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**REPORTS**

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MONITOR WELL INSTALLATION AND RISK EVALUATION REPORT

HALLIBURTON/BAROID MUD PLANT  
401 EAST AVENUE R  
LOVINGTON, LEA COUNTY, NEW MEXICO

ULSTR: M-10-165,36E

DELTA PROJECT NO. F004-004

Prepared for:

Halliburton Energy Services, Inc.  
10200 Bellaire Boulevard  
Houston, Texas 77072

January 19, 2006

Prepared by:

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# MONITOR WELL INSTALLATION AND RISK EVALUATION REPORT

HALLIBURTON/BAROID MUD PLANT  
401 EAST AVENUE R  
LOVINGTON, LEA COUNTY, NEW MEXICO

DELTA PROJECT NO. F004-004

## 1.0 REPORT SUMMARY

This report presents the results of monitor well installation and groundwater sampling activities at the site referenced above. The chemicals of concern (COCs) at the site are shown compared to the New Mexico Oil Conservation Division's (OCD's) cleanup levels, the New Mexico Water Quality Control Commission (WQCC) standards, and New Mexico Environment Department's (NMED's) risk guidelines. Also included in this text is a qualitative risk evaluation to determine the actual or potential for public and environmental exposure to hydrocarbon impact at the site.

## 2.0 SITE HISTORY

The site is a former mud plant operated by Baroid, now owned by Halliburton Company. The mud plant has been inactive for approximately 20 years; however, the warehouse area of the site is currently in use. Site demolition activities in early 2004 indicated several potential areas of concern (AOCs) on the mud plant portion of the property, north of the warehouse. These included: an unlined pit on the north side of the property, the former mud tank containment area with one former below grade tank, several areas where apparently impacted surface soil was observed, and the former debris pile area on the north end of the property.

In April 2004, the contents of the mud tanks were removed, the mud tank containment area was razed, the tanks and debris from the site were removed, and some soil excavation (surface soil and the soil in the mud tank containment area) occurred. One sample from the mud plant and one soil sample from the pit area were collected during the field activities. The mud plant sample contained 6,820 milligrams per kilogram (mg/kg) total petroleum hydrocarbons (TPH) by EPA Method 418.1, and the sample from the pit area contained 24,200 mg/kg TPH. TCLP semi-volatile organic compounds (SVOCs) and TCLP RCRA Metals were below laboratory detection limits. TCLP volatile organic compounds (VOCs) were either below laboratory detection limits or below the Environmental Protection Agency's (EPA's) limit for each compound. Copies of the laboratory analytical reports were previously submitted to the OCD. The sludge and soil were removed and transported for off-site disposal at Sundance Services in Eunice, New Mexico. Excavation was not completed in the pit area at that time.

In July 2004, eight soil borings were advanced in the areas of concern. Soil sample results indicated impact near the former mud tank containment area and near the pit. Subsequently, approximately 2,800 cubic yards of soil were removed from the pit area. Soil confirmation results indicated total petroleum hydrocarbons – diesel range organics (TPH-D) concentrations ranged from <5 mg/kg to 13,000 mg/kg. Six of the eight soil confirmation samples exceeded the target level of 1,000 mg/kg TPH-D.

In September 2004, an estimated additional 3,000 cubic yards of soil were removed from the pit and former mud plant areas. Soil confirmation results indicate only one sample collected from the north wall of the mud plant excavation exceeded 1,000 mg/kg TPH-D. The samples with the two highest TPH-D results were also analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), and TCLP metals. All results were below laboratory detection limits or State standards. Soil sample analytical results are shown in Table 1.

The excavations were backfilled in November 2004 after verbal approval from the OCD. At the request of the OCD, Halliburton sampled the backfill material for TPH and chlorides. The results indicated a chloride concentration in excess of the OCD target level. Halliburton re-sampled the backfill by collecting eleven soil samples and the results indicated that the average chloride concentration of the backfill was not above the OCD target level of 250 mg/kg. The results of the backfill samples were submitted to the OCD on September 13, 2005.

In April 2004, Halliburton resubmitted the monitor well installation and risk evaluation work plan and an additional C-144 form at the request of the OCD. After further discussions with the OCD, Halliburton submitted a revised work plan and C-144 form for review and approval. The work plan was verbally approved in September 2005 after receipt of the backfill sample results.

### 3.0 CHEMICALS OF CONCERN

Both soil and groundwater have been analyzed for TPH-G, TPH-D, TPH-O, BTEX, PAHs, and/or RCRA metals. Only one soil sample collected after excavation activities exceeded the excavation target level of 1,000 mg/kg TPH-D (MPSS-5). The two samples with the highest TPH-D results were analyzed for BTEX

and PAHs and all analytes were either below laboratory detection limits or below site target levels. Soil analytical data are summarized in Table 1.

#### 4.0 GROUNDWATER ASSESSMENT

Three monitor wells were installed at the site on October 12, 2005. Monitor well locations are shown on Figure 1. One monitor well was advanced in the location of the former below-grade tank in the former mud plant area. One monitor well was advanced directly in the center of the former pit area. One monitor well was advanced in the assumed down-gradient direction on the north side of the property. Following the approved work plan, soil samples were not collected. Each monitor well is 2-inch in diameter, constructed in compliance with OCD guidelines, screened across the water table and completed flush with the existing ground surface. Monitor well construction diagrams are included in Appendix A.

Each well was developed by surging and bailing until fines were removed. Purged water is currently being stored in 55-gallon drums pending disposal characterization.

The north-side top-of-casing elevations were surveyed relative to an arbitrary benchmark. Depth to groundwater measurements were collected using a product/water interface probe. The average groundwater elevation in October 2005 was 55 feet. Groundwater elevation data from the October 2005 site visit indicate that groundwater flows to the south, not to the north with the topographic gradient. Groundwater elevation data are summarized in Table 2, and a groundwater gradient map is included as Figure 2.

After groundwater elevations stabilized, groundwater samples were collected from each monitor well according to OCD protocol and submitted for analysis of TPH-G, TPH-D and TPH-O by EPA Method 8015M and BTEX by EPA Method 8021B. The sample with the highest TPH result was also analyzed for PAHs by EPA Method 8270 and RCRA Metals. Only one groundwater sample (MW-3) exceeded the TPH-D standard established by the NMED TPH screening guidance. However, this sample was also analyzed for BTEX, RCRA Metals and PAHs and all of these COCs were below the Water Quality Control Commission (WQCC) drinking water standards. Groundwater sample analytical results are presented in Table 3.

## 5.0 RISK EVALUATION

The objective of this risk evaluation is to determine the potential threat to human health and/or the environment to COCs remaining in soil and those detected in groundwater at the site. The only COC that exceeded site target levels is TPH-D in soil sample MPSS-5 and groundwater sample MW-3. TPH is a good indicator compound used to assess the relative impact from a petroleum release, but can not be used to definitively assess risk. Petroleum hydrocarbons contain a mixture of compounds and therefore the toxicity of TPH can not be evaluated. To assess risk, further sample analysis is required. For both of these samples BTEX, PAHs and RCRA Metals were analyzed. According to the laboratory data, none of these individual COCs exceeded OCD, NMED or WQCC target levels.

The site is currently operated as a warehouse facility (Figure 1). The former mud plant was located to the north of the warehouse area. Surrounding land use is industrial. Access to the property is restricted by a locked fence. Currently, there is no complete pathway of exposure to impacted soil or groundwater at the site.

Soil containing residual COCs is present on-site at a depth of 14 feet below grade. There is no off-site impact. Site workers will not come in contact with residual COCs remaining in on-site soil, since impacted surface soil was removed during excavation activities. Site construction workers are not anticipated to be exposed to the remaining hydrocarbons in soil because the soil is present below the average construction depth of 10 feet below grade. Furthermore, COCs are protective of both types of exposures because BTEX, PAHs and RCRA Metals are below the NMED risk screening standards for these exposure scenarios.

Water is supplied to the site by the City of Lovington. Groundwater is present at depths of 54 to 58 feet below grade. According to the New Mexico State Engineer's Office database, no water wells are currently located on or within 2,640 feet of the site. A copy of the water well search is included as Appendix C. Groundwater analytical data shows that the shallow water-bearing zone meets drinking water standards.

### 6.0 RECOMMENDATION

Based on the results of the soil excavation activities, the recent groundwater sampling and the risk evaluation, Halliburton recommends project closure. Upon OCD approval, Halliburton will plug the on-site monitor wells per New Mexico guidelines and dispose of the monitor well purge water at an approved off-site facility.

