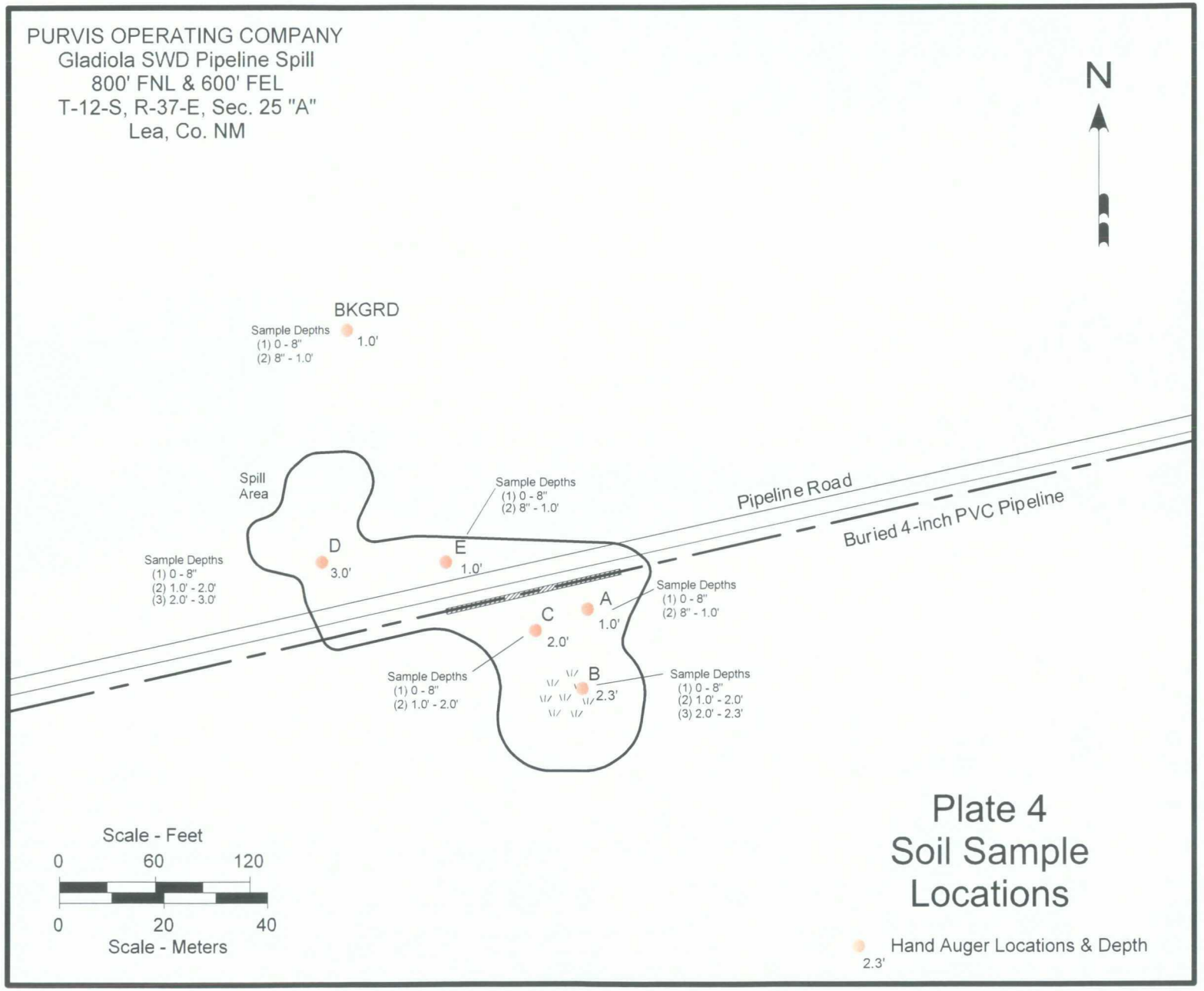

PURVIS OPERATING COMPANY
Gladiola SWD Pipeline Spill
800' FNL & 600' FEL
T-12-S, R-37-E, Sec. 25 "A"
Lea, Co. NM
N
BKGRD
Sample Depths
(1) 0 - 8"
(2) 8" - 1.0'
1.0'
Spill
Area
Sample Depths
(1) 0 - 8"
(2) 8" - 1.0'
Pipeline Road
Buried 4-inch PVC Pipeline
Sample Depths
(1) 0 - 8"
(2) 1.0' - 2.0'
(3) 2.0' - 3.0'
D
3.0'
E
1.0'
A
1.0'
Sample Depths
(1) 0 - 8"
(2) 8" - 1.0'
C
2.0'
Sample Depths
(1) 0 - 8"
(2) 1.0' - 2.0'
B
2.3'
Sample Depths
(1) 0 - 8"
(2) 1.0' - 2.0'
(3) 2.0' - 2.3'
Scale - Feet
0
60
120
0
20
40
Scale - Meters
Plate 4
Soil Sample
Locations
Hand Auger Locations & Depth
2.3'

Table 1
Purvis Operating Company
Gladiola SWD System Release Site
T-12-S, R-37-E, Section 25, Unit "A"

Sample Location	Project Area					Plant Growth Limitations		
	Recent Gladiola Spill Composite			Background		Soil/Plant	Soil	Halophyte
Depth (ft)	0 to 8"	8" to 24"	24" to Cal.	0 to 8"	8" to 12"	Impacted	Damage	Growth
Sample Date	7/2/07	7/2/07	7/2/07	7/2/07	7/2/07	Limits	Limits	Limits
Saturation (%)	45	48	47	48	57	--	--	--
Saturated Paste pH	6.9	7.3	7.7	7.5	7.8	--	--	--
Extract EC (mmho/cm)	**23.5**	**13.9**	**11.9**	**0.55**	**0.42**	**4**	**16**	12 - 19
HCO_3 (ppm)	40	40	0	160	80	--	--	--
Cl (ppm)	10,200	5,740	4,740	40	32	--	--	--
Ca (ppm)	1,987	757	649	119	86	--	--	--
Mg (ppm)	541	426	306	27	27	--	--	--
Na (ppm)	550	310	321	183	161	--	--	--
Sodium Adsorption Ration	2.8	2.2	2.6	3.9	3.9	--	--	--
Calculated TDS	18,800	11,120	9,520	337	257	--	--	--
Calculated ESP (%)	**2.8**	**1.9**	**2.5**	**4.3**	**4.3**	**5**	**15**	--

Appendix A – Laboratory Results & Chain of Custody

WARD
Laboratories, Inc.
Ag Testing - Consulting

7-17-07

To: 27772
Dale Littlejohn
RT Hicks Consulting LTD
PO Box 7624
Midland, TX 79708-7624

From: Raymond C. Ward

RE: SAR (sodium adsorption ratio) interpretation for Gladiola Spill.

Lab No. 45896 0-8 inches:

EC is 23.50 mmho/cm (dS/M) which is extremely high. A soil is classed as "Saline" if the EC is greater than 4.0. The salt is mainly calcium chloride. The sodium level SAR is low.

Lab No. 45897 8-24 inches:

EC is lower at 13.90 mmho/cm but is still pretty high. The salt is calcium and magnesium chloride. SAR is low.

Lab No. 45898 24-36 inches:

EC is a little lower, but high. SAR is low.

Lab No. 45899 and 45900 0-8 and 8-12 inches, Background:

EC is normal for plant growth. Note the low chloride compared to the Spill samples. SAR or sodium hazard is a little higher in the background. However, the values are low. SAR is a problem when values are above 12.

Phone: 308-234-2419
Fax: 308-234-1940
web site
www.wardlab.com
4007 Cherry Ave., P.O. Box 702
Kearney, Nebraska 68847-0702

Account No. : 27772

Soil Analysis Report

LITTLEJOHN, DALE T
RT HICKS CONSULTING LTD
PO BOX 7624
MIDLAND TX 79708-7624

Invoice No. : 1017334
Date Received : 07/03/2007
Date Reported : 07/06/2007

Results For : GLADIOLA
Location : SPILL

Lab No. : 45896	Depth :	0 - 8
ID : 0-8		
Saturated Soil Paste Analysis (SAR)		
Saturation, %		45
Saturated Paste pH		6.9
Extract E.C. mmho/cm		23.50
HCO_3 ppm		40
Cl ppm		10200
Ca ppm		1987
Mg ppm		541
Na ppm		550
Sodium Adsorption Ratio		2.8

Lab No. : 45897	Depth :	8 - 24
ID : >2 FT		
Saturated Soil Paste Analysis (SAR)		
Saturation, %		48
Saturated Paste pH		7.3
Extract E.C. mmho/cm		13.90
HCO_3 ppm		40
Cl ppm		5740
Ca ppm		757
Mg ppm		426
Na ppm		310
Sodium Adsorption Ratio		2.2

Lab No. : 45898	Depth :	24 - 36
ID : 24-36		
Saturated Soil Paste Analysis (SAR)		
Saturation, %		47
Saturated Paste pH		7.7
Extract E.C. mmho/cm		11.90
HCO_3 ppm		0
Cl ppm		4740
Ca ppm		649
Mg ppm		306
Na ppm		321
Sodium Adsorption Ratio		2.6