### 7.0 REMARKS AND SIGNATURES

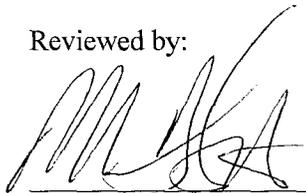
The interpretations contained in this report represent Delta's professional opinions based upon the currently available information and are arrived at in accordance with currently acceptable professional standards. This report is based upon a specific scope of work requested by the client. The Contract between Delta and its client outlines the scope of work, and only those tasks specifically authorized by that contract or outlined in this report were performed. This report is intended only for the use of Delta's Client and anyone else specifically listed on this report. Delta will not and cannot be liable for unauthorized reliance by any other third party. Other than as contained in this paragraph, Delta makes no express or implied warranty as to the contents of this report.

This report was prepared by **DELTA ENVIRONMENTAL CONSULTANTS, INC.**

  
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Project Manager/Geologist

Date: 01-19-06

Reviewed by:

  
Mark T. Smith  
Senior Specialist

Date: 01-19-06

KLR/

**TABLES**

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TABLE 1  
 SOIL LABORATORY ANALYTICAL RESULTS  
 HALLIBURTON/BAROID MUD PLANT  
 LOVINGTON, NEW MEXICO  
 DELTA PROJECT NO. F004-004

Sample ID and Depth	Date Collected	TPH GRO (mg/kg)	TPH DRO (mg/kg)	TPH ORO (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)
SS-1	07/27/04	115	6800	500	NA	NA	NA	NA	NA	NA	NA	NA
SCS-1	09/16/04	<5	220	23	NA	NA	NA	NA	NA	NA	NA	NA
SS-2	07/27/04	246	13000	1000	2.42	814	<0.75	1.83	4.28	<0.2	1.2	<0.2
SCS-2	09/16/04	<5	67	10	1.13	54	<0.75	1.47	1.27	<0.2	<1.0	<0.2
SS-3	07/27/04	21.8	1200	400	NA	NA	NA	NA	NA	NA	NA	NA
SCS-3	09/16/04	<5	120	98	NA	NA	NA	NA	NA	NA	NA	NA
SS-4	07/27/04	70.2	3500	600	NA	NA	NA	NA	NA	NA	NA	NA
SCS-4	09/16/04	<5	110	21	NA	NA	NA	NA	NA	NA	NA	NA
SS-5	07/27/04	10.3	310	350	NA	NA	NA	NA	NA	NA	NA	NA
SCS-5	09/16/04	<5	5.4	<5	NA	NA	NA	NA	NA	NA	NA	NA
SS-6	07/27/04	9.42	<5	12	NA	NA	NA	NA	NA	NA	NA	NA
SCS-6	09/16/04	<5	8	5.9	NA	NA	NA	NA	NA	NA	NA	NA
SS-7	07/27/04	323	13000	1000	1.19	80.4	<0.75	3.53	3.65	<0.2	<1.0	<0.2
SCS-7	09/16/04	<5	340	50	NA	NA	NA	NA	NA	NA	NA	NA
SS-8	07/27/04	202	8500	1000	3.08	245	<0.75	1.26	1.17	<0.2	1.64	<0.2
SCS-8	09/16/04	6.56	970	130	NA	NA	NA	NA	NA	NA	NA	NA
NMOC Remediation Level		1000	1000	1000	NE	NE	NE	NE	NE	NE	NE	NE
NMED TPH Screening Standard-Ind		NE	2200	2200	NE	NE	NE	NE	NE	NE	NE	NE
NMED Soil Screening Standard-Ind		NE	NE	NE	17.7	78300	8600	3400	750	68.4	5680	5680
NMED Soil Screening Standard-Constr.		NE	NE	NE	85.2	1440	0.00474	180	750	23.8	1550	1550
Sample ID and Depth	Date Collected	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)	Total BTEX (mg/kg)	PAHs (mg/kg)	TCLP Metals (mg/L)				
SCS-1	09/16/04	<0.025	<0.025	<0.025	<0.025	<0.1	<0.067	0.946 barium				
NMOC Remediation Level		10	NE	NE	NE	50	NE	NE				
NMED TPH Screening Standard-Ind		NE	NE	NE	NE	NE	NE	NE				
NMED Soil Screening Standard-Ind		73.6	248	25400	132	NE	Various	NE				
NMED Soil Screening Standard-Constr.		157	248	571000	132	NE	Various	NE				

Explanation:  
 All values are expressed in milligrams per kilogram (mg/kg) except for the TCLP metals analyses  
 Non-detect results are expressed as less than the reporting limit  
 TPH - total petroleum hydrocarbons by EPA Method 8015M  
 GRO - gasoline range organics  
 DRO - diesel range organics  
 ORO - oil range organics  
 Benzene, toluene, ethylbenzene, and total xylenes analysis by EPA Method 8021B  
 PAH - polynuclear aromatic hydrocarbons by EPA Method 8270C  
 NMOC Remediation Level - New Mexico Oil Conservation Division, Pit and Below-Grade Tank Guidelines (April 13, 2004)  
 NMED TPH Screening Standard - New Mexico Environment Department, Technical Background Document for Development of Soil Screening Levels, Revision 2.0 (February 2004)  
 NMED Soil Screening Standard - New Mexico Environment Department, Technical Background Document for Development of Soil Screening Levels, Revision 2.0 (February 2004)

TABLE 1  
 SOIL LABORATORY ANALYTICAL RESULTS  
 HALLIBURTON/BAROID MUD PLANT  
 LOVINGTON, NEW MEXICO  
 DELTA PROJECT NO. F004-004

Sample ID and Depth	Date Collected	TPH GRO (mg/kg)	TPH DRO (mg/kg)	TPH ORO (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)
MPSS-1	09/16/04	<5	21	18	NA	NA	NA	NA	NA	NA	NA	NA
MPSS-3	09/16/04	<5	530	60	4.08	143	<0.75	<1.0	<1.0	<0.2	2.54	<0.2
MPSS-4	09/17/04	<5	130	23	NA	NA	NA	NA	NA	NA	NA	NA
MPSS-5	09/17/04	10.6	1200	220	<10	6.78	1.25	7.54	48.4	<0.2	<10	<0.2
MPSS-6	09/17/04	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA
MPSS-7	09/20/04	<5	11	8.7	NA	NA	NA	NA	NA	NA	NA	NA
MPSS-8	09/20/04	<5	180	34	NA	NA	NA	NA	NA	NA	NA	NA
MPSS-9	09/21/04	<5	520	<50	NA	NA	NA	NA	NA	NA	NA	NA
MPSS-10	09/21/04	<5	61	29	NA	NA	NA	NA	NA	NA	NA	NA
MPSS-11	09/21/04	<5	23	5.6	NA	NA	NA	NA	NA	NA	NA	NA
NMOCd Remediation Level		1000	1000	1000	NE	NE	NE	NE	NE	NE	NE	NE
NMED TPH Screening Standard-Ind		NE	2200	2200	NE	NE	NE	NE	NE	NE	NE	NE
NMED Soil Screening Standard-Ind		NE	NE	NE	17.7	78300	8600	3400	750	68.4	5680	5680
NMED Soil Screening Standard-Constr		NE	NE	NE	85.2	1440	0.00474	180	750	23.8	1550	1550

Sample ID and Depth	Date Collected	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Total BTEX (mg/kg)	PAHs (mg/kg)	TCLP Metals (mg/L)
MPSS-5	09/17/04	<0.025	<0.025	<0.025	<0.025	<0.1	<0.67	4.5 barium
NMOCd Remediation Level		10	NE	NE	NE	50	NE	NE
NMED TPH Screening Standard-Ind		NE	NE	NE	NE	NE	NE	NE
NMED Soil Screening Standard-Ind		73.6	248	25400	132	NE	Various	NE
NMED Soil Screening Standard-Constr		157	248	571000	132	NE	Various	NE

Explanation:  
 All values are expressed in milligrams per kilogram (mg/kg) except for the TCLP metals analyses  
 Non-detect results are expressed as less than the reporting limit  
 TPH - total petroleum hydrocarbons by EPA Method 8015M  
 GRO - gasoline range organics  
 DRO - diesel range organics  
 ORO - oil range organics  
 Benzene, toluene, ethylbenzene, and total xylenes analysis by EPA Method 8021B  
 PAH - polynuclear aromatic hydrocarbons analysis by EPA Method 8270C  
 NMOCd Remediation Level - New Mexico Oil Conservation Division, Pit and Below-Grade Tank Guidelines (April 13, 2004)  
 NMED TPH Screening Standard - New Mexico Environment Department, Technical Background Document for Development of Soil Screening Levels, Revision 2.0 (February 2004)