Reviewed By : Raymond Ward

7/9/2007

Copy : 1

Bus: 308-234-2418
Fax: 308-234-1940
web site
www.wardlab.com
4007 Cherry Ave., P.O. Box 788
Kearney, Nebraska 68848-0788

Account No. : 27772

Soil Analysis Report

LITTLEJOHN, DALE T
RT HICKS CONSULTING LTD
PO BOX 7624
MIDLAND TX 79708-7624

Invoice No. : 1017334
Date Received : 07/03/2007
Date Reported : 07/06/2007

Results For : GLADIOLA
Location : BACKGROUND

Lab No. : 45899	Depth :	0 - 8
ID : 0-8		
Saturated Soil Paste Analysis (SAR)		
Saturation, %		48
Saturated Paste pH		7.5
Extract E.C. mmho/cm		0.55
HCO_3 ppm		160
Cl ppm		40
Ca ppm		119
Mg ppm		27
Na ppm		183
Sodium Adsorption Ratio		3.9

Lab No. : 45900	Depth :	8 - 12
ID : 8-12		
Saturated Soil Paste Analysis (SAR)		
Saturation, %		57
Saturated Paste pH		7.8
Extract E.C. mmho/cm		0.42
HCO_3 ppm		80
Cl ppm		32
Ca ppm		86
Mg ppm		27
Na ppm		161
Sodium Adsorption Ratio		3.9

Reviewed By : Raymond Ward

7/9/2007

Copy : 1

Tus: 308-234-2418
Fax: 308-234-1940

web site
www.wardlab.com

4007 Cherry Ave., P.O. Box 788
Kearney, Nebraska 68848-0788

Account No. : 27772

Soil Analysis Report

LITTLEJOHN, DALE T
RT HICKS CONSULTING LTD
PO BOX 7624
MIDLAND TX 79708-7624

Invoice No. : 1017334
Date Received : 07/03/2007
Date Reported : 07/06/2007

Results For : HISTORIC
Location : SPILL SITE

Lab No. : 45901 Depth : 0 - 8
ID : 0-8

Saturated Soil Paste Analysis (SAR)	
Saturation, %	47
Saturated Paste pH	7.0
Extract E.C. mmho/cm	25.80
HCO_3 ppm	40
Cl ppm	10200
Ca ppm	983
Mg ppm	537
Na ppm	1281
Sodium Adsorption Ratio	8.1

Reviewed By : Raymond Ward 7/9/2007 Copy : 1

Bus: 308-234-2418
Fax: 308-234-1940
web site
www.wardlab.com
4007 Cherry Ave., P.O. Box 786
Kearney, Nebraska 68848-0786

RT Hicks Consultants Ltd

RT Hicks Consultants Ltd
P.O. Box 7624
Midland, Texas 79708
(432) 528-3878
(432) 689-4578 (Fax)
Email: dale@rthicksconsult.com

L-141-7

Chain of Custody

Date 7-2-07 Page 1 of 1

Lab Name: Ward Laboratories, Inc.
Address: 4007 Cherry Ave.
Kearney, Nebraska 68848
Telephone: (308) 234-2418
Contact: Raymond C. Ward
Samplers (SIGNATURES): Dale T. Littlejohn

Sample Identification	Matrix	Date	Time	Sample Type: G - Grab, C- Composite	BTEX (EPA 8021B)	MTBE (EPA 8021B)	SVOC (EPA 8270)	PAH (EPA 8270)	VOC (EPA 8260)	TPH (EPA 418.1)	TPH (TX-1005) Ext. to 35	TPH (TX-1006) * Highest	GRO (EPA 8015G)	DRO (EPA 8015D)	TDS (SM 2540C)	Anions/Cations	Total Metals	TCLP Metals	Chloride (EPA 300)	Salinity/Sodium Evaluation				Number of Containers
					Analysis Request																			
Gladiola Spill (0 - 8" deep)	Soil	7/2/07	N/A	C																X				1
Gladiola Spill (8" - 2' deep)	Soil	7/2/07	N/A	C																X				1
Gladiola Spill (>2' deep)	Soil	7/2/07	N/A	C																X				1
Gladiola Background (0 - 8")	Soil	7/2/07	N/A	C																X				1
Gladiola Background (8" - 1')	Soil	7/2/07	N/A	C																X				1

Project Information		Sample Receipt	
Project Client:	Purvis Operating Co.	Total Containers:	
Project Name:	Gladiola SWD Spill	COC Seals:	
Project Location:	T-12-S, R-37-E, S-25-A	Rec'd Good Cond/Cold:	
Project Manager:	Dale Littlejohn	Conforms to Records:	
FedEx Tracking No.:		Lab No.:	
Template/Prelogin:		Cooler No.:	

Special Instructions/Comments:

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.

	(1)	(2)	(3)
Relinquished By:	Dale T. Littlejohn	Dale T. Littlejohn	
(Company)	RT Hicks Consultants, Ltd	Raymond Ward	
(Printed Name)	Dale T. Littlejohn	Raymond Ward	
(Signature)	Dale T. Littlejohn		
(Date) (Time)	7-2-07 5:00 pm	7/12/07 10:30 AM	
Received By:	(1)	(2)	(3)
(Company)	Ward Lab		
(Printed Name)	Kristin Mitchell		
(Signature)	Kristin Mitchell		
(Date) (Time)	7/3/07 10 'clock		

Copy signed original form for RT Hicks Consultants records

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

Appendix B: Explanation of Simulation Modeling

The simulations presented herein predict the effects on vadose zone chloride profiles and ground water quality at the Purvis Gladiola Spill Site. The simulations are conservative as assumptions employed in the modeling cause the model to exaggerate any deleterious impact on soil and/or ground water.

To predict the effects of chloride migration on ground water, output of the unsaturated zone model HYDRUS-1D is used as input to a ground water mixing model that returns a calculation of the water quality at a hypothetical well at the down gradient edge of the application. To predict the effects in the vadose zone, HYDRUS-1D is used without the mixing model.

HYDRUS-1D numerically solves the Richard's equation for vadose zone water flow and the Fickian-based advection-dispersion equation for heat and solute transportation. The HYDRUS-1D flow equation allows the inclusion of a sink term (a term used to specify water leaving the system) to account for transpiration by plants when applicable. The solute transport equation considers advective, dispersive transport in the liquid phase, diffusion in the gaseous phase, nonlinear and non-equilibrium sorption, linear equilibrium reactions between the liquid and gaseous phases, zero-order production, and first-order degradation.

The ground water mixing model uses the chloride flux from the vadose zone to ground water provided by HYDRUS-1D and instantaneously mixes this chloride and water with the ground water flux of chloride plus water that enters the mixing cell beneath the subject site. The reader is referred to API Publication 4734, Modeling Study of Produced Water Release Scenarios (Hendrickx and others, 2005) for a general description of the techniques employed for this simulation experiment.

For these simulations, the migration through the vadose zone of a conservative solute (chloride) was modeled at a constant temperature. Simulations allowing vegetation (a sink term for water content in the root zone) and not allowing vegetation were made.

A description of the model input parameters to HYDRUS-1D and then to the mixing model are listed below.

HYDRUS INPUTS

Soil Profile - The vadose zone profile is 40 feet thick and was developed from well logs on file at the Office of the State Engineer (OSE) and from samples collected at the site. The upper three feet of the vadose zone were modeled as one-foot of silt loam on top of two-feet of sandy loam. Below this, three four-foot thick caliche layers were alternated with two one-foot thick layers of sandy loam. From 17 feet below ground surface (bgs), the vadose zone was modeled as sand. Well logs from adjacent sections describe caliche beds as never less than this in thickness. In one log (L-2430), the driller records caliche from five-feet bgs to ground water at 40 feet bgs. The modeled soil profile is conservative of ground water as it is composed of materials that have hydraulic conductivities greater than or equal to those existing within the area.

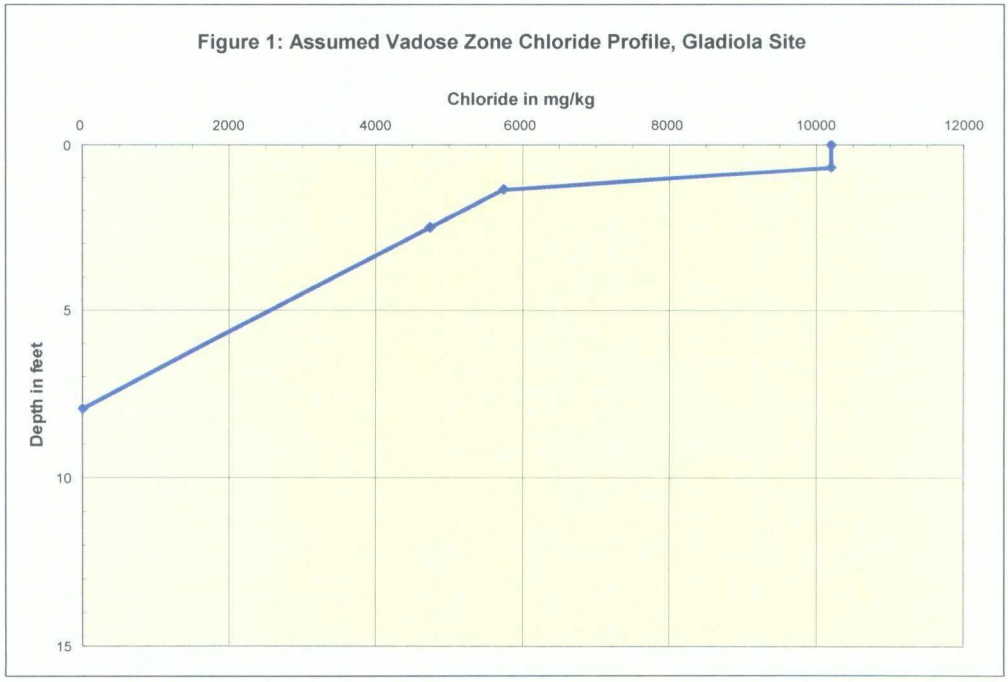
Dispersion lengths - The model employed a dispersion length of 5.0% of the model length. Standard practice calls for employing a dispersion length that is 10% of the model length. The smaller dispersion length than "standard" causes the model to exaggerate the maximum chloride concentrations within the vadose zone when compared to the standard method.