TABLE 1  
 SOIL LABORATORY ANALYTICAL RESULTS  
 HALLIBURTON/BAROID MUD PLANT  
 LOVINGTON, NEW MEXICO  
 DELTA PROJECT NO. F004-004

Sample ID and Depth	Date Collected	TPH		Arsenic (mg/kg)	Barium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)
		GRO (mg/kg)	ORO (mg/kg)								
SB-1 (9-10")	07/28/04	9.6	96	<20	520	<0.75	1.19	3.28	<0.2	2.2	<0.2
SB-1 (19-20')	07/28/04	10.7	110	NA	NA	NA	NA	NA	NA	NA	NA
SB-2 (3-4')	07/28/04	103	1000	<20	1230	<0.75	5.14	22.6	<0.2	1.1	<0.2
SB-2 (19-20')	07/28/04	11	34	NA	NA	NA	NA	NA	NA	NA	NA
SB-3 (19-20')	07/28/04	10.6	18	<20	108	<0.75	3.74	1.24	<0.2	1.6	<0.2
SB-4 (19-20')	07/28/04	8.51	27	<20	725	<0.75	7.29	3.1	<0.2	1.17	<0.2
SB-5 (19-20')	07/28/04	10.3	15	<20	286	<0.75	1.82	1.35	<0.2	<1.0	<0.2
SB-6 (19-20')	07/28/04	9.01	7.8	<20	184	<0.75	2.38	2.44	<0.2	1.16	<0.2
SB-7 (1-2')	07/28/04	236	210	<20	1420	<0.75	42.5	32.2	<0.2	<1.0	<0.2
SB-7 (29-30')	07/28/04	8.84	15	NA	NA	NA	NA	NA	NA	NA	NA
SB-8 (29-30')	07/29/04	9.99	12	<20	24.4	<0.75	1.77	1.08	<0.2	<1.0	<0.2
NMOC Remediation Level		1000	1000	NE	NE	NE	NE	NE	NE	NE	NE
NMED TPH Screening Standard	Ind	NE	2200	NE	NE	NE	NE	NE	NE	NE	NE
NMED Soil Screening Standard	Ind	NE	NE	17.7	78300	8600	3400	750	68.4	5680	5680
NMED Soil Screening Standard	Constr.	NE	NE	65.2	1440	0.00474	180	750	23.8	1550	1550

Explanation:

- All values are expressed in milligrams per kilogram (mg/kg)
- Non-detect results are expressed as less than the reporting limit
- TPH - total petroleum hydrocarbons
- GRO - gasoline range organics
- DRO - diesel range organics
- ORO - oil range organics
- NMOC Remediation Level - New Mexico Oil Conservation Division, Pit and Below-Grade Tank Guidelines (April 13, 2004)
- NMED TPH Screening Standard - New Mexico Environment Department TPH Screening Guidelines (June 3, 2003)
- NMED Soil Screening Standard - New Mexico Environment Department, Technical Background Document for Development of Soil Screening Levels, Revision 2.0 (February 2004)

TABLE 2  
GROUNDWATER ELEVATION DATA  
HALLIBURTON/BAROID MUD PLANT  
LOVINGTON, NEW MEXICO  
DELTA PROJECT NO. F004-004

Sample ID	Date Collected	Top of Casing Elevation (ft)	Depth to Product (ft)	Depth to Groundwater (ft)	Corrected GW Elevation (ft)
MW-1	10/14/05	100.28	NP	54.24	46.04
MW-2	10/14/05	100.00	NP	54.59	45.41
MW-3	10/14/05	102.42	NP	57.71	44.71

*Explanation:*

*Top of casing elevations relative to an on-site benchmark*

*NP - Not present*

TABLE 3  
GROUNDWATER LABORATORY ANALYTICAL RESULTS  
HALLIBURTON/BAROID MUD PLANT  
LOVINGTON, NEW MEXICO  
DELTA PROJECT NO. F004-004

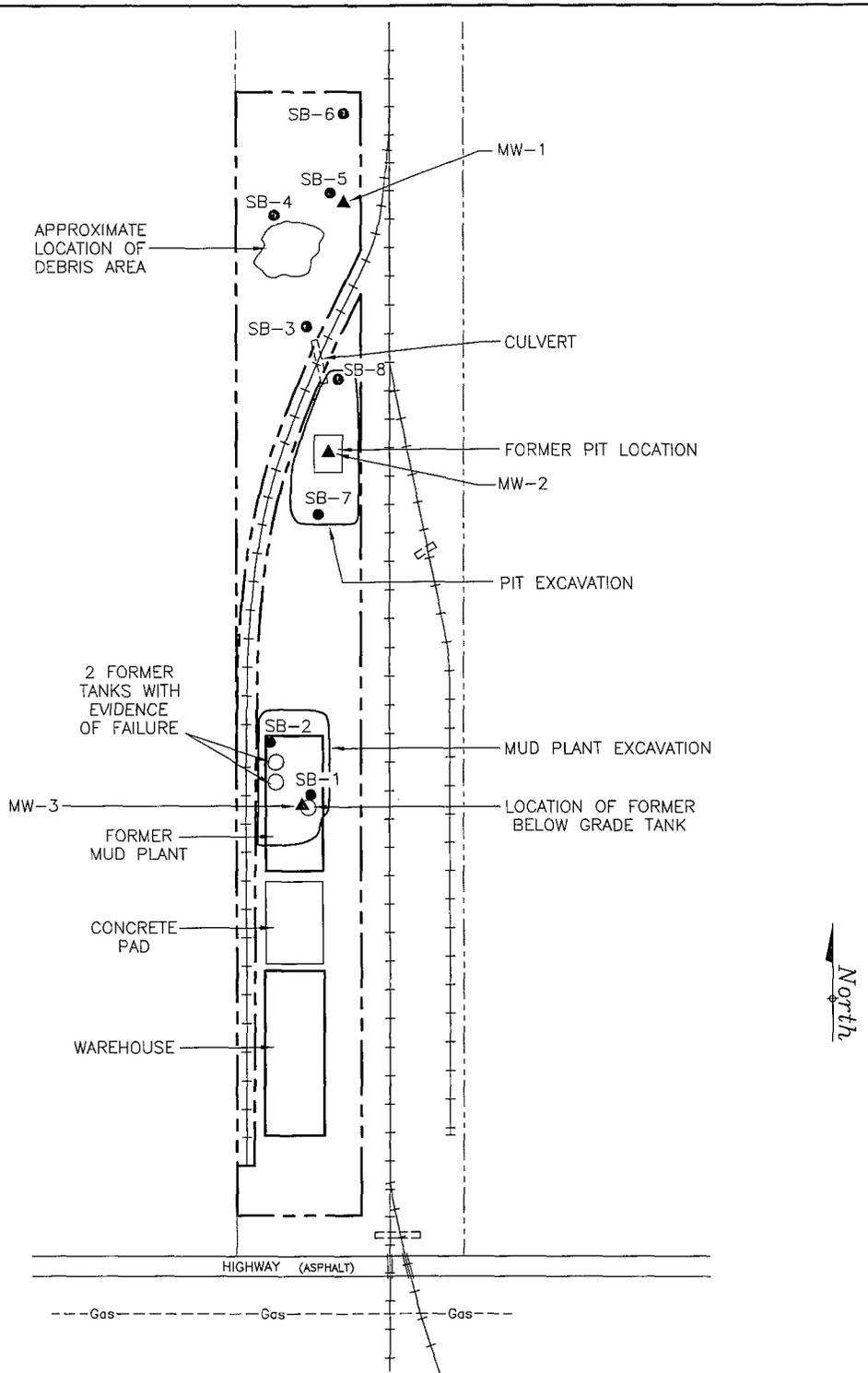
Sample ID	Date Collected	TPH		Benzene (mg/L)	Toluene (mg/L)	Ethyl-benzene (mg/L)	Total Xylenes (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Lead (mg/L)	Mercury (mg/L)	Selenium (mg/L)	Silver (mg/L)	PAHs (mg/L)
		GRO (mg/L)	DRO (mg/L)													
MW-1	10/14/05	0.102	0.24	0.00102	0.000565	<0.0005	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2	10/14/05	<0.1	0.45	<0.0005	<0.0005	<0.0005	<0.0015	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3	10/14/05	<0.1	2.2	<0.0005	<0.0005	<0.0005	<0.0015	<0.02	0.751	<0.0007	<0.01	0.00198	<0.0002	0.013	<0.0001	<0.0036*
New Mexico WQCC Level		NE	NE	0.01	0.75	0.75	0.62	0.1	1	0.01	0.05	0.05	0.002	0.05	0.05	Various
NMED TPH Screening Level		NE	1.8	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Explanation:

- All values are expressed in milligrams per liter (mg/L)
- Non-detect results are expressed as less than the reporting limit
- TPH - total petroleum hydrocarbons
- GRO - gasoline range organics
- DRO - diesel range organics
- ORO - oil range organics
- Benzene, toluene, ethylbenzene, and total xylenes analysis by EPA Method 8021B
- \*PAH - polynuclear aromatic hydrocarbons by EPA Method 8270C; all results below the laboratory detection limits which ranged from 0.00052 to 0.0036 mg/L
- New Mexico WQCC Level - New Mexico Water Quality Control Commission Regulations 20.6.2 NMAC (September 15, 2002)
- NMED TPH Screening Standard - New Mexico Environment Department TPH Screening Guidelines (June 3, 2003)

**FIGURES**

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**LEGEND**

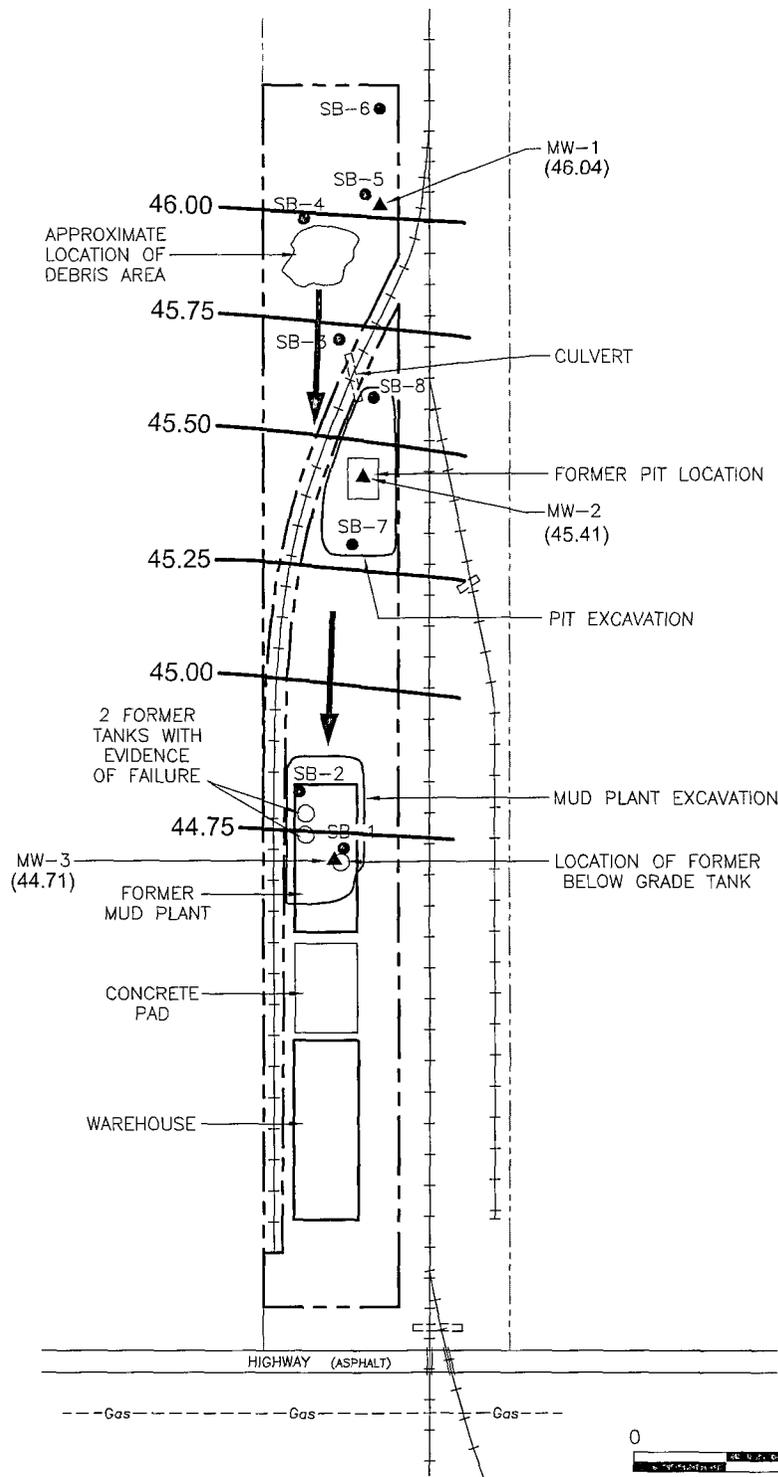
- ▲ MONITOR WELL LOCATION
- SOIL BORING LOCATION
- - - - - PROPERTY BOUNDARY
- + + + + + RAILROAD SPUR
- - - Gas - - - GAS LINE

0 150  
 SCALE IN FEET

**FIGURE 1**  
**SITE MAP**  
**HALLIBURTON/BAROID MUD PLANT**  
**LOVINGTON, NEW MEXICO**

PROJECT NO. F004-004	PREPARED BY KR	DRAWN BY DD
DATE 12/20/05	REVIEWED BY	FILE NAME F004-004





**LEGEND**

- (46.04) GROUNDWATER ELEVATION (FT)
- 45.25 GROUNDWATER CONTOUR LINE  
CONTOUR INTERVAL = 0.25 FT.
- ← GROUNDWATER FLOW DIRECTION
- ▲ MONITOR WELL LOCATION
- SOIL BORING LOCATION
- - - - - PROPERTY BOUNDARY
- + + + + + RAILROAD SPUR
- Gas--- GAS LINE



**FIGURE 2**  
**GROUNDWATER ELEVATION MAP**  
 10/14/05  
**HALLIBURTON/BAROID MUD PLANT**  
**LOVINGTON, NEW MEXICO**

PROJECT NO. F004-004	PREPARED BY KR	DRAWN BY DD
DATE 12/20/05	REVIEWED BY	FILE NAME F004-004



**APPENDICES**

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APPENDIX A

SOIL BORING/MONITOR WELL CONSTRUCTION DIAGRAMS

# Delta

**Environmental Consultants, Inc.**  
 2833 Trinity Square  
 Suite 149  
 Carrollton, Texas 75006

Project No: F004-004-1  
 Logged By: Scott Barnica  
 Driller: Straub Corporation  
 Drilling Method: Air Rotary  
 Sampling Method: N/A  
 Casing Type: PVC  
 Slot Size: 0.01  
 Gravel Pack: 20/40

Client: Halliburton  
 Location: Lovington, NM  
 Date Drilled: 10-12-05  
 Hole Diameter: 5 inch  
 Hole Depth: 70 feet  
 Well Diameter: 2 inches  
 Well Depth: 70 feet  
 Casing Stickup: N/A

Boring/Well No: MW-1  
 Page 1 of 1

Halliburton/Baroid Mud Plant  
 401 E Avenue R  
 Lovington, Lea County, New Mexico

Elevation  
 100.28 ft

Latitude  
 32d 55m 56n

Longitude  
 103d 20m 40w

Well Completion			Static Water Level	Moisture Content	PID Reading (ppm)	Penetration (blows/6")	Depth (feet)	Sample Recovery Interval	Soil Type	LITHOLOGY / DESCRIPTION
Backfill	Casing	Screen								
Cement	x	x			0		5			Dark gray silty clay
	x	x			0		10			Lt gray caliche with gypsum and limestone nodules
	x	x			0		15			Fine-grained tan caliche
	x	x			0		20			
	x	x			0		25			Interbedded fine-grained sand and sandstone
	x	x			0		30			
	x	x			0		35			
	x	x			0		40			
	x	x			0		45			
Bent:	x	x			0		50			
Sand	=	=	▽		0		55			Damp
	=	=			0		60			Fine- to medium-grained tan sand, no hydrocarbon odor
	=	=			0		65			
	=	=			0		70			Total Depth = 70 ft
							75			
							80			
							85			
							90			
							95			
							100			
							105			
							110			

# Delta

Environmental  
Consultants, Inc.  
2833 Trinity Square  
Suite 149  
Carrollton, Texas 75006