Climate - Weather data used in calculation of the initial condition and the predictive modeling was from the Pearl, New Mexico weather station, about 45 miles south of the site. This station is the closest station to the site for which the necessary HYDRUS-1D input file exists. Climates on the eastern plains of New Mexico are similar enough that this was considered an acceptable choice. The weather data spans the 46. 5 year period from July, 1946 to December, 1992,

HYDRUS-1D can also employ a uniform yearly infiltration rate that will obviously smooth the temporal variations. However, because the atmospheric data are of high quality and nearby to the site, it is conservative of ground water quality to use this data as the surface input to HYDRUS-1D. This choice results in higher peak chloride concentrations in ground water due to temporally variable high fluxes from the vadose zone into ground water.

Soil Moisture - Because soils are relatively dry in this climate and vadose zone hydraulic conductivity varies with moisture content, it is important that simulation experiments of different remedial strategies begin with representative soil moisture content. Commonly, the calculation of soil moisture content begins with using professional judgment as an initial input and then running sufficient years of weather data through the model to establish"steady state" moisture content. For this simulation, only minimal changes in the HYDRUS-1D soil moisture content profile occurred after year 15 of the initial condition calculation., Therefore, 46.5 years (1 cycle of the weather data) was considered sufficient to establish an initial moisture condition. This vadose zone moisture content profile was used as the initial condition for subsequent simulations.

Initial Chloride Profile – Within the vadose zone soil profile, initial chloride concentrations were set to the profile obtained from the field samples. The sample from 0.7 feet bgs was taken as constant to the surface. A linear interpolation of chloride concentrations was made between this point and the other two deeper sampling depths. A linear extrapolation of



chloride concentrations was assumed using the slope generated by the samples from two and three-feet bgs (see Figure 1).

Vegetation – Simulations were made not allowing the existence of vegetation at the site and allowing for the existence of vegetation at the site.

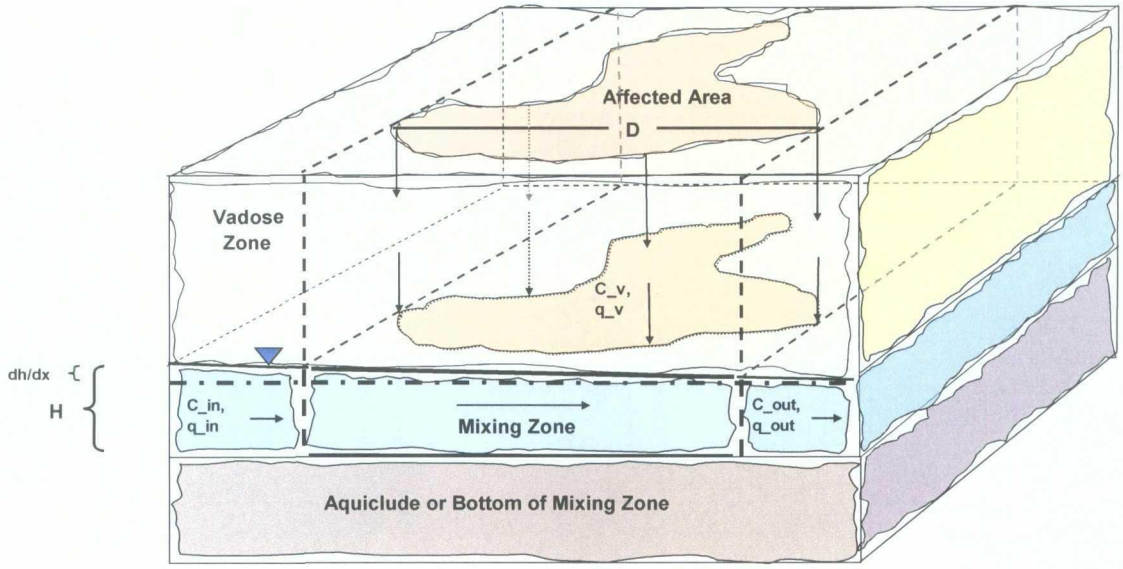
In the first case of no vegetation, there is no removal of water from the root zone through transpiration. There is only evaporation from the surface. This is highly conservative of ground water quality in that vadose zone water flux is greater making for a higher solute flux to ground water.

In the second case, vegetation was allowed to exist at the site when chloride concentrations had declined below 3,000 mg/L throughout the root zone (taken as the uppermost 3 feet of the vadose zone). This condition was met after about 40.5 years. The effect of vegetation is to remove moisture from the root zone through evapotranspiration. As such, less moisture enters the vadose zone below the root zone. Since hydraulic conductivity varies with moisture content, downwards migration of moisture and chloride is reduced in this circumstance. Favorable conditions for vegetation occur after a number of "wet" years result in sufficient moisture to move the chloride mass downwards below the root zone. This condition is the most probable for this site.

MIXING MODEL INPUTS

As described in API Publication 4734, the ground water mixing model takes the background chloride concentration in ground water multiplied by the ground water flux to calculate the total mass of ground water chloride entering the ground water mixing cell, which lies below the area of interest. The chloride and water flux from HYDRUS-1D is added to the ground water chloride mass and flux to create a final chloride concentration in ground water at a conceptual monitoring well located at the down gradient edge of the mixing cell (the down gradient edge of the release area). A schematic diagram of these inputs is shown below.

Figure 2: HYDRUS-1D input to the mixing zone is the chloride flux through time (C_v(t) x q_v(t)). Mixing Model inputs include the entering ground water chloride flux (C_in x q_in) and aquifer properties and dimensions (K, D, H, and dh/dx).



D - Maximum diameter of release or maximum diameter of release parallel to ground water flow
H - Height of mixing zone, assumed constant for the length of the mixing zone, D, and much larger than dh/dx
dh/dx - ground water gradient
K - Hydraulic conductivity of water bearing strata
C_in - background chloride concentration in ground water entering the mixing zone
C_v - chloride concentration of vadose zone water entering ground water
C_out - chloride concentration of ground water leaving the mixing zone
q_in - flux of ground water into the mixing zone
q_v - flux of vadose zone water into the mixing zone
q_out - flux of ground water leaving the mixing zone

Influence Distance (D) - The influence distance is defined as the maximal length of the application parallel to the direction of ground water flow. Because the exact direction of ground water flow is not known at the site, this distance was taken as 270 feet, the maximum diameter of the area affected by the release.

Background Chloride Concentration (C_in) based upon professional judgment; a value of 50 mg/L chloride for ground water was used at this location.

Hydraulic Conductivity (K) - Freeze and Cherry (1979) list hydraulic conductivities for clean sands as 10 feet/day to more than 2500 feet/day. Musharrafieh and Chudnoff (1999) assign a range of hydraulic conductivity of 21 to 40 feet per day to the area of the site. From this data, the saturated hydraulic conductivity of the uppermost saturated zone was assumed as 33 feet/day (10 m/day). Lower hydraulic conductivities cause a lower ground water flux than higher hydraulic conductivities, therefore selecting a relatively low hydraulic conductivity as an input reduces the amount of natural dilution that would take place beneath the release area.

Groundwater Gradient (dh/dx) – Because there is not available well data to compute a ground water gradient, a representative gradient of 0.0038 was calculated from the topography of the site. The resulting ground water flux is 3.8 cm/day (0.13 feet/day).

Aquifer Thickness (H) - A restricted aquifer thickness of 10 feet was employed in the mixing model as a conservative measure for most of our simulations, as this aquifer thickness is recommended by NMOCD for predictive modeling experiments. Musharrafieh and Chudnoff predict that saturated thickness of the alluvial aquifer beneath the site will remain at about 50 feet from now to the year 2040. Data from similar sites show that, unlike hydrocarbons, chloride that enters the upper portion of an aquifer will become distributed throughout the entire saturated thickness within a relatively short travel distance from the source. Therefore the arbitrary selection of a 10-foot thick mixing zone is conservative and probably unrealistic of ground water quality. In our opinion, simulations using the 40- to 50-foot thickness of the aquifer are appropriate for this site.

For all variables for which field data did not exist, assumptions conservative of ground water quality were made. A summary of the input parameters and a description of the source information used in the HYDRUS-1D model for this application are provided in Table 1 below.

Table 1: Modeling Inputs for the Gladiola Site Predictive Modeling

Input Parameter	Source
Vadose Zone Thickness - 40 feet	OSE Well Logs
Vadose Zone Texture - Caliche and sand	OSE Well Logs and field samples from the upper 3 feet of the vadose zone
Dispersion Length - 5.0% of model length	Professional judgment
Climate	Pearl N.M. Weather Station data
Soil Moisture	HYDRUS-1D initial condition simulation
Initial soil chloride Concentration Profile	From composite field samples.
Aquifer Thickness - 10 feet and 40 feet	Conservative assumption favored by NMOCD and regional data
Background Chloride in Ground Water - 50 mg/L	Professional Judgment
Ground Water Flux - 3.8 cm/day (0.13 feet/day)	Calculated with saturated hydraulic conductivity estimate and slope of topography
Length of release parallel to ground water flow - 270 feet	Largest diameter of the release area used as a conservative assumption

RESULTS OF SIMULATIONS

Simulation 1 (No Chloride Load Removal, Vegetation Naturally Re-established)

An assumption of vegetation at the release area after soil water chloride falls below 3000 mg/L (which is about 500 mg/kg chloride in soil) results in a simulation of chloride concentration in a well located on the down gradient edge of the spill site is shown in Figure 3. Allowing natural chloride migration at the site predicts that ground water will not exceed

WQCC standards if the chloride load is distributed throughout the upper 40-feet of the 50-foot thick aquifer or if the down-gradient well employs 40-feet of screened interval.

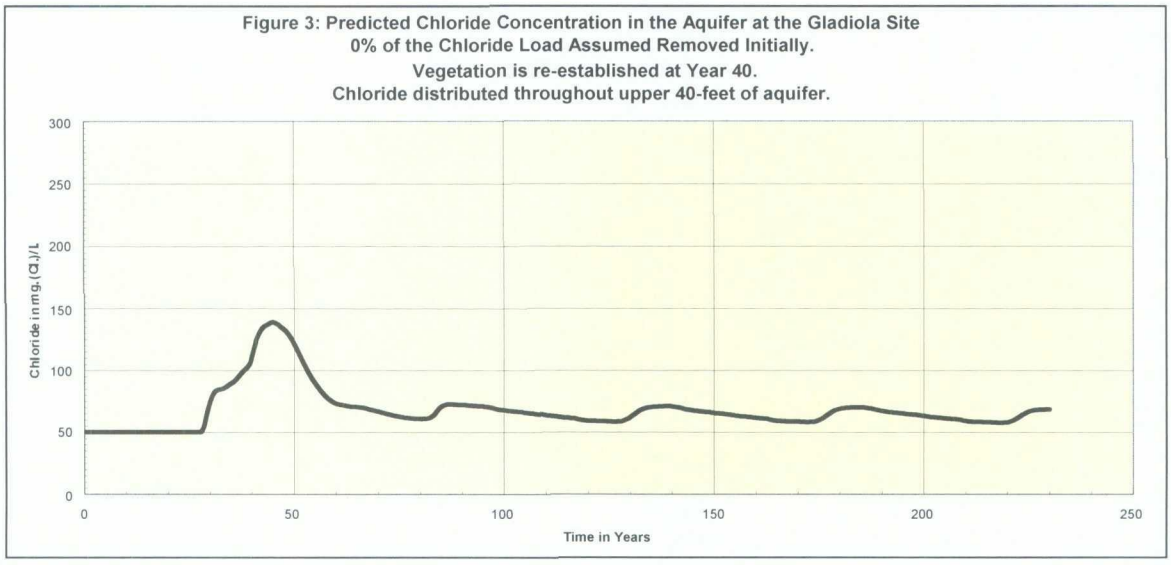
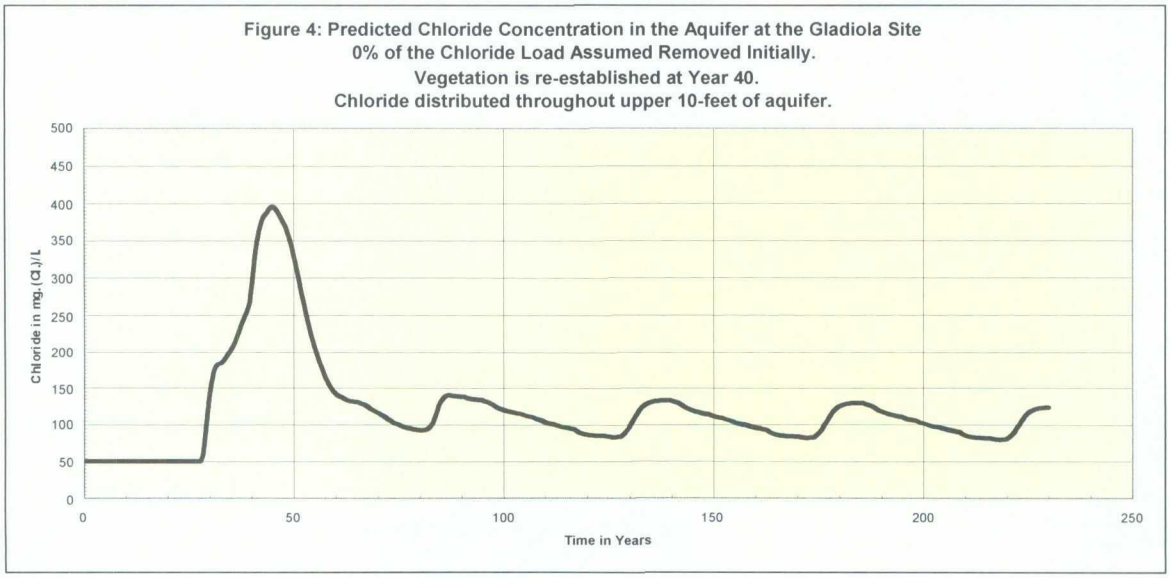


Figure 4 uses the same input as described above with the exception of a 10-foot thick aquifer mixing zone.



There is a periodicity of chloride concentration "spikes" within the predicted chloride concentration in ground water (at year 43, year 86, etc.). These "spikes" occur because of the repetition of the atmospheric data as an input. The peaks in the curves are due to periods of high precipitation (and subsequent recharge) during an El Nino weather pattern within the 46 year period of record.

We believe that Figure 3 represents the most likely impact to the aquifer employing a natural restoration remedy.

Simulation2 (Reduction of Chloride Load or Flux by 45%)

Figure 5 is a simulation in which the chloride flux to ground water is reduced by 45% of the natural flux at the site followed by complete re-vegetation by year 40. This simulation employs an aquifer thickness or mixing zone of 10-feet . A reduction in flux can be accomplished through:

1. Exportation of 45% of the chloride from the site (dig-haul-dispose)
2. Construction of an infiltration barrier that reduces the natural vadose zone flux to ground water by 45%.
3. A combination of soil exportation and construction of an infiltration barrier