Project No: F004-004-1  
Logged By: Scott Barnica  
Driller: Straub Corporation  
Drilling Method: Air Rotary  
Sampling Method: N/A  
Casing Type: PVC  
Slot Size: 0.01  
Gravel Pack: 20/40

Client: Halliburton  
Location: Lovington, NM  
Date Drilled: 10-12-05  
Hole Diameter: 5 inch  
Hole Depth: 70 feet  
Well Diameter: 2 inches  
Well Depth: 70 feet  
Casing Stickup: N/A

Boring/Well No: MW-2  
Page 1 of 1

Halliburton/Baroid Mud Plant  
401 E Avenue R  
Lovington, Lea County, New Mexico

Elevation: 100.00 ft  
Latitude: 32d 55m 53n  
Longitude: 103d 20m 40w

Well Completion			Static Water Level	Moisture Content	PID Reading (ppm)	Penetration (blows/6")	Depth (feet)	Sample		Soil Type	LITHOLOGY / DESCRIPTION
Backfill	Casing	Screen						Recovery	Interval		
Cement Grout	x	x					5			Caliche backfill	
	x	x					10				
	x	x					15				
	x	x		0			20			Fine- to medium-grained tan sand; no odor	
	x	x		0			25				
	x	x		0			30				
	x	x		0			35				
	x	x		0			40				
	x	x		0			45				
Bent Sand Pack	x	x	▽	0			50			Interbedded fine-grained sand and sandstone; no odor	
	=	=		0			55				
	=	=		0			60				
	=	=		0			65				
	=	=		0			70			Total Depth = 70 ft	
							75				
							80				
							85				
							90				
							95				
							100				
							105				
							110				

# Delta

**Environmental Consultants, Inc.**  
 2833 Trinity Square  
 Suite 149  
 Carrollton, Texas 75006

Project No: F004-004-1  
 Logged By: Scott Barnica  
 Driller: Straub Corporation  
 Drilling Method: Air Rotary  
 Sampling Method: N/A  
 Casing Type: PVC  
 Slot Size: 0.01  
 Gravel Pack: 20/40

Client: Halliburton  
 Location: Lovington, NM  
 Date Drilled: 10-12-05  
 Hole Diameter: 5 inch  
 Hole Depth: 70 feet  
 Well Diameter: 2 inches  
 Well Depth: 70 feet  
 Casing Stickup: N/A

Boring/Well No: **MW-3**  
 Page 1 of 1

Halliburton/Baroid Mud Plant  
 401 E Avenue R  
 Lovington, Lea County, New Mexico

Elevation  
 100.00 ft

Latitude  
 32d 55m 50n

Longitude  
 103d 20m 41w

Well Completion			Static Water Level	Moisture Content	PID Reading (ppm)	Penetration (blows/6")	Depth (feet)	Sample		Soil Type	LITHOLOGY / DESCRIPTION
Backfill	Casing	Screen						Recovery	Interval		
Cement Grout	x						5			Caliche backfill	
	x						10			Interbedded fine-grained sand and sandstone; no odor	
	x			0			15				
	x			0			20				
	x			0			25				
	x			0			30				
	x			0			35				
	x			0			40				
	x			0			45				
	x			0			50				
Bent Sand Pack	x			0		55					
	=		▽	0		60					
	=			0		65					
	=			0		70				Total Depth =70 ft	
						75					
						80					
						85					
						90					
						95					
						100					
						105					
						110					

**APPENDIX B**  
**GROUNDWATER LABORATORY REPORTS**



# STAR ANALYTICAL

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Delta Env. Consultants - Carrollton, TX  
2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
10/25/05 09:00

## ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	V510112-01	Liquid	10/14/05 08:20	10/17/05 13:00
MW-2	V510112-02	Liquid	10/14/05 08:45	10/17/05 13:00
MW-3	V510112-03	Liquid	10/14/05 09:15	10/17/05 13:00

Star Analytical, Inc.

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Anthony Dilday, Lab Director



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Delta Env. Consultants - Carrollton, TX  
2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
10/25/05 09:00

## MW-1

V510112-01 (Liquid) Sampled: 10/14/05 08:20 by: S.Barnica Type: Grab

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Analyst	Notes
---------	--------	-----------------	-------	----------	-------	----------	----------	--------	---------	-------

### Star Analytical, Inc.

#### Gasoline Range Organics and BTEX by EPA 8015M and 8021B

Gasoline Range Hydrocarbons	102	100	ug/L	1	V5J2008	10/20/05 11:35	10/21/05 00:09	EPA 8015M/8021B	BMH
Benzene	1.02	0.500	"	"	"	"	"	"	"
Toluene	0.565	0.500	"	"	"	"	"	"	"
Ethylbenzene	ND	0.500	"	"	"	"	"	"	"
Xylenes (total)	ND	1.50	"	"	"	"	"	"	"
Surrogate: 1,4-Difluorobenzene		104 %	71.1-131		"	"	"	"	"
Surrogate: a,a,a-TFT (PID)		105 %	81-120		"	"	"	"	"

#### Extractable Hydrocarbons (C10-C40) by EPA Method 8015M (modified)

Diesel Range Hydrocarbons	0.24	0.20	mg/L	1	V5J2105	10/21/05 08:00	10/25/05 02:12	EPA 8015 mod.	SD
Oil Range Hydrocarbons	ND	0.20	"	"	"	"	"	"	"
Surrogate: o-Terphenyl		81.8 %	49-167		"	"	"	"	"

Star Analytical, Inc.

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2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
10/25/05 09:00

## MW-2

V510112-02 (Liquid) Sampled: 10/14/05 08:45 by: S.Barnica Type: Grab

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Analyst	Notes
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### Star Analytical, Inc.

#### Gasoline Range Organics and BTEX by EPA 8015M and 8021B

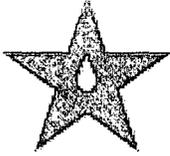
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Analyst	Notes
Gasoline Range Hydrocarbons	ND	100	ug/L	1	V5J2008	10/20/05 11:35	10/21/05 00:37	EPA 8015M/8021B	BMH	
Benzene	ND	0.500	"	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	"	
Xylenes (total)	ND	1.50	"	"	"	"	"	"	"	
Surrogate: 1,4-Difluorobenzene		106 %	71.1-131	"	"	"	"	"	"	
Surrogate: a,a,a-TFT (PID)		108 %	81-120	"	"	"	"	"	"	

#### Extractable Hydrocarbons (C10-C40) by EPA Method 8015M (modified)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Analyst	Notes
Diesel Range Hydrocarbons	0.45	0.20	mg/L	1	V5J2105	10/21/05 08:00	10/25/05 02:56	EPA 8015 mod.	SD	
Oil Range Hydrocarbons	0.28	0.20	"	"	"	"	"	"	"	
Surrogate: o-Terphenyl		104 %	49-167	"	"	"	"	"	"	

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2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
10/25/05 09:00

## MW-3

V510112-03 (Liquid) Sampled: 10/14/05 09:15 by: S.Barnica Type: Grab

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Analyst	Notes
---------	--------	-----------------	-------	----------	-------	----------	----------	--------	---------	-------

### Star Analytical, Inc.

#### Gasoline Range Organics and BTEX by EPA 8015M and 8021B

Gasoline Range Hydrocarbons	ND	100	ug/L	1	V5J2008	10/20/05 11:35	10/21/05 01:06	EPA 8015M/8021B	BMH	
Benzene	ND	0.500	"	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	"	
Xylenes (total)	ND	1.50	"	"	"	"	"	"	"	
Surrogate: 1,4-Difluorobenzene		108 %	71.1-131	"	"	"	"	"	"	
Surrogate: a,a,a-TFT (PID)		106 %	81-120	"	"	"	"	"	"	

#### Extractable Hydrocarbons (C10-C40) by EPA Method 8015M (modified)

Diesel Range Hydrocarbons	2.2	0.20	mg/L	1	V5J2105	10/21/05 08:00	10/25/05 03:39	EPA 8015 mod.	SD	
Oil Range Hydrocarbons	0.60	0.20	"	"	"	"	"	"	"	
Surrogate: o-Terphenyl		227 %	49-167	"	"	"	"	"	"	S-04

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2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
10/25/05 09:00

## Gasoline Range Organics and BTEX by EPA 8015M and 8021B - Quality Control Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