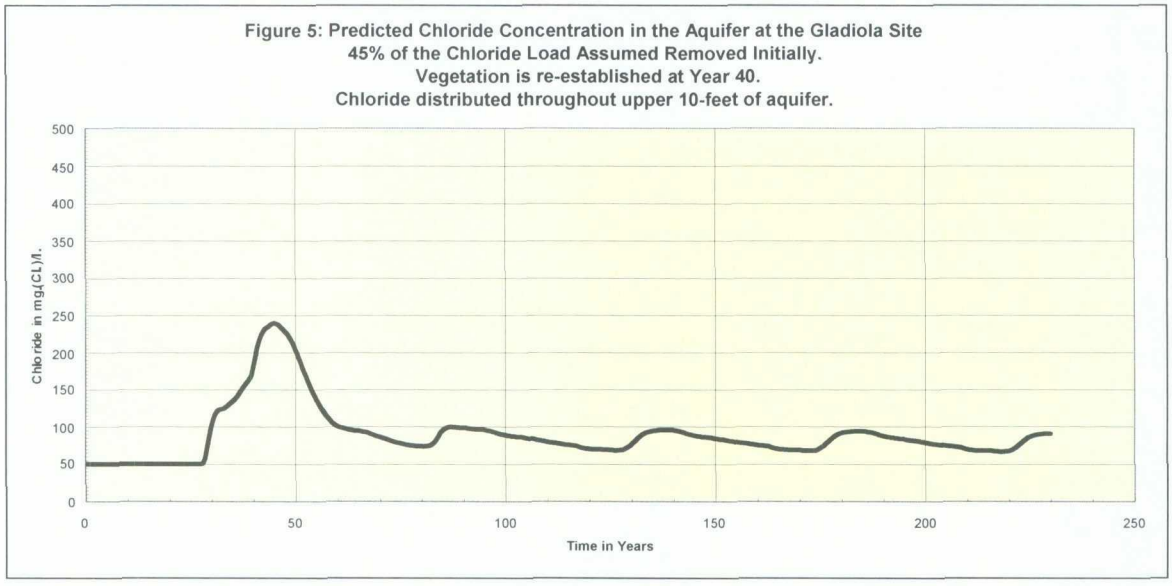
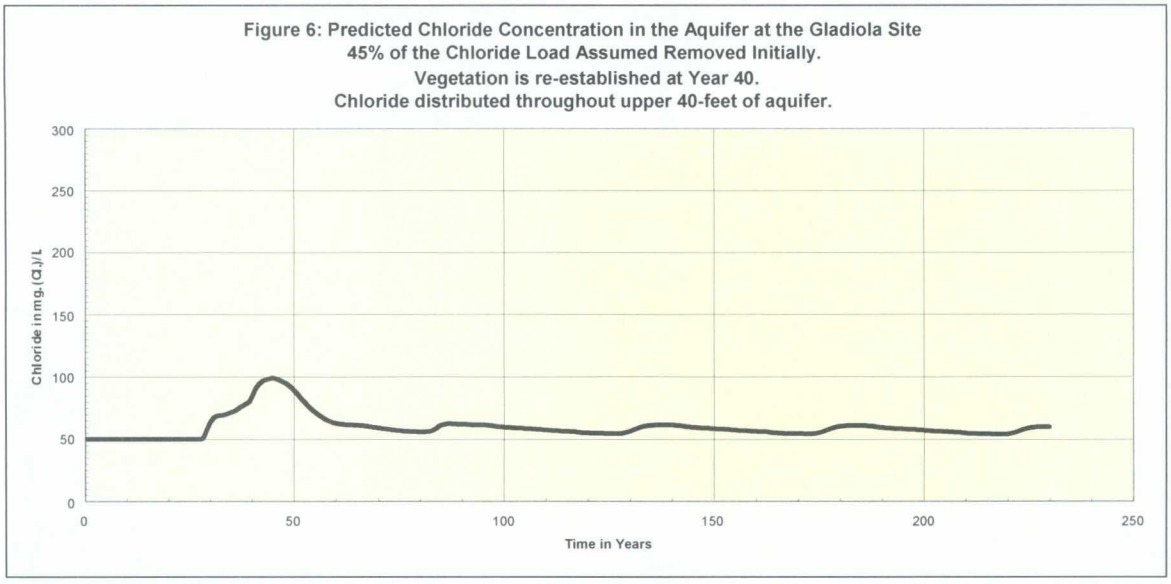
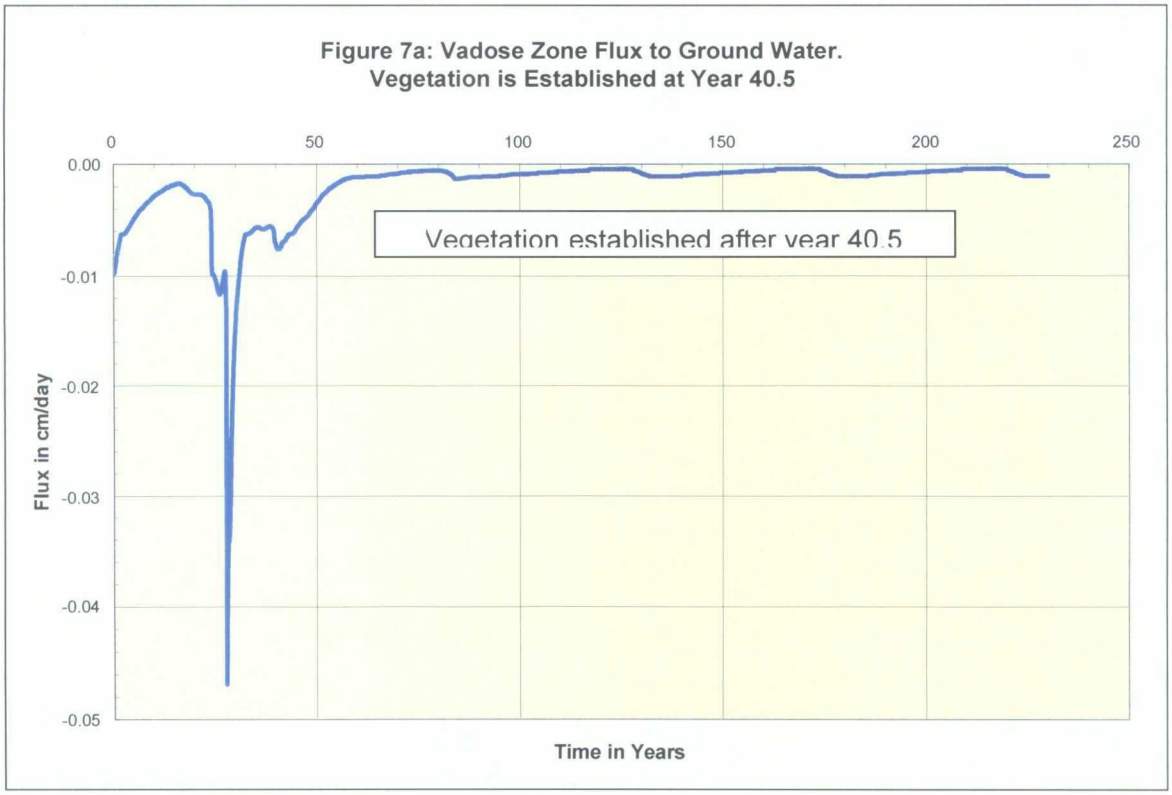
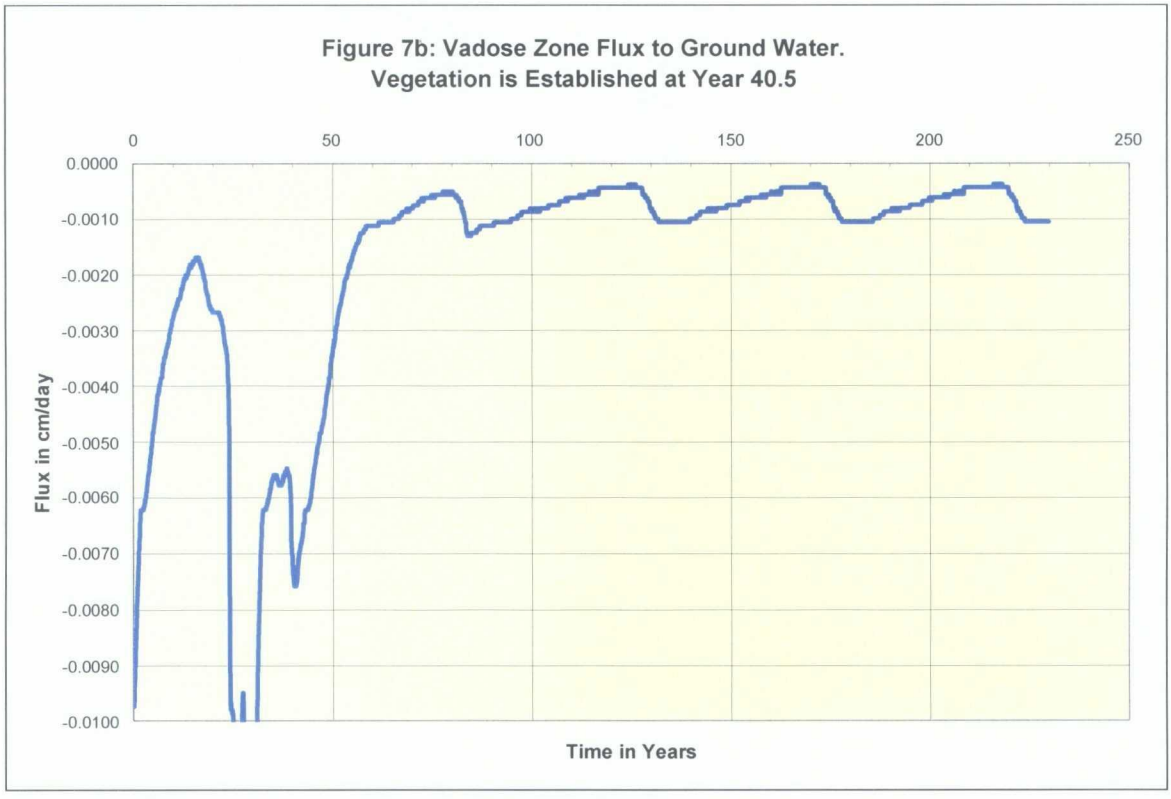


Figure 6 shows predicted chloride concentration in ground water for this simulation should the chloride be distributed throughout the upper 40-feet of the 50-foot thickness of the aquifer. Chloride concentration in ground water is increased less than 50 mg/L by the periodic El Nino recharge events and is less than 15 mg/L greater than background concentrations for the majority of the time that vadose zone chloride from the release effects ground water.



A reduction in chloride concentration in ground water is observed after vegetation is established about year 40.5. This effect is due to the reduction in vadose zone water flux to ground water as shown in Figure 7a and Figure 7b (expanded scale on y-axis). In general, vadose zone flux to ground water is significantly reduced and the recharge events (spikes in the record) are attenuated after year 40.5. An examination of the HYDRUS-1D output files shows that vadose zone water with the highest chloride concentration enters ground water between 120 and 130 years from now.





As these simulations use atmospheric data from the past rather than the actual future weather data, the time and magnitude of future El Nino events are obviously unknown.

CONCLUSIONS

1. The predictive modeling shows that a 45% reduction of the maximum natural flux to the aquifer will protect ground water quality and not permit standards to be exceeded under the highly conservative assumption that chloride molecules will remain in the upper 10-feet of the saturated zone.

2. If we assume that chloride molecules that enter ground water from the vadose zone beneath the release site are distributed throughout the uppermost 40-feet of the aquifer, the release poses no threat to fresh water or public health.

3. Because HYDRUS-1D assumes that precipitation falls on a flat ground surface with minimal runoff. Sloping the ground surface increases runoff of large events (e.g. El Nino) and thereby limits infiltration and deep percolation.

4. Sloping the ground surface at the spill site and re-establishing vegetation creates an effective evapotranspiration barrier at the site that can reduce the maximum flux to ground water by more than 45%.

Appendix C – Analysis of Corrective Action Alternatives

We used field data, laboratory analyses, site conditions, the results of the simulations, and the advice of an agronomist associated with NMSU to evaluate the following corrective action alternatives:

1. Dig-haul-dispose of the upper 2-feet of soil and replacement of the excavated chloride-impacted soil with imported clean soil.
2. Remove the upper 1-foot of impacted soil, use fresh water to flush residual chloride to below the root zone, grade the site to prevent ponding of precipitation, and re-establish vegetation.
3. Grade the site to facilitate enhanced flushing of chloride from the soil, then re-grade the site and re-vegetate.
4. Leave the uppermost sandy-loam soil in place, allow natural flushing and natural re-vegetation of the site, assume that chloride is distributed throughout the uppermost 40 feet of the 50-foot thick aquifer.

Regulatory Considerations

We are addressing this release under Rule 116, which states:

> (2) The division shall be notified in accordance with Section 116 of 19.15.3 NMAC with respect to any release from any facility of oil or other water contaminant, in such quantity as may with reasonable probability be detrimental to water or cause an exceedance of the standards in Section 19, Subsection B, Paragraphs (1) and (2) or (3) of 19.15.1 NMAC.
>
> B. Reporting Requirements. Notification of the above releases shall be made by the person operating or controlling either the release or the location of the release in accordance with the following requirements: (1) A Major Release shall be reported by giving both immediate verbal notice and timely written notice pursuant to Subsection C, Paragraphs (1) and (2) of 19.15.3.116 NMAC. A Major Release is:
>
> (a) an unauthorized release of a volume, excluding natural gases, in excess of 25 barrels;
>
> (b) an unauthorized release of any volume which:
>
> (i) results in a fire;
>
> (ii) will reach a water course;
>
> (iii) may with reasonable probability endanger public health; or
>
> (iv) results in substantial damage to property or the environment;

The corrective action requirements of this rule are outlined below:

> D. Corrective Action. The responsible person must complete division approved corrective action for releases which endanger public health or the environment. Releases will be addressed in accordance with a remediation plan submitted to and approved by the division or with an abatement plan submitted in accordance with Section 19 of 19.15.1 NMAC.
>
> [1-1-50...5-22-73...2-1-96; A, 3-15-97; 19.15.3.116 NMAC - Rn, 19 NMAC 15.C.116, 11-15-01]

Although Rule 19 (Abatement Plan) does not apply to this site, this rule provides additional guidance relating to a corrective action under Rule 116. We compared the remedy proposed herein with the following sections of Rule 19 as well as the sections of Rule 116 presented above. Rule 19 states:

19.15.1.19 PREVENTION AND ABATEMENT OF WATER POLLUTION:

A. Purpose

(1) The purpose of this rule are to:

(a) Abate pollution of subsurface water so that all ground water of the state of New Mexico which has a background concentration of 10,000 mg/L or less TDS, is either remediated or protected for use as domestic, industrial and agricultural water supply, and to remediate or protect those segments of surface waters which are gaining because of subsurface-water inflow, for uses designated in the water quality standards for interstate and intrastate surface waters in New Mexico (20.6.4 NMAC); and

(b) Abate surface-water pollution so that all surface waters of the state of New Mexico are remediated or protected for designated or attainable uses as defined in the water quality standards for interstate and intrastate surface waters in New Mexico (20.6.4 NMAC).

(2) If the background concentration of any water contaminant exceeds the standard or requirement of Section 19.15.1.19 NMAC, Subsection B, Paragraphs (1), (2) or (3) pollution shall be abated by the responsible person to the background concentration.

(3) The standards and requirements set forth in of Section 19.15.1.19 NMAC, Subsection B, Paragraphs (1), (2) or (3) are not intended as maximum ranges and concentrations for use, and nothing herein contained shall be construed as limiting the use of waters containing higher ranges and concentrations.

B. Abatement standards and requirements

(1) The vadose zone shall be abated so that water contaminants in the vadose zone will not with reasonable probability contaminate ground water or surface water, in excess of the standards in Paragraphs (2) and (3) below, through leaching, percolation, or other transport mechanisms, or as the water table elevation fluctuates.

(2) Ground-water pollution at any place of withdrawal for present or reasonably foreseeable future use, where the TDS concentration is 10,000 mg/L or less, shall be abated to conform to the following standards:

(a) Toxic pollutant(s) as defined in 20.6.2.7 NMAC shall not be present; and

(b) The standards of 20.6.2.3103 NMAC shall be met.

(3) Surface-water pollution shall be abated to conform to the water quality standards for interstate and intrastate surface waters in New Mexico 20.6.4 NMAC.

(4) Subsurface-water and surface-water abatement shall not be considered complete until eight (8) consecutive quarterly samples, or an alternate lesser number of samples approved by the director, from all compliance sampling stations approved by the director meet the abatement standards of Paragraphs (1), (2) and (3) above. Abatement of water contaminants measured in solid-matrix samples of the vadose zone shall be considered complete after one-time sampling from compliance stations approved by the director.

Selection of Ranking Criteria

The regulatory language identified above as well as a thorough examination of the NMOCD Rules and the Oil and Gas Act demonstrate that a responsible party must propose an action that creates an appropriate balance of costs and benefits with respect to:

1. Fresh water (surface water and ground water)
2. Public health (which the regulations associate with a water supply for human consumption)
3. The environment (e.g. habitat, soil productivity, air quality, etc.)
4. Safety (to humans)
5. Protection of property (e.g. loss of use)

Scoring of Alternatives

The table below presents the results of a simple method of ranking the alternatives. The corrective action that provided the highest net benefit received the highest score. Because we evaluated four possible actions, the highest possible score for an evaluation criterion was 4.

Corrective Action Alternative	Fresh Water	Public Health	Environment	Safety	Property	Total Score
1. Dig-Haul-Dispose-Import Soil	4	0	1	1	1	7
2. Remove 1-foot-Flush Chloride-Grade to Drain	2	0	2	2	2	8
3. Flush Chloride-Revegetate	1	0	3	3	3	10
4. Natural Restoration-Compensate Landowner	3	0	4	4	4	15

Protection of Fresh Water: The HYDRUS-1D simulations show that the removal of the majority of chloride mass through the exportation of the upper 2-feet of soil and the importation of clean soil with a similar sandy-loam texture would effectively eliminate the threat to ground water with a high degree of certainty. This option received the highest score in this category. Removal of 2-feet of soil and importation of clean soil also permits immediate re-vegetation of the site with salt-tolerant plants, thereby creating an effective ET barrier.

The simulation modeling predicts that the no action will result in ground water exceeding WQCC Standards at and near the site only if one assumes that chloride molecules that enter the aquifer from the release are confined to the uppermost 10-feet of the aquifer. Using this assumption, natural restoration and compensation to the landowner for a 40-year loss of productive rangeland does not comply with the NMOCD Rules and therefore cannot be implemented at this site. However, if one assumes that chloride is distributed throughout the uppermost 40 feet of the 50-foot thick aquifer, then ground water does not exceed WQCC Standards. Natural restoration was ranked second because we believe that chloride disperses throughout the aquifer.

Removal of the uppermost 1-foot of soil eliminates about 40% of the chloride mass at the site. When this soil exportation option is combined with chloride leaching via the application of fresh water then construction of an ET Barrier, chloride is effectively sequestered in the upper vadose zone. Unlike dig-haul-dispose or natural restoration, the uncertainty associated with this option is greater because of the lack of site-specific data and the relatively thin (40-foot thick) vadose zone. We ranked this option last.

As stated in the modeling appendix, any remedy that limits the natural chloride flux to ground water by 45% is an effective remedy with respect to the protection of ground water. We believe that exportation of 2-feet of topsoil (about 65% of the load) combined with grading to shed precipitation and re-vegetation (alternative #1) accomplishes this. If a

remedy can flush chloride from the topsoil and sequester the load in the upper vadose zone with a reasonable degree of scientific certainty, such a remedy is also effective.