### Batch V5J2008 - EPA 5030

#### Blank (V5J2008-BLK1)

Prepared & Analyzed: 10/20/05

Gasoline Range Hydrocarbons	ND	100	ug/L							
Benzene	ND	0.500	"							
Toluene	ND	0.500	"							
Ethylbenzene	ND	0.500	"							
Xylenes (total)	ND	1.50	"							
Surrogate: 1,4-Difluorobenzene	32.8		"	30.0		109	71.1-131			
Surrogate: a,a,a-TFT (PID)	33.1		"	30.0		110	81-120			

#### LCS (V5J2008-BS1)

Prepared & Analyzed: 10/20/05

Benzene	20.6	0.500	ug/L	20.0		103	85-115			
Toluene	20.1	0.500	"	20.0		100	85-115			
Ethylbenzene	20.1	0.500	"	20.0		100	85-115			
Xylenes (total)	59.0	1.50	"	60.0		98.3	85-115			
Surrogate: 1,4-Difluorobenzene	31.3		"	30.0		104	71.1-131			
Surrogate: a,a,a-TFT (PID)	30.0		"	30.0		100	81-120			

#### LCS (V5J2008-BS2)

Prepared & Analyzed: 10/20/05

Gasoline Range Hydrocarbons	565	100	ug/L	500		113	61.6-138			
Surrogate: 1,4-Difluorobenzene	29.6		"	30.0		98.7	71.1-131			
Surrogate: a,a,a-TFT (PID)	31.8		"	30.0		106	81-120			

#### LCS Dup (V5J2008-BSD1)

Prepared & Analyzed: 10/20/05

Benzene	20.7	0.500	ug/L	20.0		104	85-115	0.484	20	
Toluene	20.2	0.500	"	20.0		101	85-115	0.496	20	
Ethylbenzene	20.3	0.500	"	20.0		102	85-115	0.990	20	
Xylenes (total)	59.1	1.50	"	60.0		98.5	85-115	0.169	20	
Surrogate: 1,4-Difluorobenzene	31.4		"	30.0		105	71.1-131			
Surrogate: a,a,a-TFT (PID)	31.1		"	30.0		104	81-120			

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 2833 Trinity Square, Suite 149  
 Carrollton, TX 75006

Project: Halliburton - Lovington  
 Project Number: F004-004  
 Project Manager: Kristin Ruff

Reported:  
 10/25/05 09:00

## Gasoline Range Organics and BTEX by EPA 8015M and 8021B - Quality Control Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------	-------

### Batch V5J2008 - EPA 5030

#### LCS Dup (V5J2008-BSD2)

Prepared & Analyzed: 10/20/05

Gasoline Range Hydrocarbons	571	100	ug/L	500		114	61.6-138	1.06	20	
Surrogate: 1,4-Difluorobenzene	29.6		"	30.0		98.7	71.1-131			
Surrogate: a,a,a-TFT (PID)	31.4		"	30.0		105	81-120			

#### Duplicate (V5J2008-DUP1)

Source: V510119-03

Prepared & Analyzed: 10/20/05

Gasoline Range Hydrocarbons	3980	100	ug/L		3700			7.29	30	
Benzene	3.75	0.500	"		3.22			15.2	30	
Toluene	0.504	0.500	"		ND			29.1	30	
Ethylbenzene	77.8	0.500	"		77.0			1.03	30	J-1
Xylenes (total)	ND	1.50	"		ND			38.2	30	A-03
Surrogate: 1,4-Difluorobenzene	13.7		"	30.0		45.7	71.1-131			S-04
Surrogate: a,a,a-TFT (PID)	13.9		"	30.0		46.3	81-120			S-04

#### Matrix Spike (V5J2008-MS1)

Source: V510112-02

Prepared & Analyzed: 10/20/05

Benzene	21.3	0.500	ug/L	20.0	ND	106	80.4-120			
Toluene	20.6	0.500	"	20.0	ND	102	77.5-127			
Ethylbenzene	20.8	0.500	"	20.0	ND	104	82.8-121			
Xylenes (total)	59.7	1.50	"	60.0	ND	99.5	84.8-118			
Surrogate: 1,4-Difluorobenzene	32.1		"	30.0		107	71.1-131			
Surrogate: a,a,a-TFT (PID)	32.2		"	30.0		107	81-120			

#### Matrix Spike (V5J2008-MS2)

Source: V510119-03

Prepared & Analyzed: 10/20/05

Gasoline Range Hydrocarbons	4460	100	ug/L	500	3700	152	73-150			M-01
Surrogate: 1,4-Difluorobenzene	14.6		"	30.0		48.7	71.1-131			S-04
Surrogate: a,a,a-TFT (PID)	15.7		"	30.0		52.3	81-120			S-04

Star Analytical, Inc.

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Delta Env. Consultants - Carrollton, TX  
2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
10/25/05 09:00

## Extractable Hydrocarbons (C10-C40) by EPA Method 8015M (modified) - Quality Control Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch V5J2105 - EPA 3510C</b>										
<b>Blank (V5J2105-BLK1)</b>										
				Prepared: 10/21/05 Analyzed: 10/24/05						
Diesel Range Hydrocarbons	ND	0.20	mg/L							
Oil Range Hydrocarbons	ND	0.20	"							
Surrogate: o-Terphenyl	0.0670		"	0.100		67.0	49-167			
<b>LCS (V5J2105-BS1)</b>										
				Prepared: 10/21/05 Analyzed: 10/25/05						
Diesel Range Hydrocarbons	0.70	0.20	mg/L	1.00		70.0	60-130			
Surrogate: o-Terphenyl	0.0959		"	0.100		95.9	49-167			
<b>LCS Dup (V5J2105-BSD1)</b>										
				Prepared: 10/21/05 Analyzed: 10/25/05						
Diesel Range Hydrocarbons	0.69	0.20	mg/L	1.00		69.0	60-130	1.44	30	
Surrogate: o-Terphenyl	0.0931		"	0.100		93.1	49-167			
<b>Duplicate (V5J2105-DUP1)</b>										
				Source: V510112-02 Prepared: 10/21/05 Analyzed: 10/25/05						
Diesel Range Hydrocarbons	0.42	0.20	mg/L		0.45			6.90	30	
Oil Range Hydrocarbons	0.26	0.20	"		0.28			7.41	30	
Surrogate: o-Terphenyl	0.114		"	0.100		114	49-167			
<b>Matrix Spike (V5J2105-MS1)</b>										
				Source: V510112-01 Prepared: 10/21/05 Analyzed: 10/25/05						
Diesel Range Hydrocarbons	0.86	0.20	mg/L	1.00	0.24	62.0	60-140			
Surrogate: o-Terphenyl	0.111		"	0.100		111	49-167			

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Delta Env. Consultants - Carrollton, TX  
2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
10/25/05 09:00

## Notes and Definitions

- A-03 The RPD value for this QC sample is outside the established control limit. Review of associated QC indicates the data may still be useful for its intended purpose(s).
- J-1 Estimated value.
- M-01 Spike recovery outside control limits due to sample matrix interference.
- S-04 The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference







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Delta Env. Consultants - Carrollton, TX  
2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
11/11/05 16:06

## ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-3	V510179-01	Liquid	10/14/05 09:15	10/25/05 10:45

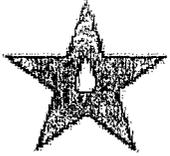
Star Analytical, Inc.