Assuming that NMOCD will require the use of the 10-foot thick ground water mixing zone rather than a 40-foot mixing zone, we developed the following alternative:

1. Beginning in January, implement a 3-month soil flushing remedy on 10% of the spill area The flushing program consists of applying 8 cm/week of water.
2. Re-grade the tract to allow drainage of excess precipitation then plant native and salt tolerant species in the tract after completion of the soil flushing program.
3. Monitor the site on a regular basis and obtain shallow and deep soil moisture measurements on a monthly basis for nine months.
4. If visual monitoring shows indications of erosion due to wind or water, place an erosion control blanket over portions of the site to minimize any impact.
5. If necessary, use the data from the 9 months of monitoring to revise the flushing program, then implement the 3-month chloride leaching/flushing program on a second tract followed by a 3-month flushing program on a third tract. Continue the program until 90% of the affected area is leached of chloride. As many as 9 tracts may be employed.
6. When the remedy is complete, two ponding areas will exist outside of the affected area and the soil excavated to create the ponding areas will have been used to establish a 2-5% slope across the restored spill site.

Protection of Public Health: There are no public or domestic water wells threatened by the release at or near the site. Under any corrective action, the chloride mass will disperse and dilute as it enters ground water and ground water will meet standards with 50 feet of the release site. The closest down gradient water supply wells is 1.0 miles from the site. Therefore, we did not consider this criterion in our evaluation.

Protection of the Environment: Natural restoration does not pose a threat to the environment because:

- the area of impact is small and does not represent a material reduction in habitat
- windborne spreading of surface salt is minimized by the residual root structure of the plants and, if necessary, the proposed placement of mulch over the impacted surface area
- a surface water course is not threatened by this release,
- we will limit the footprint caused by the installation of soil borings and the monitoring well to limit any additional damage to the surrounding area.

We ranked this corrective option highest of the four identified alternatives.

The dig-haul-dispose-import soil remedy will cause the greatest amount of air pollution in terms of exhaust and dust generation. This remedy will also create the greatest disturbance to the area in the form of soil compaction on haulage roads. We ranked this alternative the lowest of the four. Excavation of 1-foot of soil rather than 2-feet reduces the mass of dust, exhaust and soil compaction, permitting a ranking of third best.

Flushing the chloride from the site in the absence of any exportation of impacted soil requires contouring the site to facilitate the application of fresh water and either transportation of water to the site via trucks or drilling a well at the site to supply fresh water. Because of the required excavation, the generation of dust and exhaust is greater than natural restoration but less than either dig-haul-dispose options. We ranked this alternative second.

Protection of Human Safety: The remedy most protective of human safety limits the invasive corrective actions or actions that require significant hauling. Therefore, natural restoration is ranked highest and the 2-foot dig-haul-dispose option is ranked lowest.

Mitigate the Damage to the Property: Presently 0.544 acres of productive pasture land has been damaged by the release. The 2-foot deep dig-haul-dispose and import alternative will probably restore the range land to its original productive capacity in 1-2 years. The soil flushing options will also restore the rangeland to its original productive capacity in about the same time. Natural re-vegetation of the site will probably require about 40 years.

Purvis could offer to lease the area of the spill site and 2.5 additional acres surrounding the site for a period of 40 years to compensate for the lost grazing area until the vegetation is restored. Because any lease would begin at the time of the spill, this alternative is most protective of property.

Recommended Alternative

Although natural restoration with compensation to the landowner is considered to have the greatest net benefit using this simple ranking protocol, this alternative does not comply with NMOCD Rules at this site using the 10-foot ground water mixing zone assumption. The phased soil flushing program (alternative 3) complies with all NMOCD Rules and provides the highest net benefit compared to the other alternatives.

If NMOCD agrees that chloride from the release is dispersed throughout the aquifer, then the natural restoration alternative with compensation to the landowner provides the highest net benefit.

New File

District I
1625 N. French Dr., Hobbs, NM 88240
District II
1301 W. Grand Avenue, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised October 10, 2003

Submit 2 Copies to appropriate District Office in accordance with Rule 116 on back side of form

Release Notification and Corrective Action

OPERATOR

☐ Initial Report ☐ Final Report

Name of Company: Purvis Operating Co.	Contact: Donnie E. Brown
Address: P O Box 51990	Telephone No.: 432-682-7346
Facility Name: Gladiola SWD	Facility Type: Produced Water Disposal
Surface Owner: Tommy Burrus	Mineral Owner:	Lease No.:

LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
A	25	12S	37E	800	N	600	West	Lea

Latitude_____ Longitude_____

NATURE OF RELEASE

Type of Release: Produced Devonian Water	Volume of Release: 50 Bbl	Volume Recovered: Zero
Source of Release: Pipeline	Date and Hour of Occurrence: 6/9/07	Date and Hour of Discovery: 6/10/07 11:00 AM
Was Immediate Notice Given? ☐ Yes ☒ No ☐ Not Required	If YES, To Whom?	
By Whom?	Date and Hour	
Was a Watercourse Reached? ☐ Yes ☒ No	If YES, Volume Impacting the Watercourse	

If a Watercourse was Impacted, Describe Fully.*

Describe Cause of Problem and Remedial Action Taken.*

Pipeline Leak. Dug up and replaced cracked 4" PVC Pipe with new 4" PVC pipe.

Describe Area Affected and Cleanup Action Taken.*

Killed about 0.62 Acres of grassland. Water soaked away. No Action taken. See attached map.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: Donnie E. Brown

Printed Name: Donnie E. Brown

Title: Perroleum Engineer

E-mail Address: eng@purvisop.com

Date: 6-13-07 Phone: 432-682-7346

OIL CONSERVATION DIVISION

Approved by District Supervisor:

Approval Date: Expiration Date:

Conditions of Approval: Attached ☐

* Attach Additional Sheets If Necessary

NEW MEXICO ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT

BILL RICHARDSON
Governor
Joanna Prukop
Cabinet Secretary

Mark E. Fesmire, P.E.
Director
Oil Conservation Division

Field Inspections Program
"Protecting the Integrity of Fresh Waters"

14-Jun-07

PURVIS OPERATING CO
3101 N. Pecos St. POB 51990 79710-1990
Midland TX 79705

LETTER OF VIOLATION - Inspection

Dear Operator:

The following inspection(s) indicate that the well, equipment, location or operational status of the well(s) failed to meet standards of the New Mexico Oil Conservation Division as described in the detail section below. To comply with standards imposed by Rules and Regulations of the Division, corrective action must be taken immediately and the situation brought into compliance. The detail section indicates preliminary findings and/or probable nature of the violation. This determination is based on an inspection of your well or facility by an inspector employed by the Oil Conservation Division on the date(s) indicated.

Please notify the proper district office of the Division, in writing, of the date corrective actions are scheduled to be made so that arrangements can be made to reinspect the well and/or facility.

INSPECTION DETAIL SECTION

HOUSTON A No.001 L-19-12S-38E **30-025-07202-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
06/14/2007	Routine/Periodic	Maxey Brown	Yes	No	7/17/2007	iMGB0716557040

Violations
Surface Leaks/Spills

Comments on Inspection: NEED TO SUBMIT RELEASE AND CORRECTIVE ACTION, (C141). IN CLEANUP PLAN ADDRESS COMPLETE REMOVAL OF CONTAMINATED SOIL BY HORIZONTAL AND VERTICAL DELINEATION. CONTACT LARRY JOHNSON (505-393-6161, EXT 111) FOR APPROVAL PRIOR TO BEGINNING WORK. THIS IS 1ST LETTER OF NON-COMPLIANCE.

LOWE No.001 A-34-12S-37E **30-025-20724-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
06/14/2007	Routine/Periodic	Maxey Brown	Yes	No	9/17/2007	iMGB0716543210

Violations
Absent Well Identification Signs (Rule 103)
Surface Leaks/Spills

Comments on Inspection: NO WELL SIGN, (RULE 103). NEED TO SUBMIT C-141, TO REPORT SPILL OF FLUIDS FROM TANK, WHICH RESULTED FROM FIRE AT TAB.

In the event that a satisfactory response is not received to this letter of direction by the "Corrective Action Due By:" date shown above, further enforcement will occur. Such enforcement may include this office applying to the Division for an order summoning you to a hearing before a Divison Examiner in Santa Fe to show cause why you should not be ordered to permanently plug and abandon this well. Such a hearing may result in imposition of CIVIL PENALTIES for your violation of OCD rules.

Sincerely,

Maley Brown

COMPLIANCE OFFICER

Hobbs OCD District Office

Note: Information in Detail Section comes directly from field inspector data entries - not all blanks will contain data.
*Significant Non-Compliance events are reported directly to the EPA, Region VI, Dallas, Texas

Dale Littlejohn

From: Randy Hicks [r@rthicksconsult.com]
Sent: Tuesday, September 09, 2008 10:12 PM
To: Hansen, Edward J., EMNRD; Donnie Brown; Dale Littlejohn; Ocean Munds-Dry
Subject: Purvis 1RP - 1481

Ed

I am glad Wayne assigned this case to you. Before this week is out I will send you a paper copy of the reports for the two Purvis spill sites in Lea County.

For the site referenced above, which we call the Gladiola Site, we would like to work with you to gain NMOCD approval for the surface restoration as soon as possible so we can make sure we can re-seed the site when the conditions are optimal. This site released water on virgin ground and
we would like to get it back to productive capacity as soon as we can.
Please look carefully at our findings regarding ground water at the site
- we believe the evidence demonstrates that we have a perched zone.

The other site we call the Gladiola NE site. A previous pipeline operator released water at this site and then last year Purvis had a spill in the same area - so the pasture has been damaged for years. We want to get the surface restored here as well - but the urgency with respect to the restoration of the land is not as great - since it has been damaged for more than a decade.

At the Gladiola site we will probably have difficulty gaining approval from the landowner to implement a plan. At the Gladiola NE site, the
landowner appears willing to work with us. We fully realize that it is
the job of NMOCD to look at the submissions and determine if they meet the mandates in the Rules then either approve the plan or work with us to make some modifications to come into compliance with the Rules. We also realize that it is the duty of the operator to work with the landowner to get permission to implement an NMOCD-approved plan. So unless we need your help, we will deal with the landowners and let you do the technical/regulatory review. However, I thought you would like to be aware of the back-story and you can contact Larry Johnson who may have more insight than me.

Dale and I look forward to working with you on this project and I would be pleased to present the plan in Santa Fe OR, better yet, Dale can show you around the sites the next time you are in Lea County.

Thanks - I have copied Holland and Hart on this email so that they know they can stand down and a hearing is not required at this time.

Randy

Randy Hicks

From: Williams, Chris, EMNRD [chris.williams@state.nm.us]
Sent: Monday, August 25, 2008 9:08 AM
To: Randy Hicks
Subject: RE: Purvis Gladiola release

Randy I'm sorry it's been hard to get hold of me. Anything that needs to be approved needs to go through Santa Fe. As of 8/29/08, I will no longer be working for the OCD. So, good luck in business dealings.
Chris

-----Original Message-----
From: Randy Hicks [mailto:r@rthicksconsult.com]
Sent: Monday, August 25, 2008 8:24 AM
To: Williams, Chris, EMNRD; Dale Littlejohn; Donnie Brown
Subject: Purvis Gladiola release

Chris

I am on vacation - returning to the office on Thursday.

We would like to determine if you would prefer us to ask for a hearing on NMOCD's rejection of our corrective action proposal on the Purvis Gladiola site or if you wish to try to work things out without a hearing. While a hearing can be a healthy process, we do not wish to move down that path unless you feel it is the best way to go.

A short email indicating yes-hearing or no hearing, let's meet in Hobbs

and work it out - is all we need.

Thanks

Randy Hicks
505-238-9515 I am checking email and phone periodically during my time off.

Randy Hicks

From: Randy Hicks [r@rthicksconsult.com]
Sent: Monday, August 18, 2008 10:19 AM
To: 'chris.williams@state.nm.us'
Cc: 'DONNIE BROWN'; 'Dale Littlejohn'
Subject: Purvis 1RP-1481

Chris:

Prior to requesting a hearing to appeal NMOCD's denial of our proposed corrective action proposal for the Purvis site 1RP-1481, we would like to provide you with an opportunity to respond to our concerns

First a few facts:

1. I received the e-mail transmission of the corrective action proposal from Dale Littlejohn to NMOCD at 2:58 pm on August 15, 2008 (see below)
2. I received the e-mail transmission of NMOCD's denial of the proposal from Larry Johnson at 3:11 pm on that same day
3. NMOCD's denial states: "Attached proposal is herby DENIED. Contamination requires removal"
4. The corrective action proposal is a 7-page letter that includes
   a. Five plates presenting data and lithologic logs from three borings
   b. Peer review of our proposed remedy by Dr. Kerry Sublette of the University of Tulsa and Dr. Robert Flynn of NMSU (Artesia)
   c. References to our previously-submitted HYDRUS modeling of the potential threat to ground water posed by the release
   d. Reference to our analysis of the remedy as it relates to corrective action criteria (e.g. Rule 19) in the NMOCD Rules

Our concerns are simple:

A. Did the 13-minute review of our submission fully consider the data from the newly-installed borings and the relationship of these new data to the November 2008 submission to NMOCD?
B. We can find no support in the NMOCD Rules that "contamination requires removal". Can NMOCD provide a regulatory or statutory reference that supports the rationale for denial in light of the site-specific evidence presented in our submissions?

Implementation of the proposed corrective actions is best performed prior to the next growing season. Therefore, we would appreciate your rapid response so that we may either request a hearing or address NMOCD's specific technical and regulatory concerns in a subsequent submission.

	Johnson, Larry, EMNRD	RE: Purvis Operating Gladiola Spill Report NMOCD #1RP-1481
	Dale Littlejohn	Purvis Operating Gladiola Spill Report NMOCD #1RP-1481

I will call you later today to get your input on how we should proceed.

Randall Hicks
505-266-5004
505-238-9515 - cell

Dale Littlejohn

From: Johnson, Larry, EMNRD [larry.johnson@state.nm.us]
Sent: Friday, August 15, 2008 4:11 PM
To: Dale Littlejohn
Cc: Donnie Brown; Randy Hicks (Randy Hicks); osevenranch@lyntegar.com
Subject: RE: Purvis Operating Gladiola Spill Report NMOCD #1RP-1481

Attached proposal is herby DENIED. Contamination requires removal.
Larry Johnson NMOCD District 1

From: Dale Littlejohn [mailto:dale@rthicksconsult.com]
Sent: Friday, August 15, 2008 2:57 PM
To: Johnson, Larry, EMNRD
Cc: 'Donnie Brown'; Randy Hicks (Randy Hicks); osevenranch@lyntegar.com
Subject: Purvis Operating Gladiola Spill Report NMOCD #1RP-1481

Larry,

Please find the attached report concerning proposed actions at the Purvis Gladiola site. A hard copy will follow via regular mail. Please contact me if you have any questions or require additional information.

Thanks,

Dale T Littlejohn, PG
R T Hicks Consultants Ltd
(432) 528-3878 (office)
(432) 689-4578 (fax)

Dale Littlejohn

From: Dale Littlejohn [dale@rthicksconsult.com]
Sent: Friday, May 09, 2008 12:57 PM
To: osevenranch@lyntegar.com
Cc: Randy Hicks (Randy Hicks); 'Donnie Brown'
Subject: Soil Borings at the Gladiola Spill Site

Mr. Burrus,

It is my understanding, based on my discussion with Randy this morning, that you will allow us to install the soil borings on your property to begin the characterization and remediation process, but would like for me to schedule the work on a day that you will be available. I have tentatively scheduled the driller for Thursday May 15th. If this is not a good time for you please let me know as soon as possible so that I can re-schedule at a later date. I will contact you early next week if I do not hear from you.

Thanks for your help,

Dale T Littlejohn, PG
R T Hicks Consultants Ltd
(432) 528-3878 (office)
(432) 689-4578 (fax)

Dale Littlejohn

From: DONNIE BROWN [eng@purvisop.com]
Sent: Monday, May 05, 2008 8:57 AM
To: 'R.T. Hicks Consultants, Ltd.'
Cc: 'Dale Littlejohn'
Subject: FW: Landowner T. Burris

From: Johnson, Larry, EMNRD [mailto:larry.johnson@state.nm.us]
Sent: Friday, April 25, 2008 6:50 PM
To: eng@purvisop.com
Subject: Landowner T. Burris

Mr. Brown,

I just received a phone call from Mr. Burris indicating that he was not in agreement with the proposal submitted by your contractor in regard to the investigation of the produced water leaks on his land. His concerns are valid as there is no mention of any removal of contaminants.

The line has apparently leaked on numerous occasions with little regard of required reporting by Purvis as outlined in NMAC. Situations that demonstrate repeated failures that damage property, endanger the groundwater and environment are a serious concern to the NMOCD.

Purvis is directed to consider a more aggressive pursuit of removing contamination and replacing or shutting down this line now.

Larry Johnson
NMOCD District 1

Dale Littlejohn

From: Randall Hicks [R@rthicksconsult.com]
Sent: Tuesday, July 17, 2007 1:16 PM
To: 'Caperton, Patricia, EMNRD'; larry.johnson@state.nm.us
Cc: 'Donnie Brown'; 'Dale Littlejohn'
Subject: Purvis Gladiola

Mr. Johnson:

Regarding a release at the Purvis facility known as:

Gladiola SWD
T 12S R37E Section 25 Unit Letter A

We have been charged by Purvis Operating to develop a Remediation Plan in accordance with NMOCD Rule 116. We have obtained soil samples and are waiting on final analytical results. Additional sampling and analysis may be required prior to our developing an appropriate response to the release that is consistent with NMOCD Rules. Preliminary results suggest that the chemistry of the spill is dominated by calcium chloride rather than sodium chloride.

The NMOCD letter of 14 June 2007 from Maxey Brown requested a Corrective Action by 7/17/2007 for a Houston A No. 001, which we believe is the same spill site that we are currently addressing. We respectfully request an extension of time to allow for the return of the analytical results associated with the soil sampling, additional sampling (if required) and development of a final plan that is consistent with NMOCD Rules. At this time, we anticipate a final submission to NMOCD no later than September 15, 2007.

We thank you in advance for your consideration.

Randall Hicks
Tel: 505-266-5004
Cell 505-238-9515