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Anthony Dilday, Lab Director

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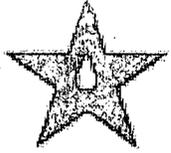
Delta Env. Consultants - Carrollton, TX  
2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
11/11/05 16:06

## Total Metals by EPA 6000/7000 Series Methods Star Analytical, Inc.

Analyte	Result	SQL	MDL	MQL	Units	Dilution	Batch	Prepared	Analyzed	Method	Analyst	Notes
MW-3 (V510179-01) Liquid Sampled: 10/14/05 09:15 Received: 10/25/05 10:45												
Sampled by: S.Barnica Type: Grab Received: 10/25/05 10:45												
Silver	ND	0.000100	0.000100	0.00100	mg/L	1	V5J3101	10/31/05 07:45	10/31/05 21:49	EPA 6020	KOB	
Arsenic	ND	0.200	0.0200	0.300	"	10	"	"	10/31/05 22:05	"	"	I-06
Barium	0.751	0.00500	0.00500	0.00500	"	1	"	"	10/31/05 21:49	"	"	
Cadmium	ND	0.000700	0.000700	0.00500	"	"	"	"	"	"	"	
Chromium	ND	0.0100	0.0100	0.0200	"	"	"	"	11/01/05 15:24	"	"	
Mercury	ND	0.000200	0.000200	0.00100	"	"	V5J2604	10/26/05 10:15	10/26/05 17:05	EPA 7470A	KO	
Lead	0.00198	0.000300	0.000300	0.00500	"	"	V5J3101	10/31/05 07:45	10/31/05 21:49	EPA 6020	KOB	Q-19,J
Selenium	0.0130	0.0120	0.00120	0.200	"	10	"	"	10/31/05 22:05	"	"	I-06,Q-19,J



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Delta Env. Consultants - Carrollton, TX  
2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
11/11/05 16:06

## Semivolatile Organic Compounds by EPA Method 8270C

### Sequoia Analytical - Morgan Hill

Analyte	Result	SQL	MDL	MLL	Units	Dilution	Batch	Prepared	Analyzed	Method	Analyst	Notes
MW-3 (V510179-01) Liquid Sampled: 10/14/05 09:15 Received: 10/25/05 10:45												
Sampled by: Client Type: Received: 10/25/05 10:45												
Acenaphthene	ND	1.8	0.88	10	ug/l	1	5K08044	10/21/05 09:00	11/08/05 15:59	EPA 8270C	RS	
Acenaphthylene	ND	2.4	1.2	10	"	"	"	"	"	"	"	
Anthracene	ND	1.7	0.84	10	"	"	"	"	"	"	"	
Benzo (a) anthracene	ND	2.4	1.2	10	"	"	"	"	"	"	"	
Benzo (a) pyrene	ND	1.3	0.64	10	"	"	"	"	"	"	"	
Benzo (b) fluoranthene	ND	7.2	3.6	10	"	"	"	"	"	"	"	
Benzo (g,h,i) perylene	ND	2.0	0.99	20	"	"	"	"	"	"	"	
Benzo (k) fluoranthene	ND	3.8	1.9	10	"	"	"	"	"	"	"	
Chrysene	ND	1.0	0.52	10	"	"	"	"	"	"	"	
Dibenz (a,h) anthracene	ND	5.4	2.7	10	"	"	"	"	"	"	"	
Fluoranthene	ND	1.2	0.60	10	"	"	"	"	"	"	"	
Fluorene	ND	1.8	0.88	10	"	"	"	"	"	"	"	
Indeno (1,2,3-cd) pyrene	ND	1.4	0.69	20	"	"	"	"	"	"	"	
Naphthalene	ND	1.7	0.86	10	"	"	"	"	"	"	"	
Phenanthrene	ND	1.2	0.58	10	"	"	"	"	"	"	"	
Pyrene	ND	1.5	0.77	10	"	"	"	"	"	"	"	
Surr: Nitrobenzene-d5		26 %										S02
Surr: 2-Fluorobiphenyl		28 %										S02
Surr: p-Terphenyl-d14		18 %										S02



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Delta Env. Consultants - Carrollton, TX  
2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
11/11/05 16:06

## Total Metals by EPA 6000/7000 Series Methods - Quality Control Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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### Batch V5J2604 - EPA 7470

#### Blank (V5J2604-BLK1)

Prepared & Analyzed: 10/26/05

Mercury ND 0.00100 mg/L

#### LCS (V5J2604-BS1)

Prepared & Analyzed: 10/26/05

Mercury 0.00390 0.00100 mg/L 0.00400 97.5 80-120

#### LCS Dup (V5J2604-BSD1)

Prepared & Analyzed: 10/26/05

Mercury 0.00394 0.00100 mg/L 0.00400 98.5 80-120 1.02 20

#### Matrix Spike (V5J2604-MS1)

Source: V510179-01

Prepared & Analyzed: 10/26/05

Mercury 0.00390 0.00100 mg/L 0.00400 ND 97.5 80-120

#### Matrix Spike Dup (V5J2604-MSD1)

Source: V510179-01

Prepared & Analyzed: 10/26/05

Mercury 0.00384 0.00100 mg/L 0.00400 ND 96.0 80-120 1.55 20

### Batch V5J3101 - EPA 3010

#### Blank (V5J3101-BLK1)

Prepared & Analyzed: 10/31/05

Arsenic ND 0.0300 mg/L  
 Barium ND 0.00500 "  
 Cadmium ND 0.00500 "  
 Chromium ND 0.0200 "  
 Lead 0.000560 0.00500 "  
 Selenium 0.00133 0.0200 "  
 Silver ND 0.00100 "

Q-19,J  
Q-19,J

#### LCS (V5J3101-BS1)

Prepared & Analyzed: 10/31/05

Arsenic 0.0414 0.0300 mg/L 0.0400 104 80-120  
 Barium 0.0402 0.00500 " 0.0400 100 80-120  
 Cadmium 0.0407 0.00500 " 0.0400 102 80-120  
 Chromium 0.0438 0.0200 " 0.0400 110 80-120  
 Lead 0.0417 0.00500 " 0.0400 104 80-120  
 Selenium 0.0377 0.0200 " 0.0400 94.2 80-120  
 Silver 0.0404 0.00100 " 0.0400 101 80-120

Star Analytical, Inc.

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Delta Env. Consultants - Carrollton, TX 2833 Trinity Square, Suite 149 Carrollton, TX 75006	Project: Halliburton - Lovington Project Number: F004-004 Project Manager: Kristin Ruff	Reported: 11/11/05 16:06
---	---	-----------------------------

## Total Metals by EPA 6000/7000 Series Methods - Quality Control Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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### Batch V5J3101 - EPA 3010

#### LCS Dup (V5J3101-BSD1)

Prepared & Analyzed: 10/31/05

Arsenic	0.0438	0.0300	mg/L	0.0400		110	80-120	5.63	20	
Barium	0.0414	0.00500	"	0.0400		104	80-120	2.94	20	
Cadmium	0.0406	0.00500	"	0.0400		102	80-120	0.246	20	
Chromium	0.0442	0.0200	"	0.0400		110	80-120	0.909	20	
Lead	0.0412	0.00500	"	0.0400		103	80-120	1.21	20	
Selenium	0.0413	0.0200	"	0.0400		103	80-120	9.11	20	
Silver	0.0408	0.00100	"	0.0400		102	80-120	0.985	20	

#### Matrix Spike (V5J3101-MS1)

Source: V510181-01

Prepared & Analyzed: 10/31/05

Arsenic	0.0567	0.0300	mg/L	0.0400	ND	142	80-120			M-01
Barium	0.108	0.00500	"	0.0400	0.0620	115	80-120			
Cadmium	0.0399	0.00500	"	0.0400	ND	99.8	75-125			
Chromium	0.0436	0.0200	"	0.0400	ND	109	75-125			
Lead	0.0422	0.00500	"	0.0400	0.000820	103	75-125			
Selenium	0.0390	0.0200	"	0.0400	ND	97.5	75-125			
Silver	0.0406	0.00100	"	0.0400	ND	102	80-120			

#### Matrix Spike Dup (V5J3101-MSD1)

Source: V510181-01

Prepared & Analyzed: 10/31/05

Arsenic	0.0565	0.0300	mg/L	0.0400	ND	141	80-120	0.353	20	M-01
Barium	0.108	0.00500	"	0.0400	0.0620	115	80-120	0.00	20	
Cadmium	0.0402	0.00500	"	0.0400	ND	100	75-125	0.749	20	
Chromium	0.0434	0.0200	"	0.0400	ND	108	75-125	0.460	20	
Lead	0.0431	0.00500	"	0.0400	0.000820	106	75-125	2.11	20	
Selenium	0.0367	0.0200	"	0.0400	ND	91.8	75-125	6.08	20	
Silver	0.0416	0.00100	"	0.0400	ND	104	80-120	2.43	20	

#### Post Spike (V5J3101-PS1)

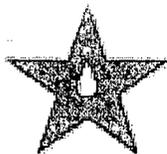
Source: V510181-01

Prepared & Analyzed: 10/31/05

Arsenic	0.0584	0.0300	mg/L	0.0400	ND	146	75-125			M-01
Barium	0.103	0.00500	"	0.0400	0.0620	102	75-125			
Cadmium	0.0402	0.00500	"	0.0400	ND	100	75-125			
Chromium	0.0433	0.0200	"	0.0400	ND	108	75-125			
Lead	0.0432	0.00500	"	0.0400	0.000820	106	75-125			
Selenium	0.0369	0.0200	"	0.0400	ND	92.2	75-125			
Silver	0.0408	0.00100	"	0.0400	ND	102	75-125			

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2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
11/11/05 16:06

## Semivolatile Organic Compounds by EPA Method 8270C - Quality Control Sequoia Analytical - Morgan Hill

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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### Batch 5K08044 - EPA 3510C SepFunnel

#### Blank (5K08044-BLK1)

Prepared: 10/21/05 Analyzed: 11/08/05

Acenaphthene	ND	10	ug/l							
Acenaphthylene	ND	10	"							
Anthracene	ND	10	"							
Benzo (a) anthracene	ND	10	"							
Benzo (a) pyrene	ND	10	"							
Benzo (b) fluoranthene	ND	10	"							
Benzo (g,h,i) perylene	ND	20	"							
Benzo (k) fluoranthene	ND	10	"							
Chrysene	ND	10	"							
Dibenz (a,h) anthracene	ND	10	"							
Fluoranthene	ND	10	"							
Fluorene	ND	10	"							
Indeno (1,2,3-cd) pyrene	ND	20	"							
Naphthalene	ND	10	"							
Phenanthrene	ND	10	"							
Pyrene	ND	10	"							
Surrogate: Nitrobenzene-d5	33.8		"	100		34	35-115			S02
Surrogate: 2-Fluorobiphenyl	38.7		"	100		39	35-120			
Surrogate: p-Terphenyl-d14	28.4		"	100		28	40-130			S02

#### LCS (5K08044-BS1)

Prepared: 10/21/05 Analyzed: 11/08/05

Acenaphthene	79.0	10	ug/l	100		79	75-115			
Acenaphthylene	91.1	10	"	100		91	70-120			
Anthracene	92.5	10	"	100		92	70-125			
Benzo (a) anthracene	76.1	10	"	100		76	70-125			
Benzo (a) pyrene	101	10	"	100		101	70-125			
Benzo (b) fluoranthene	96.8	10	"	100		97	70-125			
Benzo (g,h,i) perylene	83.6	20	"	100		84	55-145			
Benzo (k) fluoranthene	99.4	10	"	100		99	75-130			
Chrysene	78.4	10	"	100		78	70-125			
Dibenz (a,h) anthracene	85.2	10	"	100		85	60-140			
Fluoranthene	90.1	10	"	100		90	65-135			
Fluorene	86.4	10	"	100		86	75-120			
Indeno (1,2,3-cd) pyrene	84.0	20	"	100		84	65-135			
Naphthalene	76.9	10	"	100		77	55-115			
Phenanthrene	91.6	10	"	100		92	75-120			
Pyrene	79.6	10	"	100		80	75-140			

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Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
11/11/05 16:06

## Semivolatile Organic Compounds by EPA Method 8270C - Quality Control Sequoia Analytical - Morgan Hill

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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### Batch 5K08044 - EPA 3510C SepFunnel

#### LCS (5K08044-BS1)

Prepared: 10/21/05 Analyzed: 11/08/05

Surrogate: Nitrobenzene-d5	38.9		ug/l	100		39	35-115			
Surrogate: 2-Fluorobiphenyl	37.4		"	100		37	35-120			
Surrogate: p-Terphenyl-d14	28.3		"	100		28	40-130			S02

#### LCS Dup (5K08044-BSD1)

Prepared: 10/21/05 Analyzed: 11/08/05

Acenaphthene	73.8	10	ug/l	100		74	75-115	7	15	QL02
Acenaphthylene	87.6	10	"	100		88	70-120	4	15	
Anthracene	86.8	10	"	100		87	70-125	6	15	
Benzo (a) anthracene	75.2	10	"	100		75	70-125	1	15	
Benzo (a) pyrene	97.7	10	"	100		98	70-125	3	15	
Benzo (b) fluoranthene	93.9	10	"	100		94	70-125	3	10	
Benzo (g,h,i) perylene	80.0	20	"	100		80	55-145	4	35	
Benzo (k) fluoranthene	92.5	10	"	100		92	75-130	7	15	
Chrysene	77.5	10	"	100		78	70-125	1	15	
Dibenz (a,h) anthracene	82.3	10	"	100		82	60-140	3	25	
Fluoranthene	83.2	10	"	100		83	65-135	8	15	
Fluorene	83.5	10	"	100		84	75-120	3	15	
Indeno (1,2,3-cd) pyrene	82.8	20	"	100		83	65-135	1	20	
Naphthalene	72.8	10	"	100		73	55-115	5	20	
Phenanthrene	85.8	10	"	100		86	75-120	7	10	
Pyrene	79.3	10	"	100		79	75-140	0.4	15	
Surrogate: Nitrobenzene-d5	37.5		"	100		38	35-115			
Surrogate: 2-Fluorobiphenyl	37.6		"	100		38	35-120			
Surrogate: p-Terphenyl-d14	41.7		"	100		42	40-130			

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2833 Trinity Square, Suite 149  
Carrollton, TX 75006

Project: Halliburton - Lovington  
Project Number: F004-004  
Project Manager: Kristin Ruff

Reported:  
11/11/05 16:06

## Notes and Definitions

- I-06 Due to matrix interference, this sample was diluted for analysis. As a result, the reporting limit has been raised.
- J The reported result is an estimated value. The reported result is above the Method Detection Limit but below the standard Reporting Limit.
- M-01 Spike recovery outside control limits due to sample matrix interference.
- Q-19 The method blank contains an analyte at a concentration above the MDL.
- QL02 The LCS recovery was below the control limit by 1%.
- S02 The surrogate recovery was below control limits.
- DET Analyte DETECTED
- dry Sample results reported on a dry weight basis
- ISTD Internal Standard
- MDL Method Detection Limit - minimum concentration at which a chemical can be measured with a statistical confidence of 99% that the analyte is present and the concentration is greater than zero.
- MQL Method Quantitation Limit - lowest detectable and quantifiable concentration on the laboratory instrument calibration curve.
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- Qual The quality of the library search result. The range is 0 to 99 where 99 is the best match.
- RPD Relative Percent Difference
- SQL Sample Quantitation Limit - MDL adjusted for sample characteristics (e.g., dilution, sample size, and/or moisture content).  
Note that this is actually equivalent to the "sample detection limit."

(P8K) →

## Star Analytical Sample Re-Log Request

Reason for Re-Log:  Client Request  Log-In Correction  Other:

Original Work Order Number: V510112

Client Name: DELTA ENV. CONSULT. - LAMARCA

Original Work Order Due Date: 10/24/05

Project Name: HALL-BUILDING - LAMARCA (FOO4-004)

Recalculated Work Order Due Date: 11/1/05 (5 day TAT)

Sample Number	Sample Letter(s)	Client Sample Identification	Sample Matrix	Sample Date	Login/Analyst Action (Add, Change, Delete, Re-digest/Re-extract/Re-analyze)	Affected Analysis(es) Method(s)	Create New Work Order?	New Work Order Lab Number
03	A→C	MW-3	Liquid	10/14/05 0915	Re-log	TRAP REPORT FORMS PART-BARS PCA B. METALS	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	V510179-01
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	
							<input type="checkbox"/> Yes <input type="checkbox"/> No	

For KAUSTI-PAFF 10/27/05 1045  
Client Authorization (Representative, Date, Time)

*[Signature]*  
Star Authorization (Project Manager)

APPENDIX C  
WATER WELL SEARCH

**Office**

**Project**

6 January 2006

**INPUT**

Geographic, NAD83

**OUTPUT**

State Plane, NAD27  
3001 - New Mexico East, U.S. Feet

*Accuracies of conversions from NAD 83 to NAD 27 are typically 12 to 18 cm.*

---

**Former Baroid Mudplant**

1/1

**Latitude:** 32 55.836  
**Longitude:** 103 20.679

**Northing/Y:** 703645.374  
**Easting/X:** 803510.243

**Convergence:** 0 32 15.99929

**Scale Factor:** 1.000014578

Datum Shift (m.): Delta Lat. = -13.174, Delta Lon = -46.578

---

Remark:

New Mexico Office of the State Engineer  
POD Reports and Downloads

Township: [ ] Range: [ ] Sections: [ ]

NAD27 X: [703645] Y: [803510] Zone: [E] Search Radius: [2640]

County: [ ] Basin: [ ] Number: [ ] Suffix: [ ]

Owner Name: (First) [ ] (Last) [ ]  Non-Domestic  Domestic  
 All

POD / Surface Data Report  Avg Depth to Water Report  
 Water Column Report

POD / SURFACE DATA REPORT 01/06/2006

DB File Nbr	(acre ft per annum) Use	Diversion	Owner	POD Number	(qua
No Records found, try again					